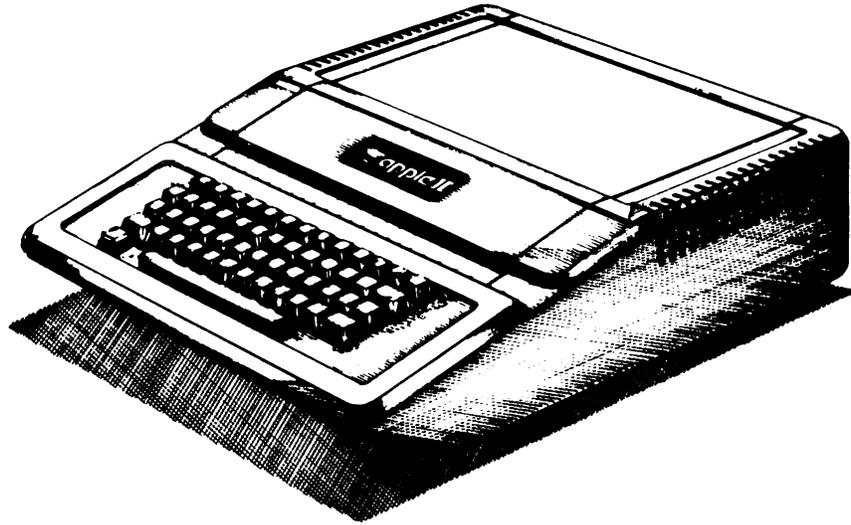


🍏 Apple 2 Computer Technical Information 🍏



Apple II Computer Family
Technical Documentation

**APPLE II FAMILY
HARDWARE INFORMATION**

<ftp://ground.ecn.uiowa.edu/2/apple2/miscinfo/hardware>

May 2001

CATALOG

a2.hw	genericio.specs	mouse.iie
a2memory	graphics.tablet	mousepens
ad.da	grappler-phasor.dips	nsc-
adb.devices	grappler.dips	smartwatch.ds1216e
adb.keyboards	gsfans	nsc.battery
adb.mice	GSpowerlight	nsclock.reset
adb.problem	gssauce.dips	nsclock.resetpatch
aeserialpro	gsslots.bad	nsclock.resetpatch.a
amigamonitor.cable	hardware.projects	sm
annunciators	hdpower	octoram
ap64e	hsscsi.id	octoramgs
ap64e.eprom	ide.interface	oldserial.dips
apple.house	ii+keyboards	paddles
apple2pc.joystck	ii.power	paddles.info
applemuseum.www	iie2gspwr.guide	parallel.signals
bicolor.led	iiepower	parallel2ibm
bitmouse.dips	iigsram	parallelpro
breadboard	interfacing	pc2a2.joystick
buggie.pwr	io16.serial	pc2gs.hscable
buggpower.manual	io32	pcjoystick.base64
bulbs	j25.pinout	PCJoytoAppleII.gif
catweasel	joyst.ibm2aii	pcstick
ccs7710	joystck.read	pcstick.conv
ccs7710a	joystick.asm	pcsticks
clocks	joystick.convertor	pctconnections
CMS.scsi	joystick.ibm2aii	pctdrive.pinout
colorburst.iie	joystick.orca	pctvideo
cvtech.gsrsm	joystick.pcm0d	peaking.coil
dbxx.aux	joystick.read	pinouts
dconnectors	keybd.repair	power.fix
digicard	keyboardrom	power.plug
digitize	keycaps.fix	power.problems
digitizer	keyfix	power.supply
digitizer.circuit	keyfix.2	power.supplyfix
digitizer.circuit2	keypresses	powerfix.cap
diskii.bicolorled	keyswitch.fix	powerglove
diskii.leds	keyswitch.fix2	powersupply.caps
diskkii.led	koalapad.c64	powersupply.fix
drive.signals	kssfan.fix	powersupply.test
dsk535.pinouts	laser128.info	powersupplyfix.resis
duodisk.cable	laser128.ports	tors
dvorak.mod	lcase.promadapt	pwrfix
dynacomp.pwrfix	lego.kits	pwrsppl.leads
echoii.docs.uue	logic.chart	pwrsppl.fixes
encoding35	logictest	pwrsuppl.globar
eprom.convert	lowcase.iiplus	pwrsuppl.iie2iigs
ethernet.cards	maciie	pwrsupply
falsereads.6502	mackybds	pwrsupply.fixes
fastpath4	magnvx.cable	pwrsupply.globar
fasttwgs	mcmultifunc	pwrsupply.pinout
fdc10	mctspeeddemon	ram16k.card
fix.cap	memswitches	ramfast
flash.eeprom	microtek.cards	ramfast.docs
flyback	mockingboard	ramworksexpander
gameio.pinouts	model.numms	resistor.codes
gameio.pins	monitor.repair	rgb.cable
	monitorgs.fix	rgb.connect
	motherboard.power	rgb.flyback.fix

rgb.pinouts	ssc.dips	twgs.osc.and misc
RGB.repair	ssc.example	twgs.speed
RGBcable	ssc.info	twgs.upgrade
romproject-cgo.html	ssc.jumper	twiie.dips
scandoubler.rgb	ssc.reggs	twiie.upgrade
scc	ssc2null.modemcbl	VGAmonitors
shiftkeymod	ssc6551	video.pinouts
sider.tapes	sscclone.manual	video.rgb
sirius.ram	sva	video.softswitches
slots.iienvsgs	sva8	video7
sonicblaster	syssaver.fan	voc.pots
sound.caps	thermistor	voc.setup
sound.cards	timemastii	voltage
sound.digitizer	titanii	wide.narrow
soundin	titaniiie	x10.software
speaker.plug	Trackstar	x10.suppliers
speed.demon	transwarp	zipgs.fast
speeddemon	turbo.mouse	zipgs.prblms
ssc.cable	turboasb	
ssc.cts.etc	twgs	

```
#####
### FILE      : a2.hw
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 9016 bytes   8 KB
#####
```

```
Path:
news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!moe.ksu.ksu.edu!ux1.cs
o.uiuc.edu!newsrelay.iastate.edu!iscsvax.uni.edu!thompsal597
From: thompsal597@iscsvax.uni.edu
Newsgroups: comp.sys.apple2
Subject: Re: Language Card access -- do $C08x switches work on IIGS?
Message-ID: <1993Jun7.004328.13550@iscsvax.uni.edu>
Date: 7 Jun 93 00:43:28 -0600
References: <XHaa5Blwl65w@sms.business.uwo.ca>
Organization: University of Northern Iowa
Lines: 225
```

Fire up your copy buffers. This should answer your question about the soft switches. Four pages of goodies no Appler should be without:

SOFT SWITCHES

ACTION	ADDRESS	READ	WRITE?	\$D0
R	\$C080 / 49280	RAM	NO	2
RR	\$C081 / 49281	ROM	YES	2
de R	\$C082 / 49282	ROM	NO	2
RR	\$C083 / 49283	RAM	YES	2
R	\$C088 / 49288	RAM	NO	1
RR	\$C089 / 49289	ROM	YES	1
R	\$C08A / 49290	ROM	NO	1
RR	\$C08B / 49291	RAM	YES	1
de W	\$C008 / 49160	MAIN ZPAGE,STACK,LC		
W	\$C009 / 49161	AUX. ZPAGE,STACK,LC		
R7	\$C011 / 49169	\$D0 BANK 2(1) OR 1(0)		
R7	\$C012 / 49170	READ RAM(1) OR ROM(0)		
R7	\$C016 / 49174	USE AUX(1) OR MAIN(0)		
de W	\$C002 / 49154	READ FROM MAIN 48K		
W	\$C003 / 49155	READ FROM AUX. 48K		
de W	\$C004 / 49156	WRITE TO MAIN 48K		
W	\$C005 / 49157	WRITE TO AUX. 48K		
R7	\$C013 / 49171	RDG MN (0) OR AX (1)		
R7	\$C014 / 49172	WRT MN (0) OR AX (1)		
de W	\$C000 / 49152	RD/WR MAIN \$40-5F		
W	\$C001 / 49153	RD/WR AUX. \$40.5F		
R	\$C054 / 49236	VIEW PG 1		
R	\$C055 / 49237	VIEW PG 2		
R	\$C056 / 49238	VIEW TEXT & LO-RES		
R	\$C057 / 49239	VIEW HI-RES		

? R7	\$C018 / 49176	80STORE ON(1) OR OFF(0)
R7	\$C01C / 49180	VEIW PAGE 2(1) OR 1(0)
W	\$C07E / 49278	ENABLE DHIRES
de W	\$C07F / 49279	DISABLE DHIRES
R/W	\$C05E / 49246	DHIRES ON
de R/W	\$C05F / 49247	DHIRES OFF
R7	\$C07E / 49278	DHRS ENABLED 1=Y 0=N
R7	\$C07F / 49279	DHIRES ON(1) OR OFF(0)
W	\$C00C / 49164	40 COLUMN
W	\$C00D / 49165	80 COLUMN
R7	\$C01F / 49183	VIEWING 40(0) OR 80(1)
R7	\$C068 / 49256	80/40 DOWN(1) OR UP(0)
W	\$C073 / 49267	RAM BANK (0-15)

HARDWARE LOCATIONS

DEC	HEX	USE
49280	\$C080	PHASE 0 OFF
49281	\$C081	PHASE 0 ON
49282	\$C082	PHASE 1 OFF
49283	\$C083	PHASE 1 ON
49284	\$C084	PHASE 2 OFF
49285	\$C085	PHASE 2 ON
49286	\$C086	PHASE 3 OFF
49287	\$C087	PHASE 3 ON
49288	\$C088	MOTOR OFF
49289	\$C089	MOTOR ON
49290	\$C08A	DRIVE 1
49291	\$C08B	DRIVE 2
49292	\$C08C	READ LATCH OR WRITE+SHIFT
49293	\$C08D	WRITE+LOAD OR PROTECT CHK
49294	\$C08E	READ LATCH OR PROTECT CHK
49295	\$C08F	WRITE+LOAD OR WRITE+SHIFT

I/O FUNCTIONS

READ	WRITE	PROTECTED?
LDA \$C08E,X	LDA \$C08F,X	
...	...	
LDA \$C08C,X	STA \$C08D,X	LDA \$C08D,X
BPL -1	ORA \$C08C,X	LDA \$C08E,X
		BMI PROTECT

SKEWING

DOS : 0 1 2 3 4 5 6 7 8 9 A B C D E F
 PRODOS: 0A 7A 6B 6A 5B 5A 4B 4A 3B 3A 2B 2A 1B 1A 0B 7B
 DISK : 0 D B 9 7 5 3 1 E C A 8 6 4 2 F

SIZES

PRO+VOL+TRK+SEC+CSM+EPG = 3+2+2+2+2+3 = 14 (\$0E)

PRO+BYTES+CSM+EPG = 3+342+2+3 = 350 (\$015E)

4 & 4 encoding = SEC, ROL 1st, AND with 2nd

300 baud = 3.33 bks/min

1200 baud = 13.33 bks/min

2400 baud = 26.50 bks/min

DISK DRIVE ADDRESSES

ADDRESS FIELD											
PROLOGUE				EPILOGUE							
\$D5/213		\$AA/170		\$96/150		\$DE/222		\$AA/170		\$EB/235	
RD	47445	47455	47466	47505	47515	- - -	RD				
	\$B955	\$B95F	\$B96A	\$B991	\$B99B	- - -					
WR	48250	48255	48260	48302	48307	48312	WR				
	\$BC7A	\$BC7F	\$BC84	\$BCAE	\$BCB3	\$BCB8					

Read checksum at \$B989: D0 B7 (47497 = 208,183)

DATA FIELD											
PROLOGUE				EPILOGUE							
\$D5/213		\$AA/170		\$AD/173		\$DE/222		\$AA/170		\$EB/235	
RD	47335	47345	47356	47413	47423	- - -	RD				
	\$B8E7	\$B8F1	\$B8FC	\$B935	\$B93F	- - -					
WR	47187	47192	47197	47262	47267	47272	WR				
	\$B853	\$B858	\$B85D	\$B89E	\$B8A3	\$B8A8					

Read checksum at \$B92D: D0 13 (47405 = 208,19)

RWTS LOCATIONS

\$B7E9 / 47081 = SLOT * 16

\$B7EA / 47082 = DRIVE

\$B7EB / 47083 = ZERO

\$B7EC / 47084 = TRACK

\$B7ED / 47085 = SECTOR

\$B7F0 / 47088 = BUFFER LO

\$B7F1 / 47089 = BUFFER HI

\$B7F3 / 47091 = ZERO

\$B7F4 / 47092 = SEEK/READ/WRITE

\$03E3 / NA = LOAD X/Y WITH PARM LIST ADDRESS
 \$03D9 / NA = CALL RWTS (MUST CALL ABOVE FIRST)

 \$B793 / 46995 = SEEK/READ/WRITE MULTIPLE PAGES
 \$B7E1 / 47073 = NUMBER OF PAGES
 ROM SUBROUTINES
 BASCLCTX \$FBC1
 IP Ar = vtab - 1
 OP \$28.29 = base location htab 1
 HOME \$FC58
 CHAROUT \$FDF0
 IP Ar = a character
 OP print Ar at (\$28)+\$36
 READKEY \$FD0C
 OP character in Ar
 PRINTEX \$FDE3
 IP Ar = a number 00-0F
 OP Ar printed as a number, form \$A
 PRBYTE \$FDDA
 IP Ar = a number
 OP Ar printed as a number, form \$AA
 PRINTAX \$F941
 IP Ar & Xr = a number
 OP Ar & Xr printed as a number, form \$AAXX
 TEXT \$FB2F
 BASCLCHI \$F411
 IP Ar, Xr, Yr = hires location, form YYXX,AA
 OP (\$26) = base address
 CLRHIRES \$F3F6
 IP \$E6 = page, \$1C = hcolor
 OP hires screen cleared to given color
 HPLOT \$F457
 IP \$E4 = hcolor, HPOSN called
 OP point plotted
 PRNMZERO \$FE93
 NORMAL \$FE84
 OP \$32: FF
 WAIT \$FCA8
 IP Ar = length of pause
 OP returns after relative pause
 CHKCOMMA \$DEBE
 IP command line = char
 OP syntax error if not a comma
 GETHIRES \$F6B9
 IP command line = hires location
 OP location in form YYXX,AA, or ill. quant.
 GETCHAR \$00B1
 IP command line = char or token
 OP char/token in Ar
 GETSMNUM \$E6F8
 IP command line = number
 OP Xr = number 00-FF
 GETBGNM \$DD67 + \$E752
 IP command line = number
 OP \$50.51 = number 0000-FFFF
 ILLQUAN \$F6E6
 SNTXERR \$DEC9
 PRTAREG \$FE95
 IP: number in Areg

op: number printed
RDPADDL \$FB1E
IP: Xreg = paddle #
OP: xreg = pdl(x)

A note of care: CLRHIRES has been found to ERASE parts of ProDOS if you don't make sure to set the hires page at \$E6. (found this one out the *hard way*)

E N D O F F I L E
a2.hw
E N D O F F I L E

```
#####
### FILE      : a2memory
#####
### Created   : Tuesday, January 1, 1980  Modified: Thursday, March 1, 1973
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 6266 bytes   6 KB
#####
```

Darkcodel <no-one@microsoft.com> wrote:

```
> I have an enhanced apple ][e with 128k ram and after reading through some
> old nibble magazines of mine, i stumbled across this confusing bit of
> information:
>
> It seems in the apple ][e, memory from $d000-$dfff has two banks where as
> memory from $e000-$ffff has only one, but what happens when there is a
> memory card installed?
```

If you have a 128K Apple IIe, there are actually five banks of memory in the \$D000-\$DFFF area:

- ROM
- Main memory language card bank 1
- Main memory language card bank 2
- Auxiliary memory language card bank 1
- Auxiliary memory language card bank 2

There are three banks in the \$E000-\$FFFF area: ROM, main language card and auxiliary language card.

The auxiliary memory in the IIe (64K memory expansion card) mirrors the main memory for the most part. You have 48KB of RAM from \$0000-\$BFFF and a further 16KB in \$D000-\$FFFF, with two 4KB banks in \$D000-\$DFFF.

There are three main sets of soft switches which deal with auxiliary memory:

- RDMAIN/RDAUX and WRMAIN/WRAUX select main or auxiliary memory for reading or writing the \$0200-\$BFFF area (independent control of read and write bank select).
- MAINZP/AUXZP selects main or auxiliary memory for the \$0000-\$01FF and \$D000-\$FFFF areas (one switch affecting both read and write bank select).

The traditional language card switches (\$C080-\$C083 and \$C088-\$C08B) are independent of the main/aux bank select. You can read from ROM or RAM, and optionally write enable the RAM. Any access to RAM will refer to main or auxiliary RAM according to the MAINZP/AUXZP switch.

- The 80STORE switch determines whether the PAGE1/PAGE2 switch is used to select a displayed video page or whether it is used to bank switch text page 1 (\$0400-\$07FF) between main and auxiliary memory. The AN3 (annunciator 3) switch also plays a role here, determining whether 80STORE also affects hi-res page 1 (\$2000-\$3FFF). I think that the HIREN switch must also be enabled for this, but I'd have to refer to documentation to confirm this.

If you have a multi-bank auxiliary slot RAM card (such as a RamWorks) there is an additional register, usually at \$C073, which selects a bank on the card. This bank then replaces auxiliary memory in the addressing mechanisms of the IIe. I think that the 80-column video buffers only exist in bank 0 of a multi-bank auxiliary slot card.

> I'm use to using the apple][+ with language card...so, could somebody
> please explain
> all the memory bank switching and all the new I/O soft switches in the][e.

There are a lot of new soft switches: the IIe has every location in \$C000-\$C01F used for something (in addition to the keyboard functions which affect all these locations).

The \$C000-\$C00F switches are write-only (reading gives you the keyboard latch). The \$C010-\$C01F switches are read-only, and only bit 7 is significant (bits 0-6 are the last key value).

\$C000-\$C00F READ Keyboard buffer and latch flag in bit 7 (as][/][+)

\$C000 WRITE 80STORE OFF
 \$C001 WRITE 80STORE ON
 \$C002 WRITE RDMAIN
 \$C003 WRITE RDAUX
 \$C004 WRITE WRMAIN
 \$C005 WRITE WRAUX
 \$C006 WRITE SLOTCXROM
 \$C007 WRITE INTCXROM
 \$C008 WRITE MAINZP
 \$C009 WRITE AUXZP
 \$C00A WRITE INTC3ROM
 \$C00B WRITE SLOTC3ROM
 \$C00C WRITE 80VID OFF
 \$C00D WRITE 80VID ON
 \$C00E WRITE PRCHARSET
 \$C00F WRITE ALTCHARSET

\$C010-\$C01F WRITE Reset keyboard latch

\$C010 READ Keyboard buffer, any-key-down flag in bit 7, reset latch
 \$C011 READ RDLC2 Read language card bank 2 enable
 \$C012 READ RDLCRD Read language card read enable
 \$C013 READ RDRAMRD Read main/aux read select
 \$C014 READ RDRAMWR Read main/aux write select
 \$C015 READ RDCXROM Read slot/internal CX ROM select
 \$C016 READ RDAUXZP Read main/aux zero page and language card select
 \$C017 READ RDC3ROM Read slot/internal C3 ROM select
 \$C018 READ RD80STO Read 80-column store enable
 \$C019 READ RDVBL Read vertical blanking
 \$C01A READ RDTXT Read text/graphics enable
 \$C01B READ RDMIX Read full/mixed screen select
 \$C01C READ RDP2 Read page1/page2 select
 \$C01D READ RDHIRES Read hires/lores select
 \$C01E READ RDCHARSET Read primary/alternate character set select
 \$C01F READ RD80VID Read 80-column video enable

The SLOTCX/INTCX switch determines whether \$C100-\$C2FF and \$C400-\$C7FF access slot ROM space or the internal ROM. The internal ROM contains

diagnostic routines and some monitor extensions.

The SLOTC3/INTC3 switch determines whether \$C300-\$C3FF access slot ROM space or the internal ROM. The \$C800-\$CFFF space is tied into this to some extent, following the normal rules for the IOSEL soft switch. The internal ROM in these areas contains the 80-column firmware.

The 80-column video modes are implemented by overlaying main and auxiliary memory buffers, with the hardware reading simultaneously from main and auxiliary memory and outputting data at twice the rate. For each line, bytes alternate between main and auxiliary memory, with the first byte coming from auxiliary memory.

In addition to 80-column text mode, there is a "double lo-res" mode and a "double hi-res" mode. These aren't supported by firmware in the IIe. (The IIgs does support double lo-res mode in Applesoft BASIC.)

The double resolution modes have two video buffers, but it is harder to use the second page, since there are no bank switching methods to toggle the \$0800-\$0BFF and \$4000-\$5FFF areas except the RAMRD/RAMWR switch. In addition, you cannot display page 2 while the 80STORE switch is enabled, since the PAGE1/2 switch becomes a bank selector and the video hardware always displays page 1.

The primary character set is the same as the][+ with the addition of normal lower case characters: \$00-\$3F are inverse, \$40-\$7F are flashing, \$80-\$9B are control characters (display as normal) and \$A0-\$FF are normal, including lower cases.

The alternate character set is used by the 80-column firmware. It disables flashing, and replaces the \$60-\$7F range with inverse lower case characters. The \$40-\$5F range have two implementations: in the original IIe they are inverse upper case (identical to \$00-\$1F), and in the enhanced IIe (and the IIC and IIgs) they are mousetext characters.

```
##### E N D O F F I L E
### a2memory
##### E N D O F F I L E
```

```
#####
### FILE      : ad.da
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1825 bytes   1 KB
#####
```

```
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!cs.utexas.edu!geraldo.cc.utexas.edu!sleepy.cc.utexas.edu!not-for-mail
From: foegelle@sleepy.cc.utexas.edu (Michael Foegelle)
Newsgroups: comp.sys.apple2
Subject: Re: Voltage Samplers for the ][e
Date: 27 May 1994 11:12:35 -0500
Organization: The University of Texas - Austin
Lines: 35
Message-ID: <2s565j$jdm@sleepy.cc.utexas.edu>
References: <CqE5rD.LA5@cpsc.ucalgary.ca>
NNTP-Posting-Host: sleepy.cc.utexas.edu
```

In article <CqE5rD.LA5@cpsc.ucalgary.ca>, Robert Fridman <fridman@cpsc.ucalgary.ca> wrote:

```
>
>Hello.
>
>I want to use my ][e to sample voltages from various sensors. Does
>anyone know where I can get a/d cards. I heard that external a/d
>boards can connect to the apple through the serial card. Does anyone
>know anything about this?
```

For a relatively inexpensive alternative, contact Vernier Software at (503) 297-1760. They're a company that got their start making scientific sensors and programs for the Apple for use in schools. They still sell Apple stuff, as well as IBM and Mac modules. They have a voltage sensor that connects to the game port for \$45 assembled, \$30 in kit form.

You might also try a similar company, PASCO, at 1-800-772-8700.

```
> RF.
```

```
>
```

```
>-----
```

```
>Robert Fridman          fridman@cpsc.ucalgary.ca
>Dept. of Computer Science
>University of Calgary    voice (403) 220-5104
>Calgary, Alberta       fax   (403) 284-4707
>Canada
>
```

Michael Foegelle

```
--
```

```
Michael Foegelle | Call Wunderland BBS! | foegelle@ccwf.cc.utexas.edu
University of    | (512) 472-0544 8n1 | foegelle@utaphy.ph.utexas.edu
Texas at Austin  | 14.4kbaud, v.32/bis | GENie: M.FOEGELLE2
Physics Department | *** New number! (512) 335-6753 effective 6/1/94! ***
```

```
##### E N D O F F I L E
```

ad.da

E N D O F F I L E

```
#####
### FILE      : adb.devices
#####
### Created   : Friday, September 5, 1997 Modified: Friday, September 5, 1997
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 9473 bytes    9 KB
#####
```

Path:

```
news1.icaen!news.uiowa.edu!uunet!in5.uu.net!news.mathworks.com!news.mathworks.com!
www.nntp.primenet.com!globalcenter1!news.primenet.com!bpvh
From: bpvh@primenet.com (Bradley P. Von Haden)
Newsgroups: comp.sys.apple2
Subject: Apple IIgs compatible Mac ADB mice, trackballs and other devices
Date: 5 Sep 1997 17:48:00 -0700
Organization: Primenet (602)416-7000
Lines: 218
Message-ID: <5uq980$mbv@nntp02.primenet.com>
X-Posted-By: bpvh@206.165.6.202 (bpvh)
```

The Apple IIgs can use some Mac ADB mice, trackballs, touchpads and miscellaneous other ADB devices (note: there is a separate list for keyboards). The following ADB devices work with the Apple IIgs. 'Reviews', where available, are included. These reviews, solicited or found in the online world, are used only with the permission of their authors. Additions, corrections and reviews (hint, hint - positive, negative, different, etc) are encouraged.

Last updated: 05 Sep 1997

Some ADB mice that work on a IIgs:

- Apple ADB mice
- Interex Ergonomic
- Interex Mac-100A
- Interex Mac-180
- Jameco Mac Mouse (P/N 119327)
- LogicTech 3 button MouseMan (M/N M-AC13-4MD) - Review
- MicroTrac
- Mouse Systems Optical ADB Mouse
- Mouse Systems Optical ADB Little Mouse - Review
- NeXT ADB
- Precision Instruments - Review
- Sun Mouse

Some ADB trackballs that work:

- CH Products RollerMouse
- Identity Systems Technology Mac Compatible Trackball
- Interex Mac-200 Mac Compatible Trackball
- Kensington TurboMouse ADB (old)
- Kensington TurboMouse ADB v3.0 [note: later versions NOT IIgs compatible]
- Logitech Trackman Marble for Macintosh (P/N 804219-0000) - Review
- MicroSpeed Trackball for Mac ADB
- MicroSpeed MicroTRAC Trackball - Review

Precision Instruments Macintosh ADB Trackball - Review

Other ADB devices that work:

Cirque Glidepoint touchpad
Touche Technologies TouchPad - Review

Electric Crayon (Quality Computer)

Mice Reviews:

LogicTech 3 button MouseMan (M/N M-AC13-4MD) (Made in Ireland)
[Tony Cianfaglione]

I use a Logitech ADB three button mouse with my GS and all three buttons function well. The left button selects the item, the middle button scrolls left or up and the right button scrolls down and right among the GS desktop items such as Finder lists or lists of items in programs such as Print Shop GS and Appleworks GS.

The two scrolling buttons also work on any GS finder list. It comes in extremely handy when scrolling through subdirectories containing hundreds of files. You can scroll a lot faster and with much more precision that you can by using the up or down scroll buttons within the window itself.

My GS is accelerated to 13.75 mhz and the scroll function is fantastic. The 3 button mouse is the way to go as far as I'm concerned.

Mouse Systems ADB Little Mouse (M/N 403323-001) [Don V. Zahniser]

An optical mouse that is slightly smaller than the standard Apple mouse. The mouse button is larger than that of the Apple mouse, covering about the front 1/3 of the mouse body. Switch action is more sensitive than the Apple mouse. Comes with a metal mousepad with an imprinted pattern that the mouse responds to. Felt strips on the bottom of the mouse make it self-cleaning. 'Faster' than the Apple mouse (less movement of the mouse for the same cursor movement) and ultra-reliable.

Precision Instruments Mouse [Ryan Suenaga]

Category 12, Topic 32
Message 62 Sat Dec 03, 1994

Shopping tip for you. . . I was at Computer City tonight and picked up a "precision instruments" brand mouse which is two buttoned (one for chording) and, not only was it cheap (29.99), not only does it work, but the documentation actually says (verbatim):

"Your pointing device is compatible with the
MACINTOSH, MACINTOSH II, MACINTOSH IICX and
_APPLE II GS.-"

We do get a little respect, sometimes. . .

Trackballs:

Logitech Trackman Marble for Macintosh (P/N 804219-0000) [Don V. Zahniser]

An ergonomically-designed trackball with 3 mouse buttons that correspond to the index, middle, and third finger positions. The thumb moves the trackball (about 1.25" diameter), which is mounted on the left-hand side of the assembly. Software is provided for programming the buttons on the Macintosh, but on the GS, all three buttons act as a normal mouse button. On a ROM 01, fast mouse speed is fine for normal use, but slow is better for activities that require precision. A really nice, comfortable, easy to use trackball. Does not have a free-wheeling spinning action as on some larger trackballs. Appears to be immune to dirt build-up.

MicroSpeed MicroTRAC Trackball [Don V. Zahniser]

Category 12, Topic 32
 Message 222 Tue Mar 28, 1995
 D.ZAHNISER [IronTooth] at 18:39 EST

Well, there was this really cute little MicroTRAC (by Microspeed) trackball there, and it sort of followed me home. It's one of those little thingies that can be used with laptops, with a total footprint about 2/3 the size of the mouse that came with my GS. I have it attached to the side of my keyboard right now. It's a three button mouse - er, trackball. Left has standard mouse button action, right is a double-click button, and center (behind the little ball) is a click-lock button. It's got an LED that lights up when the mouse button is down (great for those 2am CoPilot sessions ;^). Action on the ball is pretty good (far better than my defective Kraft), but certainly not as smooth as the Kensington Expert Mouse that I use on my Vectra at work. I kinda like it :^)

Don V. Zahniser
 Delivered by: CoPilot v2.55 & ANSITerm v2.12

 Category 12, Topic 32
 Message 224 Sat Apr 01, 1995
 D.ZAHNISER [IronTooth] at 11:14 EST

A quick update on the MicroTRAC -

This little critter has a decided X-Y axis preference; I think it's because it doesn't have a diagonal idler bearing. This makes it harder to track from corner to corner of the screen. OTOH, it is GREAT as a 'mouse' in AppleWorks, where inadvertant diagonal movement of my mouse was driving me crazy trying to position the cursor (and yes, I did play with the mouse sensitivity settings).

The other neat thing about this micro-ball is that I have it mounted on a bracket from one of the screws holding the keyboard case together. I work the ball and switches with my fingers, and my thumb is resting right next to the 'Enter' key at the keypad. I actually need to move back and forth to the keyboard less than before when negotiating menus and dialogs. Having the Enter key so 'handy' compensates to a great extent for the X-Y preference.

Don V. Zahniser
Delivered by: CoPilot v2.55 & ANSITerm v2.12

Precision Instruments Macintosh ADB Trackball [Ryan Suenaga]

Category 12, Topic 32
Message 154 Sun Mar 12, 1995
R.SUENAGA1 [Ryan] at 23:49 EST

For those interested in a GS compatible trackball;

Precision Instruments makes one; it's labeled as a Macintosh ADB but it works just fine with my GS. Got mine for just under \$40 at the local Computer City, and yes, even the lock light works. . .

Ryan
Graduate School:
What to do when you really don't want to grow up!
(And delivered by Copilot and PT 3.1 :)

Other ADB devices:

Touche Technologies, Inc Touchpad (ADB version) [Don V. Zahniser]

Although this touchpad appears to work pretty well some of the time, it has one glaring flaw: It will not 'release' the button action in some instances. The effect is that the user moves the cursor to the proper position, but when attempting to 'double-click', the cursor will move (drop) even when the finger is no longer touching the pad. My suspicion is that the Touche touchpad is marginally too sensitive for the GS. The Macintosh software supplied with the touchpad supposedly allows for adjustment, but this option is not available on the GS. I have tried it on two ROM 01 systems with the same results.

Reviewers Contact Information:

Tony Cianfaglione [ab616@chebucto.ns.ca or
ip-nsaug@chebucto.ns.ca]
Ryan Suenaga [A2LAMP@genie.com]
Don V. Zahniser [d.zahniser@genie.com]

**** bpvh Internet: bpvh@primenet.com GENie: B.VONHADEN ****
**** Posted by an Apple IIgs using my own Proterm 3.1 File Macro ****

E N D O F F I L E

adb.devices

E N D O F F I L E

```
#####
### FILE      : adb.keyboards
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2728 bytes   2 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!newsfeed.internetmci.com!news.fibr.net!nntp.news.
primenet.com!news.primenet.com!bpvh
From: bpvh@primenet.com (Bradley P. Von Haden)
Newsgroups: comp.sys.apple2
Subject: RE: Replacement keyboard for IIgs P/N C 658-4081
Date: 6 Jan 1996 23:11:03 -0700
Organization: Primenet (602)395-1010
Lines: 61
Sender: root@primenet.com
Message-ID: <4cno5n$kkq9@nnrpl.news.primenet.com>
X-Posted-By: bpvh@usr3.primenet.com
```

crownmi@io.org (Myles Fudge) wrote:

```
>Since my stock GS keyboard has been flaky for a little while, and
>now I've got my PCT working, I'm looking for a keyboard
>replacement that resembles the extended keyboard (F-keys, etc). I
>have purchased two 'extended' keyboards that do not work with my
>GS's ADB port. They are both Mac keyboards. One is "MacAlly
>Peripherals Extended Keyboard" and the other is "Micro Speed Mac
>Keyboard Deluxe. Neither keyboard requires a driver to work with
>the Mac, and both are standard 105-key layouts.
```

Here is a list of ADB keyboards that I have compiled as of 96/01/06.
Additions/corrections welcome.

'+' designates changes from previous list

I have the following that work:

```
AppleDesign Keyboard ($85-90)
Apple Extended Keyboard II ($155-160)
Adesso 105 Extended Keyboard ($80 - Mac's Place, MacZone, Tiger SW)
Adesso 102 Extended Keyboard w/ Trackball [Trackball does NOT work]
($100 - Mac's Place, MacZone, Tiger Software)
Arrive Extended ($50 - MacMall)
Interex 105 Extended ($55 - MacMall, Syex Express; $34 - Computer City)
Key Tronic MacPro Plus ($130 - MacZone, APS Tech.)
OptiMac Extended Keyboard (???)
PowerUser 105E Extended Keyboard ($50 - MacWarehouse)
SIIG, Inc MacTouch Model 1905 (~$100.00)
Sun OmniMac Ultra [extended, ADB type] (???)
Suntouch ADB Extended Keyboard ($75 - Syex Express)
VividKey Extended Keyboard ($60 - MacMall)
```

Do not work:

Apple Adjustable Keyboard

MacALLY Peripherals Extended Keyboard
MicroSpeed Keyboard Deluxe MAC

???:

ClubMac Extended Keyboard (\$59 - ClubMac)
Datadesk MAC 101 E (\$100 - MacWarehouse, MacZone)
Datadesk TrackBoard (\$100 - MacWarehouse, MacZone)
Key Tronic Trak Pro Plus (\$230 - APS Tech.)
Performance Soft Touch Extended Keyboard (\$59 - MacZone)
Spring Sun Tech MacPride 97 (\$90 - MacMall)
Spring Sun Tech MacPride 105 (\$59 - MacMall)
Spring Sun Tech MacPride 110 (\$80 - MacMall) [MAC/IBM switchable]
Spring Sun Tech MacPride KidBoard (\$100 - MacMall)

????:

Adesso Tru-From Ergonomic extended keyboard (\$90 - CDW)
Adesso Tru-Form Ergonomic ext kb w/ pointer (\$116 - MacZone)

**** bpvh Internet: bpvh@primenet.com GENie: B.VONHADEN ****
**** Posted by an Apple IIgs using my own Proterm 3.1 File Macro ****

E N D O F F I L E
adb.keyboards
E N D O F F I L E

```
#####
### FILE      : adb.mice
#####
### Created   : Wednesday, May 6, 1998   Modified: Wednesday, May 6, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1253 bytes   1 KB
#####
```

Path:

```
news1.icaen!news.uiowa.edu!news2.chicago.iagnet.net!qual.net!iagnet.net!newsreader
.digex.net!www.nntp.primenet.com!globalcenter0!news.primenet.com!bpvh
From: bpvh@primenet.com (Bradley P. Von Haden)
Newsgroups: comp.sys.apple2
Subject: Re: Apple II GS mice -- Mac-mouse compatibility?
Date: 6 May 1998 13:13:03 -0700
Organization: CD Club Central
Lines: 26
Message-ID: <6iqg8f$hri@nntp02.primenet.com>
References: <6il20t$elt@netaxs.com>
X-Posted-By: bpvh@206.165.6.204 (bpvh)
Xref: news1.icaen comp.sys.apple2:133454
```

vsp@unix3.netaxs.com (have clue--will travel) wrote:

```
>Are there any Mac mice known not to work with the GS's ADB port,
>and are there any cheapies out there that are considered good?
```

While not an exhaustive list, here are some ADB mice that work on a IIgs:

- Apple ADB mice
- Interex Ergonomic
- Interex Mac-100A
- Interex Mac-180
- Jameco Mac Mouse (P/N 119327)
- LogicTech 3 button MouseMan (M/N M-AC13-4MD)
- MicroTrac
- Mouse Systems Optical ADB Mouse
- Mouse Systems Optical ADB Little Mouse
- NeXT ADB
- Precision Instruments
- Sun Mouse

```
**** bpvh      Internet: bpvh@primenet.com      Delphi: bpvh ****
**** Posted by an Apple IIgs using my own Proterm 3.1 File Macro ****
```

```
##### E N D O F F I L E
### adb.mice
##### E N D O F F I L E
```

```
#####
### FILE      : adb.problem
#####
### Created   : Wednesday, June 10, 1998 Modified: Wednesday, June 10, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 4161 bytes   4 KB
#####
```

Path:

```
newsl.icaen!news.uiowa.edu!iagnet.net!iagnet.net!NewsNG.Chicago.Qual.Net!Qual.Net!
ais.net!nntp.giganews.com!newsgate.swbell.net!151.164.30.35.MISMATCH!cyclone.swbel
l.net!swbell!not-for-mail
```

From: Rubywand <rubywand@swbell.net>

Newsgroups: comp.sys.apple2

Subject: Re: help with broken GS

Date: Wed, 10 Jun 1998 05:44:16 -0500

Organization: Southwestern Bell Internet Services, Richardson, TX

Lines: 80

Message-ID: <357E6380.4E2F46C@swbell.net>

References: <357F2600.AA434F7@tridel.net>

Reply-To: rubywand@swbell.net

NNTP-Posting-Host: ppp-207-193-8-21.hstntx.swbell.net

Mime-Version: 1.0

Content-Type: text/plain; charset=us-ascii

Content-Transfer-Encoding: 7bit

X-Trace: (null) 897475466 10652 (None) 207.193.8.21

X-Complaints-To: usenet@nnrp3

X-Mailer: Mozilla 4.04 [en] (Win95; I)

Xref: newsl.icaen comp.sys.apple2:135111

Jon Christopher Co writes ...

>

```
> I was using my GS and smoke started coming out from the inside. after
> opening it up my best guess tells me the smoke came from an 8 legged
> chip right under the power supply at the upper leftmost corner (right
> behind the composite video connector and ADB jack). Right now the
> computer still boots up, but will not respond to any ADB device
> (keyboard). can anybody identify what this chip is? i also noticed
> there is a slight bump in the middle.. is this normal or is it > supposed to be
perfectly flat?
```

My guess is that the chip or module you are talking about is L2 "D-15C". This is an 8-pin thing with 4 inductors (coils). Three inductors are used. They are in series with the ADB Desktop connector.

Evidently, one of the inductors burned out. This would explain the loss of ADB functioning and the bump on the module.

Repairing the burned out inductor should be fairly easy, although it will probably be necessary to remove the motherboard. You could take a length of thin wire-- like wirewrap wire-- make a small coil, and connect it across the terminals of the module corresponding to the burned-out inductor.

The three inductors run ...

pin 1 to pin 8

pin 2 to pin 7
pin 3 to pin 6

You can use an Ohm meter to detect which one is open. (Example: the correct reading from pin 2 to pin 7 would, probably, be less than an Ohm.)

The 'catch' in all this is ... Why did the inductor burn out?!

Since the pin2-pin7 inductor connects to +5V on the pin7 side, it appears that pin2 is, some how, shorted to ground.

Another possible candidate is the pin1-pin8 inductor. Pin8 connects to +5V through a 470 Ohm resistor. If pin1 should be shorted to ground, there might be enough current to heat up and burn out the pin1-pin8 coil. However, this does not seem likely.

With the motherboard removed and KB disconnected, check Resistance from pin1 to pin8, etc.. When you find the open (high R) inductor, check R from the low-numbered side (1, 2, or 3) to Ground. (The silvery metal shield near the ADB socket should be = Ground.)

If you discover a low R (like a few Ohms) to ground on the low number side of the blown inductor, my guess is that it will be at pin2 and that the culprit is a shorted capacitor, BC91 and that your GS is a ROM-03 (since no capacitor is shown on the ROM-01 schematic). If this is the case, cut the trace to the capacitor and replace it with a compact 0.01 uF capacitor rated at 15V or better.

Another possible cause of shorting is a bent piece of shielding near the ADB connector.

If you discover no short on the low-numbered pin of the blown inductor, plug in your ADB cable without the KB and measure again. If you, now, find a short, the indication is a messed up cable.

If there is, still, no short plug in the KB. A short now would indicated a messed up connection at the KB socket.

If there is, still, no short, try the check while wiggling the cable and plugs on both ends.

If you can find no short, my suggestion is that you remove the bottom and back shields and throw them away-- they are a shorting hazard.

After repairing the blown coil with a bit of coiled wire, put everything together and see if your GS is fixed.

Rubywand

```
##### E N D O F F I L E
### adb.problem
##### E N D O F F I L E
```

```
#####
### FILE      : aeserialpro
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2931 bytes   2 KB
#####
```

Path:

```
blue.weeg.uiowa.edu!news.uiowa.edu!uunet!usc!howland.reston.ans.net!agate!msuinfo!
kagunij.bch.msu.edu!user
From: carrkevi@student.msu.edu (Kevin M. Carr)
Newsgroups: comp.sys.apple2
Subject: Re: AE Serial Pro
Date: Mon, 22 Aug 1994 01:57:55 -0600
Organization: Michigan State University, Dept. of Biochemistry
Lines: 58
Message-ID: <carrkevi-2208940157550001@kagunij.bch.msu.edu>
References: <1994Aug20.124829.20517@pro-algonquin.mn.org>
NNTP-Posting-Host: kagunij.bch.msu.edu
```

In article <1994Aug20.124829.20517@pro-algonquin.mn.org>,
craigl@pro-algonquin.mn.org (Craig Larson) wrote:

```
> Could someone who has an Applied Engineering Serial Pro card please send me
> a list of the dip switch settings for the 2 banks of switches? Thanks in
> advance!
> ----
```

I use an AE Serial Pro in my //e to connect to my ImageWriter II. All of the DIP switches are set to OPEN (switch down). The switch block next to the printer interface connector is for hardware handshaking signals. (Copied without any permission whatsoever from the AE Serial Pro User's Manual.)

- o Switch 1, when closed, select pin 4 (Request to send) as the flow control handshaking line. Some printers which use this line are: Data General TP2; Heath H-25; Olympia ESW102/103; QUME Sprint 5; and Smith-Corona TP1
- o Switch 2, when closed, selects pin 11 which is, according to RS-232-C specifications, undefined and is used by some serial printers as a printer-ready signal. Some Centronics, Texas Instruments, and Epson serial printers may use this pin.
- o Switch 3, when closed, selects pin 19 (Secondary Request to Send) as the handshaking line. Some of the printers that use this pin are the Anadex DP8000/9000, Bell TP-1000, Lear Seigler 310, NEC 3500/7700, and Digital Equipment (DEC) LA-series serial printers.
- o Switch 4, when closed, selects pin 20 (Data Terminal Ready) as not only the device-available handshaking line but also as the data-flow-control line. Some Diablo, C.Itoh, Okidata, QUME, Tectronics, or Xerox printers may use this handshaking signal.
- o When all of the switches are open, Data Terminal Ready (DB-25 pin 20) is the only line monitored as the hardware handshaking line

from your printer. This supports most popular serial printers.

The second set of DIP switches (close to the front of the card) is for generating Maskable (IRQ) and Non Maskable (NMI) interrupts from the 6551 Asynchronous Communications Interface Adaptor (ACIA) chip and the 6818 clock chip. The switches select the type and source of interrupt request. Normally all switches are in the OPEN position.

- o Switch 1: IRQ from 6551
- o Switch 2: NMI from 6551
- o Switch 3: IRQ from 6818
- o Switch 4: NMI from 6818

Hope this information helps.

Kevin M. Carr
carrkevi@student.msu.edu

```
##### E N D O F F I L E  
### aeserialpro  
##### E N D O F F I L E
```

```
#####
### FILE      : amigamonitor.cable
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1728 bytes   1 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!cs.utexas.edu!swrinde!sgiblab!munnari.oz.au!newshost.anu.edu.au!csc.canb
erra.edu.au!student!u901841
From: u901841@student.canberra.edu.au (Hickey / Michael Gerard (ISE))
Subject: Re: Help! Need replacement GS monitor info
Message-ID: <1994Mar12.071700.3587@csc.canberra.edu.au>
Sender: news@csc.canberra.edu.au
Nntp-Posting-Host: student.canberra.edu.au
Organization: University of Canberra
References: <CM3p6w.BLJ@hpcvsnz.cv.hp.com> <1994Mar4.234639.11768@pro-sol.cts.com>
Date: Sat, 12 Mar 94 07:17:00 GMT
Lines: 33
```

In article <1994Mar4.234639.11768@pro-sol.cts.com> james@pro-sol.cts.com
(James Stafford) writes:

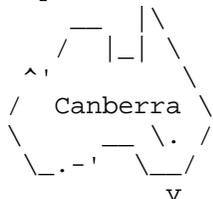
```
>All Tech Electronics sells RGB monitors that they specially set up for the
>Apple II for arround $150.00 I believe. These monitors were Attari monitors
>that they fixed to work on Aplle II's. All Tech's # is 1-800-995-7773.
>Also Quality Computers has monitors made by Magnavox for the Apple II. The
>price of these RGB monitors are $300.00. Quality's # is 1-800-777-3642.
>I should mention that All Tech also has used Aplle RGB monitors.
```

I have good information that the AMIGA 1084s monitor will work with the
Apple IIgs. I have no information on the quality of the output, I've seen
some Amiga displays that look no better than your average colour TV.
Perhaps the local WAL-Mart will have a few in stock at a low price.

You will need to build your own DB9 to DB 15 cable.

```
1084s to //gs
DB9      DB15
1        13
3        2
4        5
5        9
7        3
```

easy!



Michael Hickey
u901841@student.canberra.edu.au

```
##### END OF FILE
### amigamonitor.cable
```

E N D O F F I L E

```
#####
### FILE      : annunciators
#####
### Created   : Tuesday, November 26, 1996 Modified: Tuesday, November 26, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1840 bytes    1 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.erols.net!feedl.news.erols.com!phase2.worldnet.att.net!uunet!inl
.uu.net!news.emi.com!usenet
From: drsmooth@relex.com (Edhel Iaur, Esq.)
Newsgroups: comp.sys.apple2
Subject: Re: Interfacing the Apple // to External devices
Date: Tue, 26 Nov 1996 01:04:07 GMT
Organization: US-A2WUG
Lines: 30
Message-ID: <57dfor$3l3@news.emi.com>
References: <3298A07A.2C7C@usfca.edu>
Reply-To: drsmooth@relex.com
NNTP-Posting-Host: slip12.relex.com
X-Newsreader: Forte Free Agent 1.0.82
```

Matt McDonald <mcdonaldm@usfca.edu> wrote:

```
>Has anyone tried interfacing their Apple // to external devices, such as
>motors for robotics experiments, and such? I am interested in attempting
>this, and wondered if any others have any advice...
```

The first things to try is the following (use relays & external power if 3.5V ain't enough):

```
Poke -16296,1 Clear game I/O AN0 output (OFF-3.5V HIGH)
Poke -16295,0 Set game I/O AN0 output (ON-.3V LOW)
Poke -16294,1 Clear game I/O AN1 output (OFF-3.5V HIGH)
Poke -16293,0 Set game I/O AN1 output (ON-.3V LOW)
Poke -16292,1 Clear game I/O AN2 output (OFF-3.5V HIGH)
Poke -16291,0 Set game I/O AN2 output (ON-.3V LOW)
Poke -16290,1 Clear game I/O AN3 output (OFF-3.5V HIGH)
Poke -16289,0 Set game I/O AN3 output (ON-.3V LOW)
```

These correspond to some pins on the internal 16-pin joystick socket near the right-rear. I forgot which ones; sorry. If you're interested, someone (or maybe I) can find out which pins go where.

```
--
| / / / />_____ +==Apple // Forever==+
| \ \ / / M#M#M# | |_____ ---_ +-37th Wisest Wizard-+
| #M#M#M# | |_____ --- +- Edhel Iaur, Esq. -+
| / / \_/ \>
http://www.wco.com/~3d5dlwsw/US-A2WUG/FOUNDING.MEMBERS/HOME.PAGES/EDHEL
```

```
##### E N D O F F I L E
### annunciators
##### E N D O F F I L E
```

```
#####
### FILE      : ap64e
#####
### Created   : Tuesday, January 1, 1980 Modified: Thursday, March 1, 1973
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1201 bytes    1 KB
#####
```

This news thread inspired me to play with my AP-64E card...

I haven't used this thing since my dad last used it. The card works, and I even have the original documentation for it. However, I have a couple of questions that the manual doesn't help me with (poorly written - I think it was translated to English)...

- When I place a ROM into the textool (2716, 2732), does the ROM get placed into the UPPER 24 pins (leaving the last two on the bottom empty, and pin #1 closest to the textool lever), OR is it the LOWER 24 pins?

- When I want to make a binary file of the ROM that's currently in the textool, what start address and length do I use?

In my dad's handwritten notes in the manual, he wrote down:

```
BSAVE NAME OF FILE,A$XXXX,L$XXXX
```

Then he has specific address ranges that he had written down:

```
2K - BSAVE APPLE D8,A$4000,L$800
4K - BSAVE APPLE D8,A$4000,L$1000
8K - BSAVE APPLE D8,A$4000,L$2000
```

Then to verify two memory locations, he had the following written down:

```
2K - 4000<6000.7FFV
4K - 4000<6000.6FFFV
8K - 4000<6000.7FFFV
```

Can someone make some sense into what all that stuff means?

As Patrick suggested, I placed the burner card into slot 7 of my Apple IIe.

Thanks, guys!

```
##### E N D O F F I L E
### ap64e
##### E N D O F F I L E
```

```
#####
### FILE      : ap64e.eprom
#####
### Created   : Tuesday, January 1, 1980  Modified: Thursday, March 1, 1973
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 890 bytes   1 KB
#####
```

Andrew Harvey schrieb:

```
>
> Does anyone have docs for the AP-64E eprom burner for the Apple ][?
> I think it has onboard software, but, I don't know how to access it.
```

There are seven DIP-switches next to the EPROM socket. You have to close 3..4 of them to select the EPROM type. The card supports 2716, 2732 and 2764 wit Vpp=21 V. 2764A (Vpp=12,5V) cannot be used.

Set the EPROM type, insert the chip and type PR#7. In fact, you can use any slot for the card, but you will use slot 7 because this is the only slot where you can access the Textool socket. The software asks for the EPROM type (2k, 4k, 8k), then a menu appears. Select Blanktest, Read, Pgm or whatever. When the software asks you to 'close SW' you have to close the black switch next to the EPROM socket. This turns on Vpp, the red LED will light. Do not remove the EPROM while this light is on.

That's all.

Patrick

```
##### E N D O F F I L E
### ap64e.eprom
##### E N D O F F I L E
```

```
#####
### FILE      : apple.house
#####
### Created   : Monday, November 24, 1997 Modified: Monday, November 24, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1253 bytes   1 KB
#####
```

Path:

```
news1.icaen!news.uiowa.edu!news1.chicago.iagnet.net!iagnet.net!199.0.154.56!ais.net!newsfeed.concentric.net!global-news-master
From: Erick Wagner <wagnere@concentric.net>
Newsgroups: comp.sys.apple2.marketplace,comp.sys.apple2
Subject: Re: Apple IIe House Control?
Date: Mon, 24 Nov 1997 00:36:41 -0600
Organization: Concentric Internet Services
Lines: 12
Message-ID: <34792079.6A96@concentric.net>
References: <narf-2111972140300001@s29.netgate.net>
Reply-To: wagnere@netcom.com
NNTP-Posting-Host: ts007d17.dal-tx.concentric.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Mailer: Mozilla 3.0 (Win95; U)
To: Matt Clark <narf@netgate.net>
Xref: news1.icaen comp.sys.apple2.marketplace:21896 comp.sys.apple2:127634
```

Matt Clark wrote:

```
>
> I seem to remember seeing a book about using an Apple IIe as a house
> controller. (IE: Lights, etc). Anyone heard of it?
```

You're probably thinking of a book called "The Apple House" by John Blankenship. It was published by Prentice-Hall in 1984. The ISBN is 0-13-038711-8 (paperback) or 0-13-038729-0

You might be able to locate a copy at a local library or a second-hand bookstore like Half-Price Books (not sure if this is local, regional, or national).

```
##### E N D O F F I L E
### apple.house
##### E N D O F F I L E
```

```
#####
### FILE      : apple2pc.joystck
#####
### Created   : Wednesday, February 5, 1997   Modified: Wednesday, February 5, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5574 bytes   5 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!chi-
news.cic.net!mr.net!newsfeeds.sol.net!news.maxwell.syr.edu!cpk-news-
hubl.bbnplanet.com!news.bbnplanet.com!cam-news-
hubl.bbnplanet.com!howland.erols.net!newsxfer3.itd.umich.edu!portc01.blue.aol.com!
audrey01.news.aol.com!not-for-mail
From: rubywand@aol.com
Newsgroups: comp.sys.apple2
Subject: Re: Apple Joystick adapter for IBM port available? How to make?
Date: 5 Feb 1997 18:22:46 GMT
Organization: AOL http://www.aol.com
Lines: 222
Message-ID: <19970205182201.NAA21017@ladder01.news.aol.com>
References: <32f87b85.1846351@news.minn.net>
NNTP-Posting-Host: ladder01.news.aol.com
X-Admin: news@aol.com
X-Newsreader: AOL Offline Reader
```

In article <32f87b85.1846351@news.minn.net>, ttec@minn.net (Greg) writes:

```
>
>I have an apple //c joystick and was wondering if anyone out there has
>made a cable/adapter to use it with an IBM joystick port.
>
>
```

Here is a Step-by-Step followup to the earlier info on doing the Apple2-to-PC joystick conversion ...

Apple2-to-PC Joystick Conversion: Part 2

Step-by-Step (2/5/97 version)
to A2-WUG,lwsw, GS.WorldView

DOING THE CONVERSION

To convert an Apple2 joystick for PC use you will need a cable from an old PC stick (or a 6-wire cable and 15-pin female connector). You can find junk PC sticks with good cables at flea markets and lots of other places. You will also need two 330k resistors.

1. First, open the Apple joystick case and mark each wire going to the cable. The best way is to use small self-stick labels. Label each wire by function (e.g. "+5", "X", "GND", etc.).

You can use an Ohm meter to, for example, verify that the wire you think is Button 0 really goes to pin 7 on the Apple 9-pin connector (or pin 2 on the old 16-pin IC style connector). Pinouts for both kinds of A2 sticks are shown below:

Apple II Joystick
(9-pin male)

[2]---- +5V
[7]---- Button 0
[5]---- X-axis
[8]---- Y-axis
[1]---- Button 1
[3]---- Ground

Apple II Joystick
(16-pin IC-style plug)

[1]---- +5V
[2]---- Button 0
[6]---- X-axis
[10]--- Y-axis
[3]---- Button 1
[8]---- Ground

The +5V wire is easy to find. It will go to each pot and to one side of each Button switch.

The Apple2 Ground wire goes to the 'bottom' end of each fixed resistor. You do not need to label it; because it will be removed.

2. Once the wires are labeled, cut each about 1 inch from the point it goes into the cable. Remove the cable. (Keep the cable; it may come in handy for some later Apple2 project.)

Now, is the time to rewire the Buttons.

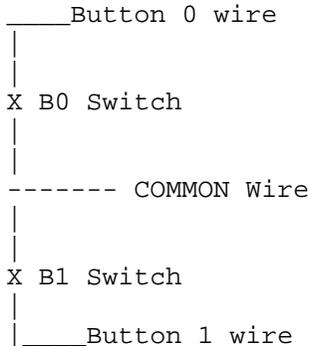
3. Remove (snip or unsolder) the two fixed resistors. If the Button 0 or Button 1 lead becomes disconnected from its switch during removal of a resistor, reconnect the lead.

Check to see that, now, the Button 0 wire is the only one going to one side of the Button 0 switch. The same goes for the Button 1 wire.

Snip off or unsolder the +5 leads

going to the other side of each button switch at the non-switch end. If a wire runs from one switch to the other, leave it alone. If not, connect a wire from switch to switch. This is the "common" side of the switches.

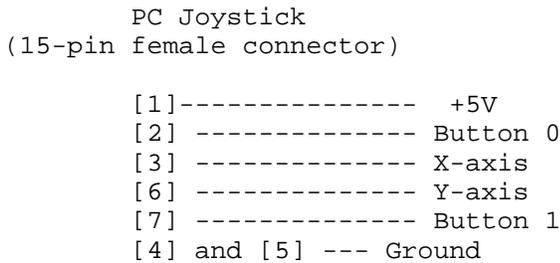
You want to end up with a single wire going to the common side of the switches and separate Button 0 and Button 1 wires going to the other side:



Label the COMMON wire as "GROUND"

4. The 330k resistors will help bring the outputs of the Apple2 X and Y 150k Ohm pots closer to the 0-100k range PC prefers. Connect a 330k resistor 'across' each pot-- i.e. from the center post to the post going to a +5 lead.

5. Label each of the leads coming from the PC cable. If it is still connected to a joystick, the following pic will help identify each lead:



If the cable is still connected, snip the the leads once they are all labeled. If both Ground ([4] and [5]) leads are present, twist them together and treat like a single Ground lead.

FINISHING UP

You have six labeled wires in the Apple2 joystick case: +5, GROUND, B0,

B1, X, and Y. The same six leads are labeled on the PC cable. Splice each Apple2 wire to the corresponding PC cable wire. Use heat-shrinkable tubing to cover each connection.

Seat the new cable in the joystick case, arrange leads to avoid mounting posts, etc., and close up the case. Viola!

CHECKS

If you have an Ohm meter here are some checks you can do:

X (Horizontal) Check- check R between cable pins 1 and 3. As you move stick left to right R should go from 0 to about 100k.

Y (Vertical) Check- check R between cable pins 1 and 6. As you move stick up to down R should go from 0 to about 100k.

Button 0 Check- (Button 0 is the main, "Fire" button.) cable pins 2 and 4 or 5. It should be very high and go to 0 when Button 0 is pressed.

Button 1 Check- check R between cable pins 7 and 4 or 5. It should be very high and go to 0 when Button 1 is pressed.

TRYOUT

Plug in the stick and try it with a game.

Some games (such as Elite Plus) will claim no joystick is present if the stick is badly out of adjustment. If this happens, try the stick on a game which is less picky and includes pre-play stick adjustment.

Once adjusted, your 'new' stick should work fine with all PC wares.

R/\//\//

Rubywand

```
##### E N D O F F I L E
### apple2pc.joystck
##### E N D O F F I L E
```

```
#####  
### FILE      : applemuseum.www  
#####  
### Created   : Thursday, January 16, 1997 Modified: Thursday, January 16, 1997  
### File Type: "TEXT"      File Creator: "LMAN"  
### File Size: 2078 bytes   2 KB  
#####
```

```
Path: newsl.icaen!news.uiowa.edu!chi-news.cic.net!feedl.news.erols.com!tezcat!cam-  
news-hubl.bbnplanet.com!news.bbnplanet.com!su-news-  
hubl.bbnplanet.com!newsxfer3.itd.umich.edu!howland.erols.net!newsfeed.internetmci.  
com!news.hughes.net!pm-35-169.hughes.net!user  
From: gcifu@hughes.net (Greg Cifu)  
Newsgroups: comp.sys.apple2  
Subject: Apple Online Museum  
Date: Mon, 13 Jan 1997 18:56:15 -0800  
Organization: Electronic Commerce  
Lines: 36  
Message-ID: <gcifu-1301971856150001@pm-35-169.hughes.net>  
NNTP-Posting-Host: pm-35-141.hughes.net
```

I'm not normally a participant of this group. You guys are WAY over my head when it comes to Apple II stuff. I am however a Macintosh (and Apple in general) proponent.

I am writing to share the existence of my Unofficial, Unauthorized Apple Online Museum. It started with a Mac 512, then a IIC, IIgs and it snowballed from there.

<<http://www.hughes.net/~gcifu/applemuseum/index.html>>

I've tried to be true to each model to the best of my abilities and research. Of particular interest is the Gantt style timeline of the introduction of each model from 1976 through to the Macintosh (graphical browser required). It's interesting to see which models coexisted in the Apple lineup.

There are pages on each model. The Apple II pages are a little thin but I'm working on them. Since rolling out the new version of the site 1/1/97 I've also purchased a IIE, and a Mac 128 (coming soon). An Apple III is in the works.

I tried to capture the feel of each model. I have the original Apple computer logo, scans from some of the user docs, and scans of 1982-85 Apple related magazines. I'm constantly updating the site and will continue based on it's worth to the web community. It's what I have to offer to the web. I hope some of you enjoy it.

Thanks for the space in your newsgroup. Flame on if you must ;-)

--

Greg Cifu
<gcifu@hughes.net>

Be sure to visit my website at <<http://www.hughes.net/~gcifu/>>

```
##### E N D O F F I L E  
### applemuseum.www  
##### E N D O F F I L E
```

```
#####
### FILE      : bicolor.led
#####
### Created   : Tuesday, March 24, 1998   Modified: Tuesday, March 24, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 4197 bytes   4 KB
#####
```

```
Path: news.uiowa.edu!uunet!in2.uu.net!newsfeed.internetmci.com!206.229.87.25!news-
peer.sprintlink.net!news-backup-west.sprintlink.net!news-in-
west.sprintlink.net!news.sprintlink.net!Sprint!151.164.30.38!newsgate.swbell.net!s
wbell!not-for-mail
From: Rubywand <rubywand@swbell.net>
Newsgroups: comp.sys.apple2
Subject: Re: Bi-color red/green LEDs: Disk II read/write???
Date: Sat, 14 Mar 1998 18:36:36 -0600
Organization: Southwestern Bell Internet Services, Richardson, TX
Lines: 84
Message-ID: <350B2294.929D0294@swbell.net>
References: <6eeq9s$mhc$1@lynx.unm.edu>
Reply-To: rubywand@swbell.net
NNTP-Posting-Host: ppp-207-193-12-217.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Trace: (null) 889922047 4837 (None) 207.193.12.217
X-Complaints-To: usenet@nnrp3
X-Mailer: Mozilla 4.04 [en] (Win95; I)
Xref: news.uiowa.edu comp.sys.apple2:133622
```

stephen e buggie writes ...

```
>
> A store is clearing out bi-color LEDs red/green.  These LEDs have three
> wires:  black (negative), red (red +), green (green +).
>
> I want to add the bi-color LED to my Disk II drives, so that it will glow
> GREEN for READ, and RED for WRITE.  I already have an AE 3.5" 800K drive
> that does this, and it looks nice.  This will be a third enhancement to
> Disk II --- "Super Bugg-Drive."
>
> First, what value of resistor should be added?  The ad says these are 2
> volt LEDs, and that 20 milliamps should flow through the LED.
>
> Will the 20 milliamps affect the read/write performance of the drive in
> any way?
>
```

Since you would be sticking a 20ma load onto a 74LSxxx TTL output in each case, the odds are pretty good that Read and Write data would be screwed up.

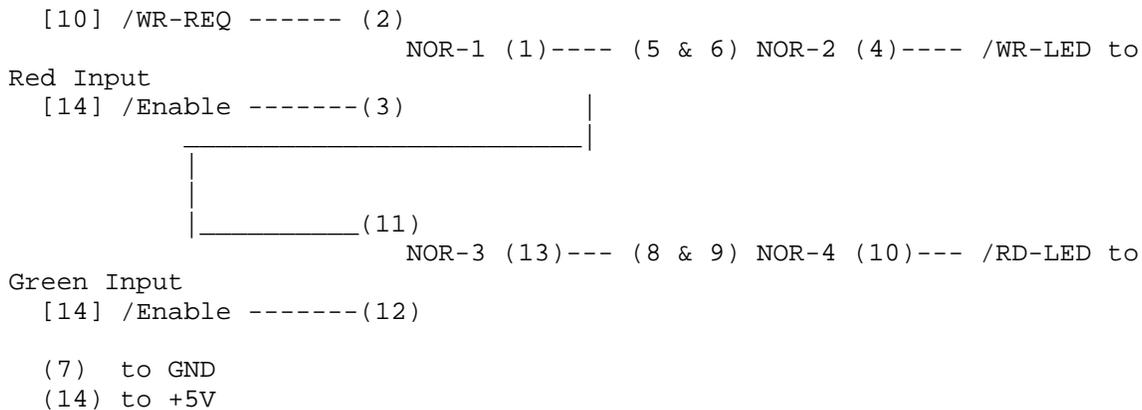
One idea is to use a couple general purpose PNP transistors. The LED GND lead goes to GND. The Red lead goes through a 150 or so Ohm resistor to the Collector of the "Write Transistor". The Green lead goes through a 150 or so Ohm resistor to the Collector of the "Read Transistor". Each transistor's Emitter goes to +5V.

The Base of each transistor has a 1k or so Ohm resistor attached. The resistor connected to each Base is the Input for that LED. This should take care of driving the LEDs. When an Input goes Low (e.g. to GND), the corresponding LED should light. If you feel brightness is too high, increase the Base R value.

The rest of the circuit depends upon the conditions you choose for lighting an LED and how many of what kinds of IC's you have in your parts bin.

For example, you could use the condition: when /Enable is low and /WR-REQ is low then /WR-LED is low. /WR-LED goes to the Write LED (Red) Input. If /Enable is low and /WR-REQ is high then you assume a Read and /RD-LED goes low to turn on the Read (Green) LED.

A single quad dual input NOR IC, like a 74LS02, could handle the logic. In the circuit below, "[]" numbers are Disk][Analog board connector points and "()" numbers refer to pins on a 74LS02.



In the above, when /Enable is low, one of the LED's will light. If /WR-REQ is low, the Red LED will light; if /WR-REQ is high, the Green LED will light. (Some fiddling with resistor values may be required to settle on the right ON brightness levels.) One advantage of this circuit is that you always have a 'drive ON' indicator and, so, do not need to drill a hole for another LED.

An alternative circuit could monitor actual Read [16] and Write [18] activity using /Enable [14] to enable inputs to a dual 1-Shot IC. Write transitions would fire the Write 1-Shot; Read transitions would fire the Read 1-Shot. The /Q output from a 1-shot would connect to the desired Red or Green Input. Pulse time for each 1-Shot could be something like 1/5 second in order to guarantee a stable, bright display.

Rubywand

```

##### E N D O F F I L E
### bicolor.led
##### E N D O F F I L E
    
```

```
#####
### FILE      : bitmouse.dips
#####
### Created   : Sunday, January 14, 1996  Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 950 bytes   1 KB
#####
```

```
Path: news.uiowa.edu!chi-
news.cic.net!newsfeed.internetmci.com!elvis.delphi.com!news.delphi.com!usenet
From: Alberto Roffe <roffe@delphi.com>
Newsgroups: comp.sys.apple2
Subject: Re: Help with 2 cards
Date: Tue, 31 Oct 95 22:50:42 -0500
Organization: Delphi (info@delphi.com email, 800-695-4005 voice)
Lines: 26
Message-ID: <RrEkRC6.roffe@delphi.com>
References: <Pine.SUN.3.91.951031104005.16116B@owens>
NNTP-Posting-Host: boslf.delphi.com
X-To: Cyrus Roton <croton@ridgecrest.ca.us>
```

Cyrus Roton <croton@ridgecrest.ca.us> writes:

```
>Can someone tell me the dip-switch settings for the "BITMOUSE" card by
>Sequential Systems?
```

The following comes from the BitMouse card manual, which I have installed in my //e:

Switch 1- This switch controls mouse tracking sensitivity

```
OFF: Slow
ON:  Fast
```

Switch 4- CPU speed

```
OFF: 1 to 4 MHz
ON:  5+ MHz
```

Switches 2&3 currently have no function.

Hope that helps.

```
-Alberto Roffe
Roffe@delphi.com
```

```
##### E N D O F F I L E
### bitmouse.dips
##### E N D O F F I L E
```

```
#####
### FILE      : breadboard
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3914 bytes   3 KB
#####
```

Newsgroups: comp.sys.apple2.programmer

Path:

news.uiowa.edu!news.uiowa.edu!uunet!inl.uu.net!comp.vuw.ac.nz!actrix.gen.nz!dempson

From: dempson@atlantis.actrix.gen.nz (David Empson)

Subject: Re: Bare board for Apple //e

Message-ID: <DF05Lq.54u@actrix.gen.nz>

Sender: news@actrix.gen.nz (News Administrator)

Organization: Actrix - Internet Services

Date: Sat, 16 Sep 1995 14:29:50 GMT

References: <DDvzqF.71t@news.zippo.com> <42nane\$rpt@maverick.tad.eds.com>

<DEwsn6.Cp1@serval.net.wsu.edu> <43e589\$5pq@news.scruz.net>

X-Nntp-Posting-Host: atlantis.actrix.gen.nz

Lines: 99

In article <43e589\$5pq@news.scruz.net>, Richard Steven Walz <rsteview@armory.com> wrote:

>

> I thought the board for // and //+ and //e was the same, is it not?

Prototyping boards certainly would be (and for the IIgs).

The slots on all slotted Apple IIs are physically identical, and are compatible with most cards. In some cases there are firmware or CPU compatibility problems (e.g. many new cards require an enhanced IIe or IIgs).

There are minor differences between the slot signals on the various machines (and even on some slots in the same machine), mostly affecting rarely used special pins. Here is a quick summary:

Pin 1: I/O Select (\$Cn00-\$CnFF, where n is the slot number).

Pins 2-17: Address bus.

Pin 18: Read/Write.

Pin 19: unused on the II and II+. On the IIe and IIgs, this has composite horizontal and vertical sync on slot 7, and is unused on other slots, except for slot 1 on the IIe only, which has a diagnostic function to disable the oscillator on the motherboard.

Pin 20: I/O Strobe (\$C800-\$CFFF).

Pin 21: this is the RDY input to the micro on all machines, but it behaves a little differently in the IIgs, or in a machine with a 65802 installed.

Pin 22: this is the DMA pin on all machines. Again, there are special

issues for doing DMA on the IIgs which can cause compatibility problems.

Pin 23: this is used for the interrupt daisy chain (out) on all slots except 7. In the IIe only, this pin can be connected to the GR signal (graphics mode enabled) via a motherboard modification.

Pin 24: DMA daisy chain out.

Pin 25: +5V.

Pin 26: Ground.

Pin 27: DMA daisy chain in.

Pin 28: Interrupt daisy chain in.

Pin 29: Non Maskable Interrupt.

Pin 30: Interrupt Request.

Pin 31: Reset.

Pin 32: this is the INHIBIT pin on all machines. This behaves differently on all three machines: the II and II+ only allow the \$D000-\$FFFF ROM area to be inhibited. The IIe allows RAM to be inhibited as well, but has strange interaction with main and auxiliary memory. The IIgs only allows this signal to be used if the machine is running in slow mode.

Pin 33: -12V.

Pin 34: -5V.

Pin 35: unused on the II and II+. On the IIe and IIgs, this is the colour reference signal on slot 7 only. It is unused for other slots in the IIe, except for slot 1 where it provides a poorly documented facility to disable the keyboard address decoding. On the original IIgs, slot 3 provides the M2B0 signal (Mega II Bank 0) via this pin and it is unused on other slots. The ROM 3 provides M2B0 for slots 1 to 6.

Pin 36: 7 MHz system clock.

Pin 37: Q3 - Asymmetrical 2 MHz clock.

Pin 38: Phase 1 clock (1.023 MHz).

Pin 39: something called "USER 1" on the II and II+, which can be used to disable all I/O decoding if a modification is made on the motherboard. On the IIe, this pin provides the SYNC signal from the micro, which indicates an opcode fetch. On the IIgs, this pin provides the M2SEL signal, which indicates that a valid slow memory access is in progress. This pin must be used by IIgs cards that decode the address without use of the IOSEL, IOSTRB or DEVSEL pins.

Pin 40: Phase 0 clock (1.023 MHz).

Pin 41: Device Select (\$C0n0-\$C0nF, where n is the slot number plus 8).

Pins 42-49: Data bus.

Pin 50: +12V.

--

David Empson

dempson@actrix.gen.nz

Snail mail: P.O. Box 27-103, Wellington, New Zealand

```
##### E N D   O F   F I L E  
### breadboard  
##### E N D   O F   F I L E
```

```
#####
### FILE      : buggie.pwr
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1724 bytes    1 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.erols.net!newsfeed.internetmci.com!ncar!newshost.lanl.gov!ferrari.
mst6.lanl.gov!tesuque.cs.sandia.gov!lynx.unm.edu!indus.unm.edu!buggie
From: buggie@indus.unm.edu (stephen e buggie)
Newsgroups: comp.sys.apple2.marketplace
Subject: 150 WATT IBM-to-IIGS (or IIE) POWER SUPPLIES
Date: 16 Sep 1996 22:44:40 GMT
Organization: University of New Mexico, Albuquerque
Lines: 35
Message-ID: <51kl8o$jng@lynx.unm.edu>
NNTP-Posting-Host: indus.unm.edu
X-Newsreader: TIN [version 1.2 PL2]
```

Since April, I have made/shipped 51 units. Prices are unchanged:

150 watt IBM power supply for IIGs: \$27 plus shipping

150 watt for IIE: \$27 plus shipping

200 watt for IIGs (NOT for RamFast or Second Sight: \$30 plus shipping

200 watt for IIE (NOT for Ramfast or Second Sight) \$30 plus shipping

Cable-only version: \$14 plus \$3 shipping (plugs onto your own IBM-style power supply) Specify whether for IIGs or IIE.

WHEN ORDERING, please list the interface cards residing in your slots. RamFast, Second Sight, and high-speed accelerators (10 MHz and above) are most fussy about power, so for those, I will ship a power supply that is most compatible with those cards.

SHIPPING (within lower-48 U.S. states): \$5.00 to a UPS-deliverable address; but \$8.00 if to a post office box (Post office shipping costs more!)

My article, POWER BOOSTING THE IIGS, will appear in the fall issue of Max Jones' newsletter, JUICED.IIGS. The article gives all the details needed for do-it-yourself modification of IBM power supplies for use with the IIGs or IIE.

Mail payment to:

Steve Buggie
Psychology
Univ of New Mexico at Gallup
200 College Rd
Gallup NM 87301

```
##### END OF FILE
### buggie.pwr
```

E N D O F F I L E

performance when used with the Apple II. Note these features:

(a) Heavy-duty stranded wire (AWG-18): This is the heaviest grade of wire that will fit on the Molex and AMP connectors. Most wires are American-made.

(b) Heavy-duty insulation: Wires are wrapped with color-coded 600v heavy duty insulation. (Standard insulation is rated merely at 300v.)

Heavy-duty

insulation gives maximum protection against inter-wire shortages within the

6-conductor cable; it also minimizes the risk of damage by wire-chewing puppies or infants who may be nearby on the floor near the computer desk.

(c) Durable interwire connections: Soldered wire-to-wire connections are covered securely to eliminate shorts: First, the soldered connection is painted with an insulating paint; next, two layers of polyolefin shrink-tubing are added to insulate and strengthen the joint.

High-current

lines (+12v, +5v) are connected to multiple wires coming from the power supply. Unused wires are trimmed, insulated, and tucked in bundles. The

entire six-wire cable is secured together with sections of 1/2"

shrink-tubing

and nylon ties.

(d) A Molex-4 connector left intact: The IBM power supply has two connectors (P8, P9) that transfer power to the motherboard, plus 3-5

Molex-4

female connectors that empower the disk drives. A Molex-4 female

connector

has been left intact; extras have been removed. The Molex-4 crimp pins

deliver these high amperage voltages: (+12, neg, neg, +5v). The Molex-4

is useful for several reasons: (a) It can be used for testing a hard

drive,

which receives power via the Molex-4; (b) the +12v and +5v lines, the

most

important outputs, can be monitored with a DC voltmeter from the Molex-4,

and (c) other appliances such as indicator

lights or a hard drive can be attached to the Molex-4 connector.

(e) The finest crimp-pins ("Trifurcon," from Digi-Key) have been used in

power supplies shipped since July 1996. Previously, "Jameco generic"

crimp-pins were used. Trifurcon crimp-pins are superior because they

surround the male pin on three sides, giving better electrical contact.

This enables the transfer of maximum amperage from the power supply to

the motherboard.

(f) Note that the 6 ft grounded 120v ac power cord is NOT INCLUDED with the power supply. The standard Apple II power cable works perfectly with IBM-style power supplies.

(g) A female Molex-4 connector is left intact on each power supply, mainly as a site for voltage testing. But this connector can be used as a

stabilized source of DC voltage (either +5v dc or +12v dc) for small

appliances such as cassette players, radios, pencil sharpeners, etc. Most

items that use 6v dc will work with 5v dc supplied by this power supply.

I use a pencil sharpener at a Molex-4 plug, and its use creates no

interference whatsoever with the computer. For \$3 plus shipping, I can

make a plug-in cable with male Molex-4 plug, 6 ft cable, and 2.1mm barrel

The accessories can be connected to a Molex-4 female socket via a Molex-4 male plug. For 5v DC accessories, use two pins (red and black). For 12 DC accessories, use two other pins (yellow and black). I have Molex-4 male plugs (including crimp pins) available as an option for \$0.75 each, five for \$3.00. With 6 ft twin wire attached, \$1.00 each, or five for \$4.00. Specify whether the plug should be wired for 5v or 12v accessories.

Accessory plugs are handy and they do not interfere with the computer's operation. Most radios, etc. that use four batteries (6v DC) will work fine on the carefully regulated 5v DC output. I have attached an electric pencil sharpener, transistor radio, cassette player, radio-cassette, DC mini-drill, etc. to these power supplies. Running those appliances can be done concurrently with computer operation. There is plenty of power to spare!

COOLING FAN NOISE
HHHHHHHHHHHHHHHHHHHHHH

Fan noise is part of IBM folklore; all of us have seen IBM PCs that sounded like reincarnated vacuum cleaners. Ball-bearing fans are quieter than sleeve fans. The IBM fan is powered from the +12v DC line. This fan differs from the AC 110v fan in Apple II System Savers. These options are available:

(a) Position the IBM power supply at a distant corner below the computer desk so that its audible sounds are unnoticed.

(b) Remove or disconnect the fan. Most IBMs run cool with Apple II because the load is only 1/3 the power supply's capacity. The fan could be disconnected or removed but this is NOT recommended.

(c) Beginning in summer 1997, a \$5.00 option is offered: COOLING FAN SPEED KNOB. This is a five watt wire-wound heavy-duty potentiometer of 100-500 ohms resistance. The potentiometer is wired in series with the DC 12 volt fan, and is mounted on the casing. With this knob, fan noise can be reduced by running the fan at a slightly slower speed. The fan should be started at FAST speed, then dialed back to a quiet slower speed. The user should ensure that the fan is spinning during use; do NOT totally shut off the fan. It is insufficient to slow the fan merely by moving the red (live) wire from +12v DC to +5v DC, because the fan will not start to spin with just 5v DC. The fan needs +12v DC to begin to spin. The user must verify that the unit operates coolly if the unit is run with slowed fan speed.

RISKS AND COMPLICATIONS
HHHHHHHHHHHHHHHHHHHHHH

1. Follow usual precautions: All computer power OFF when connecting or disconnecting accessories; also, discharge static before going into the CPU.

Note though, that when the internal power supply is replaced, you will need to discharge static by touching a lamp, metal file cabinet first.

2. Metal objects (paperclips, etc.) may spill into the power supply on

floor, especially through the fan openings. Put a barrier (e.g., plastic lid for tennis balls, coffee, etc.) on the power supply if a fan opening is facing upward.

3. If drinks or other liquids are occasionally spilled on the floor near your computer desk, then it may be prudent to raise the height of the power supply 1"-3" above the floor by placing height spacers below it.

4. Puppies, babies, etc. may damage the cable or external power supply. The heavy duty 600v insulation gives maximum protection, but keep young kids and puppies away from the power supply!

5. When transporting your computer, remember that the MOLEX-7 PLUG and its motherboard mating socket are delicate! Either carefully remove the plug, or secure the cable so that movement won't stress the plug.

6. Fan openings in the case expose the power supply at risk to rain damage when using the computer outdoors.

7. An Internet correspondent stated that high capacity power supplies can create problems because the underloaded power capacity makes the internal protection circuits less responsive.

8. The older RamFast SCSI cards by C.V. Technologies appear to be finicky about the 200 watt power supplies. If you have an older (Rev. B or Rev. C) RamFast card, then the you should get the 150 watt version, not the 200 watt version. Why? I suspect that the 150 watt version delivers output voltages that are more precisely on target because the load is closer to the power supply's capacity.

9. Two users (among 68 users so far) have expressed concern about radio frequency (RF) interference emanating from the cable. Presently I am trying out a metal braid shielding option (MagnaBraid, available from auto parts supply shops), but it is premature to judge at this time whether this shielding makes any difference. Most users have reported no RF interference.

10. Do not damage the Molex-7 crimp-pins by pushing voltmeter probes into them! The standard voltmeter probes are too wide for insertion into the Molex-7 plug. Two safer options are available: (a) Clip a 1" lengths of jumbo paper clip, then insert that section into the crimp-pin opening. Measure voltage by touching the voltmeter probe to the paper clip. (b) Touch the voltmeter probes on the metal strips exposed on the back side of the Molex-7 plug.

11. Some large power supplies have a slower "rise-time" to their target voltages. If the Apple crashes immediately at power-up, then allow 5-10 seconds of warm-up, followed by a PR#n "warm re-boot," where n is the slot number of your hard drive card (Typically this is PR#7 if you boot from the hard drive as most users do.)

12. The Molex-7 IIGs power plug may feel stiff because of the clear silicon caulking that surrounds the wires. The silicon adhesive

strengthens the wires and crimp pins. It is flexible, so just bend the wires slowly as they are positioned in the IIgs casing.

13. Does plug insertion endanger the male pins of the motherboard IIgs connector? This is doubtful; All the power supplies are pretested prior to shipment on my two IIgs systems at home. Each motherboard power point has had MANY power supplies connected, and no pins have been broken yet.

TROUBLE-SHOOTING TIPS
 HHHHHHHHHHHHHHHHHHHHHHHHHHH

PROBLEM	COMMENTS / WHAT TO DO
=====	=====
===== UNIT DOES NOT POWER-UP.	1. Check power switch: " " is on, "0" is off.
have	2. Try a different AC power cord; internal crimps on the AC power cord's female connector may be spread too wide to make good contact with the power unit's male input prongs.
but	3. Shake the power supply and listen for rattling sound. Rough handling during shipment may shaken loose the internal fuse. (Fuse is soldered to holder in half the power units,
visually	4. Fuse may have blown; must be inspected is clamped in place in half the units.)
way	5. Use caution if testing voltages with standard voltmeter probes inserted into IIgs female Molex-7 plug, or into IIe female AMP-6 plug. Voltmeter probes are too wide for the crimp pins, and will spread the crimps, causing poor contact on the motherboard connector. Safe to test voltages is to insert short length of paper clip into the plug, then touch voltmeter probe to paper clip metal. Alternatively, IIgs Molex-7 plug has exposed metal strips on its back side on which voltmeter probes can be safely touched.
UNIT STARTS BUT SHUTS OFF IMMEDIATELY.	1. Half the units have "no-load auto-off" protection circuit, which shuts off power immediately if no load is connected. If power supply has this feature, the phrase is etched near the power switch. Voltage can be tested by connecting a load (such as a hard drive) to
a	Molex-4 connector; fan will spin and voltages can be tested.
UNIT POWERS-UP BUT APPLE THEN CRASHES IMMEDIATELY.	1. This is more often a problem with IIgs ROM 3 than with IIgs ROM 1 or with IIe. Some large power supplies have a slower "rise-time" to their target voltages. Solution is to do a "warm

reboot." Allow 5-10 seconds for power unit to warm up; get basic prompt], then do "PR#n" with n being the slot number of your launching disk drive. Typically this is PR#7 or PR#6.

ARE INTERFACE CARDS INCOMPATIBLE WITH interface POWER SUPPLY UNIT? interface

1. Remove all interface cards, and boot-up the computer. If boot succeeds, then add cards one at a time, booting up. Fussy card will make computer crash. This procedure identifies any problem interface card.

MEASURED VOLTAGES SEEM TOO LOW.

1. Orange +5v, yellow +12v, green -12v, blue -5v. As a safety feature, the output voltages are normally LESS than these values when measured without full load attached. When connected to computer motherboard load, voltages will reach their expected target values.

HOLES IN BACK OF IIGS CASE ARE TOO SMALL TO THREAD CABLE TO MOTHERBOARD CONNECTOR; MOLEX-7 PLUG IS TOO BIG.

1. Note that there are two holes at rear of CPU case behind location of internal power supply. Use thin-nose pliers to remove small amount of thin plastic around the larger (rectangular) hole. Then Molex-7 plug and cable will pass through.

CLEAR SILICON CAULK ON IIGS OR IIE CABLE PLUG SEEMS TOO STIFF TO MAKE RIGHT-ANGLE BEND TO CONNECT TO MOTHERBOARD.

1. Clear silicon caulk was added to reduce strain on individual wires. IT IS FLEXIBLE. Slowly bend the power cable after threading it into the CPU case; it will fit successfully on the motherboard male connector.

CABLE MOLEX-7 PLUG WON'T MATE WITH MALE MOTHERBOARD CONNECTOR. prevents off-center. Polarizing-ramp on IIGs plug must face the slots. With IIE version, the AMP-6 plug's two black wires must be positioned closest to the keyboard

1. Shine bright light into CPU. Be sure that Molex-7 plug is correctly centered on motherboard connector. The polarizing-key in plug's third hole prevents Molex-7 plug from being inserted off-center. Polarizing-ramp on IIGs plug must face the slots. With IIE version, the AMP-6 plug's two black wires must be positioned closest to the keyboard (front) side of the CPU.

COOLING FAN IS NOISY. cousins! the ears. into unit

1. This is a normal feature of IBM-style power units. Some sound like vacuum cleaners' Take advantage of the 5 ft cable to position unit under your computer table, away from ears.
2. If sound suggests that an object has fallen into the unit through a fan opening, SHUT OFF the unit immediately and shake unit so object will fall out. Disconnect AC power, open unit, remove item.
3. Most units generate no heat when used with Apples, so the fan speed can be slowed with

the event of an exchange due to incompatibility, the buyer should enclose payment for the shipment of the second unit. This will be expected in the event that the unit works well on my computer. But if the unit is actually defective, then I will pay shipping on the second unit. (So far, all returns have been due to incompatibilities, no defects).

150 WATT POWER SUPPLY: \$27.00 Specify whether for IIgs plug or IIe plug.

200 WATT POWER SUPPLY: \$30.00 Specify whether for IIgs plug or IIe plug.

300 WATT POWER SUPPLY \$40.00 Includes Y-cable to run two Apples at the same time. Specify whether for IIgs, IIe, or both. Includes fan-speed adjuster knob.

FAN SPEED ADJUSTER KNOB: Add \$5.00 (allows cooling fan noise to be reduced by dialing a slower speed) Extra cost only if for 150w or 200w types.

Y-ADAPTOR CABLE: with both styles of plug (IIgs and IIe). Add \$4.00 Extra cost only if ordered for 150w or 200w types.

EXTRA CABLE LENGTH beyond 5 ft: Add \$1.00 per ft length.

ACCESSORY CABLE: Supplies either 12v dc or 6 v dc to male Molex-4 plug, with 6 ft cable leading to 2.1 mm barrel plug. Specify voltage (5 v dc or 12 v dc), and also whether the barrel plug center should have positive or negative polarity. \$2.00 (6 ft cable on Molex-4 without barrel plug: \$1.00 each)

ACCESSORY PLUG AND FOUR CRIMP-PINS (Molex-4 male plug). Unsoldered, no wire included. You construct your own accessory cable using your own wires. \$0.75 for one set; \$3.00 for five sets; \$5.00 for ten sets.

"FOOT COOLER" EXTERNAL 3 1/2" FAN. Using a fan salvaged from a scrapped power supply, this fan has a two ft cord, a male Molex-4 plug, and chromed screens on both front and back sides. Power consumption: 2-4 watts. Does not interfere in any way with computer operation. It connects to a female Molex-4 accessory socket on your power supply. \$5.00

=====
=====

SUPER-BUGG DISK II DRIVE: (featured on covers of Summer 1996 and Fall 1996 issues of II ALIVE magazine; shown at KansasFest '96) Apple Disk II 5.25" drive with two special front panel features: (a) 3-position write-protect switch (normal/enable/protect), and (b) speed-control knob; allows convenient adjustment of rotational disk speed.


```
#####
### FILE      : bulbs
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 881 bytes   1 KB
#####
```

```
Newsgroups: comp.sys.apple2.marketplace
Path: blue.weeg.uiowa.edu!news.uiowa.edu!uunet!news.sprintlink.net!crash!pro-
algonquin!craigl
From: craigl@pro-algonquin.mn.org (Craig Larson)
Subject: Apple IIe Keyboard light
Organization: The Algonquin Round Table
Date: Wed, 10 Aug 94 08:37:13 CDT
Message-ID: <1994Aug10.083713.2170@pro-algonquin.mn.org>
Lines: 9
```

It anyone is looking for replacement bulbs for the keyboard light on Apple II and Apple III computers, the industry standard number for it is #7362. They are available through Industrial Lighting in Minneapolis, Minnesota (612) 333-4406 at \$1.35 per bulb sold in packages of 10 only. If you call there to order some, ask for Todd. He is familiar with this bulb.

craigl@pro-algonquin.mn.org --- Sysop of Electronics Shop BBS (612) 789-2149
Chip Master @ Electronics Shop --- Supporting Apple II line of computers

```
##### E N D O F F I L E
### bulbs
##### E N D O F F I L E
```

```
#####
### FILE      : catweasel
#####
### Created   : Monday, December 6, 1999  Modified: Monday, December 6, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2643 bytes   2 KB
#####
```

mystix@direct.ca@direct.ca writes:

>You the ability to use Apple drives would be more convenient than trying to
>produce images. But you're right on the issue of the SWIM chips. ROMs could be
>easily be pulled out of existing GS's, but the disk controller chips aren't
socketed.

The //gs only used the IWM and they are socketed in //c and Mac 128/512/Plus/SE motherboards.

If you want to read Apple // disks in your PC you can already do it. Just buy a Catweasel board (see <http://www.jschoenfeld.com/ecatweasel.htm> or <http://members.tripod.com/~apd2/catweasl.htm>):

Catweasel is a universal floppy disk controller that uses unmodified PC diskdrives. The Catweasel can handle nearly any disk format, you just have to find a drive for them. Normally, these drives are just 3.5 inch and 5.25 inch drives. PC floppy drives used to be known as being able to work with PC formatted disks only, but now you can access any of the disk formats listed further below. We're updating the software regularly since 1996. Here's the list of the supported formats. This list applies to all versions of the Catweasel!

- * all PC-formats (180K up to 1440K)
- * Amiga DD and HD (also 5,25" formats)
- * Atari 9, 10 and 11 sektor disks
- * Macintosh 720K, 800K, 1440K (DD, GCR, HD)
- * Commodore 1541, 1571, 1581 (C64, C128 and 3,5" C-64 disks)
- * XTRA High density with 2380KByte per disk
- * Nintendo backup station 1600KB format
- * Atari 800XL (all MFM formats, FM under developement)
- * Apple IIe disks (Apple DOS 3.3 and up)
- * further 8-bit formats planned

Sophisticated error correction algorithms enable you to read otherwise unreadable disks. In other words, you have an excellent chance to read your formally unreadable floppy disks.

You can connect up to two drives to the Catweasel, and the two drives can be any combination of 3.5" and 5.25".

Catweasel ISA version (PC, Alpha AXP, BeBox)

The ISA version of the Catweasel is shipped with MS-DOS (TM) software. Writing to disks is only possible under Linux at the moment. The drivers are not designed to be easy-to-use. Instead, they are tools "for-freaks-only". You can read disk images from the formats listed above, and single files can be copied from Amiga, PC and C-64 disks. Drivers for the Alpha AXP are only available under Linux, and BeBox support is under developement. The ISA Catweasel only needs I/O address space, it does not need any DMA or IRQ channel. This way, a maximum level of compatibility is given.

Accessing the Catweasel drives with a drive letter is not possible.

--

David Wilson School of IT & CS, Uni of Wollongong, Australia

```
##### E N D O F F I L E  
### catweasel  
##### E N D O F F I L E
```

```
#####
### FILE      : ccs7710
#####
### Created   : Saturday, April 5, 1997   Modified: Saturday, April 5, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1396 bytes   1 KB
#####
```

```
Subject: Re: Serial card identificatio
Date: Thu, 3 Apr 97 08:04:14 CST
Message-ID: <00034CEE.fc@haaug.org>
X-FirstClass: 0x59F8 0x00000000 0x00000000 0x000F4C26 0x0000
Newsgroups: comp.sys.apple2
Path:
news1.icaen!news.uiowa.edu!uunet!inl.uu.net!207.172.3.52!feed1.news.erols.com!cpk-
news-hubl.bbnplanet.com!news.bbnplanet.com!news.sesqui.net!news.hal-
pc.org!haaug.org!CJ_Settles
From: CJ_Settles@haaug.org (CJ Settles)
To: pliethen@globaldialog.com (Peter Liethen)
Organization: Houston Area Apple Users Group
X-HoloGate: 1.1.7
Lines: 31
```

>I have two serial cards and I'm trying to get some info on them,
>so I can use them.

>The other one is a little harder. It has 4 DIP switches in the
>top-righthand cornner, next to the large crystal (2.4576 mHz) All
>I know is that is is a model 7710 Asynchronous Serial interface,
>reversion B. I'd like to know what the DIP switches should be set
>at so that I can be used.

The "other one" is California Computer Systems (CCS) Model 7710
Asynchronous Serial Interface. The DIP switches are for setting the baud
rate. Here's a table for the usual baud rates. A 1 is for On (up); the 0
is for Off (down).

Baud Rate	Switch
19200	0111
9600	1110
2400	0001 or
2400	1100
1200	0010

I don't know about the Apple card you describe. Good luck.

CJ
CJ_Settles@haaug.org

```
##### E N D O F F I L E
### ccs7710
##### E N D O F F I L E
```

```
#####
### FILE      : ccs7710a
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1827 bytes    1 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!news.starnet.net!waikato!comp.vuw.ac.nz!asgard.ac
trix.gen.nz!atlantis.actrix.gen.nz!not-for-mail
From: dempson@atlantis.actrix.gen.nz (David Empson)
Newsgroups: comp.sys.apple2.comm
Subject: Re: CCS 7710 info??
Date: 17 Apr 1996 01:13:00 +1200
Organization: Actrix - Internet Services
Lines: 30
Message-ID: <4106cs$i7f@atlantis.atlantis.actrix.gen.nz>
References: <creimanDpvv5B.HJz@netcom.com>
NNTP-Posting-Host: atlantis.actrix.gen.nz
Keywords: apple2 help serial
```

```
In article <creimanDpvv5B.HJz@netcom.com>,
Charlie Reiman <creiman@netcom.com> wrote:
> I have a CCS 7710 serial card that I purchased to hook up my brand
> spankin' used Apple IIe to my 'real' computers.
```

You bought a CCS 7710 (it should have an "A" on the end)? How recently? It is a rather old serial card (1980 according to the manual I have here, so it predates the Apple Super Serial Card). It is not supported by much software that I know about, because it is not compatible with the Apple SSC (which is the most common type of serial card).

```
> I'm only able to get serial output from my Apple2. I cannot send
> anything into the machine.
```

The CCS 7710A uses a Motorola 6850 ACIA chip. This chip requires that certain flow control signals be active in order to allow it to transmit and/or receive. The DCD input must be active to receive anything. The CCS 7710A's serial connector is wired as a DCE, so it redirects the RTS input (pin 4) to the DCD pin of the chip.

You must therefore have RTS connected to an active flow control signal to be able to receive anything.

(It also uses DTR, pin 20, rerouted to the CTS pin of the 6850, to allow the card to transmit.)

```
--
David Empson
dempson@actrix.gen.nz
Snail mail: P.O. Box 27-103, Wellington, New Zealand
```

```
##### E N D O F F I L E
### ccs7710a
##### E N D O F F I L E
```

```
#####
### FILE      : clocks
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3460 bytes   3 KB
#####
```

```
Path: news.uiowa.edu!chi-news.cic.net!uwm.edu!lll-
winken.llnl.gov!enews.sgi.com!news.mathworks.com!newsfeed.internetmci.com!news.uor
egon.edu!cie-2.uoregon.edu!nparker
From: nparker@cie-2.uoregon.edu (Neil Parker)
Newsgroups: comp.sys.apple2
Subject: Re: Clock, BASIC, and IIgs
Date: 12 Jun 1996 07:52:02 GMT
Organization: University of Oregon Campus Information Exchange
Lines: 86
Message-ID: <4plsv2$rm1@pith.uoregon.edu>
References: <4plje3$2td@news.nevada.edu>
NNTP-Posting-Host: cie-2.uoregon.edu
```

In article <4plje3\$2td@news.nevada.edu> snit@nevada.edu (Snit) writes:
>Does anybody know how to access the clock from BASIC on a IIgs? Is
>there a way of doing something similar on a IIE (obviously not with the
>real time, unless you have a clock added). Specifically, I am trying to
>record the times of a photosensor attached to PDL (0) into a text file
>that can be imported into a spreadsheet or stats program. Thanks...

There are no BASIC commands for accessing the clock--the only good way to do it is to call a machine-language routine.

The most portable way to access the clock is through ProDOS. Your BASIC program calls this machine-language routine:

```
JSR $BF00
DFB $82      ; GET_TIME
DW 0
RTS
```

Then you can PEEK the time and date out of the ProDOS global page. The minute is PEEK(49042), and the hour is PEEK(49043). The date is in PEEK(49040) and PEEK(49041), but after PEEKing it, you have to unpack it before you can use it (see the example below).

```
10 FOR X = 0 TO 6: READ Y: POKE 768 + X,Y: NEXT
20 DATA 32,0,191,130,0,0,96: REM Machine code
30 CALL 768
40 HR = PEEK (49043): REM Hour (0..23)
50 MI = PEEK (49042): REM Minute (0..59)
60 D = PEEK (49040) + 256 * PEEK (49041)
70 X = INT (D / 32)
80 DA = D - 32 * X: REM Day (1..31)
90 D = X:X = INT (D / 16)
100 MO = D - 16 * X: REM Month (1..12)
110 YR = X + 1940: REM Year (1940..2039)
```

If the day and the month are both zero, then either no clock is available,

or ProDOS doesn't have a driver for the clock.

The drawback of this method, of course, is that you only get one-minute resolution. If you want to time events more accurately than that, you'll have to use more complicated methods.

The GS clock can provide one-second resolution. The easiest (and only Officially Supported) way to get it is to call the Miscellaneous Toolset. Again, you need to CALL a machine-language routine:

```

        clc          ; switch to native mode
        xce
        rep #$30
        pha          ; push space for result
        pha
        pha
        pha
        ldx #$0D03   ; ReadTimeHex
        jsl $E10000
        sec          ; back to emulation mode
        xce
        ldx #7       ; pop results and save
11      pla
        sta $200,X
        dex
        bpl 11
        rts

```

This routine leave the clock values in the following memory locations:

```

PEEK(512) -- weekday (1..7, 1=Sunday)
PEEK(513) -- (not used)
PEEK(514) -- month (0..11)
PEEK(515) -- day (0..30)
PEEK(516) -- year minus 1900
PEEK(517) -- hour (0..23)
PEEK(518) -- minute (0..59)
PEEK(519) -- second (0..59)

```

(Sorry...no BASIC example this time. I'm not feeling quite ambitious enough to hand-assemble that machine language and convert it to DATA statements.)

-- Neil Parker

--

Neil Parker, nparker@{cie-2,cie}.uoregon.edu, <http://cie-2.uoregon.edu/~nparker>

"Evolution is vastly overrated." -- Ambassador DeLenn, Babylon_5

```

##### E N D O F F I L E
### clocks
##### E N D O F F I L E

```

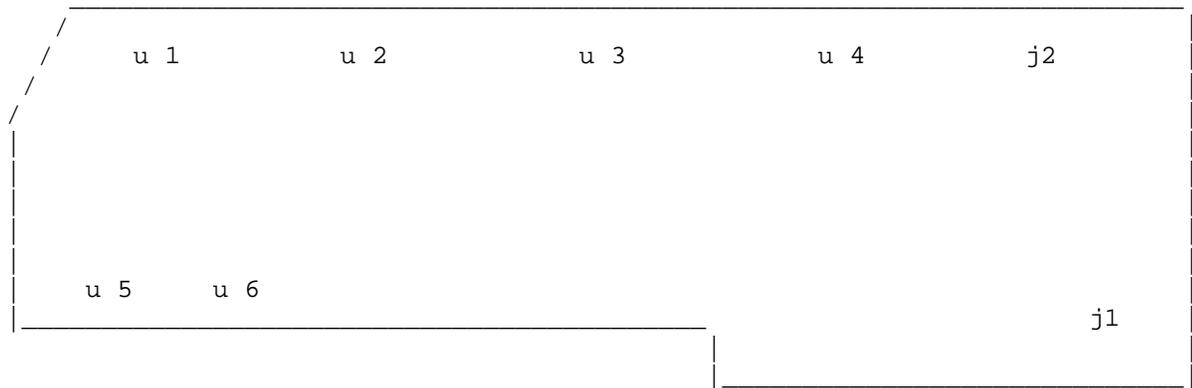
```
#####
### FILE      : CMS.scsi
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 3436 bytes   3 KB
#####
```

```
Path: blue.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!agate!ucbvax!IDEANET.DOE.STATE.IN.US!jcountry
From: jcountry@IDEANET.DOE.STATE.IN.US (Jack Countryman IAC)
Newsgroups: comp.sys.apple2
Subject: Re: CMS card and write protect
Message-ID: <Pine.3.85.9407120131.A25312-0100000@ideanet.doe.state.in.us>
Date: 12 Jul 94 05:46:31 GMT
References: <2vkoda$e0r@scipio.cyberstore.ca>
Sender: daemon@ucbvax.BERKELEY.EDU
Distribution: world
Organization: The Internet
Lines: 77
```

On 8 Jul 1994, John Blaby wrote:

```
> This info is needed for a friend.
>
> She has a CMS hard drive controller and wants to configure it to run a
> 20 meg drive for a //e. She has no documentation whatsoever. Can
> anyone help out with jumper settings and any other pertinent
> information?
>
> Thanks in advance..
>                               John
```

According to the CMS manual, page D3, the six sets of eight pairs of jumpers (u1...u6) are for the following purpose:



u 1: Boot Scan delay...manual shows no jumpers here in default configuration

u 2: first (left) jumper is 'Enable I.C.P. (Yes/No)', middle 6 not used, last (right) is 'multiple initiators (Yes/No)'...manual shows no jumpers in default configuration

u 3: Selection phase time out delay....I believe this sets how long the card waits for the drive to come up to speed(?)...manual shows the default as having 4, 5, and 7 with jumpers installed

u 4: Arbitration phase time out delay...manual shows default as no jumpers installed

u 5: Bus Free phase time out delay...manual shows default as jumper on number 1

u 6: Interrupt recovery delay...manual shows jumpers on 3, 4, and 5

j1 and j2 are single sets of pins....the manual says J2 is not used, but J1 is to be jumpered.

.....

The card I have here, came out of a IIGS where it was hooked to first a twenty meg CMS drive, and later a forty meg CMS drive. It has the following jumpers set:

- u1: jumper on 7
- u2: no jumpers
- u3: jumpers on 4, 5, and 7
- u4: no jumpers
- u5: jumper on 1
- u6: jumpers on 3, 4, and 5
- j2: no jumper
- j1: jumper

As I recall, this setup yeilded a rather long pause for the hard disk to come up to speed (about 40 to 45 seconds) that we found necessary at the time to avoid boot problems.

Good luck....

```
##### E N D O F F I L E
### CMS.scsi
##### E N D O F F I L E
```

```
#####
### FILE      : colorburst.iie
#####
### Created   : Tuesday, March 18, 1997   Modified: Tuesday, March 18, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3124 bytes    3 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!chi-
news.cic.net!cs.utexas.edu!howland.erols.net!cam-news-hubl.bbnplanet.com!su-news-
hubl.bbnplanet.com!news.bbnplanet.com!news.pbi.net!newsl.rcsntx.swbell.net!usenet
From: rubywand@swbell.net
Newsgroups: comp.sys.apple2
Subject: Re: Return fixing & Color killing?
Date: Tue, 18 Mar 1997 06:03:20 +0000
Organization: Southwestern Bell Internet Services
Lines: 53
Message-ID: <332E3028.37DA@swbell.net>
References: <3318df94.17282735@167.152.149.11> <331BBC35.4E3D@swbell.net>
<332e08c2.3032080@167.152.149.11>
NNTP-Posting-Host: ppp-207-193-8-12.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Mailer: Mozilla 2.02E (Win16; I)
```

Edhel Iaur, Esq. wrote:

```
>
> On Tue, 04 Mar 1997 06:07:49 +0000, rubywand@swbell.net wrote:
>
> >Edhel Iaur, Esq. wrote:
>
> >> Does anybody remember the book _Enhancing Your Apple II_? Well, I
> >> just bought a pack of resistors, and opened up my //e to do the "Color
> >> Killer Mod". However, as the title implies, the book is apparently
> >> written for Apple // users, not Apple //e users. The chips, etc. are
> >> in a totally different position. Does anybody know how to do the
> >> "Color Killer Mod" on a //e?
>
> > .... I don't know about the color-killer mod you
> > mention. What is it supposed to do?
>
> FINALLY! I Just got this article! It's supposed to turn everything
> monochromatic (like that button on the good Apple color monitors), via
> software, via one of the annunciators.
```

Thanks for the info. It looks like you should be able to do this kind of full-screen color-killer on a IIE by using a general purpose NPN transistor (2N3904, 2N2222, etc.) to shunt the Color Burst signal. The transistor's collector would connect to the junction of R15 and R13; the emitter lead would go to Ground. The transistor should be connected directly to the R15-R13 junction and ground.

The base lead would go through a 2k-3k Ohm resistor to an annunciator output, such as An-3 at pin 12 on the 16-pin J-15 Game connector. PEEKing the appropriate addresses should flip Color OFF and ON.

The reason for qualifiers such as "looks like", etc. is that I have not actually tried a mod like this on a IIE. Monitors are remarkably sensitive to Color Burst. If the transistor does not do a good job of shunting the signal, enough may get through to trigger Color-ON.

A more positive (but less easy) technique is to use a 74LS32 OR gate to control flow of the 3.58MHz signal. The IC could be tack-soldered onto U88 via its +5 and GND pins. U88 is the 74S02 which has the gate which produces Color Burst.

Pin 12 of the 'S02 would be bent up and connected to the output of an 'LS32 OR gate (e.g. pin 3). One of the OR gate's inputs (pin 2) would go to Pin 12 of the 'S02 socket. The other (pin 1) would go to an annunciator output.

Turning ON the annunciator forces the OR gate output to "1" and eliminates Color Burst. Turning OFF the annunciator lets the OR gate output follow the 3.58MHz signal and enables Color Burst.

Rubywand

```
##### E N D O F F I L E
### colorburst.iie
##### E N D O F F I L E
```

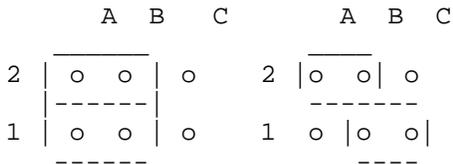
```
#####
### FILE      : cvtech.gsram
#####
### Created   : Sunday, January 14, 1996  Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1897 bytes   1 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path:
blue.weeg.uiowa.edu!news.uiowa.edu!uunet!tadpole.com!news.dell.com!swrinde!elroy.j
pl.nasa.gov!decwrl!netcomsv!netcom.com!butch
From: butch@netcom.com (Gabe Sanchez)
Subject: Re: Help with CV Tech GS-RAM's jumpers
Message-ID: <butchCvGIMv.J0I@netcom.com>
Organization: NETCOM On-line Communication Services (408 261-4700 guest)
X-Newsreader: TIN [version 1.2 PL1]
References: <33vrkn$4vv@nyx10.cs.du.edu>
Date: Thu, 1 Sep 1994 15:20:55 GMT
Lines: 41
```

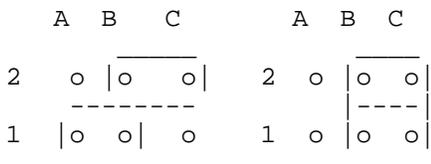
Fan Li TAI (ftai@nyx10.cs.du.edu) wrote:

```
: Hiyas,
: I need to know the jumper settings for the CV Tech GS-RAM card. I'd
: lost my manual (sigh). The settings I need are for 2 meg on the CV Tech
: card, and a 4 meg piggy-backed Sequential card.
: Thank you very much in advance.
```

Ok here is what my manual says interms of the jumbners:



1Mb on GS boar 2Mb on GS board



3 Mb on Gs board 4Mb on GSboard

"Note: these settings do not any meonry that may be piggy based on the board"

So thats it, so as long as you are using the one with 2 Mb on the Gs memory board, it does not matter how many ohter megs you have piggy backed (acording to the manual)

hope this heps you!

--

```
.....  
:: Mr.Butch Sysop of The Micro Exchange      :: o RamFast Speed      ::  
:: 714-992-4520 2400 - 28.8k Dual Standard  :: o 15 Mhz 64 Cache Zip GS ::  
::                                           :: o Internet          ::  
.....
```

```
##### E N D O F F I L E  
### cvtech.gsrar  
##### E N D O F F I L E
```

```
#####
### FILE      : dbxx.aux
#####
### Created   : Sunday, January 14, 1996  Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2216 bytes   2 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!europa.eng.gtefsd.com!uunet!comp.vuw.ac.nz!actrix
.gen.nz!dempson
From: dempson@swell.actrix.gen.nz (David Empson)
Subject: Auxiliary types (was Re: Space Fox and System 6?)
Organization: Actrix Information Exchange
Date: Wed, 2 Feb 1994 14:05:20 GMT
Message-ID: <CKLoGx.9rJ@actrix.gen.nz>
References: <2ie9os$jli@panix.com> <CKF7Gt.4ov@well.sf.ca.us>
<CKIBFM.3vu@tsoft.net>
Sender: dempson@actrix.gen.nz (David Empson)
Lines: 43
```

In article <CKIBFM.3vu@tsoft.net> prisoner@tsoft.net (The Prisoner) writes:
> Uh... I think the Auxtype should be \$DB02... way back when System 6 was just
> released, I contacted Dave Lyons and described the Problem and after
> I switched all the \$B3 and \$B5 files to a \$DB02 Auxtype and they
> worked fine... something about Smoothlaunch...

For GS/OS applications and shell EXE files (types \$B3 and \$B5), the last digit of the auxiliary type is defined on a bit-by-bit basis.

The high byte must be \$DB, or the low byte is invalid.

Bit 0 means the application is GS/OS aware, in that it uses prefix numbers 8 and higher, rather than the ProDOS-16 prefixes (0 through 7), and can cope with long pathnames.

Bit 1 means it is a desktop application, and is able to cope with the super hi-res screen being active when the program starts up (or the text screen, for that matter).

Bit 2 means it is "message aware" - it uses the pathname message supplied by Finder when you launch an application by double-clicking a document (or selecting the document then using the Open or Print command).

Thus, the valid auxiliary types are:

	Message aware	Desktop app	GS/OS aware
\$DB00	No	No	No
\$DB01	No	No	Yes
\$DB02	No	Yes	No
\$DB03	No	Yes	Yes
\$DB04	Yes	No	No
\$DB05	Yes	No	Yes
\$DB06	Yes	Yes	No
\$DB07	Yes	Yes	Yes

This is documented in the File Type Notes for file types \$B3 and \$B5.
Refer there for more information.

--

David Empson
dempson@swell.actrix.gen.nz
Snail mail: P.O. Box 27-103, Wellington, New Zealand

E N D O F F I L E
dbxx.aux
E N D O F F I L E

```
#####
### FILE      : dconnectors
#####
### Created   : Wednesday, December 2, 1998   Modified: Wednesday, December 2, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2598 bytes   2 KB
#####
```

```
Path:
news1.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!news.altair.com!news.kodak.com!
news-nysernet-16.sprintlink.net!news-east1.sprintlink.net!news-
peer1.sprintlink.net!news.sprintlink.net!howland.erols.net!sunqbc.risq.qc.ca!news.
uow.edu.au!david
From: david@uow.edu.au (David Wilson)
Newsgroups: comp.sys.apple2
Subject: Re: Unindentifiable motherboard port (II Plus clone)
Date: 2 Dec 98 01:13:15 GMT
Organization: University of Wollongong, Australia
Lines: 39
Message-ID: <david.912561195@wraith>
References: <20NOV199814103540@vax2.concordia.ca>
<365622F8.976CD19D@cyberhighway.net> <26NOV199803363783@vax2.concordia.ca>
<Pine.GSO.3.94.981127143622.3400A-100000@Ocean.CAM.ORG>
<74lrec$927@login.freenet.columbus.oh.us>
NNTP-Posting-Host: wraith.cs.uow.edu.au
X-Trace: wylm.its.uow.edu.au 912562191 20641 130.130.64.1 (2 Dec 1998 01:29:51
GMT)
X-Complaints-To: usenet@wylm.its.uow.edu.au
NNTP-Posting-Date: 2 Dec 1998 01:29:51 GMT
X-Newsreader: NN version 6.5.0 #15 (NOV)
Xref: news1.icaen comp.sys.apple2:142464
```

```
dalloff@freenet.columbus.oh.us (Dave Althoff) writes:
>Michael Black (blackm00@CAM.ORG) wrote:
>: I have a II clone board that I found in the garbage at one point. It was
>: missing parts, so it's scrap. But it had two DB-9 connectors on it. One
>: of them I took off for something else, but the remaining one is male and
>: I assume the missing one was male too. They are both labelld (in silk
>: screening on the board) "Game I/O". The IC's that would be in the
>: joystick circuitry are right near it.
```

My Multitech MPF-III (//e clone) uses DE-9M plugs for both the keyboard and the joystick ports.

If they are both labeled Game I/O I would hazard a guess that they both have the same signals but that AN0/1 are swapped with AN2/3 on the second port. Probably something similar with the push buttons. The advantage of this would be that you could plug two standard (apart from the sex of the plug) joysticks in at the same time for two player games.

Pet Peeve time: it is not a DB-9 but a DE-9. The D is the shape of the plug, the letter tells you the size and the number the pin count. Here are the standard ones:

- DE-9 (AT serial port, Apple //e joystick)
- DA-15 (IBM PC joystick)
- DB-25 (standard serial port)

DC-37 (IBM-PC external floppy)
DD-50 (some really old SCSI devices from Sun etc)

And these are the high density ones:

DE-15 (VGA monitor)
DA-26
DB-44
DC-62

Other than the DB-25, the DD-50 is about the only one people get right.
All the rest get lumped together as DB-xx.

--

David Wilson School of IT & CS, Uni of Wollongong, Australia david@uow.edu.au

E N D O F F I L E
dconnectors
E N D O F F I L E

```
#####
### FILE      : digicard
#####
### Created   : Tuesday, January 1, 1980 Modified: Thursday, March 1, 1973
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 6518 bytes    6 KB
#####
```

On Mon, 11 Dec 2000 03:55:18 GMT, George Rentovich <grent@home.com>
wrote:

```
>
>"Mr. Boffo" wrote:
>>
>> What I likely do NOT have, is knowledge of the password on the system
>> I am buying. So the big question is, is there a way to hack the
>> password file on the Digicard server?
>
>First the easiest way to find the password would be to contact the school
>it was connected to. Some times the school ID is on the unit, or the
>district.
```

Yes, I will likely be asking the eBay seller where they got it.

```
>> I wouldn't have a problem with just swapping in a different hard drive
>> and starting over, but I've never built one up from scratch so I'm not
>> sure if the Digicard server is capable of formatting, partitioning,
>> and create a "default" volume set. Any suggestions?
>
>I have a Digicard what appears to be a 5.25 disk., but to set up a
>network like you suggest requires more than a Server.
```

I'm sorry but your sentence seems to be missing a word. (??)

```
>> My plan is to use it as a Master Server, for every game and software I
>> have ever owned. If you've never used the Digicard, it is truly weird
>> in that it can support both ProDOS AND DOS 3.3 volumes on the same
>> drive, and in the process of using it, it frequently crosses back 'n
>> forth between the two.
>>
>> This to me makes it more worthwhile than just an Apple SCSI card and
>> drive, since Apple's implementation appears to only support ProDOS
>> with the SCSI card. Plus, it only cost me $27 for the server and HD,
>> as compared to Apple's SCSI card which still goes for up to $175
>> alone. What a deal!! :)
>>
>
>Nice plan but as I said it takes more than a Digicard Server to make a
>net work.
>First you need the Digicard Server.
> Second you need for each computer a Digi Card external satellite like
>modem.
> Third you need for each machine is a Digi Card card to interface with
>the modem like device.
```

As I may have mentioned, I am a school admin. I am currently providing
tech support for two different schools, and both have DigiCard
hardware. One school had mostly dumped their Digicard network but

after talking with some teachers it seems some in the elementary actually wanted it back!

The humorous bit about Apple II hardware is that it is PERFECT for "drill and practice" for the lowest grades (Preschool to Grade 3). Little kids don't really care about fancy 3D graphics.. to them even Number Munchers is cool.

So I hooked it all back up for them. That old digicard server is currently serving about 35 Apple II's daisy chained across about seven classrooms, and sitting on a UPS to fight off problems of SCSI drive sticktion during an outage..

Note that this is the "newer" digicard. There is an "older" digicard with different wiring. There appear to have been three versions of the digicard server. The PhoneNet one is the 2nd and 3rd generation server. Here's a picture of the one I'm getting, a 2nd generation server without an Ethernet jack on the back:

http://www.geocities.com/s_c_a_l_a_r/digicard-src2.jpg

This later version of the Digicard server is easy to manage because it is essentially an AppleTalk network, except it uses the cheaper "PhoneNet" connectors with plain old telephone wire strung from one machine to the next. At the end of a wiring run, you insert a "termination resistor" -- little more than a phone jack with a resistor crimped in it -- into the last network port to absorb noise on the network.

You can use the official Digicard network boxes, or you can use the Farallon Macintosh PhoneNet boxes, and they all work together, no problem. There doesn't appear to be much difference at all between a Farallon PhoneNet Star Controller, and a Digicard 12-channel Star controller either. Lurking in my bedroom closet is a Farallon network repeater, should anyone ever want to use a IIe with Digicard some 500 meters away..

And indeed the rewiring of the building with cat-5 100base-T is a boon for the old Digicard network! Merely yank out the Ethernet jumpers linking a port to the 100base-T hub, and instead use the jumpers to loop Digicard signals out from one room's network port and into another. The wiring itself doesn't care if it carries 100mbit Ethernet or 1mbit DigiCard signals.

You can wire the digicard network either as a bus, one machine to the next, to the next, etc, or as a star -- like our "modern" 10/100base-T hubs -- or a combination of both.

The one school doesn't have any star/hub controllers, so I've wired all the machines into a bus network. This design requires two Ethernet wall jacks to work, because all machines are in a big long chain and the signal has to come into the room on one port and head back out on another. Newer machines get Ethernet priority, so in some rooms I use jacks on opposite sides of the room to pass the digicard through to the next room. Lotta phone wire strung everywhere, but it works! :-)

In case you ever find any, there's a IIe digicard with a DB-9 output, and there's a IIgs version with NO cable connection at all. With the IIe digicard, you plug in a ribbon cable with a DB-9 port, and a DB-9

phonenet network box into the ribbon cable.

With the IIgs digicard you use a standard Mac PhoneNet box and plug it into the circular DIN IIgs Printer serial port. There seems to be a bit of trickery here because somehow the IIgs Digicard is taking over the motherboard serial port, even with slot 7 set to "Your Card". This is something which I wouldn't think a slotted card could do...

I have found that the IIgs can use the IIe card and its DB-9 network box. The only real difference is that the IIgs can't print to the network printers using the IIe digicard. Since most people no longer do this anyway, it is not a real concern.

The printer "card" is a bit of a joke, really. It's a card you stick in slot 1, yes, but it has only a SINGLE pin on it, no chips at all. That single pin runs to a single wire, which connects to a jumper on the IIe digicard network card. My guess is that it is grabbing the device select line, so that the digicard board can pretend it is a printer card. AFAIK, all other slot lines are shared across the slots, so with the slot 1 device select line, a card in slot 7 can pretend to be in slot 1, too.. ;-)

I'm just getting started with the other school, getting their digicard network up and running. Not sure what amount of documentation they have.. perhaps they have a system manual which describes password recovery.

-Mr. Boffo

Email: mister_boffo@hotmail.com

```
##### E N D   O F   F I L E
### digicard
##### E N D   O F   F I L E
```

```
#####
### FILE      : digitize
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3217 bytes   3 KB
#####
```

```
Path: ns-mx!hobbes.physics.uiowa.edu!news.iastate.edu!vaxe.iastate.edu!TWBV4
From: twbv4@isuvax.iastate.edu (Ian Schmidt)
Newsgroups: comp.sys.apple2
Subject: Re: Sound Digitization
Message-ID: <1991Dec17.153321.2611@news.iastate.edu>
Date: 17 Dec 91 15:33:21 GMT
References:
<1991Dec16.162532.14913@crash.cts.com>,<1991Dec17.101532.8062@nntp.uoregon.edu>
Sender: news@news.iastate.edu (USENET News System)
Reply-To: twbv4@isuvax.iastate.edu
Organization: Iowa State University, Ames, Iowa
Lines: 71
```

Okay, here goes, the official AudioZap Digitizing Method. :-)
 Set BufPtr to a pointer to the buffer for digitizing and EndPtr to
 the ADDRESS (not byte count) of the end of the buffer.
 As always, its in ORCA/M ASM65816 1.2 format.

; DP Equates

```
BufPtr    equ 0
EndPtr    equ 4
```

; other equates

```
IRQ_Volume equ $e100ca
Sctl       equ $c03c
SData     equ $c03d
SAdrL     equ $c03e
SAdrH     equ $c03f
Kbd       equ $c000
Strobe     equ $c010
```

```
DigitizeIt START
            sep #$20
            longa off
            lda #0
            pha
            plb

            lda >IRQ_Volume
            and #$0f
            ora #$20
            sta Sctl
            lda #$e2
            sta SAdrL

LoopIt     lda Delay      ; digitizing rate; see why Hertz in AZ ain't
            dec a         ; gonna happen?
            bne LoopIt
```

```

                sta SData      ; write to trigger the Ensoniq
                lda SData      ; garbage, works as delay
                lda SData      ; get sample
                bne NonZ       ; zero samples are invalid on IIgs
                lda #1
NonZ            sta [BufPtr],y
                inc BufPtr
                bne CkEnd
                inc BufPtr+1
                bne CkEnd
                inc BufPtr+2
CkEnd          lda Kbd
                bmi EndIt
                lda BufPtr
                cmp EndPtr
                bne LoopIt
                lda BufPtr+1
                cmp EndPtr+1
                bne LoopIt
                lda BufPtr+2
                cmp EndPtr+2
                bne LoopIt
EndIt          sta Strobe
                phk
                plb
                rep #$20
                longa on
                rts
                END

```

```

-----
Ian Schmidt                twbv4@isuvax.iastate.edu            irsman@iastate.edu
  ->  USUAL SIG IS ON VACATION TO PROTEST ISU CENSORSHIP OF USENET  <-
-----

```

```

Path: ns-
mx!uunet!think.com!rpi!usenet.coe.montana.edu!milton!nntp.uoregon.edu!cie.uoregon.
edu!nparker
From: nparker@cie.uoregon.edu (Neil Parker)
Newsgroups: comp.sys.apple2
Subject: Re: Sound Digitization
Message-ID: <1991Dec18.022207.7036@nntp.uoregon.edu>
Date: 18 Dec 91 02:22:07 GMT
References: <1991Dec16.162532.14913@crash.cts.com>
<1991Dec17.101532.8062@nntp.uoregon.edu>
Sender: news@nntp.uoregon.edu
Organization: The Universal Society for the Prevention of Reality
Lines: 22

```

In article <1991Dec17.101532.8062@nntp.uoregon.edu> nparker@cie.uoregon.edu (Neil Parker) writes:

>[...code containing nasty typo...]

Sorry about that, folks. I posted some code that started like this:

```

>irqVolume equ 6
>soundCtl equ $E0C03C
>soundData equ $E0C03D
>soundAdrL equ $E0C03E
>soundAdrH equ $E0C03F
>

```

```
> pha
> pha
> pea irqVolume
> _GetVector ;Get ptr to system volume
```

That should be _GetAddr, not _GetVector. It makes a BIG difference...

- Neil Parker

--

Neil Parker No cute ASCII art...no cute quote...no cute
nparker@cie.uoregon.edu disclaimer...no deposit, no return...
parker@corona.uoregon.edu (This space intentionally left blank:)

```
##### E N D O F F I L E
### digitize
##### E N D O F F I L E
```

```
#####
### FILE      : digitizer
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1732 bytes   1 KB
#####
```

Path: ns-mx!hobbes.physics.uiowa.edu!zaphod.mps.ohio-
state.edu!mips!spool.mu.edu!agate!dog.ee.lbl.gov!nosc!crash!pnet01!pro-
hindugods.cts.com!steve
From: steve@pro-hindugods.cts.com (Steve Fenwick)
Newsgroups: comp.sys.apple2
Subject: Re: GS digitizing sounds
Message-ID: <1992May01.040028.20174@crash.cts.com>
Date: 1 May 92 04:00:28 GMT
Sender: news@crash.cts.com
Organization: Crash TimeSharing, El Cajon, CA
Lines: 28

In <1992Apr30.024719.6357@visual.spk.wa.us>
tkolstee@visual.spk.wa.us (Tony Kolstee) writes:

>I also have a question on the mod that I did. When I hook the wires up to
>the SPEAKER port on my amplifier and put up the Oscilliscope (sp?) screen,
>the sound wave centers around the bottom. If I blast the volume and then
>bring it back down, the wave centers in the middle, and it works okay.
>Why is this? And how come if I connect my speakers to the amp at the same
>time the wave stays at the bottom no matter what I do? Could this be an
>impedence problem?

I had that EXACT same problem. It is a grounding problem. The Line and
Mic outputs of most equipment has a lower reference voltage for the audio
waveform signal. To fix this, you need to run it through any op-amp I.C.,
and have a potentiometer going to ground from the inverting input to adjust
the waveform level. Make sure you have a relatively large value capacitor on
the output, because I noticed that with small values, the waveform starts to
'drift' down, I don't know why, though. I used an LM324, but any op-amp
should work.

Hope this helped!

Steve

```
ProLine: steve@pro-hindugods      | I know
Internet: steve@pro-hindugods.cts.com | that you
UUCP:    pro-hindugods!steve%ttardis@nosc.mil | know.....
```

```
##### E N D O F F I L E
### digitizer
##### E N D O F F I L E
```

```
#####
### FILE      : digitizer.circuit
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3425 bytes   3 KB
#####
```

```
Path: ns-mx!hobbes.physics.uiowa.edu!zaphod.mps.ohio-
state.edu!caen!nic.umass.edu!risky.ecs.umass.edu!umaecs!wistey
From: wistey@ecs.umass.edu
Newsgroups: comp.sys.apple2
Subject: Re: Sampling Directly and chip burnout
Message-ID: <17705.2a046a02@ecs.umass.edu>
Date: 3 May 92 22:32:33 GMT
References: <1992May01.201921.4002@ecst.csuchico.edu>
Distribution: usa
Lines: 57
```

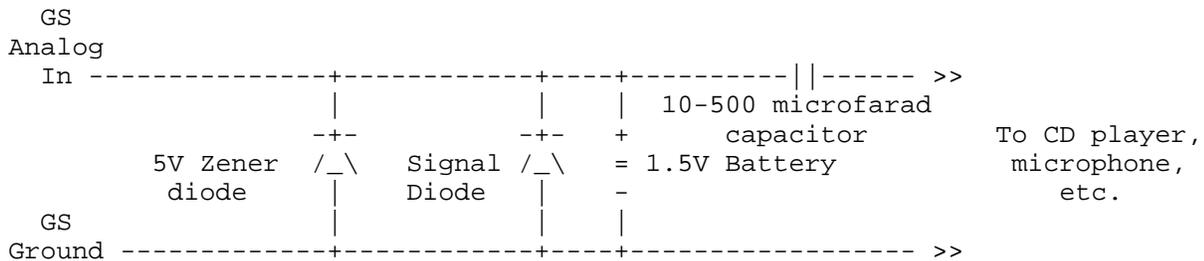
In article <1992May01.201921.4002@ecst.csuchico.edu>, jcrane@ecst.csuchico.edu (John Crane) writes:

```
> Hello Apple II Users !!!!!!!!
Hello !!!!!!! :-)
>
```

```
> Here is my question ..... Has anyone out there who has been successful at
> doing sampling without additional hardware tell me how you did it so that
> i dont damage my machine
```

"Sampling directly" is a good way to blow your Ensoniq chip. (I know: \$25 labor, \$25+ chip.) Yes, it's possible, and it works for a while, but the chip wasn't designed for that.

If you don't mind putting together a few parts, you can build your own adapter, though (explanation follows):



I don't remember the pin connections for Analog In and Ground on the 7-pin sound connector in the GS. Others have probably posted them. If not, write back and I'll look inside mine.

The Ensoniq is designed to handle 0 to +2.5 Volts. Most tape and CD players produce an output from, say, -1 to +1 volts. (Or -5 to +5 if you turn it up.) So the battery boosts this up to within the right range for the IIgs. The 5V Zener gives protection against brief voltage spikes, like sudden loud noises from the microphone. The signal diode gives protection from the other end, when the microphone is trying to drive negative voltages (from excessively loud noises). To test this, use AudioZap, HyperStudio, or some

other sound utility which lets you watch the level of the digitized input. The level should stay steady somewhere in the middle. Turn the volume all the way down on your CD/tape player, press Play, and turn it up until you can clearly see the sound moving above and below the middle.

There are ways to improve this, like adding a capacitor in parallel with the battery (if the battery is interfering with the sound for some odd reason) or replacing the given capacitor with a bigger one. If you're using a microphone, you don't need the capacitor, but then you would need to put the microphone in series with the battery: Ground-battery-microphone-Analog In, with the diodes still between Ground and Analog In. Other comments or questions, please write to ask...

>
> Thanks ----->John Crane CSUC

Mark Wistey: wistey@ecs.umass.edu (InterNet) | Bicycling, Christ-like living,
Lewis Hall 102, Amherst, MA 01003 (BikeNet) | Apple II's, Music, & Physics!
Shadowed address: Quad D, MSU (NSE exchange) | "QM:thedreamsthatstuffismadeof"

E N D O F F I L E
digitizer.circuit
E N D O F F I L E

```
#####
### FILE      : digitizer.circuit2
#####
### Created   : Thursday, January 16, 1997 Modified: Thursday, January 16, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5188 bytes   5 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!chi-news.cic.net!EU.net!news.bbnplanet.com!cpk-
news-
hubl.bbnplanet.com!feedl.news.erols.com!news.ecn.uoknor.edu!munnari.OZ.AU!metro!me
tro!cassius.ee.usyd.EDU.AU!adrianw
From: adrianw@cassius.ee.usyd.EDU.AU (Adrian Whichello)
Newsgroups: comp.sys.apple2
Subject: Sound input to the 2gs [long]
Date: 13 Jan 1997 22:53:35 GMT
Organization: Department of Electrical Engineering, Sydney University
Lines: 105
Distribution: inet
Message-ID: <5beedf$09r@metro.ucc.su.OZ.AU>
NNTP-Posting-Host: cassius.ee.usyd.edu.au
```

Hi everyone,

I've been mucking around with getting sounds into the 2gs lately, and thought I'd share the results, so far. Ages ago David Empsom wrote about using the internal ADC (to comp.sys.apple2):

```
> It is the 7-pin molex connector in the lower right corner of the
> motherboard, next to the Ensoniq. All stereo cards plug into this
> connector.
>
> Most of the pins are used for sound output and associated demultiplexing.
> Pin 1 is the sound input and pin 2 is analog ground. (Pin 1 is the one
> closest to the back of the computer, right next to the legend "J25" on the
> ROM 1 motherboard.)
```

NB^^^^^^^^^^^^^^^^^^^^ THIS IS BACKWARDS!!! Pin 1 is closest the FRONT of the 2gs, ie close to the green power on light.

```
>
> The sound input expects a signal which has a maximum range of 2.5V peak to
> peak. The input impedance is 3000 ohms.
>
> I'm not all that clear on audio impedances and voltages, so I'm not sure
> if it is safe to connect anything directly to this pin. It may be
> necessary to use a simple amplifier circuit to handle impedance matching.
>
> Can anyone elaborate on this?
```

I found the following circuit on ground (in

<ftp://ground.isca.uiowa.edu/apple2/MiscInfo/Hardware/digitizer.circuit>

[quote]

If you don't mind putting together a few parts, you can build your own

--

Dr Adrian Whichello Phone: +61 2 9351 4824
Imaging Science and Engineering Laboratory Fax: +61 2 9351 3847
Sydney University Electrical Engineering Email: adrianw@ee.usyd.edu.au
Australia WWW: http://www.ee.usyd.edu.au/~adrianw

"I wish to God these calculations had been executed by steam!" - C. Babbage

E N D O F F I L E
digitizer.circuit2
E N D O F F I L E

```
#####
### FILE      : diskii.bicolorled
#####
### Created   : Thursday, May 14, 1998 Modified: Thursday, May 14, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5961 bytes   5 KB
#####
```

Path:

```
news1.icaen!news.uiowa.edu!uunet!in4.uu.net!news1.interlink.net!sunqbc.risq.qc.ca!
howland.erols.net!news-peer.sprintlink.net!news-backup-
east.sprintlink.net!news.sprintlink.net!151.164.30.38!newsgate.swbell.net!151.164.
30.35.MISMATCH!cyclone.swbell.net!swbell!not-for-mail
From: Rubywand <rubywand@swbell.net>
Newsgroups: comp.sys.apple2
Subject: Re: Bi-color red/green LEDs: Disk II read/write?-- correction & update
Date: Wed, 13 May 1998 17:53:55 -0500
Organization: Southwestern Bell Internet Services, Richardson, TX
Lines: 135
Message-ID: <355A2483.51691F77@swbell.net>
References: <6eeq9s$mhc$1@lynx.unm.edu> <351318BF.6731F16F@swbell.net>
Reply-To: rubywand@swbell.net
NNTP-Posting-Host: ppp-207-193-9-18.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Trace: (null) 895099388 11695 (None) 207.193.9.18
X-Complaints-To: usenet@nnp3
X-Mailer: Mozilla 4.04 [en] (Win95; I)
Xref: news1.icaen comp.sys.apple2:133705
```

There was a recent opportunity to do the two-color LED mod to some Disk II drives-- i.e. A bi-color LED is swapped in for the old red "in Use" LED. It shows Green for Reads and Red for Writes.

Additional testing during the recent work led to an improved circuit and the discovery of an error in my description of the earlier circuit.

First the correction. My earlier post says ...

.....

```
> pin 11 goes to + end of mini 10uF capacitor
> pin 12 goes to - end of the mini 10uF capacitor; and
> pin 12 goes to a 22000 Ohm resistor
```

.....

There is no connection to pin 12 of the 74121. The above should have read ...

```
> pin 10 goes to + end of mini 10uF capacitor
> pin 11 goes to - end of the mini 10uF capacitor; and
> pin 11 goes to a 22000 Ohm resistor
```

The original circuit works fairly well (if you figure out that the directions contain an error); but, breadboard tests indicate that the 74121 can not adequately source many LEDs which might be employed.

The new circuit uses transistors to drive the LED sections. By getting LED power from the +12V line switched by power transistor Q1 in response to /Drive Enable, the transistor used for this purpose in the old circuit is eliminated. So, the new circuit needs only two transistors-- just one more than before-- and drives the Green/Red LED at higher brightness.

As in the original design, the new circuit shows Green for Drive Enabled + no Write and Red for Drive Enabled + Write. That is, a Read is assumed if the drive is ON and no Write is occurring. The advantage of this approach is that you always have a lighted LED 'drive ON' indicator and, so, there is no need to drill a new hole in your drive panel. The new LED can use the hole occupied by the old "in Use" indicator LED.

Parts

IC- 74121 or 74LS121 1-Shot multi-vibrator
 Qgreen- 2N2222A gen purpose NPN transistor
 Qred- 2N2222A gen purpose NPN transistor
 Rcath- 120 Ohm 5% 1/4 watt resistor
 Rgreen- 3.3k 5% 1/8 watt resistor
 Rred- 3.3k 5% 1/8 watt resistor
 Rp- 20k 5% 1/8 watt resistor
 Cp- 10uF/10v 10% "dipped tantalum" capacitor
 LED- 2.2V 20ma 3-lead (common cathode) Green/Red bi-color LED

Building the Circuit

IC- locate pin-1 and mark it on bottom side with white-out.
 'Dead-bug' mount the IC using epoxy in the open area near top-middle of board with pin-1 end pointing to the right.

connect Rcath to solder pad at - (minus) end of C2
 connect #20 wire from IC pin-7 to solder pat at - end of C2

connect Rp from IC pin-11 to IC pin-14
 connect Cp + to IC pin-10 and Cp - to IC pin-11

connect #20 wire from IC pin-14 to solder pat at + end of C4

connect a wire from IC pin-3 to end of R16 closest to 74LS125

connect Rgreen to IC pin-1 (74121 "/Q" output)
 connect Rred to IC pin-6 (74121 "Q" output)

solder transistor Qred Collector to Q1 power transistor Collector
 (solder pad area at left front of circuit board just to left of the power transistor). Position toward left edge of pad.

solder transistor Qgreen Collector to Q1 power transistor Collector
 solder pad to the right of Qred.

LED- connect a 3-wire 11" cable to the LED (black to center, red to to lead with right-angle bend, green to lead with slant bend).

Old "in Use" LED- pop off the retainer ring and push through the LED. Leave the LED mount in the hole. Cut off the LED, spread cable ends and tab over with cellophane tape. (Put old LED and

ring into parts box.

Spread apart retainer 'leaves' of LED mount (at back side of panel) to permit easier insertion of new 3-lead LED.

Run LED + cable over back of board and along bottom toward the hole in the front panel. Push through hole. (If hole is too small, use a Dremel tool and steel 'bulb bit' to slightly enlarge front part of hole.)

connect LED cable black to free end of Rcath
 connect LED cable green to Emitter of Qgreen (right transistor)
 connect LED cable red to Emitter of Qred.

position old LED cable beneath new LED cable.

connect a wire from the free end or Rgreen (on IC pin-1) to the Base lead of transistor Qgreen.

connect a wire from the free end or Rred (on IC pin-6) to the Base lead of transistor Qred.

Add epoxy to the back of the LED to secure LED in place
 ..

How it Works

When /Enable goes low to select the Drive, the power transistor (Q1) switches ON and supplies +12V at its Collector. If there is no Write, 74121 output /Q is high, Qgreen conducts, and the LED shows Green. That is: the Green LED will light during boots and for any READs.

If the Drive is selected (/Enabled is low) and there is a Write operation and Write Protect is not ON, then, the /Write Request signal at 74LS125 pin 8 will go low. This triggers the 74121 One-Shot (at pin 3) producing an aprox. 160ms pulse at 74121 output Q. For the duration of the pulse, /Q is low and Q is high. Qred conducts, and the LED shows RED to indicate WRITE.

Rubywand

```
##### E N D O F F I L E
### diskii.bicolorled
##### E N D O F F I L E
```

```
#####
### FILE      : diskii.leds
#####
### Created   : Saturday, March 21, 1998 Modified: Saturday, March 21, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5211 bytes   5 KB
#####
```

Path:

```
news1.icaen!news.uiowa.edu!news1.chicago.iagnet.net!qual.net!iagnet.net!newsfeed.i
nternetmci.com!206.229.87.25!news-peer.sprintlink.net!news-backup-
west.sprintlink.net!news-in-
west.sprintlink.net!news.sprintlink.net!Sprint!151.164.30.38!newsgate.swbell.net!s
wbell!not-for-mail
From: Rubywand <rubywand@swbell.net>
Newsgroups: comp.sys.apple2
Subject: Re: Bi-color red/green LEDs: Disk II read/write?-- update
Date: Fri, 20 Mar 1998 19:32:47 -0600
Organization: Southwestern Bell Internet Services, Richardson, TX
Lines: 112
Message-ID: <351318BF.6731F16F@swbell.net>
References: <6eeq9s$mhc$1@lynx.unm.edu>
Reply-To: rubywand@swbell.net
NNTP-Posting-Host: ppp-207-193-13-77.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Trace: (null) 890443787 27099 (None) 207.193.13.77
X-Complaints-To: usenet@nnrp3
X-Mailer: Mozilla 4.04 [en] (Win95; I)
Xref: news1.icaen comp.sys.apple2:131475
```

stephen e buggie writes ...

```
>
> A store is clearing out bi-color LEDs red/green. These LEDs have three
> wires: black (negative), red (red +), green (green +).
>
> I want to add the bi-color LED to my Disk II drives, so that it will glow
> GREEN for READ, and RED for WRITE. I already have an AE 3.5" 800K drive
> that does this, and it looks nice. This will be a third enhancement to
> Disk II --- "Super Bugg-Drive."
> ....
```

Since the last post, there was a chance to do some experimentation.
The circuit below seems to work well ...

```
NPN transistor Collector to Bi-color LED center
NPN Emitter to GND
NPN Base to two 3300 Ohm resistors
    One resistor goes to GND
    The other resistor goes ULN2003 pin 15 (connect to R2 at point
        closest to ULN2003)
```

```
LED Red (lead has right-angle at LED) to 150 Ohm resistor
    Resistor goes to pin 6 (Q output) of a 74121 One-Shot IC
```

```
LED Green (lead has slant-angle at LED) to 150 Ohm resistor
```


(7) to GND
(14) to +5V

*Note: To have the Write LED remain OFF when Write Protect is ON, connect instead to 74LS125 pin 8 (connect to R16 at point farthest from ULN2003)

LED middle lead goes to GND

In both the One-Shot and the NOR gates circuit the IC is driving LEDs. This is why 74xxx instead of 74LSxxx or CMOS IC's are specified. Should you use a higher-current bi-color LED, it may be necessary to add the driver transistors included in the original circuit.

By the way, it turns out that the WR Data signal is frequently active (with pulses) even when a Write is not in progress. This pretty well makes it useless as a way to monitor Writes.

Rubywand

```
##### E N D O F F I L E  
### diskii.leds  
##### E N D O F F I L E
```


The existing LED circuit is:

```

                    560ohm   Red LED
+12v switched ----/\ /\ /\ /-----B --|>|-- 2---Gnd  current =

```

As a Red/Green LED can do 3 colours (Green, Orange and Red) but we cannot do only Green or Red (as one LED will be run from the existing Enable while the 2nd will illuminate when writing is also occurring), I would recommend the following:

```

                    560ohm
+12v switched ----/\ /\ /\ /-----B --|>|----+ Green LED
                    |
                    Gnd--2 -----+
                    |
ULN2003 (D4-10) --/\ /\ /\ /-----|>|----+ Red LED
                    180ohm

```

This way you get Green for reading and Orange for writing. This immediately tells you that the drive has been modified and the contrast between green and orange is higher than between red and orange.

I do not know if the write signal is actually long enough to see (formatting a disk should be no problem but normal writes may not keep the red LED on long enough to see). If this is the case, additional circuitry would be needed to stretch the write pulse to the LED.

Note, this has not been tried, I make no guarantee that this will work. Try it on scratch disks first.

To calculate LED currents, use the following formula:

$$I_{led} = (V_{supply} - V_{led}) / R$$

so for the original circuit:

$$\begin{aligned}
 I &= (12 - 2) / 560 \\
 &= 10/560 \\
 &= 17.86mA
 \end{aligned}$$

The output of pin 10 of the ULN2003 is clamped to a maximum of 5 volts by a diode so:

$$\begin{aligned}
 I &= (5 - 2) / 180 \\
 &= 3/180 \\
 &= 16.67mA
 \end{aligned}$$

--

David Wilson School of IT & CS, Uni of Wollongong, Australia david@uow.edu.au

```

##### E N D O F F I L E
### diskii.led
##### E N D O F F I L E

```

```
#####
### FILE      : drive.signals
#####
### Created   : Tuesday, January 1, 1980  Modified: Thursday, March 1, 1973
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1525 bytes   1 KB
#####
```

These are the drive control signals for each type of disk drive:

Signal	Function	Unidisk	//c	//gs	Disk][
GND	ground	1-4	1-4	1-3	1,3,5,7
+5V	+5 V	6,16	6	11,12	
-12V	-12 V	5	5	9	
+12V	+12 V	7,8	7,8	13,15,17,19	
PH 0-3	stepper motor phases	11-14	11-14	11-14	2,4,6,8
/DRVEN	drive enable	17 (9)	17	17 (9)	14
/WREQ	write request	15	15	15	10
/WRPROT	write protected	10	10	10	20
WRDATA	write data	19	19	19	18
RDDATA	read data	18	18	18	16

The UniDisk uses pin 9 to select the second drive. Inside each UniDisk, the signal from pin 9 at the computer is connected to pin 17 of the daisy-chain drive connector. When the computer selects drive 2 by activating pin 9, the first drive passes this through and the second drive sees its enable signal on pin 17. Thus all drives are identical.

The Disk][controller has two drive connectors, and the same pin (14) is used on each connector to select the appropriate drive. This signal is the only difference between the connectors - all other signals are connected in parallel.

Controllers with IWM chips can use the step motor phase outputs PH0..3 for special purposes, this is done when controlling Twiggies or 3.5" drives. The Disk II controller is a subset of the IWM functions, that means every IWM chip can emulate a Disk II controller card.

Drive connector numbering:

```
D19:
1   2   ...   9   10
11  12  ...  19
```

```
20 pin header (Disk II)
2   4   ...  20
1   3   ...  19
```

Patrick

```
##### E N D O F F I L E
### drive.signals
##### E N D O F F I L E
```

```
#####
### FILE      : dsk535.pinouts
#####
### Created   : Wednesday, May 6, 1998  Modified: Wednesday, May 6, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3095 bytes   3 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!cs.utexas.edu!news.maxwell.syr.edu!sunqbc.risq.qc.ca!news.uow.edu.au!dav
id
From: david@uow.edu.au (David Wilson)
Newsgroups: comp.sys.apple2
Subject: Re: db-19 drive cable compatibility: A2 vs Mac
Date: 6 May 98 02:51:43 GMT
Organization: University of Wollongong, NSW, Australia.
Lines: 53
Message-ID: <david.894423103@wraith>
References: <6ing4p$ulq$1@lynx.unm.edu>
NNTP-Posting-Host: wraith.cs.uow.edu.au
X-Newsreader: NN version 6.5.0 #15 (NOV)
Xref: newsl.icaen comp.sys.apple2:133439
```

buggie@musca.unm.edu (stephen e buggie) writes:

```
> COMPATIBILITY EXPERIMENTS OF APPLE II VS. EARLY MAC
> DB-19 DISK DRIVE CABLES

> I am unable to get the Mac db-19 cables to run with Disk II. Last
>weekend, I tediously measured PINOUTS on the A2 db-19 cable vs. the older
>Mac db-19 cables. Here are the disturbing results:

> First, the A2 db-19 cable uses 18 lines, while the Mac db-19 cable
>uses only 17 lines. For A2, pins 5 and 9 are used, and pin 16 is vacant.
>The Mac db-19 cable is vacant on pin #5.

> Is there any hope of modifying the Mac db-19 cable to make it work
>with A2? How vital is pin #9 wire line in the A2 drive cable? I have
>toyed with the idea that I could run a jumper in the A2 male plug from
>pin 5 to pin 16, then on the IDE-20 change the crimp pin to position 5.
>But this would do nothing about pin #9 ...
```

Here are the pinouts from Nathan's web page:

Much of this information comes from page 90 of Open-Apple Volume 1, number 11 (1985).

The following table lists all of the drive control signals for each type of controller card/disk port.

signal	function	Unidisk	IIC	IIGs	Disk][
GND	ground reference	1-4	1-4	1-3	1,3,5,7
-12V	-12 volts DC	5	5	5	9
+5V	+5 volts DC	6,16	6	6	11,12
+12V	+12 volts DC	7,8	7,8	7,8	13,15,17,19
WRPROT	write protect	10	10	10	20

PH 0-3	stepper motor phases	11-14	11-14	11-14	2,4,6,8
WREQ	write request	15	15	15	10
DRVEN	drive enable	17 (9)	17	17 (9)	14
RDDATA	read data	18	18	18	16
WRDATA	write data	19	19	19	18
EXTINT	external interrupt	-	9	-	-
3.5DISK	Apple 3.5 drive enable	-	-	4	-
HDSEL	3.5" drive head select	-	-	16	-
	not connected	-	16	-	-

As you can plainly see, pin 5 supplies the -12V used by the Disk][drive. No pin 5 => no -12V => no function. Have a look at the circuit diagram of the Disk][(in the DOS manual) to see what the -12V is used for.

Pin 9 is the second drive select and is not needed unless you intend to daisy chain drives.

--

David Wilson School of IT & CS, Uni of Wollongong, Australia david@uow.edu.au

```
##### E N D O F F I L E
### dsk535.pinouts
##### E N D O F F I L E
```

```
#####
### FILE      : duodisk.cable
#####
### Created   : Tuesday, January 1, 1980 Modified: Thursday, March 1, 1973
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1360 bytes    1 KB
#####
```

The pinout for that's in the FAQ

Here's a quote of that part

005- I picked up an apple IIe and a duodisk drive at a thrift store. Could someone describe the connecting cable?

I just checked the pinout on a Duodisk cable. The numbers for the pins are inside the plug by the pins, but I'll draw them for you.

DB 19 looking at the end of the cable:

```

 1  2  3  4  5  6  7  8  9 10
o  o  o  o  o  o  o  o  o  o
  o  o  o  o  o  o  o  o  o  o
11 12 13 14 15 16 17 18 19
```

DB 25 looking at the end of the cable: (x = no pin)

```

 1  2  3  4  5  6  7  8  9 10 11 12 13
x  o  o  o  o  o  o  o  o  o  o  o  x
  o  o  o  o  o  o  o  o  o  x  o  o  x
14 15 16 17 18 19 20 21 22 23 24 25
```

Cable

DB 19	DB 25
1	2
2	4
3	9 & 21
4	10 & 14
5	23
6	7
7	19
8	20
9	8
10	12
11	15
12	16
13	17
14	18
15	5
16	24
17	11
18	3
19	6

Eric GILLARDIN wrote:

> I bought an APPLE][e this sunday, but I have no cable to connect the
> duodisk system to the computer. I search anyone who could send me the scheme
> of such a cable to make it...
>
> If you know something about this, please : eric.gillardin@wanadoo.fr
>
> Many thanks !

E N D O F F I L E
duodisk.cable
E N D O F F I L E

```
#####
### FILE      : dvorak.mod
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1856 bytes   1 KB
#####
```

Path:

blue.weeg.uiowa.edu!news.uiowa.edu!uunet!news.mathworks.com!hookup!swrinde!howland
.reston.ans.net!vixen.cso.uiuc.edu!uwm.edu!msunews!harbinger.cc.monash.edu.au!news
.cs.su.oz.au!metro!seagoon.newcastle.edu.au!wabbit.cc.uow.edu.au!wabbit.cc.uow.edu
.au!not-for-mail

From: david@wraith.cs.uow.edu.au (David E A Wilson)
Newsgroups: comp.sys.apple2
Subject: Re: Dvorak keyboard an IIe? Possible?
Date: 13 Feb 1995 10:00:14 +1100
Organization: University of Wollongong, NSW, Australia.
Lines: 25
Message-ID: <3hm3tu\$mp6@wraith.cs.uow.edu.au>
References: <3hdh82\$nud@cello.gina.calstate.edu>
NNTP-Posting-Host: wraith.cs.uow.edu.au

lacoss@cello.gina.calstate.edu (Greg R. Achenbach) writes:

```
>I've been using IIC's, IIC+'s, and IIg's for a while and have switched
>over to the Dvorak keyboard layout. I recently started working with a
>IIe and am getting really frustrated by the Qwerty hunt-and-peck. Is
>there any way to switch the IIe keyboard to Dvorak?--
```

There are a number of ways to set the NTSC //e keyboard to Dvorak.

- 1) If you have a Rev A motherboard cut X1 and join X2. This will allow AN2 to control the keyboard layout (default will be Dvorak).
- 2) If you have a Rev B motherboard and want AN2 to control the keyboard layout cut X2 and solder a short wire between the back half of X2 and the back half of X3 (do not join X3).
- 3) Obtain a 24 pin IC socket. Solder 3 fine wires to pins 12, 19 and 24. Solder the other ends to a SPDT switch (pin 19 to the centre/common terminal). Remove the keyboard ROM, insert the switch+socket and then insert the keyboard ROM. Cut X1 (if Rev A) or X2 (if Rev B) to isolate pin 19. Mount the switch somewhere convenient.

All the above was taken from "Understanding the Apple IIe" by Jim Sather.
I recommend it to you.

--

David Wilson Dept CompSci Uni Wollongong Australia david@cs.uow.edu.au

```
##### E N D O F F I L E
### dvorak.mod
##### E N D O F F I L E
```

```
#####
### FILE      : dynacomp.pwrfix
#####
### Created   : Tuesday, July 27, 1999  Modified: Tuesday, July 27, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1886 bytes   1 KB
#####
```

Path:

```
news1.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!129.79.6.160!news.indiana.edu!l
ogbridge.uoregon.edu!newshub.tc.umn.edu!lynx.unm.edu!capella.unm.edu!buggie
From: buggie@capella.unm.edu (stephen e buggie)
Newsgroups: comp.sys.apple2
Subject: Repair of Dead IIgs DynaComp internal power supply!
Date: 26 Jul 1999 19:29:45 GMT
Organization: University of New Mexico, Albuquerque
Lines: 40
Message-ID: <7nicv9$bq6$l@lynx.unm.edu>
NNTP-Posting-Host: capella.unm.edu
X-Newsreader: TIN [version 1.2 PL2]
Xref: news1.icaen comp.sys.apple2:150182
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I've been transplanting working IIE power supplies into the IIgs internal casing, m with good results. 14 have been made so far, and they are called "BUGG-POWER IIgs JR."

Yesterday I succeeded in repairing a dead Dynacomp power supply. In fact, I have replicated the repair in four units!

There are three patterns of failure in the IIgs DynaComp power supply:

- (1) Fuse blows every time -- components look okay.
- (2) Fuse is okay, but no voltage on any line. Components look okay.
- (3) Volts test okay with no load, but unit quits when attached to motherboard. Heat scorch marks on power supply circuit board.

This fix applies ONLY to #3, above. It applies only to "early" Dynacomp power supplies. When inspecting the unit inside, the early versions have one or fewer tall yellow thin capacitors at the bow-end (10v, 1000 ufd). (The later versions have the five tall yellows).

To fix the unit, replace two tiny radial electrolytic capacitors:

REPLACE THESE: 1 ufd, 35v

NEW CAPACITORS: 1 ufd, 50v

The new ones are slightly larger than the old. Note the polarity: The "-" terminal faces the stern (back) of the power supply.

I salvaged the 1 ufd, 50v capacitors from other units that died for other reasons. But they are available from Jameco for \$0.04 in quantities of 100.

Steve Buggie buggie@unm.edu Gallup NM

E N D O F F I L E
dynacomp.pwrfix
E N D O F F I L E

MEB"6("T@(\$#-24Y35\$%,3\$%424].()8@EB M()8@EB M()8@EB"6()8@EB"6
M("T@EB"6()8@EB"6()8@+2"6()8@(#(-4U!%14-((=\$%3D52051/4B"6()8@
MEB"6()8@+2"6()8@EB M()8@EB"6()8@EB"6()8@EB"6()8@(#(-4U!%04M)
M3D<@1E)/32!7251(24X@04X@05!03\$53,\$94(%!23T=204T@ ()8@EB M()8@
MEB"6()8@(#,-5T]21"!35%)50U154D4@EB"6()8@EB"6()8@EB"6()8@EB"6
M()8@EB"6()8@EB"6("T@EB"6()8@(#,-4U!%14-((=\$5\$251/4B @EB"6()8@
MEB"6()8@EB"6()8@EB"6()8@EB"6("T@EB"6()8@EB"6()8@(#0-4U!%14-(
M(\$5\$251/4B!#3TU-04Y\$4R M()8@EB"6()8@EB"6("T@EB"6()8@EB"6()8@
MEB M()8@(#4-4\$A205-%(\$-/3E-44E5#5\$E/3B @+2"6()8@EB"6()8@EB"6
M()8@EB"6()8@EB"6()8@EB M()8@(#8-4T%-4\$Q%(%9/0T%"54Q!4ED@ ()8@
MEB"6()8@EB"6()8@EB"6()8@+2"6()8@EB"6("T@EB"6()8@(#<-4T%-4\$Q%
M(%!23T=204T@EB"6()8@+2"6()8@EB M()8@EB"6("T@EB"6()8@EB M()8@
MEB"6("T@(#<-2\$%.1U504S\@EB"6()8@EB M()8@EB"6("T@EB"6()8@+2"6
M()8@EB"6("T@EB"6()8@+2"6()8@(#<-4U!%14-((=\$5\$251/4B!%6\$%-4\$Q%
M(" "6()8@EB"6()8@EB"6()8@EB"6()8@+2"6()8@EB"6()8@(#@-4%)/1U)!
M32!%6\$%-4\$Q%(" M()8@EB"6("T@EB"6()8@EB"6()8@EB"6()8@EB"6()8@
MEB"6()8@,3(-5\$%3\$53()8@EB"6()8@+2"6()8@EB M()8@EB"6("T@EB"6
M()8@EB"6()8@EB"6("T@EB"6()8@,3,-05!014Y\$25@EB!304U03\$4@5D]#
M04)53\$%262"6("T@EB"6()8@EB"6()8@EB"6("T@EB"6()8@,30-5T%24D%.
M5\$D@EB"6()8@EB"6()8@EB"6()8@EB"6("T@EB"6()8@EB"6()8@EB"6()8@
MEB"6()8@,38-14-(3R!=6R!34\$5%0T@4UE.5\$A%4TE:15(-#4E.5%)/1%5#
M5\$E/3@T-56YT:6P@<F5C96YT;'DL(' -P965C:"!G96YE<F%T:6]N(&)Y(&\$@
M;6EC<F\M8V]M<5T97(@<F5Q=6ER960@82!F86ER(&%M;W5N="!09B!M96UO
M<GD@<W1O<F%G92!A;F0@:&%R9'=A<F4N("!7:71H('1H92!A9'9E;G0@;V8@
M(DQI;F5A@B!0<F5D:6-T:79E(\$-09&EN9R(@*&\$@;6%T:&5M871I8V%L(&UE
M=2AO9"!09B!S:6UU;&%T:6YG('1H92!H=6UA;B!V;V-A;" @=")A8W0I('1H
M92!A;6]U;G0@;V8@;65M;W)Y(&YE961E9"!T;R!S=&]R92!S<&5E8V@=@V%S
M(&=R96%T;'D@<F5D=6-E9"X@(\$EN<W1E860@;V8@<W1O<FEN9R!T:&4@86-T
M=6%L(' -P965C:"!S:6=N86PL(&]N;'D@=&AO<V4@3%!('!A<F%M971E<G,@
M(&YE961E9"!T;R!D97-C<FEB92!E86-H('!A<G1I8W5L87(@<W!E96-H(' -O
M=6YD(&%R92!S=&]R960N("!4:&ES(&%L;&]W<R!P<F]G<F%M<R!T;R!H879E
M(&\$@;&%R9V4@<F5S:61E;G0@=F]C86)U;&%R>2!W:71H;W5T(&AA=FEN9R!T
M;R!A8V-E<W,@82!D:7-K(&]R('1A<&4@979E<GD@=&EM92!A;B!A;'1E<FYA
M=&4@<F5S<&]N<V4@:7,@;F5E9&5D+B @07,@86X@:6QL=7-T<F%T:6]N+"!T
M:&4@<V%M<&QE('908V%B=6QA<GD@<W5P<&QI960@=VET:"!T:&4@14-(3R!=
M6R!C;VYT86EN<R!A;&P@;V8@=&AE(&QE='1E<G,@;V8@=&AE(&%L<&AA8F5T
M+"!N=6UB97)S+"!A;F0@;W9E<B Q,# @;W1H97(@=V]R9',@:6X@;&5S<R!T
M:&%N(&)&]F(&UE;6]R>2X-#51H92!H96%R="!09B!T:&4@14-(3R!=6R!I
M<R!497AA<R!);G-T<G5M96YT)W,@5\$U3(#4R,# @<W!E96-H('!R;V-E<W-O
M<BX@(%1H:7,@:6YT96=R871E9"!C:7)C=6ET(&ES(&%N('5P9W)A9&5D('9E
M<G-I;VX@;V8@=&AE(&]N92!U<V5D(&EN('1H92!3<&5A:R F(%-P96QL("A4
M32!09B!497AA<R!);G-T<G5M96YT<RD@=&AA="!H87,@8F5E;B!M;V1I9FEE
M9"!F;W(@=7-E('=I=&@&86X@96EG:'0@8FET('!R;V-E<W-O<BX@(%1H92!%
M0TA/(%U;(&AA<R!B965N(&1E<VEG;F5D(' -O('1H870@86QL(&]F('1H92!F
M96%T=7)E<R!09B!T:&4@5\$U3(#4R,# @;6%Y(&)E('5S960@=VET:"!T:&4@
M05!03\$4L(&AO=V5V97(@;VYL>2 @4D%-(&)A<V5D(' -P965C:"!I<R!U<V5D
M('=I=&@=&AE(&EN:71I86P@;W!E<F%T:6YG(' -Y<W1E;2X@16UP='D@<V]C
M:V5T<R!H879E(&)E96X@<')O=FED960@9F]R(' -T86YD87)D('908V%B=6QA
M<GD@4D]-<R!W:&5N('1H97D@8F5C;VUE(&%V86EL86)L92X-#51H92!I;FET
M:6%L(&]P97)A=&EN9R!S>7-T96T@:7,@82!204T@8F%S960@<&AO;F5M92!S
M>7-T96T@=&AA="!W87,@9&5S:6=N960@=&%\@<')O=FED92!F;&5X:6)I;&ET
M>2!A;F0@82!F=7)T:&5R(&EN8W)E87-E(&EN(&UE;6]R>2!E9F9I8VEE;F-Y
M(&]V97(@<W1R86EG:'0@96YC;V1E9"!W;W)D<RX@0GD@=7-I;F<@=&AE(%-0
M145#2"!%1\$E43U(@=&AE('5S97(@;6%Y(&-R96%T92!A;GD@=V]R9"!O<B!P
M:')A<V4@=&AA="!H92!D97-I<F5S('1O(&AA=F4@<W!O:V5N(&9R;VT@82 @
M<')O9W)A;2X@(%1H:7,@8V]D92!I<R!I;B!A(&-O;7!A8W0@9F]R;2!A;F0@
M8V]N=&%I;G,@:6YF;W)M871I;VX@;VX@=&AE(' -O=6YD+"!P:71C:"P@86YD
M(&1U<F%T:6]N(&]F(&5A8V@<&AO;F5M92X@02!S96-O;F0@<')O9W)A;2!C
M86QL960@4U!%14-((=\$%3D52051/4B!I<R!A(&)I;F%R>2!P<F]G<F%M('=H

M:6-H(&EN=&5R<')E=',@=&AI<R!C;V1E(&%N9"!P87-S97,@=&AE(&-O<G)E
M8W0<&%R86UE=&5R<R!T;R!T:&4@14-(3R!=6R!T;R!S<&5A:R!T:&4@=V]R
M9"X@3VYL>2!T:&4@4U!%14-((=\$=%3D52051/4B H,4L@8GET97,I(&%N9"!T
M:&4@86-T=6%L('9O8V%B=6QA<GD@*#P('1O(#P('!B>71E<R]W;W)D*2!A
M<F4@;F5E9&5D(&9O<B!A('!R;V=R86T@=&\@<W!E86LN("!4:&4@861D<F5S
M<R!O9B!T:&4@=V]R9"!T;R!B92!S<&]K96X@:7,@DW!O:V5DE"!T;R!T:&4@
M4U!%14-((=\$=%3D52051/4B!A;F0@82!C86QL(&ES(&UA9&4@=&\@:6YI=&EA
M=&4@=&AE('P965C:"X-#51H92!S96-T:6]N<R!W:&EC:"!F;VQL;W<@9&ES
M8W5S<R!I;B!D971A:6P@:&]W('1O(&EN<W1A;&P@=&AE(&-A<F0@86YD('1H
M92!D:69F97)E;G0@8V]M<&]N96YT<R!O9B!T:&4@<V]F='=A<F4@<WES=&5M
M(&%N9"!H;W<@=&AE>2!A<F4@:6UP;&5M96YT960N(\$9O;&QO=VEN9R!T:&%T
M(&ES(&\$@<W1E<"!B>2!S=&5P(&5X86UP;&4@;V8@:&]W('1O('5S92!T:&4@
M<W!E96-H(&5D:71O<B!T;R!C<F5A=&4@=V]R9',@86YD('1H96X@82!S:&]R
M="!P<F]G<F%M(&]F(&AO=R!T;R!A8V-E<W,@=&AE;2!F<F]M(\$%04\$Q%4T]O
M5"!B87-I8RX@(\$ET(&ES('U9V=E<W1E9"!T:&%T('EO=2!R96%D(&]V97(@
M=&AE(&YE>'0@<V5C=&EO;G,@9FER<W0@86YD('1H96X@=V]R:R!T:')O=6=H
M('1H92!E>&%M<&QE('1O(&)E8V]M92!F86UI;&EA<B!W:71H('1H92!S>7-T
M96TN("!9;W4@;6%Y(&%L<V\@=V%N="!T;R!L:7-T('1H92!S86UP;&4@<')O
M9W)A;7,@*%)%0TE412!A;F0@5\$%,2TE.1R!465!%5U)5\$52*2!O<B!E>&%M
M:6YE('!O<G1I;VYS(&]F('1H92!S86UP;&4@=F]C86)U;&%R>2!W:71H('1H
M92!34\$5%0T@141)5\$]2(&%S(&9U<G1H97(@97AA;7!L97,N#0TQ#45#2\$\
M75L@4U!%14-((%-%93E1(15-)6D52#0U)3E-404Q,051)3TX-#4)E9F]R92!I
M;G-T86QL:6YG('1H92!%0TA/(%U;(&)E('U<F4@86QL('!O=V5R(&ES(&1I
M<V-O;FYE8W1E9"!F<F]M('1H92!C;VUP=71E<BX@(%1H92!%0TA/(%U;(&-A
M<F0@;6%Y(&)E('!L=6=G960@:6YT;R!A;GD@;V8@<VQO=',@,B!T:')U(#4@
M;V8@=&AE(\$%04\$Q%(%U;+B @5&AE('P96%K97(@8V]R9"!S:&]U;&0@8F4@
M871T8=&H960@=&\@=&AE('1E<FUI;F%L<R!O;B!T:&4@8F%R!O9B!T:&4@
M<W!E86ME<B!A;F0@=&AE;B!P;'5G9V5D(&EN=&\@=&AE(&IA8VL@;VX@=&AE
M(&)A8VL@;V8@=&AE(\$5#2\$\
M75L@8V%R9"X@(%E<QA8V4@=&AE(&-O=F5R
M(&%N9"!T:&4@:6YS=&%L;&%T:6]N(&ES(&-O;7!L971E+B @5&AE<F4@:7,
M82!S:&]R="!S=6)R;W5T:6YE(&QO8V%T960@=VET:&EN('1H92!34\$5%0T@
M1T5.15)!5\$]2('=H:6-H('=I;&P@9&5T97)M:6YE('=H:6-H('L;W0@=&AE
M(\$5#2\$\
M75L@:7,@;&]C871E9"!I;BX@(%1H:7,@<VAO=6QD(&)E(")C86QL
M960B(&%T('1H92!S=&%R="!O9B!A('!R;V=R86T@8F5F;W)E(&%N>2!S<&5E
M8V@:7,@871T96UP=&5D(&%N9"!W:6QL(&)E(&1I<V-U<W-E9"!I;B!T:&4@
M;F5X="!S96-T:6]N+@T-5&AE(%-0145#2"!%1\$E43U(@9&ES:R!I<R!A(#\$S
M('E8W1O<B!D:7-K(&-O<&EE9"!U<VEN9R!\$3U,@,RXR+C\$@86YD('=I;&P@
M;F]T(')U;B!O(\$]1/4R S+C,@<WES=&5M('=I=&AO=70@9FER<W0@=7-I
M;F<@=&AE(\$)/3UOQ,R!U=&EL:71Y+" @270@:7,@<W5G9V5S=&5D('1H870@
M82!B86-K=7 @9&ES:R!B92!M861E(&%S('O;VX@87,@<&]S<VEB;&4@=&\@
M<')O=&5C="!I=',@8V]N=&5N='N("!)9B!Y;W4@:&%V92!\$3U,@,RXS('EO
M=2!M87D@('FJU9F9I;B(@:70@870@=&AI<R!T:6UE+@T-4U!%14-((=\$=%3D52
M051/4@T-5&AE(%-0145#2"!14Y%4D%43U(@:7,@82 Q2R!B:6YA<GD@;6]D
M=6QE('1H870@8V]N=&%I;G,@=&AE(&%C='5A;"!P:&]N96UE(&-O9&5S+"!R
M;W5T:6YE<R!F;W(@<')O8V5S<VEN9R!T:&5S92!C;V1E<R!A;&]N9R!W:71H
M('1H96ER('9A<FEA8FQE<R H<&ET8V@L(&QE;F=T:"P@86YD("!V;VQU;64I
M+"!A;F0@=&AE(')O=71I;F4@9F]R(&QO8V%T:6YG('1H92!%0TA/(%U;('L
M;WON("!)9B!Y;W4@('F-A=&%L;V<B('1H92!S=7!P;&EE9"!D:7-K+"!Y;W4@
M=VEL;"!S964@9F]U<B @9&EF9F5R96YT("!V97)S:6]N<R @;V8@=&AE(%-0
M145#2"!14Y%4D%43U(N(" @16%C:"!V97)S:6]N(')E<VED96YT(&EN(&\$@
M9&EF9F5R96YT('!O<G1I;VX@;V8@;65M;W)Y('1O(&%C8V]M;6]D871E('1H
M92!(25)%4R!P86=E<R!A;F0@9&EF9F5R96YT('I>F4@<WES=&5M<RX@(%1H
M92!L;V-A=&EO;G,@;V8@=&AE<V4@<F]U=&EN97,@86YD('1H96ER(&%S<V]C
M:6%T960@(&5N=')Y('!O:6YT<R!A<F4@;&ES=&5D(&EN(%1!0DQ%(\$@870@
M=&AE(&5N9"!O9B!T:&4@;6%N=6%L+@T-5&AE(%-P96%K(')O=71I;F4@=&%K
M97,@=&AE(&-O;7!R97-S960@<W!E96-H(&1A=&\$@8F5G:6YN:6YG(&%T('1H
M92!S=&%R=&EN9R!A9&1R97-S("AS<&5C:69I960@8GD@=&AE(")C86QL:6YG
M(B!P<F]G<F%M*2P@<')O8V5S<V5S(&ET+"!A;F0@=&AE;B!O=71P=71S(&ET
M('1O('1H92!%0TA/(%U;(&9O<B!S<&5A:VEN9RX@(\$ET('=I;&P@:V5E<"!P

M<F]C97-S:6YG("!S=6-C97-S:79E("!B>71E<R @;V8@:6YF;W)M871I;VX@
M=6YT:6P@:7,@8V]M97,@86-T;W(G<R!A;B B96YD(B!C;VUM86YD("@@2\$58
M(")!OR(@*2!W:&EC:"!I<R!T86-K960@;VYT;R!T:&4@96YD(&]F(&5A8V@@
M=V]R9"!B>2!T:&4@4U!%14-(((\$5\$251/4BX@(\$%T('1H870@<&]I;G0@<W!E
M96-H(&ES('1E<FUI;F%T960@86YD(&-O;G1R;VP@:7,@<F5T=7)N960@=&\@
M=&AE(&UA:6X@<')O9W)A;2X-#51H92!315133%0<F]U=&EN92!A8W1U86QL
M>2 B;]&O:W,B(&9O<B!T:&4@14-(3R!=6R!C87)D(&%N9"!T:&5N(&UO9&EF
M:65S("!T:&4@4W!E86L@<F]U=&EN92!A8V-O<F1I;F=L>2X@(%1H:7,@<F]U
M=&EN92!S:&]U;@0@8F4@8V%L;&5D(&%T('1H92!S=&%R="!O9B!A;GD@(' -P
M965C:" @<')O9W)A;2!S:6YC92!D:69F97)E;G0@<')O9W)A;7,@;6%Y(&)E
M('5S:6YG(&1I9F9E<F5N="!L;V-A=&EO;G,@9F]R('1H92 @4U!%14-((=\$=%
M3D52051/4BX@(\$EF('EO=7(@8V%R9"!I<R!I;G-T86QL960@:6X@<VQO=" U
M('EO=2!D;VXG="!R96%L;'D@;F5E9"!T;R!U<V4@=&AE(%-%5%- ,5"!R;W5T
M:6YE+"!H;W=E=F5R(&EF('EO=2!C:&%N9V4@=&AE(&QO8V%T:6]N(&]F('1H
M92!%0TA/(%U;(&-A<F0@=&AE('!R;V=R86T@=VEL;"!N;W0@9G5N8W1I;VX@
M<')O<&5R;'DN#0U4:&4@4T544TQ4(')O=71I;F4@:7,@86QS;R!U<V5F=6P@
M9F]R(&1E=&5R;6EN:6YG#0TR#45#2\$\@75L@4U!%14-((%-93E1(15-)6D52
M#0UW:&5T:&5R('1H97)E(&ES(&%N(\$5#2\$\@75L@8V%R9"!I;G-T86QL960@
M:6X@=&AE(' -Y<W1E;2X@(%1H870@=V%Y(&\$@<')O9W)A;2!W:&5R92!S<&5E
M8V@@:7,@86X@96YH86YC96UE;G0@8G5T(&YO="!A(&YE8V5S<VET>2!M87D@
M<W1I;&P@8F4@<G5N('=I=&AO=70@=&AE(' -P965C:"X@(%1O(&1O('1H:7,@
M82 B4\$5%2R(@;F5E9',@=&\@8F4@;6%D92!T;R!T:&4@;&]C871I;VX@8V%L
M;&5D(")33\$]4(B H<V5E(%1A8FQE(#\$I+B @268@=&AE(%-%5%- ,5"!R;W5T
M:6YE(&-A;FYO="!F:6YD(&%N(\$5#2\$\@75L@8V%R9"!I="!W:6QL(' -E="!T
M:&ES(&QO8V%T:6]N('1O(#\$V("@Q," @2&5X*2X@(\$%N(&5X86UP;&4@:7,@
M;&ES=&5D(&Z)&]W.@T-,3 @("!,3T)95\$4@/2 Q-C,X-#H@2%E"651% (#T@
M,38S.#4Z(%-014%+ (#T@,38S.#8Z(\$Y85%-02R](#\$V,SDX.B!33\$]4 (#T@
M,38T,3,Z(%-%5%- ,5"](#\$W,SS#0TR," @(\$5#2\$\@/2 Q.B!#04Q,(%-%
M5%- ,5#H@6"](%!%14L@*%- ,3U0I.B!)1B!8 (#T@,38@5\$A%3B!%0TA/(#T@
M, T-26X@=&AE(&%B;W9E(&QI<W1I;F<@82!F;&%G(&QA8F5L960@(D5#2\$\B
M('=A<R!S970@=&\@;VYE(&EF(&\$@<W!E96-H(&-A<F0@=V%S('!R97-E;G0@
M;W(@>F5R;R!I9B!T:&5R92!W87-N)W0N("!4:&ES(&UA>2!B92!U<V5D(&QA
M=&5R(&EN('1H92!P<F]G<F%M('1O(&)Y<&%S<R!S<&5E8V@@<F]U=&EN97,
M=VAI8V@<8V]U;@0@8V%U<V4@=&AE('!R;V=R86T@=&\@ (FAA;F<B(&EF("!N
M;R!C87)D('=A<R!B96EN9R!U<V5D+@T-4U!%04M)3D<@1E)/3B!7251(24X@
M04X@05!03\$533T94(%!23T=204T-#4EN(&]R9&5R(&9O<B!T:&4@4U!%14-
M(\$=%3D52051/4B!T;R!S87D@82!W;W)D+"!I="!H87,@=&\@:VYO=R!T:&4@
M<W1A<G1I;F<@861D<F5S<R!O9B!T:&4@=V]R9"X@(%-I;F-E(\$)!4TE#(&1E
M86QS('=I=&@<9&5C:6UA;"!N=6UB97)S(&%N9"!T:&4@4U!%14-((=\$=%3D52
M051/4B!D96%L<R!W:71H(&)I;F%R>2!N=6UB97)S+"!T:&4@861D<F5S<R!W
M:6QL(&AA=F4@=&\@8F4@<W!L:70@:6YT;R!T=V\@<&]R=&EO;G,@86YD('1H
M96X@<&]K960@=&\@=&AE(%-0145#2"!14Y%4D%43U(@=VET:"!T=V\@<V5P
M87)A=&4@<&]K97,N("!&;W(@8V]N=F5N:65N8V4@=&AE(&%D9')E<W-E<R!F
M;W(@=&AE<V4@<&]K97,@:&%V92!B965N(&QA8F5L960@(DA)0EE412(@86YD
M("),3T)95\$4B(&%N9"!A<F4@;&ES=&5D(&EN(%!1!0DQ%(\$N(\$\$@<VAO<G0@
M<F]U=&EN92!T;R!A8V-O;7!L:7-H('1H:7,@:7,@<VAO=VX@8F5L;W<Z#0TQ
M,# @("!!2"](\$E.5" H041\$("\@,C4V*2 Z(\$%,(#T@041\$()8@04@*B R
M-38-#3\$Q," @(%!/2T4@2\$E"651%+"!!2" Z(%!/2T4@3\$]"651%+"!!3 T-
M3VYC92!T:&%T(&AA<R!B965N(&%C8V]M<&QI<VAE9"!A(&-A;&P@=&\@=&AE
M(%-014%+(')O=71I;F4@=VEL;"!C875S92!T:&4@=V]R9"!T;R!B92!S<&]K
M96XN("!&<F]M(&%8FEN87)Y('!R;V=R86T@=&AE(' -A;64@=&AI;F<@;6%Y
M(&)E(&%C8V]M<&QI<VAE9" @=VET:"!T=V\@4U1!(&EN<W1R=6-T:6]N<R!F
M;VQL;W=E9"!B>2!A(\$I34BX-#5=/4D0@4U1254-455)%#0U7;W)D<R!M87D@
M8F4@8G)O:V5N('5P(&EN=&\@<V5P87)A=&4@86YD(&1I<W1I;F-T(' -O=6YD
M<R!O<B!P:&]N96UE<RX@(%1H92!%0TA/(%U;(%-0145#2"!%1\$E43U(@=7-E
M<R!A(' -E="!O9B @9F]R='DM;VYE("!P;W-S:6)L92 @<&AO;F5M97,@(&%L
M;VYG("!W:71H("!T=V\@(&1I9F9E<F5N="!T>7!E<R!O9B!P875S97,@86YD
M(&\$@<W1O<"!C;VUM86YD("AA=71O;6%T:6-A;&QY(&%P<&5N9&5D(&%T('1H
M92 @96YD(&]F("!W;W)D<UTN(" @26X@(&=E;F5R86PL("!V;VEC960@(' -O

M=6YD<R H<V5E(%1A8FQE(#(I(&AA=F4@=F%R:6%B;&4@<&ET8V@L(&1U<F%T
M:6]N+!"A;F0@=F]L=6UE+B @56YV;VEC960@('O=6YD<R @*'-E92!486)L
M92 S*2!H879E('1H97-E('9A<FEA8FQE<R!P<F5S970N#0TS#45#2\$@\@75L@
M4U!%14-((%-93E1(15-)6D52#0U4:&5R92!A<F4@<VEX=&5E;B!D:69F97)E
M;G0@<&ET8V@@;&5V96QS(&%V86EL86)L92!F;W(@=F]I8V5D('O=6YD<RX@
M('1H97-E(')A;F=E(&9R;VT@;VYE("AH:6=H97-T*2!T;R!S:7AT965N("AL
M;W=E<W0I+B @5F%R>6EN9R!T:&4@<&ET8V@@86QL;W=S('1H92!C;VUP=71E
M<B!T;R!A<VL@<75E<W1I;VYS(&]R(&UA:V4@97AC;&%M871I;VYS+B!)9B!T
M:&4@<&ET8V@@:7,@86QL(&]N92!L979E;"P@=&AE('P965C:"!W:6QL(&AA
M=F4@82!M;VYO=&]N:6,@;W(@<F]B;W1I8R!S;W5N9"X-#51H92!L96YG=&@@
M;V8@96%C:"!V;VEC960<V]U;F0@;6%Y(&E('P96-I9FEE9"!A<R!B96EN
M9R!F<F]M(&]N92!T;R!E:6=H=" R-2!M:6QL:7-E8V]N9" B9G)A;65S(B!L
M;VYG+B!5;G9O:6-E9"!S;W5N9',@87)E('!R97-E="!T;R!B92!A;GEW:&5R
M92!F<F]M('!W;R!T;R!F:79E(&9R86UE<R!L;VYG(&1E<&5N9&EN9R!O;B!T
M:&4@<V]U;FON("!4:&4@E!!;2(@:7,@=&AE(&5X8V5P=&EO;BX@5&AI<R!S
M=&]P<R!S<&5E8V@@86-T:79I='D@,C4@=&\@,C P(&UI;&QI<V5C;VYD<R!S
M<&5C:69I960@:6X@,C4@;6EL;&ES96-O;F0@:6YC<F5M96YT<RX@5&AE('!R
M:6UA<GD@=7-E(&]F('1H92 B4\$\$Q(B!I<R!B971W965N('O<F1S('I=&AI
M;B!A('!H<F%S92!O<B!B969O<F4@<W1O<"!P;&]S:79E<R H(C@B+")(BPB
M5"(L971C+BDN(%1(12 B4\$\$B('!A=7-E(&I=F5S(&\$@9&5L87D@;V8@,C4@
M;6EL;&ES96-O;F1S(&AO=V5V97(@=&AE<F4@:7,@<W1I;&P@<V]M92!S;W5N
M9"!O8V-U<G)I;F<@9'5R:6YG('1H:7,@<&5R:6]D(&%L=&AO=6=H(&ET(&ES
M(&9A:6YT+@T-5&AE<F4@87)E(&5I9VAT(&%V86EL86)L92!V;VQU;64@;&5V
M96QS(')A;F=I;F<@9G)O;2!O;F4H<V]F=&5S="D@=&\@96EG:'0@;&]U9&5S
M="X@5&AE('!5S=6%L(')A;F=E(&ES(&9R;VT@9FEV92!T;R!E:6=H="!F;W(@
M=F]W96P@<V]U;F1S(&5X8V5P="!W:&5N('!A<&5R:6YG(&]F9B!A="!T:&4@
M96YD(&]F('O;64@=V]R9',N#0U-86YY(&-O;6UO;FQY('!5S960@<V]U;F1S
M(&%R92!M861E('!5P(&]F(&%8V]M8FEN871I;VX@;V8@<&AO;F5M97,N(\$%N
M(&5X86UP;&4@:7,@=&AE('O=6YD(")O:"(N(%1O('!R;V1U8V4@=&AI<R!S
M;W5N9"!A;B B,#\$B('O=6YD(&UU<W0@8F4@9F]L;&]W960@8GD@86X@(C R
M(B!S;W5N9"X@4V]M92!O=&AE<B!E>&%M<&QE<R @87)E(" B97EE(B @*")!
M2"(L(DDB+"))(BD@(&%N9" @(F]O;V@B("B53\$B+")5,B(I+@T-4U!%14-
M(\$5\$251/4@T-5&AE(%-0145#2"!%1\$E43U(@:7,@86X@05!03\$533T94('!R
M;V=R86T@=VAI8V@@86QL;W=S('EO=2!T;R!C;VYS=')U8W0@8W5S=&]M('O
M<F1S(&%N9"!P:')A<V5S(&9O<B!T:&4@14-(3R!=6RX@0F%S:6-A;&QY+"!I
M="!A<G)A;F=E<R!T:&4@<V]U;F1S(&%C8V]R9&EN9R!T;R!L:6YE(&YU;6)E
M<G,N(%1H97-E(&QI;F5S(&UA>2!B92!A9&1E9"!T;RP@9&5L971E9"P@;6]D
M:69I960L(&%N9"!I;G-B-E<G1E9"!A<R!N96-E<W-A<GD@9'5R:6YG('O<F0@
M8V]N<W1R=6-T:6]N+B @5VAE;B!T:&4@=V]R9"!I<R!F:6YI<VAE9"!I="!M
M87D@8F4@(G-A=F5D(B!T;R!204T@=VAI8V@@86QS;R!W:6QL(&%S<V5M8FQE
M(&ET(&EN=&\@=&AE(&9O<FUA="!T:&4@4U!%14-((=\$%3D52051/4B!R97%U
M:7)E<RX@1G)O;2!T:&5R92!I="!M87D@86QS;R!B92 B<V%V960B('!O('!H
M92!D:7-K(&9O<B!L871E<B!U<V4N(%1H92!W;W)D(&]R('!H<F%S92!M87D@
M8F4@<W!O:V5N(&%T(&%N>2!T:6UE(&1U<FEN9R!T:&4@<')O8V5S<R!T;R!V
M97)I9GD@:70@9F]R('1H92!C;W)R96-T('O=6YD<RX@5&AE(\$5\$251/4B!C
M;VUM86YD<R!A<F4@9&5S8W)I8F5D(&EN(&1E=&%I;"!B96QO=R!A;F0@87)E
M(&%L<V\@;&ES=&5D(&EN(%1!0DQ%(#0N(\$]N;'D@=&AO<V4@;&5T=&5R<R!E
M;F-L;W-E9"!I;B!P87)E;G1H97-I<R!A8W1U86QL>2!N965D('!O(&)E('!Y
M<&5D(&EN(&9O<B!T:&4@8V]M;6%N9"!T;R!B92!R96-O9VYI>F5D+@T-5&AE
M<F4@87)E('!W;R!M;V1E<R!W:&EC:"!T:&4@141)5\$]2(&]P97)A=&5S(&EN
M+B!);B!T:&4@8V]M;6%N9"!M;V1E+"!Y;W4@=VEL;"!B92!P<F]M<'!E9"!B
M>2!A("C(B!A;F0@>6]U(&UA>2!E;G1E<B!A;GD@;V8@=&AE(&-O;6UA;F1S
M(&QI<W1E9"!B96QO=RX@26X@=&AE(&%D9"!M;V1E('EO=2!W:6QL(&)E(&5X
M<&5C=&5D('!O('!R;W9I9&4@82!S;W5N9"!O<B!N=6UB97(@<W!E8VEF>6EN
M9R!O;F4@;V8@=&AE('9A<FEA8FQE<RX@(\$EF('EO=2!T>7!E(&\$@;&5T=&5R
M('H96X@82!N=6UB97(@:7,@97AP96-T960@>6]U('I;&P@8F4@87-K960@
M=&\@E)5%5E013]B+B @5&\@97AI="!T:&4@861D(&UO9&4@86YD(')E='5R
M;B!T;R!T:&4@8V]M;6%N9"!M;V1E('!R97-S('!H92 B4D5455).E"!K97D@
M5VAE;B!T:&4@8W5R<V]R(&ES(&EN('!H92 B4T]53D0B(&-O;'5M;BX-#30-

```

M14-(3R!=6R!34$5%0T@@4UE.5$A%4TE:15(-#5-0145#2"!%1$E43U(@0T]-
M34%.1%, -#2A!*41$( )8@5&AI<R!C;VUM86YD('!U=', @>6]U(&EN('1H92!A
M9&0@;6]D92!A;F0@86QL;W=S('EO=2!T;R!A9&0@<V]U;F1S('1O('1H92!E
M;F0@;V8@=&AE(&-U<G)E;G0@=V]R9"!O<B!P:' )A<V4N("!9;W4@=VEL;"!B
M92!A<VME9"!F;W(@=&AE(' -O=6YD(&9O<B!E86-H(&QI;F4@86YD(&%L<V\@
M=&AE('9A<FEA8FQE<R!I9B!I="!I<R!A('9O:6-E9"!S;W5N9"!O<B B4$$Q
ME"X@5&\@97AI="!T:&ES(&UO9&4@<' )E<W, @=&AE(")215154DXB(&ME>2!W
M:&5N('1H92!C=7)S;W(@:7, @:6X@=&AE(' -O=6YD(&-O;'5M;BX-#2A!4"E0
M14Y$( )8@66]U(&UA>2!A9&0@82!W;W)D(&]R('!H<F%S92!F<F]M(&UE;6]R
M>2!T;R!T:&4@96YD(&]F('1H92!C=7)R96YT('=O<F0@;W(@<&AR87-E+B!+
M965P(&EN(&UI;F0@=&AA="!T:&5R92!I<R!A(&UA>&EM=6T@;V8@9F]R='D@
M;&EN97, @9F]R('1H92!C=7)R96YT('=O<F0@;W(@<&AR87-E+B @5&\@8V]N
M<W1R=6-T(&$@;&]N9V5R('!H<F%S92!S964@=&AE(' -E8W1I;VX@;VX@<&AR
M87-E(&-O;G-T<G5C=&EO;BX-#2A#*4%404Q/1R"6(%1H:7, @8V%U<V5S(&$@
M1$]3(&-A=&%L;V<@;V8@=&AE(&-U<G)E;G0@9&ES:R!D<FEV92!A;F0@=&AE
M;B!R971U<FY$('EO=2!T;R!T:&4@8V]M;6%N9"!M;V1E+@T-*$0I14Q%5$4@
MEB!7:&5N('1H:7, @8V]M;6%N9"!I<R!E;G1E<F5D('EO=2!W:6QL(&)E(&%S
M:V5D('=H:6-H(&QI;F4@;G5M8F5R('EO=2!W:7-H('1O(&1E;&5T92X@(%1H
M870@;&EN92!W:6QL(&)E(&1E;&5T960@86YD(&%L;"!S=6)S97%U96YT(&QI
M;F5S('=I;&P@8F4@<VAI9G1E9"!D;W=N(&]N92!L:6YE('1O(&9I;&P@:71S
M('!L86-E+@T-*$5.1"D@EB!4:&ES(&5X:71S('1H92!34$5%0T@@141)5$]2
M+"!C;&5A<G, @=&AE(' -C<F5E;BP@86YD(' )E='5R;G, @>6]U('1O($%04$Q%
M4T] &5"X-#2A)*4Y315)4( )8@268@>6]U('=I<V@=@=&\@861D(&QI;F5S('=I
M=&AI;B!A('=O<F0@=7-E('1H:7, @8V]M;6%N9"X@66]U('=I;&P@8F4@87-K
M960@=VAI8V@;&EN92!Y;W4@=VES:"!T;R!I;G-E<G0@=&AE(&YE=R!L:6YE
M*' , I(&EN(&9R;VYT(&]F+B!4:&ES(&-O;6UA;F0@<'5T<R!Y;W4@:6X@=&AE
M(&%D9"!M;V1E(&AO=V5V97(@86QL(&YE=R!L:6YE<R!A<F4@:6YS97)T960@
M=VET;&EN('1H92!W;W)D(' )A=&AE<B!T:&%N(&%T('1H92!E;FON(%1O(&5X
M:70@<' )E<W, @E)%5%523B(N#0TH3"E)4U0@EB!292UL:7-T<R!T:&4@8W5R
M<F5N="!W;W)D(&]R('!H<F%S92X@($EF('EO=2!W:7-H('1O('!A=7-E(&1U
M<FEN9R!T:&4@;&ES=&EN9R H=7-E9G5L(&EF('1H97)E(&ES(&UO<F4@=&AA
M;B!O;F4@<V-R965N(&]F('1E>'0I('EO=2!M87D@<' )E<W, @=&AE(")34$%#
M12!"05(B(&%N9"!T:&4@;&ES=&EN9R!W:6QL(&)E(&AA;'1E9"X@5&\@<F5S
M=6UE('1H92!L:7-T:6YG('!R97-S('1H92 B4U!!0T4@0D%2(B!A9V%I;BX@
M5&AI<R!I<R!S:6UI;&%R('1O('!R97-S:6YG($-44DPM4R!W:&5N(&QI<W1I
M;F<@05!03$533T94('!R;V=R86US+@T-*$Q/*4%$( )8@5VAE;B!T:&ES(&ES
M(&5N=&5R960@>6]U('=I;&P@8F4@87-K960@=VAE=&AE<B!Y;W4@=VES:"!T
M;R!L;V%D(&-O9&4@9G)O;2!T:&4@8W5R<F5N="!D:7-K(&1R:79E(&]R(&EF
M('EO=2!W:7-H('1O(&QO860@=&5X="!F<F]M('1H92!M96UO<GD@:6YT;R!T
M:&4@8W5R<F5N="!W;W)D(&]U9F9E<BX@268@>6]U(&%R92!A8V-E<W-I;F<@
M=&AE(&1I<VLL('EO=2!W:6QL(&)E(&%S:V5D(&9O<B!T:&4@;F%M92!O9B!T
M:&4@9FEL92!A;&]N9R!W:71H('1H92!A9&1R97-S('1O(&QO860@:70@:6YT
M;RX@268@>6]U(&%R92!L;V%D:6YG('1E>'0@9G)O;2!M96UO<GD@>6]U('=I
M;&P@:&%V92!T;R!S<&5C:69Y('1H92!S=&%R=&EN9R!A9&1R97-S+B!)="!W
M:6QL('1H96X@;&]A9"!U<"!T;R!F;W)T>2!L:6YE<R!U;G1I;"!I="!E;F-O
M=6YT97)S(&$@<W1O<"!C;VUM86YD('=I=&AI;B!T:&4@=&5X="X@268@=&AE
M<F4@87)E(&UO<F4@=&AA;B!F;W)T>2!L:6YE<R!Y;W4@=VEL;"!G970@82!B
M965P(&%N9"!A(" <J0E5&1D52($953$PB('=A<FYI;F<N#0TH32E/1$E&62"6
M(%1H:7, @86QL;W=S('EO=2!T;R!M;V1I9GD@82!L:6YE('1H870@:&%S('!R
M979I;W5S;'D@8F5E;B!E;G1E<F5D+B!)="!I<R!E<W-E;G1I86QL>2!T:&4@
M<V%M92!A<PT--0U%0TA/(%U;(%-0145#2"!364Y42$5325I%4@T-82 B1$5,
M151% (B!C;VUM86YD(&9O;&QO=V5D(&]Y(&%N("))3E-%4E0B(&-O;6UA;FON
M(%EO=2!W:6QL(&)E(&%S:V5D('=H:6-H(&QI;F4@>6]U('=I<V@=@=&\@;6]D
M:69Y+B @66]U('=I;&P@96YT97(@=&AE(&%D9"!M;V1E(&%N9"!A;&P@;F5W
M(&QI;F5S('=I;&P@8F4@:6YS97)T960@870@=&AA="!L;V-A=&EO;BX-#2A.
M*457( )8@0VQE87)S('1H92!C=7)R96YT('=O<F0@8G5F9F5R(' -O('EO=2!M
M87D@<W1A<G0@9F]R;6%T:6]N(&]F(&$@;F5W('=O<F0N(%EO=2!W:6QL(&)E
M(&%S:V5D(&EF(&ET(&ES($]+('1O(&-L96%R+B!!;GD@<F5S<&]N<V4@;W1H
M97(@=&AA;B!A(")9(B!O<B!A(")915, B('=I;&P@86)O<G0@=&AE(&-O;6UA

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M;F0N#0TH4%(I24Y4()8@268@>6]U('=I<V@=@=&\@;6%K92!A(&AA<F0@8V]P
M>2!09B!T:&4@8W5R<F5N="!W;W)D(&]R('!H<F%S92!M86ME=7 @=7-E('!H
M:7,@8V]M;6%N9"X@66]U('=I;&P@8F4@87-K960@=&\@='EP92!I;B!T:&4@
M=&ET;&4@=VAI8V@=@=VEL;"!B92!P<FEN=&5D(&%T('!H92!T;W @;V8@=&AE
M(&QI<W1I;F<N(\$%L;"!O=71P=70@:7,@<'!I;G1E9"!T;R!3;&]T(" ,Q+@T-
M*%-!*59%()8@66]U(&UA>2!S879E('!H92!C=7)R96YT('!E>'0@=&\@;65M
M;W)Y(&]R(&-O9&4@=VET:&EN(&UE;6]R>2!T;R!T:&4@8W5R<F5N="!D:7-K
M(&1R:79E+B!)9B!Y;W4@87)E('!A=FEN9R!T97AT('EO=2!W:6QL(&)E(&%S
M:V5D(&9O<B!T:&4@<W1A<G1I;F<@861D<F5S<R!T;R!S879E(&ET('!O+B!+
M965P(&\$@<F5C;W)D(&]F('!H:7,@86YD(&AO=R!M86YY(&)Y=&5S(&%R92!S
M879E9" H:70@=&5L;' ,>@6]U*2!F;W(@9G5T=7)E(')E9F5R96YC92X@02!S
M=&]P(&-O;6UA;F0@:7,@875T;VUA=&EC86QL>2!A9&1E9"!T;R!T:&4@96YD
M(&]F('!H92!W;W)D(&%S(&ET(&ES('!A=F5D+B!4:&ES(&ES(&EN8VQU9&5D
M(&EN('!H92!T;W1A;"!N=6UB97(@;V8@8GET97,@=&AA="!I="!T96QL<R!Y
M;W4@:&%V92!B965N('!A=F5D+B!)9B!Y;W4@87)E('!A=FEN9R!C;V1E('!O
M('!H92!D:7-K+"!Y;W4@;75S="!S<&5C:69Y('!H92!F:6QE(&YA;64L('!H
M92!S=&%R=&EN9R!A9&1R97-S+"!A;F0@=&AE(&YU;6)E<B!O9B!B>71E<R!T
M;R!B92!S879E9"X-#2A34"E%04L@EB!">2!E;G1E<FEN9R!T:&ES(&-O;6UA
M;F0@>6]U(&UA>2!H96%R('!H871E=F5R(&ES("!I;B @=&AE("!C=7)R96YT
M(&)U9F9E<BX@(%!H:7,@:7,@=7-E9G5L(&9O<B B9&5B=6=G:6YG(B!W;W)D
M<R!D=7)I;F<@8V]N<W1R=6-T:6]N+B! ,:6ME(&%L;"!O=&AE<B!C;VUM86YD
M<RP@=&AI<R!C;VUM86YD(&ES(&]N;D@879A:6QA8FQE('!H96X@:6X@=&AE
M(&-O;6UA;F0@;6]D92X-#2A34\$TI14Y/4ED@EB!4:&ES('!I;&P@<W!E86L@
M=V]R9" ,@;W(@<&AR87-E<R!T:&%T(&AA=F4@8F5E;B!P<F5V:6]U<VQY('!T
M;W)E9"!I;B!M96UO<GDN(%EO=2!W:6QL(&)E(&%S:V5D(&9O<B!T:&4@<W1A
M<G1I;F<@861D<F5S<R!A="!W:&EC:"!T:6UE('!H871E=F5R(&ES('!T;W)E
M9"!I;T:&5R92!W:6QL(&)E('!P;VME;BX-#5!(4D%312!#3TY35%)50U1)3TX-
M#51H97)E(&%R92!A(&9E=R!D:69F97)E;G0@=V%Y<R!I;B!W:&EC:"!W;W)D
M<R!M87D@8F4@<W1R=6YG('!O9V5T:&5R('!O(&9O<FT@<&AR87-E<RX@1F]R
M(&\$@<VAO<G0@<&AR87-E('EO=2!W:6QL('!A;G0@=&\@;&]A9"!O<B!E;G1E
M<B!T:&4@9FER<W0@=V]R9"!I;G1O('!H92!34\$5%0T@141)5\$]2(&)U9F9E
M<B!A;F0@=&AE;B!A<'!E;F0@96%C:"!A9&1I=&EO;F%L('!O<F0N(%EO=2!W
M:6QL('!H96X@=V%N="!T;R!G;R!B86-K(&%N9"!I;G-E<G0@82 B4\$\$Q(B!I
M;B!B971W965N(&5A8V@=@=V]R9"X-#49O<B!L;VYG97(@<&AR87-E<R!T:&%T
M(&EN8VQU9&4@;6]R92!T:&%N(&9O<G1Y(&QI;F5S+"!E86-H(&YE=R!W;W)D
M('!I;&P@:&%V92!T;R!B92!S879E9"!I;G1O(&UE;6]R>2!D:7)E8W1L>2!F
M;VQL;W-I;F<@=&AE('!R979I;W5S(&]N92X@(\$ME97 @:6X@;6EN9"!T:&%T
M('!R979I;W5S;"!D<V%V960@=V]R9" ,@=VEL;"!H879E(&\$@<W1O<"!C;VUM
M86YD('!A8WME9"!O;G1O('!H92!E;F0@;V8@=&AE;2!S;R!S879E('!H92!N
M97@=V]R9"!O;F4@8GET92!S:&]R="!O9B!T:&4@86-T=6%L(&-A;&-U;&%T
M960@861D<F5S<R H<W1A<G1I;F<@861D<F5S<R!O9B!T:&4@<'!E=FEO=7,@
M=V]R9 T--@U%0TA/(%U;(%-0145#2"!364Y42\$5325I%4@T-<&QU<R!T:&4@
M;G5M8F5R(&]F(&)Y=&5S('!A=F5D*2X@66]U('!I;&P@86QS;R!W86YT('!O
M('!T87)T(&5A8V@;F5W('!O<F0@=VET:"!A(")003\$B('!O('!H870@=&AE
M<F4@=VEL;"!B92!A('!A=7-E(&)E='E96X@=&AE('!O<F1S+B!\$;R!N;W0@
M<'5T('!H92 B4\$\$Q(B!A="!T:&4@96YD(&]F('!H92!O;&0@=V]R9"!B96-A
M=7-E(&ET(&UA>2!C875S92!T:&4@<WES=&5M('!O(")H86YG(B!W:&5N(&ET
M(&ES('!P;VME;B!F<F]M('!H92!34\$5%0T@141)5\$]2+@T-3VYE(&]T:&5R
M('!A>2!O9B!P<F]D=6-I;F<@82!L;VYG97(@<&AR87-E(&ES('!H870@=7-E
M9"!I;B!T:&4@<V%M<&QE('!R;V=R86T@(&E)%0TE412(@;VX@=&AE(&1I<VLN
M("!5;FQI:V4@=&AE(&UE=&AO9"!A8F]V92P@=&AE('!T;W @8V]M;6%N9" ,@
M87)E(&YO="!E;&EM:6YA=&5D(&%N9"!N;R B4\$\$Q(B!P875S97,@87)E(&EN
M<V5R=&5D+B!4:&4@<W1A<G1I;F<@861D<F5S<R!O9B!T:&4@9FER<W0@=V]R
M9"!I<R!G:79E;B!T;R!T:&4@4U!%14-(((\$=%3D52051/4B!A;F0@:70@:7,
@M<W!O:V5N(&EN('!H92!N;W)M86P@9F%S:&EO;BX@5&AE;B!F;W(@96%C:"!S
M=6-C97-S:79E('!O<F0@=&\@8F4@<W!O:V5N(&\$@8V%L;"!I<R!M861E('!O
M('!H92 B3EA44U!+(B!R;W5T:6YE+B!4:&4@4U!%14-(((\$=%3D52051/4B!W
M:6QL(&%L<F5A9'D@8F4@<&%I;G1I;F<@=&\@=&AE(&YE>'0@8GET92!I;B!M
M96UO<GD@869T97(@<W!E86MI;F<@=&AE('!R979I;W5S('!O<F0@<V\@:70@

M=VEL; '!A;')E861Y(&AA=F4@=&AE(&%D9')E<W,@;V8@=&AE(&YE>'0@=V]R
M9"X@5&\@=7-E('1H:7,@='EP92!O9B!0:')A<V4@>6]U(&UU<W0@:VYO=R!H
M;W<@;6%N>2!T;W1A;'!W;W)D<R!A<F4@=&\@8F4@<W!O:V5N(&%N9"!T:&5N
M(&1O('1H92!S86UE(&YU;6)E<B!O9B!C86QL<R!T;R!T:&4@E%-014%+(B!A
M;F0@E\$Y85%-02R(@<F]U=&EN97,N#0U304U03\$4@5D]#04)53\$%260T-5&AE
M(' -A;7!L92!V;V-A8G5L87)Y(&]N('1H92!E;F-L;W-E9"!D:7-K(&-O;G1A
M:6YS(#\$W-2!W;W)D<RP@;&5T=&5R<RP@86YD(&YU;6)E<G,@9F]R('5S92!F
M<F]M('=I=&AI;B!Y;W5R('!R;V=R86US(&]R(&%S(&5X86UP;&5S(&]N(&-O
M9&EN9R!Y;W5R(&]W;B!W;W)D<RX@5&AE(&9I;&4@;F%M92!O9B!T:&4@8V]D
M92!I<R B5D]#04)53\$%262(@86YD(' -H;W5L9"!B92!L;V%D960@:6YT;R!A
M9&1R97-S(#\$W-# X+B @02!C;VUP;&5T92!L:7-T:6YG(&]F('1H92!W;W)D
M<R!A;F0@=&AE:7(@<W1A<G1I;F<@861D<F5S<V5S(&ES(&=I=F5N(&EN('1H
M92!A<'!E;F1I>"!A="!T:&4@8F%CR!O9B!T:&ES(&UA;G5A;"X@(")63T-!
M0E5,05)9(B!M87D@8F4@;&]A9&5D(&EN=&\@;W1H97(@<&%R=' ,@;V8@;65M
M;W)Y(&)U="!T:&4@<W1A<G1I;F<@861D<F5S<V5S('=I;&P@:&%V92!T;R!B
M92!M;V1I9FEE9"!A8V-O<F1I;F=L>2!W:&5N(&%C8V5S<VEN9R!W;W)D<R!F
M<F]M(&\$@<')O9W)A;2X-#5-!35!,12!04D]'4D%-4PT-5&AE<F4@87)E('1W
M;R!S86UP;&4@<')O9W)A;7,@<')O=FED960@;VX@=&AE(&1I<VLN(%1H92!F
M:7)S="!O;F4L(")404Q+24Y'(%194\$574DE415(B('=I;&P@<V%Y(&5A8V@@
M;&5T=&5R(&%N9"!N=6UB97(@87,@:70@:7,@='EP960@;VX@=&AE(&ME>6)O
M87)D+B @5&AE(' -E8V]N9"!O;F4L(")214-)5\$4B('=I;&P@<V%Y(&5A8V@@
M=V]R9"!O9B!T:&4@<V%M<&QE('908V%B=6QA<GDN(\$)O=&@@;V8@=&AE<V4@
M<')O9W)A;7,@87)E(\$%04\$Q%4T]&5"!P<F]G<F%M<R!A;F0@87)E(')U;B!I
M;B!T:&4@=7-U86P@;6%N;F5R+@T-2\$%.1U504S-#4EF('EO=2!T<GD@=&\@
M<W!E86L@82!P:')A<V4@=&AA="!B96-I;G,@;W(@96YD<R!W:71H(&\$@(E!!
M,90@;W(@:&%S('1W;R B4\$SQ)W,B(&5M8F5D9&5D(&EN(&ET+"!T:&4@96YT
M:7)E('!R;V=R86T@;6%Y(")H86YG(BX@(&SET(&UA>2!A;' -O(')1H86YG(B!I
M9B!Y;W4@9VEV92!I="!T:&4@<W1A<G1I;F<@861D<F5S<R!O9B!S;VUE(&]T
M:&5R(&1A=&\$@<F%T:&5R('1H86X@<&AO;F5M92!E;F-O9&5D(&1A=&\$N(%=H
M96X@=&AI<R!O8V-U<G,@=&AE(&]N;'D@=V%Y('1O(')E9V%I;B!C;VYT<F]L
M(&]F('1H92!C;VUP=71E<B!I<R!T;R!P<F5S<R!R97-E="X@268@>6]U(&%R
M92!U<VEN9R!T:&4@<W!E96-H(&5D:7!O<B!Y;W4@;6%Y(')E='5R;B!T;R!T
M:&4@<')O9W)A;2!W:71H('9A<FEA8FQE<R!I;G1A8W0@8GD-#3<-14-(3R!=
M6R!34\$5%0T@4UE.5\$A%4TE:15(-#65N=&5R:6YG(")3U1/(\$P,# B+B @
M66]U('=I;&P@:&%V92!T;R!R92UL:7-T('1H92!C=7)R96YT('=O<F0@;W(@
M<&AR87-E(&%N9"!Y;W4@=VEL;"!N;R!L;VYG97(@:&%V92!T:&4@:&5A9&EN
M9W,@870@=&AE('1O<"!O9B!T:&4@<V-R965N+@T-5&AE<F4@:7,@86YO=&AE
M<B!P<F]B;&5M('1H870@;6%Y(&]C8W5R(&%N>71I;64@869T97(@=&AE(&%B
M;W9E(' -I='5A=&EO;B!O8V-U<G,@;W(@:68@4D53150@:7,@<')E<W-E9"!W
M:&5N('1H92!%0TA/(&Y;(&ES('1A;&MI;F<N(%1H92!N97AT('1I;64@4T54
M4TQ4(&ES(&-A;&QE9"!T;R!F:6YD('=H:6-H(' -L;W0@=&AE(\$5#2\$@75L@
M:7,@:6XL(&ET('!R;V)A8FQY('=O;B=T(&9I;F0@:70N(%1H97)E(&%R92!T
M=V@&=V%Y<R!T;R!G970@87)O=6YD('1H:7,@=VET:&]U="!H879I;F<@=&\@
M='5R;B!O9F8@=&AE(&-O;7!U=&5R(&%N9"!R96)O;W0@9G)O;2!S8W)A=&-H
M+B!;/;F4@:7,@=&\@86QW87ES(&EN<W1A;&P@=&AE(\$5#0D\@75L@8V%R9"!I
M;B!S;&]T(#4@86YD(&YE=F5R('5S92!T:&4@4T544TQ4(')O=71I;F4N(%1H
M92!O=&AE<B!I<R!T;R!03TM%("R-34B('1O(&]N92!O9B!T:&4@861D<F5S
M<V5S('=H:6-H('!U;&QS('1H92!\$159)0T4@4T5,14-4("A024X@-#\$I(&QO
M=R!O;B!T:&4@<VQO="!T:&4@14-(3R!&6R!I<R!I;BX-#5-0145#2"!%1\$E4
M3U(@15A!35!,10T-26X@=&AI<R!S96-T:6]N('=E('=I;&P@=7-E('1H92!3
M4\$5%0T@141)5\$]2('1O(&=E;F5R871E(&%N9"!S879E('1H92!P:')A<V4@
ME&%N(\$%P<&QE%Y;(&-O;7!U=&5R(B!A;F0@=&AE;B!W<FET92!A(' -H;W)T
M(\$%04\$Q%4T]&5"!P<F]G<F%M('1O(' -A>2!T:&4@;&%R.65T('!H<F%S92 B
M5&AI<R!I<R!A;B!<'!L92!&6R!C;VUP=71E<B(N(\$)E9F]R92!P<F]C965D
M:6YG('EO=2!S:&]U;&0@:6YS=&%L;" @=&AE(\$5#2\$@75L@8V%R9"!A8V-O
M<F1I;F<@=&\@=&AE(&1I<F5C=&EO;G,@<')E=FEO=7-L>2!G:79E;BX-#51O
M(&)E9VEN('EO=2!S:&]U;&0@8F]O="!U<"!T:&4@<W5P<&QI960@9&ES:R!A
M;F0@<G5N('1H92!34\$5%0T@141)5\$]2('!R;V=R86TN("!!9G1E<B!I="!H
M87,@9FEN:7-H960@;&]A9&EN9R!F<F]M('1H92!D:7-K('EO=7(@<V-R965N

M(' -H;W5L9"!B92!B;&%N:R!E>&-E<'0@9F]R('1H92!H96%D:6YG<R!A="!T
M:&4@=&]P(&%N9"!Y;W4@<VAO=6QD(&)E('!R;VUP=&5D('=I=&@@@82 B,"(N
M(%=H96YE=F5R('1H:7,@<')O;7!T(&ES(&1I<W!L87EE9"!T:&4@<')O9W)A
M;2!I<R!W86ET:6YG(&9O<B!A(&-O;6UA;FON(\$9O<B!C;&%R:71Y+ "!I;B!T
M:&ES(&5X86UP;&4@=V4@=VEL;"!A;'=A>7,@;&ES="!A;B!E;G1I<F4@8V]M
M;6%N9"!R871H97(@=&AA;B!J=7-T('1H92!F:7)S="!L971T97(H<RDN("!!
M;&P@8V]M;6%N9',@871E(&9O;&QO=V5D(&)Y(&\$@/\$-2/BX-#5-I;F-E('EO
M=2!W:6QL(&)E('5S:6YG(' -O;64@;V8@=&AE('=O<F1S(&9R;VT@=&AE(' -A
M;7!L92!V;V-A8G5L87)Y+ "!Y;W4@=VEL;"!H879E('1O(&9I<G-T(&QO860@
M:70@9G)O;2!T:&4@9&ES:R!I;G1O(&UE;6]R>2X@(%1O(&1O('1H:7,@='EP
M92!I;B!T:&4@8V]M;6%N9#H@3\$]!1"X@66]U(&%R92!T:&5N(&=I=F5N('1W
M;R!O<'1I;VYS.B!T;R!L;V%D(&-O9&4@9G)O;2!T:&4@9&ES:R!O<B!T;R!L
M;V%D('1E>'0@9G)O;2!M96UO<GDN(%EO=2!W86YT('1O(&QO860@8V]D92!F
M<F]M('1H92!D:7-K(' -O(&5N=&5R(" (QE"X@3F5X="!Y;W4@=VEL;"!B92!A
M<VME9"!F;W!D(@=&AE(&9I;&4@;F%M92X@5&AE(' -A;7!L92!V;V-A8G5L87)Y
M(&ES(' -A=F5D('5N9&5R('1H92!N86UE(&]F(")63T-!0E5,05)9(B!S;R!T
M>7!E('1H:7,@:6XN(%=H96X@:70@87-K<R!F;W(@=VAA="!A9&1R97-S('1O
M(&QO860@:70@:6YT;R!T>7!E(&EN()),Q-S0P."(N("!!;&P@861D<F5S<V5S
M(&QI<W1E9"!I;B!T:&4@8F% C:R!O9B!T:&ES(&UA;G5A;"!A<W-U;64@=&AA
M="!T:&4@=F]C86)U;&%R>2!H87,@8F5E;B!L;V%D960@:6YT;R!T:&ES(&QO
M8V%T:6]N+@T-069T97(@=&AE(&9I;&4@:&%S(&)E96X@;&]A9&5D('EO=2!S
M:&]U;&0@8F4@8F% C:R!I;B!T:&4@8V]N=")O;"!M;V1E(&]F('1H92!E9&ET
M;W(@86YD('1H92 B(R(@<VAO=6QD(')E87!P96%R+B!4:&4@9FER<W0@=V]R
M9"!O9B!O=7(@<&AR87-E(&ES(")A;B(N(%1H:7,@:7,@;F]T(&]N92!O9B!T
M:&4@=V]R9',@:6X@=&AE(' -A;7!L92!V;V-A8G5L87)Y(&)U="!C86X@96% S
M:6QY(&)E(&UA9&4@8GD@;6]D:69Y:6YG('1H92!W;W)D(")A;F0B+B!;/;F-E
M(&%G86EN('EO=2!W:6QL('=A;G0@=&&\@=7-E('1H92!,3T%\$(&-O;6UA;F0L
M(&AO=V5V97(@=&AI<R!T:6UE('EO=2!W:6QL('=A;G0@=&&\@=7-E(&]P=&EO
M;B B,B(@:6YS=&5A9"!O9B B,2(N(%=H96X@87-K960@9F]R('1H92!A9&1R
M97-S('1O#0TX#45#2\$ \@75L@4U!%14-((%-93E1(15-)6D52#0UL;V%D('1H
M92!T97AT(&9R;VT@>6]U(' -H;W5L9"!E;G1E<B!T:&4@861D<F5S<R!L:7-T
M960@:6X@=&AE(&%P<&5N9&EX(&9O<B B86YD(BX@(%1H:7,@:7,@(C\$W-#,T
ME"!S;R!T>7!E(&ET(&EN(&YO=RX@069T97(@82!B<FEE9B!P875S92!Y;W5R
M(' -C<F5E;B!S;&]U;&0@87!P96%R(&%S(&9O;&QO=W,Z#0U,24Y%(R!33U5.
M1"!0251#2"! ,14Y'5\$@&5D],54U%#0TQ(" @044)-@DS"3<- ,B @(\$%%"3@)
M,PDW#3,@("!!12 @(" @,3),@DU#30@("!. "0DY"3()-0TU(" @1 T-5&\@
M8VAA;F-E('1H:7,@=&\@=&AE('=O<F0@(F%NE"!A;&P@>6]U(&AA=F4@=&\@
M9&\@:7,@9&5L971E('1H92 B1"(@870@=&AE(&5N9"X@5&\@9&\@=&AI<R!T
M>7!E(&EN('1H92!C;VUM86YD(\$1%3\$5412!A;F0@=VAE;B!Y;W62<F4@87-K
M960@9F]R('1H92!L:6YE(&YU;6)E<B!E;G1E<B B-2(N(\$YO=R!T>7!E('1H
M92!C;VUM86YD(%-014%+(&%N9"!Y;W4@=VEL;"!H871E('1H92!%0TA/(%U;
M(' -P96%K(&ET+@T-0F]T:"!O9B!T:&4@=V]R9',@(F%P<&QE(B!A;F0@(G1W
M;R(@87)E(&EN('1H92!S86UP;&4@=F]C86)U;&%R>2!S;R!T:&5Y(&-A;B!B
M92!U<V5D(&%S('1H97D@87)E+B!4;R!A9&0@=&AE('=O<F0@(F%P<&QE(B!Y
M;W4@=VEL;"!U<V4@=&AE(\$%04\$5.1"!C;VUM86YD+B!4>7!E('1H:7,@:6X@
M86YD('=H96X@:70@87-K<R!Y;W4@9F]R('1H92!A9&1R97-S('1O(&%P<&5N
M9"!F<F]M('1Y<&4@:6X@=&AE(&%D9')E<W,@;&ES=&5D(&EN('1H92!B86-K
M(&YE>'0@=&\@ (F%P<&QE(B H,3<T-3<I+B @069T97(@86YO=&AE<B!B<FEE
M9B!P875S92!Y;W4@=VEL;"!G970@82!L:7-T:6YG(&]F('1H92!T=V\@=V]R
M9',@<W1R=6YG('1O9V5T:&5R+B!5<V4@=&AE(%-014%+(&-O;6UA;F0@86YD
M(&QI<W1E;B!T;R!H;W<@=&AE>2!S;W5N9"X@(%1H97D@<G5N('1O9V5T:&5R
M(' -O(&\$@<&%U<V4@:7,@;F5E9&5D(&)E='E96X@=&AE;2X-#5EO=2!C86X@
M:6YS97)T(&\$@<&%U<V4@8GD@=7-I;F<@=&AE(\$E.4T525"!C;VUM86YD+B!7
M:&5N(&%S:V5D('=H:6-H(&QI;F4@=&\@:6YS97)T(&)E9F]R92!T>7!E(&EN
M(" (U(BX@66]U(&%R92!N;W<@:6X@=&AE(&EN<V5R="!M;V1E(&%N9"!T:&4@
M8V]M<'5T97(@<VAO=6QD(&)E(&1I<W!L87EI;F<@82 B-2(@=VET:"!T:&4@
M8W5R<V]R(&EN('1H92!S;W5N9"!C;VQU;6XN(%-I;F-E('EO=7(@:6YS97)T
M:6YG(&\$@<&%U<V4@='EP92!I;B B4\$ \$Q(B!F;VQL;W=E9"!B>2!A(#Q#4CXN
M("!4:&4@8W5R<V]R('=I;&P@;F]W(&IU;7 @=&\@=&AE(&QE;F=T:"!C;VQU

M;6X@<VEN8V4@;F\@;W1H97(@<%%R86UE=&5R<R!M87D@8F4@<W!E8VEF:65D
M(&9O<B!A(")003\$B('!A=7-E+B!9;W4@;6%Y(&5N=&5R(&%N>2!N=6UB97(@
M>6]U('=I<V@&9G)O;2 Q('!O(#@L(&AO=V5V97(@,B!I<R!C;VUM;VYL>2!U
M<V5D(&)E='=E96X@=V]R9',N("!!9G1E<B!Y;W4@96YT97(@=&AE(&QE;F=T
M:"!O9B!T:&4@<%%U<V4@=&AE(&-U<G-O<B!W:6QL(&UO=F4@9&]W;B!T;R!T
M:&4@;F5X="!L:6YE(&%N9"!W86ET(&9O<B!Y;W4@=&\@:6YP=70@86YO=&AE
M<B!S;W5N9"X@4VEN8V4@>6]U(&]N;'D@=VES:"!T;R!I;G-E<G0@;VYE(&QI
M;F4@870@=&AI<R!T:6UE('EO=2!M87D@97AI="!T:&4@:6YS97)T(&UO9&4@
M86YD(')E='5R;B!T;R!T:&4@8V]M;6%N9"!M;V1E('!-I;7!L>2!B>2!P<F5S
M<VEN9R \OU(^+@T-5&AE('!A=7-E(&)E9F]R92!T:&4@=V]R9" B='=O(B!M
M87D@8F4@861D960@8F5F;W)E:&%N9"!R871H97(@=&AA;B!I;G-E<G1I;F<@
M:70@869T97)W87)D<RX@5&\@9&\@=&AI<R!E;G1E<B!T:&4@041\$(&-O;6UA
M;F0N('!9;W4@=VEL;"!B92!I;B!T:&4@861D(&UO9&4@*!-I;6EL87(@=&\@
M=&AE(&EN<V5R="!M;V1E(&5X8V5P="!N97<@<V]U;F1S(&%R92!A9&1E9"!T
M;R!T:&4@96YD(&]F('!H92!W;W)D*2!A;F0@8V%N(&5N=&5R('!H92 B4\$SQ
M(B!W:71H(&\$@;&5N9W1H(&]F("R(BX@17AI=&EN9R!T:&4@861D(&UO9&4@
M:7 @86QS;R!A8V-O;7!L:7-H960@8GD<')E<W-I;F<@/\$-2/B!W:&5N('!H
M92!C=7)S;W(@:7,@:6X@=&AE('!-O=6YD(&-O;'5M;BX-#4-!551)3TXA("!\$
M;R!N;W0@871T96UP="!T;R!U<V4@=&AE(%-014%+(&-O;6UA;F0@=VAE;B!E
M:71H97(@=&AE(&9I<G-T(&]R(&QA<W0@;&EN92!O9B!T:&4@8W5R<F5N="!B
M=69F97(@:7,@80T-.0U%0TA/(%U;(%-0145#2"!364Y42\$5325I%4@T-(E!!
M,2(N("!4:&ES('=I;&P@8V%U<V4@=&AE('!-Y<W1E;2!T;R B:&%N9R(@=VET
M:"!P<F5S<VEN9R!T:&4@E)%4T54(B!B=71T;VX@=&AE(&]N;'D@86QT97)N
M871I=F4N("!4:&ES('=I;&P@86QS;R!H87!P96X@:68@>6]U('!R>2!T;R!S
M<&5A:R!A('!O<F0@=VET;"!T=V\@E!!;2=S(B!I;B!A(')O=RX@06QL(&ES
M(&YO="!L;W-T(&AO=V5V97(@:68@=&AI<R!H87!P96YS+B @4&QE87-E('!-E
M92!T:&4@<V5C=&EO;B!E;G1I=&QE9" B2\$%.1U504S\B("!T;R!L96%R;B!H
M;W<@=&\@<F5C;W9E<B!W:71H('EO=7(@9&%T82!I;G1A8WON#0U!9G1E<B!T
M:&4@<%%U<V4@:&%S(&)E96X@861D960@>6]U(&UA>2!A<'!E;F0@=&AE('!O
M<F0@G1W;R(@8GD@=7-I;F<@=&AE(\$%04\$5.1"!C;VUM86YD(&%N9"!I;G!U
M='!I;F<@=&AE('!R;W!E<B!A9&1R97-S(&9O<B B='=O(B!F<F]M('!H92!A
M<'!E;F1I>" H,3DQ-3\$I+@T-5&AE('!O<F0@F-O;7!U=&5R(B!I<R!N;W0@
M:6YC;'5D960@:6X@=&AE('!-A;7!L92!V;V-A8G5L87)Y(&%N9"!W:6QL(&AA
M=F4@=&\@8F4@96YT97)E9"!M86YU86QL>2X@5&\@9&\@=&AI<R!U<V4@=&AE
M(\$%\$1"!C;VUM86YD(&%N9"!E;G1E<B!T:&4@;&EN97,@;&ES=&5D(&)E;&]W
M(&9O;&QO=V5D(&)Y(&\$@/\$-2/B!T;R!R971U<FX@=&\@=&AE(&-O;6UA;F0@
M;6]D92X-#4Q)3D5/(%-15DY\$(9)5\$-((9Q%3D=42"!63TQ5344-#3\$W(" @
M4\$SQ"0DR#3\$X(" @2PTQ.2 @(%5("0DW"3,)-@TR, E-"0DX"3)-@TR,2 @
M(%!!;0D),0TR,B @(% -,C,@("!9"0DT"3\$)-@TR-" @(\$E5"0DT"3\$)-@TR
M-2 @(%4R"0DT"3,)-@TR-B @(%!!;0D),0TR-R @(%0-,C@@("!%4@D)-@DR
M"38-,CD@("!%4@D). DR"38-,S @("!%4@DQ, DR"34-#4%F=&5R('!R97-S
M:6YG(#Q#4CX@=&\@<F5T=7)N('!O('!H92!C;VUM86YD(&UO9&4@=&AE(&5N
M=&ER92!B=69F97(@=VEL;"!B92!R92UL:7-T960@;VX@=&AE('!-C<F5E;BX@
M4VEN8V4@=&AE('!-C<F5E;B!I<VXG="!L;VYG(&5N;W5G:"!T;R!A8V-O;6UO
M9&%T92!T:&4@96YT:7)E(&)U9F9E<B!T:&4@9FER<W0@;&EN97,@=VEL;"!N
M;R!L;VYG97(@87!P96%R+B!4;R!R92UE>&%M:6YE('!H92!F:7)S="!L:6YE
M<RP@96YT97(@=&AE(\$Q)4U0@8V]M;6%N9"!A;F0@=VAI;&4@:70@:7,@;&ES
M=&EN9R!P<F5S<R!T:&4@<W!A8V4@8F%R+B!4:&4@;&ES=&EN9R!W:6QL(&AA
M;'0@870@=&AA="!P;VEN="!A;F0@=VEL;"!C;VYT:6YU92!O;FQY('!H96X@
M=&AE('!-P86-E(&)A<B!I<R!P<F5S<V5D(&%G86EN+B!!(&QI<W1I;F<@;6%Y
M(&)E('!T;W!P960@86YD(')E<W1A<G1E9"!I;B!T:&ES(&UA;FYE<B!A<R!M
M86YY('!I;65S(&%S&1E<VER96ON#0U.;W<@=&AA="!T:&4@<&AR87-E(")A
M;B!A<'!L92!T=V\@8V]M<'5T97(B(&AA<R!B965N(&9I;FES:&5D(&ET(&YE
M961S('!O(&)E('!-A=F5D('!O(&UE;6]R>2!A;F0@=&AE;B!T;R!T:&4@9&ES
M:R!F;W(@9G5T=7)E('5S92X@5&AE(%-0145#2"!%1\$E43U(@86YD(%-0145#
M2"!14Y%4D%43U(N0T]\$13(@=7-E(&UE;6]R>2!L;V-A=&EO;G,@8F5L;W<@
M,3<T,#@N("!,:6ME=VES92P@=&AE('!-A;7!L92!V;V-A8G5L87)Y(')E<VED
M97,@:6X@;65M;W)Y(&QO8V%T:6]N<R Q-S0P."!T;R Q.3,Y.2X@5&AE<F5F
M;W)E('!H96X@>6]U('!-A=F4@=&AE('!H<F%S92!Y;W4@:G5S="!C;VYS=')U

M8W1E9"!I="!S:&]U;&0@8F4@<'5T(&%B;W9E('1H97-E(&QO8V%T:6]N<RX@M(%1O('-A=F4@=&AE('!H<F%S92!E;G1E<B!T:&4@4T%612!C;VUM86YD+B!!M<R!W:71H('1H92!,3T%\$(&-O;6UA;F0@>6]U('=I;&P@8F4@87-K960@=VAEM=&AE<B!Y;W4@87)E('A=FEN9R!T97AT('1O(&UE;6]R>2!O<B!M96UO<GD@M=&\@9&ES:RX@16YT97(@82 B,B(@9F]R('1E>'0@=&\@;65M;W)Y(&%N9"!WM:&5N('EO=2!A<F4@87-K960-#3\$P#45#2\$\@75L@4U!%14-((%-93E1(15-)M6D52#0UF;W(@=&AE(&%D9')E<W,@=&\@<V%V92!T;R!E;G1E<B B,3DT,# B M+B!.;W1E(&AO=R!M86YY(&)Y=&5S('=E<F4@<V%V960@*#4V*2!B96-A=7-E M('EO=2!W:6QL(&YE960@=&\@:VYO=R!T:&%T('1O('-A=F4@:70@=&\@=&AE M(&1I<VLN#0U4:&4@8V]M<'E<W-E9"!B:6YA<GD@8V]D92!F;W(@>6]U<B!P M:'A<V4@:7,@;F]W(&EN(&UE;6]R>2!S=&%R=&EN9R!A="!A9&1R97-S(#\$Y M-# P+B!4;R!S879E('1H92!P:')A<V4@=&\@=&AE(&1I<VL@;VYC92!A9V%I M;B!E;G1E<B!T:&4@4T%612!C;VUM86YD+"!B=70@=&AI<R!T:6UE('E;&5C M="!T:&4@9FER<W0@;W!T:6]N+B!&;W(@82!F:6QE(&YA;64@>6]U(&-A;B!U M<V4@D%.(%\$04\$Q%(%173R!#3TU0551%4B(@86YD(&9O<B!T:&4@861D<F5S M<R!T;R!S879E(&9R;VT@='EP92!I;B!T:&4@861D<F5S<R!W:&5R92!I="!W M87,@<'E=FEO=7-L>2!S879E9"P@:6X@=&AI<R!C87-E(#\$Y-# P+B!4:&4@ M;&5N9W1H(&]F('1H92!P:')A<V4@:7,@-38@8GET97,@87,@;F]T960@86)O M=F4N#0U!="!T:&ES('!O:6YT('1H92!E;G1I<F4@=F]C86)U;&%R>2!T;R!S M87D@=&AE('!H<F%S92 B=&AI<R!I<R!A;B!A<'!L92!T=V\@8V]M<'5T97(B M(&ES('T;W)E9"!E:71H97(@=VET:&EN('1H92!S86UP;&4@=F]C86)U;&%R M>2!O<B!W:71H:6X@=&AE(&9I;&4@=&AA="!Y;W4@:G5S="!C<F5A=&5D+B!4 M:&4@96YT:7)E('!H<F%S92!C;W5L9"!H879E(&E)96X@8V]N<W1R=6-T960@ M86YD('!L86-E9"!W:71H:6X@82!S:6YG;&4@9FEL92!B=70@:6X@;W)D97(@ M=&\@;6]R92!E9F9E8W1I=F5L>2!D96UO;G-T<F%T92!H;W<@=&\@86-C97-S M('P965C:"!F<8V]M('=I=&AI;B!A('!R;V=R86T@>6]U('=I;&P@8F4@86-C M97-S:6YG(&\$@8V]M8FEN871I;VX@;V8@<VEN9VQE('O<F1S(&%N9"!A('!H M<F%S92X-#51H92!P<F]G<F%M(&QI<W1E9"!O;B!T:&4@;F5X="!P83EE('=I M;&P@<V%Y('1H92!S86UP;&4@<&AR87-E(&5V97)Y('1I;64@82 \0U(^(&ES M('!R97-S960N("!4:&4@(E)%32(@<W1A=&5M96YT<R!P<F5T='D@=V5L;"!E M>'!L86EN(&ET<R!O<&5R871I;VX@86YD('=H870@<&]R=&EO;B!O9B!T:&4@ M<'O9W)A;2!D;V5S('=H870N#0TQ,0U%0TA/(%U;(%-0145#2"!364Y42\$53 M25I%4@T-,3 @2\$E-14TZ(#<Q-C<-,34@4D5-(%-5%,@2\$E-14T@0D5,3U<@ M5\$A%(\$Q/OT%424].(\$]&%1(12!34\$5%0T@4D]55\$E.15,N#3(P(\$OD(#T@ MOTA24R H-"D-,C4@4D5)54D@4T544R!\$)"!54"!14R!(\$-/3E123TR61"!& M3U(@1\$]3(\$-/34U!3D13+@TS,"!04DE.5"!\$)#LB0DQ/040@4U!%14-((=\$% M3D52051/4BY#3T1%,"(-,S4@4D5-(\$Q/0413(\$E.(%1(12!34\$5%0T@1T5. M15)!5\$]2+D-/1\$4P(\$E.5\$@)##, # @5\$@)###!1D8N#30P(%!224Y4(\$OD M.R)"!3E]!1"!63T-!0E5,05)9(@TT-2!214T@3\$]!1%,@5\$A%(%-!35!,12!6 M3T-!0E5,05)9(\$E.5\$@3\$]#051)3TX@,3<T,#@N#34P(%!224Y4(\$OD.R)" M3\$]!1"!3B!4%!,12!45T\@0T]-4%5415(B#34U(%)%32!,3T%\$4R!42\$4@ M4\$A205-(\$E.5\$@3\$]#051)3TX@,3DT,# N#38P(\$Q/0EE412](#<Q-C@Z M2\$E"651%(#T@-S\$V.3I34\$5!2R](#<Q-S Z3EA44U!+(#T@-S\$X,CI33\$]4 M(#T@-S\$Y-SI315133%0@/2 X,#DW#38U(%)%32!31513(%50(%1(12!605)) M3U53(\$%\$1%)%4U-%4R!54T5\$(%=)5\$@4U!%14-((=\$%3D52051/4BY#3T1% M3RX--S @0T%,3"!315133%0Z02](%!%14L@*%-,3U0I.B!)1B!!(#T@,38@ M5\$A%3B!(3TU@(#H@4%)3E0@(E!,14%312!)3E-%4E0@04X@14-(3R!)22!# M05)\$ (CH@14Y\$#3<U(%)%32!\$151%4DU)3D53(%=(24-((%- ,3U0@5\$A%(\$5# M2\$@\@24D@0T%21"!)4R!)3BX@248@3D\@0T%21"!)4R!)3E-404Q,140@250@ M5T%23E,@5\$A%(%5315,@04Y\$(\$5.1%,@5\$A%(%!23T=204TN#3@P(\$A/344@ M.B!)3E!55" B4%)4U,@5\$A%(#Q#4CX@1D]2(\$@1\$5-3U-44D%424].("([M6"0-.#4@4D5-(\$-,14%24R!42\$4@4T-2145.(\$%.1"!704E44R!&3U@02!# M3TU-04Y\$(%1/(%-405)4+@TY,"!1\$0@/2 Q.3 W,#H@1T]354(@,C P#3DU M(%)%32!31513(%50(%1(12!!1\$1215-3(\$9/4B!42\$4@5T]21" B5\$A)4Y0@ M04Y\$(%1(14X@2DE-4%,@5\$@\@5\$A%(%)/551)3D4@5\$A!5"!724Q,(\$]55%!5 M5"!42\$4@041\$4D534R!!3D0@4U!%04L@250N#3\$P,"!&3U(@02](#\$@5\$@ M,3 P.B!.15A4#3\$P-2!214T@0T%54T53(\$@4\$%54T4@0D545T5%3B!42\$4@ M5T]21%,@E1(25,B(\$%.1" B25,B+@TQ,3 @041\$(#T@,3@Q.#0Z(\$=/4U5" M(#(P, TQ,34@4D5-(%-5%,@55 @5\$A%(\$%\$1%)%4U,@1D]2(%1(12!73U)\$

M(")4R(@04Y\$(%1(14X@2E5-4%,@5\$\@5\$A%(%) /551)3D4@5\$A!5"!724Q,
M(\$]55%!55"!42\$E3(\$%\$1%)%4U,@04Y\$(-014%+(\$E4+@TQ,C @1D]2(\$\$@
M/2 Q(%1/(\$#P,#H@3D585 TQ,C4@4D5-(\$-!55-%4R!!(%!!55-%(\$)%5%=%
M14X@5\$A%(=%/4D0@DE3(B!!3D0@5\$A%(\$9/3\$Q/5TE.1R!02%)!4T4N#3\$S
M,"!!1\$0@/2 Q.30P,#H@1T]354(@,C P#3\$S-2!214T@4T544R!54"!42\$4@
M041\$4D534R!&3U(@5\$A%(%(4D%312 B04X@05!03\$4@5%=((\$-/35!55\$52
M(B!!3D0@5\$A%3B!*54U04R!43R!42\$4@4D]55\$E.12!42\$%4(=%)3\$P@3U54
M4%54(%1(12!!1\$1215-3(\$%.1"!42\$5.(\$-014%+(\$E4+@TQ-# @1T]43R X
M, TR,# @04@/@2!)3E0*\$\$%\$1"\R-38I.D%,(#T@041\$("U!2" J(#U-@TR
M,#4@4D5-22!34\$Q)5%,@5\$A%(\$%\$1%)%4U,@55 @24Y43R!(24=(((\$%.1"! ,
M3U<@041\$4D534T53(\$Q%4U,@5\$A!3B R-38@04Y\$(%1(050@0T%.(\$)%(!/
M2T5\$(\$E.5\$@\@2!"24Y!4ED@4D]55\$E.12X-,C\$P(%!/2T4@2\$E"651%+\$(
M.B!03TM\$(\$Q/0EE412Q!3 TR,34@4D5-(%!/2T53(%1(12!!1\$1215-315,@
M1\$5415)-24Y%1"!!0D]612!)3E1/(%1(12!,3T-!5\$E/3E,@55-%1!"62!4
M2\$4@4U!%14-((=\$%3D52051/4BY#3T1%+@TR,C @0T%,3"!34\$5!2PTR,C4@
M4D5-(%1(25,@0T%,3%,@5\$A%(%) /551)3D4@5\$A!5"!34\$5!2U,@5\$A%(=%/
M4D0@3U(@4\$A205-%(-405)424Y'(\$%4(%1(12!!1\$1215-3(%!/2T5\$(\$%"
M3U9%+@TR,S @4D5455).#0TQ,@U%0TA/(%U;(-0145#2"!364Y42\$5325I%
M4@T-5\$% "3\$4@,2 M4U!%14-((=\$%3D52051/4B!!1\$1215-315,-#5-0145#
M2"!14Y%4D%43U(N0T] \$13 @EB D,4-/3R!43R!3,49&l@U34\$5%0T@@1T5.
M15)!5\$]2+D-/1\$4Q()8@)#-#3T\@5\$\@)#-&1D8-4U!%14-((=\$%3D52051/
M4BY#3T1%,B"6(% ,T,# P(%1/("0T,T9-0145#2"!14Y%4D%43U(N0T]\$
M13.@EB D-C P,"!43R D-C-&l@T-5D524TE/3B @3\$]"651%("!(24)95\$4@
M(%-014%+("!.6%134\$L@("!33\$]4("!315133%0-, DW,38X"3<Q-CD)-S\$W
M, DW,3@R"3<Q.3<)OC Y-PT))##,##)##,##(\$))##,##()##3T4))##
M,40))##&03\$-#3\$),34S-C),34S-C\$),34S-C(),34S-S0),34S.#D),38R
M,#D-"20S0S P"20S0S Q"20S0S R"20S0T]"20S0S%"20S1D\$Q#0TR"3\$V
M,S@T"3\$V,S@U"3\$V,S@V"3\$V,SDX"3\$V-#\$S"3\$W,S\$S#0DD-# P, DD-# P
M,0DD-# P,@DD-# P10DD-# Q1 DD-#!,0T-,PDR-#4W-@DR-#4W-PDR-#4W
M. DR-#4Y, DR-#8P-0DR-34P-0T))#8P,#)#8P,##\$))#8P,#()#8P,\$4)
M)#8P,40))#8S03\$-#5!10DQ%(#@EB!33U5.1%,@5TE42"!314Q%0U!10DQ%
M(%9!4DE!0DQ%4PT-06P@EB!L871E"44@EB!S<&5A:PE-()8@;6%N>0E/3S(@
MEB!B;V]K#4\$R()8@; &%T90E%2" "6(&QE='1E<@E.()8@;FEC90E5,2"6('1U
M;F4-044@EB!D860)"452()8@:'5R<GD)3D<@EB!L;VYG"54R()8@='5N90U!
M2" "6(&)O=&AE<B @4D@EB!F:6YG97()3S\$@EB!O: E52" "6(&9U;@U!5R"6
M(&-A;&P)254@EB!Y;W4)3S(@EB!O: E9()8@>6]U#4P@EB!L:6ME"4]/,2"6
M(&)O;VL)4\$Q()8@<&%U<V4-#5!10DQ%(#@EB!33U5.1%,@5TE42"!04D53
M150@5D%224%"3\$53#0U"()8@8F%B>0D)1R"6(&=E= E2()8@<F5D"51(,2"6
M('1H96X-0T@)EB!C:2" "6(&AE;&QO"5,@EB!S964)5B"6('9E<GD-
M1" "6(&109PD)2B"6(&IE= E32" "6('H;V4)5R"6('=I;&P-1%0@EB!B=71T
M97()2R"6(&MI8VL)5" "6('10;PE:()8@>F5R;PU&()8@:68)"5 @EB!P<FEN
M= E42" "6('1H:6YK"5!!()8@<&%U<V4-#5!10DQ%(#0@EB!34\$5%0T@@141)
M5\$]2(\$-/34U!3D13#0TH02E\$1 D)*\$5.1"D)"2A.*457#2A!4"E014Y\$"2A)
M*4Y315)4"2A04BE)3E0-*\$,I051!3\$]"2A,*4E35 DH4T\$I5D4-*\$0I14Q%
M5\$4)*\$Q/*4%"2A34"E%04L-*\$TI3T1)1ED)*%-032E%34]260T-,3,-14-(
M3R!=6R!34\$5%0T@4UE.5\$A%4TE:15(-05!014Y\$25@@EB!304U03\$4@5D]#
M04)53\$%260T-02XN+BXN+BXN+BXN,3<T,##@(" @041\$140N+BXN+BXN,3<T
M,C4@(" @04Y35T52+BXN+BXN,3<T-#0-041\$+BXN+BXN+BXN,3<T,3<@(" @
M04Y\$+BXN+BXN+BXN,3<T,S0@(" @05!03\$4N+BXN+BXN,3<T-3<-#4(N+BXN
M+BXN+BXN+C\$W-#8Y(" @(\$),544N+BXN+BXN+C\$W-#DP(" @(\$)95\$4N+BXN
M+BXN+C\$W-3\$P#4),04-++BXN+BXN+C\$W-#<W(" @(\$)9+BXN+BXN+BXN+C\$W
M-3 R#0U##+BXN+BXN+BXN+BXQ-S4R,2 @(" !#3\$]312XN+BXN+BXQ-S4U,2 @
M(" !#3TY44D],+BXN+BXQ-S4Y-0U#051!3\$]' +BXN+BXQ-S4S,B @(" !#3TQ/
M4BXN+BXN+BXQ-S4W," @(" !#3U)214-4+BXN+BXQ-S8Q, U#14Y44RXN+BXN
M+BXQ-S4T." @(" !#3TU-02XN+BXN+BXQ-S4X,PT-1"XN+BXN+BXN+BXN,3<V
M,C0@(" @1\$E32RXN+BXN+BXN,3<V-S @(" @1\$N+BXN+BXN+BXN,3<W,C0-
M1\$%412XN+BXN+BXN,3<V,S@(" @1\$E6241%+BXN+BXN,3<V.# @(" @1\$],
M3\$%24RXN+BXN,3<W,S(-1\$5#24U!3"XN+BXN,3<V-#\$@(" @1\$E6241%1"XN
M+BXN,3<V.34@(" @1\$].)U0N+BXN+BXN,3<W-#<-1\$5,151%+BXN+BXN,3<V

M-38@(" @1%)5D4N+BXN+BXN,3<W,3,-#44N+BXN+BXN+BXN+C\$W-S4X(" @M(\$5,159%3BXN+BXN+C\$W.# P(" @(\$524D]2+BXN+BXN+C\$W0C4Q#45)1TA4M+BXN+BXN+C\$W-S8U(" @(\$5.1"XN+BXN+BXN+C\$W.#\$U(" @(\$530T%012XN M+BXN+C\$W.#8R#45)1TA4145.+BXN+C\$W-S<U(" @(\$5.5\$52+BXN+BXN+C\$W M.#(U(" @(\$580TQ!34%424].+C\$W0C<T(" @#45)1TA462XN+BXN+C\$W-S@Y M(" @(\$5154%,4RXN+BXN+C\$W.#,X#0U&+BXN+BXN+BXN+BXQ-S@Y.2 @(" !& M25)35"XN+BXN+BXQ-SDT,B @(" !&3U)462XN+BXN+BXQ-SDW-0U&04Q312XN M+BXN+BXQ-SDP-2 @(" !&24Q%+BXN+BXN+BXQ-SDU,R @(" !&3U52+BXN+BXN M+BXQ-SDX-PU&2494145.+BXN+BXQ-SDQ-B @(" !&259%+BXN+BXN+BXQ-SDV M-2 @(" !&3U525\$5%3BXN+BXQ-SDY-PU&249462XN+BXN+BXQ-SDS, T-1RXN M+BXN+BXN+BXN,3@P,3@(" @1T]/1"XN+BXN+BXN,3@P,C@(" @1U5%4U,N M+BXN+BXN,4(P-#@-1T%-12XN+BXN+BXN,3@P6D\@(" @1U)%14XN+BXN+BXN M,3@P,SD-#4@N+BXN+BXN+BXN+C\$X,#4W(" @(\$A%3% N+BXN+BXN+C%3,#<U M(" @(\$A53D12140N+BXN+C\$X,#DX#4A%3\$Q/+BXN+BXN+C\$X,#8U(" @(\$A) M1T@N+BXN+BXN+C\$X,#@X#0U)+BXN+BXN+BXN+BXQ.#\$Q,B @("!)3D-/4E)% M0U0N+BXQ.#\$S-" @("!)4RXN+BXN+BXN+BXQ.#\$X- U)1BXN+BXN+BXN+BXQ M.#\$R,2 @("!)3E!55"XN+BXN+BXQ.#\$U,R @("!)5"XN+BXN+BXN+BXQ.#\$Y M, U)3BXN+BXN+BXN+BXQ.#\$R-R @("!)3E-%4E0N+BXN+BXQ.#\$V. T-2BXN M+BXN+BXN+BXN,3@Q.3@-#4LN+BXN+BXN+BXN+C\$X,C V(" @(\$M%62XN+BXN M+BXN+C\$X,C\$T(" @(\$M%64)/05)\$+BXN+C%",C(R#0U,+BXN+BXN+BXN+BXQ M.#(S-B @("!,25-4+BXN+BXN+BXQ.#(U-B @("!,3U<N+BXN+BXN+BXQ.#(W M.0U,1494+BXN+BXN+BXQ.#(T-2 @("!,3T%\$+BXN+BXN+BXQ.#(V-PT-32XN M+BXN+BXN+BXN,4(R.3 @(" @34E,3\$E/3BXN+BXN,3@S,C@(" @355,5\$E0 M3%DN+BXN,3@S-34-34%.62XN+BXN+BXN,3@S,#\$@(" @34E.55,@+BXN+BXN M,3@S-#\$@(" @355,5\$E03\$E%1"XN,3@S-S8-345-3U)9+BXN+BXN,3@S,30-M#4XN+BXN+BXN+BXN+BXN+C\$X,SDX(" @(\$Y)3D4N+BXN+BXN+C\$X-#,Q"4XP+BXN M+BXN+BXN+C\$X-#N@P#4Y!344N+BXN+BXN+BXN+C\$X-# Y(" @(\$Y)3D54145.+BXN M+C\$X-#0R"4Y/5RXN+BXN+BXN+C\$X-#@Y#4Y%6%0N+BXN+BXN+C\$X-#\$X(" @M(\$Y)3D5462XN+BXN+C\$X-#8R"4Y534)%4BXN+BXN+C\$X-#DW#0TQ- U%0TA/M(%U;(%-0145#2"!364Y42\$5325I%4@U!4%!%3D1)6""6(%-!35!,12!63T-! M0E5,05)9#0TP+BXN+BXN+BXN+BXQ.#4Q," @("!/3D4N+BXN+BXN+BXQ.#4S M-" @("!/4BXN+BXN+BXN+BXQ.#4U-0U/1D8N+BXN+BXN+BXQ.#4Q.2 @("!/ M4\$5.+BXN+BXN+BXQ.#4T,B @("!/550N+BXN+BXN+BXQ.#4V- U/3BXN+BXN M+BXN+BXQ.#4R-0T-4"XN+BXN+BXN+BXN,3@U-S,@(" @4\$5224]\$+BXN+BXN M,3@V,30@(" @4%)%4U,N+BXN+BXN,4(V-#@-4\$%214Y42\$5325,N,3@U.#,@ M(" @4\$Q54RXN+BXN+BXN,3@V,C<@(" @4%)3E0N+BXN+BXN,3@V-3@-4\$52 M0T5.5"XN+BXN,3@V,# @(" @4\$]53D0N+BXN+BXN,3@V,S@@(" @4%)/1U)! M32XN+BXN,3@V-S -#5\$N+BXN+BXN+BXN+C\$X-E,U(" @(%%515-424].+BXN M+C\$X-CDW#0U2+BXN+BXN+BXN+BXQ.#<Q,2 @("!214U/5D4N+BXN+BXQ.#<R M.2 @("!215154DXN+BXN+BXQ.#<U.0U2140N+BXN+BXN+BXQ.#<R," @("!2 M15!%050N+BXN+BXQ.#<T,R @("!224=(5"XN+BXN+BXQ.#<W- T-4RXN+BXN M+BXN+BXN,3@W.#4@(" @4T5614Y462XN+BXN,3@X-C0@(" @4U!%3\$PN+BXN M+BXN+C\$X.3,S#5-!5D4N+BXN+BXN+C\$X-SDR(" @(%-)6"XN+BXN+BXN+C\$X M.#<X(" @(%-405)4+BXN+BXN+C\$X.30R#5-%0T].1"XN+BXN+C\$X.# Q(" @M(%-)6%1%14XN+BXN+C\$X.#@X(" @(%-43U N+BXN+BXN+C\$X.34S#5-%34E# M3TQ/3BXN+C\$X.#\$T(" @(%-)6%19+BXN+BXN+C\$X.3 S(" @(%-50E1204-4 M+BXN+C\$X.38T(U3159%3BXN+BXN+BXQ.#@S-2 @("!33U)262XN+BXN+BXQ M.#DQ-2 @("!354)44D%#5\$5\$+BXQ.#DW.2 -4T5614Y4145.+BXN,3@X-#4@ M(" @4U!!0T4N+BXN+BXN,3@Y,C4-#50N+BXN+BXN+BXN+C\$X.3DW(" @(%1(M25)4145.+BXN+C\$Y,#0W(" @(%1262XN+BXN+BXN+C\$Y,3 Y(U405!%+BXN M+BXN+BXQ.3 P-R @("!42\$E25%DN+BXN+BXQ.3 V," @("!44E5%+BXN+BXN M+BXQ.3\$Q.2 -5\$A!5"XN+BXN+BXN,3DP,38@(" @5\$A)4RXN+BXN+BXN,3DP M-S @(" @5%=%3%9%+BXN+BXN,3DQ,C@@#51%3BXN+BXN+BXN+C\$Y,#(U(" @M(%1(3U5304Y\$+BXN+C\$Y,#<W(" @(%1714Y462XN+BXN+C\$Y,30P(U42\$4N M+BXN+BXN+BXQ.3 S,R @("!42%)%12XN+BXN+BXQ.3 X.2 @("!45T\N+BXN M+BXN+BXQ.3\$U,2 -5\$A%,2XN+BXN+BXN,3DP-#\$@(" @5\$E-12XN+BXN+BXN M,3DP.3@(" @5%E012XN+BXN+BXN,3DQ-3D-#54N+BXN+BXN+BXN+C\$Y,3<P M(" @(%5((\$](+BXN+BXN+C\$Y,4(Q(" @(%5.1\$524U1!3D0N+C\$Y,3DP#0U6 M+BXN+BXN+BXN+BXQ.3(P-R @("!604Q512XN+BXN+BXQ.3(Q-PT-5RXN+BXN

M7#X`%X^`!Y/@`>CX`(`<_`"(/P`2D(``\$M"``!=0@`^P`!D"33`/L`
M!9 DTP#[``&0)-, ^P`%D"33`/L`9 DTP#[``F0)-, ^P`!D"33`/L`I D
MTP#[``&0)-,]P`!D"33`/, ``9 D\$@'S``&0)-, ^P`#D"33`/L`9 DTP#[
M``.0)-, ^P`!D"33`/L`!) DTP#[``&0)-, ^P`)D"33`. ``9 DTP#[``20
M)-, ^P`!D"33`/L`Y DTP#[``&0)-, `ZP`!D"3`= .L`9 DTP#E`60)-, `
MY0`!D"33`.4`!9 DTP#E``&0)-, `X0`!D"33`-T``9 D\$@'=`&0)-, `V``\$
MD"33`-@``9 DTP#E``N0)-, `Y0`!D"33`.L``9 DW0`
M!0,1& , ```` , ``!`8````P``\$; 3````%````%`Q\$8`Q/0`@`#````1& , ```` , `
M`!`H!0````P``\$4@````#````1T!0````0````4#\$>@%``9=0@``7D(``%]\$``!@
M1 ``<\$0```%\$``" ?10``H\$4``*E%``"J10``1\$<``\$5'``!`1P``8D<``&-`
M`#Q1P``\D<``!%*``22@``*H``"E*``!52P``5DL``!%``230``:T\
M`&Q/``#_4````%\$````)1````=40``E\$`` , Y1``#/40``[U\$``/!1``#]40``
M_``!D"33`/8``") DTP#V``&0)-, _``!D"3`= /P``9 DTP#V``60)-, `]@`!
MD"33`/P``9 DW0#``&0)-, `]@`&D"33`/8``9 DTP#R``&0)-, `[@`!D"02
M`>X``9 DTP#I``.0)-, `Z0`!D"33`. , ``") DTP#C``&0)-, `WP`!D"3`= -\
M`9 DTP#C``60)-, `XP`!D"33`. , `!Y DTP#C``&0)-, `XP`)D"33`. , ``9 D
MTP#C``:0)-, `XP`!D"33`/(``9 DTP#;``&0)!(!VP`!D"33`-8``Y DTP#6
M``&0)-, `T@`!D"33`-(``9 DTP#, ``&0)-, ``````````%````%`Q!P"!&(
M"P`#````1: H````0``4#\$6 #````#````1D```` , ``!`0`@``!0``!0,1T (3
MT (`! ``!0,1T (```` , ``!`%H`0``P``\$6@3````%````%`Q\$8`Q/0`@`#````1
M& , `)/U1``4@``!%(``"E2``04@`` , %(``!]3``@4P``^E0``/M4``#>
M5P``WU<``%Q9``!=60``S5D`` , Y9``#060``ZUD``.Q9``B6P``(UL`` ,);
M``##6P``F%P``)E<``"Y7``NEP`` , 9<``#-7``W%P``.A<``#T7``^UP`
M`/4``9 DTP#H``&0)-, `X@`!D"33`-X``9 DTP#>``&0)-, `V`\$D"33`-@`
M`9 DTP#8!/^0)- %V`!D"33`-@`"Y DTP#8``&0)-, `V`&D"33`-@``9 D
MTP#8``*0)-, `V`!D"33`-0``9 DTP#0``&0)!(!T`!D"33`,L`!9 DTP#+
M``&0)-, `V`#D"33`-@``9 DTP#8``20)-, `V`!D"33`,<``9 DTP#'``&0
M)-, `PP`!D"33` , , ``9 DTP#"]``&0)-, `LP`!D"33` , , ``9 DTP##``&0)-, `
M``)````%`Q!P"!&P"@\%``\$"#0``4``4#\$' (\$; *`` , ``!&P"@``P``
M\$2 *````\$````%`Q%@`P``P``\$9````#``1^!, ``4``4#\$6 # \$] "`` , `
M`!& ("P``!0``!0,0< @1B L`# ``!0,0< @1B L/"P`#L!. %0 >0``"````*
M````%`Q!P"!& ("P\(`+@\$+ 3``@^UP``E=``870``)UT``#=-``Z70``
M25T``%A=``!G70``: %T``\$M?``! , 7P``D&\$``) %A``"480``KV\$``+!A``Y
M8@``.F(`` , MC``# , 8P``8F4``&-E``C9@``) &8``"=F``!"9@``0V8``%`F
M``"/9@``H&8``-5F````9P``0&<``%]G``"79P``^@`!D"33`/H``9 DTP#Z
M``&0)-, `]@`!D"33`/8``9 DTP#Z``&0)-, `^@`!D"33`. @``9 DTP#H``&0
M)-, `X@`(D"33`. (``9 DTP#B``F0)-, `X@`!D"33`-X``9 DTP#:```&0)!(
MV@`!D"33`-4``I DTP#5``&0)-, `SP`&D"33`,\``9 DTP#/!/^0)/T\$SP`!
MD"33`,\``Y DTP#/``&0)-, `RP`!D"33`,D``9 D\$@'``&0)-, `Q`!D"33
M`,0``9 DTP#\$``&0)-, `Q`!D"33`,0``9 DTP#\$``&0)-, `Q`!D"33`,0`
M`9 DTP````\$``1H 43 , /T``0```` , ``!`8\$@``!0``!0,1& , 3T (`! ``
M!0,1& , ```` , ``!%(````P``\$2 3````%````%`Q%@`Q/0`@`-````%`Q!P"!&P
M"@\.`3@\$+ 3@!;P@\$``(`P``\$; *````%````%`Q!P"!&P"B.79P``P6<`
M`.YG``!": ``B6@``.IH``!?:0``EVD``-)I``#L:0``9&H```]J``"Y:@``
MU&H``\$QK``!G:P``KFL`` , EK``!;: ``9FP``)IL``&;0``*6T``(QM``" ;
M;0``_FT``EN``* ; @``#6X``"AN``I ; @``36X``\$YN``!V ; @``GFx`` , 9N
M``#N ; @``[VX``/D``9 DTP#Y``&0)-, `] ``"D"33`/0``9 DTP#T``*0)-, `
M] ``"D"33`/0``9 DTP#T``&0)-, `] ``!D"33`/0``I DTP#T``&0)-, `] ``!
MD"33`/0``9 DTP#T``*0)-, `] ``!D"33`/0``9 DTP#T``&0)-, `] ``#D"33
M`/0``9 DTP#T``&0)-, `] ``"D"33`/0``9 DTP#T``*0)-, `] ``!D"33`/0`
M`I DTP#T``&0)-, `\ ``!D"33`.P``9 DTP#H``&0)!(!Z`!D"33`.0``9 D
MW0#D``&0)-, `W@`!D"33`-X``9 DTP#>``&0)-, `W@`!D"33`-<``9 DTP``
M````````````````````!@``\$\$ +\$8 \$\$U#^````%````%`Q! "Q& ! `#
M``1L \$`` , ``!&0````P``\$9 2``#``1B (``0``!&@!1,P_0`&``0
M< @1H 43 , /T``) >]N``E ; P``16``&IO``!K ; P``D6``+90``"W ; P``W6``
M``)P``#< ``*7``\$YP``! / < ``>G``MP``"C< ``S' ``/5P``?<0``
MOG\$``&)Q``!C<0``BG\$``(MQ``"P<0``UW\$``/MQ``A<@``27(``\$IR``!K
M<@`` ; ' (``(!R``":<@``LG(`` , IR``#><@``^P``"D"33`.L``9 DTP#K``&0
M)-, `ZP`!D"33`.L``9 DTP#K``&0)-, `ZP`!D"33`.L``9 DTP#K``&0)-, `


```

M
M
M_____ \. ! ( " ` ! ` $ L ` # P ` _____ ! ` ` 0 / ' _ ` @ ` < ` ` 9 .
M;W)M86P`! ` ` ` # , ` ` P ! A " 0 0 ` _____ ( @ ! ! 0 / + _ H 0 ` B
M`!9$969A=6QT(%!A<F%G<F%P:"!&;VYT` _____ @`!] `0#R`" `
M!DAE861E<@`,` ` \ ` # P @ ` ` N 0 P " $ ! ` @ ` ` ( ` @ 0 $ ` ` @ $ @ ` ` 9 & ; V ] T 9 7 ( ` # ` 0
M` \ ( ` ` + @ $ , A ` 0 ( ` ` ! @ ` ` * 4 " B ` ! $ ! & ` ` + 4 & % G 9 2 ! . = 6 U B 9 7 ( ` _____ & . $
M` ` $ " . ) ` ` ` % / _____ \ - ` ` 0 A _ \ ! ` ` ` A _ \ " ` ` 0 @ _ \ # ` ` ` @ _ \ $ ` ` 0 @ _ \ %
M` ` @ _ \ & ` ` 0 @ _ \ ` ` ` ` @ _ \ ( ` ` 0 @ _ \ ) ` ` ` @ _ \ * ` ` 0 @ _ \ + ` ` ` @ _ \ , ` ` 8 @
M_ \ - ` _____ # ! ` ` ] Q $ ` ` ! \ > ` ` " 0 * 0 ` ` E C 4 ` ` - ] ` ` ` 1 3 @ ` ` + 5 D ` ` " ] E ` ` # 7
M;0 ` ` , G 8 ` ` ( % _ ` ` ! C A ` ` ` ` - ` ` ` 0 ! ` ` ` @ ` ` ! ` ` ` P ! ` ` ` ! ` ` H ` 0 `
M!0`0` ` ` ! @ ` ` ! ` ` ! P / ` ` " ` R ` ` " 0 ` D ` ` " @ ` Y ` ` " P ! ` ` ` # ` `
M` _____ $ ` ` ` " ` ` ` % ` ` ` " ` ` 4 ` ` ` 6 ` ` ` % P ` ` ` ! @ ` ` ` 9 ` ` ` & @ ` ` ` % 8 `
M` ! 7 ` ` ` D P ` ` ` ) 0 ` ` # 0 ` ` ` T 0 ` ` ` T ! ` ` ` . 0 ` ` 2 @ $ ` ` ` 4 ` 1 ` ! O ` & , ` ` = 0 ! M
M` & 4 ; @ ! T ` % , ` ` = 0 ! M ` & T ` 8 0 ! R ` ` D ` 2 0 ! N ` & 8 ; P ! R ` & T ` 8 0 ! T ` & D ` ; P ! N `
M` _____ X ` ` ( ` _____
M` _____ " @ ` ` /
M` _____
M` _____ # _____ \
M` _____
M` _____ / _____
M_____ P
M` _____
M` _____
M_____
M` _____ 4 @ ! O ` & \ ` = ` @ ` $ 4 ; @ ! T ` ' ( ` > 0 ` ` ` ` $ % ! ( Y ` ` 0 4 $ C H ` ` ! ! 0 2 . P ` $
M% ! ( \ ` ` 0 4 $ C T ` ` ! ! 0 2 / @ ` ` $ % ! ( _ ` ` 0 4 $ D ` ` ! ! 8 ` ! 0 ' _____ P $ ` ` ` ` " 0 ( `
M` _____ , _____ ! & ` ` ` ` . ' * . Q A K ; L ! ( ) N < 9 7 V M N P % ? ` ` ` ` @ ` , ` ` ! 0 2 3 0 ! 7
M` & \ ` < @ ! D ` $ 0 ; P ! C ` ` 4 ` ; 0 ! E ` & X ` = ` ` ` ! 0 2 4 P ` $ % ! ) 4 ` ` 0 4 $ E 4 ` ` ! ! 0 2 5 @ ` $
M% ! ) 7 ` ` 0 4 $ E @ ` ` ! ! 0 2 6 0 ` $ % ! ) : & @ ` " ` 0 ( ` ` ` ` # ` ` ` _____ P 0 4 $ E X ` ` ! ! 0 2 7 P ` $
M% ! ) @ ` ` 0 4 $ F $ ` ` ! ! 0 2 8 @ ` $ % ! ) C ` ` 0 4 $ F 0 ` ! ` ` ` ` # ' K ` ` ` 0 4 $ @ $ ` 0 P ! O ` & T `
M< ! / ` & ( ` : @ ` ` ` ! 0 2 : P ` $ % ! ) L ` ` 0 4 $ F T ` ` ! ! 0 2 ; @ ` $ % ! ) O ` ` 0 4 $ G ` ` ! ! 0 2 < 0 ` $
M% ! ) R ` ` 0 4 $ G , ` ` ! ! 0 2 ` ` ( ! _____ = P ` $ % ! ) X ` ` 0 4 $ G D ` ` ! ! 0 2 > @ ` $
M% ! ( _____ & H ` ` ` 2 @ ` $ ! 0 ! 3 ` ` 4 ` ; 0 ! M ` & $ ` < @ ! Y
M` $ D ` ; @ ! F ` & \ ` < @ ! M ` & $ ` = ! I ` & \ ` ; @ ` ` ! 0 2 B 0 ` $ % ! * * ` 0 4 $ H L ` ` ! ! 0 2 C ` $
M% ! * - " @ ` ` @ ` _____ ! ` ` / _____ \ 4 $ I $ ` ` ! ! 0 2 D @ ` $ % ! * 3 ` 0 4 $ I 0 ` !
M` _____ " _____ Q $ ` ` ` ! _____ @ _____ $ ` ` ` ! 0 ` ` ` 8 `
M` _____ " _____ D ` ` ` * _____ " P ` ` ` - _____ # @ ` ` \ ` ` 0 ` ` ` $ 0 ` `
M` ! ( ` ` ` 3 ` ` ` % ` ` ` ! 4 ` ` ` 6 ` ` ` % P ` ` ` ! @ ` ` ` 9 ` ` ` & @ ` ` ` ! L ` ` ` <
M` 0 ` ` ! X ` ` ` ? ` ` ` ( _____ " $ ` ` ` B ` ` ` ( P ` ` ` " 0 ` ` ` E ` ` ` ) @ ` ` ` " < ` ` ` H
M` ` ` * 0 ` ` ` " H ` ` ` K ` ` ` + ` ` ` " T ` ` ` N ` ` ` + P ` ` ` # ` ` ` Q ` ` ` , @ ` ` ` # , `
M` ` ` T ` ` ` - 0 ` ` ` # 8 ` ` ` W ` ` ` . ` ` ` # D ` ` ` Z ` ` ` . P ` ` ` # P ` ` ` ] ` ` ` / @ ` `
M` # \ ` ` ` ! ` ` ` 0 0 ` ` ` $ ( ` ` ` ! # ` ` ` 1 ` ` ` $ 4 ` ` ` ! & ` ` ` 1 P ` ` ` $ @ ` ` ` ! ) ` ` `
M 2 @ ` ` ` $ L ` ` ` ! , ` ` ` 3 0 ` ` ` $ X ` ` ` ! / ` ` ` 4 ` ` ` % $ ` ` ` ! 2 ` ` ` 4 P ` ` ` % 0 ` ` ` ! 5
M` ` ` 5 @ ` ` ` / [ _____ [ _____ O _____ U L ` ` ` # ] _____ O _____ U X `
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MP&AX! ` ` ` $ ` ` ` ` G - , & > : V [ ` 4 ` ` ` ` % G E ; ? : V [ ` 0 , ` ` ` - ` ` ` P ` ` ` " ( 3
M` ` ` # ` ` ` $ & T ` ` ` ,
M` _____ _ O \ ` ` ` 0 ` ` ` @ ` ` `
M` _____ 0 ` ` ` + 5 S = 6 < + A L O D Y < ( " L L ^ : X P ` ` ` P ` ` ` @ ` ` ` !
M` ` ` 2 ` ` ` \ ` ` ` ! 0 ` ` ` ! ` ` ` & P ` ` ` % ` ` ` = ` ` ` 8 ` ` ` ! \ ` ` ` " P ` ` ` ( 0 `
M` ` ` 0 ` ` ` C ` ` ` P ` ` ` " 4 ` ` ` @ ` ` ` . 0 $ ` ` ` > ` ` ` $ @ ` ` ` % ! R 9 6 9 E < G ) E 9 " ! #
M;VUP86YY` ` ` P ` ` ` # * ` ` ` # ` ` ` Z ` ` ` , ` ` ` W ` ` ` " P ` ` ` + ` ` `
M` ` ` P 0 ` ` ` " ` ` ` ! @ ` ` ` ! ( ` ` ` ! 4 0 4 ) , 1 2 ! / 1 B ! # 3 T Y 4 1 4 Y 4 4 P ` # ` ` `
M` _____
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M`~~~~~\$~~~~~#_____~~~~~
M`~~~~~&`0#`6`PE@`@`0`!`,)8`~~~~~
MP5@`\$`")D"0H`!0\$1`3`9`@\$`%6!F0(!"@`%`Q%`Q/0`ID"00`
M!0.9`@\$`*`4#=\$`"\$`]"F0(!!0`1T`*9`@\$`*`4#\$:@#]\$]"F0(!!P`%`Q`H
M!9D"0H`!0,1&`,`3T`*9`@\$`(!\$8`Q/0`ID"04`\$1@#F0(!" `1T` (3T`*9
M`@\$`%`!/0`ID"0@`\$6`#]\$]"F0(!!0`0`"9`@\$`%`!#0`ID" `N@&`
M`0`~~~~~(~~~~~3~~~~~&~~~~~!D~~~~~!5~~~~~5@~~~~~)(~~~~~"3~~~~~SP~~~~~
M`0`#0\$`\$D!`!`*`0`A@\$``(<!`##`0`Q`\$`~~~~~"~~~~~!`@`~/0`(`#X"
M`!Z`@`>P`(`+<`"X`@`~]`(`~/4`~~~~~Q`P`~,`,`&X#`!O`P`!JP,`
M`*P#`#I`P`^P,`~/P#`~!!`P0`~~~~~\\$`!B#`@`8PX`~&0.~!P#`@`
M\1\$`~/0`1`#S\$0`^!\$`~@2`~~~~~"0%P`X!<`~.~\$7`!5&0`~\AH`~/,`:#`#V
M'`~]QP`!@>`9`@`&QX`" `>`P`@`9A\`(`<?`##`P`Q1\`~. `@
M`#.(P`SR,`~,D`##) `U"0`,,,G`#%)P`ABD`(`<I`~")(*0`B2D`
M`HI`~"1*0`VS\$`\$8R`~!`,`@`7C@`~&`X`!W. `F#D`~)HY`~P. @`
M\3H`~/X[`#`/@`P3X`~=-`#80`~V4`~~-]`~>0@`~T(`"I`~##
MOP`Q\$,`~%\$`~!31`~<D8`~!-&`#.2P`8\$T`~&%`~13@`H%4`~]6
M`05@`1E<`~,%8`#`6`Q%`@`~,98`#)6`RE@`~!;`"S70`M%T`
M`#U>`~"(80`B6\$`"=B`H8@`#&H`~UJ`#?;@`X6X`~/N`#[:@`
M_&X`!U]`~>?0`~.T`#E]`!\$A`~180`~%^\$`!@A`~880`~&*`\$`!C
MA`0`!GB`~!`&B(`\$\$\$`~,`\$0`!IB`~!`!\$#`~#`\$`
M\$@,`~\$0`!NB`~!`\$X#`~!`\$`~;X@`~0`"*P`~0!`~!"(~~~~~
M`\$`Q@,`~\$0`!QB`~!`(\$`~!`\$`<H@`~0`^!`~0!`~. (
M`~\$`>@0`~\$0`!TB`~!`+8\$`~!`\$`=8@`~0`#R!`~0!
M`':(`~\$`+@4`~\$0`!WB`~!`&H%`~!`\$`>(@`~0`"F!0`
M`0!`F(`~\$`X@4`~\$0`!ZB`~!`!X&`~!`\$`>X@`~0`!`
M!@`0!`R(`~\$`E@8`~\$0`!B`~!`^(~~~~~\$`D(@`
M0`#M!@`0!!!`.\&`%`\$`^P8`~\$0`"5B`~!`!`):`(\$\$\$\$`!\$`
M`40`!Y\$0`~0!`~>(`~~~~~\$`^A0`~\$0`"8B`~!`!/L4`~%`\$`
M"Q4`~\$`00"R&@`~!P!!`~)V(`~~~~~\$`QL`~<0`!W'`~0!`~)Z(`
M`\$`%`!X`~\$0`~7(`~"0!`!@@`~!`\$`GX@`~0`Y(0`~0!`~*" (
M`~~~~~\$`R\$`~\$00!+(0`~"P!!`*6(`~~~~~\$\$`HB(`~L`0`#&B`~!
M`/XB`~-\$`&20`~\$0`~)P`~"0!`~@G`~!`\$`R(@`~0`#[)P`~
M`0!!!`PH`~/`\$`R8@`~00#]`*@`#P!`~,N(`~~~~~\$`S(@`~00#-
MB`~!`~TL`~!`\$`SH@`~0`#>+`~0!!`"@U`~1`\$\$`U8@`
M0`"S-0`~0!`~:-(`~~~~~\$`RCL`~\$00#A.P`\$P!`~B(`~~~~~\$\$`!#T`
M`!,`00#B`~!`~H^`3`\$`AS\`~\$0`#;B`~!`\$E"~!`\$`
MW(@`~0`!`?1`~0!`~V(`~~~~~\$`8\$0`~\$0`#CB`~!`~)l%`~!
M`\$\$`JD4`~!,`00#DB`~!`!&-`~5`\$`Y8@`~0`#R1P`~%P!`~.>(`
M`~~~~~\$`\$4H`~\$00!L3P`~"P!!`~.B(`~~~~~\$`E\$`!D`0`#.40`~0!!
M`%U9`~!`\$\$`Z8@`~0`#L60`~&P!`~");`~!`\$\$`ZH@`~00">7`
M`0!!`~.N(`~~~~~\$\$`HEP`~\$00#MB`~!`~*9<`~!`\$\$`3%\`~<00#N
MB`~!`~+!A`~=\$`~.6(`~\$`00#OB`~!`~(5E`~!`\$`~\(@`
M0`F9@`~0!`~/&(`~~~~~\$`#6X`~\$0`#RB`~!`!/2(`~~~~~\$\$`G(`
M`\$`0`#<@`~P!`~/UR`~!`\$`~!(D`~00`A@0`~0!`~#N!`~A`\$`
M/(\$`~\$0`~%B0`~!`~:~)~~~~~\$`((D`~0`AB0`~!`~"*)`
M`\$`2H@`~\$`0P`5%I`~!`!4:6UE<R!.97<@4F]M86X`#`!`0`0(`4WEM8F]L
M`LFD`\$`~\$%R:6%L`!\$UD`\$`\$-O=7)I97(@3F5W`"(`!`~!`(@8`~#0`@`
M: `\$`~"NO)QBGD"<8`~P`@`~(A,`~!`!M`~`~#<`~\$`(`,`Z`
M`~~~~~#0!`~0`~A`P`~]`~\$51!0DQ%(\$]&(\$-/
M3E1%3E13`~#SU09VER(%O9FEC:PQ-;V=I<B!2;V9I8VL
M`
M`
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M`#<I6@`5^`!)`~%`!E`~P`2X@`~!W!
M`180`~`=
M`*@`~&P`~K@`~R@`~,JN`~RJX`~#*K@`~,JN`
M`~RJX`~!0`~#M0`~+20`~F!@`~VK4`~#M0`~~JU

```

M` `` , `` `` `` YK4 `` ! `` `` #VM0 `` 7@ `` `` -JU `` `` `` `` `` 1< `` `` $ , `` `` !4M@ `` `` `` ``
M` %2V `` `` $ `` `` 6+8 `` `` `` !8M@ `` `` `` %BV `` `` 6+8 `` `` `` !8M@ `` ``
M` `` `` %BV `` `` `` , ; 8 `` `` #_M@ `` `` / ^V `` `` `` _[ 8 `` #0 `` `` S
MMP `` L `` `` . . W `` " P `` D [ @ `` ! X `` " ( P `` 6 `` . # `` `` ] `` `` L ; @ `` ) 0 '
M` `` L `` `` . . W `` " P `` D [ @ `` ! X `` " ( P `` 6 `` . # `` `` ] `` `` L ; @ `` ) 0 '
M` `` L `` `` . . W `` " P `` D [ @ `` ! X `` " ( P `` 6 `` . # `` `` ] `` `` L ; @ `` ) 0 '
MM@ `` `` %BV `` `` `` , BV `` `` RJX `` `` !8M@ `` `` 10 ! ' `` ( # P ! 8
M` `` " QN `` `` , BV `` `` RJX `` `` # * K @ `` `` %BV `` `` 6+8 `` ``
M` `` `` `` %2V `` `` R+8 `` `` # ( M @ `` `` , BV `` ``
M6+8 `` `` ! `` # * K @ `` `` %BV `` `` RJX `` `` !8M@ `` `` / VV `` ``
M` `` `` `` @FYQE? : V [ ` = ZN `` ! 0 `` + J \ `` ( 8 `` # * K @ `` `` , JN
M` `` `` RJX `` `` # * K @ `` `` %BV `` `` _ ; 8 `` `` # ( M @ `` - 0 ``
M` , BV
M`
M` `` `` `` ! 404 ) , 12 ! / 1 B ! # 3 T Y 4 1 4 Y 4 4 P T - 2 4 Y 4 4 D ] $ 5 4 - 4 2 4 ] . ( ) 8 @ E B " 6 ( ) 8 @
MEB " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @
M3 $ % 4 2 4 ] . ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @
M+ 2 " 6 ( ) 8 @ ( # ( - 4 U ! % 1 4 - ( ( $ = % 3 D 5 2 0 5 1 / 4 B " 6 ( ) 8 @ E B " 6 ( ) 8 @ + 2 " 6 ( ) 8 @ E B " 6 ( ) 8 @
M ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ ( # ( - 4 U ! % 0 4 M ) 3 D < @ 1 E ) / 3 2 ! 7 2 5 1 ( 2 4 X @
M 0 4 X @ 0 5 ! 0 3 $ 5 3 , $ 9 4 ( % ! 2 3 T = 2 0 4 T @ ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ ( # , - 5 T ] 2 1 " ! 3
M 5 % ) 5 0 U 1 5 4 D 4 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @
MEB " 6 ( ) 8 @ ( # , - 4 U ! % 1 4 - ( ( $ 5 $ 2 5 1 / 4 B @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @
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M 4 R M ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @
M ( $ - / 3 E - 4 4 E 5 # 5 $ E / 3 B @ + 2 " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @
MEB M ( ) 8 @ ( # 8 - 4 T % - 4 $ Q % ( % 9 / 0 T % " 5 4 Q ! 4 E D @ ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @
M ( ) 8 @ + 2 " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ ( # < - 4 T % - 4 $ Q % ( % ! 2 3 T = 2 0 4 T @ E B " 6 ( ) 8 @
M+ 2 " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @
M 4 S \ @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ + 2 " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @
M+ 2 " 6 ( ) 8 @ ( # < - 4 U ! % 1 4 - ( ( $ 5 $ 2 5 1 / 4 B ! % 6 $ % - 4 $ Q % ( " " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @
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MEB " 6 ( ) 8 @ , 3 , - 0 5 ! 0 1 4 Y $ 2 5 @ @ E B ! 3 0 4 U 0 3 $ 4 @ 5 D ] # 0 4 ) 5 3 $ % 2 6 2 " 6 ( " T @ E B " 6
M ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @ , 3 0 - 5 T % 2 4 D % . 5 % D @ E B " 6 ( ) 8 @ E B " 6 ( ) 8 @
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M 6 R ! 3 4 $ 5 % 0 T @ @ 4 U E . 5 $ A % 4 T E : 1 5 ( - # 4 E . 5 % ) / 1 % 5 # 5 $ E / 3 @ T - 5 6 Y T : 6 P @ < F 5 C
M 9 6 Y T ; ' D L ( ' - P 9 6 5 C : " ! G 9 6 Y E < F % T : 6 ] N ( & ) Y ( & $ @ ; 6 E C < F \ M 8 V ] M < ' 5 T 9 7 ( @
M < F 5 Q = 6 E R 9 6 0 @ 8 2 ! F 8 6 E R ( & % M ; W 5 N = " ! 0 9 B ! M 9 6 U O < G D @ < W 1 0 < F % G 9 2 ! A ; F 0 @
M : & % R 9 ' = A < F 4 N ( " ! 7 : 7 1 H ( ' 1 H 9 2 ! A 9 ' 9 E ; G 0 @ ; V 8 @ ( D Q I ; F 5 A < B ! 0 < F 5 D : 6 - T
M : 7 9 E ( $ - 0 9 & E N 9 R ( @ * & $ @ ; 6 % T : & 5 M 8 7 1 I 8 V % L ( & U E = & A O 9 " ! 0 9 B ! S : 6 U U ; & % T
M : 6 Y G ( ' 1 H 9 2 ! H = 6 U A ; B ! V ; V - A ; " @ = ' ) A 8 W 0 I ( ' 1 H 9 2 ! A ; 6 ] U ; G 0 @ ; V 8 @ ; 6 5 M
M ; W ) Y ( & Y E 9 6 1 E 9 " ! T ; R ! S = & ] R 9 2 ! S < & 5 E 8 V @ @ = V % S ( & = R 9 6 % T ; ' D @ < F 5 D = 6 - E
M 9 " X @ ( $ E N < W 1 E 8 6 0 @ ; V 8 @ < W 1 0 < F E N 9 R ! T : & 4 @ 8 6 - T = 6 % L ( ' - P 9 6 5 C : " ! S : 6 = N
M 8 6 P L ( & ] N ; ' D @ = & A O < V 4 @ 3 % ! # ( ' ! A < F % M 9 7 1 E < G , @ ( & Y E 9 6 1 E 9 " ! T ; R ! D 9 7 - C
M < F E B 9 2 ! E 8 6 - H ( ' ! A < G 1 I 8 W 5 L 8 7 ( @ < W ! E 9 6 - H ( ' - O = 6 Y D ( & % R 9 2 ! S = & ] R 9 6 0 N
M ( " ! 4 : & E S ( & % L ; & ] W < R ! P < F ] G < F % M < R ! T ; R ! H 8 7 9 E ( & $ @ ; & % R 9 V 4 @ < F 5 S : 6 1 E
M ; G 0 @ = F ] C 8 6 ) U ; & % R > 2 ! W : 7 1 H ; W 5 T ( & A A = F E N 9 R ! T ; R ! A 8 V - E < W , @ 8 2 ! D : 7 - K
M ( & ] R ( ' 1 A < & 4 @ 9 7 9 E < G D @ = & E M 9 2 ! A ; B ! A ; ' 1 E < F Y A = & 4 @ < F 5 S < & ] N < V 4 @ : 7 , @
M ; F 5 E 9 & 5 D + B @ 0 7 , @ 8 6 X @ : 6 Q L = 7 - T < F % T : 6 ] N + " ! T : & 4 @ < V % M < & Q E ( ' 9 0 8 V % B
M = 6 Q A < G D @ < W 5 P < & Q I 9 6 0 @ = V E T : " ! T : & 4 @ 1 4 - ( 3 R ! = 6 R ! C ; V Y T 8 6 E N < R ! A ; & P @
M ; V 8 @ = & A E ( & Q E = ' 1 E < G , @ ; V 8 @ = & A E ( & % L & & A A 8 F 5 T + " ! N = 6 U B 9 7 ) S + " ! A ; F 0 @
M ; W 9 E < B Q , # @ ; W 1 H 9 7 ( @ = V ] R 9 ' , @ : 6 X @ ; & 5 S < R ! T : & % N ( # ) + ( & ] F ( & U E ; 6 ] R
M > 2 X - # 5 1 H 9 2 ! H 9 6 % R = " ! 0 9 B ! T : & 4 @ 1 4 - ( 3 R ! = 6 R ! I < R ! 4 9 7 A A < R ! ) ; G - T < G 5 M
M 9 6 Y T ) W , @ 5 $ U 3 ( # 4 R , # @ < W ! E 9 6 - H ( ' ! R ; V - E < W - O < B X @ ( % 1 H : 7 , @ : 6 Y T 9 6 = R
M 8 7 1 E 9 " ! C : 7 ) C = 6 E T ( & E S ( & % N ( ' 5 P 9 W ) A 9 & 5 D ( ' 9 E < G - I ; V X @ ; V 8 @ = & A E ( & ] N
M 9 2 ! U < V 5 D ( & E N ( ' 1 H 9 2 ! 3 < & 5 A : R F ( % - P 9 6 Q L ( " A 4 3 2 ! 0 9 B ! 4 9 7 A A < R ! ) ; G - T
M < G 5 M 9 6 Y T < R D @ = & A A = " ! H 8 7 , @ 8 F 5 E ; B ! M ; V 1 I 9 F E E 9 " ! F ; W ( @ = 7 - E ( ' = I = & @ @
M 8 6 X @ 9 6 E G : ' 0 @ 8 F E T ( ' ! R ; V - E < W - O < B X @ ( % 1 H 9 2 ! % 0 T A / ( % U ; ( & A A < R ! B 9 6 5 N
M ( & 1 E < V E G ; F 5 D ( ' - O ( ' 1 H 8 7 0 @ 8 6 Q L ( & ] F ( ' 1 H 9 2 ! F 9 6 % T = 7 ) E < R ! 0 9 B ! T : & 4 @

```

M5\$U3(#4R,# @;6%Y(&)E('5S960@=VET:"!T:&4@05!03\$4L(&AO=V5V97(@M;VYL>2 @4D%-(&)A<V5D('P965C:"!I<R!U<V5D('=I=&@@=&AE(&EN:71IM86P@;W!E<F%T:6YG('Y<W1E;2X@16UP='D@<V]C:V5T<R!H879E(&)E96X@M<')O=FED960@9F]R('T86YD87)D('908V%B=6QA<GD@4D]-<R!W:&5N('1HM97D@8F5C;VUE(&%V86EL86)L92X-#51H92!I;FET:6%L(&]P97)A=&EN9R!SM>7-T96T@:7,@82!204T@8F%S960@<&AO;F5M92!S>7-T96T@=&AA="!W87,@M9&5S:6=N960@=&\<')O=FED92!F;&5X:6)I;&ET>2!A;F0@82!F=7)T:&5RM(&EN8W)E87-E(&EN(&UE;6]R>2!E9F9I8VEE;F-Y(&]V97(@<W1R86EG:'0@M96YC;V1E9"!W;W)D<RX@0GD@=7-I;F<@=&AE(%-0145#2"!%1\$E43U(@=&AEM('5S97(@;6%Y(&-R96%T92!A;GD@=V]R9"!O<B!P:')A<V4@=&AA="!H92!DM97-I<F5S('1O(&AA=F4@<W!O:V5N(&9R;VT@82 @<')O9W)A;2X@(%1H:7,@M8V]D92!I<R!I;B!A(&-O;7!A8W0@9F]R;2!A;F0@8V]N=&%I;G,@:6YF;W)MM871I;VX@;VX@=&AE('O=6YD+"!P:71C:"P@86YD(&1U<F%T:6]N(&]F(&5AM8V@<&AO;F5M92X@02!S96-O;F0@<')O9W)A;2!C86QL960@4U!%14-(((\$=%M3D52051/4B!I<R!A(&)I;F%R>2!P<F]G<F%M('H:6-H(&EN=&5R<')E=',@M=&AI<R!C;V1E(&%N9"!P87-S97,@=&AE(&-O<G)E8W0@<&%R86UE=&5R<R!TM;R!T:&4@14-(3R!=6R!T;R!S<&5A:R!T:&4@=V]R9"X@3VYL>2!T:&4@4U!%M14-(((\$=%3D52051/4B H,4L@8GET97,I(&%N9"!T:&4@86-T=6%L('908V%B M=6QA<GD@*#\$('1O(#(P('!B>71E<R]W;W)D*2!A<F4@;F5E9&5D(&9O<B!AM('!R;V=R86T@=&\<W!E86LN("!4:&4@861D<F5S<R!O9B!T:&4@=V]R9"!TM;R!B92!S<&]K96X@:7,@DW!O:V5DE"!T;R!T:&4@4U!%14-(((\$=%3D52051/M4B!A;F0@82!C86QL(&ES(&UA9&4@=&\&@:6YI=&EA=&4@=&AE('P965C:"X-M#51H92!S96-T:6]N<R!W:&EC:"!F;VQL;W<@9&ES8W5S<R!I;B!D971A:6P@M:&]W('1O(&EN<W1A;&P@=&AE(&-A<F0@86YD('1H92!D:69F97)E;G0@8V]MM<&]N96YT<R!O9B!T:&4@<V]F='A<F4@<WES=&5M(&%N9"!H;W<@=&AE>2!AM<F4@:6UP;&5M96YT960N(\$9O;&QO=VEN9R!T:&%T(&ES(&\$@<W1E<"!B>2!SM=&5P(&5X86UP;&4Y;V8@:&]W('1O('5S92!T:&4@<W!E96-H(&5D:71O<B!TM;R!C<F5A=&4@=V]R9' ,@86YD('1H96X@82!S:&]R="!P<F]G<F%M(&]F(&AOM=R!T-#D@(" @5TA)5\$4N+BXN+BXN,3DR.#4@(" @5TE42"XN+BXN+BXN,3DSM,3\$@#5=(050N+BXN+BXN+C\$Y,C4X(" @(%=(3RXN+BXN+BXN+C\$Y,CDU(" @M(%=23TY'+BXN+BXN+C\$Y,S\$X(U72\$5.+BXN+BXN+BXQ.3(V.0T-6"XN+BXNM+BXN+BXN,3DS,C8-#5DN+BXN+BXN+BXN+C\$Y,S,U(" @(%E%4RXN+BXN+BXNM+C\$Y,S4X(" @(%E/55(N+BXN+BXN+C\$Y,S8V(U914Q,3U<N+BXN+BXQ.3,TM-0T-6BXN+BXN+BXN+BXN,3DS-S<@(" @6D523RXN+BXN+BXN,3DS.#<@(" @M14Y\$(\$]&(\$9)3\$4N,3DS.3D-#3\$U#45#2\$@75L@4U!%14-((%-93E1(15-)M6D52#5!4E)!3E19#0U,24U)5\$5\$(%!4E)!3E19#0U%=F5R>2!P<F]D=6-TM(&UA;G5F86-T=7)E9"!B>2 @4W1R965T("!%;&5C=')O;FEC<R!#;W)P;W)A M=&EO;B!I<R!F=6QL>2!T97-T960@86YD('U86QI='D@8VAE8VME9"!B969OM<F4@<VAI<&UE;G0@86YD(&ES('=A<G)A;G1E9"!T;R!B92!F<F5E(&9R;VT@M9&5F96-T<R!I;B!M871E<FEA;' ,@86YD('O<FMM86YS:&EP(&9O<B!A('!EM<FEO9"!O9B Y,"!D87ES(&9R;VT@9&%T92!O9B!P=7)C:&%S92X@1'5R:6YGM('1H870@=&EM92!P97)I;V0L(%-T<F5E="!%;&5C=')O;FEC<R!#;W)P;W)A M=&EO;B!W:6QL+"!A="!N;R!C:&%R9V4L(')E<&%I<B!O<B!R97!L86-E(&%NM>2!D969E8W1I=F4@=6YI="!R971U<FYE9"!T;R!I=' ,@4V5R=FEC92!\$97!AM<G1M96YT@T-4W1R965T(\$5L96-T<F]N:6-S(\$-O<G!O<F%T:6]N(&1I<V-LM86EM<R!A;GD@;&EA8FEL:71Y('1O('5S97)S(&]F(&ET<R!P<F]D=6-T<R!FM;W(@8V]N<V5Q=65N=&EA;"!D86UA9V5S(&]F(&%N>2!K:6YD(&%R:7-I;F<@M9G)O;2!A="!C;VYN96-T960@=VET:"!T:&4@=7-E(&]F(&ET<R!P<F]D=6-TM<RX-#51H:7,@=V%R<F%N='D@:7,@=F]I9"!I;B!C87-E<R!O9B!M:7-U<V4LM(&%B=7-E+"!A8FYO<FUA;"!C;VYD:71I;VYS(&]F(&]P97)A=&EO;B!O<B!AM='1E;7!T<R!T;R!A;"!E<B!O<B!M;V1I9GD@=&AE(&9U;F-T:6]N(&]F(&\$@M<&%R="!O<B!A<W-E;6]L>2X-#51H:7,@;&EM:71E9"!W87)R86YT>2!I<R!IM;B!L:65U(&]F("!A;&P@(&]T:&5R('=A<G)A;G1I97,@97AP<F5S<V5D(&]RM(&EM<&QI960@86YD(&YO(')E<')E<V5N=&%T:79E(&]R(&]T:&5R('!E<G-OM;B!I<R!A=71H;W)I>F5D('1O(')E<')E<V5N="!O<B!A<W-U;64@9F%T(%-TM<F5E="!%;&5C=')O;FEC<R!#;W)P;W)A=&EO;B!A;GD@=V%R<F%N='D@;&EAM8FEL:71Y(&)E>6]N9"!T:&%T('E="!F;W)T:"!H97)E:6XN#0U4:&ES('=AM<G)A;G1Y(&=I=F5S('EO=2!S<&5C:69I8R!L96=A;"!R:6=H=' ,L(&%N9"!YM;W4@;6%Y(&%L<V\@:&%V92!A9&1I=&EO;F%L(')I9VAT<R!W:&EC:"!V87)Y

M\$P`!0`!0,18 ,3T (`P`\$6 #`#`L \$`0`4#6 #`#`1
MP \`)YR`#?<@`XG(`UR`:`P`&W,`%=S`"3<P`E',`-!S`#W
M<P`^',`#1T`!P= `EW0`)AT`#4= `\$'4`\$QU`!S=0`='4`+!U
M`#L=0`*W8`%V`!3=@`CW8`,MV`'=P`&7<`!W`!6=P`?7<`
M`YW`"Z=P`X7<`.)W`>> `6G@`(%X`" "> `E'@`/P`9 DTP#X
M`&0)-,`P`D"02`?,`I DW0#S`&0)-,`[0`!D"33`.T`9 DTP#M`&0
M)-,`[0`!D"33`.D`9 DTP#I`&0)-,`[0`!D"33`.T`9 DTP#I`&0)-,`
MZ0`!D"33`.T`9 DTP#M`&0)-,`[0`!D"33`.T`9 DTP#M`&0)-,`[0`!
MD"33`.D`9 DTP#I`&0)-,`Z0`!D"33`.D`9 DTP#M`&0)-,`[0`!D"33
M`.T`9 DTP#M`&0)-,`[0`!D"33`.T`9 DTP#M`&0)-,`[0`!D"33`.T`
M`9 DTP#I`&0)-,`Z0`!D"33`.T`9 DTP#M`&0)-,`[0`!D"33`.T`9 D
MTP#D`&0)-,`0`!#0`A\$8`P`#`1& ,`4`4#\$- "\$1@#`0`!!0
M&1%(`#`1D!(`,`!\$H\$0`IE'@`)5X`#1> `TG@`YY`U>0`
M-GD`Y`N>0`P`D`,%Y`#Z>0`,WH`&QZ`!M>@`<'H`"(MZ`"H
M>@`J7H`.5Z`A>P`,WL`#1[`!P>P`K`L`.A[`#I>P`\$`P`!%`
M`!-?`B7P`(I\`#`?`WT`#])`!\?0`N7T`.!]`#A?0`GX`
M`%M`^`"8?@`U7X`/L`9 DTP#[`&0)-,`P`!D"33`/L`9 DTP#[`&0
M)-,`P`!D"33`/L`9 DTP#[`&0)-,`P`!D"33`/L`9 DTP#[`&0)-,`
M`P`!D"33`/L`9 DTP#[`&0)-,`P`!D"33`/(`9 D\$@`R`&0)-T`\@`!
MD"33`.T`9 DTP#M`&0)-,`Z0`!D"33`.D`9 DTP#M`&0)-,`[0`!D"33
M`.T`9 DTP#M`&0)-,`Z0`!D"33`.D`9 DTP#M`&0)-,`[0`!D"33`.T`
M`9 DTP#M`&0)-,`[0`!D"33`.T`9 DTP#M`&0)-,`[0`!D"33`.T`9 D
MTP#M`&0)-,`[0`!D"33`.T`9 DTP#M`&0)-,`[0`!D"33`,`!&H`P`
M! `!0,1J ,`0`!`P\$Q`8`#`12!(`0`!#0`A\$8`RK5?@`\$G\
M`\$Y`!/?P`BW\`Q`"S?P`M`\`/%`N@`X`V`!^@`
M(`&`#`@`X(`&`=@0`H\$`" &!`@\0`18\$`\$`!`!`!7
MD0`6(\$`-6`#6@`A(,`6#`A`&X0`Z`%/A0`?X4`(:%
M`"A0`CH8`(^&`#[`&0)-,`P`!D"33`/L`9 DTP#W`&0)-,`P`!
MD"33`/<`9 DTP#W`&0)-,`P`!D"33`/L`9 DTP#[`&0)-,`P`!D"33
M`/L`9 DTP#W`&0)-,`P`!D"33`/L`9 DTP#[`&0)-,`P`!D"33`/L`
M`9 DTP#[`&0)-,`P`!D"33`. \`I D\$@`O`&0)-T`[P`!D"33`.H`9 D
MTP#J`&0)-,`X@`D"33`.(`9 DTP#B`.0)-,`W`!D"33`.(`Y DTP#B
M`&0)-,`X@`%D"33`.(`9 DTP#B`*0)-,`V`!D"33`-@`9 DTP#B`60
M)-,`X@`!D"33`#`1T (`4`4#\$* %\$= " <`4#
M\$* %\$= "\$] " "\$`%`1#0`@`P`\$ " <`#`1(!,`,`!&H`P`
M! `!0,1J ,`)H`&`!&B`1X@`\$J(`!+B`:(@`&F(`!JB`X@`
M`&R(`!MB`H`&^(`!PB`<8@`*(`!SB`=(@`'6(`!VB`
M=X@`B(`!YB`H`N(`!B`?8@`Z(`!_B`@(`(&`"
MB`@X@`2(`"B`AH@`(>(`"B`B8@`(J(`"+B`^`D"33
M`/@`9 DTP#T`&0)-,`P`!D"33`.L`9 DTP#F`&0)-,`XP`!D"33`. ,`
M`9 DTP#C`&0)-,`XP`!D"33`. ,`9 DTP#O`&0)-,`[P`!D"33`. \`9 D
MTP#O`&0)-,`[P`!D"33`. \`9 DTP#O`&0)-,`[P`!D"33`. \`9 DTP#O
M`&0)-,`[P`!D"33`. \`9 DTP#O`&0)-,`[P`!D"33`. \`9 DTP#?`&0
M)-,`WP`!D"33`-\`9 DTP#?`&0)-,`WP`!D"33`-\`9 DTP#?`&0)-,`
MWP`!D"33`-\`9 DTP#?`&0)-,`WP`!D"33`-\`9 DTP#?`&0)-,`WP`!
MD"33`P`\$; !`" %`0`\$`%`1`#P`P`\$< /`\$`%`Q%@
M`P`P`\$4@2`%`Q"@!1'0`A/0`@`H#`2`@`0!+` \`!P`
M`\$#Q_P(` `&3F]R;6%L`0`S`,`80D\$
M`"(`04#R_z\$`(@`61&5F875L=`!087)A9W)A<&@1F]N=
M(`?0`\$`@`9(96%#D97(`#`/`(\`+@\$, A`0(`" `(\$`!`(!(`&
M1F]O=&5R`P`\$`/"`X!#(`0\$`"8`"E H@`1`1@`"U!A9V4@3G5M8F5R
M`L#`@`4!P`8H`E-`_D`9`!)60`4F,`\$YM`"
M=0`1GX`\$N%`\$`!`,`@`"/D`#`\$`\$`\$`\$`%`#D`
M`&\$`\`#T`(`\$`!)(`*`!\$`+`P`2X@`
M`&>(`!%`\$8`,`/L4`[(0`IC`%`U" `#]40`^UP`)=G`#O;@`
MWG(`)1X`#5?@`CX8`\$N(`!`\$@`20!*\$`\$L`3 !-`\$X`3P!0`%\$`4@!3
M`!)P`# <`!\$(`4`"NO@`+T(`##P`!P`\`/T@`&(`0`
M"B\$`!\$A`#I) `[20`\$V%`!P`!P`<`<`!P`!P`<`<`"+
MB`C(@`V(`".B`CX@`)("1B`DH@`).(`4B`E8@`):(`

```
M`"7B `F(@`F(`":B `FX@`R(`"=B `GX@`*(("`AB `HH@`
M`.(`"DB `I8@`,`>(`#(B `R8@`,`J(`#+B `S(@`,`V(`#/B `
MT(@`-&(`#2B `TX@`/P`9 DTP#`&0)-,`_ `!D"33`/P`9 DTP#`
M`&0)-,`_ `!D"33`/P`9 DTP#`&0)-,`_ `!D"33`/P`9 DTP#V`&0
M)-,`@\`!D"3 `T`9 DP #R`&0),P`\`!D"3,`/(`9 DS #R`&0),P`
M@\`!D"3,`.<`!) DTP#B`.0)-,`W@\`!D"3=-X`9 DW0#>`&0)-T`W@\`
MD"3=-X`9 DW0#G`:`0)-,`YP`!D"33`-@`!) DTP#8`R0)-,`V `!D"33
M`-@`!Y DTP#4`&0)-,`T `!D"3=-`9 DW0#0`&0)-T`T `!D"3=-`
M`9 DW0`~~~~~`!$8`P`P`$4@`~~~~%`%`Q&H`Q/0`@`#`1T (`
M`0`4#=$`"~~~~%`%`Q'0`A/0`@$`18 ,3T (`P`$6`#`%`%`%
M`Q%`Q/0`@`#`1L `$)=.(`#4B `U8@`->(`#8B `V8@`-J(`#<
MB `W8@`-Z(`#?B `X(@`.&(`#BB `XX@`.2(`#FB `YX@`.B(
M`#QB `H@`/(`#TB `!8D`!:`) `AB0`!(HD`.)`#\`&0)-T`
M_ `!D"3`=>`<`Y DTP#W`&0)-,`\0`%D"33`/$`9 DTP#Q`N0)-,`\0`!
MD"33`/P`9 DW0#`&0)-T`_ `!D"3`=/P`9 DW0#`&0)-T`_ `!D"3`=
M`/$`9 DTP#Q`F0)-,`\0`!D"33`.L`9 DTP#G`&0)-,`XP`!D"02`=X`
M`9 D$@`>`&0)!(!V@\`!D"02`=@`~~~~~`#6`~~~~~`V`~~~~~`-@`~~~~~
M`
M`
M`
M`~~~~~`0\`$$$`
M`#`0T (`0`!!0&1%(`#`1D`~~~~,`!`8$@`!0`!0,1T (3
AT (`!0`!0,1& ,3T (`! `!0,1Z 4`~~~~,`!$8`P`;
```

end

begin 600 Echo.txt

```
M#0H-"E1!0DQ%($)&($-/3E1%3E13#0H-"@T*#0H-"@T*#0I)3E123T150U1)
M3TX@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@
M+2 @,0T*#0I)3E-404Q,051)3TX@+2 M("T@+2 M("T@+2 M("T@+2 M("T@
M+2 M("T@+2 M("T@+2 M("T@+2 @,@T*#0I34$5%0T@@1T5.15)!5$]2("T@
M+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 @,@T*#0I3
M4$5!2TE.1R!&4D]-(%=)5$A)3B!!3B!!4%!,15-/1E0@4%)/1U)!32 @+2 M
M("T@+2 M("T@+2 @,PT*#0I73U)$(%-44E5#5%5212 M("T@+2 M("T@+2 M
M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 @,PT*#0I34$5%0T@@141)
M5$]2(" M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@
M+2 @- T*#0I34$5%0T@@141)5$]2($-/34U!3D13("T@+2 M("T@+2 M("T@
M+2 M("T@+2 M("T@+2 M("T@+2 @-0T*#0I02%)!4T4@0T].4U1254-424].
M(" M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 @-@T*#0I3
M04U03$4@5D]#04)53$%262 @+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M
M("T@+2 M("T@+2 @-PT*#0I304U03$4@4%)/1U)!32 M("T@+2 M("T@+2 M
M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 @-PT*#0I(04Y'55!3/R M
M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@
M+2 @-PT*#0I34$5%0T@@141)5$]2($5804U03$4@("T@+2 M("T@+2 M("T@
M+2 M("T@+2 M("T@+2 M("T@+2 @. T*#0I04D]'4D%-(5804U03$4@("T@
M+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@
M+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2
M("T@+2 M("T@+2 Q,PT*#0I4
M04),15,@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M
M("T@+2 M("T@+2 Q,PT*#0I!4%!%3D1)6" M(%-!35!,12!63T-!0E5,05)9
M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 Q- T*#0I705)204Y462 M
M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@+2 M("T@
M+2 Q-@T*#0H-"@T*#0H-"@T*#0H-"@T*#0H-"@T*#0H-"@T*#0H-"@T*#0H-"@T*#0H-
M@T*#0H-"@T*#0H-"DE.5%)/1%5#5$E/3@T*#0I5;G1I;"!R96-E;G1L>2P@
M<W!E96-H(&=E;F5R871I;VX@8GD@82!M:6-R;RUC;VUP=71E<B!R97%U:7)E
M9"!A(&9A:7(@86UO=6YT(&]F(&UE;6]R>2!S=&]R86=E(&%N9"!H87)D=V%R
M92X@(%=I=&@=&AE(&%D=F5N="!09B B3&EN96%R(%!R961I8W1I=F4@0V]D
M:6YG(B H82!M871H96UA=&EC86P@;65T:&]D(&]F('!-I;75L871I;F<@=&AE
M(&AU;6%N('908V%L("!T<F%C="D@=&AE(&%M;W5N="!09B!M96UO<GD@;F5E
M9&5D('!0('!-T;W)E('!-P965C:"!W87,@9W)E871L>2!R961U8V5D+B @26YS
M=&5A9"!09B!S=&]R:6YG('!H92!A8W1U86P@<W!E96-H('!-I9VYA;"P@;VYL
M>2!T:&]S92!,4$,@&%R86UE=&5R<R @;F5E9&5D('!0(&1E<V-R:6)E(&5A
```

M8V@<&%R=&EC=6QA<B!S<&5E8V@<V]U;F0@87)E(' -T;W)E9"X@(%1H:7,@
M86QL;W=S('!R;V=R86US('!O(&AA=F4@82!L87)G92!R97-I9&5N="!V;V-A
M8G5L87)Y('!I=&AO=70@:&%V:6YG('!O(&%C8V5S<R!A(&1I<VL@;W(@=&%P
M92!E=F5R>2!T:6UE(&%N(&%L=&5R;F%T92!R97-P;VYS92!I<R!N965D960N
M("!!<R!A;B!I;&QU<W1R871I;VXL('!H92!S86UP;&4@=F]C86)U;&%R>2!S
M=7!P;&EE9"!W:71H('!H92!%0TA/(%U;(&-O;G1A:6YS(&%L;"!O9B!T:&4@
M;&5T=&5R<R!O9B!T:&4@86QP:&%B970L(&YU;6)E<G,L(&%N9"!O=F5R(#\$P
M,"!O=&AE<B!W;W)D<R!I;B!L97-S('!H86X@,DL@;V8@;65M;W)Y+@T*#0I4
M:&4@:&5A<G0@;V8@=&AE(\$5#2\$\@75L@:7,@5&5X87,@26YS=')U;65N="=S
M(%1-4R U,C P('!P965C:"!P<F]C97-S;W(N("!4:&ES(&EN=&5G<F%T960@
M8VER8W5I="!I<R!A;B!U<&R861E9"!V97)S:6]N(&]F('!H92!O;F4@=7-E
M9"!I;B!T:&4@4W!E86L@)B!3<&5L;" H5\$T@;V8@5&5X87,@26YS=')U;65N
M=' ,I('!H870@:&%S(&)E96X@;6]D:69I960@9F]R('!S92!W:71H(&%N(&5I
M9VAT(N)I="!P<F]C97-S;W(N("!4:&4@14-(3R!=6R!H87,@8F5E;B!D97-I
M9VYE9"!S;R!T:&%T(&%L;"!O9B!T:&4@9F5A='5R97,@;V8@=&AE(%1-4R U
M,C P(&UA>2!B92!U<V5D('!I=&@@=&AE(\$%04\$Q%+"!H;W=E=F5R(&]N;D@
M(%)!32!B87-E9"!S<&5E8V@@:7,@=7-E9"!W:71H('!H92!I;FET:6%L(&]P
M97)A=&EN9R!S>7-T96TN(\$5M<'1Y('!-O8VME=' ,@:&%V92!B965N('!R;W9I
M9&5D(&9O<B!S=&%N9&%R9"!V;V-A8G5L87)Y(%)/37,@=VAE;B!T:&5Y(&)E
M8V]M92!A=F%I;&%B;&4N#0H-"E1H92!I;FET:6%L(&]P97)A=&EN9R!S>7-T
M96T@:7,@82!204T@8F%S960@<&AO;F5M92!S>7-T96T@=&AA="!W87,@9&5S
M:6=N960@=&%\@<')O=FED92!F;&5X:6)I;&ET>2!A;F0@82!F=7)T:&5R(&EN
M8W)E87-E(&EN(&UE;6]R>2!E9F9I8VEE;F-Y(&]V97(@<W1R86EG:'0@96YC
M;V1E9"!W;W)D<RX@0GD@=7-I;F<@=&AE(%-0145#2"!%1\$E43U(@=&AE('5S
M97(@;6%Y(&-R96%T92!A;GD@=V]R9"!O<B!P:')A<V4@=&AA="!H92!D97-I
M<F5S('!O(&AA=F4@<W!O:V5N(&9R;VT@82 @<')O9W)A;2X@(%1H:7,@8V]D
M92!I<R!I;B!A(&-O;7!A8W0@9F]R;2!A;F0@8V]N=&%I;G,@:6YF;W)M871I
M;VX@;VX@=&AE('!-O=6YD+"!P:71C:"P@86YD(&1U<F%T:6]N(&]F(&5A8V@@
M<&AO;F5M92X@02!S96-O;F0@<')O9W)A;2!C86QL960@4U!%14-(((\$=%3D52
M051/4B!I<R!A(&)I;F%R>2!P<F]G<F%M('!H:6-H(&EN=&5R<')E=' ,@=&AI
M<R!C;V1E(&%N9"!P87-S97,@=&AE(&-O<G)E8W0@<&%R86UE=&5R<R!T;R!T
M:&4@14-(3R!=6R!T;R!S<&5A:R!T:&4@=V]R9"X@3VYL>2!T:&4@4U!%14-(
M(\$=%3D52051/4B H,4L@8GET97,I(&%N9"!T:&4@86-T=6%L('9O8V%B=6QA
M<GD@*#\$P('!O(#P("!B>71E<R]W)D*2!A<F4@;F5E9&5D(&9O<B!A('!R
M;V=R86T@=&%\@<W!E86LN("!4:&4@861D<F5S<R!O9B!T:&4@=V]R9"!T;R!B
M92!S<&]K96X@:7,@(G!O:V5D(B!T;R!T:&4@4U!%14-(((\$=%3D52051/4B!A
M;F0@82!C86QL(&ES(&UA9&4@=&%@:6YI=&EA=&4@=&AE('!-P965C:"X-"@T*
M5&AE('!-E8W1I;VYS('!H:6-H(&9O;&QO=R!D:7-C=7-S(&EN(&1E=&%I;"!H
M;W<@=&%\@:6YI=S&%L;"!T:&4@8V%R9"!A;F0@=&AE(&1I9F9E<F5N="!C;VUP
M;VYE;G1S(&]F('!H92!S;V9T=V%R92!S>7-T96T@86YD(&AO=R!T:&5Y(&%R
M92!I;7!L96UE;G1E9"X@1F]L;&]W:6YG('!H870@:7,@82!S=&5P(&)Y('!-T
M97 @97AA;7!L92!O9B!H;W<@=&%\@=7-E('!H92!S<&5E8V@@961I=&]R('!O
M(&-R96%T92!W;W)D<R!A;F0@=&AE;B!A('!-H;W)T('!R;V=R86T@;V8@:&]W
M('!O(&%C8V5S<R!T:&5M(&9R;VT@05!03\$533U!4(&)A<VEC+B @270@:7,@
M<W5G9V5S=&5D('!H870@>6]U(')E860@;W9E<B!T:&4@;F5X="!S96-T:6]N
M<R!F:7)S="!A;F0@=&AE;B!W;W)K('!H<F]U9V@@=&AE(&5X86UP;&4@=&%\@
M8F5C;VUE(&9A;6EL:6%R('!I=&@@=&AE('!-Y<W1E;2X@(%EO=2!M87D@86QS
M;R!W86YT('!O(&QI<W0@=&AE('!-A;7!L92!P<F]G<F%M<R H4D5#251%(&%N
M9"!404Q+24Y'(%194\$574DE415(I(&]R(&5X86UI;F4@<&]R=&EO;G,@;V8@
M=&AE('!-A;7!L92!V;V-A8G5L87)Y('!I=&@@=&AE(%-0145#2"!%1\$E43U(@
M87,@9G5R=&AE<B!E>&%M<&QE<RX-"@T*#0I)3E-404Q,051)3TX-"@T*0F5F
M;W)E(&EN<W1A;&QI;F<@=&AE(\$5#2\$\@75L@8F4@<W5R92!A;&P@<&]W97(@
M:7,@9&ES8V]N;F5C=&5D(&9R;VT@=&AE(&-O;7!U=&5R+B @5&AE(\$5#2\$\@
M75L@8V%R9"!M87D@8F4@<&QU9V=E9"!I;G1O(&%N>2!O9B!S;&]T<R R('!H
M<G4@-2!O9B!T:&4@05!03\$4@75LN("!4:&4@<W!E86ME<B!C;W)D('!-H;W5L
M9"!B92!A='1A8VAE9"!T;R!T:&4@=&5R;6EN86QS(&]N('!H92!B86-K(&]F
M('!H92!S<&5A:V5R(&%N9"!T:&5N('!L=6=G960@:6YT;R!T:&4@:F%C:R!O
M;B!T:&4@8F%C:R!O9B!T:&4@14-(3R!=6R!C87)D+B @4F5P;&%C92!T:&4@
M8V]V97(@86YD('!H92!I;G-T86QL871I;VX@:7,@8V]M<&QE=&4N("!4:&5R

M92!I<R!A(' -H;W)T(' -U8G)O=71I;F4@;&]C871E9"!W:71H:6X@=&AE(%-0
M145#2"! '14Y%4D%43U(=@=VAI8V@=@=VEL;"!D971E<FUI;F4@=VAI8V@=@<VQO
M="!T:&4@14-(3R!=6R!I<R!L;V-A=&5D(&EN+B @5&AI<R!S:&]U;&0@8F4@
M(F-A;&QE9"(@870@=&AE(' -T87)T(&]F(&\$@<')O9W)A;2!B969O<F4@86YY
M(' -P965C:"!I<R!A='1E;7!T960@86YD(' =I;&P@8F4@9&ES8W5S<V5D(&EN
M('1H92!N97AT(' -E8W1I;VXN#0H-"E1H92!34\$5%0T@141)5\$]2(&1I<VL@
M:7,@82 Q,R!S96-T;W(@9&ES:R!C;W!I960@=7-I;F<@1\$]3(#,N,BXQ(&%N
M9"!W:6QL(&YO="!R=6X@;VX@82!\$3U,@,RXS(' -Y<W1E;2!W:71H;W5T(&9I
M<G-T('5S:6YG('1H92!"3T]4,3,@=71I;&ET>2P@(\$ET(&ES(' -U9V=E<W1E
M9"!T:&%T(&\$@8F%&C:W5P(&1I<VL@8F4@;6%D92!A<R!S;V]N(&%S('!O<W-I
M8FQE('1O('!R;W1E8W0@:71S(&-O;G1E;G1S+B @268@>6]U(&AA=F4@1\$]3
M(#,N,R!Y;W4@;6%Y(")M=69F:6XB(&ET(&%T('1H:7,@=&EM92X-"@T*#0H-
M"@T*#0H-"@T*4U!%14-((=\$%3D52051/4@T*#0I4:&4@4U!%14-((=\$%3D52
M051/4B!I<R!A(#%+(&)I;F%R>2!M;V1U;&4@=&AA="!C;VYT86EN<R!T:&4@
M86-T=6%L('!H;VYE;64@8V]D97,L(')O=71I;F5S(&9O<B!P<F]C97-S:6YG
M('1H97-E(&-O9&5S(&%L;VYG('=I=&@=&AE:7(@=F%R:6%B;5S("AP:71C
M:"P@;&5N9W1H+"!A;F0@('9O;'5M92DL(&%N9"!T:&4@<F]U=&EN92!F;W(@
M;&]C871I;F<@=&AE(\$5#2\$\@75L@<VQO="X@(\$EF('EO=2 B8V%T86QO9R(@
M=&AE(' -U<'!L:65D(&1I<VLL('EO=2!W:6QL(' -E92!F;W5R("!D:69F97)E
M;G0@('9E<G-I;VYS("!O9B!T:&4@4U!%14-((=\$%3D52051/4BX@("!%86-H
M('9E<G-I;VX@<F5S:61E;G0@:6X@82!D:69F97)E;G0@<&]R=&EO;B!O9B!M
M96UO<GD@=&@\@86-C;VUM;V1A=&4@=&AE(\$A)4D53('!A9V5S(&%N9"!D:69F
M97)E;G0@<VEZ92!S>7-T96US+B @5&AE(&QO8V%T:6]N<R!O9B!T:&5S92!R
M;W5T:6YE<R!A;F0@=&AE:7(@87-S;V-I871E9" @96YT<GD@<&]I;G1S(&%R
M92!L:7-T960@:6X@5\$%!"3\$4@,2!A="!T:&4@96YD(&]F('1H92!M86YU86PN
M#0H-"E1H92!3<&5A:R!R;W5T:6YE('1A:V5S('1H92!C;VUP<F5S<V5D(' -P
M965C:"!D871A(&)E9VEN;FEN9R!A="!T:&4@<W1A<G1I;F<@861D<F5S<R H
M<W!E8VEF:65D(&)Y('1H92 B8V%L;&EN9R(@<')O9W)A;2DL('!R;V-E<W-E
M<R!I="P@86YD('1H96X@;W5T<'5T<R!I="!T;R!T:&4@14-(3R!=6R!F;W(@
M<W!E86MI;F<N("!)="!W:6QL(&ME97 @<')O8V5S<VEN9R @<W5C8V5S<VEV
M92 @8GET97,(@&]F(&EN9F]R;6%T:6]N('5N=&EL(&ES(&-O;65S(&%C=&]R
M)W,@86X@('F5N9"(@8V]M;6%N9" H(\$A%6" B04,B("D@=VAI8V@=:7,@=&%C
M:V5D(&]N=&@\@=&AE(&5N9"!O9B!E86-H('=O<F0@8GD@=&AE(%-0145#2"!%
M1\$E43U(N("!!="!T:&%T('!O:6YT(' -P965C:"!I<R!T97)M:6YA=&5D(&%N
M9"!C;VYT<F]L(&ES(')E='5R;F5D('1O('1H92!M86EN('!R;V=R86TN#0H-
M"E1H92!315133%0@<F]U=&EN92!A8W1U86QL>2 B;&]O:W,B(&9O<B!T:&4@
M14-(3R!=6R!C87)D(&%N9"!T:&5N(&UO9&EF:65S("!T:&4@4W!E86L@<F]U
M=&EN92!A8V-O<F1I;F=L>2X@(%1H:7,@<F]U=&EN92!S:&]U;&0@8F4@8V%L
M;&5D(&%T('1H92!S=&%R="!O9B!A;GD@(' -P965C:" @<')O9W)A;2!S:6YC
M92!D:69F97)E;G0@<')O9W)A;7,@;6%Y(&)E('5S:6YG(&1I9F9E<F5N="!L
M;V-A=&EO;G,@9F]R('1H92 @4U!%14-((=\$%3D52051/4BX@(\$EF('EO=7(@
M8V%R9"!I<R!I;G-T86QL960@:6X@<VQO=" U('EO=2!D;VXG="!R96%L;'D@
M;F5E9"!T;R!U<V4@=&AE(%-%5%- ,5"!R;W5T:6YE+"!H;W=E=F5R(&EF('EO
M=2!C:&%N9V4@=&AE(&QO8V%T:6]N(&]F('1H92!%0TA/(%U;(&-A<F0@=&AE
M('!R;V=R86T@=VEL;"!N;W0@9G5N8W1I;VX@<')O<&5R;'DN#0H-"E1H92!3
M15133%0@<F]U=&EN92!I<R!A;' -O('5S969U;"!F;W(@9&5T97)M:6YI;F<@
M=VAE=&AE<B!T:&5R92!I<R!A;B!%0TA/(%U;(&-A<F0@:6YS=&%L;5D(&EN
M('1H92!S>7-T96TN("!4:&%T('=A>2!A('!R;V=R86T@=VAE<F4@<W!E96-H
M(&ES(&%N(&5N:&%N8V5M96YT(&)U="!N;W0@82!N96-E<W-I='D@;6%Y(' -T
M:6QL(&)E(')Y;B!W:71H;W5T('1H92!S<&5E8V@N("!4;R!D;R!T:&ES(&\$@
M:E!%14LB(&YE961S('1O(&)E(&UA9&4@=&@\@=&AE(&QO8V%T:6]N(&-A;&QE
M9" B4TQ/5"(@*'-E92!486)L92 Q*2X@(\$EF('1H92!315133%0@<F]U=&EN
M92!C86YN;W0@9FEN9"!A;B!%0TA/(%U;(&-A<F0@:70@=VEL;"!S970@=&AI
M<R!L;V-A=&EO;B!T;R Q-B H,3 @(\$AE>"DN("!!;B!E>&%M<&QE(&ES(&QI
M<W1E9"!B96QO=SH-"@T*,3 @("!,3T)95\$4@/2 Q-C,X-#H@2%E"651%(#T@
M,38S.#4Z(%-014%+(#T@,38S.#8Z(\$Y85%-02R](#\$V,SDX.B!33\$]4(#T@
M,38T,3,Z(%-%5%- ,5"](#\$W,S\$S#0H-"C(P(" @14-(3R](#\$Z(\$-!3\$P@
M4T544TQ4.B!8(#T@4\$5%2R H4TQ/5"DZ(\$E&(@@/2 Q-B!42\$5.(\$5#2\$@\@
M/2 P#0H-"DEN('1H92!A8F]V92!L:7-T:6YG(&\$@9FQA9R!L86)E;&5D(")%

M0TA/(B!W87,@<V5T('1O(&]N92!I9B!A('-P965C:"!C87)D('=A<R!P<F5S
M96YT(&]R('IE<F\@:68@=&AE<F4@=V%S;B=T+B @5&AI<R!M87D@8F4@=7-E
M9"!L871E<B!I;B!T:&4@<')O9W)A;2!T;R!B>7!A<W,@<W!E96-H(')O=71I
M;F5S('=H:6-H(&-O=6QD(&-A=7-E('1H92!P<F]G<F%M('1O(")H86YG(B!I
M9B @;F\@8V%R9"!W87,@8F5I;F<@=7-E9"X-"@T*#0I34\$5!2TE.1R!&4D].
M(=%)5\$A)3B!!3B!!4%!,15-/1E0@4%)/1U)!30T*#0I);B!O<F1E<B!F;W(@
M=&AE(%-0145#2"!14Y%4D%43U(@=&\@<V%Y(&\$@=V]R9"P@:70@:&%S('1O
M(&MN;W<@=&AE('T87)T:6YG(&%D9')E<W,@;V8@=&AE('=O<F0N("!3:6YC
M92!"05-)0R!D96%L<R!W:71H(&1E8VEM86P@;G5M8F5R<R!A;F0@=&AE(%-0
M145#2"!14Y%4D%43U@9&5A;',@=VET:"!B:6YA<GD@;G5M8F5R<RP@=&AE
M(&%D9')E<W,@=VEL;"!H879E('1O(&E('P; &ET(&EN=&\@='=O('!O<G1I
M;VYS(&%N9"!T:&5N('!O:V5D('1O('1H92!34\$5%0T@1T5.15)!5\$]2('=I
M=&@@='=O('E<&%R871E('!O:V5S+B @1F]R(&-O;G9E;FEE;F-E('1H92!A
M9&1R97-S97,@9F]R('1H97-E('!O:V5S(&AA=F4@8F5E;B!L86)E;&5D(")
M24)95\$4B(&%N9" B3\$]"651%(B!A;F0@87)E(&QI<W1E9"!I;B!404),12 Q
M+B!!('H;W)T(')O=71I;F4@=&\@86-C;VUP;&ES:"!T:&ES(&ES('H;W=N
M(&E);&]W.@T*#0HQ,# @("!!2"](\$E.5" H041\$("\@,C4V*2 Z(\$%,#T@
M041\$("T@04@*B R-38-"@T*,3\$P(" @4\$]+12!(24)95\$4L(\$%((#H@4\$]+
M12!,3T)95\$4L(\$%,#0H-"D]N8V4@=&AA="!H87,@8F5E;B!A8V-O;7!L:7-H
M960@82!C86QL('1O('1H92!34\$5!2R!R;W5T:6YE('=I;&P@8V%U<V4@=&AE
M('=O<F0@=&\@8F4@<W!O:V5N+B @1G)O;2!A(&)I;F%R>2!P<F]G<F%M('1H
M92!S86UE('1H:6YG(&UA>2!B92!A8V-O;7!L:7-H960@('=I=&@@='=O(%-4
M02!I;G-T<G5C=&EO;G,@9F]L;&]W960@8GD@82!*4U(N#0H-"@T*#0H-"@T*
M#0H-"E=/4D0@4U1254-455)%#0H-"E=O<F1S(&UA>2!B92!B<F]K96X@=7 @
M:6YT;R!S97!A<F%T92!A;F0@9&ES=&EN8W0<V]U;F1S(&]R('!H;VYE;65S
M+B @5&AE(\$52\$2@75L@4U!%14-((\$5\$251/4B!U<V5S(&\$@<V5T(&]F("!F
M;W)T>2UO;F4@('!O<W-I8FQE("!P:&]N96UE<R @86QO;F<@('=I=&@@('1W
M;R @9&EF9F5R96YT('1Y<&5S(&]F('!A=7-E<R!A;F0@82!S=&]P(&-O;6UA
M;F0@*%&U=&]M871I8V%L;D@87!P96YD960@870@=&AE("!E;F0@;V8@('=O
M<F1S72X@("!)B @9V5N97)A;P@('9O:6-E9" @<V]U;F1S("AS964@5&%B
M;&4@,BD@:&%V92!V87)I86)L92!P:71C:"P@9'5R871I;VXL(&%N9"!V;VQU
M;64N("!5;G9O:6-E9" @<V]U;F1S(" H<V5E(%1A8FQE(#,I(&AA=F4@=&AE
M<V4@=F%R:6%B;&5S('!R97-E="X-"@T*5&AE<F4@87)E('I>'1E96X@9&EF
M9F5R96YT('!I=&-H(&QE=F5L<R!A=F%I;&%B;&4@9F]R('9O:6-E9"!S;W5N
M9',N("!T:&5S92!R86YG92!F<F]M(&]N92 H:&EG;&5S="D@=&\@<VEX=&5E
M;B H;&]W97-T*2X@(%9A<GEI;F<@=&AE('!I=&-H(&%L;&]W<R!T:&4@8V]M
M<'5T97(@=&\@87-K('!%U97-T:6]N<R!O<B!M86ME(&5X8VQA;6%T:6]N<RX@
M268@=&AE('!I=&-H(&ES(&%L;"!O;F4@;&5V96PL('1H92!S<&5E8V@=&VEL
M;"!H879E(&\$@;6]N;W!O;FEC(&]R(')O8F]T:6,@<V]U;F0N#0H-"E1H92!L
M96YG=&@@<V8@96%C:"!I;VVEC960@<V]U;F0@;6%Y(&)E('P96-I9FEE9"!A
M<R!B96EN9R!F<F]M(&]N92!T;R!E:6=H=" R-2!M:6QL:7-E8V]N9" B9G)A
M;65S(B!L;VYG+B!5;G9O:6-E9"!S;W5N9',@87)E('!R97-E="!T;R!B92!A
M;GEW:&5R92!F<F]M('1W;R!T;R!F:79E(&9R86UE<R!L;VYG(&1E<&5N9&EN
M9R!O;B!T:&4@<V]U;F0N("!4:&4@(E!!),2(@:7,@=&AE(&5X8V5P=&EO;BX@
M5&AI<R!S=&]P<R!S<&5E8V@86-T:79I='D@,C4@=&\@,C P(&UI;&QI<V5C
M;VYD<R!S<&5C:69I960@:6X@,C4@;6EL;&ES96-O;F0@:6YC<F5M96YT<RX@
M5&AE('!R:6UA<GD@=7-E(&]F('1H92 B4\$\$Q(B!I<R!B971W965N('=O<F1S
M('=I=&AI;B!A('!H<F%S92!O<B!B969O<F4@<W!O<"!P;&]S:79E<R H(C@B
M+)+(BPB5"(L971C+BDN(%1(12 B4\$B('!A=7-E(&=I=F5S(&\$@9&5L87D@
M;V8@,C4@;6EL;&ES96-O;F1S(&AO=V5V97(@=&AE<F4@:7,@<W1I;&P@<V]M
M92!S;W5N9"!O8V-U<G)I;F<@9'5R:6YG('1H:7,@<&5R:6]D(&%L=&AO=6=H
M&ET(&ES(&9A:6YT@T*#0I4:&5R92!A<F4@96EG:'0@879A:6QA8FQE('9O
M;5M92!L979E;',@<F%N9VEN9R!F<F]M(&]N92AS;V9T97-T*2!T;R!E:6=H
M="!L;W5D97-T+B!4:&4@=7-U86P@<F%N9V4@:7,@9G)O;2!F:79E('1O(&5I
M9VAT(&9O<B!V;W=E;"!S;W5N9',@97AC97!T('=H96X@=&%P97)I;F<@;V9F
M(&%T('1H92!E;F0@;V8@<V]M92!W;W)D<RX-"@T*36%N>2!C;VUM;VYL>2!U
M<V5D('=O=6YD<R!A<F4@;6%D92!U<"!O9B!A(&-O;6)I;F%T:6]N(&]F('!H
M;VYE;65S+B!!;B!E>&%M<&QE(&ES('1H92!S;W5N9" B;V@B+B!4;R!P<F]D
M=6-E('1H:7,@<V]U;F0@86X@<C Q(B!S;W5N9"!M=7-T(&)E(&9O;&QO=V5D

M(&)Y(&%N(" (P,B(@<V]U;F0N(%-O;64@;W1H97(@97AA;7!L97,@(&%R92 @M(F5Y92(@("B04@B+"))(BPB12(I("!A;F0@(")O;V]H(B H(E4Q(BPB53(BM*2X-"@T*#0I34\$5%0T@141)5\$]2#0H-"E1H92!34\$5%0T@141)5\$]2(&ESM(&%N(\$%04\$Q%4T]1&5"!P<F]G<F%M('=H:6-H(&%L;&]W<R!Y;W4@=&\@8V]NM<W1R=6-T(&-U<W1O;2!W;W)D<R!A;F0@<&AR87-E<R!F;W(@=&AE(\$5#2\$\@M75LN(\$)A<VEC86QL>2P@:70@87)R86YG97,@=&AE(' -O=6YD<R!A8V-O<F1IM;F<@=&\@;&EN92!N=6UB97)S+B!4:&5S92!L:6YE<R!M87D@8F4@861D960@M=&\L(&1E;&5T960L(&UO9&EF:65D+"!A;F0@:6YS97)T960@87,@;F5C97-SM87)Y(&1U<FEN9R!W;W)D(&-O;G-T<G5C=&EO;BX@(%=H96X@=&AE('=O<F0@M:7,@9FEN:7-H960@:70@;6%Y(&)E(")S879E9"(@=&\@4D%-(='=H:6-H(&%LM<V\@=VEL;"!A<W-E;6)L92!I="!I;G1O('1H92!F;W)M870@=&AE(%-0145#M2"!14Y%4D%43U(@<F5Q=6ER97,N(\$9R;VT@=&AE<F4@:70@;6%Y(&%L<V\@M8F4@<G-A=F5D(B!T;R!T:&4@9&ES:R!F;W(@;&%T97(@=7-E+B!4:&4@=V]RM9"!O<B!P:!)A<V4@;6%Y(&)E(' -P;VME;B!A="!A;GD@=&EM92!D=7)I;F<@M=&AE('!R;V-E<W,@=&\@=F5R:69Y(&ET(&9O<B!T:&4@8V]R<F5C="!S;W5NM9',N(%1H92!%1\$E43U(@8V]M;6%N9',@87)E(&1E<V-R:6)E9"!I;B!D971AM:6P@8F5L;W<@86YD(&%R92!A;' -O(&QI<W1E9"!I;B!404),12 T+B!;/FQYM('1H;W-E(&QE='1E<G,@96YC;&]S960@:6X@<&%R96YT:&5S:7,@86-T=6%LM;'D@;F5E9"!T;R!B92!T>7!E9"!I;B!F;W(@=&AE(&-O;6UA;F0@=&\@8F4@M<F5C;V=N:7IE9"X-"@T*5&AE<F4@87)E('1W;R!M;V1E<R!W;&EC:"!T:&4@M141)5\$]2(&]P97)A=&5S(&EN+B!);B!T:&4@8V]M;6%N9"!M;V1E+"!Y;W4@M=VEL;"!B92!P<F]M<1E9"!B>2!A("C(B!A;F0@>6]U(&UA>2!E;G1E<B!AM;GD@;V8@=&AE(&-O;6UA;F1S(&QI<W1E9"!B96QO=RX@26X@=&AE(&%D9"!MM;V1E('EO=2!W:6QL(&)E(&5X<&5C=&5D('1O('!R;W9I9&4@82!S;W5N9"!OM<B!N=6UB97(@<W!E8VEF>6EN9R!O;F4@;V8@=&AE('9A<FEA8FQE<RX@(\$EFM('EO=2!T>7!E(&\$@;&5T=&5R('=H96X@82!N=6UB97(@:7,@97AP96-T960@M>6)E("=I;&P@8F4@87-K960@=&\@&E)E)5%5E013\B+B @5&\@97AI="!T:&4@M861D(&UO9&4@86YD(')E='5R;B!T;R!T:&4@8V]M;6%N9"!M;V1E('!R97-SM('1H92 B4D5455).(B!K97D@5VAE;B!T:&4@8W5R<V]R(&ES(&EN('1H92 BM4T]53D0B(&-O;5M;BX-"@T*(T*#0H-"@T*#0H-"@T*#0I34\$5%0T@141)M5\$]2(\$-/34U!3D13#0H-"BA!*41\$("T@5&AI<R!C;VUM86YD('!U=',@>6]UM(&EN('1H92!A9&0@;6]D92!A;F0@86QL;W=S('EO=2!T;R!A9&0@<V]U;F1SM('1O('1H92!E;F0@;V8@=&AE(&-U<G)E;G0@=V]R9"!O<B!P:!)A<V4N("!9M;W4@=VEL;"!B92!A<VME9"!F;W(@=&AE(' -O=6YD(&9O<B!E86-H(&QI;F4@M86YD(&%L<V\@=&AE('9A<FEA8FQE<R!I9B!I="!I<R!A('9O:6-E9"!S;W5NM9"!O<B B4\$SQ(BX@5&\@97AI="!T:&ES(&UO9&4@<')E<W,@=&AE(")21515M4DXB(&ME>2!W:5N('1H92!C=7)S;W(@:7,@:6X@=&AE(' -O=6YD(&-O;5MM;BX-"@T*#\$%0*5!%3D0@+2!9;W4@;6%Y(&%D9"!A('=O<F0@;W(@<&AR87-E M(&9R;VT@;65M;W)Y('1O('1H92!E;F0@;V8@=&AE(&-U<G)E;G0@=V]R9"!OM<B!P:!)A<V4N(\$ME97 @:6X@;6EN9"!T:&%T('1H97)E(&ES(&\$@;6%X:6UUM;2!O9B!F;W)T>2!L:6YE<R!F;W(@=&AE(&-U<G)E;G0@=V]R9"!O<B!P:!)AM<V4N("!4;R!C;VYS=')U8W0@82!L;VYG97(@<&AR87-E(' -E92!T:&4@<V5CM=&EO;B!O;B!P:!)A<V4@8V]N<W1R=6-T:6]N+@T*#0HH0RE!5\$%,3T<@+2!4M:&ES(&-A=7-E<R!A(\$!/4R!C871A;&]G(&]F('1H92!C=7)R96YT(&1I<VL@M9')I=F4@86YD('1H96X@<F5T=7)N<R!Y;W4@=&\@=&AE(&-O;6UA;F0@;6]DM92X-"@T*#\$0I14Q%5\$4@+2!7:5N('1H:7,@8V]M;6%N9"!I<R!E;G1E<F5DM('EO=2!W:6QL(&)E(&%S:V5D('=H:6-H(&QI;F4@;G5M8F5R('EO=2!W:7-HM('1O(&1E;&5T92X@(%1H870@;&EN92!W:6QL(&)E(&1E;&5T960@86YD(&%LM;"!S=6)S97%U96YT(&QI;F5S('=I;&P@8F4@<VAI9G1E9"!D;W=N(&]N92!LM:6YE('1O(&9I;&P@:71S('!L86-E+@T*#0HH14Y\$*2 M(%1H:7,@97AI=',@M=&AE(%-0145#2"!%1\$E43U(L(&-L96%R<R!T:&4@<V-R965N+"!A;F0@<F5TM=7)N<R!Y;W4@=&\@05!03\$533T94+@T*#0HH22E.4T525" M(\$EF('EO=2!WM:7-H('1O(&%D9"!L:6YE<R!W:71H:6X@82!W;W)D('5S92!T:&ES(&-O;6UAM;F0N(%EO=2!W:6QL(&)E(&%S:V5D('=H:6-H(&QI;F4@>6]U('=I<V@=&\@M:6YS97)T('1H92!N97<@;&EN92AS*2!I;B!F<F]N="!O9BX@5&AI<R!C;VUMM86YD('!U=',@>6]U(&EN('1H92!A9&0@;6]D92!H;W=E=F5R(&%L;"!N97<@M;&EN97,@87)E(&EN<V5R=&5D('=I=&AI;B!T:&4@=V]R9"!R871H97(@=&AAM;B!A="!T:&4@96YD+B!4;R!E>ET('!R97-S(")215154DXB+@T*#0HH3"E)M4U0@+2!292UL:7-T<R!T:&4@8W5R<F5N="!W;W)D(&]R('!H<F%S92X@(\$EF

M('EO=2!W:7-H('10('!A=7-E(&1U<FEN9R!T:&4@;&ES=&EN9R H=7-E9G5L
M(&EF('1H97)E(&ES(&UO<F4@=&AA;B!O;F4@<V-R965N(&]F('1E>'0I('EO
M=2!M87D@<')E<W,@=&AE(")34\$%#12!"05(B(&%N9"!T:&4@;&ES=&EN9R!W
M:6QL(&)E(&AA;'1E9"X@5&\@<F5S=6UE('1H92!L:7-T:6YG('!R97-S('1H
M92 B4U!!0T4@0D%2(B!A9V%I;BX@5&AI<R!I<R!S:6UI;&%R('10('!R97-S
M:6YG(\$-44DPM4R!W:&5N(&QI<W1I;F<@05!03\$533T94('!R;V=R86US+@T*
M#0HH3\$\!040@+2!7:&5N('1H:7,@:7,@96YT97)E9"!Y;W4@=VEL;"!B92!A
M<VME9"!W:&5T:&5R('EO=2!W:7-H('10(&QO860@8V]D92!F<F]M('1H92!C
M=7)R96YT(&1I<VL@9')I=F4@;W(@:68@>6]U('=I<V@=&\@;&]A9"!T97AT
M(&9R;VT@=&AE(&UE;6]R>2!I;G1O('1H92!C=7)R96YT('=O<F0@8G5F9F5R
M+B!)9B!Y;W4@87)E(&%C8V5S<VEN9R!T:&4@9&ES:RP@>6]U('=I;&P@8F4@
M87-K960@9F]R('1H92!N86UE(&]F('1H92!F:6QE(&%L;VYG('=I=&@=&AE
M(&%D9')E<W,@=&\@;&]A9"!I="!I;G1O+B!)9B!Y;W4@87)E(&QO861I;F<@
M=&5X="!F<F]M(&UE;6]R>2!Y;W4@=VEL;"!H879E('10('!-P96-I9GD@=&AE
M("-T87)T:6YG(&%D9')E<W,N(\$ET('=I;&P@=&AE;B!L;V%D('5P('10(&9O
M<G1Y;&QI;F5S('5N=&EL(&ET(&5N8V]U;G1E<G,@82!S=&]P(&-O;6UA;F0@
M=VET:&EN('1H92!T97AT+B!)9B!T:&5R92!A<F4@;6]R92!T:&%N(&9O<G1Y
M(&QI;F5S('EO=2!W:6QL(&=E="!A(&)E97 @86YD(&\$@)RI"549&15(@1E5,
M3"@=V%R;FEN9RX-"@T**\$TI3T1)1ED@+2!4:&ES(&%L;&]W<R!Y;W4@=&\@
M;6]D:69Y(&\$@;&EN92!T:&%T(&AA<R!P<F5V:6]U<VQY(&)E96X@96YT97)E
M9"X@270@:7,@97-S96YT:6%L;D@=&AE('!A;64@87,@82 B1\$5,151%(B!C
M:VUM86YD(&9O;&QO=V5D(&)Y(&%N("))3E-%4E0B(&-O;6UA;FON(%EO=2!W
M:6QL(&)E(&%S:V5D('=H:6-H(&QI;F4@>6]U('=I<V@=&\@;&]D:69Y+B @
M66]U('=I;&P@96YT97(@=&AE(&%D9')M;V1E(&%N9"!A;&P@;F5W(&QI;F5S
M('=I;&P@8F4@:6YS97)T960@870@=&AA="!L;V-A=&EO;BX-"@T**\$XI15<@
M+2!#;&5A<G,@=&AE(&-U<G)E;G0@=V]R9"!B=69F97(@<V\@>6]U(&UA>2!S
M=&%R="!F;W]M871I;VX@;V8@82!N97<@=V]R9"X@66]U('=I;&P@8F4@87-K
M960@:68@:70@:7,@3TL@=&\@8VQE87(N(\$N>2!R97-P;VYS92!O=&AE<B!T
M:&%N(&\$@(&EDB(&]R(&\$@(&EE%4R(@=VEL;"!A8F]R="!T:&4@8V]M;6%N9"X-
M"@T**%!*2*4E.5" M(\$EF('EO=2!W:7-H('10(&UA:V4@82!H87)D(&-O<'D@
M;V8@=&AE(&-U<G)E;G0@=V]R9"!O<B!P:')A<V4@;6%K975P('5S92!T:&ES
M(&-O;6UA;FON(%EO=2!W:6QL(&)E(&%S:V5D('10('!Y<&4@:6X@=&AE('1I
M=&QE('=H:6-H('=I;&P@8F4@<')I;G1E9"!A="!T:&4@=&]P(&]F('1H92!L
M:7-T:6YG+B!!;&P@;W5T<'5T(&ES('!R:6YT960@=&\@4VQO=" C,2X-"@T*
M*%-!*59%("T@66]U(&UA>2!S879E('1H92!C=7)R96YT('1E>'0@=&\@;&]65M
M;W)Y(&]R(&-O9&4@=VET:&EN(&UE;6]R>2!T;R!T:&4@8W5R<F5N="!D:7-K
M(&1R:79E+B!)9B!Y;W4@87)E('!A=FEN9R!T97AT('EO=2!W:6QL(&)E(&%S
M:V5D(&9O<B!T:&4@&W1A<G1I;F<@861D<F5S<R!T;R!S879E(&ET('10+B!+
M965P(&\$@<F5C;W)D(&]F('1H:7,@86YD(&AO=R!M86YY(&)Y=&5S(&%R92!S
M879E9" H:70@=&5L;' ,@>6]U*2!F;W(@9G5T=7)E(')E9F5R96YC92X@02!S
M=&]P(&-O;6UA;F0@:7,@875T;VUA=&EC86QL>2!A9&1E9"!T;R!T:&4@96YD
M(&]F('1H92!W;W)D(&%S(&ET(&ES('!A=F5D+B!4:&ES(&ES(&EN8VQU9&5D
M(&EN('1H92!T;W1A;"!N=6UB97(@;V8@8GET97,@=&AA="!I="!T96QL<R!Y
M;W4@:&%V92!B965N('!A=F5D+B!)9B!Y;W4@87)E('!A=FEN9R!C;V1E('10
M('1H92!D:7-K+"!Y;W4@;75S="!S<&5C:69Y('1H92!F:6QE(&YA;64L('1H
M92!S=&%R=&EN9R!A9&1R97-S+"!A;F0@=&AE(&YU;6)E<B!O9B!B>71E<R!T
M;R!B92!S879E9"X-"@T**%-0*45!2R M(\$)Y(&5N=&5R:6YG('1H:7,@8V]M
M;6%N9"!Y;W4@;6%Y(&AE87(@=VAA=&5V97(@:7,@(&EN("!T:&4@(&-U<G)E
M;G0@8G5F9F5R+B @5&AI<R!I<R!U<V5F=6P@9F]R(")D96)U9V=I;F<B('=O
M<F1S(&1U<FEN9R!C;VYS=')U8W1I;VXN(\$QI:V4@86QL(&]T:&5R(&-O;6UA
M;F1S+"!T:&ES(&-O;6UA;F0@:7,@;VYL>2!A=F%I;&%B;&4@=VAE;B!I;B!T
M:&4@8V]M;6%N9"!M;V1E+@T*#0HH4U!-*45.3U)9("T@5&AI<R!W:6QL('!-P
M96%K('=O<F1S(&]R('!H<F%S97,@=&AA="!H879E(&)E96X@<')E=FEO=7-L
M>2!S=&]R960@:6X@;65M;W)Y+B!9;W4@=VEL;"!B92!A<VME9"!F;W(@=&AE
M('!-T87)T:6YG(&%D9')E<W,@870@=VAI8V@=&EM92!W:&%T979E<B!I<R!S
M=&]R960@=&AE<F4@=VEL;"!B92!S<&]K96XN#0H-"@T*#0I02%)!4T4@0T].
M4U1254-424].#0H-"E1H97)E(&%R92!A(&9E=R!D:69F97)E;G0@=V%Y<R!I
M;B!W:&EC:"!W;W]D<R!M87D@8F4@<W1R=6YG('109V5T:&5R('10(&9O<FT@
M<&AR87-E<RX@1F]R(&\$@<VAO<G0@<&AR87-E('EO=2!W:6QL('=A;G0@=&\@

M; &]A9"!O<B!E;G1E<B!T:&4@9FER<W0@=V]R9"!I;G1O('1H92!34\$5%0T@@M141)5\$]2(&)U9F9E<B!A;F0@=&AE;B!A<'!E;F0@96%C:"!A9&1I=&EO;F%LM('=O<F0N(%EO=2!W:6QL('1H96X@=V%N="!T;R!G;R!B86-K(&%N9"!I;G-E M<G0@82 B4\$SQ(B!I;B!B971W965N(&5A8V@@=V]R9"X-"@T*1F]R(&QO;F=E M<B!P:')A<V5S('1H870@:6YC;'5D92!M;W)E('1H86X@9F]R='D@;&EN97,L M(&5A8V@@;F5W('=O<F0@=VEL;"!H879E('1O(&)E('A=F5D(&EN=&\@;65M M;W)Y(&1I<F5C=&QY(&9O;&QO=VEN9R!T:&4@<')E=FEO=7,@;VYE+B @2V5E M<"!I;B!M:6YD('1H870@<')E=FEO=7-L>2!S879E9"!W;W)D<R!W:6QL(&AA M=F4@82!S=&]P(&-O;6UA;F0@=&%C:V5D(&]N=&\@=&AE(&5N9"!O9B!T:&5M M('O('A=F4@=&AE(&YE=R!W;W)D(&]N92!B>71E('H;W)T(&]F('1H92!A M8W1U86P@8V%L8W5L871E9"!A9&1R97-S("AS=&%R=&EN9R!A9&1R97-S(&]F M('1H92!P<F5V:6]U<R!W;W)D('!L=7,@=&AE(&YU;6)E<B!O9B!B>71E<R!S M879E9"DN(%EO=2!W:6QL(&%L<V\@=V%N="!T;R!S=&%R="!E86-H(&YE=R!W M;W)D('=I=&@&82 B4\$SQ(B!S;R!T:&%T('1H97)E('=I;&P@8F4@82!P875S M92!B971W965N('1H92!W;W)D<RX@1&\@;F]T('!U="!T:&4@<E!!;2(@870@ M=&AE(&5N9"!O9B!T:&4@;VQD('=O<F0@8F5C875S92!I="!M87D@8V%U<V4@ M=&AE('Y<W1E;2!T;R B:&%N9R(@=VAE;B!I="!I<R!S<&]K96X@9G)O;2!T M:&4@4U!%14-(((\$5\$251/4BX-"@T*3VYE(&]T:&5R('A>2!O9B!P<F]D=6-I M;F<@82!L;VYG97(@<AR87-E(&ES('1H870@=7-E9"!I;B!T:&4@<V%M<&QE M('!R;V=R86T@<E)%0TE412(@;VX@=&AE(&1I<VLN("!5;FQI:V4@=&AE(&UE M=&AO9"!A8F]V92P@=&AE('T;W @8V]M;6%N9',@87)E(&YO="!E;&EM:6YA M=&5D(&%N9"!N;R B4\$SQ(B!P875S97,@87)E(&EN<V5R=&5D+B!4:&4@<W1A M<G1I;F<@861D<F5S<R!O9B!T:&4@9FER<W0@=V]R9"!I<R!G:79E;B!T;R!T M:&4@4U!%14-(((\$=3D52051/4B!A;F0@:70@:7,@<W!O:V5N(&EN('1H92!N M;W)M86P@9F%S:&EO;BX@5&AE;B!F;W(@96%C:"!S=6-C97-S:79E('=O<F0@ M=&\@8F4@<W!O:V5N(&\$@8V%L;"!I<R!M861E('1O('1H92 B3EA44U!+(B!R M;W5T:6YE+B!4:&4@4U!%14-(((\$=3D52051/4B!W:6QL(&%L<F5A9'D@8F4@ M<&%I;G1I;F<@=&\@=&AE(&YE>'0@8GET92!I;B!M96UO<GD@869T97(@<W!E M86MI;F<@=&AE('!R979I;W5S('=O<F0@<V\@:70@=VEL;"!A;')E861Y(&AA M=F4@=&AE(&%D9')E<W,@;V8@=&AE(&YE>'0@=V]R9"X@5&\@=7-E('1H:7,@ M='EP92!O9B!0:')A<V4@>6]U(&UU<W0@:VYO=R!H;W<@;6%N>2!T;W1A;"!W M;W)D<R!A<F4@=&\@8F4@<W!O:V5N(&%N9"!T:&5N(&1O('1H92!S86UE(&YU M;6)E<B!O9B!C86QL<R!T;R!T:&4@<E-014%+(B!A;F0@<DY85%-02R(@<F]U M=&EN97,N#0H-"@T*4T%-4\$Q%(%9/0T%"54Q!4ED-"@T*5&AE('A;7!L92!V M;V-A8G5L87)Y(&]N('1H92!E;F-L;W-E9"!D:7-K(&-O;G1A:6YS(#\$W-2!W M;W)D<RP@;&5T=&5R<RP@86YD(&YU;6)E<G,@9F]R('5S92!F<F]M('=I=&AI M;B!Y;W5R('!R;V=R86US(&]R(&%S(&5X86UP;&5S(&]N(&-O9&EN9R!Y;W5R M(&]W;B!W;W)D<RX@5&AE(&9I;&4@;F%M92!O9B!T:&4@8V]D92!I<R B5D]# M04)53\$%262(@86YD('H;W5L9"!B92!L;V%D960@:6YT;R!A9&1R97-S(#\$W M-# X+B @02!C;VUP;&5T92!L:7-T:6YG(&]F('1H92!W;W)D<R!A;F0@=&AE M:7(@<W1A<G1I;F<@861D<F5S<V5S(&ES(&=I=F5N(&EN('1H92!A<'!E;F1I M>"!A="!T:&4@8F%C:R!O9B!T:&ES(&UA;G5A;"X@(")63T-!0E5,05)9(B!M M87D@8F4@;&]A9&5D(&EN=&\@;W1H97(@<&%R=',@;V8@;65M;W)Y(&)U="!T M:&4@<W1A<G1I;F<@861D<F5S<V5S('=I;&P@:&%V92!T;R!B92!M;V1I9FEE M9"!A8V-O<F1I;F=L>2!W:&5N(&%C8V5S<VEN9R!W;W)D<R!F<F]M(&\$@<')O M9W)A;2X-"@T*#0H-"@T*#0H-"@T*#0I304U03\$4@4%)/1U)!35,-"@T*5&AE M<F4@87)E('!W;R!S86UP;&4@<')O9W)A;7,@<')O=FED960@;VX@=&AE(&1I M<VLN(%1H92!F:7)S="!O;F4L(")404Q+24Y'(%194\$574DE415(B('=I;&P@ M<V%Y(&5A8V@@;&5T=&5R(&%N9"!N=6UB97(@87,@:70@:7,@='EP960@;VX@ M=&AE(&ME>6)O87)D+B @5&AE('E8V]N9"!O;F4L(")214-)5\$4B('=I;&P@ M<V%Y(&5A8V@@=V]R9"!O9B!T:&4@<V%M<&QE('908V%B=6QA<GDN(\$)O=&@@ M;V8@=&AE<V4@<')O9W)A;7,@87)E(\$%04\$Q%4T]&5"!P<F]G<F%M<R!A;F0@ M87)E(')U;B!I;B!T:&4@=7-U86P@;6%N;F5R+@T*#0H-"DA!3D=54%,_#0H-M"DEF('EO=2!T<GD@=&\@<W!E86L@82!P:')A<V4@=&AA="!B96=I;G,@;W(@ M96YD<R!W:71H(&\$@<E!!;2(@;W(@:&%S('1W;R B4\$SQ)W,B(&5M8F5D9&5D M(&EN(&ET+"!T:&4@96YT:7)E('!R;V=R86T@;6%Y(")H86YG(BX@(\$ET(&UA M>2!A;'O(")H86YG(B!I9B!Y;W4@9VEV92!I="!T:&4@<W1A<G1I;F<@861D M<F5S<R!O9B!S;VUE(&]T:&5R(&1A=&\$@<F%T:&5R('1H86X@<&AO;F5M92!E M;F-O9&5D(&1A=&\$N(%=H96X@=&AI<R!O8V-U<G,@=&AE(&]N;'D@=V%Y('1O

M(')E9V%I;B!C;VYT<F]L(&]F('1H92!C;VUP=71E<B!I<R!T;R!P<F5S<R!R
M97-E="X@268@>6]U(&%R92!U<VEN9R!T:&4@<W!E96-H(&5D:71O<B!Y;W4@
M;6%Y(')E='5R;B!T;R!T:&4@<')O9W)A;2!W:71H('9A<FEA8FQE<R!I;G1A
M8W0@8GD@96YT97)I;F<@D=/5\$ \@,3 P,"(N('!9;W4@=VEL;"!H879E('1O
M(')E+6QI<W0@=&AE(&-U<G)E;G0@=V]R9"!O<B!P:')A<V4@86YD('EO=2!W
M:6QL(&YO(&QO;F=E<B!H879E('1H92!H96%D:6YG<R!A="!T:&4@=&]P(&]F
M('1H92!S8W)E96XN#0H-"E1H97)E(&ES(&%N;W1H97(@<')O8FQE;2!T:&%T
M(&UA>2!O8V-U<B!A;GET:6UE(&%F=&5R('1H92!A8F]V92!S:71U871I;VX@
M;V-C=7)S(&]R(&EF(%)%4T54(&ES('!R97-S960@=VAE;B!T:&4@14-(3R!=
M6R!I<R!T86QK:6YG+B!4:&4@;F5X="!T:6UE(%-%5%- ,5"!I<R!C86QL960@
M=&%\@9FEN9"!W:&EC:"!S;&]T('1H92!%0TA/(%U;(&ES(&EN+"!I="!P<F]B
M86)L>2!W;VXG="!F:6YD(&ET+B!4:&5R92!A<F4@='=O('=A>7,@=&%\@9V5T
M(&%R;W5N9"!T:&ES('=I=&AO=70@:&%V:6YG('1O('1U<FX@;V9F('1H92!C
M;VUP=71E<B!A;F0@<F5B;V]T(&9R;VT@<V-R871C:"X@3VYE(&ES('1O(&%L
M=V%Y<R!I;G-T86QL('1H92!%0T)/(%U;(&-A<F0@:6X@<VQO=" U(&%N9"!N
M979E<B!U<V4@=&AE(%-%5%- ,5"!R;W5T:6YE+B!4:&4@;W1H97(@:7,@=&%\@
M4\$]+12 B,C4U(B!T;R!O;F4@;V8@=&AE(&%D9')E<W-E<R!W:&EC:"!P=6QL
M<R!T:&4@1\$5624-%(%-%3\$5#5" H4\$E.(#0Q*2!L;W<@;VX@=&AE(' -L;W0@
M=&AE(\$5#2\$ \@/75L@:7,@:6XN#0H-"@T*4U!%14-(((\$5\$251/4B!%6\$%-4\$Q%
M#0H-"DEN('1H:7,@<V5C=&EO;B!W92!W:6QL('5S92!T:&4@4U!%14-(((\$5\$
M251/4B!T;R!G96YE<F%T92!A;F0@<V%V92!T:&4@<&AR87-E(")A;B!!<'!L
M92!=6R!C;VUP=71E<B!@86YD('1H96X@=W)I=&4@82!S:&]R="!!4%!,15-/
M1E0@<')O9W)A;2!T;R!S87D@=&AE(&QA<CEE="!P:')A<V4@(E1H:7,@:7,
M86X@07!P;&4@75L@8V]M<'5T97(B+B!"9690<F4@<')O8V5E9&EN9R!Y;W4@
M<VAO=6QD(&EN<W1A;&P@('1H92!%0TA/(%U;(&-A<F0@86-C;W)D:6YG('1O
M('1H92!D:7)E8W1I;VYS('!R979I;W5S;'D@9VEV96XN#0H-"E1O(&)E9VEN
M('EO=2!S:&]U;&0@8F]O="!U<"!T:&4@<W5P<&QI960@9&ES:R!A;F0@<G5N
M('1H92!34\$5%0T@141)5\$]2('!R;V=R86TN("!!9G1E<B!I="!H87,@9FEN
M:7-H960@;&]A9&EN9R!F<F]M('1H92!D:7-K('EO=7(@<V-R965N(' -H;W5L
M9"!B92!B;&%N:R!E>&-E<'0@9F]R('1H92!H96%D:6YG<R!A="!T:&4@=&]P
M(&%N9"!Y;W4@<VAO=6QD(&)E('!R;VUP=&5D('=I=&%@82 B,"(N(%=H96YE
M=F5R('1H:7,@<')O;7!T(&ES(&1I<W!L87EE9"!T:&4@<')O9W)A;2!I<R!W
M86ET:6YG(&9O<B!A(&-O;6UA;F0N(\$9O<B!C;&%R:71Y+"!I;B!T:&ES(&5X
M86UP;&4@=V4@=VEL;"!A;'=A>7,@;&ES="!A;B!E;G1I<F4@8V]M;6%N9"!R
M871H97(@=&AA;B!J=7-T('1H92!F:7)S="!L971T97(H<RDN("!!;&P@8V]M
M;6%N9',@871E(&9O;&QO=V5D(&)Y(&\$@/\$-2/BX-"@T*4VEN8V4@>6]U('=I
M;&P@8F4@=7-I;F<@<V]M92!O9B!T:&4@=V]R9',@9G)O;2!T:&4@<V%M<&QE
M('908V%B=6QA<GDL('EO=2!W:6QL(&AA=F4@=&%\@9FER<W0@;&]A9"!I="!F
M<F]M('1H92!D:7-K(&EN=&%\@;65M;W)Y+B @5&%\@9&%\@=&AI<R!T>7!E(&EN
M('1H92!C;VUM86YD.B! ,3T%\$+B!9;W4@87)E('1H96X@9VEV96X@='=O(&]P
M=&EO;G,Z('1O(&QO860@8V]D92!F<F]M('1H92!D:7-K(&]R('1O(&QO860@
M=&5X="!F<F]M(&UE;6]R>2X@66]U('=A;G0@=&%\@;&]A9"!C;V1E(&9R;VT@
M=&AE(&1I<VL<V\@96YT97(@C\$B+B!.97AT('EO=2!W:6QL(&)E(&%S:V5D
M(&9O<B!T:&4@9FEL92!N86UE+B!4:&4@<V%M<&QE('908V%B=6QA<GD@:7,
M<V%V960@=6YD97(@=&AE(&YA;64@;V8@E9/0T%"54Q!4EDB(' -O('1Y<&4@
M=&AI<R!I;BX@5VAE;B!I="!A<VMS(&9O<B!W:&%T(&%D9')E<W,@=&%\@;&]A
M9"!I="!I;G1O('1Y<&4@:6X@C\$W-# X(BX@(\$%L;"!A9&1R97-S97,@;&ES
M=&5D(&EN('1H92!B86-K(&]F('1H:7,@;6%N=6%L(&%S<W5M92!T:&%T('1H
M92!V;V-A8G5L87)Y(&AA<R!B965N(&QO861E9"!I;G1O('1H:7,@;&]C871I
M;VXN#0H-"D%F=&5R('1H92!F:6QE(&AA<R!B965N(&QO861E9"!Y;W4@<VAO
M=6QD(&)E(&)A8VL@:6X@=&AE(&-O;G1R;VP@;6]D92!O9B!T:&4@961I=&]R
M(&%N9"!T:&4@B,B(' -H;W5L9"!R96%P<&5A<BX@5&AE(&9I<G-T('=O<F0@
M;V8@;W5R('!H<F%S92!I<R B86XB+B!4:&ES(&ES(&YO="!O;F4@;V8@=&AE
M('=O<F1S(&EN('1H92!S86UP;&4@=F]C86)U;&%R>2!B=70@8V%N(&5A<VEL
M>2!B92!M861E(&)Y(&UO9&EF>6EN9R!T:&4@=V]R9" B86YD(BX@3VYC92!A
M9V%I;B!Y;W4@=VEL;"!W86YT('1O('5S92!T:&4@3\$]!1"!C;VUM86YD+"!H
M;W=E=F5R('1H:7,@=&EM92!Y;W4@=VEL;"!W86YT('1O('5S92!O<'1I;VX@
M(C(B(&EN<W1E860@;V8@C\$B+B!7;&5N(&%S:V5D(&9O<B!T:&4@861D<F5S
M<R!T;R!L;V%D('1H92!T97AT(&9R;VT@>6]U(' -H;W5L9"!E;G1E<B!T:&4@

M861D<F5S<R!L:7-T960@:6X@=&AE (&%P<&5N9&EX (&9O<B B86YD (BX@(%1H
M:7,@:7,@(C\$W-#,T(B!S;R!T>7!E (&ET (&EN (&YO=RX@069T97 (@82!B<FEE
M9B!P875S92!Y;W5R ('-C<F5E;B!S:&]U; &0@87!P96%R (&%S (&9O; &QO=W, Z
M#0H-"DQ)3D4C (%-/54Y\$ (%!)5\$- ((\$Q%3D=42"!63TQ5344-"@T*, 2 @(\$%%
M"38), PDW#0HR (" @044). DS"3<-"C,@("!!12 @(" @,3),@DU#0HT (" @
M3@D).0DR"34-"C4@("!\$#0H-"E1O (&-H86YG92!T:&ES ('1O ('1H92!W;W)D
M (")A;B (@86QL ('EO=2!H879E ('1O (&1O (&ES (&1E; &5T92!T:&4@ (D0B (&%T
M ('1H92!E; F0N (%1O (&1O ('1H:7, @='EP92!I; B!T:&4@8V]M; 6%N9"!\$14Q%
M5\$4@86YD ('=H96X@>6]U)W)E (&%S:V5D (&9O<B!T:&4@; &EN92!N=6UB97 (@
M96YT97 (@ (C4B+B!.; W<@='EP92!T:&4@8V]M; 6%N9"!34\$5!2R!A; F0@>6]U
M ('=I; &P@: &%T92!T:&4@14- (3R!=6R!S<&5A:R!I="X-"@T*0F]T: " !09B!T
M:&4@=V]R9', @ (F%P<&QE (B!A; F0@ (G1W; R (@87)E (&EN ('1H92!S86UP; &4@
M=F]C86)U; &%R>2!S; R!T:&5Y (&-A; B!B92!U<V5D (&%S ('1H97D@87)E+B!4
M; R!A9&0@=&AE ('=O<F0@ (F%P<&QE (B!Y; W4@=VEL; " !U<V4@=&AE (\$%04\$5.
M1"!C; VUM86YD+B!4>7!E ('1H:7, @:6X@86YD ('=H96X@:70@87-K<R!Y; W4@
M9F]R ('1H92!A9&1R97-S ('1O (&%P<&5N9"!F<F]M ('1Y<&4@:6X@=&AE (&%D
M9')E<W, @; &ES=&5D (&EN ('1H92!B86-K (&YE>'0@=&\@ (F%P<&QE (B H, 3<T
M-3<I+B @069T97 (@86YO=&AE<B!B<FEE9B!P875S92!Y; W4@=VEL; " !G970@
M82!L:7-T:6YG (&]F ('1H92!T=V\@=V]R9', @<W1R=6YG ('109V5T:&5R+B!5
M<V4@=&AE (%-014%+ (&-O; 6UA; F0@86YD (&QI<W1E; B!T; R!H; W<@=&AE>2!S
M; W5N9"X@ (%1H97D@<G5N ('109V5T:&5R ('-O (&\$@<&%U<V4@:7, @; F5E9&5D
M (&E='E96X@=&AE; 2X-"@T*66]U (&-A; B!I; G-E<G0@82!P875S92!B>2!U
M<VEN9R!T:&4@24Y315)4 (&-O; 6UA; F0N (%=H96X@87-K960@=VAI8V@@; &EN
M92!T; R!I; G-E<G0@8F5F; W)E ('1Y<&4@:6X@ (C4B+B!9; W4@87)E (&YO=R!I
M; B!T:&4@:6YS97)T (&UO9&4@86YD ('1H92!C; VUP=71E<B!S:&]U; &0@8F4@
M9&ES<&QA>6EN9R!A ('U (B!W:71H ('1H92!C=7)S; W (@:6X@=&AE ('-O=6YD
M (&-O; '5M; BX@4VEN8V4@>6]U<B!I; G-E<G1I; F<@82!P875S92!T>7!E (&EN
M (")003\$B (&9O; &QO=V5D (&)Y (&\$@/\$-2/BX@ (%1H92!C=7)S; W (@=VEL; " !N
M; W<@:G5M<"!T; R!T:&4@; &5N9W1H (&-O; '5M; B!S:6YC92!N; R!O=&AE<B!P
M87)A; 65T97)S (&UA>2!B92!S<&5C:69I960@9F]R (&\$@ (E!! , 2 (@<&%U<V4N
M (%EO=2!M87D@96YT97 (@86YY (&YU; 6)E<B!Y; W4@=VES: " !F<F]M (#\$@=&\@
M. "P@: &]W979E<B R (&ES (&-O; 6UO; FQY ('5S960@8F5T=V5E; B!W; W)D<RX@
M (\$%F=&5R ('EO=2!E; G1E<B!T:&4@; &5N9W1H (&]F ('1H92!P875S92!T:&4@
M8W5R<V]R ('=I; &P@; 6]V92!D; W=N ('1O ('1H92!N97AT (&QI; F4@86YD ('=A
M:70@9F]R ('EO=2!T; R!I; G!U="!A; F]T:&5R ('-O=6YD+B!3:6YC92!Y; W4@
M; VYL>2!W:7-H ('1O (&EN<V5R="!O; F4@; &EN92!A="!T:&ES ('1I; 64@>6]U
M (&UA>2!E>&ET ('1H92!I; G-E<G0@; 6]D92!A; F0@<F5T=7)N ('1O ('1H92!C
M; VUM86YD (&UO9&4@<VEM<&QY (&)Y ('!R97-S:6YG (#Q#4CXN#0H-"E1H92!P
M875S92!B969O<F4@=&AE ('=O<F0@ (G1W; R (@; 6%Y (&)E (&%D9&5D (&)E9F]R
M96AA; F0@<F%T:&5R ('1H86X@:6YS97)T:6YG (&ET (&%F=&5R=V%R9', N (%1O
M (&1O ('1H:7, @96YT97 (@=&AE (\$%\$1"!C; VUM86YD+B @66]U ('=I; &P@8F4@
M:6X@=&AE (&%D9"!M; V1E ("AS:6UI; &%R ('1O ('1H92!I; G-E<G0@; 6]D92!E
M>&-E<'0@; F5W ('-O=6YD<R!A<F4@861D960@=&\@=&AE (&5N9"!09B!T:&4@
M=V]R9"D@86YD (&-A; B!E; G1E<B!T:&4@ (E!! , 2 (@=VET: " !A (&QE; F=T: " !O
M9B B, B (N (\$5X:71I; F<@=&AE (&%D9"!M; V1E (&ES (&%L<V\@86-C; VUP; &ES
M:&5D (&)Y ('!R97-S:6YG (#Q#4CX@=VAE; B!T:&4@8W5R<V]R (&ES (&EN ('1H
M92!S; W5N9"!C; VQU; 6XN#0H-"D-!551)3TXA ("!\$; R!N; W0@871T96UP="!T
M; R!U<V4@=&AE (%-014%+ (&-O; 6UA; F0@=VAE; B!E:71H97 (@=&AE (&9I<G-T
M (&]R (&QA<W0@; &EN92!09B!T:&4@8W5R<F5N="!B=69F97 (@:7, @82 B4\$\$Q
M (BX@ (%1H:7, @=VEL; " !C875S92!T:&4@<WES=&5M ('1O (")H86YG (B!W:71H
M ('!R97-S:6YG ('1H92 B4D53150B (&)U='1O; B!T:&4@; VYL>2!A; '1E<FYA
M=&EV92X@ (%1H:7, @=VEL; " !A; ' -O (&AA<'!E; B!I9B!Y; W4@='!Y ('1O ('-P
M96%K (&\$@=V]R9"!W:71H ('1W; R B4\$\$Q)W, B (&EN (&\$@<F]W+B!!; &P@:7, @
M; F]T (&QO<W0@: &]W979E<B!I9B!T:&ES (&AA<'!E; G, N ("!0; &5A<V4@<V5E
M ('1H92!S96-T:6]N (&5N=&ET; &5D (")04Y'55!3/R (@ ('1O (&QE87)N (&AO
M=R!T; R!R96-O=F5R ('=I=&@>6]U<B!D871A (&EN=&%C="X-"@T*069T97 (@
M=&AE ('!A=7-E (&AA<R!B965N (&%D9&5D ('EO=2!M87D@87!P96YD ('1H92!W
M; W)D (")T=V]B (&)Y ('5S:6YG ('1H92!!4% !%3D0@8V]M; 6%N9"!A; F0@:6YP
M=71T:6YG ('1H92!P<F]P97 (@861D<F5S<R!F; W (@ (G1W; R (@9G)O; 2!T:&4@

M87!P96YD:7@*#\$Y,34Q*2X-"@T*5&AE('=O<F0@(F-O;7!U=&5R(B!I<R!N
M;W0@:6YC;5D960@:6X@=&AE('-A;7!L92!V;V-A8G5L87)Y(&%N9"!W:6QL
M(&AA=F4@=&\@8F4@96YT97)E9"!M86YU86QL>2X@5&\@9&\@=&AI<R!U<V4@
M=&AE(\$%\$1"!C;VUM86YD(&%N9"!E;G1E<B!T:4@;&EN97,@;&ES=&5D(&)E
M;&]W(&9O;&QO=V5D(&)Y(&\$@/\$-2/B!T;R!R971U<FX@=&\@=&AE(&-O;6UA
M;F0@;6]D92X-"@T*3\$E.12,@4T]53D0@4\$E40T@3\$5.1U1((%9/3%5-10T*
M#0HQ-R @(%!!;0D),@T*,3@@("!+#0HQ.2 @(%5("0DW"3,)-@T*,C @("!-
M"0DX"3()-@T*,C\$@("!003\$)"3\$-"C(R(" @4 T*,C,@"!9"0DT"3\$)-@T*
M,C0@("!)50D)-DQ"38-"C(U(" @53(")30),PDV#0HR-B @(%!!;0D),0T*
M,C<@("!4#0HR." @(\$52"0DV"3()-@T*,CD@("!%4@D).DR"38-"C,P(" @
M15(")3\$P"3()-0T*#0I!9G1E<B!P<F5S<VEN9R \0U(^('10(')E='5R;B!T
M;R!T:4@8V]M;6%N9"!M;V1E('1H92!E;G1I<F4@8G5F9F5R('=I;&P@8F4@
M<F4M;&ES=&5D(&]N('1H92!S8W)E96XN(%-I;F-E('1H92!S8W)E96X@:7-N
M)W0@;&]N9R!E;F]U9V@=&\@86-C;VUM;V1A=&4@=&AE(&5N=&ER92!B=69F
M97(@=&AE(&9I<G-T(&QI;F5S('=I;&P@;F\@;&]N9V5R(&%P<&5A<BX@5&\@
M<F4M97AA;6EN92!T:4@9FER<W0@;&EN97,L(&5N=&5R('1H92!,25-4(&-O
M;6UA;F0@86YD('=H:6QE(&ET(&ES(&QI<W1I;F<@<')E<W,@=&AE('P86-E
M(&)A<BX@5&AE(&QI<W1I;F<@=VEL;"!H86QT(&%T('1H870@<&]I;G0@86YD
M('=I;&P@8V]N=&EN=64@;VYL>2!W:&5N('1H92!S<&%C92!B87(@:7,@<')E
M<W-E9"!A9V%I;BX@02!L:7-T:6YG(&UA>2!B92!S=&]P<&5D(&%N9"!R97-T
M87)T960@:6X@=&AI<R!M86YN97(@87,@;6%N>2!T:6UE<R!A<R!D97-I<F5D
M=@T*#0I.;W<@=&AA="!T:4@<&AR87-E(")A;B!A<'!L92!T=V\@8V]M<'5T
M97(B&AA<R!B965N(&9I;FES:&5D(&ET(&YE961S('10(&)E('A=F5D('10
M(&UE;6]R>2!A;F0@=&AE;B!T;R!T:4@9&ES:R!F;W(@9G5T=7)E('5S92X@
M5&AE(%-0145#2"!%1\$E43U(@86YD(%-0145#2"!14Y%4D%43U(N0T]\$13(@
M=7-E(&UE;6]R>2!L;V-A=&EO;G,@8F5L;W<@,3<T,#@N("!,:6ME=VES92P@
M=&AE('A;7!L92!V;V-A8G5L87)Y(')E<VED97,@:6X@;65M;W)Y(&QO8V%T
M:6]N<R Q-S0P."!T;R Q.3,Y.2X@5&AE<F5F;W)E('H96X@>6]U('A=F4@
M=&AE('!H<F%S92!Y;W4@:G5S="!C;VYS=')U8W1E9"!I="!S:&]U;&0@8F4@
M<'5T(&%B;W9E('1H97-E(&QO8V%T:6]N<RX@(%10('A=F4@=&AE('!H<F%S
M92!E;G1E<B!T:4@4T%612!C;VUM86YD+B!!<R!W:71H('1H92!,3T%\$(&-O
M;6UA;F0@>6]U('=I;&P@8F4@87-K960@=VAE=&AE<B!Y;W4@87)E('A=FEN
M9R!T97AT('10(&UE;6]R>2!O<B!M96UO<GD@=&\@9&ES:RX@16YT97(@82 B
M,B@9F]R('1E>'0@=&\@;65M;W)Y(&%N9"!W:&5N('EO=2!A<F4@87-K960@
M9F]R('1H92!A9&1R97-S('10('A=F4@=&\@96YT97(@C\$Y-# P(BX@3F]T
M92!H;W<@;6%N>2!B>71E<R!W97)E('A=F5D("@U-BD@8F5C875S92!Y;W4@
M=VEL;"!N965D('10(&MN;W<@=&AA="!T;R!S879E(&ET('10('1H92!D:7-K
M+@T*#0I4:4@8V]M<')E<W-E9"!B:6YA<GD@8V]D92!F;W(@>6]U<B!P:')A
M<V4@:7,@;F]W(&EN(&UE;6]R>2!S=&%R=&EN9R!A="!A9&1R97-S(#\$Y-# P
M+B!4;R!S879E('1H92!P:')A<V4@=&\@=&AE(&1I<VL@;VYC92!A9V%I;B!E
M;G1E<B!T:4@4T%612!C;VUM86YD+"!B=70@=&AI<R!T:6UE('E;&5C="!T
M:&4@9FER<W0@;W!T:6]N+B!;&W(@82!F:6QE(&YA;64@>6]U(&-A;B!U<V4@
M(D%.(%\$04\$Q%(%173R!#3TU0551%4B(@86YD(&9O<B!T:4@861D<F5S<R!T
M;R!S879E(&9R;VT@='EP92!I;B!T:4@861D<F5S<R!W:&5R92!I="!W87,@
M<')E=FEO=7-L>2!S879E9"P@:6X@=&AI<R!C87-E(#\$Y-# P+B!4:&4@;&5N
M9W1H(&]F('1H92!P:')A<V4@:7,@-38@8GET97,@87,@;F]T960@86)O=F4N
M#0H-"D%T('1H:7,@<&]I;G0@=&AE(&5N=&ER92!V;V-A8G5L87)Y('10('A
M>2!T:4@<&AR87-E(")T:&ES(&ES(&%N(&%P<&QE('1W;R!C;VUP=71E<B(@
M:7,@<W1O<F5D(&5I=&AE<B!W:71H:6X@=&AE('A;7!L92!V;V-A8G5L87)Y
M(&]R('=I=&AI;B!T:4@9FEL92!T:&%T('EO=2!J=7-T(&-R96%T960N(%1H
M92!E;G1I<F4@&AR87-E(&-O=6QD(&AA=F4@8F5E;B!C;VYS=')U8W1E9"!A
M;F0@<&QA8V5D('=I=&AI;B!A('I;F=L92!F:6QE(&)U="!I;B!O<F1E<B!T
M;R!M;W)E(&5F9F5C=&EV96QY(&1E;6]N<W1R871E(&AO=R!T;R!A8V-E<W,@
M<W!E96-H(&9R;VT@=VET:&EN(&\$@<')O9W)A;2!Y;W4@=VEL;"!B92!A8V-E
M<W-I;F<@82!C;VUB:6YA=&EO;B!O9B!S:6YG;&4@=V]R9',@86YD(&\$@<&AR
M87-E+@T*#0I4:&4@<')O9W)A;2!L:7-T960@;VX@=&AE(&YE>'0@<&%G92!W
M:6QL('A>2!T:4@<V%M<&QE('!H<F%S92!E=F5R>2!T:6UE(&\$@/\$-2/B!I
M<R!P<F5S<V5D+B @5&AE(")214TB('T871E;65N=',@<')E='1Y('=E;&P@
M97AP;&%I;B!I=',@;W!E<F%T:6]N(&%N9"!W:&%T('!O<G1I;VX@;V8@=&AE

M('!R;V=R86T@9&]E<R!W:&%T+@T*#0H-"D5#2\$\@75L@4U!%14-((%-93E1(M15-)6D52#0H-"C\$P(\$A)345-. B W,38W#0HQ-2!214T@4T544R!(24U%32!"M14Q/5R!42\$4@3\$]#051)3TX@3T8@5\$A%(%-0145#2"!23U5424Y%4RX-"C(PM(\$OD(#T@0TA24R H-"D-"C(U(%)%255)(%-%5%,@1"0@55 @05,@02!#3TY4M4D],+40@1D]2(\$1/4R!#3TU-04Y\$4RX-"C,P(%!224Y4(\$OD.R)"3\$]!1"!3M4\$5%0T@@1T5.15)!5\$]2+D-/1\$4P(@T*,S4@4D5-(\$Q/0413(\$E.(%1(12!3M4\$5%0T@@1T5.15)!5\$]2+D-/1\$4P(\$E.5\$\@)#%#, # @5\$\@)#%#1D8N#0HTM,"!04DE.5"!\$)#LB0DQ/040@5D]#04)53\$%262(-"C0U(%)%32!,3T%\$4R!4M2\$4@4T%-4\$Q(%%9/0T%"54Q!4ED@24Y43R!,3T-!5\$E/3B Q-S0P."X-"C4PM(%!224Y4(\$OD.R)"3\$]!1"!!3B!!4%!,12!45T\@0T]-4%5415(B#0HU-2!2M14T@3\$]!1%,@5\$A%(%!(4D%312!)3E1/(\$Q/0T%424].(#\$Y-# P+@T*-C @M3\$]!"651%(#T@-S\$V.#I(24)95\$4@/2 W,38Y.E-014%+(#T@-S\$W,#I.6%13M4\$5L@/2 W,3@R.E-,3U0@/2 W,3DW.E-%5%-,"5"](#@P.3<-"C8U(%)%32!3M1513(%50(%1(12!605))3U53(\$%\$1%)%4U-%4R!54T5\$(%=)5\$@@4U!%14-(M(\$=%3D52051/4BY#3T1%3RX-"C<P(\$-!3\$P@4T544TQ4.D\$@/2!0145+("A3M3\$]4*3H@248@02](#\$V(%1(14X@2\$]-12 Z(%!224Y4(")03\$5!4T4@24Y3M15)4(\$%.(5\$#2\$\@24D@0T%21"(Z(\$5.1 T*-S4@4D5-(\$1%5\$5234E.15,@M5TA)0T@4TQ/5"!42\$4@14-(3R!)22!#05)\$(\$E3(\$E.+B!)1B!.3R!#05)\$M(\$E3(\$E.4U!13\$Q%1"!)5"!705).4R!42\$4@55-%4B!!3D0@14Y\$4R!42\$4@M4%)/1U)!32X-"C@P(\$A/344@.B!)3E!55" B4%)%4U,@5\$A%(#Q#4CX@1D]2M(\$@1\$5-3U-44D%424].("([6"0-"C@U(%)%32!#3\$5!4E,@5\$A%(%-#4D5%M3B!!3D0@5T%]5%,@1D]2(\$@0T]-34%.1"!43R!35\$%25"X-"CDP(\$%\$1"]M(#\$Y,#<P.B!'3U-50B R,# -"CDU(%)%32!31513(%50(%1(12!!1\$1215-3M(\$9/4B!42\$4@5T]21" B5\$A)4R(@04Y\$(%1(14X@2DE-4%,@5\$\@5\$A%(%)/M551)3D4@5\$A!5"!724Q,(\$]55%!55"!42\$4@041\$4D534R!!3D0@4U!%04L@M250N#0HQ,# @1D]2(\$@/2 Q(%1/(#P,#H@3D585 T*,3 U(%)%32!#0553M15,@02!0055312!"1517145.(%1(12!73U)\$4R B5\$A)4R(@04Y\$())4R(NM#0HQ,3 @041\$(#T@,3@Q.#0Z(\$=/4U5"#(P, T*,3\$U(%)%32!31513(%50M(%1(12!!1\$1215-3(\$9/4B!42\$4@5T]21" B25,B(\$%.1"!42\$5.(\$I535!3M(%1/(%1(12!23U5424Y%(%1(050@5TE,3"!/5510550@5\$A)4R!!1\$1215-3M(\$%.1"!34\$5!2R!)5"X-"C\$R,"!&3U(@02](#\$@5\$\@,3 P.B!.15A4#0HQM,C4@4D5-(\$-!55-%4R!!(%!!55-%(\$)%5%=%14X@5\$A%(%=/4D0@(DE3(B!!M3D0@5\$A%(\$9/3\$Q/5TE.1R!02%)!4T4N#0HQ,S @041\$(#T@,3DT,# Z(\$=/M4U5"#(P, T*,3,U(%)%32!31513(%50(%1(12!!1\$1215-3(\$9/4B!42\$4@M4\$A205-%(")!3B!!4%!,12!45T\@0T]-4%5415(B(\$%.1"!42\$5.(\$I535!3M(%1/(%1(12!23U5424Y%(%1(050@5TE,3"!/5510550@5\$A%(\$%\$1%)%4U,@M04Y\$(%1(14X@4U!%04L@250N#0HQ-# @1T]43R X, T*,C P(\$((#T@24Y4M("A!1\$00,C4V*3I!53"](\$%\$1" M04@*B R-38-"C(P-2!214U)(%-03\$E4M4R!42\$4@041\$4D534R!54"!)3E1/((\$A)1T@04Y\$(\$Q/5R!!1\$1215-315,@M3\$534R!42\$%. (#(U-B!!3D0@5\$A!5"!#04X@0D4@4\$]+140@24Y43R!!(\$))M3D%262!23U5424Y%+@T*,C\$P(%!/2T4@2\$E"651%+\$(.B!03TM%(\$Q/0EE4M12Q!3 T*,C\$U(%)%32!03TM%4R!42\$4@041\$4D534T53(\$1%5\$5234E.140@M04)/5D4@24Y43R!42\$4@3\$]#051)3TY3(%53140@0ED@5\$A%(%-0145#2"!M14Y%4D%43U(N0T]\$12X-"C(R,"!#04Q,(% -014%+#0HR,C4@4D5-(%1(25,@M0T%,3%,@5\$A%(%)/551)3D4@5\$A!5"!34\$5!2U,@5\$A%(%=/4D0@3U(@4\$A2M05-%(%-405)424Y'(\$%4(%1(12!!1\$1215-3(%!/2T5\$(\$%3U9%+@T*,C,P M(%)%5%523@T*#0H-"D5#2\$\@75L@4U!%14-((%-93E1(15-)6D52#0H-"E1!M0DQ#(\$@+5-0145#2"!14Y%4D%43U(@041\$4D534T53#0H-"E-0145#2"!M14Y%4D%43U(N0T]\$13 @+2 D,4-/3R!43R!3,49&1@T*4U!%14-(((\$=%3D52M051/4BY#3T1%,2 M("0S0T]/(%1/("0S1D9�I34\$5%0T@1T5.15)!5\$]2M+D-/1\$4R("T@4S0P,# @5\$\@)#0S1D8-"E-0145#2"!14Y%4D%43U(N0T]\$M13,@+2 D-C P,"!43R D-C-&1@T*#0I615)324].("!,3T)95\$4@(\$A)0EE4M12 @4U!%04L@(\$Y85%-02R @(%-,3U0@(%-%5%-,"5 T*, DW,38X"3<Q-CD)M-S\$W, DW,3@R"3<Q.3<)0C Y-PT*"20Q0S P"20Q0S Q"20Q0S R"20Q0T]%M"20Q0S%"20Q1D\$Q#0H-"C\$),34S-C),34S-C\$),34S-C(),34S-S0),34S M.#D),38R.#D-"@DD,T,P, DD,T,P,0DD,T,P,@DD,T-/10DD,T,Q1 DD,T9!M,0T*#0HR"3\$V,S@T"3\$V,S@U"3\$V,S@V"3\$V,SDX"3\$V-#\$S"3\$W,S\$S#0H)M)#0P,#))#0P,#\$))#0P,#()#0P,#\$))#0P,#4))#0P,#40))#0S03\$-"@T*,PDR-#4WM-@DR-#4W-PDR-#4W. DR-#4Y, DR-#8P-0DR-34P-0T*"20V,# P"20V,# Q

M"20V,# R"20V,#!%"20V,#%\$"20V,T\$Q#0H-"E1!0DQ%(#@+2!33U5.1%,@M5TE42"!314Q%0U1!0DQ%(9!4DE!0DQ%4PT*#0I!;" M(&QA=&4)12 M(' -PM96%K"4T@+2!M86YY"4]/,B M(&)O;VL-"D\$R("T@;&%T90E%2" M(&QE='1EM<@E.("T@;FEC90E5,2 M('1U;F4-"D%(("T@9&%D"0E%4B M(&AU<G)Y"4Y'M("T@;&]N9PE5,B M('1U;F4-"D%((("T@8F]T:&5R(")22 M(&9I;F=E<@E/M,2 M(&]H"55((("T@9G5N#0I!5R M(&-A;&P)254@+2!Y;W4)3S(@+2!O: E9M("T@>6]U#0I,("T@;&EK90E/3S\$@+2!B;V]K"5!!,2 M('!A=7-E#0H-"E1!M0DQ%(#, @+2!33U5.1%,@5TE42"!04D53150@5D%224%"3\$53#0H-"D(@+2!BM86)Y"0E'("T@9V5T"5(@+2!R960)5\$@Q("T@=&AE;@T*0T@+2!C:&]O<V4)M2" M(&AE;&QO"5,@+2!S964)5B M('9E<GD-"D0@+2!D;V<)"4H@+2!J970)M4T@+2!S:&]E"5<@+2!W:6QL#0I\$5" M(&)U='1E<@E+("T@:VEC:PE4("T@M=&]O"5H@+2!Z97)O#0I&("T@:68)"5 @+2!P<FEN= E42" M('1H:6YK"5!!M("T@<&%U<V4-"@T*5\$%"3\$4@-" M(%-0145#2"!%1\$E43U(@OT]-34%.1%,-M"@T**\$]I1\$0)"2A%3D0I"0DH3BE%5PT**\$%0*5!%3D0)*\$DI3E-%4E0)*%!2M*4E.5 T**\$,I051!3\$]"2A,*4E35 DH4T\$!5D4-"BA\$*45,151%"2A,3RE!M1 DH4U I14%+#0HH32E/1\$E&60DH4U!-*45-3U)9#0H-"@T*#0I%0TA/(%U;M(%-0145#2"!364Y42\$5325I%4@T*05!014Y\$25@@+2!304U03\$4@5D]#04)5M3\$%260T*#0I!+BXN+BXN+BXN+BXQ-S0P." @("!!1\$1%1"XN+BXN+BXQ-S0RM-2 @("!!3E-715(N+BXN+BXQ-S0T- T*041\$+BXN+BXN+BXN,3<T,3<@(" @M04Y\$+BXN+BXN+BXN,3<T,S0@(" @05!03\$4N+BXN+BXN,3<T-3<- "@T*0BXNM+BXN+BXN+BXN,3<T-CD@(" @0DQ512XN+BXN+BXN,3<T.3 @(" @0EE412XNM+BXN+BXN,3<U,3 -"D),04-++BXN+BXN+C\$W-#<W(" @(\$)9+BXN+BXN+BXNM+C\$W-3 R#0H-"D,N+BXN+BXN+BXN+C\$W-3(Q(" @(\$-,3U-%+BXN+BXN+C\$WM-34Q(" @(\$-/3E123TPN+BXN+C\$W-3DU#0I#051!3\$]' +BXN+BXQ-S4S,B @M("!#3TQ/4BXN+BXN+BXQ-S4W," @("!#3U)214-4+BXN+BXQ-S8Q, T*0T5.M5%,N+BXN+BXN,3<U-#@@(" @0T]-34\$N+BXN+BXN,3<U.#,-"@T*1"XN+BXNM+BXN+BXN,3<V,C0@(" @1\$E32RXN+BXN+BXN,3<V-S @(" @1\$N+BXN+BXNM+BXN,3<W,C0-"D1!5\$4N+BXN+BXN+C\$W-C,R(" @(\$1)5DE\$12XN+BXN+C\$WM-C@P(" @(\$1/3\$Q!4E,N+BXN+C\$W-S,R#0I\$14-)34%,+BXN+BXQ-S8T,2 @M("!\$259)1\$5\$+BXN+BXQ-S8Y-2 @("!\$3TXG5"XN+BXN+BXQ-S<T-PT*1\$5,M151%+BXN+BXN,3<V-38@(" @1%)5D4N+BXN+BXN,3<W,3,-"@T*12XN+BXNM+BXN+BXN,3<W-3@@(" @14Q%5D5.+BXN+BXN,3<X,# @(" @15)23U(N+BXNM+BXN,3="3\$-"D5)1TA4+BXN+BXN+C\$W-S8U(" @(\$5.1"XN+BXN+BXN+C\$WM.#\$U(" @(\$530T%012XN+BXN+C\$W.#8R#0I%24=(5\$5%3BXN+BXQ-S<W-2 @M("!\$3E1%4BXN+BXN+BXQ-S@R-2 @("!%6\$-,04U!5\$E/3BXQ-T(W-" @ (T*M14E'2%19+BXN+BXN,3<W.#D@(" @15%504Q3+BXN+BXN,3<X,S@-"@T*1BXNM+BXN+BXN+BXN,3<X.3D@(" @1DE24U0N+BXN+BXN,3<Y-#@(" @1D]25%DNM+BXN+BXN,3<Y-S4-"D9!3%-+%+BXN+BXN+C\$W.3 U(" @(\$9)3\$4N+BXN+BXNM+C\$W.34S(" @(\$9/55(N+BXN+BXN+C\$W.3@W#0I&2494145.+BXN+BXQ-SDQM-B @("!&259%+BXN+BXN+BXQ-SDV-2 @("!&3U525\$5%3BXN+BXQ-SDY-PT*M1DE&5%DN+BXN+BXN,3<Y,S -"@T*1RXN+BXN+BXN+BXN,3@P,3@(" @1T]/M1"XN+BXN+BXN,3@P,C@@(" @1U5%4U,N+BXN+BXN,4(P-#@-"D=!344N+BXNM+BXN+C\$X,%I/(@(\$=2145.+BXN+BXN+C\$X,#,Y#0H-"D@N+BXN+BXN+BXNM+C\$X,#4W(" @(\$A%3% N+BXN+BXN+C%3,#<U(" @(\$A53D12140N+BXN+C\$XM,#DX#0I(14Q,3RXN+BXN+BXQ.# V-2 @("!(24=(+BXN+BXN+BXQ.# X. T*M#0I)+BXN+BXN+BXN+BXQ.#\$Q,B @("!)3D-/4E)%0U0N+BXQ.#\$S-" @("!)M4RXN+BXN+BXN+BXQ.#\$X-T*248N+BXN+BXN+BXN,3@Q,C\$@(" @24Y0550NM+BXN+BXN,3@Q-3,@(" @250N+BXN+BXN+BXN,3@Q.3 -"DE.+BXN+BXN+BXNM+C\$X,3(W(" @(\$E.4T525"XN+BXN+C\$X,38X#0H-"DHN+BXN+BXN+BXN+C\$XM,3DX#0H-"DLN+BXN+BXN+BXN+C\$X,C V(" @(\$M%62XN+BXN+BXN+C\$X,C\$TM(" @(\$M%64)/05)\$+BXN+C%,C(R#0H-"DPN+BXN+BXN+BXN+C\$X,C,V(" @M(\$Q)4U0N+BXN+BXN+C\$X,C4V(" @(\$Q/5RXN+BXN+BXN+C\$X,C<Y#0I,1494M+BXN+BXN+BXQ.#(T-2 @("!,3T%\$+BXN+BXN+BXQ.#(V-PT*#0I-+BXN+BXNM+BXN+BXQ0C(Y," @("!-24Q,24].+BXN+BXQ.#,R." @("!-54Q425!,62XNM+BXQ.#,U-0T*34%.62XN+BXN+BXN,3@S,#\$@(" @34E.55,@+BXN+BXN,3@SM-\$#@(" @355,5\$E03\$E%1"XN,3@S-S8-"DU%34]262XN+BXN+C\$X,S\$T#0H-M"DKN+BXN+BXN+BXN+C\$X,SDX(" @(\$Y)3D4N+BXN+BXN+C\$X-#,Q"4XP+BXNM+BXN+BXN+C\$X-#@P#0I.04U%+BXN+BXN+BXQ.#0P.2 @("!.24Y%5\$5%3BXNM+BXQ.#0T,@E.3U<N+BXN+BXN+BXQ.#0X.0T*3D585"XN+BXN+BXN,3@T,3@@

M(" @3DE.1519+BXN+BXN,3@T-C()3E5-0D52+BXN+BXN,3@T.3<- "@T*,30-
M"D5#2\$@\75L@4U!%14-((%-93E1(15-)6D52#0I!4%!%3D1)6" M(%-!35!,
M12!63T-!0E5,05)9#0H-"C N+BXN+BXN+BXN+C\$X-3\$P(" @(\$].12XN+BXN
M+BXN+C\$X-3,T("@(\$]2+BXN+BXN+BXN+C\$X-34U#0I/1D8N+BXN+BXN+BXQ
M.#4Q.2 @("!/4\$5.+BXN+BXN+BXQ.#4T,B @("!/550N+BXN+BXN+BXQ.#4V
M- T*3TXN+BXN+BXN+BXN,3@U,C4-"@T*4"XN+BXN+BXN+BXN,3@U-S,@(" @
M4\$5224]\$+BXN+BXN,3@V,30@(" @4%)%4U,N+BXN+BXN,4(V-#@-"E!!4D5.
M5\$A%4TE3+C\$X-3@S(" @(!,55,N+BXN+BXN+C\$X-C(W(" @(!224Y4+BXN
M+BXN+C\$X-C4X#0I015)#14Y4+BXN+BXQ.#8P," @("!03U5.1"XN+BXN+BXQ
M.#8S." @("!04D]'4D%-+BXN+BXQ.#8W, T*#0I1+BXN+BXN+BXN+BXQ.#93
M-2 @("!154535\$E/3BXN+BXQ.#8Y-PT*#0I2+BXN+BXN+BXN+BXQ.#<Q,2 @
M("!214U/5D4N+BXN+BXQ.#<R.2 @("!215154DXN+BXN+BXQ.#<U.0T*4D5\$
M+BXN+BXN+BXN,3@W,C @(" @4D5014%4+BXN+BXN,3@W-#,@(" @4DE'2%0N
M+BXN+BXN,3@W-S0-"@T*4RXN+BXN+BXN+BXN,3@W.#4@(" @4T5614Y462XN
M+BXN,3@X-C0@(" @4U!%3\$PN+BXN+BXN+C\$X.3,S#0I3059%+BXN+BXN+BXQ
M.#<Y,B @("!325@N+BXN+BXN+BXQ.#@W." @("!35\$%25"XN+BXN+BXQ.#DT
M,@T*4T5#3TY\$+BXN+BXN,3@X,#\$@(" @4TE85\$5%3BXN+BXN,3@X.#@@(" @
M4U1/4"XN+BXN+BXN,3@Y-3,-"E-%34E#3TQ/3BXN+C\$X.#\$T(" @(%-)6%19
M+BXN+BXN+C\$X.3 S(" @(%-50E1204-4+BXN+C\$X.38T(T*4T5614XN+BXN
M+BXN,3@X,S4@(" @4T]24EDN+BXN+BXN,3@Y,34@(" @4U5"5%)!0U1%1"XN
M,3@Y-SD#@#0I3159%3E1%14XN+BXQ.#@T-2 @("!34\$%#12XN+BXN+BXQ.#DR
M-0T*#0I4+BXN+BXN+BXN+BXQ.#DY-R @("!42\$E25\$5%3BXN+BXQ.3 T-R @
M("!44EDN+BXN+BXN+BXQ.3\$P.2 -"E!4\$4N+BXN+BXN+C\$Y,# W(" @(!1(
M25)462XN+BXN+C\$Y,#8P(" @(!2544N+BXN+BXN+C\$Y,3\$Y(T*5\$A!5"XN
M+BXN+BXN,3DP,38@(" @5\$A)4RXN+BXN+BXN,3DP-S @(" @5%=%3%9%+BXN
M+BXN,3DQ,C#@#0I414XN+BXN+BXN+BXQ.3 R-2 @("!42\$]54T%.1"XN+BXQ
M.3 W-R @("!45T5.5%DN+BXN+BXQ.3\$T," -"E1(12XN+BXN+BXN+C\$Y,#,S
M(" @(!1(4D5%+BXN+BXN+C\$Y,#@Y(" @(!173RXN+BXN+BXN+C\$Y,34Q(T*
M5\$A%,2XN+BXN+BXN,3DP-#\$@(" @5\$E-12XN+BXN+BXN,3DP.3@@(" @5%E0
M12XN+BXN+BXN,3DQ-3D-"@T*52XN+BXN+BXN+BXN,3DQ-S @(" @54@#3T@N
M+BXN+BXN,3DQ0C\$@(" @54Y\$15)35\$%.1"XN,3DQ.3 -"@T*5BXN+BXN+BXN
M+BXN,3DR,#<@(" @5D%,544N+BXN+BXN,3DR,3<-"@T*5RXN+BXN+BXN+BXN
M,3DR,S\$@(" @5TA%4D4N+BXN+BXN,3DR-S<@(" @5TE,3"XN+BXN+BXN,3DS
M,#,@#0I705,N+BXN+BXN+BXQ.3(T.2 @("!72\$E412XN+BXN+BXQ.3(X-2 @
M("!7251(+BXN+BXN+BXQ.3,Q,2 -"E=(050N+BXN+BXN+C\$Y,C4X(" @(%=(
M3RXN+BXN+BXN+C\$Y,CDU(" @(%=23TY'+BXN+BXN+C\$Y,S\$X(T*5TA%3BXN
M+BXN+BXN,3DR-CD-"@T*6"XN+BXN+BXN+BXN,3DS,C8-"@T*62XN+BXN+BXN
M+BXN,3DS,S4@(" @6453+BXN+BXN+BXN,3DS-3@@(" @64]54BXN+BXN+BXN
M,3DS-C8#@#0I914Q,3U<N+BXN+BXQ.3,T-0T*#0I:+BXN+BXN+BXN+BXQ.3,W
M-R @("!:15)/+BXN+BXN+BXQ.3,X-R @("!%3D0@3T8@1DE,12XQ.3,Y.0T*
M#0H-"D5#2\$@\75L@4U!%14-((%-93E1(15-)6D52#0I705)204Y460T*#0I,
M24U)5\$5\$(%=!4E)!3E19#0H-"D5V97)Y('!R;V1U8W0@;6%N=69A8W1U<F5D
M(&)Y("!3=')E970@(\$5L96-T<F]N:6-S(\$-O<G!O<F%T:6]N(&ES(&9U;&QY
M('!E<W1E9"!A;F0@<75A;&ET>2!C:&5C:V5D(&)E9F]R92!S:&EP;65N="!A
M;F0@:7,@=V%R<F%N=&5D('!O(&)E(&9R964@9G)O;2!D969E8W1S(&EN(&UA
M=&5R:6%L<R!A;F0@=V]R:VUA;G-H:7 @9F]R(&\$@<&5R:6]D(&]F(#DP(&1A
M>7,@9G)O;2!D871E(&]F('!U<F-H87-E+B!\$=7)I;F<@=&AA="!T:6UE('!E
M<FEO9"P@4W1R965T(\$5L96-T<F]N:6-S(\$-O<G!O<F%T:6]N('=I;&PL(&%T
M(&YO(&-H87)G92P@<F5P86ER(&]R(')E<&QA8V4@86YY(&1E9F5C=&EV92!U
M;FET(')E='5R;F5D('!O(&ET<R!397)V:6-E(\$!E<&%R=&UE;GON#0H-"E-T
M<F5E="!%;&5R(')O;FEC<R!#;W)P;W)A=&EO;B!D:7-C;&%I;7,@86YY(&QI
M86)I;&ET>2!T;R!U<V5R<R!O9B!I=',@<')O9'5C=',@9F]R(&-O;G-E<75E
M;G1I86P@9&%M86=E<R!O9B!A;GD@:VEN9"!A<FES:6YG(&9R;VT@870@8V]N
M;F5C=&5D('=I=&@=&AE('5S92!O9B!I=',@<')O9'5C=',N#0H-"E1H:7,@
M=V%R<F%N='D@:7,@=F]I9"!I;B!C87-E<R!O9B!M:7-U<V4L(&%B=7-E+"!A
M8FYO<FUA;"!C;VYD:7!I;VYS(&]F(&]P97)A=&EO;B!O<B!A='!E;7!T<R!T
M;R!A;'!E<B!O<B!M;V1I9GD@=&AE(&9U;F-T:6]N(&]F(&\$@<&%R="!O<B!A
M<W-E;6]L>2X-"@T*5&AI<R!L:6UI=&5D('=A<G)A;G1Y(&ES(&EN(&QI974@
M;V8@(&%L;" @;W1H97(@=V%R<F%N=&EE<R!E>'!R97-S960@;W(@:6UP;&EE

M9"!A;F0@;F\@<F5P<F5S96YT871I=F4@;W(@;W1H97(@<&5R<V]N(&ES(&%U
M=&AO<FEZ960@=&\@<F5P<F5S96YT(&]R(&%S<W5M92!F870@4W1R965T(\$5L
M96-T<F]N:6-S(\$-O<G!O<F%T:6]N(&%N>2!W87)R86YT>2!L:6%B:6QI='D@
M8F5Y;VYD('1H870@<V5T(&9O<G1H(&AE<F5I;BX-"@T*5&AI<R!W87)R86YT
M>2!G:79E<R!Y;W4<W!E8VEF:6,@;&5G86P@<FEG:'1S+"!A;F0@>6]U(&UA
M>2!A;'-O(&AA=F4@861D:71I;VYA;"!R:6=H=',@=VAI8V@=@=F%R>2!F<F]M
M('T871E('!O#0IS=&%T92X-"@T*26X@(&-A<V4@(&]F("!P<F]B;&5M<R!W
M:71H(&\$@4W1R965T(\$5L96-T<F]N:6-S(\$-O<G!O<F%T:6]N('!R;V1U8W0L
M('!L96%S92!N;W1I9GD@=7,@;V8@=&AE(&UO9&5L+"!S97)I86P@;G5M8F5R
M+"!D871E(&]F('!U<F-H87-E+"!A;F0@<&%R=&EC=6QA<B!D971A:6QS+B!\$
M;R!N;W0@<F5T=7)N('1H92!U;FET('!O(%-T<F5E="!%;&5C='!O;FEC<R!#
M;W)P;W)A=&EO;B!U;G1I;"!Y;W4@:&%V92!R96-E:79E9"!A=71H;W)I>F%T
M:6]N('!O(&1O('!O+@T*#0I7:&5N('!E='5R;FEN9R!E<75I<&UE;G0L('!H
M:7 @:6X@=&AE(&]R:6=I;F%L(&-A<G1O;B!O<B!S96-U<F5L>2!P86-K960@
M:6X@82!C87)D8F]A<F0@8V%R=&]N('!I=&@@870@;&5A<W0@='!O(&EN8VAE
M<R!O9B!C=7-H:6]N960@<&%C:VEN9R!M871E<FEA;"!O;B!A;&P@<VED97,N
M(\$UA<FL@=&AE('!A8VMA9V4@(D9204=)3\$4B(&%N9"!S:&EP('9I82!54%,L
M(%!A<F-E;"!O;W-T+"!O<B!!:7(@1G)E:6=H="P@:6YS=7)E9"!A;F0@<'!E
M<&%I9"X*-\$-O;&QE8W0@<VAI<&UE;G1S('!I;&P@8F4@<F5F=7-E9"!A;F0@
M<F5T=7)N960N*2!%;F-L;W-E(&\$@8VQE87(@9&5S8W)I<'!I;VX@;V8@=&AE
M('!R;V)L96US(&5X<&5R:65N8V5D+"!P<F]O9B!O9B!P=7)C:&%S92 @9&%T
M92P@('!E='5R;B!A9&1R97-S+"!A;F0@<'!E9F5R<F5D('!H:7!P:6YG(&UE
K=&AO9"X-"@T*#0I%0TA/(%U;(%-0145#2"!364Y42\$5325I%4@T*#0H-"FUE
、

end

E N D O F F I L E
echoii.docs.uue
E N D O F F I L E

```
#####
### FILE      : encoding35
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 4731 bytes   4 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!mntp.coast.net!news.kei.com!newsfeed.internetmci.
com!in2.uu.net!news.u.washington.edu!news.uoregon.edu!cie-2.uoregon.edu!nparker
From: nparker@cie-2.uoregon.edu (Neil Parker)
Newsgroups: comp.sys.apple2.programmer
Subject: Re: Q: 3.5" encoding scheme
Date: 24 Jun 1996 09:50:51 GMT
Organization: University of Oregon Campus Information Exchange
Lines: 98
Distribution: world
Message-ID: <4qlodr$mad@pith.uoregon.edu>
References: <4qjdnj$t5a@elna.ethz.ch>
NNTP-Posting-Host: cie-2.uoregon.edu
```

```
In article <4qjdnj$t5a@elna.ethz.ch> GUDATH@EZINFO.VMSMAIL.ETHZ.CH (Henrik
'Ratte' Gudat) writes:
>[...snip...]
>- as with 5.25" disks, address fields are encoded 4&4, the data chunk 6&2,
>right?
```

Wrong. The address fields of a 3.5-inch disk are encoded 6&2 (sort of).
The address field looks like this:

\$D5, \$AA, \$96, track, sector, sides, format, checksum, \$DE, \$AA

Each datum in the address field is a 6-bit number. Their meanings are as follows:

track	The low-order six bits of the track number
sector	The sector number
sides	Bit 0 is the high-order bit of the track number Bit 5 is the side number (0 for side 1, 1 for side 2) All other bits are zero (i.e. the number looks like "s0000t")
format	The low four bits are the interleave (usually 2, unless the disk was formatted on a Unidisk 3.5) The high bit is the number of sides (0=single, 1=double) Bit 4 is always 0 (the number looks like "s0iiii")
checksum	A checksum of the previous four values (I'm not sure, but I think it's computed by EORing)

Each of these numbers is translated to a valid disk byte by looking it up in the 6&2 translation table (so that 0 becomes \$96, 1 becomes \$97, 2 becomes \$9A, etc.).

```
>- the two bits that are rolled out of each byte (6&2 scheme) are put into a
>secondary buffer. Where will this buffer be written? After the main buffer
>(with bits 2-8 of each byte)? or will it also be divided by some magic figure
>(for example, 6 chunks of 86 bytes from main buffer and 27 bytes from secondary
>each)?
```

It's a bit more complicated than that.

There are, in effect, four buffers. They get filled something like this:

```
1st byte --> 6 bits to byte 1 of buffer 1, 2 bits to byte 1 of buffer 4
2nd byte --> 6 bits to byte 1 of buffer 2, 2 bits to byte 1 of buffer 4
3rd byte --> 6 bits to byte 1 of buffer 3, 2 bits to byte 1 of buffer 4
4th byte --> 6 bits to byte 2 of buffer 1, 2 bits to byte 2 of buffer 4
5th byte --> 6 bits to byte 2 of buffer 2, 2 bits to byte 2 of buffer 4
and so forth.
```

All the while a three-byte checksum is being computed, in a very hard-to-understand way. Watch out! The checksum computation modifies the data, just like it does on the 5.25-inch drive.

Once the buffers are filled, they're written:

```
1st byte of buffer 1
1st byte of buffer 2
1st byte of buffer 3
1st byte of buffer 4
2nd byte of buffer 1
2nd byte of buffer 2
etc.
```

So the byte containing the extra two bits from three other bytes is written immediately following those three bytes. The three-byte checksum expands to four bytes in exactly the same fashion.

The data field looks like this:

```
$D5, $AA, $AD, track, 699 data bytes, 4 checksum bytes, $DE, $AA
```

The "track" number is identical to the "track" number from the address field.

Remember that the original data is 524 bytes, not 512.

>- is the book "Beneath Apple ProDOS" still available? :-)))))

I think Byteworks still sells it. But it was written before the 3.5-inch drive was available for the Apple II, so its contents are only relevant in a very general sort of way.

- Neil Parker

P.S. I recommend having a look at the 3.5-inch drive I/O routines in the IIGS ROM. You can find them by looking in the SetHook/GetHook table, which is at \$E10F6F in ROM 1 (note that there are two identical JMP instructions for each vector). It's best to do this without booting GS/OS, because GS/OS patches the vectors. See the file on undocumented Smartport info on my home page, <http://cie-2.uoregon.edu/~nparker>.

P.P.S. Are you aware that something keeps adding control-P's to the subject lines of your postings? I've seen it in at least three unrelated posts from you.

--

Neil Parker

| No cute quote, no cute ASCII art, no cute

nparker@cie-2.uoregon.edu | disclaimer, no deposit, no return....
nparker@cie.uoregon.edu | (This space intentionally left blank:
http://cie-2.uoregon.edu/~nparker |)

E N D O F F I L E
encoding35
E N D O F F I L E

```
#####
### FILE      : eprom.convert
#####
### Created   : Friday, April 9, 1999  Modified: Friday, April 9, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2858 bytes   2 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.erols.net!newspeer.monmouth.com!intgwpad.nntp.telstra.net!newsl.
optus.net.au!optus!news.usyd.edu.au!news.uow.edu.au!david
From: david@uow.edu.au (David Wilson)
Newsgroups: comp.sys.apple2
Subject: Re: II+ vs IIe Char Gen PROMs and Shift-key mods-- LC $F8 PROM mod
Date: 9 Apr 99 02:54:01 GMT
Organization: University of Wollongong, Australia
Lines: 38
Message-ID: <david.923626441@wraith>
References: <7cosa7$rgl$l@nnrpl.dejanews.com> <36F01E44.8DB3CAE4@swbell.net>
<1doxxsz.5zmnazv7ggaN@dempson.actrix.gen.nz> <3701FF21.C4F327BD@swbell.net>
<37020A8B.46585F3E@iolinc.net> <37023162.11165D84@swbell.net>
<37041CA0.6C13D2DE@iolinc.net> <3704A7A3.72AE153F@swbell.net>
<3704B626.DF28564C@iolinc.net> <370C3F1C.8D3C3DA3@swbell.net>
<david.923554356@wraith> <370CB616.B63AD078@swbell.net>
NNTP-Posting-Host: wraith.cs.uow.edu.au
X-Trace: wyrm.its.uow.edu.au 923627584 5827 130.130.64.1 (9 Apr 1999 03:13:04 GMT)
X-Complaints-To: usenet@wyrm.its.uow.edu.au
NNTP-Posting-Date: 9 Apr 1999 03:13:04 GMT
X-Newsreader: NN version 6.5.0 #15 (NOV)
Xref: newsl.icaen comp.sys.apple2:146701
```

```
Rubywand <rubywand@swbell.net> writes:
>David Wilson writes ...
>>The only problem with this change is that the ROMs in a ][ or ][+ are not
>>pin-compatible with EPROMs of the same size. Thus, to make this change you
>>would need to wire an adapter between the EPROM and the ROM socket to sort out
>>the chip select polarities.

> True. The 2516 and 2716 2k x 8 PROMs come close.

> One problem is that the ROMs have three enable/select pins; the PROM has two.

> Fortunately, the Apple II uses only two select lines; so, the main thing you
>need to add to an adaptor is an inverter-- like a 74LS04 or any other inverting
>gate.
```

According to Jim Sather, the inverter can be dispensed with:

```
Pin # ROM socket      2716 (except TMS2716 - use TMS2516 instead)
18   CS2 (active high) /CE (active low)
20   CS1' (active low) /G (active low)
21   CS3' (active low) Vpp (25v prog, 5v read)
```

So if pin 18 (ROM) goes to pin 21 (EPROM) and pin 20 (ROM) goes to both pin 20 and 18 (EPROM) it should work.

Looking at the 2716 data sheets I have this is not valid as Vpp is only

defined at 5v and 25v, not at 0v. If you do not have any cards which drive the INHIBIT' line then this will not be a problem.

>Probably, a II+ will have the Language Card plugged into Slot 0. With the LC >plugged in the \$F8 ROM used is going to be the one on the LC; so, this is >where you would swap in the adaptor with the PROM.

If you have a Language Card, it already has two solder points to convert it to 2716 polarity. A third point marked F8 should be left open unless you want the motherboard F8 PROM used when the motherboard BASIC is selected.

--

David Wilson School of IT & CS, Uni of Wollongong, Australia david@uow.edu.au

```
##### E N D O F F I L E
### eprom.convert
##### E N D O F F I L E
```

```
#####
### FILE      : ethernet.cards
#####
### Created   : Thursday, September 9, 1999   Modified: Thursday, September 9, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1495 bytes   1 KB
#####
```

Article 152387 of comp.sys.apple2:

Path:

newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!hammer.uoregon.edu!newshub.north
east.verio.net!howland.erols.net!portc02.blue.aol.com!audrey01.news.aol.com!not-
for-mail

From: supertimer@aol.com (Supertimer)

Newsgroups: comp.sys.apple2

Subject: Re: New Ethernet card for the Apple II

Lines: 29

NNTP-Posting-Host: ladder07.news.aol.com

X-Admin: news@aol.com

Date: 09 Sep 1999 04:28:58 GMT

References: <37D6C727.CA037176@SPAM_wanadoo.fr>

Organization: AOL <http://www.aol.com>

Message-ID: <19990909002858.08450.00003745@ng-fr1.aol.com>

Xref: newsl.icaen comp.sys.apple2:152387

Babar de Saint Cyr <babardesaintcyr_NO@SPAM_wanadoo.fr> wrote:

```
>> are you planning to mass produce these Ethernet
>> cards for the Apple II?
>
>Absolutely not.
>I have no time, no possibility.
```

Too bad, but...

>But to built it is simple:

```
>- the ethernet module
>- any test/prototype board you can find for Apple2
>- two wellknow low cost TTL chips
>Doable by any hobbist.
```

That's good news. Last time I checked, at least one of the following sources have Apple II prototype boards (empty Apple Bus slot cards) that you could just plug components in and solder wiring to:

<http://www.digikey.com/> DigiKey Corporation

<http://www.jdr.com/> JDR Microdevices

Once the driver is written, perhaps the design for this card can be added to the FAQ. That way, IIGS users can build their own Ethernet card! Or maybe a company in the States like Alltech can manufacture them on PCBs!

```
##### E N D O F F I L E
### ethernet.cards
```

E N D O F F I L E

```
#####
### FILE      : falsereads.6502
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2479 bytes   2 KB
#####
```

```
Path: news.uiowa.edu!chi-
news.cic.net!sintel!harbinger.cc.monash.edu.au!news.cs.su.oz.au!metro!news.ci.com.
au!wabbit.cc.uow.edu.au!wabbit.cc.uow.edu.au!not-for-mail
From: david@wraith.cc.uow.edu.au (David E A Wilson)
Newsgroups: comp.emulators.apple2,comp.sys.apple2,comp.sys.apple2.programmer
Subject: Re: 6502 false references?
Date: 22 Oct 1995 12:04:19 +1000
Organization: University of Wollongong, NSW, Australia.
Lines: 69
Message-ID: <46c8r3$ijr@wraith.cc.uow.edu.au>
References: <45ulkp$ppd@post.gsfc.nasa.gov> <462ah4$as_001@news.usa.net>
NNTP-Posting-Host: wraith.cs.uow.edu.au
Xref: news.uiowa.edu comp.emulators.apple2:4091 comp.sys.apple2:94056
comp.sys.apple2.programmer:5613
```

```
>In article <45ulkp$ppd@post.gsfc.nasa.gov>,
> klipsch@ssvs.gsfc.nasa.gov (Colin Klipsch) wrote:
>>My question is: which 6502 instructions generate double references? More
>>specifically, which instructions will hit the speaker twice instead of
>>once, when applied to the speaker I/O addresses? I've looked in
>>Leventhal's and Zak's 6502 books, but didn't find this information.
```

From MOS Microcomputers Hardware Manual (publication number 6500-10A) Jan 1976:

```
ASL,CLC,CLD,CLI,CLV,DEX,DEY,INX,INY,LSR,NOP,ROL,SEC,SED,SEI,
TAX,TAY,TSX,TXA,TXS,TYA
single byte instruction
    false read of following opcode
```

```
ADC,AND,BIT,CMP,CPX,CPY,EOR,LDA,LDX,LDY,ORA,SBC
indirect,x
    false read of 00mn before x is added to mn
absolute,x or absolute,y
    false read if page crossing occurs
zp,x or zp,y
    false read of 00mn before x/y is added to mn
indirect,y
    false read if page crossing occurs
```

```
STA,STX,STY
indirect,x
    false read of 00mn before x is added to mn
absolute,x or absolute,y
    false read
zp,x or zp,y
    false read of 00mn before x/y is added to mn
indirect,y
    false read
```

ASL,DEC,INC,LSR,ROL,ROR

zp or absolute
false write of old data

zp,x or abs,x
false read of 00nn before x is added to nn
false write of old data

PHP,PHA
false read of following opcode

PLP,PLA
false read of following opcode
false read of stack (before stkptr incremented)

JSR
false read of stack

BRK
false read of following opcode

RTI
false read of following opcode
false read of stack

RTS
false read of following opcode
false read of stack
false read of byte before next instruction to execute

Bxx
false read of PC+2+offset (no carry) if page crossed

Hope this helps. Let me know if you need the full cycle by cycle details.

--

David Wilson Dept CompSci Uni Wollongong Australia david@cs.uow.edu.au

E N D O F F I L E
falsereads.6502
E N D O F F I L E

```
#####
### FILE      : fastpath4
#####
### Created   : Saturday, November 7, 1998 Modified: Saturday, November 7, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3877 bytes   3 KB
#####
```

Path:

newsl.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!vixen.cso.uiuc.edu!howland.erol
s.net!newsfeed.berkeley.edu!xmission!nntp.csuchico.edu!orion.whowhere.com!namche.S
un.COM!sunnewsl.Eng.Sun.COM!engnewsl.eng.sun.com!not-for-mail

From: Charles Stephens <devnull@dobbs.eng.sun.com>

Newsgroups: comp.sys.apple2

Subject: Re: Fastpath 4 Information

Date: 06 Nov 1998 10:34:20 -0800

Organization: Sun Microsystems, Inc.

Lines: 30

Message-ID: <afkvhkshdqr.fsf@dobbs.eng.sun.com>

References: <Pine.SGI.3.91r.981106101731.16431B-100000@tcfreenet.org>

NNTP-Posting-Host: brak.eng.sun.com

X-Face:

(xx[.&.0Swozm=m{+3EKI-Wiz/bZn}xO&',E2Q}s!4BVkO"5Warsdm>3E}5uY'wkp%(zm{pl>A<S%/\$}{g
!)W|4T9mRlK}V[lyOV*O[eUz4<7P,HtN{]_ ;0kU;09+:yL2T7Oo^mrp{DYlcWZc-kRGaJhn+qlU

X-Newsreader: Gnus v5.5/XEmacs 20.4 - "Emerald"

Xref: newsl.icaen comp.sys.apple2:141422

>>>> "GB" == Greg J Buchner <buchner@tcfreenet.org> writes:

GB> So, someone out there in CSA2 must have some info on the
GB> Kinetics (Shiva) Fastpath 4 router I got. I have downloaded
GB> the v9.1.2 software from Shiva's website, but the Fastpath
GB> needs to be reset. It has the v5.1 ROMs and on the Shiva
GB> website it says to call Tech Support. But I figure I
GB> probably have a better chance of getting an answer through
GB> here than from Shiva these days.

GB> So, any information on the Fastpath 4 would be greatly
GB> appreciated.

Open the unit and on the motherboard there should be 3 pairs of jumper
blocks and two jumpers. Make a record of which posts the jumpers are
on and remove them. Wait about 30 minutes and replace the jumpers.
Then power the unit and run the utility program.

Also be sure to read the release notes to make sure you are running
the correct FP utility. There are two and one of them is for the FP5
only.

cfs

--

Charles F. Stephens = cfs AT eng.sun.com
Software Psychic and Illuminary =
Solaris Network Sustaining = "We know what you buy, we know where you
Solaris Software = live." -- Wesayso Corp.
Sun Microsystems, Inc. =
Menlo Park, California, USA =

Path:
 newsl.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!nyd.news.ans.net!newsfeeds.ans.net!news.idt.net!dcal-hubl.news.digex.net!digex!news2.randori.com!tcfreenet.org!buchner
 Newsgroups: comp.sys.apple2
 From: "Greg J. Buchner" <buchner@tcfreenet.org>
 Subject: Re: Fastpath 4 Information
 In-Reply-To: <afkvhkshdqr.fsf@dobbs.eng.sun.com>
 Message-ID: <Pine.SGI.3.91r.981106175841.10363B-100000@tcfreenet.org>
 References: <Pine.SGI.3.91r.981106101731.16431B-100000@tcfreenet.org>
 <afkvhkshdqr.fsf@dobbs.eng.sun.com>
 MIME-Version: 1.0
 Content-Type: TEXT/PLAIN; charset=US-ASCII
 Lines: 25
 Date: Fri, 6 Nov 1998 18:00:53 -0600
 NNTP-Posting-Host: 206.8.96.2
 X-Trace: news2.randori.com 910396958 206.8.96.2 (Fri, 06 Nov 1998 16:02:38 PDT)
 NNTP-Posting-Date: Fri, 06 Nov 1998 16:02:38 PDT
 Xref: newsl.icaen comp.sys.apple2:141430

On 6 Nov 1998, Charles Stephens wrote:

```
> >>>> "GB" == Greg J Buchner <buchner@tcfreenet.org> writes:
>
> GB> So, someone out there in CSA2 must have some info on the
> GB> Kinetics (Shiva) Fastpath 4 router I got. I have downloaded
>
> Open the unit and on the motherboard there should be 3 pairs of jumper
> blocks and two jumpers. Make a record of which posts the jumpers are
> on and remove them. Wait about 30 minutes and replace the jumpers.
> Then power the unit and run the utility program.
```

But, on the Shiva website it says not to do that if you have the v5.1 ROM's, which I do have.

It says to contact Shiva Tech Support...and I don't really feel like calling their normal number and trying to talk with someone. If they had e-mail tech support it'd be a bit better.

Greg B.

```
+-----+
| buchner@tcfreenet.org -or- gjb@wavetech.net |
+-----+
```

```
##### E N D O F F I L E
### fastpath4
##### E N D O F F I L E
```

```
#####
### FILE      : fasttwgs
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 11892 bytes   11 KB
#####
```

```
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!zaphod.mps.ohio-
state.edu!howland.reston.ans.net!agate!spool.mu.edu!uwm.edu!caen!destroyer!cs.ubc.
ca!unixg.ubc.ca!kakwa.uca.ualberta.ca!ersys!herbertf
From: herbertf@ersys.edmonton.ab.ca (Herbert Fung)
Newsgroups: comp.sys.apple2
Subject: Transwarp GS upgrade article
Message-ID: <aFZBZB2w165w@ersys.edmonton.ab.ca>
Date: Sun, 21 Feb 93 09:53:09 MST
Organization: Edmonton Remote Systems #1, Edmonton, AB, Canada
Lines: 266
```

The following is a post I found a few months ago. This should answer most questions about the TransWarp GS upgrade that people have been asking me, and whether or not you need the GAL chip upgrade. Of course the information about the availability of the GAL chips is outdated.

[begin repost]

```
From: posty@soecs.uts.edu.au (Andrew Roughan)
Newsgroups: comp.sys.apple2
Subject: Transwarp GS upgrade article
Date: 22 Oct 92 07:18:34 GMT
Organization: Computing Sciences, Uni of Technology, Sydney.
Lines: 237
```

This is an article I wrote for my local user group magazine. Information was sourced heavily from fellow Internet users and GNO-L users.

I am placing it here as a summary, and because people are again starting to ask questions about topics contained herein.

Regards
Andrew

Permission is granted for any non-profit organisation to reprint this.
Please keep author and source intact.

---cut here---

Breaking the 10Mhz barrier
By Andrew Roughan
Source Apple Users' Group, Sydney Australia

Hot news travels fast these days, and seemingly none travels faster than the news of "14Mhz" 65C816 chips. The undercurrent at Kansasfest always brimmed with comments about Tim Meekins running his Transwarp GS accelerator (TWGS) at 13.75Mhz or Steven Chiang running at 14Mhz. For those of us without accelerators, running at 2.8Mhz, this is mind bogglingly fast! The chips in question originated from Sanyo who

re-engineered the 65C816 to boost its performance. The Sanyo chips run at higher speeds without needing higher voltages or cooling systems.

Western Design Center (WDC - the company behind development of the 65xxx series) purchased a large batch of these chips directly from Sanyo and have made them available to people wishing to upgrade their TWGS boards. WDC have always been able to provide limited quantities of 'engineering parts' which performed better than 7Mhz, but the Sanyo batch has brought the average performance to greater than 12Mhz.

So with a faster processor available, are manufacturers offering faster accelerators? Zip Technology offered an upgrade for a short time and now list a 14Mhz Zip GSX card. Applied Engineering do not offer anything for TWGS owners, but fortunately it is easy enough to do it yourself.

The procedure for upgrading a Zip GSX board involves cutting traces and replacing logic array circuitry, as well as purchasing a faster processor and oscillator. At this stage the process is not well documented and owners are advised to purchase the upgrade through Zip Technology directly.

Available Documentation

Until now, for most of us at with 7Mhz Transwarps, the quest for speed has been a little daunting. Getting accurate upgrade information and finding parts suppliers has been difficult.

The article by Andrew Hall, prepared for Western Design Center and published in September 1991 Applications, outlines four steps for getting the best possible speed out of the TWGS.

The National AppleWorks Users Group (NAUG) publication 'AppleWorks Forum' has three articles containing very detailed, accurate and informative information written by John Link. The issues are March, April and May 1991. These three issues are considered 'must read' material and are supplied by WDC to any prospective TWGS upgrader. When you contact WDC to purchase a 65C816 chip, they will insist on sending this document (by fax or mail) before processing your order.

The aim of this article is to give additional information not generally available. The upgrading steps are still the same, but now the faster parts available make it easier to get a faster speed which may tempt more Transwarp GS owners to break the 10Mhz barrier.

Prerequisites

The TWGS needs ROM version 1.5 (or greater) to work at speeds greater than 7Mhz. The current ROM can be obtained directly from Applied Engineering for US\$20. The NAUG document describes how to replace the ROM. It is recommended that the TWGS have the 32k Cache upgrade. This will give you the latest ROM, faster cache memory and complimentary performance improvements. The 32k Cache upgrade can be purchased locally from Two Series Software for \$99.

The other speed dependent parts on the TWGS are the GAL chips which are seated together on the right hand side of the card. The minimum versions that are known to work are TWGS1A1, TWGS2B1, TWGS3E1, TWGS4B1, TWGS5A1, TWGS6A1, TWGS7A1, TWGS8B1. A fast GAL chip set is available from LRO Computer Sales for \$79 + shipping. Applied Engineering's code for the set is 10MHZPALKIT.

Obtaining the Microprocessor

Replacement 65C816 chips are obtained directly from WDC. The processors cost US\$95. Shipping by airmail is an extra US\$5. NAUG members can obtain 65C816 chips for US\$71.25. I really shouldn't point out that if a group got together to purchase 65C816s in one shipment, that it would be worthwhile for one person to join NAUG - membership is US\$31.

Obtaining the Crystal oscillator

The WDC supplied document explains why the oscillator must be four times the speed that you wish to run your system at. The shmoo plot supplied with the processor will enable you to identify what speed the processor can run at.

You then must obtain the appropriate oscillator.

Oscillators are available on this side of the Pacific Ocean from Clarke & Severn Electronics. Different speed oscillators have different prices ranging up to \$12. Contact them for information as to pricing and availability. Non "off the shelf" speed oscillators can also be ordered at a cost of \$21 each. The TWGS uses a 1/2 TTL oscillator. The oscillators supplied by Clarke & Severn are standard size TTL oscillators. This means you will need to modify the oscillator to fit the TWGS. The WDC supplied document describes one method of doing this.

Another is to obtain a 16 pin DIP socket from Dick Smith Electronics for 40 cents. Cut 8 pins off of one end, and solder a jumper wire between the 8th pin (cut off) and the 4th pin (not cut off) on each side. This method has the added advantage of making oscillator swapping an effortless task whereas the NAUG method involves modifying the actual oscillator.

As an alternative to Clarke & Severn, you may like to try Digi-Key in the USA. Digi-Key have the following 1/2 TTL oscillators which fit into the TWGS with no modifications:

Mhz	Part	Price (US\$)
32	SE1101	3.60
33.33	SE1102	3.60
36	SE1103	3.60
40	SE1104	3.60
42	SE1105	3.60
46	SE1106	3.60
48	SE1107	3.60
50	SE1108	3.60
55	SE1109	3.60
60	SE1110	3.75

If you wish to look for other alternatives, make sure that you get TTL or CMOS oscillators. Sizes are 1/2 or standard. They come in metal and plastic bodies. The plastic ones work just fine and are possibly cheaper.

Obtaining faster cache memory

The standard TWGS 8k cache memory is 45 nanoseconds (ns). The 32k cache memory is 35ns. 35ns is supposedly fast enough for 14Mhz so you may not need faster SRAMs than this. Experimentation is still continuing in this area. SRAMs used by the TWGS and Zip GS are 32768x8 general purpose SRAMs. Try and get chips needing the lowest power requirements.

Sony make a very low power 25ns chip, CXK58258B-25LL, and a 15ns chip CXK58258A-15. VLSI Tech make 25ns, 20ns and 15ns chips: VT62832UHL-25, VT62832UHL-20, VT62832UHL-15. Other 25ns chips are Mosel, MS62256-25, and Paradigm, PDM41256L-25.

All the chips mentioned are available in 28 pin DIPS, with tri-state outputs.

Some may only be available in .3 inch or .6 inch widebody packages. My TWGS 32k Cache upgrade takes the .3 inch packages but you should check yours to make sure you get the correct size, otherwise some messy soldering could be involved.

Increasing the Power Supply

Increasing the power supply increases the performance of the processor, oscillator and GAL chip components thereby giving improved system performance. There are two methods of increasing the power supply to the TWGS. The first is to increase the voltage level output from the power supply which affects the whole system. Adjusting the power supply output is not a user servicable operation. Applied Engineering sell a 5.25 volt supply to NAUG members. The second is to use the 12 volt supply line on the TWGS edge connector, see Andrew Hall's article for this procedure. Running your 65C816 higher than 5.5 volts is asking for trouble. The buffer chips in the TWGS and the IIGs are TTL and the design tolerances on those don't guarantee they will survive anything above 5.5 volts. There's going to be some drop, so feeding the 65C816 5.6 volts would probably work since the rest of the machine will still see 5.5 volts, but it is not recommended to go above 5.6 volts under any circumstances.

System testing

You should allow a significant period of running time to make sure that your system is reliable. Your system may work well when cool but crash unmercilessly when warm.

Success Stories

Steven Chiang (DreamWorld Software) 14Mhz
Tim Meekins (Procyon) 13.75Mhz
Chris Deschu (Internet user) 13.75Mhz
Chris Nelligan (AUG Vice-president) 12.5Mhz
Cameron Brawn (AUG Apple // sysop) 11.5Mhz

I am currently running my ROM 3 system at 12.5Mhz. I purchased a ROM 1.8S Transwarp GS with the 32k cache upgrade directly from Two Series Software.

The GAL versions are TWGS1A1, TWGS2B1, TWGS3E1, TWGS4B1, TWGS5A1, TWGS6A1, TWGS7A1, TWGS8B1. I bought a WDC engineering part 65C816 for \$180 (including UPS freight and duty), a 50Mhz oscillator (to run my system at 12.5Mhz) from Clarke & Severn for \$7.50. I have not purchased faster SRAMs or modified the power supply.

PARTS SUPPLIERS

High speed 65C816 processors are available from:

The Western Design Center Inc. (WDC)

2166 East Brown Road

Mesa, AZ. 85213

(602) 962-4545 (voice)

(602) 835-6442 (fax)

Talk to Deborah Lamoree when you call.

Oscillators are available from:

Clarke & Severn Electronics

PO Box 1

Hornsby NSW 2077

(02) 482-1944 (voice)

(02) 482-1309 (fax)

Digi-Key

701 Brooks Ave S

PO BOX 677

Theif River Falls, MN 56701-0677

(218) 681-6674


```
#####
### FILE      : fdc10
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1424 bytes   1 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path:
news.weeg.uiowa.edu!news.uiowa.edu!uunet!orca!javelin.sim.es.com!javelin!kpopple
From: kpopple@imp.sim.es.com (Ken Poppleton)
Subject: Re: VGA card on an Apple II?
Message-ID: <1992Oct19.145430.12472@javelin.sim.es.com>
Sender: news@javelin.sim.es.com
Nntp-Posting-Host: imp.sim.es.com
Reply-To: kpopple@imp.sim.es.com (Ken Poppleton)
Organization: Evans & Sutherland Computer Corp., Salt Lake City, UT
References: <92287.154203JJMCWILL@MTUS5.BITNET> <behrenss.719055899@hphalle6>
<1992Oct15.225650.11922@fawlty.towers.oz.au> <1992Oct17.005632.6095@utstat.uucp>
Date: Mon, 19 Oct 1992 14:54:30 GMT
Lines: 23
```

In article <1992Oct17.005632.6095@utstat.uucp>, philip@utstat.uucp (Philip McDunnough) writes:

```
> In article <1992Oct15.225650.11922@fawlty.towers.oz.au>
johnmac@fawlty.towers.oz.au (John MacLean) writes:
> More than anything the GS needs
>
> (1) Inexpensive 3.5" drives.
> ...
```

This is currently available in the form of 800k IBM-PC compatible drives through the use of the FDC-10 from CTI.

```
Conversion Technology (CTI)
in the care of
Patrick L. McLaughlin
516 12th Ave
Salt Lake City, Utah 84103
```

At least the card works well for Apple II's running ProDos.

```
-----
Ken Poppleton
kpopple@imp.sim.es.com
-----
```

```
##### E N D O F F I L E
### fdc10
##### E N D O F F I L E
```

```
#####
### FILE      : fix.cap
#####
### Created   : Monday, November 18, 1996 Modified: Monday, November 18, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 3081 bytes    3 KB
#####
```

Path:

```
news1.icaen!news.uiowa.edu!news.physics.uiowa.edu!mntp.ksu.edu!news.cis.okstate.ed
u!news.ecn.uoknor.edu!munnari.OZ.AU!spool.mu.edu!uwm.edu!cs.utexas.edu!news.sprint
link.net!news-peer.sprintlink.net!news-
peer.gsl.net!news.gsl.net!portc01.blue.aol.com!audrey01.news.aol.com!not-for-mail
From: rubywand@aol.com
Newsgroups: comp.sys.apple2
Subject: Re: IIGS Monitor problem...Help, Please
Date: 18 Nov 1996 04:26:45 GMT
Organization: America Online, Inc. (1-800-827-6364) (1.10)
Lines: 54
Sender: news@aol.com
Message-ID: <19961118042900.XAA21384@ladder01.news.aol.com>
References: <hlJVYDW.tdon@delphi.com>
NNTP-Posting-Host: ladder01.news.aol.com
X-Newsreader: AOL Offline Reader
```

In article <hlJVYDW.tdon@delphi.com>, Tom O'Neill <tdon@delphi.com> writes:

```
>
>While tickling the keys two nights ago and dling my e-mail from Delphi
>using Spectrum, there was a slight "poof" sound. Immediately, the screen
>went from text to a checkerboard pattern, multicolored...red, green, and
>blue, I think...and it began flipping about once or twice a
>second...scrolling
>upwards, that is.
>....
>
```

Since you still have power for the drives, the "POOF" sounds like a blowing electrolytic capacitor. (Sometimes, they explode; sometimes, they poof.)

The main suspect is one of the caps in your power supply; but, it won't hurt to look and sniff around your Slot cards and the motherboard. If you do not find anything, pull your Slot cards, replace the 65C816 uP, and turn ON the computer.

Check the +5V line voltage. (You can find +5V on Pin 25 of any Slot socket.) If the voltage is at or close to 5V (4.8V-5.1V), there is a decent chance the 5V line is okay. Also check the other voltages (+12V at Pin 50, -12V at Pin 33, -5V at Pin 34).

If your system can boot ProDOS 8 from diskette and the display looks normal, then, suspicion falls on one of the cards you've pulled. Carefully examine each. You are looking for a capacitor with scum at its base; but, if you see a burned resistor, blown diode, ..., this could be your problem. (Diodes, however, seldom poof; resistors usually either pop or

fry. Globars can poof; but, then, you would be getting no power at all.)
Coils can poof; but, this is fairly rare.

Use your nose, too. Lots of times it can zero-in on the problem area. A blown electrolytic cap smells a bit like burned bakelite.

If your +5V line is reading low, the power supply should be pulled and checked. One test is to clip a 10 Watt 10 Ohm resistor between +5V and Gnd and measure each of the voltages from the output to Gnd. If any voltages are low, then open the supply and look/sniff around. You should find one or more caps with scum at the base and a distinctive scent and/or a charred choke coil or a cracked rectifier diode..

If the power supply seems okay, you can try increasing the load on the +5V line by adding another 10 Watt 10 Ohm resistor in parallel with the first. If it's still okay, suspicion shifts to some kind of short on the motherboard, probably on the +5V line.

Replace any bad components.

Rubywand

```
##### E N D O F F I L E  
### fix.cap  
##### E N D O F F I L E
```

```
#####
### FILE      : flash.eeprom
#####
### Created   : Friday, November 13, 1998  Modified: Friday, November 13, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2767 bytes   2 KB
#####
```

Path:

```
news1.icaen!news.uiowa.edu!uunet!in5.uu.net!news1.interlink.net!news1.interlink.net!sunqbc.risq.qc.ca!news.uow.edu.au!david
```

From: david@uow.edu.au (David Wilson)

Newsgroups: comp.sys.apple2

Subject: Re: Hardware Project

Date: 14 Nov 98 03:15:42 GMT

Organization: University of Wollongong, Australia

Lines: 43

Message-ID: <david.911013342@wraith>

References: <364919f0.0@news.cgocable.net> <364A6F6E.46D6C5B6@thegrid.net>
<david.910851756@wraith> <Pine.GSO.3.96.981112082457.18971F-100000@ordinateur>
<ldigo03.118jc48dwtlg5N@dempson.actrix.gen.nz>

NNTP-Posting-Host: wraith.cs.uow.edu.au

X-Trace: wyrm.its.uow.edu.au 911014648 9909 130.130.64.1 (14 Nov 1998 03:37:28 GMT)

X-Complaints-To: usenet@wyrm.its.uow.edu.au

NNTP-Posting-Date: 14 Nov 1998 03:37:28 GMT

X-Newsreader: NN version 6.5.0 #15 (NOV)

Xref: news1.icaen comp.sys.apple2:141759

dempson@actrix.gen.nz (David Empson) writes:

```
>Yet another variant is Flash ROM.  I've never been entirely clear on the
>difference between Flash ROM and EEPROM, as they seem to overlap in
>features.  Flash is generally characterised by being able to be erased
>and reprogrammed in sectors, while EEPROM is more often bulk erased and
>reprogrammed one byte at a time.
```

I had the same query re the difference between Flash and EEPROM.

Here is one explanation from <http://webopedia.internet.com/TERM/E/EEPROM.html>:

```
EEPROM is similar to flash memory
(sometimes called flash EEPROM).
The principal difference is that
EEPROM requires data to be written
or erased one byte at a time whereas
flash memory allows data to be
written or erased in blocks. This
makes flash memory faster.
```

I find this explanation unconvincing but reading a few data sheets gives some credence to it. For example, the MC68HC912B32 has both EEPROM and Flash EEPROM and is described as follows:

```
The chip is the first microcontroller to include both byte-erasable
EEPROM and Flash EEPROM on the same device.
```

The Flash chips I have been using lately in another project are 4Mb (512KByte)

and can be erased in 64KB blocks and are rewritten one byte at a time needing only 5v supply (the 1Mb parts we had before this needed 12v to program).

The MC68HC12A4 has internal 16 bit wide EEPROM which can be erased either by the byte, aligned word, aligned row (32 bytes) or bulk (4KB) but can only be written by the byte or aligned word.

Based on that, Flash seems less flexible than EEPROM. Having to erase 64KB to rewrite a sector would prevent its use as a standard disk but would still be useful for a read mostly disk.

EEPROM is typically good for 10,000 erase/write cycles while flash is 100,000 erase/write cycles (based on a sample of two datasheets).

--

David Wilson School of IT & CS, Uni of Wollongong, Australia david@uow.edu.au

E N D O F F I L E
flash.eeprom
E N D O F F I L E

```
#####
### FILE      : flyback
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1659 bytes   1 KB
#####
```

```
Xref: news.weeg.uiowa.edu comp.sys.apple2:63949 comp.sys.misc:2753
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!gatech!prism!gtl666b
From: gtl666b@prism.gatech.EDU (SHELL,MICHAEL DAVID)
Newsgroups: comp.sys.apple2,comp.sys.misc
Subject: Re: look for monitor flyback
Message-ID: <116546@hydra.gatech.EDU>
Date: 13 Oct 93 02:21:56 GMT
References: <CELCxy.1JJ@chemelex.com>
Followup-To: comp.sys.apple2
Distribution: ba,usa
Organization: Georgia Institute of Technology
Lines: 49
```

```
In article <CELCxy.1JJ@chemelex.com> fms@chemelex.com writes:
>Hi, My wife's school Apple II GS, with many happy years as a
>classroom computer has died. Actually, the monitor gave it up
>with a small puff of smoke. The TV repairman in town says we
>need a
>
>   Mitisbushi (sp?) manufacturers part number
>       CP334P00901
>
>   which is a high voltage transformer (I think) or a
>flyback.
>
>Our repairman is unable to locate this part. Anyone have one or
>know how or where to get one? I'm located in the San Francisco
>Bay Area.
>
>Thanks,
>---
>Fred Schenkelberg
>fms@chemelex.com
>--
>Fred Schenkelberg
```

Try this:

```
Mitsubishi Electric Sales America, Inc.
Service Dept. Consumer Prod.
5757 Plaza Dr.
P.O. Box 6007
Cypress,CA 90630-007
(714)-220-2500
(800)-888-6773
```

or

MCM Electronics
650 Congress Park Dr.
Centerville, Ohio 45459-4072
(800) 543-4330

They carry a good selection of aftermarket replacement flyback transformers.
(at least they did the last time I ordered from them)

Both places should be happy to do a mail order.
Hope this helps! Good luck!

--
Mike Shell
gtl666b@prism.gatech.edu

E N D O F F I L E
flyback
E N D O F F I L E

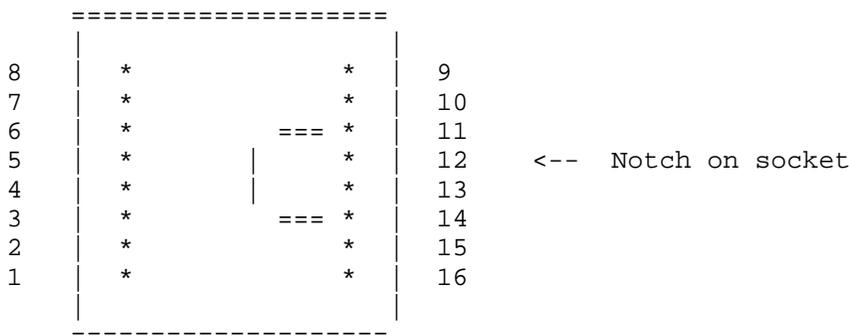
```
#####
### FILE      : gameio.pinouts
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 2340 bytes    2 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!newsfeed.internetmci.com!news.kei.com!nntp.coast.
net!lll-winken.llnl.gov!fnnews.fnal.gov!nntp-server.caltech.edu!nathan
From: nathan@cco.caltech.edu (Nathan Mates)
Newsgroups: comp.sys.apple2.programmer
Subject: Re: TTL
Date: 31 May 1996 07:44:49 GMT
Organization: California Institute of Technology, Pasadena
Lines: 53
Message-ID: <4om8lh$ap6@gap.cco.caltech.edu>
References: <Pine.A32.3.93.960531001302.14571B-100000@freenet4.afn.org>
NNTP-Posting-Host: accord.cco.caltech.edu
```

```
In article <Pine.A32.3.93.960531001302.14571B-100000@freenet4.afn.org>,
Donald 'X-caiver' Pattee Jr <afn45687@afn.org> wrote:
>I was trying to use my gamepot (In my GS) to drive some little relays...I
>know I have my program correct and I know I am using the correct addresses
>because the inputs are working). To test I tried to just drive an LED with
>the outputs (which according to teh manual, should work). I know which pins
>the annunciator outputs are in, but where is 'ground' or whatever I should
>clip the other end of my LED too, at?
```

Shameless plug: the following is a cut & paste job off my Apple II Resources WWW pages, specifically the 'general questions' page at <http://www.ugcs.caltech.edu/~nathan/a2stuff/generalques.html>

Apple 16-pin DIP socket (on the motherboard):



- Pin 1 - +5V Power
- Pin 2 - Pushbutton 0
- Pin 3 - Pushbutton 1
- Pin 4 - Pushbutton 2
- Pin 5 - Strobe
- Pin 6 - Game Control 0
- Pin 7 - Game Control 2
- Pin 8 - Ground

Pin 9 - No Connection
Pin 10 - Game Control 1
Pin 11 - Game Control 3
Pin 12 - Annunciator 3
Pin 13 - Annunciator 2
Pin 14 - Annunciator 1
Pin 15 - Annunciator 0
Pin 16 - No Connection

Use pin 8 for the ground.

Nathan Mates

```
--  
<*> Nathan Mates http://www.ugcs.caltech.edu/~nathan/ <*>  
# And he said to them, "To you has been given the secret of the  
# Kingdom of God, but for those outside, everything comes in  
# parables" Mark 4:11, NRSV
```

```
##### E N D O F F I L E  
### gameio.pinouts  
##### E N D O F F I L E
```

```
#####
### FILE      : gameio.pins
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3751 bytes   3 KB
#####
```

Path:

```
news.uiowa.edu!uunet!salliemae!europa.chnt.gtegsc.com!cantaloupe.srv.cs.cmu.edu!da
s-news2.harvard.edu!news2.near.net!howland.reston.ans.net!usc!nic-
nac.CSU.net!cello.gina.calstate.edu!cello.gina.calstate.edu!not-for-mail
From: jkenner@cello.gina.calstate.edu (Jason Kennerly)
Newsgroups: comp.sys.apple2.programmer
Subject: Re: Game port pin #'s
Date: 1 Apr 1995 19:27:14 -0800
Organization: GINA and CORE+ Services of The California State University
Lines: 16
Message-ID: <3115ii$jd@cello.gina.calstate.edu>
References: <kjTQg2a0WBO0392sk@andrew.cmu.edu>
NNTP-Posting-Host: cello.gina.calstate.edu
```

Description:	Internal pin#:	External pin #:
+5 Power Supply	1	2
Switches [buttons]	2,3,4	7,1,6
Strobe	5	-
Paddle 0-3	6,10,7,11	5,8,4,9
Ground	8	3
Annunciators	15,14,13,12	-
Nothing	9,16	-

hope this helps...

I have the //e technical reference [and an apple 2, 2+, and 2c, but no 2e... gotta love the irony] so just ask if ya have ?'s
--

Remember what the doormouse said - feed your head!

Path:

```
news.uiowa.edu!hobbes.physics.uiowa.edu!news.ksu.ksu.edu!vixen.cso.uiuc.edu!howlan
d.reston.ans.net!news.sprintlink.net!malgudi.oar.net!infinet!vleonard
From: vleonard@infinet.com (Victor Leonard)
Newsgroups: comp.sys.apple2.programmer
Subject: Re: Game port pin #'s
Date: 2 Apr 1995 04:18:01 GMT
Organization: InfiNet
Lines: 46
Message-ID: <3118hp$bqr@horus.infinet.com>
References: <kjTQg2a0WBO0392sk@andrew.cmu.edu>
NNTP-Posting-Host: rigel.infinet.com
X-Newsreader: TIN [version 1.2 PL2]
```

Ido Ben-Shachar (grasshopper+@CMU.EDU) wrote:

```
: Does anyone know the pins on the internal game port? (ie, where you
: plug in joystick stuff)
```

```
: This is the 16 pin connector, by the way.
```

From apple //e technical reference manual (combined from about 4 pages all of which got VERY well used when I used to connect apples together using game port for fun and games (that I wrote))

	9	8	GND
PDL1	10	7	PDL2
PDL3	11	6	PDL0
AN3	12	5	STB
AN2	13	4	SW2
AN1	14	3	SW1/CAPL (OPTION)
AN0	15	2	SW0/OAPL
	16	1	+5C

1 +5C +5 volts (not to exceed 100mA)
 2 PB0 (button 0 or switch 0) (read \$c061)
 3 PB1 (read \$c062)
 4 PB2 (read \$c063)
 5 STROBE' also 'Analog input reset' Strobe output. line goes low during 00 of a read or write instruction to \$c040
 6 PDL0 (read \$c064) goes low after read or write to \$c040 until capacitors recharge (connect +5v to PDLn with resistance. amount of resistance determines how long til \$c064 goes high)
 7 PDL2
 8 GND system ground
 9 n.c. not connected
 10 PDL1
 11 PDL3
 12 AN3 Annunciators. These are standard 74LS TTL outputs and must be buffered to drive other than TTL inputs (on = rw \$c05f, off \$c05e)
 13 AN2 (on \$c05d, off \$c05c)
 14 AN1 (\$c05b, \$c05a)
 15 AN0 (\$c059, \$c058)
 15 n.c.

```
jim
vleonard@infinet.com
Path:
news.uiowa.edu!hobbes.physics.uiowa.edu!newsrelay.iastate.edu!vixen.cso.uiuc.edu!h
owland.reston.ans.net!newsjunkie.ans.net!newstf01.news.aol.com!newsbf02.news.aol.c
om!not-for-mail
From: wagnere@aol.com (WagnerE)
Newsgroups: comp.sys.apple2.programmer
Subject: Re: Game port pin #'s
Date: 3 Apr 1995 02:41:35 -0400
Organization: America Online, Inc. (1-800-827-6364)
Lines: 6
Sender: root@newsbf02.news.aol.com
Message-ID: <3lo5b0$8ig@newsbf02.news.aol.com>
References: <3lltfj$gl@paris.ics.uci.edu>
Reply-To: wagnere@aol.com (WagnerE)
NNTP-Posting-Host: newsbf02.mail.aol.com
```

Be aware that Apple made some slight changes to the 16-pin gameport on the Apple IIgs.

A fourth push button switch was added (SW3 or PB3) at pin 9
 And the STROBE' output signal at pin 5 was replaced with a +5-volt pull-up

E N D O F F I L E

gameio.pins

E N D O F F I L E

```
#####
### FILE      : genericio.specs
#####
### Created   : Tuesday, November 17, 1998   Modified: Tuesday, November 17, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 7359 bytes   7 KB
#####
```

```
From: "ntt" <ntt@dove.mtx.net.au>
Newsgroups: comp.sys.apple2
References: <364919f0.0@news.cgocable.net> <Pine.SOL.3.96.981114110324.27535A-100000@moose> <david.911171291@wraith>
Subject: Re: Hardware Project
Date: Tue, 17 Nov 1998 08:08:37 +1030
Lines: 76
X-Newsreader: Microsoft Outlook Express 4.72.3110.1
X-MimeOLE: Produced By Microsoft MimeOLE V4.72.3110.3
NNTP-Posting-Host: pppk56a-77.mtx.net.au
Message-ID: <36509add.0@news.mtx.net.au>
X-Trace: 17 Nov 1998 08:06:29 -1050, pppk56a-77.mtx.net.au
Path: newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!news.cis.ohio-
state.edu!news.maxwell.syr.edu!newspeer.monmouth.com!intgwpad.nntp.telstra.net!new
sl.optus.net.au!optus!yorrell.saard.net!duster.adelaide.on.net!news.saix.saia.asn.
au!news.mtx.net.au!pppk56a-77.mtx.net.au
Xref: newsl.icaen comp.sys.apple2:141876
```

David Wilson wrote in message ...

```
>Most any card you design with on-board ROM needs to decode all three
selects
>(DEVSEL, IOSEL and IOSTB) and generate chip selects for ROM, devices and
the
>data bus buffer. This tends to take quite a few LSTTL chips. My idea is to
>replace these with a single PAL/GAL (plus an 8 input NAND gate) to take
care
>of all this (including the CFFF disable function). It will also allow for
the
>use of RAM instead of ROM as this makes code development much easier.
>
>Any thoughts on this would be appreciated.
```

It is hard to imagine any significant project being undertaken which would really benefit from this. It is almost impossible to get hold of devices (eg EPROM) that would fit into the memory space (and those you do get, you probably wouldn't want to use). Using larger devices would be a waste without making available the rest of the memory which means using some form of bank switching.

How generic is the PAL/GAL to be (since you're also adding a TTL device as well)?

PLDs are becoming inexpensive and readily available. It would be easy enough to produce a trivial PLD design which would decode everything (get rid of the NAND gate), provide /CS lines and addressing for modern memory devices (eg 128Kx8 --> 512Kx8) making the entire space available through the 2K C800:CFFF window using an arbitrary location (eg C0[n+8]0) for the bank

switching. Decoding the slot ROM (Cnxx) could force a certain bank (such as bank zero which would presumably always be there). The PLD could also convert the R/W line to /OE and /WE lines for memory.

You don't need to use all this space, but at least make it available...

Lets see...

To make all of this happen, you need /IOSEL, /IOSTRB & /DEVSEL for the 3 memory spaces

 you need the 8 data bus lines to latch a bank number
 (if you wanna make it simple make this read only)

 A7:0 can go straight through to the memory chips...

 A10:8 need to be latched (and driven) if you want to force Cnxx accesses to a certain bank

 you need to produce the high 8 address lines
 (latched from the data bus/forced by /IOSEL)

 you need to produce at least one /CS line

 you need to convert R/W into /OE and /WE

adding that up you get 3 + 8 + 0 + (3 + 3) + 8 + 1 + (1 + 2) = 29 available I/Os

This will fit comfortably in a 44-pin PLCC (socketable) package for under \$10 and will address all locations ('cept for the 256 CFFF locations (one in each bank)) of a 512Kx8 FLASH (non-volatile memory) or SRAM. Smaller parts will just 'wrap around in the available banks.

There are still outputs available in the same package for decoding other locations in the C0[n+8]x range for other devices or purposes.

If you want to get fancy you could use the 7M clock to generate /CAS and /RAS signals for DRAMs but this would require a larger package.

Going to a 68-pin PLCC package (or 84-pin PLCC) would give you enough I/Os to decode almost anything.

If you were to produce some generic 'application-specific' logic parts you might as well do it properly...

cheers
ntt@dove

Path: newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!math.ohio-state.edu!howland.erols.net!sunqbc.risq.qc.ca!news.uow.edu.au!david

From: david@uow.edu.au (David Wilson)

Newsgroups: comp.sys.apple2

Subject: Re: Hardware Project

Date: 16 Nov 98 22:03:27 GMT

Organization: University of Wollongong, Australia

Lines: 58

Message-ID: <david.911253807@wraith>

References: <364919f0.0@news.cgocable.net> <Pine.SOL.3.96.981114110324.27535A-100000@moose> <david.911171291@wraith> <36509add.0@news.mtx.net.au>

NNTP-Posting-Host: wraith.cs.uow.edu.au

X-Trace: wyrm.its.uow.edu.au 911255509 207 130.130.64.1 (16 Nov 1998 22:31:49 GMT)

X-Complaints-To: usenet@wyrm.its.uow.edu.au

NNTP-Posting-Date: 16 Nov 1998 22:31:49 GMT

X-Newsreader: NN version 6.5.0 #15 (NOV)

Xref: news1.icaen comp.sys.apple2:141879

"ntt" <ntt@dove.mtx.net.au> writes:

>It is hard to imagine any significant project being undertaken which would
>really benefit from this. It is almost impossible to get hold of devices (eg
>EPROM) that would fit into the memory space (and those you do get, you
>probably wouldn't want to use). Using larger devices would be a waste
>without making available the rest of the memory which means using some form
>of bank switching.

I had already discarded 2716/2732 and reached 2764/6264 sized chips. Bank selection is included (1/4 is used for the slot space, the remainder is banked 3 ways into the C800-CFFF space).

>How generic is the PAL/GAL to be (since you're also adding a TTL device as well)?

Just a standard 20V10 or similar.

>PLDs are becoming inexpensive and readily available. It would be easy enough
>to produce a trivial PLD design which would decode everything (get rid of
>the NAND gate), provide /CS lines and addressing for modern memory devices
>(eg 128Kx8 --> 512Kx8) making the entire space available through the 2K
>C800:CFFF window using an arbitrary location (eg C0[n+8]0) for the bank
>switching. Decoding the slot ROM (Cnxx) could force a certain bank (such as
>bank zero which would presumably always be there). The PLD could also
>convert the R/W line to /OE and /WE lines for memory.

Very similar to my GAL design. Rather than using up the limited C0[8+n]X space I am using CFFC-E to select banks 0..2 while bank 3 is forced when IOSEL is asserted.

The reason for a GAL is that it is relatively small and I have access to a GAL burner.

>To make all of this happen, you need /IOSEL, /IOSTRB & /DEVSEL for the 3
>memory spaces

Got them.

> you need the 8 data bus lines to latch a bank number
> (if you wanna make it simple make this read only)

No need as I use A0-A2 instead.

> A7:0 can go straight through to the memory chips...
> A10:8 need to be latched (and driven) if you want to
> force Cnxx accesses to a certain bank

I feed A10:8 straight to the EPROM - this uses 8x256 bytes for the slot ROM but does allow slot dependant code rather than having to write PIC.

> you need to produce the high 8 address lines
> (latched from the data bus/forced by /IOSEL)

I am producing A11 & 12.

> you need to produce at least one /CS line

Yep.

> you need to convert R/W into /OE and /WE
Currently /WE = R/W* and the GAL inverts R/W* to form /OE.

>If you were to produce some generic 'application-specific' logic parts you
>might as well do it properly...

Very interesting ideas. Thanks for the input.

--

David Wilson School of IT & CS, Uni of Wollongong, Australia david@uow.edu.au

E N D O F F I L E
genericio.specs
E N D O F F I L E

```
#####
### FILE      : graphics.tablet
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3350 bytes   3 KB
#####
```

```
Path: news.uiowa.edu!chi-
news.cic.net!hookup!news.mathworks.com!tank.news.pipex.net!pipex!blackbush.xlink.n
et!ka.sub.net!news
From: Oliver.Schmidt@powerframe.de (Oliver Schmidt)
Newsgroups: comp.sys.apple2
Subject: Re: Apple Graphics Tablet
Date: Wed, 12 Jun 1996 08:25:43 GMT
Organization: powerframe Datensysteme GmbH
Lines: 77
Message-ID: <4pluvs$mh8@ka.sub.net>
References: <255967003.15208359@adbbs.antioch.edu>
NNTP-Posting-Host: pcos.pf.sub.de
Mime-Version: 1.0
Content-Type: text/plain; charset=iso-8859-1
Content-Transfer-Encoding: 8bit
X-Newsreader: Forte Free Agent 1.0.82
```

John_L._Graham@adbbs.antioch.edu (John L. Graham) wrote:

```
>I had a similar question. I recently was given an Apple Graphics Tablet in
>_mint_ condition. Interface card and everything, but no software. Does anyone
>know how to write programs which can use it? I looked in our library of Apple
>tech notes but came up empty.
```

Hi,

first, let's make sure we're talking about the same thing: the Apple Graphics Tablet I know of is rather large and heavy; its pen is attached to it with a (too short) cable; it makes funny sounds that change when the pen is moved in/out the reach of of the tablet.

A long time ago I patched a few programs to make use of this tablet. To make it clear in the first place - I don't have these patched versions available anymore :-(. But I found a listing from which I can tell You this:

To detect to interface card, I looped over all slots to check in its firmware for

\$B0 at location \$Cx01 and

\$20 at location \$Cx09

beeing x the slot number. I never found this 'signature' in any other firmware.

To check for the pen position one has to poll the tablet (again beeing x the slot number):

```

LDA $CFFF ; switch off all extension ROMS

LDA $Cx00 ; switch on the extension ROM of the tablet

LDA #$Cx
STA $07F8 ; initialize some hidden text screen data area for the
tablet firmware

JSR $CBB9 ; call well known location ;- ) in tablet firmware

```

When the pen is in reach of the tablet (up or down) this routine will return immediatly. Else it will block - fortunatly the routine checks the keyboard strobe (\$C010) too and will also return if a key is pressed, even if the pen remains out of tablets reach.

After the routine has returned one can get the information:

\$0280 contains the state of the pen (up or down), I don't know excatly any more wich bit it is nor if one can distiguish between 'pen up' and 'pen out of reach but key pressed'

\$0281, \$0282 contains the absolute X position of the pen

\$0283, \$0284 contains the absolute Y position of the pen

As far as I can remember the values have about 12 bit resolution (!). Usually I needed screen coordinates (280 x 192), so I dropped the 4 least significant bits and did some additional adjustment. Unfortunatly I can't remember either what coordinates will be there in the 'out of reach but key pressed' case.

Hope this helps a little - if somebody has success using this method, please give me some feedback.

BTW: I'm working on an Apple][+ emulator, but suffer from a total lack of infos about the Apple][mouse (I think it goes into slot 4 and uses some interrupt stuff ???) due to the fact that I have never even seen such a mouse. Any way I'd like to build support for it into my emulator. So what ports - what firmware - ... thanks for help in advance.

Oliver

EOF

```

##### E N D O F F I L E
### graphics.tablet
##### E N D O F F I L E

```

```
#####
### FILE      : grappler-phasor.dips
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 6244 bytes   6 KB
#####
```

Newsgroups: comp.sys.apple2

Path:

blue.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!newsrelay.iastate.edu!
 newsxfer.itd.umich.edu!gatech!rutgers!utcsri!newsflash.concordia.ca!vax2.concordia
 .ca!spector

From: spector@vax2.concordia.ca (Mitchell Spector)

Subject: Re: Need info re: Phazor, SeriALL, Grappler + (Buffered)

Message-ID: <12AUG199418444616@vax2.concordia.ca>

News-Software: VAX/VMS VNEWS 1.41

Sender: usenet@newsflash.concordia.ca (USENET News System)

Nntp-Posting-Host: vax2.concordia.ca

Organization: Concordia University

References: <brianf.2zt3@sempco.uucp>

Date: Fri, 12 Aug 1994 23:44:00 GMT

Lines: 107

In article brianf@sempco.uucp (Brian Flanagan) writes...

>

>I recently picked up some old Apple cards, but didn't get any technical

>documentation on them. Could someone please tell me...

Sure.. :)

>re: Buffered Grappler +: What are the 4 DIP switches used for? What is the
 >pinout on the cable (I don't have a cable for it.)?

I have two standard Grappler+ cards, as well the the 64k Buffered Grappler+ version. The DIP switches are used to configure your card for a series of different printers out there (I'll list those settings below). You may also want to test the RAM memory on your Buffered Grappler+, so do the following to invoke it's built-in self test. Making sure the card is installed in slot #1, with the cable attached to the printer and the printer online with paper in it, turn on your Apple II with the RESET key hold down, then release it after 2-3 seconds. If you've done this correctly, a message will be printed saying the test is in progress. After 45 seconds the status of your RAM chips will be printed, numbered 1 to 8. If an "X" appears, this indicates the absence of a RAM chip or a bad chip. If you see a "1", this means a DRAM chip has been found at the location and tests good. The cable you need is very common, and all my other Apple II printer cards use it. It's a 26-pin female, to a 25-pin centronics ribbon cable.

G+	Pin assignments:	DIP switch settings:	1	2	3	4
STB	1	DIP SWITCH POSITIONS				
D0	3					
D1	5	Epson Series and Star Gemini	OFF	ON	ON	ON
D2	7	NEC 8023/C, Itoh 8510/DMP 85	OFF	ON	ON	OFF
D3	9	Centronics 739-1	OFF	ON	OFF	ON
D4	11	Anadex Printers	OFF	ON	OFF	OFF

D5	13	Okidata 82A, 83A, 92, 93, 84	OFF	OFF	ON	ON
D6	15	Okidata 84 w/o Step II Graphics	OFF	OFF	OFF	ON
D7	17	Apple Dot Matrix		OFF	OFF	ON
ACK	19	IDS Printers				OFF
BUSY	21					(Any position)
P.E.	23	Notes: "+" side, or set to right, the switch is set to				
SLCT	25	the ON position. Switch 1 controls MSB, the 8th bit.				
N/C	-	Setting switch 1 to 'ON' makes MSB <u>not</u> transmitted...				
GND		all others				

[ps - Anyone know if a Grappler+ (or Buffered Grappler+) will function in an Apple IIgs to drive a centronics printer? (ie - DeskJet 560, etc). I haven't tried, but I suspect a ROM update may be necessary. Is it?]

>re: Phasor (Applied Engineering) What are the 4 DIP switches used for? What >are the 2 POTs used for? Where can I get programming information for this >soundcard? Is Applied Engineering still in business? (I hope so, they're my >favorite Apple hardware company!) I've tried contacting them recently, but >couldn't find a current phone number.

The Phasor is a great sound card. Offers you 12 sound channels (using all sorts of wave-form patterns and effects, similar to FM-synthesis in IBMs), 4 white noise generators (synthesized drums, etc) and a 1-voice synthesized speech channel, expandable to 2 speech channels. Has a 4 watt amplifier that can drive stereo speakers (left & right). It's compatible with most older sound cards, like the Mockingboard, ALF, SMS and Echo+. Few programs ever supported it, let alone many programs out there that supported the older cards. It did, however, come with some decent software that showed off the card's features and let you experiment with it a bit.

The four DIP switches control emulation modes and standard Apple][internal speaker sound-level (only if you disconnect internal speaker and have old speaker toggling sent to Phasor). Switches #1 and #2 are for emulations. Switches #3 and #4 control your old internal speaker sounds, again, *if* you have speaker disconnected and that pin location on motherboard connected to Phasor. You can set Low, Medium and High volume with three different DIP positions. This doesn't affect Phasor music/sound however. To do that, you must turn those two pots you asked about. Each controls either the left or right stereo channel. Turning them clock-wise increases volume, and you probably don't want this too high up, or sound gets distorted! Put both on an equal setting, unless you want one channel louder/softer than the other.

Phasor DIP switch emulation modes:

```

~~~~~
Native Phasor mode:  1: closed, 2: closed
Mockingboard mode:  1: opened, 2: closed
Echo+ mode:         1: opened, 2: opened (Never got this mode to work!)

```

As for Applied Engineering, you won't be able to contact them. They went out of business back around March 1994. Not just the Apple II division, but the entire company as a whole (Mac, Apple, Amiga divisions -- gone!). You may be able to contact former AE employees on GEnie, there was a rumour of someone taking over their repair/support for II users.

>re: SerialL (Practical Peripherals) Same questions... What are the cable >pinouts? What are all the switches used for?

I have a Practical Peripherals MicroBuffer II card. Mine seems to

be the parallel version of what you have. If the same, it may use the same non-standard 20-pin connector.

>If anybody has any technical information on any of these cards, (or knows where >I can get some) please e-mail me a note.

>

>Thanks!

>

>Brian Flanagan, please address E-Mail as follows,

>from INTERNET: sempco!brianf@wupost.wustl.edu

> UUCP: wupost.wustl.edu!sempco!brianf

Mitchell Spector

sb_spec@pavo.concordia.ca / spector@vax2.concordia.ca

E N D O F F I L E

grappler-phasor.dips

E N D O F F I L E

```
#####
### FILE      : grappler.dips
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 2365 bytes    2 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!usc!newshub.cts.com!crash!pro-palmtree!rder
From: rder@pro-palmtree.cts.com (Richard Der)
Subject: Re: Dip switch setting on Z-80 Card and Grappler+ Printer card
Organization: The Palmtree BBS - 310/453-8726 - Santa Monica, CA
Date: Wed, 10 Jul 96 00:39:32 PDT
Message-ID: <ga02410@pro-palmtree.cts.com>
Lines: 50
```

```
>Does any one know what the dip switches on the above mentioned
>card are used for?
>
>The printer card is a Grappler+ Printer interface made by
>Orange Micro Inc, On it there is a bank of 4 dip switches.
```

Grappler+ DIP switch settings:

DIP switch positions	1*	2	3	4

Anadex Printers	off	on	off	off
Apple DMP	off	off	on	off
C. Itoh 8510 EP	off	on	on	on
Epson Dot Matrix Printers	off	on	on	on
Hewlett Packard Think-Jet	off	on	on	on
NEC 8023, C.Itoh 8510/ProWriter	off	on	on	off
Okidaata 82A,83A,84,182,183,92,				
93,192,193	off	off	on	on
Okidata 84 w/o Step II Graphics	off	off	off	on
Panasonic KXP-1090	off	on	on	on
Smith-Corona D-100/200/300	off	on	on	on
Star Micronics Series	off	on	off	on
**Transparent Mode	off	off	off	off

* Switch 1 controls the MSB (Most Significant Bit=8th bit of data). When this switch is on, the MSB is not transmitted to the printer. When this switch is off, the MSB is under software control. The printer must be set to 7 data bits, no line feed to use the settings in the table.

** If your printer is not listed, then the card should be set to "transparent" mode (turn all switches to off). This will disable the special screen dump features, which are only useful under BASIC anyway.

The screen dump commands are: Control-I G (press control-I, followed by the letter G) for a hi-res page 1 dump, Control-I G2 for a page 2 dump, Control-I Ge for a double-hi-res dump, Control-I S for a 40 column text screen dump and Control-I 8S for an 80 column screen dump.

The Palmtree BBS 310-453-8726 v.32
Inet: rder@pro-palmtree.cts.com

E N D O F F I L E
grappler.dips
E N D O F F I L E

```
#####
### FILE      : gsfans
#####
### Created   : Thursday, September 18, 1997 Modified: Thursday, September 18,
1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2000 bytes   1 KB
#####
```

Path:

newsl.icaen!news.uiowa.edu!uunet!in5.uu.net!newsflash.concordia.ca!newsflash.conco
rdia.ca!not-for-mail

From: spec@vax2.concordia.ca (Mitchell Spector)

Newsgroups: comp.sys.apple2

Subject: Re: IIGs internal fan hookup question...

Date: 18 Sep 1997 03:03 -0500

Organization: Concordia University

Lines: 30

Distribution: world

Message-ID: <18SEP199703035333@vax2.concordia.ca>

References: <pdueck-1709971532440001@dial24.pli.mb.ca>

NNTP-Posting-Host: vax2.concordia.ca

NNTP-Posting-User: SPEC

News-Software: VAX/VMS VNEWS 1.50AXP

In article pdueck@pli.mb.ca (Perry Dueck) writes...

>If one were to install an internal fan in an Apple IIGs, what is the
>proper Amps level that the fan should be rated at, in order to connect it
>to the two pin fan connector at the rear of the IIGs motherboard?

The pinout for the "Fan" connector is +12V and Ground. The +12 is
the pin closest to the powersupply, or the pin on the left if you are
facing the GS motherboard from the front end. Most fan wires are color
coded, so the red wire goes to power and black to ground.

>I pulled a perfectly good working fan out of a non-functioning 386sx power
>supply. This fan I have is an NMB "FLOW MAX", and it is rated:
>DC +12V 0.14 Amps. Is this the proper amperage level, or is it too low
>or too high?

The voltage rating is fine, the amperage level should be fine as well
as long as it's not too high where it overloads the powersupply (I doubt
that in this case). I've connected all sorts of fans to the "Fan" pins,
back when I was trying to cool down my accelerator board. I had a 486
CPU mini-cooling fan in there (0.9W) as well as a full-sized fan pulled
from an IBM powersupply, which had a higher power consumption rating.
They were all DC +12V in case your wondering, it was just the wattage/
amperage levels that differed.

You just need to slice the wires and stick them in a two-pin molex
connector, I found one on a dead 80 columns card. :)

Mitchell Spector

spec@vax2.concordia.ca

E N D O F F I L E

gsfans

E N D O F F I L E

```
#####
### FILE      : GSpowerlight
#####
### Created   : Tuesday, January 1, 1980 Modified: Thursday, March 1, 1973
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1173 bytes    1 KB
#####
```

Wayne Stewart (waynes@intergate.bc.ca) wrote:

: Quadrajet1 wrote:

```
: > The Apple /// and the //e, and later ][+'s used a bayonet style 5 volt
bulb.
: > The early Apple ][ used a "grain of wheat" style of bulb. Mainly the ]['s
: > with the power light that looked like a keycap. The Apple II and /// series
: > never used LED's for the power light on the keyboard. I should have both
styles
: > of bulbs still around in my parts bins.
```

: Except for the Platinum IIe

Don't know about the platinum][e, but the IIgs most certainly uses an LED.

Also, a neat trick: There are two lamp pockets under the power light lens on the IIgs. Put a red high-brightness LED in the second pocket and wire it up to the LED connector on your internal hard disk, and your green power light will turn yellow on disk activity. Thanks to the Vulcan GS manual for that tip.

--Dave Althoff,][.

--

```
          /X\                *** Open evenings and weekends! ***
        /XXX\          /X\          /X\          /X\          /X\          /X\          /X\
      /XXXXX\        /XXX\      /XXXXX\      /X\      /XXXXX\      /X\      /X\      /XXXXX
_/_/XXXXXXXX\_/XXXXX\/XXXXXXXXX\_/XXX\_/XXXXXXXXX\_/XXX\_/XXX\_/\/XXXXXXXX
```

```
##### E N D O F F I L E
### GSpowerlight
##### E N D O F F I L E
```

```
#####
### FILE      : gssauce.dips
#####
### Created   : Friday, December 5, 1997 Modified: Friday, December 5, 1997
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 2248 bytes    2 KB
#####
```

Path:

```
news1.icaen!news.uiowa.edu!news1.chicago.iagnet.net!streamer1.cleveland.iagnet.net
!iagnet.net!newsfeed.internetmci.com!206.165.113.230!www.nntp.primenet.com!globalc
enter0!news.primenet.com!bpvh
```

From: bpvh@primenet.com (Bradley P. Von Haden)

Newsgroups: comp.sys.apple2

Subject: GS Sauce dip settings

Date: 4 Dec 1997 20:10:01 -0700

Organization: Primenet (602)416-7000

Lines: 75

Message-ID: <667ra9\$ccn@nntp02.primenet.com>

X-Posted-By: bpvh@206.165.6.208 (bpvh)

Matthew Hudson <mhudson@home.com> wrote:

>Anyone know what the dip switch settings for this card are?

Here are a couple of responses I have in my archives. Hope this helps:

Newsgroups: comp.sys.apple2

From: edward@pro-ren.cts.com (Edward Floden)

Subject: Re: Harris Tech. RAM Card

Date: Fri Nov 4 06:26:57 1994

256K SIMMS

	Switch			
	1	2	3	4
256K	O	O	O	O
512K	O	C	O	O
1M	C	C	O	O

1M SIMMS

	Switch			
	1	2	3	4
1M	O	O	C	O
2M	O	C	C	O
4M	C	C	C	O

...and, *never* set both switches 3 and 4 to closed. You'll fry something. :(

From: bedwards@arthur.st.nepean.uws.edu.au (Brett Edwards)

Newsgroups: comp.sys.apple2

Subject: Re: Harris Tech. RAM Card

Date: Fri Nov 4 22:29:15 1994

Here are the complete dip switch settings for the gs Sauce card

Dip switch settings for GS Sauce Memory Card.

256Kb Simm s1 s2 s3 s4

256Kb off off off off

512Kb off on off off

1024Kb on on off off

1Mb Simm s1 s2 s3 s4

1Mb off off on off

2Mb off on on off

4Mb on on on off

One Note: ensure that switches 3 and 4 are never on (closed positions) at the same time, mentions something about endangering powersupply.

Kryten

```

****                Maintainer of the CD CLUB FAQ                ****
****                http://www.primenet.com/~bpvh/cdclubs          ****
****                ftp://ftp.primenet.com/users/b/bpvh/cdclubfq.txt ****
**** bpvh           Internet: bpvh@primenet.com           Delphi: bpvh ****
**** Posted by an Apple IIgs using my own Proterm 3.1 File Macro ****

```

```

##### E N D    O F    F I L E
### gssauce.dips
##### E N D    O F    F I L E

```

```
#####
### FILE      : gsslots.bad
#####
### Created   : Friday, February 20, 1998  Modified: Friday, February 20, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2636 bytes   2 KB
#####
```

Path:

newsl.icaen!news.uiowa.edu!newsl.chicago.iagnet.net!qual.net!iagnet.net!howland.er
ols.net!news-peer.sprintlink.net!news-backup-east.sprintlink.net!news-in-
east.sprintlink.net!news.sprintlink.net!Sprint!151.164.30.38!newsgate.swbell.net!s
wbell!not-for-mail

From: Rubywand <rubywand@swbell.net>

Newsgroups: comp.sys.apple2

Subject: Re: Slots not working

Date: Fri, 20 Feb 1998 04:01:57 -0600

Organization: Southwestern Bell Internet Services, Richardson, TX

Lines: 39

Message-ID: <34ED5495.D940E49B@swbell.net>

References: <19980220051700.AAA25108@ladder03.news.aol.com>

Reply-To: rubywand@swbell.net

NNTP-Posting-Host: ppp-207-193-8-177.hstntx.swbell.net

Mime-Version: 1.0

Content-Type: text/plain; charset=us-ascii

Content-Transfer-Encoding: 7bit

X-Trace: (null) 887968850 19553 (None) 207.193.8.177

X-Complaints-To: usenet@nnp3

X-Mailer: Mozilla 4.04 [en] (Win95; I)

Xref: newsl.icaen comp.sys.apple2:130451

Supertimer writes ...

```
>
> I had a ROM 1 GS motherboard which worked fine except the slots
> did not work. When a card was plugged in and the control panel was
> set to YOUR CARD, the slots were still seen by the GS as empty.
> ALL the slots had this problem EXCEPT the memory expansion slots.
> What was wrong with this motherboard?
```

If you are saying that, whatever the card and whatever the Slot, the cards plugged into the GS's Slots did not work, then, there are a few halfway decent suspects on a GS that, otherwise, seems to work okay:

1. A break in the trace which is supposed to supply +5V to each Slot card would shut down nearly any Slot card.
2. Most Slot cards need to receive and/or send information over the Slot Data bus. A defective 74HCT245 (IC UF2) or one with a loose/broken pin connection would be likely to kill Slot Data bus transfers.
3. A defective Slotmaker chip (IC UE11) or one with a broken trace on any of several inputs would render most Slot cards non-functional.
4. A break in any of several traces supplying signals to the Slots would disable many Slot cards.
5. Many Slot cards would not work should any of several Slot traces be

shorted to another trace or to ground. (Sources of shorting include bent case shielding below or behind the motherboard, a Slot socket into which a shard of metal, solder, or bit of wire has fallen, a shorted bypass capacitor, and, possibly a Coke, etc. spill leaving conductive residue beneath several Slot sockets.)

6. If a defective Slot card is plugged into one Slot while other Slots are being tried with other cards, the defective card could short or corrupt critical bus lines and render other cards non-functional.

Rubywand

```
##### E N D O F F I L E  
### gsslots.bad  
##### E N D O F F I L E
```

```
#####
### FILE      : hardware.projects
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2119 bytes   2 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path: news.weeg.uiowa.edu!news.uiowa.edu!uunet!spool.mu.edu!bloom-
beacon.mit.edu!mrcim.mcgill.edu!sifon!CC.UMontreal.CA!IRO.UMontreal.CA!guertinp
From: guertinp@IRO.UMontreal.CA (Paul Guertin)
Subject: Re: Apple IIe project
Message-ID: <CFD9Es.5MA@IRO.UMontreal.CA>
Sender: news@IRO.UMontreal.CA
Organization: Universite de Montreal, Canada
References: <50.6196.2096.0N003110@freddy.ersys.edmonton.ab.ca>
Date: Sat, 23 Oct 1993 20:11:15 GMT
Lines: 19
```

```
In article <50.6196.2096.0N003110@freddy.ersys.edmonton.ab.ca>
phil.ware@freddy.ersys.edmonton.ab.ca (Phil Ware) writes:
>Could anyone suggest a good project book for the Apple IIe.
>I'm interested in using an old box for tracking the
>temperature in a water bath.
>
```

```
Vernier software publishes a book called "How to Build a Better Mousetrap"
which contains 14 hardware projects for the Apple II. Project #6 is a
temperature probe connected to PDL0.
```

```
ISBN for the book is 0-918731-16-X.
Vernier Software
2920 S.W. 89th Street
Portland, Oregon 97225 USA
(503) 297-5317
```

```
Paul
guertinp@iro.umontreal.ca
```

```
Path:
news.weeg.uiowa.edu!news.uiowa.edu!uunet!europa.eng.gtefsd.com!howland.reston.ans.
net!gatech!prism!gt2011a
From: gt2011a@prism.gatech.EDU (gt2011a Sheldon Simms)
Newsgroups: comp.sys.apple2
Subject: Re: Apple IIe project
Message-ID: <118842@hydra.gatech.EDU>
Date: 24 Oct 93 00:15:46 GMT
References: <50.6196.2096.0N003110@freddy.ersys.edmonton.ab.ca>
Organization: Georgia Institute of Technology
Lines: 17
```

```
In article <50.6196.2096.0N003110@freddy.ersys.edmonton.ab.ca>
phil.ware@freddy.ersys.edmonton.ab.ca (Phil Ware) writes:
>Could anyone suggest a good project book for the Apple IIe.
>I'm interested in using an old box for tracking the
>temperature in a water bath.
```

A good book is _Inside The Apple IIe_ by Gary B. Little. It isn't a project book, but it does have a good chapter on using the Game I/O connector for "electronics experiments."

-Sheldon

--

W. Sheldon Simms |
gt2011a@prism.gatech.edu | Newt Gingrich for minority leader!

-----+-----

E N D O F F I L E
hardware.projects
E N D O F F I L E

```
#####
### FILE      : hdpower
#####
### Created   : Tuesday, January 1, 1980  Modified: Thursday, March 1, 1973
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1019 bytes   1 KB
#####
```

They would be +5v, +12v and ground. Usually the wires are colour-coded, 5v is red, 12v is yellow and ground is black. I would test the voltages on the internal connector first, as it might not be the power supply at fault.

If the drive's not spinning up, it could be a case of 'sticktion' which can be fixed by a sharp torque applied to unstick the rotating platters.

Simon.

"Jack Countryman" <jcountry@mac.com> wrote in message
news:3A97262F.66F4@mac.com...

```
> I have a Quality Computers 40 meg external Q drive here, off a friend's
> IIGS. It had stopped working, and doesn't seem to spin up. I suspect
> the power brick to be dead. To test that, I'd try using an external
> power supply to power the drive...if I knew what voltage to hook to each
> of the three connectors inside the case. They are not marked, and since
> there is no power there, I have no way of telling what voltage goes
> where to feed power across the pc board to the notebook size drive
> used. Ideas, anyone?
>
> jcountry@mac.com
```

```
##### E N D O F F I L E
### hdpower
##### E N D O F F I L E
```

```
#####
### FILE      : hsscsi.id
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2025 bytes   1 KB
#####
```

Path:

```
blue.weeg.uiowa.edu!news.uiowa.edu!uunet!spool.mu.edu!uwm.edu!cs.utexas.edu!bcm!pe
ndragon!fullfeed!fullfeed!not-for-mail
From: bpvh@msn.fullfeed.com (Bradley VonHaden)
Newsgroups: comp.sys.apple2
Subject: RE: Bernoulli on a //gs? (Please Read)
Date: 26 Oct 1994 05:47:10 -0500
Organization: FullFeed Communications (Internet +1.608.246.2701 info)
Lines: 43
Message-ID: <381c3e$k07@fullfeed.fullfeed.com>
NNTP-Posting-Host: fullfeed.fullfeed.com
```

gardnern@ucsu.Colorado.EDU (RKE) wrote:

```
>I am trying to attach a 90mb Bernoulli drive to my GS.
>My system is as follows:
>
>ROM 1 Apple //gs
>4mb AE RAM card
>8mhz ZIP GS
>Apple High-Speed SCSI card
>90 mb Bernoulli hard drive
>System 6.0.1
```

Three things I can think of to check:

One possibility is DMA compatibility. If your memory card is not DMA compatible, then switch 1 on the Apple HS SCSI card should be open (up).

Another possibility I guess is a SCSI ID conflict. The Apple HS SCSI card's ID at the factory is set to 7. Here are the Apple HS SCSI card switch combinations:

```
note: Switch 1 controls DMA; open (up) turns DMA off
note: Switches 2-4 control SCSI card ID
note: 'U' means open (up), 'D' means closed (down)
```

SWITCH:	1234	1234	1234	1234	1234	1234	1234	1234
SETTING:	.UUU	.UUD	.UDU	.UDD	.DUU	.DUD	.DDU	.DDD
CARD ID:	0	1	2	3	4	5	6	7

Third, the scsi chain needs termination power to work properly. This is different from termination. Both are required for a properly functioning scsi chain. It is possible that neither the Bernoulli drive nor the Apple HS SCSI card is supplying termination power. If this is the case, and there is no other device on the scsi chain to supply said power, it probably won't work. There is a modification (requires soldering skills) to the Apple HS SCSI card to make it

supply termination power.

****bpvh Internet: bpvh@fullfeed.com GENie: B.VONHADEN****
****Posted by an Apple IIGS using my own Proterm 3.1 File Macro****

E N D O F F I L E
hsscsi.id
E N D O F F I L E

```
#####  
### FILE      : ide.interface  
#####  
### Created   : Tuesday, January 1, 1980 Modified: Thursday, March 1, 1973  
### File Type: "TEXT"      File Creator: "LMAN"  
### File Size: 462 bytes   1 KB  
#####
```

Mr. Carp <mr_carp@hotmail.com> a Ècrit dans le message :
mr_carp-A324B8.11094828042001@news.esper.com...
> Does anyone have a URL for StÈphanie Guillard's build-it yourself IDE
> interface?

The schematics and basic software are available since today at
<http://s.guillard.free.fr>

If anything is not OK then email me at stephane.guillard@steria.com

Please read the included html doc !-)

Kind regards,

--

Stephane Guillard - stephane.guillard@steria.com

```
##### E N D O F F I L E  
### ide.interface  
##### E N D O F F I L E
```

```
#####
### FILE      : ii+keyboards
#####
### Created   : Saturday, July 12, 1997   Modified: Saturday, July 12, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3049 bytes   2 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!chi-news.cic.net!howland.erols.net!news-
peer.sprintlink.net!news-sea-19.sprintlink.net!news-in-
west.sprintlink.net!news.sprintlink.net!Sprint!205.185.79.4!zdc!super.zippo.com!ne
wsl.rcsntx.swbell.net!usenet
From: Rubywand <rubywand@swbell.net>
Newsgroups: comp.sys.apple2
Subject: Re: ][ + control key locked
Date: Sat, 12 Jul 1997 07:26:10 +0000
Organization: Southwestern Bell Internet Services
Lines: 54
Message-ID: <33C73192.3DFC@swbell.net>
References: <33c6d63e.0@newsl.ibm.net>
NNTP-Posting-Host: ppp-207-193-8-157.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Mailer: Mozilla 2.02E (Win16; I)
```

wshek@ibm.net writes ...

```
>
> Anyone have any experience with keyboard encoder chips and such?
>
> I have a ][+ with a keyboard symptomatic of control key always pressed when
> it isn't. ie. press the single key 'g' get beep....press 'm' get cr etc.
> Keyboard appears to be functioning properly by process of elimination but I
> don't have another encoder chip to try.
> Has anyone purchased parts for a ][+ recently? Would like as near original as
> possible.
```

Are you sure that your CTRL key is not stuck? (Try diddling the key.)

Another possible source of the problem is a KB Controller IC pin making poor contact with the line coming from the CTRL key circuit. (Try removing and re-socketing the KB IC.)

U1, a 7400 quad nand gate IC, could have gone bad or be making poor contact at some pins. This could result in an 'always-pressed CTRL key' signal at pin 11.

When the CTRL key is not pressed, pins 12 and 13 of U1 (connected to the CTRL key switch) should be at nearly 5V and pin 11 (which goes to pin 19 of the KB Controller IC) should be at logic "0" (roughly 0V - 0.25V).

If U1 pins 12 and 13 are at 0V (or very close) when the CTRL key is not pressed, your CTRL key switch is, probably, stuck.

If U1 pins 12 and 13 are at/near 5V and pin 11 is not near 0V, U1 is probably bad or making poor contact at some pins.

If U1 pin 11 is near 0V and pin 19 of the KB Controller IC is not, then, there is either a break in the line connecting the pins or one or both IC's are making poor socket contact.

If pin 19 of the KB Controller IC is near 0V when the CTRL key is not pressed and near 4-5V when the CTRL key is pressed, then, if you still have 'stuck CTRL key' symptoms, there is a good chance that the KB Controller IC is messed up.

Note: all of this assumes that your KB is like the one diagrammed in the Apple][Reference Manual on page 101.

The keyboard is known to be a weak point in][+ design. Probably, Apple did not expect the machines to be in service at the turn of the century!

After a plague of KB problems, we ended up yanking the entire thing, enlarging the KB opening, and installing a home-brew KB. It uses the key matrix from a surplus reed-switch KB and a decoder circuit designed around the SMC KR2376-ST KB Controller IC.

Rubywand

E N D O F F I L E
ii+keyboards
E N D O F F I L E

```
#####
### FILE      : ii.power
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1394 bytes   1 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path:
news.weeg.uiowa.edu!news.uiowa.edu!uunet!noc.near.net!howland.reston.ans.net!math.
ohio-state.edu!cs.utexas.edu!sdd.hp.com!crash!pro-sol!tomk
From: tomk@pro-sol.cts.com (Tom Kelly)
Subject: Re: Power Supplies
Organization: ProLine [pro-sol], Rancho San Diego, CA
Date: Sun, 13 Jun 93 21:01:36 PDT
Message-ID: <fd80651@pro-sol.cts.com>
In-Reply-To: tomk@pro-sol.cts.com (Tom Kelly)
References: <fc48797@pro-sol.cts.com>
Lines: 34
```

The following is the connections for the power supply ON THE MOTHERBOARD for the Apple][,][+,][e. It was derived from the Apple][Reference Manual and examining a Apple][. It is to be used as a reference and should NOT be accepted as GOSPEL until you have verified it yourself. It is most useful when splicing a "OLD IBM POWER SUPPLY" on the cable of a Apple][supply when they go bad. The IBM supply will NOT fit inside the Apple][case. I don't have the connection diagram for the IBM connectors.



PIN	NAME	COLOR
1,2	GROUND	BLACK
3	+5V	ORANGE
4	+12V	YELLOW
5	-12V	GREEN
6	-5V	BLUE

Please feel FREE to correct and provide anything I have left out. It will be for the GOOD of the Apple "world".

```
ProLine: tomk@pro-sol
Internet: tomk@pro-sol.cts.com
UUCP: crash!pro-sol!tomk
```

E N D O F F I L E

ii.power

E N D O F F I L E

```
#####
### FILE      : iie2gspwr.guide
#####
### Created   : Monday, January 25, 1999   Modified: Monday, January 25, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 6893 bytes   6 KB
#####
```

Path:

newsl.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!207.24.245.130!nyd.news.ans.net!
!news.idt.net!logbridge.uoregon.edu!news.nero.net!newshub.tc.umn.edu!lynx.unm.edu!
benl6.unm.edu!buggie

From: buggie@benl6.unm.edu (stephen e buggie)

Newsgroups: comp.sys.apple2

Subject: How-to-Do-It: Transplant p.s. innards IIE-IIgs

Date: 23 Jan 1999 22:17:37 GMT

Organization: University of New Mexico, Albuquerque

Lines: 132

Message-ID: <78dhql\$ieu\$2@lynx.unm.edu>

NNTP-Posting-Host: benl6.unm.edu

X-Newsreader: TIN [version 1.2 PL2]

Xref: newsl.icaen comp.sys.apple2:144424

buggie@unm.edu

January 23, 1999

APPLE II INTERNAL POWER SUPPLIES:
HOW TO TRANSPLANT THE IIE P.S. CIRCUITRY
INTO THE IIGS CASING

by Steve "Power Man" Buggie

Working IIE internal power supplies are abundant and cheap, while IIGs power supplies are getting scarcer and scarcer. I sell _external_ 150 watt "bugg-power" units for \$27 plus \$5 shipping; 201 of these units have been shipped since April 1996!

The IIE and IIGs internal power supplies use exactly the same output voltages and color codes: BLACK = negative (two wires); ORANGE = +5v DC; YELLOW = +12v DC, GREEN = -12vDC, BLUE = -5v DC. The IIE unit is rated by Apple at about 35 watts and the IIGs unit is rated by Apple at about 45 watts. The IIE units were made by Astec, while the IIGs units were made either by Astec (heavy, steel casing), or by DynaComp (lightweight brushed aluminum casing. The DynaComp IIGs p.s. is more prone to failure.

Still, for portability, the internal power supply remains useful. I can do the work described below for you at nominal cost: \$12 plus \$4 shipping for an outright sale. \$6 plus shipping if you mail me your dead IIGs power supply. \$2.00 plus shipping if you send me a GOOD IIE p.s. in addition to the dead IIGs p.s.

The transplant is easy enough that the ordinary "solder-slinging" user can do this himself Here are step-by-step instructions. These instructions apply to dead DYNACOMP IIGs power supplies --- I have done the transplant successfully on two of these units. The ASTEC IIGs p.s. has a different mounting arrangement for the circuit board. I've looked at it, but have not yet done the transplant on the Astec

IIgs version.

TOOLS & MATERIALS NEEDED: Soldering iron and rosin-core solder;
wire cutter and wire-stripping tool, philips-head screwdriver;
electric drill; brown corrugated cardboard, adhesive glue (e.g,
"Liquid Nails" or equivalent non-conductive adhesive), heat-
shrink insulation for AWG-18 wire: 3/16" diameter prior to
shrinkage, DC voltmeter.

1. TEST both power supplies to verify that the IIE unit is GOOD and that the IIgs unit is BAD.
2. With power cord disconnected, remove the case=screws and open the two units.
3. Inspect the FUSE in the IIgs unit. It is soldered to the board :-(
If fuse is blown, replace with a fuse of the same amperage. Apply power and check voltages at the Molex-7 nylon plug. If unit works, then close up the box --- you're done! If fuse blows again, then proceed to step 4.
4. Cut the colored output wires: For IIgs unit, cut them NEAR the board; for IIE unit, cut them near the plug. This will allow wires of the finished unit to remain relatively long. AC plug to be DETACHED from the unit in this and in the remaining steps.
5. IIgs unit: near the AC switch/socket end, notice where the brown (live) wire and blue (neutral) wire are soldered to the board. But both wires close to the board. Detach the green wire (ground) from its bolt on the inside casing.
6. IIE unit: Find the brown (live) and blue (neutral) AC wires; cut those wires, leaving the wires that attach to the circuit board as LONG as possible. These wires are located near the switch/socket end of the unit.
7. IIgs unit: remove the philips-head small screws that hold the circuit board to the casing, and lift the circuit board out.
8. IIE unit: remove philips-head small screws; lift the circuit board out.
9. Hold the two circuit boards side by side. Notice that the IIgs version is LONGER than the IIE version. Notice and compare the locations of the holes for the mounting screws on the two boards. Near the "switch-socket" end, both boards have two holes. Midway down the length, on the "starboard" (right side), the mounting holes are slightly misplaced. Using a 3/16" drill, drill a hole on the IIE circuit board slightly "forward" of the present hole, so that the bolt will be positioned correctly with its barrel-nut on the IIgs inside casing. (The drilled hole will pass through a non-critical portion of the board.) Clean away any drill filings.
10. The IIE circuit board will be attached with only three bolts inside the IIgs casing. Check that it will fit correctly by sliding the board into the IIgs casing. Redrill the midway-positioned hole if necessary, removing the board from the casing while doing the drilling.
11. With the circuit board removed, cut to size a piece of brown corrugated cardboard to fit in the "forward" 2/3 length of the casing.

Attach the cardboard to the inside of the casing with "liquid nails" adhesive --- or other non-conductive adhesive. The cardboard provides physical support for the circuit board, and also insulates the underside contacts against possible short circuits! Secure the three mounting screws through the circuit board: two screws at the "switch-socket" end, and one screw through the drilled "midway hole.

12. Connect the AC wires: BLUE to BLUE, and BROWN to BROWN. Solder them, clean the solder flux from the solder joint, and insulate with heat-shrink tubing. Three layers of heat-shrink tubing are recommended.

13. At the "bow" (forward end), connect/solder all six output wires, matching color-codes exactly: BLACK to BLACK, ORANGE to ORANGE, YELLOW to YELLOW, GREEN to GREEN, BLUE to BLUE. Clean the rosin from the solder joints, insulated with triple layers of heat-shrink tubing.

14. String the output wires through the side-opening, passing them through the black plastic strain-relief.

14. (Optional step) Before sealing the unit, non-conductive adhesive caulking could be smeared on circuit board edges to secure the board from vibration or movement. I use 100% silicone caulking in the big tubes: either "GE SOLICONE II" or "ACE HARDWARE 50-YEAR 100% SILICONE."

15. Blow out any dust or shavings. Reattach the cover with its small bolts. Before connecting to the computer, attach the AC cord and TEST THE VOLTAGE OUTPUTS at the Molex-7 plug. If these are normal, then the unit can be attached to the IIgs.

16. Salvage reusable parts left over: The switch/ AC socket from the IIE casing; fuse, resistors, capacitors, etc. from the dead IIgs DynaComp board. That's it!
Steve "Power Man: Buggie

```
##### E N D O F F I L E
### iie2gspwr.guide
##### E N D O F F I L E
```

```
#####
### FILE      : iiepower
#####
### Created   : Tuesday, November 3, 1998 Modified: Tuesday, November 3, 1998
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1543 bytes    1 KB
#####
```

Path:

newsl.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!nyd.news.ans.net!newsfeeds.ans.net!news.idt.net!newsfeed.berkeley.edu!cyclone.swbell.net!typhoon01.swbell.net.POS
 TED!not-for-mail

Message-ID: <363E94A6.887BB984@swbell.net>

From: Rubywand <rubywand@swbell.net>

Reply-To: rubywand@swbell.net

X-Mailer: Mozilla 4.06 [en] (Win95; I)

MIME-Version: 1.0

Newsgroups: comp.sys.apple2

Subject: Re: Apple //e Power Supply

References: <363dd01e.0@195.226.32.5>

Content-Type: text/plain; charset=us-ascii

Content-Transfer-Encoding: 7bit

Lines: 23

Date: Mon, 02 Nov 1998 23:29:10 -0600

NNTP-Posting-Host: 209.184.93.158

X-Complaints-To: abuse@swbell.net

X-Trace: typhoon01.swbell.net 910070960 209.184.93.158 (Mon, 02 Nov 1998 21:29:20 PDT)

NNTP-Posting-Date: Mon, 02 Nov 1998 21:29:20 PDT

Organization: SBC Internet Services

Xref: newsl.icaen comp.sys.apple2:141285

Tim Anderson writes ...

```
>
> I have recently aquired a //e, green screen monitor and two disc drive for 5
> pounds, only problem is that the computer doesn't have a power supply. What
> voltages does the //e require.
```

Here is some info on the IIe power supply:

II+/IIe Power Supply Socket		Power Supply Output Ratings							
-12V	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px 5px;">5</td> <td style="padding: 2px 5px;">6</td> </tr> <tr> <td style="padding: 2px 5px;">3</td> <td style="padding: 2px 5px;">4</td> </tr> <tr> <td style="padding: 2px 5px;">1</td> <td style="padding: 2px 5px;">2</td> </tr> </table>	5	6	3	4	1	2	-5V	+5V @ 2.50 Amps (continuous)
5	6								
3	4								
1	2								
+5V		+12V	-5V @ 0.25 Amps (continuous)						
			+12V @ 1.50 Amps (continuous)						
GND		GND	-12V @ 0.25 Amps (continuous)						

Rubywand

```
##### E N D O F F I L E
### iiepower
##### E N D O F F I L E
```

```
#####
### FILE      : iigsram
#####
### Created   : Friday, February 7, 1997 Modified: Friday, February 7, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2066 bytes   2 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.erols.net!cam-news-hubl.bbnplanet.com!news.bbnplanet.com!cpk-
news-
hubl.bbnplanet.com!newsfeed.internetmci.com!status.gen.nz!news.express.co.nz!actri
x.gen.nz!dempson
From: dempson@actrix.gen.nz (David Empson)
Newsgroups: comp.sys.apple2
Subject: Re: Hacking GS memory card?
Date: Fri, 7 Feb 1997 20:57:58 +1300
Organization: Empsoft
Lines: 34
Message-ID: <19970207205758321397@dempson.actrix.gen.nz>
References: <5ddo00$81f@balsam.unca.edu>
NNTP-Posting-Host: dempson.actrix.gen.nz
X-Newsreader: MacSOUP 2.2b6
```

Rhonda K. Faircloth <RKFAIRCLOTH@unca.edu> wrote:

```
> I've been poking around Apple's 1meg memory board for the //gs, trying
> to increase it's memory capacity... hopefully to 4meg. Anybody have
> any experience/knowledge in gs memory handling?
```

Yep. I have the IIgs hardware reference, and I'm quite familiar with how standard memory cards are implemented (the more oddball ones are somewhat of a mystery).

```
> I desolered the eight dram chips already on the board and ran some wires
> to a socketed 256k SIMM on a proto-board. This tested ok. I then tacked a
> wire to the unused FRA9 (pin3) line, ran that through the same type of
> inverter/resistor (as the other address lines are handled) and brought it
> to A9 of a 1meg simm. It would only give me 768k.d
```

You have missed an important step. There is a pin on the memory slot which tells the motherboard what size of RAM is installed on the card. The Apple IIgs Memory Expansion Card is set for 256KB rows, so the motherboard doesn't use FRA9, and the row address lines decode into multiples of 256KB.

If the appropriate pin is set for 1MB RAM then FRA9 contains the next multiplexed address bit, and the row address lines decode into multiples of 1MB.

The pin in question is called MSIZE. It is pin 27 on the slot connector. It is unconnected for a card with 256KB rows, connected to ground for a card with 1MB rows.

```
--
David Empson
dempson@actrix.gen.nz
```

Snail Mail: P.O. Box 27-103, Wellington, New Zealand

```
##### E N D O F F I L E  
### iigsrn  
##### E N D O F F I L E
```

```
#####
### FILE      : interfacing
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3616 bytes   3 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path: news.uiowa.edu!chi-
news.cic.net!newsfeed.internetmci.com!news.msfc.nasa.gov!elroy.jpl.nasa.gov!usc!ne
ws.cerf.net!nntp-server.caltech.edu!news.ridgecrest.ca.us!owens!croton
From: Cyrus Roton <croton@ridgecrest.ca.us>
Subject: versatile interface
X-Sender: croton@owens
X-Nntp-Posting-Host: owens
Content-Type: TEXT/PLAIN; charset=US-ASCII
Message-ID: <Pine.SUN.3.91.951025104138.7395A-100000@owens>
Sender: usenet@ridgecrest.ca.us (Ridgenet Usenet admin)
Organization: RidgeNet - SLIP/PPP Internet, Ridgecrest, CA. (619) 371-3501
Mime-Version: 1.0
Date: Wed, 25 Oct 1995 17:44:56 GMT
Lines: 71
```

GAME PORT, VERSATILE INTERFACE

A multitude of interface cards exist for the Apple II. But, few people realize that the Apple II game port can be a very versatile interface.

A "paddle" input is internally connected to a trigger chip and a .022 MFD capacitor. The paddle is a variable resistor and a voltage source. In use, the capacitor is discharged, a timer (counter) is reset, and then the capacitor is allowed to charge by current passing through the external resistor while the counter is incrementing. When the charge on the capacitor reaches 3.2 volts, the trigger circuit stops the counter. The number stored in the counter at that time gives an indication of the time required for the capacitor to charge up to the trigger voltage, and that time relates the value of the external resistor (paddle) as follows:

$$V = (\text{input voltage}) * (1 - \text{EXP}(-t/R * C))$$

From experiment, we find that with a 5 volt input and a 120K resistor, the counter will reach a value of 250. From this fact, and using the above formula, we can plot the count as a function of resistance

Knowing all of this, we can design interface circuits. Such devices as photocells, photo resistors, thermistors, and other things could be connected to the game port. With appropriate software, we could use the Apple to monitor a variety of real-world events, and to display the results.

For example, a local chemistry lab wanted to measure the "time of solution" when a chemical was dropped into a test tube

containing a solvent. The solvent was clear, but changed color when the chemical dissolved into it. A light was passed through the test tube to strike a photo resistor. A TYPE 7 photo resistor, which has peak sensitivity with orange light, varies its resistance as a function of light intensity, with the formula

$$R = (443) * (I^{(-0.6692)})$$

where R is in Kilohms and I is in foot-candles. Futhermore, the minimum sensitivity of the photo resistor is with violet light, which happens to be the color when thiothymolyne is dissolved in water.

When the photo resistor is connected to the paddle input with 33 volt source, the resistance in Megohm is calculated by the approximation;

$$R = (\text{count}) / 209.9$$

The point of all this was an attempt to refute the results obtained by Prof. Azimov, as reported in April 1948. The Prof. had reported that thiothymolyne displays a negative "time of solution" when dropped into water. Prof. Azimov may have been correct. Unfortunately, meaningful results could not be obtained from the above experiment because the Apple II is too slow to measure negative time. Perhaps one of the new optical computers, which operates at the speed of light, could be fitted with an accelerator to operate faster than light, and thus be used to measure negative time.

Of course, some of this is in jest. But such interfaces are practical, within the limitations of the Apple II game port.

Cyrus Roton croton@ridgecrest.ca.us
Ridgecrest Apple User Group

```
##### E N D O F F I L E
### interfacing
##### E N D O F F I L E
```

```
#####
### FILE      : io16.serial
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 7794 bytes   7 KB
#####
```

```
Newsgroups: comp.sys.apple2.comm
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!sol.ctr.columbia.edu!newsxfer.itd.umich.edu!nntp.cs.ubc.ca!uw-
beaver!netnews.nwnet.net!news.clark.edu!lclark!NewsWatcher!user
From: drucker@lclark.edu (Ivan Drucker)
Subject: plans for simple serial i/o (game port) part 1
Message-ID: <drucker-270294181337@149.175.6.233>
Followup-To: comp.sys.apple2.comm
Sender: usenet@lclark.edu (News Poster)
Nntp-Posting-Host: 149.175.6.233
Organization: Lewis and Clark College, Portland OR
Date: Sun, 27 Feb 1994 18:13:36 +0000
Lines: 138
```

By previous demand from a long time ago, I'm going to reproduce the plans for a simple serial output from the][/][+][e 16-pin game port. These originally appeared in the January 1978 Apple][Reference manual that was included with the computer back when they gave useful informatin as part of the package.

A SIMPLE SERIAL OUTPUT

The Apple II is equipped with a 16 pin DIP socket most frequently used to connect potentiometers, switches, etc. to the computer for paddle control and other game applicatins. This socket, located at J-14, has outputs available as well. With an appropriate machine language program, these output lines may be used to serialize data in a format suitable for a teletype. A suitable interface circuit must be built since the outputs are merely LSTTL and won't run a teletype without help. Several interface circuits are discussed below and the user may pick the one best suited to his needs.

The ASR-33 Teletype

The ASR-33 Teletype of recent vintage has a transistor circuit to drive its solenoids. This circuit is quite easy to interface to, since it is provided with its own power supply. (Figure 1a) It can be set up for a 20mA current loop and interfaced as follows (whether or not the teletype is strapped for full duplex or half duplex operation):

a) The yellow wire and purple wire should both go to terminal 9 of Terminal Strip X. If the purple wire is going to terminal 8, then remove it and relocate it at terminal 9. This is necessary to change from the 60mA current loop to the 20mA current loop.

b) Above Terminal Strip X is a connector output socket identified as "2". Pin 8 is the input line + or high; Pin 7 is the input line - or low. This connector mates with a Molex receptacle model 1375 #03-09-2151 or #03-09-2153. Recommended terminals are Molex #02-09-2136. An alternate connection method is via spade lugs to Terminal Strip X, terminal 7 (the + input line) and 6 (the - input line).

c) The following circuit can be built on a 16 pin DIP component carrier

and then plugged into the Apple 16 pin socket found at J-14: (The junction of the 3.3k resistor and the transistor base lead is floating). Pins 16 and 9 are used as tie points as they are unconnected on the Apple board. (Figure 1a).

The "RS-232 Interface"

For this interface to be legitimate, it is necessary to twice invert the signal appearing at J-14 pin 15 and have it swing more than 5 volts both above and below ground. The following circuit does that but requires that both +12 and -12 supplies be used. (Figure 2) Snipping off pins on the DIP-component carrier will allow the spare terminals to be used for other tie points. The output ground connects to pin 7 of the DB-25 connector. The signal output connects to pin 3 of the DB-25 connector. The "protective" ground wire normally found on pin 1 of the DB-25 connector may be connected to the Apple's base plate if desired. Placing a #4 lug under one of the four power supply mounting screws is perhaps the simplest method. The +12 volt supply is easily found on the auxiliary Video connector (see Figure S-11 or Figure 7 of the manual). The -12 volt supply may be found at pin 33 of the peripheral connectors (see Figure 4) or at the power supply connector (see Figure 5 of the manual).

A Serial Out Machine Center Language Program

Once the appropriate circuit has been selected and constructed a machine language program is needed to drive the circuit. Figure 3 lists such a teletype output machine language routine. It can be used in conjunction with an Integer BASIC program that doesn't require page \$300 hex of memory.

This program resides in memory from \$370 to \$3E9. Columns three and four of the listing show the op-code used. To enter this program into the Apple II the following procedure is followed:

Entering Machine Language Program

1. Power up Apple II
2. Depress and release the "RESET" key. [Note: This is for Rev. 0 Apple]['s!] An asterick and flashing cursor should appear on the left hand side of the screen below the random text matrix.
3. Now type in the data from columns one, two and three for each line from \$370 to 03E9. For example, type in "370: A9 82" and then depress and release the "RETURN" key. Then repeat this procedure for the data at \$372 and on until you complete entering the program.

Executing this Program

1. From BASIC a CALL 880 (\$370) will start the execution of this program. It will use the teletype or suitable 80 column printer as the primary output device.
2. PR#0 will inactivate the printer transferring control back to the Video monitor as the primary output device.
3. In Monitor mode \$370G activates the printer and hitting the "RESET" key exits the program.

[Note: I know you don't need to know this, I'm entering it for completion's sake and 'cause I find it amusing...]

Saving the Machine Language Program

After the machine language program has been entered and checked for accuracy it should, for convenience, be saved on tape - that is unless you prefer to enter it from the keyboard every time you want to use it.

The way it is saved is as follows:

1. Insert a blank program cassette into the tape recorder and rewind it.
2. Hit the "RESET" key. The system should move into Monitor mode. An asterick "*" and flashing cursor should appear on the left-hand side of the

screen.

3. Type in "370.03E9W 370.03E9W". [Teaching you to back up even then.]
4. Start the tape recorder in record mode and depress the "RETURN" key.
5. When the program has been written to tape, the asterick and flashing cursor will reappear.

The Program

After entering, checking and saving the program perform the following procedure to get a feeling of how the program is used:

1. Bc (control B) into BASIC
2. Turn the teletype (printer on)
3. Type in the following


```
10 CALL 880
15 PRINT "ABCD...XYZ01123456789"
20 PR#0
25 END
```
4. Type in RUN and hit the "RETURN" key. The text in line 15 should be printed on the teletype and control is returned to the keyboard and Video monitor.

Line 10 activates the teletype machine routine and all "PRINT" statements following it will be printed to the teletype until a PR#0 statement is encountered. Then the text in line 15 will appear on the teletype's output. Line 20 deactivates the printer and the program ends on line 25.

Conclusion

With the circuits and machine language program described in this paper the user may develop a relatively simple serial output interface to an ASR-33 or RS-232 compatible printers. This circuit can be activated through BASIC or monitor levels. And it is a valuable addition to any users program library.

Ok. That's all of the text -- all that's left to reproduce is the machine code and the two schematics. I'm debating whether or not to reproduce the whole source with comments, or whether to just do a hex dump -- it'll depend upon how ambitious I'm feeling. I'm not so slick with schematics so we'll see how this turns out with only ASCII to work with. It'll be in the next post.

Ivan Drucker
drucker@lclark.edu
Lewis & Clark College, Portland OR

```
##### E N D O F F I L E
### iol6.serial
##### E N D O F F I L E
```

```
#####
### FILE      : io32
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3782 bytes   3 KB
#####
```

```
Path: news.uiowa.edu!chi-
news.cic.net!mntp.coast.net!news2.acs.oakland.edu!newshub.gmr.com!hobbes.tad.eds.c
om!maverick.tad.eds.com!news-admin@tad.eds.com
From: Erick Wagner <wagnere@netcom.com>
Newsgroups: comp.sys.apple2.programmer
Subject: Re: Q: I/O 32 card from Applied Engineering
Date: 5 Dec 1995 15:53:02 GMT
Organization: PRC
Lines: 96
Message-ID: <4alpsu$02u@maverick.tad.eds.com>
References: <49dv74$ccm@trib.apple.com> <49iui9$fgr@nnrpl.news.primenet.com>
NNTP-Posting-Host: 148.94.8.235
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Mailer: Mozilla 1.22 (Windows; I; 16bit)
```

Recently Dave Lyons and John Bowling asked about the AE I/O 32 card.

I sent Dave some info via email but thought I should post so others could benefit from it too.

>I suspect that the AE card used a couple of 6522's

Good guess but wrong :) AE used a pair of Motorola 6821 chips. MicroDimensions also used the 6821 chip in at least one of their I/O boards and the John Bell Engineering board uses the 6522. If you have a choice over which I/O to use, I'd lean towards the 6522. It seems to be a little more straightforward in terms of setting it up for I/O and it has some wonderful built-in timers that can prevent you from writing some fairly complex code.

Well, here's the info I sent to Dave:

```
=====
Applied Engineering I/O 32 Information
=====
```

If a bit in the Data Direction Register is 1, the corresponding bit of the Port is an output; otherwise, it is an input.

The procedure for writing to an output is:

- (1) Write a 0 to bit 2 of the Control Register
- (2) Write 1's to the Data Direction Register of each output bit
- (3) Write a 1 to bit 2 of the Control Register
- (4) Write data to the Port

The procedure for reading to an input is:

- (1) Write a 0 to bit 2 of the Control Register
- (2) Write 0's to the Data Direction Register of each input bit
- (3) Write a 1 to bit 2 of the Control Register
- (4) Read data from the Port

Control Register A \$C085+s0

Control Register B \$C087+s0

Control Register C \$C089+s0

Control Register D \$C08B+s0

Examples:

Reading all 8 bits from Port A

```
LDA $C085+s0    ;Read Control Register A
AND #%11111011 ;Turn off bit 2
STA $C085+s0    ;Set CRA for Data Direction
LDX #$00        ;All bits are inputs
STX $C084+s0    ;Set Data Direction for all inputs
ORA #%00000100 ;Turn on bit 2
STA $C085+s0    ;Set CRA for Port A data
LDA $C084+s0    ;Read Port A data
```

Reading bits 0, 1, 2 from Port B

```
LDA $C087+s0    ;Read Control Register B
AND #%11111011 ;Turn off bit 2
STA $C087+s0    ;Set CRB for Data Direction
LDX #%11111000 ;Bits 0, 1, 2 are inputs
STX $C086+s0    ;Set Data Direction
ORA #%00000100 ;Turn on bit 2
STA $C087+s0    ;Set CRB for Port B data
LDA $C086+s0    ;Read Port B data
```

Writing bits 4, 5, 6, 7 to Port C

```
LDA $C089+s0    ;Read Control Register C
AND #%11111011 ;Turn off bit 2
STA $C089+s0    ;Set CRC for Data Direction
LDX #%11110000 ;Bits 4, 5, 6, 7 are outputs
STX $C088+s0    ;Set Data Direction
ORA #%00000100 ;Turn on bit 2
STA $C089+s0    ;Set CRC for Port C data
LDA #$A0        ;Data to write
STA $C088+s0    ;Write Port C data
```

Writing all 8 bits to Port D

```
LDA $C08B+s0    ;Read Control Register D
AND #%11111011 ;Turn off bit 2
STA $C08B+s0    ;Set CRD for Data Direction
LDX #$FF        ;All bits are outputs
STX $C08A+s0    ;Set Data Direction for all outputs
ORA #%00000100 ;Turn on bit 2
STA $C08B+s0    ;Set CRD for Port D data
LDA #$AE        ;Data to write
STA $C08A+s0    ;Write Port D data
```

[end of document]

```
##### E N D   O F   F I L E  
### io32  
##### E N D   O F   F I L E
```

```
#####
### FILE      : j25.pinout
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1207 bytes   1 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!news-
e2a.gnn.com!newstf01.news.aol.com!newsbf02.news.aol.com!not-for-mail
From: rubywand@aol.com (RUBYWAND)
Newsgroups: comp.sys.apple2
Subject: Re: Sonic Blaster HELP!
Date: 1 May 1996 04:52:54 -0400
Organization: America Online, Inc. (1-800-827-6364)
Lines: 34
Sender: root@newsbf02.news.aol.com
Message-ID: <4m78p6$96d@newsbf02.news.aol.com>
References: <4m6d8r$cji@nyx10.cs.du.edu>
NNTP-Posting-Host: newsbf02.mail.aol.com
X-Newsreader: AOL Offline Reader
```

In article <4m6d8r\$cji@nyx10.cs.du.edu>, wbaguhn@nyx10.cs.du.edu (Will Baguhn) writes:

```
>
>AIGH! I've recently gotten a Sonic Blaster (AE), and not the sound
output
>cable that goes with it. the output (?) on the card is a Molex-6, i
believe.
>
>I really would like stereo output, so a pinout would be appreciated.
THANKS!
>
```

Here is the pinout for J-25. I'm pretty sure Pin [1] is closest to the front of the computer.

- [1] A/D Converter Input (3000 Ohms)
- [2] Analog GND
- [3] Analog Output (-5 to +5 P-P, 10,000 Ohms minimum)
- [4] Channel ADDR 0
- [5] Channel ADDR 1
- [6] Channel Strobe (goes Low when ADDR valid)
- [7] Channel ADDR 2

Rubywand

```
##### E N D O F F I L E
```

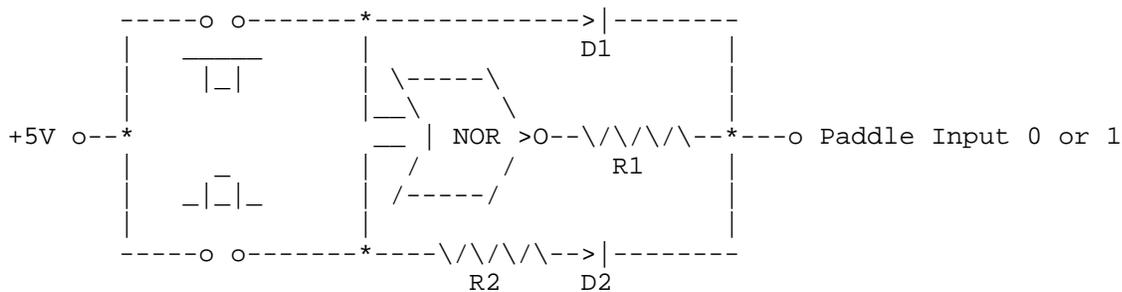
j25.pinout

E N D O F F I L E

```
#####
### FILE      : joyst.ibm2a1i
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 3171 bytes    3 KB
#####
```

```
Path:
news.weeg.uiowa.edu!news.uiowa.edu!uunet!think.com!sdd.hp.com!zaphod.mps.ohio-
state.edu!cs.utexas.edu!gateway
From: C1891@slvaxa.umsl.edu
Newsgroups: comp.sys.apple2
Subject: Apple II digital joystick interface
Date: 22 Nov 1992 12:54:42 -0600
Organization: UTexas Mail-to-News Gateway
Lines: 70
Sender: daemon@cs.utexas.edu
Message-ID: <01GRGBHATRO08WW0UZ@slvaxa.umsl.edu>
NNTP-Posting-Host: cs.utexas.edu
```

This is the schematic for using a digital joystick on an Apple II game port. Use one copy of this circuit for each joystick axis (i.e. you need two of these).



```
R1 = about 71K
R2 = 150K
D1 & D2 are switching diodes
```

I don't know if this company is still around, but they used to sell factory seconds of commercial quality digital joystick elements (the type used in commercial arcade games). The company is Newport Machine Design, PO Box 418, Bishop, CA, 93514 (phone: 619-873-5677).

The suggested pin-out for this is the Coleco Adam, which is the same as the Atari, but has a second push button.

joystick position	socket # on plug
=====	=====
UP	1
DOWN	2
LEFT	3
RIGHT	4
FIRE 2	5
FIRE 1	6

```

-----          7
Common Ground    8      (connect to +5V for the Apple interface)
-----          9

```

By using this pin-out, your joystick can also be used on Commodore 64 and Atari (computer or game) systems.

For Apple II and II+ owners:

The logic for the push-buttons is not positive logic. You will need to use a 5V coil relay or a transistor circuit to convert the +5V, normally open switch logic for FIRE 1 & 2 to the open-collector logic (normally closed switch connected to ground) used by the game port.

** disclaimer time **

I have used the above circuit on my Apple II+ for 9 years without any problem. However, I am not responsible or liable for your ability with a soldering iron. Use this circuit at your own risk. Someday I will probably redesign this to work better (I know a lot more about electronics now than I did 9 years ago), but it works and so improving the design has been a very low priority. When the day comes that I do redesign this interface, I will certainly post it for the Apple II community to share and enjoy.

Shade and sweet water,

Curt

```

Curt Schroeder | McDonnell Douglas Aerospace - East | c1891@slvaxa.ums1.edu |
-----|-----| curts@tmpcu.mdc.com |
These opinions are mine, mine, mine! |-----|
I am not an instantiation of Std_Employee! | - Apple II Forever - |

```

```

##### E N D O F F I L E
### joyst.ibm2aii
##### E N D O F F I L E

```

```
#####
### FILE      : joystck.read
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3757 bytes   3 KB
#####
```

Newsgroups: comp.sys.apple2

Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!zaphod.mps.ohio-
state.edu!cs.utexas.edu!sun-barr!ames!agate!dog.ee.lbl.gov!news!nosc!crash!pro-
nbs!pro-harold!pro-cajun!pro-gumbo!tgeer

(Smail3.1.28.1 #7) id m0nEz5Z-000012C; Thu, 21 Jan 93 02: 24 PST

From: tgeer@pro-gumbo.cts.com (System Administrator)

Subject: Re: Attention assembly programmers...

Organization: Apple Gumbo BBS

Date: Tue, 19 Jan 93 20:29:30 CST

Message-ID: <aj74842@pro-gumbo.cts.com>

In-Reply-To: andreprellwitz@balboa.eng.uci.edu (Andre Prellwitz)

References: <2B59CDAB.12197@news.service.uci.edu>

Lines: 59

In <2B59CDAB.12197@news.service.uci.edu>

andreprellwitz@balboa.eng.uci.edu (Andre Prellwitz) writes:

>A while ago someone posted about how to read the joystick on a //gs in native
>mode. They said that it was possible to read both paddles at once and there-
>fore get much more accurate readings. I don't recall exactly how to do this,
>but I've been trying the following: strobe the analog paddle reset (\$c070)
>and then read locations \$c064 and \$c065 and wait until both return to zero.
^^

Only the high bit of these locations is valid. When the high bit of either location becomes 0 then the corresponding analog input has timed out. You will actually get more accurate results by reading them one after the other with the accumulator set to 8 bits wide and the index registers used to hold the counts (16 bits wide). This allows for a much faster loop, giving better resolution. Assuming that this routine is called from full native mode, the following code will do the trick:

```
strobe    equ    $C070        ; analog input timing reset
pd10     equ    $C064        ; analog input 0
pd11     equ    $C065        ; analog input 1

start     php                    ; save processor status register
          phb                    ; and data bank register
          sep    #100000        ; make accumulator 8 bits wide
          lda    #0             ; make data bank = 0
          pha
          plb
          ldx    #0             ; initialize the counters
          txy
loop1     lda    strobe          ; strobe the timing reset
          inx                    ; increment pd10 count
          lda    pd10           ; is high bit = 0?
          bmi    loop1          ; no, keep checking
          lda    strobe          ; yes, strobe the timing reset again
```

```

loop2   iny           ; increment pdll counter
        lda    pdll   ; is high bit = 0?
        bmi    loop2  ; no, keep checking
        plb           ; yes, restore data bank
        plp           ; and processor status register
        rts          ; return to caller (could be RTL)

```

Notice that the actual counting loops are only 9 cycles long. This gives the best possible resolution. You will need your counters to be 16 bits wide as the results will easily overflow the capacity of an 8 bit counter. Using memory locations as counters will only serve to slow the counting loop down. If X and Y contain valid data before entry, you will need to save them off to the stack and pull them back in after interpreting the joystick results. I have used this exact method to read the analog inputs on my Science Toolkit box which connects to the joystick port. The results have been extremely accurate (much more than would be needed for a game which reads the joystick).

```

-----
ProLine: tgeer@pro-gumbo      Internet: tgeer@pro-gumbo.cts.com
UUCP:   crash!pro-gumbo!tgeer  Fidonet: tom.geer@f20.n380.z1.fidonet.org
-----

```

"My wife is a bargain hunter - I just carry the ammunition."

```

##### E N D       O F       F I L E
### joystick.read
##### E N D       O F       F I L E

```

```
#####
### FILE      : joystick.asm
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 2466 bytes    2 KB
#####
```

Path:

```
blue.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!newsfeed.ksu.ksu.edu!m
oe.ksu.ksu.edu!vixen.cso.uiuc.edu!uwm.edu!cs.utexas.edu!usc!nic-
nac.CSU.net!csulb.edu!paris.ics.uci.edu!clyde.ics.uci.edu!jlee
From: jlee@ics.uci.edu (Orion Pax)
Newsgroups: comp.sys.apple2.programmer
Subject: Re: Joystick Code... Help Please!
Date: 26 Nov 1994 06:32:24 GMT
Organization: Creative 'Ware @ University of California, Irvine
Lines: 59
Message-ID: <3b6kpo$ooos@paris.ics.uci.edu>
References: <3b37bu$8ag@condor.ic.net>
NNTP-Posting-Host: clyde.ics.uci.edu
X-Newsreader: TIN [version 1.2 PL2]
```

Shawn Platkus (platkus@ic.net) wrote:

: I'm in need of some code to read the joystick values from 65816 assembly.

Here's the code I copied from Out of This World and used in Star Command GS:

```
readJoystick      START
*
* Reads the values for the joystick paddles && returns values in the x/y regs
* 7/93 version 4.0.2
*
* Code from Out of This World by Bill Heineman
*
    php                      ; save states of cpu
    phd
    pea $100                  ; put maxReadBound on stack (values max at $FF)
    tsc                      ; point dp to maxReadBound
    tcd
    sei                      ; interrupts off
    lda >$C070                ; reset joystick i/o timer
    ldx #0                   ; zero counters
    txy
readLup anop
    lda >$C064                ; read x/y axes
    and #$8080
    beq quit                 ; if neither valid, quit
checkY anop
    asl a
    bcc ySpinWheels         ; if invalid y, do dummy code for dummy cycle time
    iny                     ; else increment y counter
    bra checkX
ySpinWheels anop           ; dummy code of similiar cycle time
    nop
    nop
    nop
```

```

checkX anop
      asl a
      beq xSpinWheels      ; if invalidx, do dummy code for dummy cycle time
      inc
      bra maxDec
xSpinWheels anop          ; dummy code of similiar cycle time
      nop
      nop
      nop
maxDec anop
      dec <1              ; this makes sure values are <= 255
      bne readLup
quit anop
      pla
      pld                ; restore cpu state
      plp
      rtl
      END

```

Joseph

```

--
jlee@clyde.ics.uci.edu | Have you watched your Koko wa GreenWood, Yotoden,
-----+ Gundam 0083, Bubble Gum Crisis/Crash!, Video Girl
II(> Creative 'Ware <)II | Ai, Tenchi Miyou, Ah! My Goddess, Maison Ikkoku,
  Cal-Animage Epsilon VP | PatLabor, Ranma 1/2, and Five Star Stories today?

```

```

##### E N D O F F I L E
### joystick.asm
##### E N D O F F I L E

```

```
#####
### FILE      : joystick.convertor
#####
### Created   : Sunday, February 14, 1999  Modified: Sunday, February 14, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 4176 bytes   4 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.erols.net!newsfeed.berkeley.edu!cyclone.swbell.net!typhoon01.swb
ell.net.POSTED!not-for-mail
Message-ID: <36C54EDC.81B6B38@swbell.net>
From: Rubywand <rubywand@swbell.net>
Reply-To: rubywand@swbell.net
X-Mailer: Mozilla 4.5 [en] (Win95; U)
X-Accept-Language: en
MIME-Version: 1.0
Newsgroups: comp.sys.apple2
Subject: Re: Joystick Pin-Out
References: <rB7x2.616$_B2.11382@newsfeed.slurp.net>
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
Lines: 88
Date: Sat, 13 Feb 1999 04:07:24 -0600
NNTP-Posting-Host: 207.193.8.30
X-Complaints-To: abuse@swbell.net
X-Trace: typhoon01.swbell.net 918900432 207.193.8.30 (Sat, 13 Feb 1999 02:07:12
PDT)
NNTP-Posting-Date: Sat, 13 Feb 1999 02:07:12 PDT
Organization: SBC Internet Services
Xref: newsl.icaen comp.sys.apple2:145074
```

"Charles J. Sarchet" writes ...

```
>
> Could someone please post the pin out for the 9-pin joystick connection and
> the 16-pin connection on the motherboard of the GS. I would like to convert
> my Wingman Extreme to a GS capatible joystick.
```

Converting a PC stick is probably the best way to get a high quality stick for your IIgs. Here are directions for making a converter:

To PC Stick	To Apple II	Or to 16-pin IC plug
15-pin Dsub	9-pin Dsub	ribbon cable to
female connector	male connector	internal Game socket

[1] [4] and [5]	-----[2]	+5V	[1]
[2]	-----[7]	Button 0	[2]
[3]	-----[5]	X-axis	[6]
[6]	-----[8]	Y-axis	[10]
[7]	-----[1]	Button 1	[3]
	[3]	Ground	[8]

On the Apple II side ...	9-Pin	16-Pin
add 680 Ohm resistor between	[7] & [3]	[2] & [8]
add 680 Ohm resistor between	[1] & [3]	[3] & [8]

add .01 uF cap* between [5] & [3] [6] & [8]
 optional: for fine-tuning,
 add 50K-100K trim pot
 in series with the cap

add .01 uF cap* between [8] & [3] [10] & [8]
 optional: for fine-tuning,
 add 50K-100K trim pot
 in series with the cap

*Note: The Capacitors compensate for smaller R range of PC sticks. The C values are approximate. For standard 100K Ohm PC sticks, .01 uF pretty well guarantees you will be able to cover the full Apple II X and Y range (0-255).

Values of .01 uF (X-axis) and .005 uF (Y-axis) worked well for a PC "FlightStick" when plugged into our Apple II+.

For checking and adjusting stick performance on your Apple II, use a program which continuously reads and displays X and Y stick values. The program below does this and displays "B0" when Button 0 is pushed and "B1" when Button 1 is pushed. Do a CTRL-C to exit.

```
20 PRINT "X= "; PDL(0); TAB(15); "Y= ";PDL(1); TAB(30);
30 IF PEEK(49249)>127 THEN PRINT " B0";
40 IF PEEK(49250)>127 THEN PRINT " B1";
50 PRINT: GOTO 20
```

Note: If your Apple II uses an accelerator chip or board, make sure that it "slows down" for joystick accesses or just set Speed to "Normal" (1MHz).

Most likely, you will find that the a stick tops-out too early in the X-max and/or Y-max direction. For best control precision, what you want is for extreme values to occur near the extremes of stick movement:

X (horizontal) Left= 0 Right= 255
 Y (vertical) Up= 0 Down= 255

This way, you have lots of active swing which makes graphics work and playing most games much easier.

If you included the trim pots in your converter, adjusting for maximum active swing will be easy. If your converter does not include the trim pots, experiment with swapping in capacitance values between ..002 uF and .01 uF to get the best control 'spread'.

The converter I built fit inside heat-shrink tubing. Putting it in a small plastic box may be better. You could mount the trim pots (and/or switches with fixed "trim resistors") and select between settings for a 'Fast', short swing, 'hot' Game Stick and a 'Normal', full swing, 'cool' Game/Graphics Stick.

Rubywand

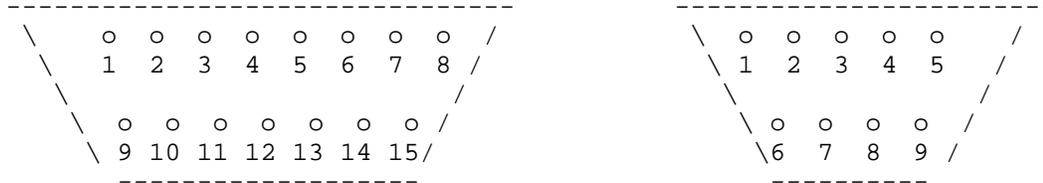
```
##### E N D O F F I L E
### joystick.convertor
##### E N D O F F I L E
```

```
#####
### FILE      : joystick.ibm2aii
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2624 bytes   2 KB
#####
```

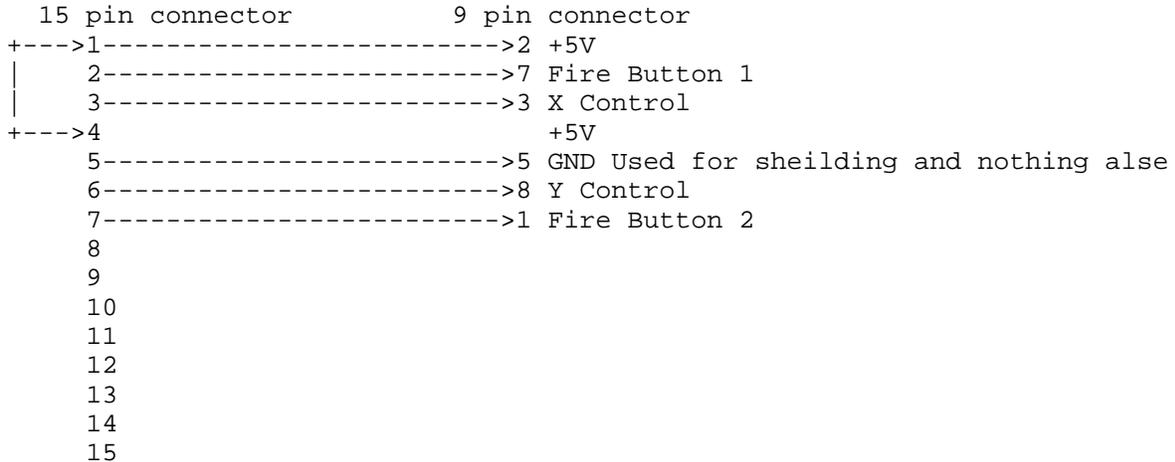
```
Path: news.weeg.uiowa.edu!news.uiowa.edu!uunet!wupost!zaphod.mps.ohio-
state.edu!menudo.uh.edu!elroy.uh.edu!stldr
From: stldr@elroy.uh.edu (Frankfort, David C.)
Newsgroups: comp.sys.apple2
Subject: Joystick IBM->Apple2
Date: 15 Nov 1992 23:51 CST
Organization: University of Houston
Lines: 47
Distribution: world
Message-ID: <15NOV199223511033@elroy.uh.edu>
NNTP-Posting-Host: elroy.uh.edu
News-Software: VAX/VMS VNEWS 1.41
```

This is the requested conversion from an IBM joystick to an Apple joystick. The materials required to do it is a shielded 6 wire cable to any length desired. Also include a 15 pin sub d male and a 9 pin sub d male. Of course you'll need a soldering iron and solder or else get the crimping kind of pins for the sub d connectors.

Pin assignments - looking into the d



Now with the knowledge of the pin assignments the actual dirty work can begin. The layout is with respect to the 15 pin IBM connector. Pins not mentioned on the 9 pin connector are not used. Note the jumper between pin 1 and pin 4 on the 15 pin sub d.



Once all the connections are put together put the screws to hold it all together. A suggestion is to put a nut with a one piece screw and nut like the one used on the Super Serial Card for the 15 pin sub d. This will allow for the screws on the IBM joystick. BTW I will not held responsible for any subsequent faults or failure due to the above information. To send comments or suggestions please mail to stldr@jetson.uh.edu.

*David F. No silly quote. *

E N D O F F I L E
joystick.ibm2aii
E N D O F F I L E

```
#####
### FILE      : joystick.orca
#####
### Created   : Sunday, January 14, 1996  Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5171 bytes   5 KB
#####
```

Newsgroups: comp.sys.apple2.programmer

Path:

news.uiowa.edu!uunet!usc!elroy.jpl.nasa.gov!decwrl!waikato!comp.vuw.ac.nz!actrix.gen.nz!dempson

From: dempson@atlantis.actrix.gen.nz (David Empson)

Subject: Re: Joystick and stuff

Message-ID: <D5JGFJ.Bp7@actrix.gen.nz>

Sender: news@actrix.gen.nz (News Administrator)

Organization: Actrix Information Exchange

Date: Thu, 16 Mar 1995 15:02:06 GMT

References: <pU26uow.sjc@delphi.com>

X-Nntp-Posting-Host: atlantis.actrix.gen.nz

Lines: 138

In article <pU26uow.sjc@delphi.com>, Stephen Carpenter <sjc@delphi.com> wrote:
> I am on a GS and was wondering how I can read the Joystick
> I am using Orca/c (if that helps any)

It certainly affects how you will go about reading the joystick.

There is no firmware or toolbox support provided for reading the joystick from GS/OS. Apart from writing your own assembly language code to read it, the easiest way is to use the FWEntry tool call in the Miscellaneous toolset to call the old PREAD routine in the monitor. This will allow one axis of the joystick to be read. You can then call it again with different parameters to read the other axis.

Note: you have to ensure each axis has timed out before trying to read it. If you try to read the X and Y values immediately after each other, you will probably get a false reading on the second one. A delay of at least three milliseconds is recommended. One commonly used solution is to separate the reading of the X and Y values and do several other operations between them.

Reading the buttons is easier: it is just a matter of reading the appropriate I/O locations directly.

Now for the details:

First, a very major warning: the FWEntry toolbox call has been implemented incorrectly in all versions of ORCA/C: its parameters are in a different order than they are listed in the toolbox reference. Even worse, the parameter order varies depending on which compiler version you have (all of them are wrong).

The official definition of FWEntry is:

```
regs = FWEntry(aReg, xReg, yReg, entryPt);
```

With ORCA/C 1.0 to 2.0.0, you must reverse the parameters:

```
regs = FWEntry(entryPt, yReg, xReg, aReg);
```

With ORCA/C 2.0.1 to 2.0.3, you must swap the first and last parameters:

```
regs = FWEntry(entryPt, xReg, yReg, aReg);
```

This will probably be fixed in a future version of the compiler (it is actually a bug in the library code), so the correct parameter order will be used (a, x, y, entryPt). [Yes, Mike does know about this one.]

If you change compiler versions, make sure you check your FWEntry calls are correct for the new version.

Having got that out of the way, here is the code required to read either axis of the joystick from ORCA/C. I've used inline assembly language to read I/O ports directly, to avoid possible hiccups with ORCA/C reading the following byte as well.

```
#include <misctool.h>

/* Set the FWENTRY_BUG macro according to the compiler version you are using:

1  ORCA/C 1.x, or ORCA/C 2.0.0
2  ORCA/C 2.0.1 through 2.0.3, or future versions that still have
   the same bug.
0  Future versions of ORCA/C that have the bug fixed.
*/

#define      FWENTRY_BUG 2          /* I'm assuming ORCA/C 2.0.1 to 2.0.3 */

#define      PRead 0xFB1E         /* Paddle read routine entry point */

Word read_paddle(Word n) {
    /* Get the current reading from a paddle.  Paddle 0 is the
       joystick X axis, paddle 1 is the joystick Y axis.  If a second
       joystick is connected, it corresponds to paddles 2 (X) and 3 (Y). */
    FWRec regs;
    #if FWENTRY_BUG == 2
        regs = FWEntry(PRead, n, 0, 0);
    #elif FWENTRY_BUG == 1
        regs = FWEntry(PRead, 0, n, 0);
    #else
        regs = FWEntry(0, n, 0, PRead);
    #endif
    return regs.yRegExit & 0xFF;
}

Boolean test_paddle(Word n) {
    /* Test if a paddle has timed out since the last read.  This routine
       can be used to check whether it is safe to call read_paddle again.
       The return value is TRUE if the specified paddle has timed out
       and can be read again, FALSE if it is still timing out (this may
       indicate that the paddle/joystick has not been connected if it
       continues long enough). */
    Byte paddle_flag;
```

```

asm {
    sep #0x30
    lda n
    and #0x03
    tax
    lda 0xE0C064,x
    and #0x80
    sta paddle_flag
    rep #0x30
}
return (paddle_flag != 0);
}

```

```

Boolean read_button(Word n) {
    /* Read the state of the specified paddle/joystick button.  The return
       value will be TRUE if the button is on, FALSE if the button
       is off.  This routine supports buttons 0, 1, 2, and 3.  Button
       3 is only available on the IIgs, and only on the internal 16-pin
       game port.
       Note: holding down the Apple key will make button 0 appear to
       be on; similarly, the Option key will make button 1 appear to
       be on.  */
    Byte button_state;
    asm {
        sep #0x30
        lda n
        inc a
        and #0x03
        tax
        lda 0xE0C060,x
        and #0x80
        sta button_state
        rep #0x30
    }
    return (button_state != 0);
}

```

--

David Empson
dempson@actrix.gen.nz
Snail mail: P.O. Box 27-103, Wellington, New Zealand

```

##### E N D O F F I L E
### joystick.orca
##### E N D O F F I L E

```

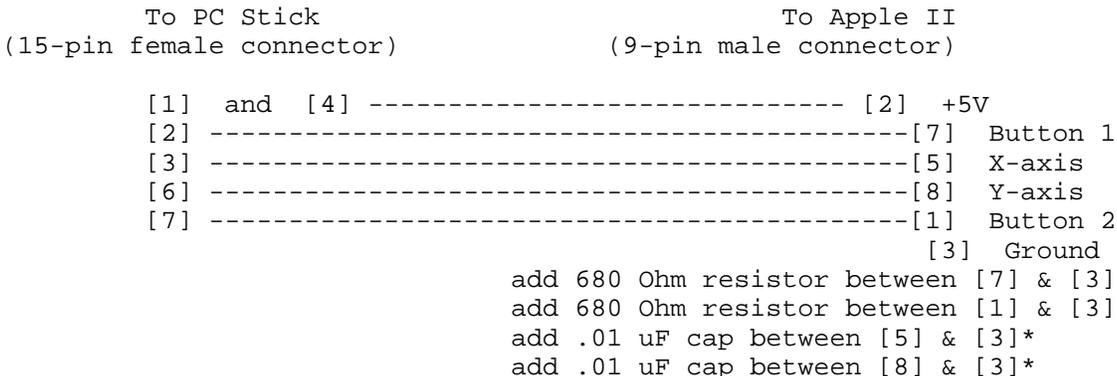
```
#####
### FILE      : joystick.pcmo
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2766 bytes   2 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!newsfeed.internetmci.com!inl.uu.net!newstf01.news
.aol.com!newsbf02.news.aol.com!not-for-mail
From: rubywand@aol.com (RUBYWAND)
Newsgroups: comp.sys.apple2
Subject: Re: Joysticks for Newbie? IIC and IIE.
Date: 6 Jan 1996 07:27:15 -0500
Organization: America Online, Inc. (1-800-827-6364)
Lines: 46
Sender: root@newsbf02.news.aol.com
Message-ID: <4clpr3$mlr@newsbf02.news.aol.com>
References: <4cj35n$jjs@newsbf02.news.aol.com>
NNTP-Posting-Host: newsbf02.mail.aol.com
X-Newsreader: AOL Offline Reader
```

Re question: What joystick can I use on a IIC and where can I buy one?
Same for a IIE. ...

When John Dobbins emailed a question about stick wiring, it suddenly dawned upon me that I've never seen a modern, pure PC stick converted for use on an Apple II or a "PC-to-Apple converter cable". It seemed like a good idea to actually try building a converter cable.

My PC stick is a standard CH Products "FlightStick". A resistance measurement produced a disconcerting revelation: the X and Y pots top-out around 100K Ohms-- 50K less than a standard Apple II stick! Fortunately, you can compensate for the difference just fine by adding a bit of capacitance. The finished converter is shown below:



*NOTE: These C values are approximate. For standard 100K Ohm PC sticks, .01 uF pretty well guarantees you will be able to cover the full Apple II X and Y range (0-255).

However, you may find that the stick tops-out too early in the X and/or Y max direction. For best control precision, what you want is for extreme

values to occur near the extremes of stick movement.

Use a program which continuously reads and displays X and Y stick values and experiment with capacitance values between .002 uF and .01 uF to get the best 'spread'.

Values of .01 uf (H-axis) and .005 uF (Y-axis) worked well on the PC "FlightStick" when plugged into our Apple II+.

```
##### E N D O F F I L E  
### joystick.pcm  
##### E N D O F F I L E
```

```
#####
### FILE      : joystick.read
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 4001 bytes   3 KB
#####
```

```
Path: blue.weeg.uiowa.edu!news.uiowa.edu!uunet!usc!elroy.jpl.nasa.gov!netline-
fddi.jpl.nasa.gov!mntp-server.caltech.edu!nathan
From: nathan@cco.caltech.edu (Nathan Mates)
Newsgroups: comp.sys.apple2.programmer
Subject: Re: Joystick Code... Help Please!
Date: 25 Nov 1994 06:39:52 GMT
Organization: California Institute of Technology, Pasadena
Lines: 82
Message-ID: <3b40ro$ief@gap.cco.caltech.edu>
References: <3b37bu$8ag@condor.ic.net>
NNTP-Posting-Host: accord.cco.caltech.edu
```

In article <3b37bu\$8ag@condor.ic.net>, Shawn Platkus <platkus@ic.net> wrote:
>I'm in need of some code to read the joystick values from 65816 assembly.

This was sent to me a while back.

Nathan

```
--- Begin included file
From afcdyajim@aol.com Sat Mar 27 21:47:15 1993
From: afcdyajim@aol.com
X-Mailer: America Online Mailer
To: nathan@cco.caltech.edu
Subject: joystick routine
```

Path: Assembly (6502/65816)/Asm65816 Code Wanted...

```
Subj: My code... 92-10-21 22:48:08 EST
>From: AFL GaryJ
Posted on: America Online
```

Here's the code I used. There are a few things to keep in mind with this code: Because I'm using wide registers, the X and Y values of the joystick may come back with values greater than \$FF. The size of the number returned depends (in part) upon the speed of the machine that the code is running on. Accelerated IIGS's will return greater values than stock 2.8 MHz machines. Having the user do a joystick calibration at the start of the program would be one way of solving this problem.

Also, because the maximum joystick value returned is not "clipped off" (i.e. maxed out at \$FF), the X and Y maximum returned values may differ, depending on the model and wear of your joystick.

And one last thing: The timing cycles of my routine are greater than the sum of the cycles required to execute the standard paddle reading routine built into the II+ ROM. But, since my routine will execute at speeds greater than 1 MHz, the net difference results in a faster joystick read. That, coupled with the fact that both paddles are read at the same time, makes this routine

much faster than the standard ROM call.

I haven't looked at this code for a long time, and I'm sure there are ways to improve it. Anyone, feel free to post possible enhancements!

```

;
; Read the joystick controls:
PRead   anop
        php
        sei
        lda   >$00C070 ; trigger paddles      (6)
        ldy   #0       ;                      (3)
        ldx   #3       ;                      (3)
PRtime   dex         ;                      (2)
        bne   PRtime   ; timing loop for 1st count (2,3)
PRead2   lda   >$00C064 ; check paddle 0,1 status (6)
        and   #$8080   ; check high bits of each (3)
        beq   PRXit    ; exit if both are done   (2)
        cmp   #$0080   ; see if X only is active (3)
        bmi   PRBoth   ; > no, do both         (2,3)
        beq   PRXOnly  ; > X axis only         (2,3)
PRYonly  iny         ;                      (2)
        bpl   PRYmore  ; (just for timing)      (3)
        bmi   PRXit    ; (prevent endless loop)
PRYmore  bra   PRead2  ; go back for more      (3)
PRXOnly  inx         ;                      (2)
        bmi   PRXit    ; (prevent endless loop)
        bra   PRead2  ; go back for more      (3)
PRBoth   inx         ;                      (2)
        iny         ;                      (2)
        nop         ; match timing of others  (2)
        bpl   PRead2  ;                      (3)
PRXit    plp
        rts         ; x = pdl(0), y = pdl(1)

;-----

Gary

--
* Nathan Mates   http://www.ugcs.caltech.edu/~nathan/      *
* Ftp humor archiver: ftp to cco.caltech.edu, look in pub/humor *
* "Always listen to experts. They'll tell what can't be done, and *
* why. Then do it." -- Robert A. Heinlein, Lazarus Long    *

##### E N D O F F I L E
### joystick.read
##### E N D O F F I L E

```

```
#####
### FILE      : keybd.repair
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5216 bytes   5 KB
#####
```

Newsgroups: comp.sys.apple2

Path:

news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!newsfeed.ksu.ksu.edu!moe.ksu.ksu.edu!vixen.cso.uiuc.edu!howland.reston.ans.net!agate!darkstar.UCSC.EDU!news.hal.COM!olivea!decwrl!pa.dec.com!acme.freenet.columbus.oh.us!dalloff

From: dalloff@freenet.columbus.oh.us (Dave Althoff)

Subject: Dave's Guide to][e Keyboard Repair

Message-ID: <Pine.3.07.9406062340.A16870-bl00000@acme.freenet.columbus.oh.us>

Date: Mon, 6 Jun 1994 23:13:40 -0400 (EDT)

X-Received: by usenet.pa.dec.com; id AA03764; Mon, 6 Jun 94 20:35:30 -0700

X-Received: by pobox1.pa.dec.com; id AA03304; Mon, 6 Jun 94 20:35:27 -0700

X-Received: from acme.freenet.columbus.oh.us by inet-gw-3.pa.dec.com (5.65/27May94)

id AA16069; Mon, 6 Jun 94 20:31:52 -0700

X-Received: by acme.freenet.columbus.oh.us (8.6.7/5.901231)

id XAA17652; Mon, 6 Jun 1994 23:30:22 -0400

X-To: hbcsc003@huey.csun.edu

X-Cc: comp.sys.apple2.usenet@decwrl.dec.com

X-Mime-Version: 1.0

X-Content-Type: TEXT/PLAIN; charset=US-ASCII

Lines: 47

Most Apple][e's use all-mechanical Alps keyswitches in the keyboards. Some use a short-stem switch, some use a short-stem switch with an extender, and some use a long-stem switch. In most cases, the switches are not repairable.

Fortunately, replacement is fairly easy.

1. Remove the screws from the bottom of the][e case, and remove the top half of the case.
2. Scribe the position of the keyboard on the keyboard support brackets, to facilitate reinstallation.
3. Remove the keycaps of the blown key and the surrounding keys.
4. Remove the four keyboard mounting screws, and unplug the ribbon connector from the keyboard. At this point, I generally find it convenient to mount the keyboard PCB-side-up on the mounting brackets.
5. Locate the two solder pads under the blown key. Heat these pads and, using a vacuum bulb, remove all of the solder from the pins. Grasp the exposed pins with a small plier and wiggle a bit to make sure they are free of the board.
6. To remove the keyswitch, you must fully depress the tabs on either side of the key stem, and lift the entire switch upward. This is the tricky part.

7. To install the new keyswitch, simply press the switch into the hole in the keyboard until it snaps into position. Carefully solder the pins to the pads on the PC board, then reinstall the keyboard in the reverse of removal.

8. When reinstalling the keyboard, line the edges up with the scribe marks on the brackets. If you get it malpositioned, you may find that certain keys (most notably the "`") will stick by jamming against the system cover.

If you need more information, I am...

--Dave Althoff, Jr.
(dalloff@freenet.columbus.oh.us)
(long-time Apple][user)

Newsgroups: comp.sys.apple2
Path:
news.weeg.uiowa.edu!news.uiowa.edu!uunet!newsflash.concordia.ca!vax2.concordia.ca!
spector
From: spector@vax2.concordia.ca (Mitchell Spector)
Subject: Re: Keyboard repair
Message-ID: <7JUN199411052817@vax2.concordia.ca>
Summary: 3 key doesn't work; help!
News-Software: VAX/VMS VNEWS 1.41
Sender: usenet@newsflash.concordia.ca (USENET News System)
Nntp-Posting-Host: vax2.concordia.ca
Organization: Concordia University
References: <2st9n7\$9nc@nic-nac.CSU.net>
Date: Tue, 7 Jun 1994 16:05:00 GMT
Lines: 35

In article hbcsc003@huey.csun.edu (will irace) writes...

>
>I've just picked up a //e enhanced, and it's great except for the fact
>that the "3" key is stone cold dead. ("Aaigh! no PR#6!") I've taken it
>apart only to find that the keyboard is apparently RIVETED together! Is
>there no way for me to repair this? How about some sort of workaround
>(i.e., figuring out which pins I should short together to get a "3" out)?

I had a similar problem happen to me recently. Some months ago, my friend found an Apple //e in the trash and gave it to me the night of Oct.31st last year (hey, talk about your "enchanted" //e! ;-), but the keyboard was damaged and it was missing a screen. I soon discovered it would be much cheaper to just buy another second-hand //e, than pay for a replacement keyboard and monitor. So, a few weeks ago that's just what I did! When I brought it home it was fairly dirty, so I took it apart and cleaned everything including the brand-new working keyboard. Unfortunately, once I put everything back together, I found many of the keys were acting totally dead. Well, I was on verge of giving up until I tried this....

Remove the plastic-keycap on your "3" key. Do you see little plastic tabs on either side on the the keyswitch? Poke something in between these tabs (ie - toothpick, long metal-pin) and very gently pry them away from the keyswitch. If that doesn't work, push them in closer. Try depressing the keyswitch (without keycap back on yet) until you get a response on screen from the "3" key again. You might have to play around until it's fully functioning again. In my case, I think there was a contact-pad or something

similar that wasn't making a connection. While this solution may not sound so orthodox, it may just save you from having to do any messy soldering.

>Will Irace
>wirace@csun.edu

Mitchell Spector
sb_spec@pavo.concordia.ca / spectator@vax2.concordia.ca

```
##### E N D O F F I L E  
### keybd.repair  
##### E N D O F F I L E
```

```
#####
### FILE      : keyboardrom
#####
### Created   : Tuesday, January 1, 1980  Modified: Thursday, March 1, 1973
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1591 bytes   1 KB
#####
```

Wayne Stewart <waynes@intergate.bc.ca> writes:

>David Wilson wrote:

>> The Platinum //e has a 2nd ESC key on its numeric keypad but I recall reading
>> somewhere (probably Open-Apple newsletter) that there is a jumper connection
>> to make it send ^X just like the clear key on a //gs.

>>

>> The external numeric keypad on a beige //e has its own XY coordinates in the
>> keyboard decoder ROM so by changing the contents of the ROM you can make
>> any character key send anything you want.

>> --

>> David Wilson School of IT & CS, Uni of Wollongong, Australia

>I checked out a Platinum IIe keyboard and am satisfied none of the jumpers on it
>effect the esc keys. however I was pleasantly surprised that the numeric keypad
esc

>key is connected differently than the other one. So if there's a jumper the
changes

>the esc key function it must be on the motherboard. However I'm not using a

>motherboard from a Platinum IIe but an earlier one which has a few less jumpers.

>I don't want to switch motherboards so I'll take a look at thr ROM and see if I
can

>figure out how to add that

If the bowties & solder points on the underside of the keyboard do not have
that effect then replacing the keyboard ROM will do the trick.

If the keyboard ROM is the same as that in the Beige //e then the locations
in the ROM image to change are:

```
XY    ROMADDR
70    $118 (add 0 for caps lock, $200 for no caps, $400 for Dvorak, $600
        for Dvorak with no caps)
```

This info taken from "Understanding the Apple //e" by Jim Sather, page 7-17.

--

David Wilson School of IT & CS, Uni of Wollongong, Australia

```
##### E N D O F F I L E
### keyboardrom
##### E N D O F F I L E
```

```
#####
### FILE      : keycaps.fix
#####
### Created   : Sunday, January 14, 1996  Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 806 bytes   1 KB
#####
```

```
Path: ns-mx!hobbes.physics.uiowa.edu!zaphod.mps.ohio-
state.edu!sol.ctr.columbia.edu!spool.mu.edu!agate!dog.ee.lbl.gov!ucbvax!cxr_rs6000
.med.ge.com!marc
From: marc@cxr_rs6000.med.ge.com (Marc Wolfgram)
Newsgroups: comp.sys.apple2
Subject: Re: Keys which break!
Message-ID: <9205011742.AA09578@cxr_rs6000>
Date: 1 May 92 17:42:27 GMT
Sender: daemon@ucbvax.BERKELEY.EDU
Organization: The Internet
Lines: 5
```

On repairing keycaps: take a paperclip and bend a tight hook in one end to pull the broken part of the cap out of the switch itself... then cut up the paperclip and bend a short u-shaped piece to be used inside the broken part and the cap as a "splint"... put the parts together, push in the wire, add superglue, and wait a bit for the glue to dry before putting the fixed keycap back in the switch.

```
##### E N D O F F I L E
### keycaps.fix
##### E N D O F F I L E
```

```
#####
### FILE      : keyfix
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3678 bytes   3 KB
#####
```

```
Path: ns-mx!uunet!zephyr.ens.tek.com!tektronix!reed!nobody
From: reeder@reed.edu (Doug Reeder)
Newsgroups: comp.sys.apple2
Subject: Re: Apple 2e key(board) trouble
Keywords: apple 2e, spam, lust, keycaps, keyswitches
Message-ID: <m0kHuNa-0003DZC@romulus.reed.edu>
Date: 4 Sep 91 10:22:44 GMT
References: <1304@ucsbcscl.ucsb.edu>
Sender: nobody@reed.edu (anonymous NFS user)
Distribution: comp
Organization: Tether Propulsion Division, Institute of Knowledge, Jinx
Lines: 64
```

In article <1304@ucsbcscl.ucsb.edu> 6600faze@ucsbuxa.ucsb.edu (Jennifer Mosley) writes:
-I don't know the details, but my father is complaining that the
-a-key on his Apple 2e "doesn't work."

The simple solution is to clean the keyswitch, as detailed in another article. If this does not fix the problem, you must replace the keyswitch, a very simple repair.

- 1) pull the keycap (the part with the letter on it) straight up. There exists at tool that does this nicely, but one can get by without it.
- 2) remove the keyboard from the machine.
 - a) unscrew the screws on the bottom of the case
 - b) lift the top casing off the bottom casing
 - c) unplug the keyboard from the motherboard
 - d) unscrew the screws that connect the keyboard with whichever casing it's connected to
- 3) unsolder the keyswitch from the keyboard. There are two leads on the bottom of the keyboard for each keyswitch.
- 4) squeeze the plastic tabs on the side of the keyswitch toward the center, while pulling up on the stem of the keyswitch. This usually requires two pairs of needle-nose pliers and lots of patience.
- 5) get a replacement keyswitch from your Apple dealer (or elsewhere). Bring in the old old keyswitch, because there are five different kinds used on the IIe, and you want an exact match. You'll need a "straight adapter" as well, if all the other keys on your keyboard have them. Short stem keyswitches need adapters, and a long-stem is not quite the same length as the short+adapters.
- 6) push the new keyswitch straight into the hole, making sure the leads go through the holes in the printed circuit board, until the plastic tabs click in place.
- 7) solder the two leads to the circuit board.
- 8) put the computer back together
- 9) replace the keycap

-BTW, when we bought my apple, one of the keys was broken and the
-'tile' (the cover with the letter on it) was missing.


```
#####
### FILE      : keyfix.2
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 6180 bytes    6 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-state.edu!pacific.mps.ohio-
state.edu!freenet.columbus.oh.us!not-for-mail
From: dalloff@freenet.columbus.oh.us (Dave Althoff)
Newsgroups: comp.sys.apple2
Subject: Re: Problem with IIe keyboard
Date: 4 Sep 1996 23:19:50 -0400
Organization: The Greater Columbus FreeNet
Lines: 123
Message-ID: <50lgsm$qq1@login.freenet.columbus.oh.us>
References: <Pine.SOL.3.94.960827203857.8368A-100000@apollo>
<Dx3xG2.95B.0.queen@torfree.net> <Pine.SOL.3.95.960902103418.26501D-100000@owens>
NNTP-Posting-Host: login.freenet.columbus.oh.us
X-Newsreader: TIN [version 1.2 PL2]
```

I promised to post this...

If you can't get a solvent to clean your bad keyswitch, here are detailed instructions for replacing the faulty switch...

A Guide to Replacing Apple][e Keyswitches

By Dave Althoff,][. (dalthoff@capital.edu)

NOTE: This document details the methods I have used to replace Apple][e keyswitches. The procedure is fairly straightforward, but it does involve completely disassembling your computer, desoldering the old keyswitch, and resoldering the new switch. If you mess it up, damage your computer, hurt yourself, or experience other difficulties, I cannot assume any responsibility. As with any repair or modification, proceed at your own risk.

Various comp.sys.apple2 correspondents have reported success with cleaning Apple][e keyswitches. I have not had much luck with this myself, but I have replaced a bunch of the switches in one of my][e's. The procedure is fairly straightforward. I have been able to get replacement keyswitches from Micro Center (Columbus, Ohio) for \$10/each (Yikes!) for the Alps long-stem switch..which is also used in the Macintosh Plus keyboard. Some][e's use the Alps short-stem key switch with an extension. If anyone knows a cheaper source for these parts, PLEASE let me know!

1. Turn the computer off, ground yourself to the chassis, then pull the plug on the machine.
2. Invert the computer and remove the Phillips head screws from the perimeter. There are supposed to be three under the front edge, and three more along each side edge. Some may be missing (mine had only four). Do NOT remove the four smaller

screws which secure the power supply. With the screws removed, turn the computer right-side up. Hold it together when you do so!

3. Remove the top of the case. NOTE: There are two styles!!
 - 3a. IF THE KEYBOARD IS NOT ATTACHED TO THE UPPER CASE:
 - i. Set the case lid aside.
 - ii. The keyboard is attached to two supports attached to the computer's base pan. Mark the supports at the edge of the keyboard assembly.
 - iii. Note the orientation of the ribbon connector either at the edge of the keyboard, or on the motherboard, and unplug the ribbon cable.
 - iv. Remove the four screws which secure the keyboard to the supports, and remove the keyboard assembly. Proceed to step 4.
 - 3b. IF THE KEYBOARD IS ATTACHED TO THE UPPER CASE:
 - i. Note the orientation of the ribbon cable either at the edge of the keyboard or on the motherboard, and unplug the ribbon cable. Set the motherboard assembly aside.
 - ii. Remove the four screws which secure the keyboard to the upper case and remove the keyboard assembly. Proceed to step 4.
4. Locate the bad keyswitch, and remove the keycap by pulling straight up. Also remove the keycaps from the surrounding keys.
5. On the bottom of the keyboard, there are two solder points beneath each keyswitch. Locate the solder points for the bad keyswitch and COMPLETELY desolder the terminals using some kind of vacuum desoldering tool. I use a squeeze bulb, but the spring-loaded desoldering tools sometimes work better. Be careful not to damage the printed circuit trace...do not overheat the joint!
6. Now for the tough part. Squeeze together the tabs on either side of the keyswitch post, and lift the keyswitch straight up out of the keyboard assembly. If it won't come, then you probably don't have all of the solder off of the connection posts. Or you aren't squeezing the tabs enough.
7. Align the posts on the bottom of the new keyswitch with the holes in the circuit board. It will only fit one way. Press the keyswitch into the keyboard assembly until it snaps into place.
8. Carefully solder the pins on the keyswitch to the circuit board. Replace the keycaps.
- 9a. IF THE KEYBOARD WAS ATTACHED TO THE UPPER CASE:
 - i. Attach the keyboard to the upper case using the four screws.
 - ii. Connect the ribbon cable between the keyboard and the motherboard
 - iii. Proceed to step 10.
- 9b. IF THE KEYBOARD WAS ATTACHED TO SUPPORTS ATTACHED TO THE BASE PLATE:

- i. Align the edge of the keyboard with the mark you made on the support in step 3a(ii).
 - ii. Attach the keyboard to the keyboard support bracket using the four screws. Alignment is very important!
 - iii. Reconnect the ribbon cable between the keyboard and the motherboard.
 - iv. Proceed to step 10.
10. Drop the upper case onto the computer base plate, invert the unit, and reinstall the screws from the bottom of the case.
11. Reconnect the computer and test the keyboard. Make sure that all of the keys work, in particular the key that you replaced. Also, check all of the keys around the edge of the keyboard, particularly the open-apple and tilde, to make sure that none of the keys are jamming against the edge of the case.
12. Go enjoy a beverage of your choice, as you have successfully repaired your keyboard. The whole operation should take about a half-hour.

--Dave Althoff,][.

--

```

  /-\      Celebrating the International Year of the Roller Coaster
 /XXX\    /X\      /X\_   _   /XX\_   _   _   _
/XXXXX\  /XXX\  _/XXXX\_/X\  /XXXXX\  /X\  /X\  /XXXXX
_/XXXXXXXX\_/XXXXX\/XXXXXXXXX\_/XXX\_/XXXXXXXXX\_/XXX\_/X\_/XXXXX

```

```

##### E N D      O F      F I L E
### keyfix.2
##### E N D      O F      F I L E

```

```
#####
### FILE      : keypresses
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 4094 bytes   3 KB
#####
```

```
Newsgroups: comp.sys.apple2.programmer
Path: news.uiowa.edu!chi-
news.cic.net!newsfeed.internetmci.com!news.msfc.nasa.gov!pendragon!ames!waikato!co
mp.vuw.ac.nz!actrix.gen.nz!dempson
From: dempson@atlantis.actrix.gen.nz (David Empson)
Subject: Re: Control key
Message-ID: <DMps0s.B8r@actrix.gen.nz>
Sender: news@actrix.gen.nz (News Administrator)
Organization: Actrix - Internet Services
Date: Tue, 13 Feb 1996 12:29:15 GMT
References: <4fb591$4kc@lastactionhero.rs.itd.umich.edu>
<4fcats$hvt@tuba.cit.cornell.edu> <4fk52s$l8q@lastactionhero.rs.itd.umich.edu>
<4fmt3p$nu9@nnrpl.news.primenet.com>
X-Nntp-Posting-Host: atlantis.actrix.gen.nz
Lines: 82
```

```
In article <4fmt3p$nu9@nnrpl.news.primenet.com>,
John Bowling <johnlb@primenet.com> wrote:
> >In article <4fcats$hvt@tuba.cit.cornell.edu>,
> >Jay Krell <jmk3@crux4.cit.cornell.edu> wrote:
> >>mcafee@umich.edu (Sean McAfee) writes:
> >>>How is it that the Event Manager is able to determine that the Control key
> >>>was being pressed during the last keydown event?
> >
> >>C025 (don't use it) is well documented to hold the status of
> > ^^^^^^^^^^^^^
> >>control, shift, apple, option, keypad, etc., though with slight
> >>inaccuracies wrt control and the arrows.
```

I don't understand this comment about control/arrow inaccuracies. It has always worked fine for me - the arrow keys by themselves do not indicate that the control key is down, so they can be detected (because the ASCII code was a control character). If Control-Arrow is pressed, it cannot be distinguished from Control and the corresponding letter.

(This could be avoided by bypassing the standard keyboard handling provided by the keyboard microcontroller, and processing key up/down sequences directly, using the ADB service request mechanism - you then get scan codes for the keys, so every key can be identified correctly.)

```
> I've used it in a few programs that need to get around the C crap of
> requiring a <return> key on every entry, and I've never had a problem
> with it.
>
> So, why not?
```

Compatibility.

If you access the hardware directly, you will reduce the number of situations in which your program will work properly. In particular, it will NOT work properly in the background under GNO or another multitasking system.

It also might not work reliably if something else has enabled the Event Manager - keys might be swallowed behind your back as the Event Manager's interrupt handler picks them up.

If you get keys using the Event Manager, then it will always work.

In shell programs, another option is to use the new calls provided by ORCA/Shell 2.0.1 and later, and recent versions of GNO. The ORCA/Shell implementation of the calls "KeyPress" and "ReadKey" will use the Event Manager if it is active, or access the hardware directly.

The GNO implementation also copes with programs that have been switched into the background, not providing them with any keypresses.

I wrote my own keyboard read routines that do the following:

1. Try the ORCA/Shell call.
2. If an error occurred (older version of the shell, or no shell present), and the Event Manager is active, then use it.
3. If all else fails, access the hardware directly.

This should work in any 16-bit environment (GNO, ORCA/Shell 2.0.1 or later, older shell versions, a standalone application, CDA, etc.)

Note that if you do choose to access the hardware directly, make sure you use \$C025, \$C000 and \$C010 correctly. The proper sequence for detecting a keypress and reading the modifiers is:

- Check for a keypress by looking at bit 7 of location \$C000.
- If a key is available, read the modifiers from \$C025, with the associated key value from \$C000.
- Reset the keyboard strobe by accessing \$C010.

Note that if keyboard buffering is enabled, the modifiers will be stable until the associated key is cleared. If keyboard buffering is disabled, the modifiers can change on the fly (this is also the case when buffering is enabled and no non-modifier has been pressed yet).

--

David Empson
 dempson@actrix.gen.nz
 Snail mail: P.O. Box 27-103, Wellington, New Zealand

```
##### E N D O F F I L E
### keypresses
##### E N D O F F I L E
```

```
#####
### FILE      : keyswitch.fix
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 4148 bytes   4 KB
#####
```

```
Path: news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-state.edu!magnus.acs.ohio-
state.edu!freenet.columbus.oh.us!not-for-mail
From: dalloff@freenet.columbus.oh.us (Dave Althoff)
Newsgroups: comp.sys.apple2
Subject: Re: partially dead //e keyboard
Date: 2 Mar 1995 00:48:29 -0500
Organization: The Greater Columbus Freenet
Lines: 74
Message-ID: <3j3m7d$cq@acme.freenet.columbus.oh.us>
References: <3j349a$9md@lastactionhero.rs.itd.umich.edu>
NNTP-Posting-Host: acme.freenet.columbus.oh.us
X-Newsreader: TIN [version 1.2 PL2]
```

What you've got is a dead keyswitch.

I like the][e keyboard; it has a great feel to it, especially compared to my GS keyboard. The trouble is that with discrete keys, you've got some 63 little switches to fail.

They're not hard to replace; I've probably bought enough keyswitches for Mom's][e to buy two or three new keyboards (anyone know where to get one for, say, \$70? "Genuine" type][e keyboard? Jameco dropped them from the catalog right when I was about to order one!)

Anyway, the last time I checked, keyswitches were about \$10 each retail for the Alps Long-Stem switch. That's the same switch as used in the Mac Plus keyboard, so they are still available.

To replace the keyswitch:

Remove the screws from the bottom of the][e case. Remove the case. If you have a classic][e (beige), the keyboard will be supported on two triangular supports attached to the base plate. On the "platinum"][e, the keyboard is attached to the upper case.

On the beige][e, save yourself a lot of grief before going any further. Get a marker and scribe the supports at the edge of the keyboard assembly. This will allow you to get the horizontal alignment right when you put it all back together; this keeps you from getting hung with stuck keys later.

Remove the four screws holding the keyboard, and disconnect it from the motherboard. I suggest unplugging the ribbon connector from the end of the keyboard so it will be out of your way.

Remove the keycaps from the bad key and from the surrounding keys by pulling them straight off. Examine the keyboard, and locate the two solder connections on the back directly below the bad key.

At this point, I usually mount the keyboard upside-down on the support in the computer, since it provides a handy support which also protects the

keycaps by suspending them, but, as they say, YMMV.

Using a low-wattage soldering iron and a desoldering bulb, carefully remove all the solder from the two connections under the bad key. When you have done so, the pins sticking through the holes should be completely free of the board tracings. Be careful; if you use too much heat, you can lift the copper trace off the board. You do NOT want to do that!

Turn the keyboard up-side-up. There is a squeeze-tab on either side of the keyswitch. With the solder completely removed from the bottom, you should be able to squeeze these tabs together and lift the switch straight out. Sorry, no tips here...I have trouble doing it myself. Two tiny flat-head screwdrivers usually work; sometimes I can get a pair of needle-nose pliers to do the trick.

To install the new switch, make sure it is oriented the same way as the old one, and snap it into the hole. If you did it right (and it's REALLY hard to screw this part up!), the contacts should be sticking through the holes in the bottom of the circuit board. Heat up the pins and apply solder to connect the new switch to the board. Reconnect the keyboard to the computer, power it all up, and make sure the new key works.

Reinstall the key caps, and reattach the keyboard. On the beige][e's, line up the edge of the keyboard with the mark you made earlier. Put the case back together, and it's all good as new.

Usual cost:
 \$10 (keyswitch)
 about an inch of solder
 about fifteen minutes-half an hour.

--Dave Althoff, Jr.
 (sometimes I think I should buy keyswitches by the dozen 8-()
 --

```

    /-\      _ | \
   /XXX\    /X\ | \  X
  /XXXXX\  /XXX\ <XXXX  X  _XXXXX |(hard hat area... )
_/XXXXXXXX\_/XXXXX XXXXXXXX XXX XXXXXXXXo(.sig under construction)
    
```

```

##### E N D O F F I L E
### keyswitch.fix
##### E N D O F F I L E
    
```

```
#####
### FILE      : keyswitch.fix2
#####
### Created   : Thursday, December 5, 1996 Modified: Thursday, December 5, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 4154 bytes   4 KB
#####
```

```
Path: icaen!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!magnus.acs.ohio-state.edu!freenet.columbus.oh.us!not-for-mail
From: dalloff@freenet.columbus.oh.us (Dave Althoff)
Newsgroups: comp.sys.apple2
Subject: Re: partially dead //e keyboard
Date: 2 Mar 1995 00:48:29 -0500
Organization: The Greater Columbus Freenet
Lines: 74
Message-ID: <3j3m7d$cq@acme.freenet.columbus.oh.us>
References: <3j349a$9md@lastactionhero.rs.itd.umich.edu>
NNTP-Posting-Host: acme.freenet.columbus.oh.us
X-Newsreader: TIN [version 1.2 PL2]
```

What you've got is a dead keyswitch.

I like the][e keyboard; it has a great feel to it, especially compared to my GS keyboard. The trouble is that with discrete keys, you've got some 63 little switches to fail.

They're not hard to replace; I've probably bought enough keyswitches for Mom's][e to buy two or three new keyboards (anyone know where to get one for, say, \$70? "Genuine" type][e keyboard? Jameco dropped them from the catalog right when I was about to order one!)

Anyway, the last time I checked, keyswitches were about \$10 each retail for the Alps Long-Stem switch. That's the same switch as used in the Mac Plus keyboard, so they are still available.

To replace the keyswitch:

Remove the screws from the bottom of the][e case. Remove the case. If you have a classic][e (beige), the keyboard will be supported on two triangular supports attached to the base plate. On the "platinum"][e, the keyboard is attached to the upper case.

On the beige][e, save yourself a lot of grief before going any further. Get a marker and scribe the supports at the edge of the keyboard assembly. This will allow you to get the horizontal alignment right when you put it all back together; this keeps you from getting hung with stuck keys later.

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Reinstall the key caps, and reattach the keyboard. On the beige][e's, line up the edge of the keyboard with the mark you made earlier. Put the case back together, and it's all good as new.

Usual cost:
 \$10 (keyswitch)
 about an inch of solder
 about fifteen minutes-half an hour.

--Dave Althoff, Jr.
 (sometimes I think I should buy keyswitches by the dozen 8-()
 --

```

    /-\      _ | \
   /XXX\    /X\ | \  X
  /XXXXX\  /XXX\ <XXXX  X  _XXXXX |(hard hat area... )
_/XXXXXXXX\_/XXXXX XXXXXXXX XXX XXXXXXXXo(.sig under construction)
    
```

```

##### E N D O F F I L E
### keyswitch.fix2
##### E N D O F F I L E
    
```

```
#####
### FILE      : koalapad.c64
#####
### Created   : Thursday, August 28, 1997 Modified: Thursday, August 28, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3531 bytes   3 KB
#####
```

Path:

```
newsl.icaen!news.uiowa.edu!newsl.chicago.cic.net!iagnet.net!howland.erols.net!news
2.digex.net!swbell!not-for-mail
From: Rubywand <rubywand@swbell.net>
Newsgroups: comp.sys.apple2
Subject: C-64 to A2 Koala Pad Converter? (was Re: Koala Pad)
Date: Thu, 28 Aug 1997 12:30:51 +0000
Organization: Southwestern Bell Internet Services, Richardson, TX
Lines: 67
Message-ID: <34056F7B.352F@swbell.net>
References: <3401193C.4D74@itis.com> <34013A26.7CB7@swbell.net>
<34028079.125890516@news.interlog.com> <340390C6.3BCF@itis.com>
NNTP-Posting-Host: ppp-207-193-9-18.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Mailer: Mozilla 2.02E (Win16; I)
```

Ray writes ...

```
> .... This Koala Pad has a 9 pin male connector the same
> as the male joystick port on my apple IIe. I thought I may be able to
> get a gender changer and connect there but it doesn't sound that way.
> Is there a practical way to use this with any AppleII product?
>
Ray
```

It appears that there is some confusion about male/female. The standard Apple II 9-pin Game/Joystick port has a female connector or socket. Standard Apple II joysticks with 9-pin DIN plugs have male connectors.

Since the standard Commodore-64 9-pin DIN port is male, it looks like your Koala Pad (with a female plug) is intended to work on a C-64, VIC-20, etc. machine.

As to whether or not the C-64 Koala Pad can be used on an Apple II, it looks like, probably, it can, if you can find or build an adaptor. This is, really, a guess. It is based upon the capabilities of the C-64 Game port, time constant capacitor values used in the C-64, and the probability that Koala Pad's makers would not wish to make major design changes between Apple and C-64 models.

Although C-64 joysticks are of the simple "switcher" type which connect to Game port switch inputs, the C-64 Game port also includes X and Y analog "paddle" inputs. These are at pin 9 (X) and pin 5 (Y). The C-64 manual does not ever seem to specify an optimal max R value for the pots connected to these inputs; but, the capacitor part of the expected R/C circuit is 1000 pF in each case and the caps go to ground.

In short, the C-64 "paddle" inputs look very much like the Apple II joystick inputs. A _try_ at an adaptor would look something like the following ...

To C-64 Koala Pad (9-pin male DIN)	To Apple II Game Port (9-pin male DIN)
---------------------------------------	---

```

1 ?
2 ?   2nd Button -> 1
3 ?
4 ?
5 <- PDL1 (Y)   -> 8
6 <- main button -> 7
7 <- +5V line   -> 2
8 <- GND        -> 3
9 <- PDL0 (X)   -> 5

```

The above assumes that the C-64 Koala Pad will use C-64's "Fire Button" input for its main button. The second button would, then, connect to one of the four joystick switch inputs. (Actually, since all of the switch inputs, including the Fire Button, are just inputs to a port IC, any two may be the ones used to handle Koala Pad's buttons.)

It should be possible to detect the button lines on the Koala Pad connector using an Ohm meter (on R x 100 range) with one lead connected to the GND pin (pin 8) and using the other lead to check pins 1, 2, 3, 4, and 6. A button lead similar to one on an Apple II should show up as a 500-700 Ohm resistance.

Again, we are dealing with guesses. If you decide to try making a converter, be sure to post what you discover. Good luck!

Rubywand

```

##### E N D   O F   F I L E
### koalapad.c64
##### E N D   O F   F I L E

```

```
#####
### FILE      : kssfان.fix
#####
### Created   : Friday, July 18, 1997  Modified: Friday, July 18, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5489 bytes   5 KB
#####
```

```
Path: news1.icaen!news.uiowa.edu!chi-news.cic.net!howland.erols.net!news-
peer.sprintlink.net!news-pull.sprintlink.net!news-in-
east.sprintlink.net!news.sprintlink.net!Sprint!164.67.241.200!myriad!mail
From: nobody@REPLAY.COM (Anonymous)
Newsgroups: comp.sys.apple2
Subject: Re: WTB: System Saver GS or Equiv
Date: 18 Jul 1997 13:00:10 -0700
Organization: Replay and Company UnLimited
Lines: 107
Message-ID: <199707181948.VAA17856@basement.replay.com>
To: comp.sys.apple2@myriad.alias.net
X-001: Replay may or may not approve of the content of this posting
X-002: Report misuse of this automated service to <abuse@replay.com>
X-URL: http://www.replay.com/remailer/
```

```
darsys@pro-entropy.cts.com (Eric A. Seiden) wrote:
>Am looking for one of these babies to help keep my Proline BBS site up and
>running. Current one is dying and system will overheat without it. Email me
>directly with offers or inquiries.
>
>      Thanks
>      Eric
```

Eric, here's a repost of my System Saver GS repair article:

Hacker's Corner

Replacing the System Saver IIGS Fan

Does your Kensington System Saver IIGS sound like a broken record? It may be that the fan inside the unit is showing wear. The good news is that replacing the fan is an easy and rewarding task.

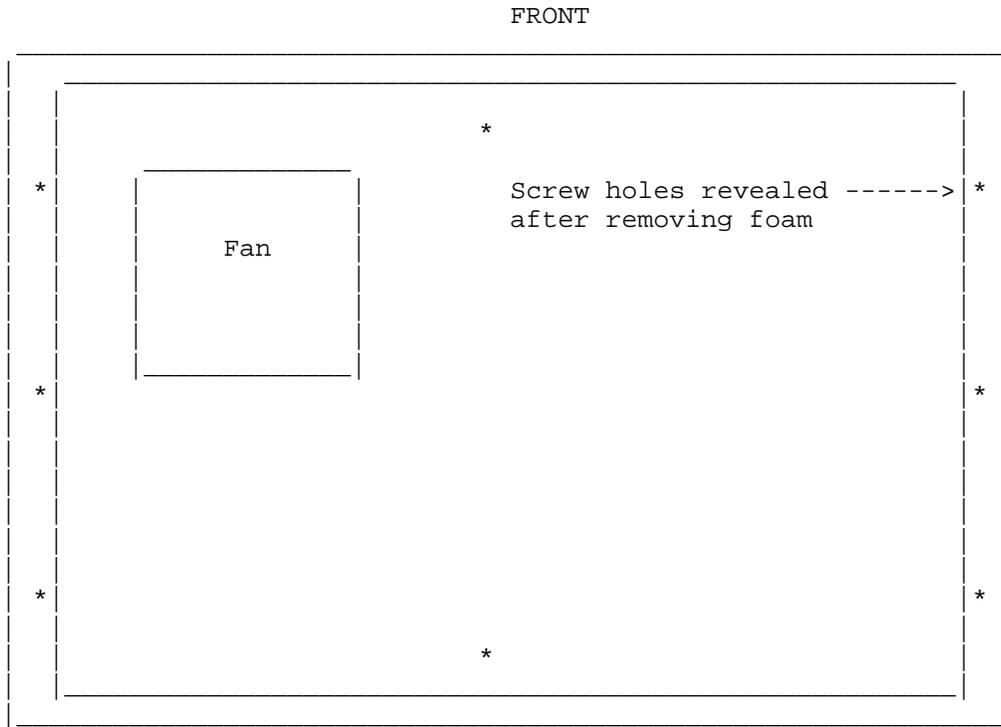
I knew my fan was starting to die when it sounded like it was wheezing during spin-up. The fan, a Sprite model SU2C7, uses sleeve bearings, whose lifespan is determined by the lubricating oil supply in the bearings. When enough of the oil evaporates, metal will grind against metal resulting in heat and resistance that cause the fan to quickly lock-up. Better quality fans use ball-bearings, but Kensington apparently used the cheapest component available. Even among the models with sleeve bearings, the SU2C7 is the least capable. It can only move 15 cubic feet of air a minute (half what a typical PC fan moves) and has a 55,000 hour rating.

In looking for a replacement for my dying fan, I chose to use a better model. The Sprite model SU2B1 has the same dimensions as the SU2C7 used in the System Saver and is readily available from Digi-Key corporation. It uses ball bearings for long life (the fan is rated for 73,000 hours) and can move 28 cubic feet of air a minute. The higher quality is

readily apparent: the replacement is currently noticeably quieter than the original even though it is moving more air per minute.

Make sure the System Saver is unplugged before opening the case.

Opening the System Saver case involves removing eight screws. You must remove the foam weatherstripping along the periphery of the case to expose the screws. Once the weatherstripping is removed, you should be able to see the screw access holes. They are arranged as shown in the following diagram (bottom view of the System Saver):



Once inside, the fan can be removed by unplugging the power cord that connects it to the circuit board. A grounding wire that is attached by a screw must also be removed. The fan itself is held to the case by two screws. Once you remove the SU2C7, you can replace it with the SU2B1. Now mount everything back together again with the screws. Apply new foam weatherstripping to the periphery of the bottom of the system saver.

The refurbished System Saver is now better than a factory new model! Notice the difference in sound: a quiet hum rather than a load rumble. If you have a lot of cards, you will notice that the inside of the IIGS is a lot cooler too. An upgraded System Saver is a great way to counteract accelerator instability caused by heat.

Sources and parts needed:

- 1) Part: Sprite model SU2B1 (Digi-Key Part No. CR103-ND)
Source: Digi-Key Corp. (1-800-344-4536/www.digikey.com)
- 2) Part: Foam weatherstripping tape (3/8th inch width, 3/16th inch thick)

Source: Home Depot (or a comparable hardware store)

-Scott G.

```
##### E N D O F F I L E  
### kssfán.fix  
##### E N D O F F I L E
```

```
#####
### FILE      : laser128.info
#####
### Created   : Thursday, August 6, 1998 Modified: Thursday, August 6, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 6982 bytes   6 KB
#####
```

Path:

```
newsl.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!nyd.news.ans.net!newsfeeds.ans.
net!news.idt.net!newsfeed.internetmci.com!152.163.199.19!portc03.blue.aol.com!audr
ey03.news.aol.com!not-for-mail
From: supertimer@aol.com (Supertimer)
Newsgroups: comp.sys.apple2
Subject: Re: Laser 128 info needed
Lines: 150
Message-ID: <1998080608463001.EAA25852@ladder03.news.aol.com>
NNTP-Posting-Host: ladder03.news.aol.com
X-Admin: news@aol.com
Date: 6 Aug 1998 08:46:30 GMT
Organization: AOL http://www.aol.com
References: <35c709b2.2781016@news.coil.com>
Xref: newsl.icaen comp.sys.apple2:137711
```

1. Make and Model:
Video Technology Laser 128EX/2 (refined and extremely popular Apple IIc Plus clone)
2. Released:
1988
3. Follows:
Video Technology Laser 3000
4. Followed by:
N/A
5. CPU:
Western Design Center (not to be confused with Western Digital, the hard drive maker) 65C02 running at 3.6Mhz
6. ROM:
64K -- This includes the only legal Apple compatible ROM by 1988 (Apple lost a lawsuit challenging it) and Microsoft BASIC (the Applesoft compatible version) licensed from Microsoft.
7. RAM:
128K standard with built in sockets for expansion to 1MB using 41256 chips of 120ns or faster (the motherboard is designed to do bank switching, like the IIc Plus). Memory support is controlled by a custom Memory Management Unit (MMU) array...memory size is automatically detected when new chips are put in.
8. Case:
Attractive light beige ABS impact resistant plastic.

Case has handle that doubles as a prop to raise the rear of the computer for easy typing.

9. Keyboard:

Full layout keyboard with numeric keypad and function keys. The copyrighted Open Apple and Closed Apple have been replaced with Open Laser and Closed Laser symbols. The keys have rollover and full travel and a very nice feel.

10. Display:

The Laser 128EX/2 has all the graphics modes found on the Apple IIc, with an extra character set for RGB.

- Text mode: 40x24 and 80x24. Characters are formed by a 7x8 pixel matrix ON THE COMPOSITE OUTPUT. The 128EX/2's Video Display Generator chip also provided both analog RGB video (for connecting an Apple IIGS, Amiga, or Atari ST monitor) and digital RGB video (for connecting a CGA monitor). In RGB mode, the Video Display Generator (VDG) chip generates a text character set identical to an IBM PC (with the addition of the Open and Closed Triangle characters and MouseText). Text mode is monochrome.
- Low Resolution: 40x48 pixels in 16 colors.
- Double Low Resolution: 80x48 pixels in 16 colors.
- High Resolution: 280x192 pixels in 6 colors
- Double High Resolution: 560x192 pixels in 16 colors.
- Combinations/Variations: 4 lines of text mode can be mixed with a truncated Low Resolution or High Resolution mode graphic. The text in mixed mode can be either 40 column or 80 column.

11. Audio:

Simple beeper driven by the CPU. Because the Laser's motherboard operates at 3.6Mhz (notice that it requires 120ns or faster RAM), sound in programs designed for earlier Apple IIs is often distorted.

12. Media:

The Laser 128EX/2 has a built in 3.5" double-sided, double-density floppy drive with a storage space of 800K. The drive and the external daisy-chain floppy "SmartPort" is driven by Video Technology's custom "Universal Disk Controller" (UDC) disk array chip. The SmartPort supports Apple IIe/IIc UniDisks (3.5" and 5.25" models), Macintosh 3.5" drives (the ones without the buttons), Apple IIGS daisy-chain 3.5" drives and Apple 5.25" drives. It is also designed to support the Chinook CT-series 20MB to 100MB SmartPort hard drives.

The SmartPort can support two 800K 3.5" drives, two 140K 5.25" drives, and one 100MB CT100 hard drive simultaneously daisy-chained to each other.

The Laser 128EX/2 has one Apple bus compatible expansion slot on the side opposite the 3.5" disk drive. This bus can hold an Apple High Speed (DMA) SCSI controller for running additional SCSI based storage devices.

13. Input/Output:

- Two RS-232C ports
- One MIDI port (setting Port 2 to MIDI deactivates one serial port)
- One Centronics parallel port (setting Port 1 to parallel deactivates one serial port)
- Composite display output (NTSC or PAL depending on the country)
- LCD output (for flat panel display)
- RGB monitor output (both analog and digital monitors supported by the Video Display Generator chip with its 64K of VRAM)
- External Drive "SmartPort" (supports Mac, IIGS, or UniDisks 3.5" drives, Apple 5.25" drives, and CT-series 20MB to 100MB hard drives)
- Joystick/Mouse port (connecting one precludes connecting the other...mouse is the same mouse used in original Mac to Mac Plus)
- Headphone connector
- Speaker volume control
- One Apple bus (same as Apple IIe) expansion slot

14. Trivia:

This unit was so good that Apple Computers was prompted to upgrade the IIC to counter it. The result was the Apple IIC Plus, also released in 1988. The IIC Plus had a 4Mhz Western Design Center 65C02 processor, an 800K 3.5" drive built-in, and an External Drive "SmartPort" capable of the same tricks as the Laser's. Although the two units were similarly matched, Video Technology actively advertised the Laser 128EX/2 while Apple had moved on to advocating Macintosh. The Laser became the most successful Apple II clone ever and this model was 99.8% IIC Plus compatible. The only two software the Apple magazines reported incompatible were The New Print Shop (Borderbund) and HomeWord (Sierra).

In North America, the Laser was aggressively marketed in Sears department stores, where it eroded its niche rival's sales, the Commodore 128.

This Laser unit's case was also used to make a Turbo XT PC clone. The PC clone and the Laser 128EX/2 shared the same case. They looked identical except for the label. Instead of "Laser 128EX/2," the XT had "Laser XT10"

15. Emphasis:

Small business, Home, Education, Gaming, Programming

16. Net Resources:

- <http://ground.ecn.uiowa.edu/> (1.7GB A2 knowledge and software repository)
- <http://www.sequential.com/> (Video cards and storage)
- <http://www.allelelec.com/> (Various hardware and software)

17. Picture (see <http://ground.ecn.uiowa.edu/> the ground ftp server)

E N D O F F I L E

laser128.info

E N D O F F I L E

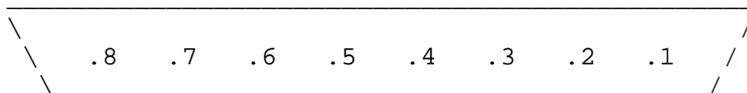
```
#####
### FILE      : laser128.ports
#####
### Created   : Tuesday, November 17, 1998 Modified: Tuesday, November 17, 1998
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 3624 bytes    3 KB
#####
```

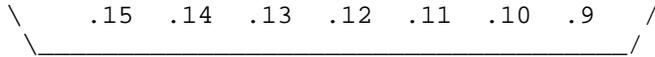
Path:

```
newsl.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!nyd.news.ans.net!newsfeeds.ans.
net!newspump.monmouth.com!newspeer.monmouth.com!newsfeed.cwix.com!208.140.2.17!reg
gie.win.bright.net!not-for-mail
From: Brent <bharrisnospam2391@vax2.winona.msus.edu>
Newsgroups: comp.sys.apple2
Subject: Re: Laser 128 (Again)
Date: Mon, 16 Nov 1998 19:14:40 -0600
Organization: none
Lines: 72
Message-ID: <72qj09$2jv$1@reggie.win.bright.net>
References: <19981115183830.02820.00001641@ng71.aol.com>
<19981116051452.14142.00001983@ng40.aol.com>
Reply-To: bharrisnospam2391@vax2.winona.msus.edu
NNTP-Posting-Host: gal-usrl-cs-24.win.bright.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Mailer: Mozilla 3.04 (Win95; U)
Xref: newsl.icaen comp.sys.apple2:141887
```

Supertimer wrote:

```
>
> jacc7621@aol.com (JACC7621) wrote:
>
> >thanks for the info, but does anyone know the pinoust for all the ports? I
> >don't have any manuals, and most of the ports are non-standard. Also, does
> >anyone know what is in slot 5? the prodos users disk says it is "used", and
> >slotscan just crashes. Thanks again.
>
> Well, the two serial ports accept IIC serial cables. If you want
> parallel, dunno (the parallel cable plugs into the serial ports
> and you flip a switch).
>
> Similarly, the drive port uses Apple II smartport cables, same
> as the IIC, IIGS, Macintosh, IIE, etc.
>
> The video port takes a standard IIGS monitor cable or it can
> take an LCD panel designed for the IIC (it can act as both
> a true RGB port like the IIGS or a dumb video port like the
> IIC).
>
> So basically, just use the Apple II (mainly IIC) cables.
Actually, the parallel port is seperate from the serial port. It is a
"nonstandard" 12 pin port. It looks like this:
```





- 1. printer data bus
- 2. printer data bus
- 3. printer data bus
- 4. printer data bus
- 5. printer data bus
- 6. printer data bus
- 7. printer data bus
- 8. printer data bus
- 9. BUSY - from printer
- 10. PTRSTB - printer data strobe (active low)

Both the serial printer port and the parallel printer port share slot1. You can select which one you wish to use with a switch that's on top of the computer, next to the keyboard.

The Laser 128EX has a built in Memory expansion card, mapped to slot 5. While the Laser 128 doesn't come with this card, it could (at one time) be purchased seperately. This card is Laster 128 specific, it's an internal card, and can hold up to 1 meg of ram.

The slots are mapped out as follows:

- Slot 0: 40-column display interface
- Slot 1: Parallel or Serial printer interface
- Slot 2: Serial communication interface
- Slot 3: 80-column display interface
- Slot 4: Mouse/Joystick port
- Slot 5: Memory Expansion interface / or external expansion box
(depends on which way you set the jumper)
- Slot 6: 5.25" drive interface
- Slot 7: 3.5" drive interface / or external expansion box
(I don't believe the Laser 128 supports 3.5 drives without an extra card)

Note: The jumpers are located underneath the rom door on the bottom of your computer

The 50 pin port on the left side of you machine is an expansion port. You can hook up an expansion box to this, and plug in up two two standard apple II cards into this expansion box. If you don't have the expansion box, you can still plug any standard Apple II card into this port.

Hope this helps.

```
##### E N D O F F I L E
### laser128.ports
##### E N D O F F I L E
```

```
#####
### FILE      : lcase.promadapt
#####
### Created   : Thursday, April 8, 1999   Modified: Thursday, April 8, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5313 bytes   5 KB
#####
```

Path:

```
newsl.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!207.24.245.130!nyd.news.ans.net
!news.idt.net!newsfeed.berkeley.edu!cyclone.swbell.net!typhoon01.swbell.net.POSTED
!not-for-mail
```

Message-ID: <370CB616.B63AD078@swbell.net>

From: Rubywand <rubywand@swbell.net>

Reply-To: rubywand@swbell.net

X-Mailer: Mozilla 4.51 [en] (Win95; U)

X-Accept-Language: en

MIME-Version: 1.0

Newsgroups: comp.sys.apple2

Subject: Re: II+ vs IIe Char Gen PROMs and Shift-key mods-- LC \$F8 PROM mod

References: <7cosa7\$rgl\$1@nnrpl.dejanews.com> <36F01E44.8DB3CAE4@swbell.net>

<ldoxxsz.5zmnazpv7ggaN@dempson.actrix.gen.nz> <3701FF21.C4F327BD@swbell.net>

<37020A8B.46585F3E@iolinc.net> <37023162.11165D84@swbell.net>

<37041CA0.6C13D2DE@iolinc.net> <3704A7A3.72AE153F@swbell.net>

<3704B626.DF28564C@iolinc.net> <370C3F1C.8D3C3DA3@swbell.net>

<david.923554356@wraith>

Content-Type: text/plain; charset=us-ascii

Content-Transfer-Encoding: 7bit

Lines: 124

Date: Thu, 08 Apr 1999 08:58:46 -0500

NNTP-Posting-Host: 207.193.10.85

X-Complaints-To: abuse@swbell.net

X-Trace: typhoon01.swbell.net 923579785 207.193.10.85 (Thu, 08 Apr 1999 06:56:25 PDT)

NNTP-Posting-Date: Thu, 08 Apr 1999 06:56:25 PDT

Organization: SBC Internet Services

Xref: newsl.icaen comp.sys.apple2:146682

David Wilson writes ...

>

> Rubywand <rubywand@swbell.net> writes:

> >Not as far as I know. What you do is \$EA out the code which does the checking.

> >The code starts at address \$FD7E in both the old and Autostart Apple II+'s

> >(which should be address \$57E in a 2K \$F8 PROM) ...

>

> >FD7E- C9 E0 compare the byte to the lowest ASCII value for a lower case char

> >FD80- 90 02 if the byte is less (not lower case) hop over the next two inst bytes

> >FD82- 29 DF if the byte is lower case AND it with #\$DF to force upper case

>

> The only problem with this change is that the ROMs in a][or][+ are not

> pin-compatible with EPROMs of the same size. Thus, to make this change you

> would need to wire an adapter between the EPROM and the ROM socket to sort out

> the chip select polarities.

....

True. The 2516 and 2716 2k x 8 PROMs come close.

near the ROM socket using epoxy.

- o- 74LS04 pin 14 goes to ROM socket pin 24
- o- 74LS04 pin 7 goes to ROM socket pin 12
- o- any trace to ROM socket pin 21 would be cut and ROM socket pin 21 would be jumpered to ROM socket pin 24
- o- any trace to ROM socket pin 18 would be cut and ROM socket pin 18 would be connected to 74LS04 pin 2
- o- pin 1 of the 74LS04 goes to the trace which used to go to ROM socket pin 18

After these mods, the PROM would be swapped in for the ROM.

Let me know if you see any screw-ups in the above.

Our setup is different because we did several mods early (before getting a Language Card) and ended up with the PROM on the main board with an option to switch to the ROM on the LC.

The reason for being able to swap in the regular ROM is that we made many changes to the \$F8 ROM code and wanted to get around ROM checks which a few old copy protected programs do upon booting. (I don't know if the minor mod to enable lower case input will get past all such ROM checks-- it certainly would not pass a checksum test.) Anyway, the checks are fairly rare.

Hmmm-- what about this code substitution instead of just NOPing everything:

```
FD7E- C9 C0
FD80- 90 02
FD82- 29 FF
```

It diddles things around so that the checksum is right and the AND #\$FF leaves the input alone whatever the branch at \$FD80 decides. (According to the ROM code listing, there are no branches which go into the middle of this code and flags status doesn't matter because the code quickly does another compare operation after saving the input.)

Rubywand

```
##### E N D O F F I L E
### lcase.promadapt
##### E N D O F F I L E
```

```
#####  
### FILE      : lego.kits  
#####  
### Created   : Monday, August 24, 1998 Modified: Monday, August 24, 1998  
### File Type: "TEXT"      File Creator: "LMAN"  
### File Size: 3847 bytes   3 KB  
#####
```

Path:

news1.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!news2.ais.net!jamie!ais.net!news.maxwell.syr.edu!intgwpad.nntp.telstra.net!nsw.nntp.telstra.net!ozemail!ozemail.com.au!hmag

From: hmag@ozemail.com.au (Terry Allen)

Newsgroups: comp.sys.apple2

Subject: Lego Card Info.

Date: Sat, 22 Aug 1998 17:05:42 +1000

Organization: hEARd Magazine

Lines: 97

Message-ID: <hmag-ya02408000R2208981705420001@news.ozemail.com.au>

NNTP-Posting-Host: slgos2p56.ozemail.com.au

Mime-Version: 1.0

Content-Type: text/plain; charset=ISO-8859-1

Content-Transfer-Encoding: 8bit

X-Newsreader: Yet Another NewsWatcher 2.4.0

Xref: news1.icaen comp.sys.apple2:138410

Kind reader of rec.toys.lego emailed me the following, which may spur someone elses memory or a bit more info.

Date: Fri, 21 Aug 1998 23:33:23 -0400

From: "William 'Mr. K' Kenlon" <jwk@eaglenet.com>

Organization: None

MIME-Version: 1.0

To: Terry Allen <hmag@ozemail.com.au>

Subject: Re: Lego Controller Card for Apple II

Terry Allen wrote:

```
>  
> Recently got hold of an Apple IIGS & have been attracting various  
> equipment from friends who have old cards & things hanging around. One of  
> these cards is a Lego Controller card. Apparently, it was used for  
> controlling Lego motors.  
> If anyone has any information or knows where to find software to use it,  
> could they please email me & post the info to the newsgroup comp.sys.apple2  
> Many thanks for any info.  
>
```

Terry,

Thought you might like to know about a brochure I have (copyright date 1987), the cover of which reads "NO LIMITS -- LEGO(R) TC logo", with an Apple IIe and a LEGO Technic merry-go-round on the cover.

On the back of the brochure: "The LEGO Interface A connects to a special slot card that fits the Apple IIe and Apple IIgs computers. A power supply transformer is included in the set. The interface and computer are fully protected against wrong connections of motors

and sensors. The interface has a stop button which cuts off power to all output sockets. It also withstands normal wear and tear from fingers and dust."

Also in the booklet...

Various illustrations and explanations of the TC Logo's objective, and a short philosophical introduction to the system by a bearded, middle-aged man by the name of Seymour Papert (Prof. of Math and Education, MIT).

Toward the end of the book is a product list, which has the following items:

9700 Technic Control-0 -- \$142.00

Contains over 450 elements and a strong molded storage box. Special elements include 2-4.5 volt motors, 1 optosensor and 1 counting disk, 2 touch sensors, 4 light bricks and 7 sets of building instructions for different models.

9750 Technic Control Interface and Transformer -- \$150.00

Specially designed in conjunction with our research team at MIT. This box has 6 outputs from which students can send signals to LEGO motors and 2 input sensors which receive information from the LEGO touch and optic sensors.

950051 Starter Pack -- \$450.00

1 TC-0 Set
Interface and Transformer
Reference Guide
1 Master disk and 1 Backup disk
Quick Reference Guide
Apple IIe and Apple IIgs slot card and cable
[various teachers' & students' guides]

Also, the following contact information is given, but beware -- the brochure is eleven years old and this contact information could be very dated. (And it may not be good in Australia, either.)

Sarah McDonald
Education Dept.
LEGO Systems, Inc.
555 Taylor Road
Enfield, CT 06082

203/749-2291
800/243-4870 (ex. AK, CT, HI)

I don't know for sure if any of this is relevant, but I thought it might be of some importance, as it mentions a LEGO motor and IIgs card and all.

Leg godt,
William Kenlon (whose news server doesn't carry
<news:comp.sys.apple2>)

--
Bye For Now, Terry Allen

hEARd - Non-profit Promotion For new music.
WWW - <http://www.ozemail.com.au/~hmag>
Email - hmag@ozemail.com.au

```
##### E N D O F F I L E  
### lego.kits  
##### E N D O F F I L E
```

```
#####
### FILE      : logic.chart
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 2925 bytes    2 KB
#####
```

```
Path: news.uiowa.edu!chi-
news.cic.net!ddswl!news.mcs.net!www.nntp.primenet.com!nntp.primenet.com!howland.er
ols.net!EU.net!newsfeed.internetmci.com!inl.uu.net!news.mc.net!usenet
From: "anomaly3@mc.net" <anomaly3@mc.net>
Newsgroups: comp.sys.apple2
Subject: Apple IIe Manual Fault Dictionary
Date: Sun, 15 Sep 1996 21:10:05 -0500
Organization: McHenryCom
Lines: 87
Message-ID: <323CB6FD.4ABF@mc.net>
Reply-To: anomaly3@mc.net
NNTP-Posting-Host: d3001.mc.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Mailer: Mozilla 2.01 (Macintosh; I; 68K)
```

Apple //e Manual Fault Dictionary:

How to use this chart:

Switch on your Apple //e with no disk in any drives. Get out your logic probe, and test the pins on each chip and note their reading. Then check your list with the list below and compare them. Any inconsistencies could signal a faulty chip and should be tested and/or replaced.

	PIN #	1	2	3	4
CHIP		1234567890	1234567890	1234567890	1234567890

LS125		PPPLPPLHPHPLH			
PLA		PPPPPPHPHLLPPPPPPPPH			
FF		HHLPHPPLPPHPPPHH			
Buffer		LPPPPPPPLPPPPPPPLH			
LS245		LPPPPPPPLPPPPPPPPH			
LS374		PPPPPPPLPPPPPPPPH			
LS244		LPPPPPLPLPPPLPLPLH			
Vid ROM		PPPPPLPPLPPH			
MMU		LPPPPPPPPPPPPPHHHPHPLPPHPPPPPPPPPPPPPP			
Processor		LHPHOHPHPPPPPPPPPLLLLPPPPPPPPPPPOOPPHH			

```

ShRegistr  P P P P P P P L H P P P P P P H
IOU        L L P P P H L L P L L H H P H O P P P P P P P P P P P P P P L L P P P P H P P P
LS10       P P P H H P L H L L H H H P H
Dec/Demux  P P P P P P H L H H H H H H P H
All RAMs   H P P P P P P H P P P P P P L
CD ROM     H P P P P P P P P P P P L P P P P P L P P P P P H H L
S202      L H L P P L L P P P H P L H
EF ROM     H P P P P P P P P P P P L P P P P P L P H P P P H H H
LS154     P H H H H H H H H H H L H H H H H H P P P P P P H
Keybd ROM  L L L H L L H H P P P L P P P P H L L P H L H H
           -----
LS251     O L L H P O H L P P P H H H H H
RC741     P L L P P P H O
NE558     H O H H H H O H H O H L H H O H
Decoder    P P P L L L L H L L L H H H L L L L L L L L L L L L L L L L L L L H H H L P P P P P P P P
           -----

```

P = Pulse
H = High
L = Low
O = No Light

Pins 1-8 & 22 & 23 on the Keyboard ROM as well as pins 6-14 on the Decoder are readings made after "space bar" pressed.

+ These readings are taken under normal stand-by conditions.

That's all there is to it! Please do not ask what the chips themselves do - refer to the Apple //e Technical Reference Manual, in the Hardware Implementation section.

- Tony :-)

** This list was obtained from p.232 of "Troubleshooting and Repairing Personal Computers 2nd Edition" by Art Margolis published by Windcrest/McGraw Hill. ISBN 0-8306-2187-3. **

<<<<< DISCLAIMER: This post is for reference only - I will not be held responsible for any damages or personal injury as the result of the use, misuse, or otherwise of the information contained herein. The above procedures should only be performed by a qualified technician, or Apple authorized representative. >>>>>

```

##### E N D O F F I L E
### logic.chart
##### E N D O F F I L E

```

```
#####
### FILE      : logictest
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 2925 bytes    2 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.erols.net!news.sprintlink.net!news-
peer.sprintlink.net!newsfeed.internetmci.com!in2.uu.net!news.mc.net!usenet
From: "anomaly3@mc.net" <anomaly3@mc.net>
Newsgroups: comp.sys.apple2
Subject: Apple //e Manual Fault Dict.
Date: Wed, 18 Sep 1996 21:21:06 -0500
Organization: McHenryCom
Lines: 87
Message-ID: <3240AE12.3937@mc.net>
Reply-To: anomaly3@mc.net
NNTP-Posting-Host: d3043.mc.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Mailer: Mozilla 2.01 (Macintosh; I; 68K)
```

Apple //e Manual Fault Dictionary:

How to use this chart:

Switch on your Apple //e with no disk in any drives. Get out your logic probe, and test the pins on each chip and note their reading. Then check your list with the list below and compare them. Any inconsistencies could signal a faulty chip and should be tested and/or replaced.

	PIN #	1	2	3	4
CHIP		1234567890	1234567890	1234567890	1234567890

LS125		PPPLPPLHPHPLH			
PLA		PPPPPPHPHLLPPPPPPPPH			
FF		HHLPHPPLPPHPPPHH			
Buffer		LPPPPPPPLPPPPPPPLH			
LS245		LPPPPPPPLPPPPPPPPH			
LS374		PPPPPPPLPPPPPPPPH			
LS244		LPPPPPLPLPPPLPLPLH			
Vid ROM		PPPPPLPPLPPH			
MMU		LPPPPPPPPPPPPPHHHPHPLPPHPPPPPPPPPPPPPP			
Processor		LHPHOHPHPPPPPPPPPLLLLPPPPPPPPPPPOOPHPH			


```
#####
### FILE      : lowercase.iiplus
#####
### Created   : Sunday, January 14, 1996  Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1519 bytes   1 KB
#####
```

```
Path: news.weeg.uiowa.edu!news.uiowa.edu!uunet!zaphod.mps.ohio-
state.edu!sdd.hp.com!sgiblab!adagio.panasonic.com!mntp-server.caltech.edu!toddpw
From: toddpw@cco.caltech.edu (Todd P. Whitesel)
Newsgroups: comp.sys.apple2
Subject: Re: Lowercase characters for Apple][ +
Date: 7 Jan 1993 11:25:55 GMT
Organization: California Institute of Technology, Pasadena
Lines: 19
Message-ID: <lih403INNak5@gap.caltech.edu>
References: <1993Jan6.055154.7450@nuscc.nus.sg>
NNTP-Posting-Host: punisher.caltech.edu
```

scip2060@nusunix1.nus.sg (SARDJONO INSANI) writes:

>Anyone knows how to modify the Apple][+ keyboard to produce lowercase?

Which model have you got? The earlier ones couldn't do it without software support. The later ones had six solder pads and a couple jumpers you could change to add a DPDT switch that served as a CAPS LOCK switch. If you have the "two-piece" keyboard (there's a little PC board hanging off of the main keyboard) then you are in luck. If you look at the little PC board then look near the CONTROL/RESET switch and see if you can find a 2x3 pattern of holes with exposed metal around them and two "bow ties" nearby. You may have to partially disassemble the keyboard to find them, and you will definitely need to do that to add the Caps Lock switch and cut the bow ties (the bow ties are connections that make the board think there is a switch connected but locked in one position, and you cut them with an exacto knife when you install the real switch).

Todd Whitesel
toddpw @ cco.caltech.edu

```
##### E N D O F F I L E
### lowercase.iiplus
##### E N D O F F I L E
```

```
#####
### FILE      : macie
#####
### Created   : Tuesday, November 12, 1996 Modified: Tuesday, November 12, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1605 bytes    1 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!cs.utexas.edu!news.sprintlink.net!news-
peer.sprintlink.net!howland.erols.net!newsfeed.internetmci.com!news.ix.net!s002.ci
n.ix.net!user
From: jnichol@tso.cin.ix.net (Jim Nichol)
Newsgroups: comp.sys.apple2
Subject: Re: <no subject>
Date: Sat, 28 Sep 1996 13:09:28 -0400
Organization: IX Network
Lines: 25
Message-ID: <jnichol-2809961309280001@s002.cin.ix.net>
References: <324A6EFC.369B@wctc.net> <ggonter-2609962101570001@port-56-max-btv-
01.ramp.together.net>
NNTP-Posting-Host: s002.cin.ix.net
```

In article
<ggonter-2609962101570001@port-56-max-btv-01.ramp.together.net>,
ggonter@together.net (Geof Gonter) wrote:

```
> In article <324A6EFC.369B@wctc.net>, jfriess@wctc.net wrote:
>
>
> >But, Nate, isn't there an Apple II card for the Mac, won't it fit in a
> >Performa 630CD, and won't it run Bank Street Writer and other ProDos
> >programs? (Ulrich, I see you've posted to the Mac groups too--maybe
> >they've mentioned this or other possible solutions).
>
> The Apple II card fits LC series Macs only, or should I say any Mac with a
> LC PDS slot. Yes it'll run ProDos and DOS 3.3 applications.
```

Yes and no. The 630 Macs do have LC-style PDS slots. However, the 630's cannot use a IIe Card because you cannot turn off 32-bit addressing in a 630. The IIe Card will work in all other Macs with an LC-style PDS slot, including:

Mac LC, LCII, LCIII, Quadra 605, LC475, Performa 475, Performa 550, Performa 575-8, Color Classic, LC520 (I think), and several other Performas that are the equivalents of the LC's above.

Jim Nichol

```
##### E N D O F F I L E
### macie
##### E N D O F F I L E
```

```
#####
### FILE      : mackybds
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 3492 bytes    3 KB
#####
```

```
Path: news.uiowa.edu!chi-
news.cic.net!newspump.sol.net!www.nntp.primenet.com!nntp.primenet.com!news.primene
t.com!bpvh
From: bpvh@primenet.com (Bradley P. Von Haden)
Newsgroups: comp.sys.apple2
Subject: Re: IIgs and Mac ADB ports
Date: 17 Sep 1996 10:58:02 -0700
Organization: Primenet (602)416-7000
Lines: 83
Message-ID: <5lmora$hql@nnrpl.news.primenet.com>
X-Posted-By: bpvh@206.165.5.110 (bpvh)
```

nathan@visi.com (Nathan Mates) wrote:

>J. Morris Prosser <jmprosser@redshift.com> wrote:

```
>>Since IIgs keyboards are so hard to come by, I ordered a Mac
>>keyboard (MacALLY) from Mac Connection to replace the IIgs
>>keyboard. Only problem is that it doesn't work!
```

>Probably a software issue.

I believe it is a hardware issue.

```
>Roughly a week ago, I added some information to the
>comp.sys.apple2 FAQ detailing which ADB keyboards have been tested
>and do work, and which ones don't. Your 'MacALLY' is not listed in
>either category.
```

If it is my list of ADB keyboards, the MacALLY has been in the "Do not work" category since at least January 1996 (I do not keep older versions lying around). Someone put my list up on a ftp site without attribution and has not kept it up to date. I have posted the list of keyboards infrequently to comp.sys.apple2 and comp.sys.apple2.marketplace.

Here is a list of ADB keyboards that I have compiled as of 17 September 1996. Additions/corrections welcome.

'+' designates changes from previous list

I have the following that work:

```
Apple ADB Keyboards I and II
AppleDesign Keyboard ($85 - MacMall(66s), Mac Zone(47b))
+Apple Extended Keyboard (original)
Apple Extended Keyboard II ($155 - MacMall(66s), Mac Zone(47b))
Adesso 105 Extended Keyboard ($80 - Mac's Place, Mac Zone, Tiger SW)
Adesso 102 Wxtended Keyboard w/ Trackball [Trackball does NOT work]
```

(\$100 - Mac's Place, Mac Zone, Tiger Software)
 Arriva Extended (\$40 - MacMall(66s))
 Interex 105 Extended (\$55 - MacMall, Syex Express; \$34 - Computer
 City)
 Key Tronic MacPro Plus (\$130 - Mac Zone, APS Tech.)
 OptiMac Extended Keyboard (???)
 PowerUser 105E Extended Keyboard (\$50 - MacWarehouse(59))
 SIIG, Inc MacTouch Model 1905 (~\$100.00)
 Sun OmniMac Ultra [extended, ADB type] (???)
 Suntouch ADB Extended Keyboard (\$75 - Syex Express)
 VividKey Extended Keyboard (\$60 - MacMall)

Do not work:

Apple Adjustable Keyboard
 MacALLY Peripherals Extended Keyboard
 MicroSpeed Keyboard Deluxe MAC

???:

+Adesso Easy Touch ext kb (\$44 - Mac Zone(47b))
 +Adesso ProPoint ext kb w/ thinkpad (\$60 - MacMall(66s))
 +Alps GlidePoint kb (\$110 - Mac Zone(47b))
 ClubMac Extended Keyboard (\$39 - ClubMac(13))
 Datadesk MAC 101 E (\$100 - MacWarehouse, Mac Zone)
 Datadesk TrackBoard (\$100 - MacWarehouse, Mac Zone)
 Key Tronic Trak Pro Plus (\$230 - APS Tech.)
 Performance Soft Touch Extended Keyboard (\$49 - Mac Zone(47b))
 Spring Sun Tech MacPride 97 (\$90 - MacMall)
 Spring Sun Tech MacPride 105 (\$59 - MacMall)
 Spring Sun Tech MacPride 110 (\$80 - MacMall) [MAC/IBM switchable]
 Spring Sun Tech MacPride KidBoard (\$100 - MacMall)

????:

+Adesso NUForm Ergonomic ext kb (\$60 - MacMall(66s))
 +Adesso NUForm Ergonomic ext kb w/ pointer (\$70 - MacMall (66s))
 +Adesso NUForm Ergonomic ext kb w/ touch pad (\$90 - MacMall (66s),
 Mac Zone (47B))
 Adesso Tru-Form Ergonomic ext kb (\$79 - Mac Zone(47b))
 Adesso Tru-Form Ergonomic ext kb w/ pointer (\$90 - MacMall(66s))

**** bpvh Internet: bpvh@primenet.com GENie: B.VONHADEN ****
 **** Posted by an Apple IIgs using my own Proterm 3.1 File Macro ****

E N D O F F I L E
 ### mackybds
 ##### E N D O F F I L E

```
#####
### FILE      : magnvx.cable
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1346 bytes    1 KB
#####
```

```
Path: ns-mx!hobbes.physics.uiowa.edu!zaphod.mps.ohio-
state.edu!think.com!wupost!uunet!blkcat!Uucp
From: White.Wolf@f438.n109.z1.FidoNet.Org (White Wolf)
Newsgroups: comp.sys.apple2
Subject: Maganox to GS monitor he
Message-ID: <697093251.18@blkcat.FidoNet>
Date: 1 Feb 92 07:01:28 GMT
Lines: 34
```

[Message Deleted]

```
SDP| this is what they look like
SDP|
SDP| Apple's RGB          \ o o o . o o . . /
SDP|                    \ o o . . o . . /
SDP|                    -----
SDP|
SDP| and Maganox's RGB   \ o o o o o /
SDP|                    \ o . o o /
SDP|                    -----
```

SDP| I would appreciate any help. Drop me E-mail direct please!

Magnavox	Apple IIgs	Description
1	1	GND
2	1	GND
3	2	Red
4	5	Green
5	9	Blue
7	3	Composite Sync.

5 4 3 2 1 8 7 6 5 4 3 2 1 Female
9 8 7 6 e d c b a 0 9 Connectors

Quality Computers (I think that's the name), in A+/Incider has a cable for about \$25-\$30.

X SLMR 2.1 X White Wolf --> Tae Song

* Origin: Europa BBS (301) 718-4690 HST/DS 14.4k (1:109/438)

```
##### E N D O F F I L E
### magnvx.cable
##### E N D O F F I L E
```

```
#####
### FILE      : mcmultifunc
#####
### Created   : Sunday, January 14, 1996  Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1602 bytes   1 KB
#####
```

```
Path: news.uiowa.edu!chi-
news.cic.net!uwm.edu!msunews!harbinger.cc.monash.edu.au!news.cs.su.oz.au!metro!wab
bit.cc.uow.edu.au!wabbit.cc.uow.edu.au!not-for-mail
From: david@wraith.cc.uow.edu.au (David E A Wilson)
Newsgroups: comp.sys.apple2
Subject: Re: want help with Mountain multifunction card
Date: 12 Nov 1995 12:58:20 +1100
Organization: University of Wollongong, NSW, Australia.
Lines: 26
Message-ID: <483kbs$rfk@wraith.cc.uow.edu.au>
References: <8B424E2.0221001119.uuout@digitec.co.za>
NNTP-Posting-Host: wraith.cs.uow.edu.au
X-Newsreader: NN version 6.5.0 #5
```

```
> RJ> From: bob_jensen@jhuapl.edu (Robert Jensen)
> > Subject: want help with Mountain multifunction card
> > Date: Sun, 15 Oct 95 03:40:33 GMT
```

```
> RJ> I would like to get help with using a Mountain Computer
> > multifunction card. If anyone has experience, or better
> > yet documentation, please let me know. I can't puzzle out
> > how to address the serial port, the parallel port, or the
> > clock. Thanks for any help.
```

The memory map is as follows:

```
Cn00-CnEF      8x 240 byte ROM banks
CnF0-CnF7     32x 8 byte battery backed up RAM banks
CnF7          I/O select default (Bank 0 only) (I7..I1, bit 0 unused)
CnF8          RAM/ROM select (RAS4,RAS2,RAS1,RAS0,RAS8,ROS2,ROS1,ROS0)??
CnF9          Clock Data I/O Para SP Status
              (Spare,+OBE,-,-,+CD4,+CD2,+CD1,+CD0)??
CnFA/B        Serial chip (INS2651)
CnFC          I/O Select Mapper (+IO7..+IO1,-)
CnFD          Parallel Data Out
CnFE          Clock Address & Control (MSM5832), Serial Control
              (+SCR,+CH,+CW,+CR,+CA4,+CA2,+CA1,+CA0)??
CnFF          not used
```

```
--
David Wilson      Dept CompSci Uni Wollongong Australia      david@cs.uow.edu.au
```

```
##### E N D O F F I L E
### mcmultifunc
##### E N D O F F I L E
```

```
#####
### FILE      : mctspeeddemon
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2917 bytes   2 KB
#####
```

Path:

```
news.uiowa.edu!hobbes.physics.uiowa.edu!newsrelay.iastate.edu!vixen.cso.uiuc.edu!h
owland.reston.ans.net!news-
ela.megaweb.com!newstf01.news.aol.com!newsbf02.news.aol.com!not-for-mail
From: rubywand@aol.com (RUBYWAND)
Newsgroups: comp.sys.apple2
Subject: Re: Help I.D.ing cards.
Date: 19 Nov 1995 15:01:31 -0500
Organization: America Online, Inc. (1-800-827-6364)
Lines: 50
Sender: root@newsbf02.news.aol.com
Message-ID: <48o2er$36n@newsbf02.news.aol.com>
References: <48gsv1$1o2@lynx.unm.edu>
NNTP-Posting-Host: newsbf02.mail.aol.com
X-Newsreader: AOL Offline Reader
```

james keim (jkeim@unlinfo.unl.edu) wrote:

```
> One is an accelerator card--an "M-c-T SpeedDemon"
> It is dated 1984. Does anyone know what speed this thing
> runs? I _think_ I am seeing four 16k 90milisecond cache ram
> chips on it. There also seems to be a little place for
> jumper block on the top of the card, near the keyboard end.
> Any ideas what it might be for? Any ideas if there is a way
> to control this thing through software/hardware? Oh, I did
> notice that the card draws a little Apple on the graphics
> screen before the Autostart ROM kicks in and the "Apple ]["
> appears.
>
```

The RAMs on our Speedemon are 100ns 2048x8 9128's (for a total 8K of pretty speedy cache). I once asked McT about the jumper block you mention, they said the jumper is set at the factory to adjust on-card timing and to Leave It Alone. (On our card, the jumper block has 5 pairs. The pair 2nd from the top is jumpered.)

There is also a jumper pair near the bottom middle of the card. This is the Speed Jumper. Jumper it if you want 'demon to slow down for I/O accesses to Slots 4 & 5. (The 'demon always slows for Slot 6 I/O (\$C0E0 - \$C0EF.)

According to the "Manual" (a folded card), pressing PDL-1 (Closed-Apple on a IIe) upon power-up will engage a self-test. Pressing ESC at power-up will turn OFF the card and allow running at normal speed. To turn OFF the card later on, do a POKE (49152+256*S) where S= Slot # of the slot the card is in; then, press RESET.

You can put the 'demon into any Slot; but, if you put it in Slot 0 (Slot 3 in a IIe), the card will not respond to any KB shut-off commands.

Your card may be a slightly later model. (I've never noticed ours draw a hires apple on the screen-- darn it!) Possibly, McT came out with a revision aimed at 128K IIe's.

Indeed, the 'demon is a power gobbler-- roughly 1.5A as I recall-- and some of the IC's run hot. We finally cut out a square section on the back of the II+ and added a mini-fan, just to blow air across the 'demon board.

In terms of raw performance (once you arrange for cooling), Speedemon may be the best of the 4MHz accelerators for early II's. I've never noticed any compatibility problems and the approx. X3.5 speed increase puts real 'snap' into your machine's response. (Besides, it's great for games like Elite!)

```
##### E N D O F F I L E  
### mctspeeddemon  
##### E N D O F F I L E
```

```
#####
### FILE      : memswitches
#####
### Created   : Sunday, January 14, 1996  Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 16009 bytes   15 KB
#####
```

```
Path: news.uiowa.edu!chi-news.cic.net!news.uoregon.edu!cie-2.uoregon.edu!nparker
From: nparker@cie-2.uoregon.edu (Neil Parker)
Newsgroups: comp.sys.apple2
Subject: Re: memory switches
Date: 8 Nov 1995 09:20:23 GMT
Organization: University of Oregon Campus Information Exchange
Lines: 87
Message-ID: <47pson$cla@pith.uoregon.edu>
References: <1995Nov7.155913.3304@freenet.victoria.bc.ca>
NNTP-Posting-Host: cie-2.uoregon.edu
```

```
In article <1995Nov7.155913.3304@freenet.victoria.bc.ca>
ur448@freenet.Victoria.BC.CA (John Edward Flanders) writes:
>Could anyone please explain the locations and functions of the memory bank
>switches on an Apple //e with 128k memory?
```

Have patience...this gets rather complicated.

The bank-switching controls are as follows:

```
$C002: Select main memory for reading in $0200...$BFFF
$C003: Select aux memory for reading in $0200...$BFFF
$C004: Select main memory for writing in $0200...$BFFF
$C005: Select aux memory for reading in $0200...$BFFF
$C008: Select main memory for reading & writing in $0000...$01FF & $D000...$FFFF
$C009: Select aux memory for reading & writing in $0000...$01FF & $D000...$FFFF
```

To activate any switch, write a value at the I/O location. It doesn't matter what you write; the act of writing is what triggers the switch. (You *must* access the switch by writing--reading a switch just gets you the ASCII code of the most recent keypress, and doesn't do any bank switching.)

Don't ever try to POKE these switches from BASIC--you'll bank-switch yourself out of existence.

Note that these switches divide memory into four ranges:

```
$0000...$01FF: Switched by $C008, $C009.
$0200...$BFFF: Switched by $C002...$C005.
$C000...$CFFF: Not switchable.
$D000...$FFFF: Switched by $C008, $C009. This is the "language card"
area...the switch only controls which of the two
"language cards" (main or aux) is active...if you
have ROM mapped into this area, it never switches (i.e.
there's only one ROM, and it shows up in both the main
and aux banks).
```

Note that for memory in \$0200...\$BFFF, reading and writing are separately selectable...you can read from main memory and write to aux memory, for

example. However, for memory in \$0000...\$01FF and \$D000...\$FFFF, reading and writing are not separately selectable...you either read and write in the main bank, or you read and write in the aux bank.

Looks simple enough, doesn't it? Well, here comes the complicated part. There is another switch that affects bank switching:

\$C000: Turn off 80-column bank switching
\$C001: Turn on 80-column bank switching

(As above, these switches must be accessed by writing.)

If 80-column bank switching is off, bank switching works exactly as described above. But if 80-column bank switching is on, the text screen (\$0400...\$07FF) becomes immune to the normal bank-switching controls. In this mode, the text screen is bank-switched by the following controls instead:

\$C054: Map the main text page into \$0400...\$07FF
\$C055: Map the aux text page into \$0400...\$07FF

(These switches can be triggered by ANY access, not just a write.)

Note that this is the PAGE1/PAGE2 switch. When 80-column bank switching is on, text page 2 (and graphics page 2) cannot be displayed.

As if that weren't confusing enough, turning on the HIRES switch (by accessing \$C057) causes hires page 1 (\$2000...\$3FFF) to behave just like the text screen--it too becomes immune to the normal bank-switching controls, and is switched instead by \$C054, \$C055.

Actually, I lied when I wrote above that the I/O area (\$C000...\$CFFF) doesn't bank-switch. The following switches control portions of this memory area:

\$C006: Map slot card ROMs into \$C100...\$CFFF
\$C007: Map internal ROM into \$C100...\$CFFF
\$C00A: Map built-in 80-column firmware into \$C300...\$C3FF
\$C00B: Map slot card ROM into \$C300...\$C3FF

(These are write-only switches.)

- Neil Parker

--

Neil Parker, nparker@{cie-2,cie}.uoregon.edu, <http://cie-2.uoregon.edu/~nparker>

"Bad move, Neil!" -- The Tick

Newsgroups: comp.sys.apple2
Path: news.uiowa.edu!chi-
news.cic.net!news.uoregon.edu!waikato!comp.vuw.ac.nz!actrix.gen.nz!dempson
From: dempson@atlantis.actrix.gen.nz (David Empson)
Subject: Re: memory switches
Message-ID: <DHqCuJ.ALA@actrix.gen.nz>
Sender: news@actrix.gen.nz (News Administrator)
Organization: Actrix - Internet Services
Date: Wed, 8 Nov 1995 15:11:06 GMT
References: <1995Nov7.155913.3304@freenet.victoria.bc.ca>
X-Nntp-Posting-Host: atlantis.actrix.gen.nz

Lines: 256

In article <1995Nov7.155913.3304@freenet.victoria.bc.ca>,
John Edward Flanders <ur448@freenet.Victoria.BC.CA> wrote:
>

> Could anyone please explain the locations and functions of the memory bank
> switches on an Apple //e with 128k memory?

I assume you are referring to the IIE-specific bank switches relating to the 64K auxiliary memory, and not the \$D000-\$FFFF soft-switches, which are the same as the][/][+ with a language card installed. (I have described these anyway.)

Before mentioning the soft-switches, I should first cover the firmware routines that are normally used to access auxiliary memory. These routines are generally easier to use than trying to control the soft-switches directly, as it avoids the problem of your memory switching out from underneath you while you are trying to execute code!

Two special routines are provided in the IIE firmware. They are dependent on the built-in 80-column firmware, so they might not be available if a card with firmware on it is installed in slot 3.

AUXMOVE (\$C311) is used to copy data either way between main and auxiliary memory (in the \$0200-\$BFFF area).

Before calling AUXMOVE, the following zero page locations must be set up:

\$3C - \$3D Source starting address (low byte, high byte)
\$3E - \$3F Source ending address (low byte, high byte)
\$42 - \$43 Destination startion address (low byte, high byte)

In addition, the carry flag must be set to indicate the direction of the move: C=1 to move from main to auxiliary memory, C=0 to move from auxiliary to main memory.

XFER (\$C314) is used to transfer execution between code running in main and auxiliary memory.

Locations \$03ED and \$03EE must be set to the address of the destination routine in the other bank. The carry and overflow flags must be set as follows: C=1 to transfer execution from main to auxiliary memory, C=0 for auxiliary to main memory; V=1 to use auxiliary zero page, stack and language card, V=0 to use main zero page, stack and language card.

When using this routine, it is also necessary to save and restore the main and auxiliary stack pointers, which are stored at locations \$0100 and \$0101 respectively (both in auxiliary memory).

Since these routines execute from the I/O space, they are able to access both banks without causing problems. For code executing from main memory, it is possible to write to auxiliary memory, but reading from auxiliary memory is not directly possible (your code is switched out).

Auxiliary Memory Soft-switches

=====

The IIe-specific soft switches all use three I/O locations. A pair of locations set the soft switch to the "on" and "off" states by writing to the location (value is irrelevant). The third location allows software to read the current state of the switch, by examining bit 7 of the returned value (the switch is "on" if bit 7 is set).

The softswitches related to auxiliary memory bank switching are as follows:

Name	OFF location	ON location	READ location
RAMRD	\$C002 (write)	\$C003 (write)	\$C013 (read bit 7)
RAMWR	\$C004 (write)	\$C005 (write)	\$C014 (read bit 7)
ALTZP	\$C008 (write)	\$C009 (write)	\$C016 (read bit 7)
80STORE	\$C000 (write)	\$C001 (write)	\$C018 (read bit 7)
PAGE2	\$C054 (r/w)	\$C055 (r/w)	\$C01C (read bit 7)
AN3	\$C05E (r/w)	\$C05F (r/w)	not available

The RAMRD switch determines which bank is accessed for READ operations in the address range \$0200 to \$BFFF. If this switch is OFF, main memory is read. If this switch is ON, auxiliary memory is read.

The RAMWR switch determines which bank is accessed for WRITE operations in the address range \$0200 to \$BFFF. If this switch is OFF, main memory is written. If this switch is ON, auxiliary memory is written.

The ALTZP switch determines which bank is accessed for both READ and WRITE operations in the address ranges \$0000 to \$01FF (zero page and stack memory) and \$D000 to \$FFFF ("language card"). If this switch is OFF, main memory is accessed. If this switch is ON, auxiliary memory is accessed.

In addition to these three switches, there are special facilities to simplify access to the 80-column text buffer (half of which is in auxiliary memory at \$0400-\$07FF) and first page of the double hi-res graphics buffer (half of which is in auxiliary memory at \$2000-\$3FFF).

These facilities are controlled by the 80STORE switch. If 80STORE is OFF, then auxiliary memory switching is controlled only by the RAMWR and RAMRD switches.

If 80STORE is ON, then the PAGE2 switch controls the bank accessed in the \$0400-\$07FF area. If PAGE2 is OFF, main memory is accessed. If PAGE2 is ON, auxiliary memory is accessed. This overrides the current setting of RAMRD and RAMWR.

Note: PAGE2 normally selects the displayed text or graphics page (1 or 2). This function is disabled while 80STORE is active, and only page 1 can be displayed.

Note also that the 80STORE bank switching function is independent of the display of 80-column text and double hi-res graphics mode, which involves the 80COL soft switch (\$C00C write = OFF, \$C00D write = ON, \$C01F = read).

The AN3 switch is involved in the use of double hi-res graphics mode. If AN3 is OFF (\$C05E), double hi-res graphics is ENABLED. Double hi-res graphics will also be displayed if 80COL is ON and HIRES (\$C057) is ON.

If AN3 is ON (\$C05F), double hi-res graphics is DISABLED. Standard Hi-res graphics will be displayed, even if 80COL is ON.

If AN3 is OFF and 80STORE is ON, then PAGE2 controls whether main or auxiliary memory is accessed in the \$2000-\$3FFF area (as with the 80-column text buffer).

If AN3 is OFF and 80STORE is also OFF, then PAGE2 selects which text/graphics page is displayed, as normal. This combination allows double hi-res graphics page 2 to be displayed. This page (\$4000-\$5FFF in both banks) does not have a special bank switch mechanism, so other methods must be used to access the two halves of its address space. (The same applies to 80-column text page 2, at \$0800-\$0BFF in both banks.)

In AN3 is ON (double hi-res graphics disabled), then 80STORE has no effect on memory mapping in the \$2000-\$3FFF area.

Note that the AN3 switch also controls the state of annunciator output number 3 on the internal 16-pin game connector.

\$C100-\$CFFF ROM bank switching
=====

The IIE has internal ROM in the \$C100-\$CFFF area. Locations \$C300-\$C3FF and \$C800-\$CFFF contain the 80-column firmware. The other areas (\$C100-\$C2FF and \$C400-\$C7FF) contain monitor extensions and self-test routines.

This memory area is normally occupied by the ROM on cards in I/O slots. The IIE has two soft-switches that control what appears in these areas.

Name	OFF location	ON location	READ location
SLOTXROM	\$C006 (write)	\$C007 (write)	\$C015 (read bit 7)
SLOT3ROM	\$C00A (write)	\$C00B (write)	\$C017 (read bit 7)

The SLOTXROM switch controls locations \$C100-\$C2FF and \$C400-\$C7FF (slots 1, 2, 4, 5, 6 and 7). If this switch is OFF, the normal slot address space applies. If this switch is ON, the internal ROM is enabled for these areas.

The SLOT3ROM switch controls locations \$C300-\$C3FF (slot 3). If this switch is OFF, the internal 80-column firmware is enabled in slot 3. If this switch is ON, the slot 3 firmware is enabled.

The \$C800-\$CFFF area is bank switched between slots in the standard way - it is enabled for slot n when \$Cn00-\$CnFF is accessed (if this area is implemented for the slot in question) and is disabled for all slots when \$CFFF is accessed (it is necessary to do this first, to ensure that the bank-switch area is not enabled for multiple slots). The internal 80-column firmware will be enabled in this area if slot 3 is set to "internal" mode, and \$C300-\$C3FF is accessed.

Language Card Bank Switching
=====

The IIe has built-in emulation of the "language card" that is used in an Apple][or][+ to increase the total memory to 64K.

The language card provides 16K of additional RAM that is bank-switched into the \$D000-\$FFFF area, which is normally occupied by the firmware (Applesoft BASIC and the monitor firmware). This is only 12K of address space: the extra 4K is provided via a second bank at \$D000-\$DFFF.

In a 128K IIe, the language card structure is repeated in both main and auxiliary memory, and the same soft switches control both banks. The active bank is controlled by the ALTZP soft switch (described earlier).

The language card soft-switches are as follows. Note that they are the same for a][or][+ with a language card in slot 0, except that the "read" locations are not available. An Applesoft/Integer BASIC ROM card uses a subset of these locations (it only supports \$C080/\$C081).

All of these soft switches may be controlled with a read or write access. They control which areas are accessed for subsequent read and write operations in the \$D000-\$FFFF. "bank 1" and "bank 2" refer to the two alternative 4K RAM banks at \$D000-\$DFFF. \$E000-\$FFFF accesses the same memory area no matter which bank is selected.

Name	Location	Read	Write
LC2RD	\$C080	RAM, bank 2	-
LC2WR	\$C081	ROM	RAM, bank 2 (see below)
ROMONLY2	\$C082	ROM	-
LC2RW	\$C083	RAM, bank 2	RAM, bank 2 (see below)
LC1RD	\$C088	RAM, bank 1	-
LC1WR	\$C089	ROM	RAM, bank 1 (see below)
ROMONLY1	\$C08A	ROM	-
LC1RW	\$C08B	RAM, bank 1	RAM, bank 1 (see below)

In summary:

\$C082 or \$C08A totally disables the language card RAM. The ROM is enabled for read, and the RAM is completely disabled. The two locations are identical in function.

\$C080 or \$C088 enables the language card RAM in "write protected" mode (acting as a ROM). This is used by DOS 3.3 when Integer BASIC is loaded into the language card. The two locations select different 4K RAM banks in the \$D000-\$DFFF area.

\$C081 or \$C089 enables the language card RAM in "write only" mode, with the ROM enabled for read operations. This is used when executing code in ROM, but allowing data to be copied into the language card (e.g. when copying parts of the ROM into the language card). The two locations select different RAM banks in the \$D000-\$DFFF area.

\$C083 or \$C08B enables the language card RAM in "read/write" mode, with the ROM completely disabled. This is used when executing an operating system (e.g. ProDOS or Pascal) from the language card space, where part of the RAM is used as buffering memory, for example. The two locations select different RAM banks in the \$D000-\$DFFF area.

The "write enable" locations (\$C081, \$C083, \$C089 and \$C08B) require a special sequence to enable write access. Two or more consecutive READ accesses to the location are required to enable writes (e.g. two LDA instructions).

The current state of these soft-switches can be detected on the IIe by reading bit 7 of the following locations:

- \$C011 Read bank 2 select state (set for bank 2, clear for bank 1)
- \$C012 Read RAM read enable state (set for RAM read, clear for ROM read)

It is not possible to read the write-enable state of the language card RAM.

--

David Empson
dempson@actrix.gen.nz
Snail mail: P.O. Box 27-103, Wellington, New Zealand

```
##### E N D O F F I L E  
### memswitches  
##### E N D O F F I L E
```

```
#####
### FILE      : microtek.cards
#####
### Created   : Saturday, November 7, 1998 Modified: Saturday, November 7, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2370 bytes   2 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!nyd.news.ans.net!news-
w.ans.net!newsfeeds.ans.net!news.lava.net!news.Hawaii.Edu!gkomatsu
From: gkomatsu@Hawaii.Edu (Galen Tatsuo Komatsu)
Newsgroups: comp.sys.apple2
Subject: Re: Yet another Mystery board
Date: 6 Nov 1998 06:33:41 GMT
Organization: University of Hawaii
Lines: 37
Message-ID: <71u585$nk2@news.Hawaii.Edu>
References: <labelas-0511982218590001@lcust1.tnt23.atl2.da.uu.net>
NNTP-Posting-Host: uhunix3.its.hawaii.edu
Xref: newsl.icaen comp.sys.apple2:141394
```

```
In article <labelas-0511982218590001@lcust1.tnt23.atl2.da.uu.net>,
Labelas Enoreth <labelas@hotmail.com> wrote:
>Well, this one may not be a mystery if I am right, but I may not be.
>Microtek 'SLOTWARE'
>4 SN74xxxxx chips and a socketed chip with a label over it
>has a 26-pin connector directly on the card, like the old disk ][
>contollers were. I'm thinking it may be a parallel interface, since I
>think I may have gotten some huge daisy-wheel printer with it at the time
>and I think that this would have been the only way it could have been
>attached, but, unfortunately, since there is no adapter to go between the
>card and the back of the computer, I guess I am SOL.
```

Any other identifying codes on the card? I have a cardless manual for a Microtek Dumpling-GX Parallel Interface. ("Slotware" is apparently the name for their line of cards.)

The Manual is dated September 1, 1983 and lists these cards that Microtek makes. Any of the codes printed on your card?

```
RV-611C      7/8 BIT Parallel Interface Slotware(TM)
DUMPLING-GX  Hi-Res Graphics printer Interface Slotware(TM)
DUMPLING-64  64K Spooler Buffer Slotware(TM) for all major printers
DUMPLING-S   Programmable Serial I/O Slotware(TM) with 4 Personalities
BAM-16MM     16K Memory Expansion Slotware(TM) with Memory Management
BAM-128      64K or 128K Memory Expansion Slotware(TM)
Q-DISC       128K Disc Emulation Slotware(TM) for DOS 3.3
MAGNUM-80    80 Column Video Slotware(TM)
MAGNUM-80Me  80 Column Video Slotware(TM) with 64K Memory For Apple IIe
RAINBO-256   RGB Analog Slotware(TM) providing 256 colors
SV-622       Serial Interface Slotware(TM)
```

```
--- These people owe me stuff ---
Josh Smith (aka "itsme") : $17.00 + various specified videogame items
    (http://www2.hawaii.edu/~gkomatsu/JSmith/js.html)
Ben Cureton ("tragic")   : $85.00
```

```
##### E N D O F F I L E  
### microtek.cards  
##### E N D O F F I L E
```

```
#####
### FILE      : mockingboard
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 7097 bytes    6 KB
#####
```

```
Path: news.uiowa.edu!chi-news.cic.net!nntp.coast.net!howland.reston.ans.net!news-
ela.megaweb.com!newstf01.news.aol.com!newsbf02.news.aol.com!not-for-mail
From: rubywand@aol.com (RUBYWAND)
Newsgroups: comp.sys.apple2.programmer
Subject: Re: Mockingboard programming
Date: 14 Feb 1996 10:06:34 -0500
Organization: America Online, Inc. (1-800-827-6364)
Lines: 52
Sender: root@newsbf02.news.aol.com
Message-ID: <4fstpq$om@newsbf02.news.aol.com>
References: <victort-1302961551230001@ts-h08-15-54.ucc.su.oz.au>
NNTP-Posting-Host: newsbf02.mail.aol.com
X-Newsreader: AOL Offline Reader
```

In article <victort-1302961551230001@ts-h08-15-54.ucc.su.oz.au>, victort@extro.ucc.su.oz.au (Victor Tan) writes:

```
>can anyone supply information about how to make a mockingboard produce
>sound/music? I don't have any technical info about this so as much info
as
>you can supply would be greatly appreciated. Specifically, how to use it
>from 6502 assembly.
>
>Also, does anyone have any info about the different mockingboards? I see
>that some Apple II programs ask which type the user has: but what's the
>difference between them?
```

MockingBoard Mini-manual (Part 1)

The Sweet Micro Systems MockingBoard comes in four 'flavors':

- A. Sound I-- produces music tones and a variety of sound effects (1 channel output)
- B. Speech I-- produces speech and limited sound effects (1 channel output)
- C. Sound II-- 2 x Sound I on a single board (2 channels output)
- D. Sound/Speech I-- Sound I + Speech I on a single board (2 channels output)

MockingBoards work on Apple II's with at least 48K RAM. MB can go into any Slot. Most programs expect it to be in Slot 4; however, it is fairly common for a program which supports MB to ask you to enter the Slot #. Most for-MB products use the board for music & sound effects and will work with boards A, C, or D. Products that use MB include Ultima III, Sky Fox, Wiley Byte', Under Fire, Guitar Master, and Music Star.

MB's 0.5 Watt output(s) can directly drive an 8 Ohm speaker. You can also run the output(s) to a hi-fi amplifier.

MB "Sound" version boards use the General Instruments AY-3-8910 Programmable Sound Generator IC. The PSG has 3 on-chip tone oscillators (via channels A, B, C) and a Noise Generator (NG). So, for example, the Sound II can play up to 6 notes with 2 noises at once.

MB "Speech" version boards use the Votrax SC-01 Speech Synthesizer IC. The SC-01 uses 64 phoneme sounds to produce speech. MB software lets you adjust duration of each phoneme in 4 steps, create "rules" for custom sounds, and speak sentences from text in BASIC programs.

All MB versions use the 6522 Versatile Interface IC to handle board I/O. Except for the Sound I board, there are circuit board points to which you can add cables to utilize I/O ports not needed for Sound or Speech.

Rubywand

Path: news.uiowa.edu!chi-

news.cic.net!nntp.coast.net!news.kei.com!newsfeed.internetmci.com!howland.reston.ans.net!news-ela.megaweb.com!newstf01.news.aol.com!newsbf02.news.aol.com!not-for-mail

From: rubywand@aol.com (RUBYWAND)

Newsgroups: comp.sys.apple2.programmer

Subject: Re: Mockingboard programming

Date: 14 Feb 1996 10:06:40 -0500

Organization: America Online, Inc. (1-800-827-6364)

Lines: 110

Sender: root@newsbf02.news.aol.com

Message-ID: <4fstq0\$oo@newsbf02.news.aol.com>

References: <victort-1302961551230001@ts-h08-15-54.ucc.su.oz.au>

NNTP-Posting-Host: newsbf02.mail.aol.com

X-Newsreader: AOL Offline Reader

victort@extro.ucc.su.oz.au (Victor Tan) writes:

>.... supply information about how to make a mockingboard produce sound/music?

MockingBoard Mini-manual (Part 2): Sound Programming

The user can set Tone Frequency (12 bits, 4 coarse & 8 fine)* and Amplitude (4 bits) for each channel individually. A fifth Amplitude bit lets you decide if a channel's Level will be "fixed" (use the Level value) or "variable" (i.e. follow the current Envelope pattern). You can set NG Frequency (4 bits)* but not level.

*Tone Freq = A2 Clock Freq/ [(4096 x Coarse) + (16 x Fine)]

Noise Freq = A2 Clock Freq/ (16 x NG value)

The Envelope of the combined outputs of enabled sources can be controlled for Period (16 bits, 8 coarse & 8 fine)** and, roughly, for Shape (4 bits).

**Env Freq = A2 Clock Freq/ [(65536 x Coarse) + (256 x Fine)]

The registers of the PSG are described briefly below:

Reg. Function & Bit(s) used

```

00      A Freq. fine (0-7)
01      A Freq. coarse (0-3)
02      B Freq. fine (0-7)
03      B Freq. coarse (0-3)
04      C Freq. fine (0-7)
05      C Freq. coarse (0-3)
06      NG Freq. (0-4)
07      Enable =0/ Disable =1

```

NG on A (5) on B (4) on C (3)
Tone on A (2) on B (1) on C (0)
Ex: Writing \$F0 to Reg 07 plays tones A, B, C plus noise on C

```

08      A Level (0-3) and
        Envelope Control (4):  1 = Use Env;  0 = Use Level value

```

```

09      B Level (0-3) and ...
0A      C Level (0-3) and ...
0B      Envelope Period Fine (0-7)
0C      Envelope Period Coarse (0-7)
0D      Envelope Shape (four bits)

```

Continue (3) 0= do 1 cycle and set Level to zero
Attack (2) 1= count up 0= count down
Alternate (1) 1= reverse count direction each cycle
Hold (0) 1= do 1 cycle and hold count

To program the MB you write to the board's 6522 I/O chip(s). All addresses reference here are for a MB Sound II (2 Output channels) in Slot 4.

```

$C400 ORB1 function to perform, OUT 1
$C480 ORB2 function to perform, OUT 2
$C401 ORA1 data, OUT 1
$C481 ORA2 data, OUT 2
$C402 DDRB1 data direction, OUT 1
$C482 DDRB2 data direction, OUT 2
$C403 DDRA1 data direction, OUT 1
$C483 DDRA2 data direction, OUT 2

```

Before sending music, etc. data to the MB you must Initialize the board's I/O. To Initialize the 6522's: Store \$FF at \$C402 and the other three DDRxx addresses. This needs to be done by your program just once.

Your program gets access to a PSG via the 6522 by using a few basic Function codes which set the PSG's I/O control lines:

Set Inactive = \$04 Set PSG Reg# = \$07 Write Data = \$06 Reset = \$00

To Write to a PSG register: Tell the PSG which Register you wish to access (i.e. Set the "current register" #) and Write the data. This is easiest to do with subroutines to handle the basic Functions.

Example Subroutines (for Output Channel 1):

```

Set Reg #      1000:  A9 07   8D 00 C4   A9 04   8D 00 C4   60
Write Data     100B:  A9 06   8D 00 C4   A9 04   8D 00 C4   60

```

Notice that each Function sub ends by setting the PSG control lines to Inactive.

Similarly, to do a Reset (set all PSG regs to zero) ...

```
Reset          1016:  A9 00   8D 00 C4   A9 04   8D 00 C4   60
```

To put the value \$55 in PSG Register 02 (Channel B Freq. fine)

```
1080:  A9 02           put Reg#  in A
1082:  8D 01 C4       store A at the Data address ORA1
1085:  20 00 10       JSR to Set Reg#  (sets "current register" to Register
2)
1088:  A9 55           put the value $55 in A
108A:  8D 01 C4       store A at the Data address ORA1
108D:  20 0B 10       JSR to Write Data  ($55 goes into PSG Register 2)
1090:  60             Exit from subroutine
```

Good luck!

Rubywand

```
##### E N D   O F   F I L E
### mockingboard
##### E N D   O F   F I L E
```

```
#####
### FILE      : model.num
#####
### Created   : Monday, January 6, 1997  Modified: Monday, January 6, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2650 bytes   2 KB
#####
```

Newsgroups: comp.sys.apple2

Path:

news1.icaen!news.uiowa.edu!uunet!in2.uu.net!205.252.116.190!feed1.news.erols.com!h
 owland.erols.net!math.ohio-state.edu!usc!newshub.cts.com!crash!pro-aplbytrs!nancyc
 From: nancyc@pro-aplbytrs.pro-nsdapple.cts.com (Nancy Crawford)
 Subject: Model #s; Originally Re: Printer questions
 Organization: ProLine [pro-aplbytrs] -- Davenport, IA
 Date: Sun, 5 Jan 97 14:30:34 CST
 Message-ID: <a552366@pro-aplbytrs.pro-nsdapple.cts.com>
 Lines: 65

nathan@visi.com (Nathan Mates) replied to <kristelli@mail.earthlink.net>
 about printer questions:

> You noted what model number it is, but didn't note the manufacturer.
 > If it's by Apple, it probably will work. Other ones,
 > depends on whether it's compatible with the software you're using--
 > serial dot matrix printers will probably be the most compatible.

> Quoting from the comp.sys.apple2 Frequently Asked Questions (FAQ)
 > at <http://www.visi.com/~nathan/a2/faq/csa2.html>, sections 2.4 and
 > 4.4:

Nathan Mates,

A reference of Apple model numbers should be in a FAQ, IMO. Here's a
 few for a start:

Model number:	Equipment:	Comment:

PRINTER		
A9M0303	Image Writer I	(beige)
A9M0310	Image Writer II	(white w/ power connect on right rear leg)
MOUSE		
A2M4015	Mouse	(beige original //c mouse)
A2M2070	Apple Mouse IIe	(platinum came w/ IIe card)
DRIVE		
A2M2053	Unidisk 3.5	(white)
CPU		
A2S2064	Enhanced //e	(beige case)
A2S4000	Original //c	(white -- This particular CPU)

was an early "print peek (64447) 0" //c. The model# label is a printed stick-on label, in an inset. Same model# (A2S4000) case on a later model has the label facts molded into the case with only the serial # a stick-on label.)

MONITOR

A2M2010	Green Phosphor Monitor II	(two-tone beige; crt case and controls are darker.)
A2M6020	AppleColor Composite monitor	(platinum and heavy! plugs) into //c, //e w/RCA connect coax; same as Monitor II.)
A2M6014	IIgs AppleColor RGB Monitor	(platinum)

Anyone care to add, correct, and post...?

-- nancy

ProLine: pro-aplbytrs!nancyc@pro-nsdapple
 Internet: pro-aplbytrs!nancyc@pro-nsdapple.cts.com
 UUCP: crash!pro-nsdapple!pro-aplbytrs!nancyc

E N D O F F I L E
 ### model.num
 ##### E N D O F F I L E

```
#####
### FILE      : monitor.repair
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 4577 bytes    4 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!news-
e2a.gnn.com!newstf01.news.aol.com!newsbf02.news.aol.com!not-for-mail
From: rubywand@aol.com (RUBYWAND)
Newsgroups: comp.sys.apple2
Subject: Re: Repair Apple IIGS RGB, info wanted
Date: 21 Mar 1996 14:56:34 -0500
Organization: America Online, Inc. (1-800-827-6364)
Lines: 80
Sender: root@newsbf02.news.aol.com
Message-ID: <4isc9i$5ia@newsbf02.news.aol.com>
References: <4ip4pc$buja@madeline.INS.CWRU.Edu>
NNTP-Posting-Host: newsbf02.mail.aol.com
X-Newsreader: AOL Offline Reader
```

Monitor Repair Mini-Manual (mostly from stuff in COMPUTIST)

First, be safe. (See safety stuff at end.) Mainly, unplug the monitor and let sit for a day, wear goggles, work on non-conductive table surface, do not stress CRT neck.

Whatever it is you plan to fix, if you remove the monitor case, you will probably need to unplug the cable running from the circuit board to the Controls/Switch Module on the side of the case. Use 'whiteout', nail polish, etc. to mark the position of the plug.

If the monitor exhibits major flickering, periodic collapse of the display to a line, etc., then it may help to know that a common source of such problems is one or more bad connections where the High Voltage module is joined to the main circuit board. (This module is the black thing with a HV lead running to the CRT-- it's near the left, back. The slotted nub controls in its case set Focus and base Intensity.) Often these connections look okay because it is hard to see the small fractures in the solder surrounding the pins.

The cure is to resolder all of the pins coming from the module (on the under-side of the circuit board). Before doing the soldering, clip a wire to the metal chassis and touch the other end to each HV module pin and other points in the area. While soldering, avoid touching anything conductive on the monitor with anything but the iron and solder.

All-blue, all-red, etc. screen? You probably have a blown choke on the little chroma board mounted to the back of the CRT. The choke will be connected to one of the larger, R/G/B output transistors. Use an Ohmmeter to find the open choke. Replace the bad choke with 'one like it' or brew your own: wind about 25-30 turns of #30 wire on a small ferrite core.

For all soldering use a good quality pencil-style iron rated at 25-40 watts with a holder. Use high quality (60/40 or better) rosin core solder

(e.g. Kester "44" 20 gauge).

Arcing from the metal brace to the HV module can cause the display to momentarily shrink and flick out of focus. The cure is to bend the brace up enough to increase the arc path and clean the surfaces involved. Apply HV dope to the brace and module where distances are small.

If the case interior seems pretty clogged with dust and gunk, it's a good idea to remove the side-mounted Controls/Switch Module and give the case a good washing. (Be very sure it is well dried before replacing.) You should also clean the two controls on the C/S Module with spray-in control cleaner.

Before putting the case back, this is a good time to adjust base Intensity and Focus (the two nub controls on the HV module). Position the monitor so that screen is easy to see and the nub controls are accessible. Plug in the the C/S Module. Adjust the C/S Module controls to center positions. Plug in the monitor to the computer. Get a Desktop display with some text and icons. Use an insulated tool to adjust the nub Intensity and Focus controls for maximum sharpness at 'normal' viewing intensity. A magnifying glass is helpful to obtain max pixel sharpness.

Safety

Unplugging the monitor and letting it sit for a few hours reduces the danger of shock from stored charges; it does not eliminate it. The usual warning for this kind of work is AVOID touching two different circuit points at the same time. Like, don't touch the metal chassis and the conductive surface of the CRT at the same time. It's a good idea to clip a wire to the chassis and touch the other end to the conductive surface of the CRT a few times before doing any work.

WEAR protective GOGGLES. If you should, somehow, bump or stress the CRT neck-- as in jumping when you get shocked-- it may break. The result may be a peaceful THOOP! or the CRT may implode in a spray of glass.

Work on a wooden or plastic-topped table with plenty of space. Try to position yourself, tools, and the monitor so that when you get 'stung', the chances of breaking something are reduced.

Rubywand

```
##### E N D O F F I L E
### monitor.repair
##### E N D O F F I L E
```

```
#####
### FILE      : monitorgs.fix
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 9215 bytes   8 KB
#####
```

Path:

```
blue.weeg.uiowa.edu!news.uiowa.edu!uunet!news.mathworks.com!udel!gatech!howland.re
ston.ans.net!news.sprintlink.net!news.infi.net!larry!dynasor
From: dynasor@infi.net (Dennis McClain-Furmanski)
Newsgroups: comp.sys.apple2
Subject: Monitor Repair: Dark, Blurry
Date: 7 Feb 1995 00:48:01 GMT
Organization: InfiNet
Lines: 192
Message-ID: <3h6g01$cke@lucy.infi.net>
NNTP-Posting-Host: larry.infi.net
X-Newsreader: TIN [version 1.2 PL2]
```

Got a request to post this, so enjoy. E-mail me if you have questions. And be careful in there!
=====

Disclaimer: I have almost 30 years experience working on this type of device. I know how to be careful when doing these things. You probably don't have this much experience. I will do my best to explain this clearly and in enough detail that you can do it yourself. However, I make no promises, and I certainly do not take any responsibility for the results. If this is a problem, the course is simple: don't do it. This instruction set is offered to the public domain and may be passed around or reprinted anywhere, so that others may benefit. I only ask that you leave my name on it. Dennis McClain-Furmanski, dynasor@infi.net.

GS MONITOR REPAIR -- HIGH VOLTAGE PROBLEMS

This is a set of instructions for repairing the GS monitor. This is not hard, but it is not without difficulties or danger. Please pay very close attention to both instructions and caution warnings. Read it all at least twice before trying to do anything. Make sure all power is off before connecting or disconnecting anything to the computer.

The GS monitor, just like all other high voltage driven CRT devices deteriorates in function with age. This is unavoidable wear-and-tear, and is accounted for in the design. The problem is deterioration in the high voltage circuitry and/or those portions on the monitor which are operated by it.

SYMPTOMS: Increasing loss of brightness, contrast and/or focus. The picture may 'bloom', that is get larger when you turn up the brightness, and shrink when you turn it

down.

Associated side-effects: flashing and/or inconsistent brightness fluctuation while trying to adjust the external brightness and contrast controls.

PROBLEM: Primarily in the high voltage transformer. This 'fires' the electron guns, which produce the raster. This is adjustable up to a point. The side-effects are dirty controls; they can be cleaned.

THE FIX: The easy one first -- even if it's not necessary, you might as well do it while you're in there. Clean the brightness and contrast controls.

DISCONNECT THE MONITOR FROM THE COMPUTER AND FROM THE WALL. For safety's sake, I suggest doing this a day or two before working on it.

Open the GS monitor by removing the four screws, two on the back of the top 'flange' around the screen, two on the bottom facing the front, in the long 'channels'. Slide the back off of the monitor slowly, until the edge of the back is even with the back edge of the motherboard, the circuit board on the bottom of the monitor. Feed the power cord through the hole in the back as you slide it off. The wires leading to the controls on the side of the monitor might hang up. If so, simply loosen them and continue. Once the back is free of the chassis, slowly slide the back towards the right side (as you face the front) of the monitor. This is so you don't put strain on the wires going to the controls on the side.

Look inside the back, at the controls. The power switch, brightness and contrast controls are all mounted on the inside of the back. You can clean the brightness and contrast controls, to alleviate the flashing or inconsistent response. Using a pencil, mark the controls and the case so that you can set the controls back where they were before you started messing with them.

Get a spray can of NON-ABRASIVE contact cleaner. (This is probably all you'll find; the abrasive type was mostly for the old mechanical channel changer-tuners, but make sure). Make sure it won't hurt plastic. It will say so on the can. Try to get a can with a straw that fits into the spray cap. Spray some into one of the two controls, and turn it up and down repeatedly. Do this a few times. Then do the other control. Allow these to dry completely before you try to fire up the CRT. If this doesn't fix this problem, it's likely these will need to be replaced. The parts look to be fairly common. Sorry, I don't have details on them, so you'll have to get help with this.

Now to attack the main problem.

Look at the body of the CRT (picture tube). There's a big fat red (usually) wire coming out of it to the right of the long 'neck' of the tube (looking from the rear now). This is

the high voltage wire. In fact, it's the VERY high voltage wire. There's enough juice in this thing when operating to knock you down and possibly kill you. Even when turned off, enough can be stored in this area to really bite you. This is why I suggest waiting a day or two before messing with this. It gives the power time to drain off.

This big wire goes into the top of a plastic device which is partially covered with a metal cage. This is the high voltage transformer. Facing the rear, you will see two small adjustment stems, one above the other. The upper one is marked FOCUS, the lower one SCREEN. This is on the collar around the stem.

If your problem is increasing darkness, the SCREEN control is the one you'll want to work with mostly. If your display is out of focus, obviously you'll work with the focus control. In either case, you may have to adjust both of them somewhat. Before you do anything else, MARK THEM. Use a pencil, and mark the control and the body of the transformer so you can set things back the way they were in case you get too messed up.

Now stop and think. The rest requires adjusting the high voltage controls (THOUSANDS of volts) with the set turned on. This is DANGEROUS. If this bother you, reassemble it now and do not go any farther. Take it to a tech. They should be able to do the rest of this for a minimum labor charge. Want to continue? OK, let's go.

Set up the monitor with the back still off and slid to the side, and connect both the power and the signal cable from the computer. Set it up so that you can work with plenty of room to move around the back. Set up a mirror in front of the screen, so you can see what's going on with the picture while you make adjustments without having to crane around to look at the screen. This would cause you to be in a position where you are not able to see your hands while working, and this is the best way to get bit. DO NOT, under ANY CIRCUMSTANCES try to work on anything without being able to see your hands.

Now, fire it up, and give yourself a familiar screen such as Finder, ProSel menu, whatever. Adjust the mirror so you can see the screen clearly from behind the monitor.

Make sure your brightness and contrast controls are set back where they were before you cleaned them. Now, using a plastic handled, if not *entirely* plastic, screwdriver, slowly adjust the control on the back of the transformer. KEEP AN EYE ON YOUR HANDS. Do not come into contact with anything other than the tool handle. Watch the mirror for changes in the picture. Adjust SCREEN first if the problem is mostly brightness. Adjust FOCUS if the picture is fuzzy. Adjust them both as necessary to obtain the best picture.

You may want to adjust the brightness and contrast controls down while doing this, because you may have over time moved them up to compensate for deterioration. Try to get them in

the middle of their range, with the picture at your preferred viewing brightness.

If you can get things set the way you like it, great. Now try testing it while it's still operating. Adjust the brightness control on the side up and down. If you still get 'blooming', the transformer is going bad and will need to be replaced. It will probably cost more than the monitor is worth. Ask a tech how much to change your Hi-V transformer, and decide. If no matter what you do with the FOCUS, you still get a fuzzy picture, your CRT is probably 'gassy', that is losing vacuum. This is definitely more costly to replace than to get a new one, unless you can get a tube from another monitor and replace it yourself.

Once you have things where you want them, turn it all off, disconnect everything, and reassemble the monitor. Your repair job is done. If it worked, you just saved yourself somewhere between \$50 and \$150.

If the brightness still does not come up enough, there's one more thing that can be tried. The electron guns can be 'burned off', that is hooked up to a tube tester which can put a great deal of voltage through the guns and burn off any oxides on the gun filaments. This must be done by someone with this device, in other words a tech. This is at best a temporary fix, and is equivalent to the "picture tube brighteners" you can purchase. If this needs to be done, you're working with a limited lifetime on the tube as is, and doing this may well shorten that lifetime.

Any questions, or anything not clear about these instructions, write me and I'll clarify.

--

dynasor@infi.net

The Doctor is on.

```
##### E N D O F F I L E
### monitorgs.fix
##### E N D O F F I L E
```

```
#####
### FILE      : motherboard.power
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5700 bytes   5 KB
#####
```

```
Path: news.uiowa.edu!chi-news.cic.net!newspump.sol.net!uwm.edu!math.ohio-
state.edu!howland.erols.net!agate!newsxfer2.itd.umich.edu!portc01.blue.aol.com!new
stf01.news.aol.com!newsbf02.news.aol.com!not-for-mail
From: rubywand@aol.com (RUBYWAND)
Newsgroups: comp.sys.apple2
Subject: Re: SecondSight boot stability
Date: 24 Aug 1996 09:48:44 -0400
Organization: America Online, Inc. (1-800-827-6364)
Lines: 125
Sender: root@newsbf02.news.aol.com
Message-ID: <4vnl7s$rtq@newsbf02.news.aol.com>
References: <4vfkun$m5s@nnrpl.news.primenet.com>
NNTP-Posting-Host: newsbf02.mail.aol.com
X-Newsreader: AOL Offline Reader
```

In article <4vfkun\$m5s@nnrpl.news.primenet.com>, bpvh@primenet.com
(Bradley P. Von Haden) writes:

```
>
>
>>Fattening the PS +5V and GND leads cut glitching significantly. On
>>the motherboard, adding #16 gauge wires from the +5V and GND PS
>>connector pads to +5V and GND points on Slots 3 and 7 finished the
>>job. (Second Sight board users may need to fatten the +12V lead,
>>too) Anyway, no glitches-- the power supply "went good".
>
>
>Is this one of those modifications that if I am not sure how to do it
>I definitely should not try it?
>
>
```

That depends on your alternatives. If your GS is bombing regularly and your setup fits the "power supply problem" profile, then someone needs to do a fix. Maybe the local Apple Users Group could have a Power Supply Fix meeting. Those familiar with the work required could guide users through the motherboard and PS leads mods and check their work along the way.

Regarding the motherboard additions: Most likely, nobody especially likes to remove all cords and plugs, remove the Power Supply, pull out cards, pop out the motherboard-- be sure to undo any hold-down bolts or nuts-- and do mods. (Also, be sure to mark/label boards & cords and keep notes of what goes where!)

Once you've got the MB out, the actual mod is not that bad a job. #16 gauge wire is fairly easy to work with.

Mainly, you will constantly be worrying about whether or not you are

Using a pencil type soldering iron (approx. 25-35 watts) and good quality solder (like Kester "44) connect the wires. Avoid using wire with very thin insulation. It helps to use color-coded leads-- like Black for GND, Red for +5, and Orange for +12. Run separate leads from the PS Connector points to each Slot.

Quickie Check (viewing work from back end, bottom):

1. The wires to Slot 3 'look like' the wires going to Slot 7
 2. The GND and +5 leads go to the same end of the Slot, the end closest to you
 3. The GND and +12 leads go to the left side of the Slot
 4. The +12 lead is on the Slot end farthest from you
 5. The +5 lead is the only one on the right side of the Slot
 6. The GND leads go to one of the two PS connector points farthest from you
-
-

Regarding the Fat Power Supply leads mod, as Will Baguhn suggests, #14 gauge copper is probably heavy enough and it is easier to work with than #12 gauge. (Someone who has done a fair number of linear PS designs tends to go for the heaviest gauge that can be bent into place.) Whether #12 or #14, try to get stranded stuff for the PS leads. It is easier to position without having to worry about twisting and breaking loose from the PS circuit board.

Rubywand

```
##### E N D O F F I L E
### motherboard.power
##### E N D O F F I L E
```

```
#####
### FILE      : mouse.iie
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 3522 bytes    3 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!uwm.edu!newsfeed.internetmci.com!in2.uu.net!comp.vuw.ac.nz!waikato!news.
express.co.nz!actrix.gen.nz!atlantis.actrix.gen.nz!not-for-mail
From: dempson@atlantis.actrix.gen.nz (David Empson)
Newsgroups: comp.sys.apple2
Subject: Re: IIGS ADB keyboard fix
Date: 21 Jun 1996 21:02:04 +1200
Organization: Actrix - Internet Services
Lines: 69
Message-ID: <4qdoec$6oo@atlantis.atlantis.actrix.gen.nz>
References: <4q0fpp$8fa@milo.vcn.bc.ca> <mac-1706961455590001@auroral0.wco.com>
NNTP-Posting-Host: atlantis.actrix.gen.nz
```

```
In article <mac-1706961455590001@auroral0.wco.com>, MAC <mac@wco.com> wrote:
> In article <4q0fpp$8fa@milo.vcn.bc.ca>, trebor@vcn.bc.ca (Robert Lee_Kwen)
> wrote:
>
> > Also does a apple //e mouse card work on a Rom 03 apple //gs?
> >
>
> The Mouse card will not work in a GS of any ROM version.
```

Wrong. The original IIGs mouse support (ROM 00 and ROM 01) was specifically designed to allow the use of a IIe mouse card, so that a IIe user upgrading to a IIGs could plug in their mouse card and continue to use their mouse, rather than having to fork out money for an ADB mouse.

In the ROM 00 and ROM 01, the ADB mouse is controlled by the slot 4 mouse firmware. If you disable this, then you lose all access to the mouse, from GS/OS and ProDOS-8. However, if you install a IIe mouse card (in any slot, as long as it is set to "Your Card"), then that mouse can be used in all ProDOS-8 and GS/OS applications. (There may be some programs which assume the IIGs mouse is always in slot 4, or bypass the firmware and try to use the ADB mouse directly. These programs would not work with a IIe mouse card.)

If the ROM 03 IIGs, Apple rewrote the mouse firmware. The ADB mouse is controlled directly by the IIGs toolbox (Miscellaneous Toolset), and the slot 4 mouse firmware uses the toolbox code. (The ROM 00/01 is the other way around - the toolbox calls use the slot firmware.)

This means that for a ROM 3, if you set slot 4 to "Your Card", you can still use the mouse in GS/OS programs, but you cannot use it in ProDOS-8 programs. I have my system set up this way.

If you install a IIe mouse card into a ROM 3, then that mouse will be available to ProDOS-8 applications, provided they use the standard firmware entry points (which are the same for the IIe card, the IIC

and IIgs). You should set slot 4 to "Your Card" to avoid confusion with the ADB mouse.

GS/OS programs will not use the IIe mouse on a ROM 3, but they will continue to work with an ADB mouse.

Summary of mouse used in each situation:

Slot 4 Setting	IIe mouse card	ROM 00/01		ROM 03	
		P8	GS/OS	P8	GS/OS
Mouse Port	Not installed	ADB	ADB	ADB	ADB
	In slot 1-3	ADB?	ADB?	ADB?	ADB
	In slot 4	ADB	ADB	ADB	ADB
	In slot 5-7	IIe?	IIe?	IIe?	ADB
Your Card	Not installed	None	None	None	ADB
	In any slot	IIe	IIe	IIe	ADB

I'm not sure which order the slots are supposed to be scanned when searching for the mouse. In the table, I've assumed that the scan is supposed to start at slot 7.

As I mentioned earlier, there may be some programs which differ from this behaviour, but this is how things should work for any programs which use the standard methods to access the mouse.

--

David Empson
 dempson@actrix.gen.nz
 Snail mail: P.O. Box 27-103, Wellington, New Zealand

```
##### E N D   O F   F I L E
### mouse.iie
##### E N D   O F   F I L E
```



```
#####
### FILE      : nsc-smartwatch.dsl216e
#####
### Created   : Tuesday, January 12, 1999 Modified: Tuesday, January 12, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2301 bytes   2 KB
#####
```

```
Newsgroups: comp.sys.apple2
Subject: Re: IIE no-slot-clock: battery replacement?
From: dempson@actrix.gen.nz (David Empson)
Date: Wed, 13 Jan 1999 03:19:38 +1300
Message-ID: <1dljucj.kj0xt4ozaa7iN@dempson.actrix.gen.nz>
References: <77arda$042$l@lynx.unm.edu> <3699EB80.8DA4F9DF@EuropeM01.nt.com>
<77e85t$l1sdi$l@news.gate.net> <david.916111490@u513>
Organization: Empsoft
X-Newsreader: MacSOUP 2.3
NNTP-Posting-Host: 202.49.157.176
X-Trace: 13 Jan 1999 01:11:03 -1300, 202.49.157.176
Lines: 41
Path:
news1.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!128.174.5.49!vixen.cso.uiuc.edu
!logbridge.uoregon.edu!su-news-hubl.bbnplanet.com!lsan-cal-
snfl!news.gtei.net!news.netgate.net.nz!news.xtra.co.nz!news.iprolink.co.nz!news.ac
trix.gen.nz!dempson
Xref: news1.icaen comp.sys.apple2:144000
```

David Wilson <david@uow.edu.au> wrote:

```
> louiss@gate.net (Louis Schulman) writes:
> >I may be mistaken, but isn't the NSC just a Dallas Smartsocket?
>
> It is actually a SmartWatch - the SmartSocket goes under a RAM chip and
> turns it into NVRAM. The SmartWatch goes under a ROM and just provides time.
> There is one that goes under a RAM and provides time and NVRAM as well.
```

The one that goes under a RAM is also called a SmartWatch. There are several different models. The letter suffix indicates the chip size and type. Here is a full list from Dallas Semiconductors' 1989 data book:

```
DS1216   SmartWatch/RAM 16/64K
DS1216C  SmartWatch/RAM 64/256K
DS1216D  SmartWatch/RAM 256K/1M
DS1216E  SmartWatch/ROM 64/256K
DS1216F  SmartWatch/ROM 64/256K/1M
```

The capacities refer to bits, not bytes. The different sizes are required because various static RAMs and ROMs are different sizes and have the power supply pins in different places.

In the case of the No Slot Clock, you need a DS1216E to replace it.

In <3699EB80.8DA4F9DF@EuropeM01.nt.com>, Robert Lacoste <RLACOSTE@EuropeM01.nt.com> writes:

```
>Even if you find a way to change the battery, do you think it will pass
>the Y2K bug ?
```

Dallas Semiconductor posted a Y2K statement on their web site about this. I haven't read it myself, but I believe it states that all their timekeeper products are Y2K compliant, and will operate correctly up to the year 2099.

--

David Empson
dempson@actrix.gen.nz
Snail mail: P.O. Box 27-103, Wellington, New Zealand

E N D O F F I L E
nsc-smartwatch.dsl216e
E N D O F F I L E

```
#####
### FILE      : nsc.battery
#####
### Created   : Thursday, March 4, 1999   Modified: Thursday, March 4, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3040 bytes   2 KB
#####
```

Path:

```
newsl.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!207.24.245.130!nyd.news.ans.net
!newspump.monmouth.com!newspeer.monmouth.com!intgwpad.nntp.telstra.net!newsl.optus
.net.au!optus!news.usyd.edu.au!news.uow.edu.au!david
```

From: david@uow.edu.au (David Wilson)

Newsgroups: comp.sys.apple2

Subject: Re: Replacement for No-Slot Clock

Date: 4 Mar 99 01:54:48 GMT

Organization: University of Wollongong, Australia

Lines: 40

Message-ID: <david.920512488@wraith>

References: <36DC56CE.F66EE96A@lexis-nexis.com> <7biqf7\$1aa8\$3@lynx.unm.edu>

NNTP-Posting-Host: wraith.cs.uow.edu.au

X-Trace: wyrm.its.uow.edu.au 920513993 23390 130.130.64.1 (4 Mar 1999 02:19:53 GMT)

X-Complaints-To: usenet@wyrm.its.uow.edu.au

NNTP-Posting-Date: 4 Mar 1999 02:19:53 GMT

X-Newsreader: NN version 6.5.0 #15 (NOV)

Xref: newsl.icaen comp.sys.apple2:145476

buggie@callisto.unm.edu (stephen e buggie) writes:

```
>About six weeks ago, there was a thread on this topic ---- rejuvenating
>the NS Clock.  There _are_ two points on the green daughterboard on the
>"chip" at which an external batter could be attached.  Check with DAVID
>EPSON (New Zealand).  It looks like the external battery is feasible, but
>a trace should be cut somewhere so that the exterenal battery is not
>drained by the dead internal unit.....  [David --- please supply
>details!]      Steve Buggie
```

I think you may be getting David Empson (of New Zealand) mixed up with me [David Wilson (of Australia)].

I certainly posted information about the battery in a NSC.

If you remove the ROM chip from the NSC you will be able to see a chip, PC board and a large letter (A/B/C/D/E/F depending on model of SmartWatch).

Placing the clock chip so that the letter is the right way up (and to the right hand end of the chip, look for two small terminals to the right of the letter (above and below). They should be marked - (the top one) and + (the bottom one). You will see a trace leading from the -ve terminal to the top righthand corner of the chip inside the SmartWatch. This goes to both pins at the rh end of the chip then goes past the + terminal to the external pin on the SmartWatch package (pin 12 or 14 depending on the model).

It looks like the +ve terminal is connected on the other side of the PC board.

If you were to cut the connection between the -ve terminal and the chip, this would disconnect it. Then you could connect an external battery +ve

wire to the +ve internal battery terminal and the external battery -ve wire to the chip side of the cut you made in the -ve PC board trace then the external battery would be used and the internal disconnected.

To see the board layout in more detail, download the file app04.pdf from the Dallas web site. It is a 4 page document with descriptions of the Smartwatch options that can be changed by cutting traces and joining jumpers on the PC board. I think there is an error in this document as it has the DS1216D diagram twice and no picture of the DS1216E.

--

David Wilson School of IT & CS, Uni of Wollongong, Australia david@uow.edu.au

```
##### E N D O F F I L E
### nsc.battery
##### E N D O F F I L E
```

```
#####
### FILE      : nsclock.reset
#####
### Created   : Monday, October 11, 1999 Modified: Monday, October 11, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3014 bytes   2 KB
#####
```

Path:

newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!hammer.uoregon.edu!logbridge.uoregon.edu!news.maxwell.syr.edu!newsfeed.cwix.com!portc03.blue.aol.com!audrey03.news.aol.com!not-for-mail

From: supertimer@aol.com (Supertimer)

Newsgroups: comp.sys.apple2

Subject: Re: No Slot Clock - Damaged?

Lines: 55

NNTP-Posting-Host: ladder06.news.aol.com

X-Admin: news@aol.com

Date: 11 Oct 1999 03:20:21 GMT

References: <OjJL3.8313\$F51.95405@news3.mia>

Organization: AOL <http://www.aol.com>

Message-ID: <19991010232021.01045.00000604@ng-bk1.aol.com>

Xref: newsl.icaen comp.sys.apple2:153221

[[Mailed to Gus Vilomar and posted to csa2.]]

"Gus Vilomar" <gvilomar@bellsouth.net> wrote:

>Is there a way to reset the clock other than the NSC software? The NSC
>software is not letting me reset the clock - I keep on getting "No clock
>found or faulty time". Is there a "reset button" on the chip? I doubt it
>but it's worth asking.

There is a possibility that the IC is locked up and the battery is not dead. I've been reading the NSC manual and according to it, the SmartWatch chip only draws power from the battery when the computer is powered down. Otherwise, it draws power from the computer. So even with a dead battery, the SmartWatch should work providing you leave the power on.

The manual says:

"The SmartWatch is a 28-pin, 600 mil wide DIP socket with a built in CMOS timekeeper function and an embeded lithium energy source to maintain time and date. It accepts any 28-pin byte-wide ROM or volatile RAM. A key feature of the SmartWatch is that the timekeeper remains transparent to the memory device placed above. The SmartWatch monitors VCC (+5 volts) for an 'out of tolerance' condition. When such a condition occurs, an internal lithium energy source is automatically switched to prevent loss of clock data."

So the SmartWatch only uses the battery when the power from the computer (VCC +5 volts) is absent.

My guess is that the data in the chip has somehow become corrupted. As to how to reset the chip, the manual

says this:

"The SmartWatch information is contained in 8 registers of 8 bits each which are sequentially accessed one bit at a time after the 64 bit pattern recognition sequence has been completed...bits 4 and 5 of the day register are used to control the RESET and oscillator functions. Bit 4 controls the Reset (A14 - pin 1). When the reset bit is set to logical 1, the RESET input pin is ignored. When the RESET bit is set to logical 0, a low on the RESET pin will cause the SmartWatch to abort data transfer without changing data in the watch registers. Bit 5 controls the oscillator. This bit is shipped set to logical 1, which turns the oscillator off. When set to logical 0, the oscillator turns on and the watch becomes operational."

Ok, maybe someone who understands the above can provide a clue on what to do to reset the SmartWatch. Since this is a battery powered device with a sealed battery, you can't just cut the power to reset it. ;-(Anyone have any ideas?

```
##### E N D O F F I L E
### nsclock.reset
##### E N D O F F I L E
```

```
#####
### FILE      : nsclock.resetpatch
#####
### Created   : Tuesday, October 12, 1999  Modified: Tuesday, October 12, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5472 bytes   5 KB
#####
```

Article 153234 of comp.sys.apple2:

```
Path:
news1.icaen!news.uiowa.edu!news.physics.uiowa.edu!hammer.uoregon.edu!logbridge.uor
egon.edu!news.maxwell.syr.edu!newsfeed.atl!news1.mia.POSTED!not-for-mail
From: "Gus Vilomar" <gvilomar@bellsouth.net>
Newsgroups: comp.sys.apple2
References: <e0nL3.5780$iN6.90857@news2.mia> <19991009021849.10841.00000061@ng-
fgl.aol.com> <OjJL3.8313$F51.95405@news3.mia> <19991010232021.01045.00000604@ng-
bkl.aol.com> <ldzjfwl.liilgkulm8ld3dN@dempson@actrix.gen.nz>
Subject: Re: No Slot Clock - Damaged?
Lines: 114
X-Newsreader: Microsoft Outlook Express 5.00.2314.1300
X-Mimeole: Produced By Microsoft MimeOLE V5.00.2314.1300
Message-ID: <lmrM3.2847$Ck.6996@news1.mia>
Date: Mon, 11 Oct 1999 15:53:50 -0400
NNTP-Posting-Host: 216.78.193.201
X-Trace: news1.mia 939672061 216.78.193.201 (Mon, 11 Oct 1999 16:01:01 EDT)
NNTP-Posting-Date: Mon, 11 Oct 1999 16:01:01 EDT
Xref: news1.icaen comp.sys.apple2:153234
```

I thought the battery was dead on the chip but it actually had corrupted data. David sent me some code he wrote in a few minutes that actually resets the clock on the chip. It worked perfectly!! I'll list the code below but if anybody needs the "bin" file, let me know and I'll be happy to email it to them.

thanks,
Gus

FROM DAVID EMPSON:

```
CALL-151
300:A2 00 78 2C 04 E0 BD 30 03 A0 08 4A B0 08 2C 00
310:E0 88 D0 F7 F0 06 2C 01 E0 88 D0 EF E8 E0 10 90
320:E5 58 60
330:C5 3A A3 5C C5 3A A3 5C 00 00 00 00 16 01 10 99
300G
BSAVE FIXWATCH,A$300,L$40
```

As you are on a IIC+, I'd strongly suggest disabling the accelerator before trying this.

(I'm assuming the SmartWatch is installed under the CF ROM on the motherboard. I don't think it can go anywhere else.)

If this doesn't work, you might like to try changing the code to access the SmartWatch via the C300 page. You can do this by patching three of the "E0" bytes in the code to "C3", as follows:

305:C3
310:C3
318:C3
300G

David Empson <dempson@actrix.gen.nz> wrote in message
news:ldzjfwl.1iilgkulm8ld3dN@dempson@actrix.gen.nz...
> Supertimer <supertimer@aol.com> wrote:
>
> > My guess is that the data in the chip has somehow
> > become corrupted. As to how to reset the chip, the manual
> > says this:
> >
> > "The SmartWatch information is contained in 8 registers
> > of 8 bits each which are sequentially accessed one bit
> > at a time after the 64 bit pattern recognition sequence
> > has been completed...bits 4 and 5 of the day register
> > are used to control the RESET and oscillator functions.
> > Bit 4 controls the Reset (A14 - pin 1). When the reset
> > bit is set to logical 1, the RESET input pin is ignored.
> > When the RESET bit is set to logical 0, a low on the
> > RESET pin will cause the SmartWatch to abort data
> > transfer without changing data in the watch registers.
> > Bit 5 controls the oscillator. This bit is shipped set to
> > logical 1, which turns the oscillator off. When set to
> > logical 0, the oscillator turns on and the watch becomes
> > operational."
> >
> > Ok, maybe someone who understands the above can
> > provide a clue on what to do to reset the SmartWatch.
>
> Since I've programmed the things directly (not in the Apple II), I'm
> sure I can provide a clearer explanation of these.
>
> As described, the DAY register contains two bits which control the
> operation of the SmartWatch.
>
> The "oscillator" bit must be set to zero in order for the device to
> count the time. With this bit set to one, the time will be frozen (but
> power consumption is negligible).
>
> The "reset" bit is badly named. A better name would be "reset pin
> enable". Its purpose is to determine whether or not a specific pin on
> the package is used to reset communication with the SmartWatch.
>
> You do not want to enable this feature.
>
> If the reset pin is enabled, then this address pin must remain in the
> "not reset" state (high) during the entire 64-cycle identification
> sequence and the subsequent 64-cycle data transfer sequence. If the
> reset pin goes to the "reset" state (low) during this sequence, then the
> SmartWatch forgets you were accessing it, and you have to start again.
>
> For the DS1216E, pin 1 is reset. This is mapped to Vpp on most EPROMs,
> which should be held high. For a masked ROM or PROM, as in the Apple II
> series, this pin is tied to +5V, so the reset signal should never be
> activated, even if the feature is enabled. (This is the case for the
> Apple IIe motherboard ROMs, in any case. I haven't checked the
> situation for the IIc.)

```

>
> (It is a more serious problem for the RAM-based SmartWatch, since pin 1
> is A14: the code accessing the SmartWatch must keep A14 high for the
> entire access cycle.)
>
> Assuming the reset signal doesn't interfere, neither of these bits would
> prevent software from accessing the SmartWatch registers. The worst
> effect should be a frozen or garbage time if the OSC bit was set to 1.
>
> It is possible that the "Time is Faulty" test is looking for known
> illegal values, and the SmartWatch time has been corrupted. If so, it
> should be a simple case of writing the correct time into it, and the
> driver should kick into life again.
>
> (While doing some Y2K tests on a SmartWatch, I discovered it was
> possible to write nominally illegal dates, e.g. digits greater than 9.
> This might be rejected by the No Slot Clock driver.)
>
> --
> David Empson
> dempson@actrix.gen.nz
> Snail mail: P O Box 27-103, Wellington, New Zealand

```

```

##### E N D O F F I L E
### nsclock.resetpatch
##### E N D O F F I L E

```

```
#####
### FILE      : nsclock.resetpatch.asm
#####
### Created   : Tuesday, October 12, 1999 Modified: Tuesday, October 12, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 4017 bytes   3 KB
#####
```

Article 153252 of comp.sys.apple2:

Newsgroups: comp.sys.apple2

Subject: Re: No Slot Clock - Damaged?

From: dempson@actrix.gen.nz (David Empson)

Date: Tue, 12 Oct 1999 13:24:55 +1300

Message-ID: <ldzkcv3.ni5xsh1sbj7t6N@dempson.actrix.gen.nz>

References: <e0nL3.5780\$iN6.90857@news2.mia> <19991009021849.10841.00000061@ng-fgl.aol.com> <OjJL3.8313\$F51.95405@news3.mia> <19991010232021.01045.00000604@ng-bkl.aol.com> <ldzjfwl.liilgkulm8ld3dN@dempson.actrix.gen.nz> <lmrM3.2847\$Ck.6996@news1.mia>

Organization: Empsoft

User-Agent: MacSOUP/2.4.2

NNTP-Posting-Host: 202.49.157.176

X-Original-NNTP-Posting-Host: 202.49.157.176

X-Trace: 12 Oct 1999 13:22:47 NZST, 202.49.157.176

Lines: 107

Path:

news1.icaen!news.uiowa.edu!news.physics.uiowa.edu!hammer.uoregon.edu!newsfeed.dir.ct.ca!usenet.net.nz!news.iprolink.co.nz!news.actrix.gen.nz!dempson

Xref: news1.icaen comp.sys.apple2:153252

Gus Vilomar <gvilomar@bellsouth.net> wrote:

```
> I thought the battery was dead on the chip but it actually had corrupted
> data. David sent me some code he wrote in a few minutes that actually
> resets the clock on the chip. It worked perfectly!! I'll list the code
> below but if anybody needs the "bin" file, let me know and I'll be happy to
> email it to them.
```

>

> thanks,

> Gus

>

> FROM DAVID EMPSON:

>

> CALL-151

> 300:A2 00 78 2C 04 E0 BD 30 03 A0 08 4A B0 08 2C 00

> 310:E0 88 D0 F7 F0 06 2C 01 E0 88 D0 EF E8 E0 10 90

> 320:E5 58 60

> 330:C5 3A A3 5C C5 3A A3 5C 00 00 00 00 16 01 10 99

> 300G

> BSAVE FIXWATCH,A\$300,L\$40

>

```
> As you are on a IIC+, I'd strongly suggest disabling the accelerator
> before trying this.
```

>

```
> (I'm assuming the SmartWatch is installed under the CF ROM on the
> motherboard. I don't think it can go anywhere else.)
```

I'm glad to hear that I was able to help Gus.

Note that for this to work in a IIe, the SmartWatch must be under the EF ROM, not the CD ROM. (The program would have to be patched to refer to D000, D001 and D004 if the SmartWatch is under the CD ROM.)

In case anyone is interested, here is a source listing of the program (which may need a little tidying up to actually work, e.g. by removing the spaces in the HEX line). This is for the Merlin assembler.

* SmartWatch I/O lines are as follows:

* A2 = read/-write
 * A0 = data to SmartWatch
 * D0 = data from SmartWatch

* The following locations trigger the desired one-bit access,
 * assuming the SmartWatch is under the chip addressed when
 * accessing the range E000-E00F.

* Read E000: write a zero
 * Read E001: write a one
 * Read E004: read (data returned in bit 0)

```

                ORG $300

                LDX #0
                SEI
                BIT E004
BYTELOOP: LDA DATA,X
                LDY #8
BITLOOP:  LSR
                BCS WRITE1
                BIT E000
                DEY
                BNE BITLOOP
                BEQ NEXTBYTE
WRITE1:  BIT E001
                DEY
                BNE BITLOOP
NEXTBYTE: INX
                CPX #16
                BCC BYTELOOP
                CLI
                RTS

                ORG $330

DATA:  HEX C5 3A A3 5C C5 3A A3 5C
        HEX 00 00 00 00 16 01 10 99

```

A final point: this program can easily be modified to set the SmartWatch to an arbitrary date and time. The last eight bytes are the time written to the chip, which are in BCD (binary coded decimal). The registers are in the following order:

Tenths and hundredths of seconds
 Seconds
 Minutes
 Hours (leave the top three bits clear for 24-hour mode)

Day of week (1 = Sunday, 7 = Saturday, make sure the high digit is 1)
Day of month
Month
Year (2 digits)

Note that the day of week values are a convention only. The No Slot Clock driver might assign a different day of the week as 1.

The OSC and RST bits are in the day register. Using a value of 1 in the high order digit of the day register ensures that OSC is 0 (enabled) and RST is 1 (disabled).

The SmartWatch also supports 12-hour mode, with an AM/PM indicator in the hour register, but that wouldn't be compatible with the No Slot Clock driver.

--

David Empson
dempson@actrix.gen.nz
Snail mail: P O Box 27-103, Wellington, New Zealand

E N D O F F I L E
nsclock.resetpatch.asm
E N D O F F I L E

```
#####
### FILE      : octoram
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3677 bytes   3 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!zaphod.mps.ohio-
state.edu!cs.utexas.edu!uunet!munnari.oz.au!comp.vuw.ac.nz!actrix!David.Empson
From: David.Empson@bbs.actrix.gen.nz
Subject: Re: OctoRAM Memory upgrade
Organization: Actrix Information Exchange
Date: Sun, 17 Jan 1993 13:28:02 GMT
Message-ID: <1993Jan17.132802.18052@actrix.gen.nz>
References: <1993Jan12.022552.27758@nuscc.nus.sg>
Sender: David.Empson@actrix.gen.nz (David Empson)
Lines: 65
```

In article <1993Jan12.022552.27758@nuscc.nus.sg> ltchean@iss.nus.sg (Lim Thye Chean) writes:

>
> Hi, any OctoRAM users out there?

Yep. :-)

> I lost my OctoRAM manual, so I have to ask this in InterNet:
>
> I am now using 2MB on my RAM card, all 8 rows filled with 256K simms. I plan
> to upgrade to at least 4MB.
>
> 1. Can I upgrade to more than 4MB?

Yes. You can use eight 1 megabyte SIMMs, but DMA compatibility might be a problem.

> 2. Do I have to throw away all 8 rows of 256K simms and used all 1MB simms?

Yes.

> 3. Can I mixed both simms? For example, reserved 6 rows of 256K simms
> (6 x 256K = 1.5MB), and used 2 rows of 1MB simms to get a total of
> 3.5MB? Or reserved 4 rows of 256K simms (4 x 256K = 1MB) and used 4
> rows of 1MB simms to get 5MB?

No. All SIMMs must be the same type.

> 4. Can I have the dip-switch configuration?

In the following diagrams, L means 'jumper to the left' and R means 'jumper to the right', and the jumpers are listed top to bottom.

Using 256k SIMMs:

```
1 (256k)  L, L, L, L, L
2 (512k)  L, L, L, R, L
```

4 (1 MB) L, L, L, R, R
8 (2 MB) R, L, L, R, R (This should be your current setting)

Using 1 MB SIMMs:

1 (1 MB) L, R, R, L, L
2 (2 MB) L, R, R, R, L
4 (4 MB) L, R, R, R, R
8 (8 MB) R, R, R, R, R

> 5. What precautions should I take?

When buying the SIMMs, make sure you get ones that will work on a Mac Plus, SE, or II.

IBM SIMMs (9 way) should also work, but I've heard of some people who have had problems.

If you're installing less than 8, make sure you put them in the correct slots. The first SIMM goes in the top of the group of two slots, the second below that, then fill the group of six slots from the top.

The only valid combinations are 1, 2, 4 or 8 SIMMs.

--
David Empson

Internet: David.Empson@bbs.actrix.gen.nz EMPSON_D@kosmos.wcc.govt.nz
Snail mail: P.O. Box 27-103, Wellington, New Zealand
Path: news.weeg.uiowa.edu!news.uiowa.edu!uunet!ddswl!panix!not-for-mail
From: blakjak@panix.com (Noah Mittman)
Newsgroups: comp.sys.apple2
Subject: Re: need OctoRam manual
Date: 27 Feb 1994 19:38:17 -0500
Organization: School of Visual Arts: Video Junkies
Lines: 42
Message-ID: <2kredp\$4eq@panix.com>
References: <CLwMww.Au4@cuug.ab.ca>
NNTP-Posting-Host: panix.com
X-Newsreader: TIN [version 1.2 PL2]

Richard Murray 235-4680 (xint@cuug.ab.ca) screamed from comp.sys.apple2:
: As the heading implies I am searching for instructions on how to set my
: OctoRam cards jumpers to accept 1 meg SIMMS. Any help would be Appreciated.

The following are the jumper positions for the 1Meg SIMM configurations:

- [] means jumper over middle and right pins
[] - means the opposite
=====

[] -
- []
- []
[] -
[] - FOR 1 MEG

[] -
- []
- []
- []

[] - FOR 2 MEG
[] -
- []
- []
- []
- [] FOR 4 MEG

- []
- []
- []
- []
- [] FOR 8 MEG

--

b l a c k J A C k

Internet blakjak@panix.com FVNet #3@#53 original score by Wierzbowski
written and directed by Noah Mittman produced by SVA & digitalTarget video
"She's dead. She's alive. It's a little confusing."-Alek COMING THESIS '95

E N D O F F I L E
octoram
E N D O F F I L E

```
#####
### FILE      : octoramgs
#####
### Created   : Tuesday, August 31, 1999 Modified: Tuesday, August 31, 1999
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 4817 bytes    4 KB
#####
```

Article 152103 of comp.sys.apple2:

Path:

news1.icaen!news.uiowa.edu!news.physics.uiowa.edu!hammer.uoregon.edu!newsfeed.dire
ct.ca!newsfeed.berkeley.edu!enews.sgi.com!news.sgi.com!sdd.hp.com!col.hp.com!news.
cup.hp.com!not-for-mail

From: Dave Tribby <tribby@cup.hp.com>

Newsgroups: comp.sys.apple2

Subject: Re: OctoRAM Card Information Needed

Date: Mon, 30 Aug 1999 16:02:27 -0700

Organization: Hewlett-Packard, Cupertino CA

Lines: 102

Message-ID: <37CB0D83.117A@cup.hp.com>

References: <280819991008169211%news001@macgeek.org>

NNTP-Posting-Host: hpindhx.cup.hp.com

Mime-Version: 1.0

Content-Type: text/plain; charset=us-ascii

Content-Transfer-Encoding: 7bit

X-Mailer: Mozilla 3.01Gold (X11; I; HP-UX B.10.10 9000/715)

Xref: news1.icaen comp.sys.apple2:152103

Bryan Villados wrote:

```
>
> I'm just now installing an MDIeas OctoRAM card with an OctoRAM ESP card.
>
> One difficulty I'm running into is upgrading the RAM on the OctoRAM
> card. I've installed eight 1MB 30-pin SIMMs (80ns each). The first bank
> and second bank are different makes, but they're both running at the
> same speed. When I boot my GS up, it only recognizes 4MB. I notice that
> there's a block of jumpers on the ram card, but I don't have the
> manuals for it. Is there some kind of jumper setting I need to set to
> have it recognize all 8MB?
```

This question was asked earlier this month, so I'll post the same reply with improvements suggested by David Empson. (You need to display this with a mono-spaced font.)

OctoRAM configuration jumpers

The OctoRAM can be loaded with either 256K or 1Meg SIMMs. There can be 1, 2, 4, or 8 SIMMs loaded on the board.

Diagram A: shows the physical locations of the jumpers in either the right or left positions for the five switches.
Examples: 1 256K SIMM has all switches jumpered to the left;
8 1M SIMMs have all switches jumpered to the right.

256K SIMMs:	1	2	4	8
Switch 1	xxx .	xxx .	xxx .	. xxx
2	xxx .	xxx .	xxx .	xxx .

```

3      xxx .   xxx .   xxx .   xxx .
4      xxx .   . xxx .   xxx .   xxx .
5      xxx .   xxx .   . xxx .   xxx .

1M SIMMs:
Switch 1      1      2      4      8
Switch 1      xxx .   xxx .   xxx .   . xxx
              2      . xxx .   xxx .   xxx .   xxx
              3      . xxx .   xxx .   xxx .   xxx
              4      xxx .   . xxx .   xxx .   xxx
              5      xxx .   xxx .   . xxx .   xxx
    
```

Diagram B: shows all possible combinations of left and right settings, and notes which ones are valid

```

lllll llllr lllrl lllrr llrll llrlr llrrl llrrr
256x1      256x2 256x4
~~~~~
256K      512K 1Meg

lrrll lrrlr lrrrl lrrrr
1Mx1      1Mx2 1Mx4
~~~~~
1Meg      2Meg 4Meg

rllll rlllr rllrl rllrr rlrlr rlrrl rlrrr
256x8
~~~~~
2Meg

rrlll rrrlr rrrrl rrrrr
1Mx8
8Meg
    
```

Diagram C: shows the meaning of each switch. Note that switches 2 and 3 must be in the same position

Switch 1	LEFT	RIGHT
2 \	/256K \	/1 Meg \
3 /	\ parts/	\ parts/
4	SIMM 1	SIMMs 1-2
5		SIMMs 3-4

> Another problem I'm running into is the ESP card. It's functioning fine. However, when I copied the PRODOS file and the SYSTEM folder from the install floppy to the ROM disk (it has Apple II Desktop on it), set the control panel to boot from ROM disk, then boot from it, the system crashes when it attempts to load ProDOS-16. I booted from my hard disk running GS/OS 6.0.1, then attempted to drag the contents of the ROM disk to the trashcan. When I tried to empty the trashcan, it gave me an error message saying the disk is damaged (it's still enabled for read/write). Are there any utilities I could use to test the ROM disk integrity?

You can't fit much on the ESP ROM disk. Perhaps you could verify your setup by creating a floppy with the same files (making sure they take no more space that is used on the ESP), getting it to boot, then formatting the ROM disk and copying the files onto it.

You can always use the Finder's "Check file system" and "Verify disk" commands to check the contents of the ROM disk.

-- Dave Tribby
http://www.educate.net.au/~apple2/software/tribby/

E N D O F F I L E
octoramgs
E N D O F F I L E

```
#####
### FILE      : oldserial.dips
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1312 bytes   1 KB
#####
```

Newsgroups: comp.sys.apple2

Path:

news.uiowa.edu!news.uiowa.edu!uunet!inl.uu.net!news.sprintlink.net!usenet.kornet.n
m.kr!news.kreonet.re.kr!overload.lbl.gov!lll-winken.llnl.gov!fnnews.fnal.gov!nntp-
server.caltech.edu!news.ridgecrest.ca.us!owens!croton

From: Cyrus Roton <croton@ridgecrest.ca.us>

Subject: Re: Need info on old serial card

In-Reply-To: <437rhg\$kg6@iitmax.acc.iit.edu>

X-Sender: croton@owens

X-Nntp-Posting-Host: owens

Content-Type: TEXT/PLAIN; charset=US-ASCII

Message-ID: <Pine.SUN.3.91.950914112728.3233D-100000@owens>

Sender: usenet@ridgecrest.ca.us (Ridgenet Usenet admin)

Organization: RidgeNet - SLIP/PPP Internet, Ridgecrest, CA. (619) 371-3501

References: <437rhg\$kg6@iitmax.acc.iit.edu>

Mime-Version: 1.0

Date: Thu, 14 Sep 1995 18:35:24 GMT

Lines: 26

The switch settings for the old Apple Serial Interface card:

1	2	3	baud rate
on	on	on	110
off	on	on	134.5
on	off	on	300
off	off	on	1200
on	on	off	2400
off	on	off	4800
on	off	off	9600
off	off	off	19200

sw 4 off = enable delay after CR

5	6	line wt	video
on	on	40	enable
off	on	72	disable
on	off	80	disable
off	off	132	disable

sw 7 off = enable LF after CR

Cyrus Roton croton@ridgecrest.ca.us

Ridgecrest Apple User Group

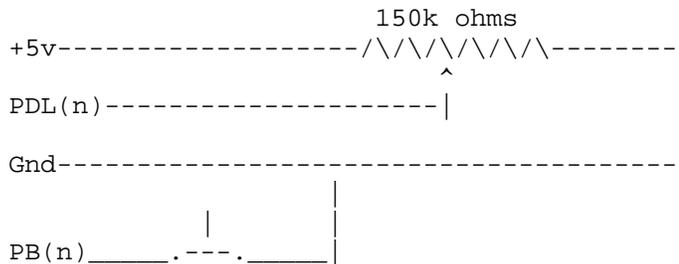
```
##### E N D O F F I L E
### oldserial.dips
##### E N D O F F I L E
```

```
#####
### FILE      : paddles
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3178 bytes   3 KB
#####
```

```
Path: news.uiowa.edu!chi-news.cic.net!uwm.edu!math.ohio-
state.edu!pacific.mps.ohio-state.edu!freenet.columbus.oh.us!not-for-mail
From: dalloff@freenet.columbus.oh.us (Dave Althoff)
Newsgroups: comp.sys.apple2
Subject: Re: Paddles
Date: 17 Oct 1995 01:03:20 -0400
Organization: The Greater Columbus FreeNet
Lines: 27
Message-ID: <45vdeo$c0n@acme.freenet.columbus.oh.us>
References: <38133725.110409771@mit.bison.mb.ca> <45ree4$eqm@gap.cco.caltech.edu>
<45rism$e2@gap.cco.caltech.edu>
<NEWTTNews.813870598.14448.oefcu@pixiuser.pixi.com>
NNTP-Posting-Host: acme.freenet.columbus.oh.us
X-Newsreader: TIN [version 1.2 PL2]
```

(Q: Can one obtain Apple][paddles)

You could build your own...they are extremely simple. The toughest part is finding a 150K-ohm linear potentiometer. The circuit is something like this...



Okay, so as a schematic, it's pretty awful. And the button input might need to connect to +5v instead of ground; it has been a long time since I built mine. But you get the idea. If you need the pin-outs of the game connectors, I have those around here someplace.

--Dave Althoff, Jr.

--

```

  /-\
 /XXX\   /X\   /X\   /XX\   *** Closed for the season ***
 /XXXXX\ /XXX\ _/XXXX\ _ /X\ /XXXXX\ /X\ /X\ /XXXXX
 _/XXXXXXXX\_/XXXXX\/XXXXXXXXX\_/XXX\_/XXXXXXXX\_/XXX\_/XXX\_/XXXXX

```

```
Path: news.uiowa.edu!chi-
news.cic.net!newsfeed.internetmci.com!news.mel.aone.net.au!inferno.mpx.com.au!metr
o!cassius!adrianw
From: adrianw@cassius (Adrian Whichello)
Newsgroups: comp.sys.apple2
Subject: Re: Paddles
Date: 19 Oct 1995 23:52:22 GMT
```

Organization: Electrical Engineering, University of Sydney
Lines: 15
Distribution: inet
Message-ID: <466obm\$6bl@metro.ucc.su.OZ.AU>
References: <45rism\$e2@gap.cco.caltech.edu>
<NEWTNews.813870598.14448.oefcu@pixiuser.pixi.com>
<45vdeo\$c0n@acme.freenet.columbus.oh.us>
NNTP-Posting-Host: cassius.ee.su.oz.au

In article <45vdeo\$c0n@acme.freenet.columbus.oh.us> dalloff@freenet.columbus.oh.us (Dave Althoff) writes:

>(Q: Can one obtain Apple][paddles)
>

>You could build your own...they are extremely simple. The toughest part
>is finding a 150K-ohm linear potentiometer.

Other values can be used, provided you compensate by changing the 0.022uF capacitor to maintain the same RC time constant (which is 150Kohms x 2.2nF = 3.3ms with the supplied values). It's easiest to do this be decreasing the R and then connecting a suitable capacitor from the wiper arm of the pot to ground in your homebuilt paddle box, to avoid having to replace components on the Apple motherboard. I did this with a couple of RS joystick controllers (100Kohm) I picked up for two dollars, by putting in an extra 1.1nF capacitance.

Adrian.

E N D O F F I L E
paddles
E N D O F F I L E

```
#####
### FILE      : paddles.info
#####
### Created   : Sunday, January 14, 1996  Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3336 bytes   3 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path:
news.weeg.uiowa.edu!news.uiowa.edu!uunet!orca!javelin.sim.es.com!animal!mmunson
From: mmunson@animal.es.com (Mark Munson)
Subject: Re: Joystick readings from ML
Message-ID: <1992Oct5.211758.17368@javelin.sim.es.com>
Sender: news@javelin.sim.es.com
Nntp-Posting-Host: animal.sim.es.com
Reply-To: mmunson@animal.es.com (Mark Munson)
Organization: Evans & Sutherland Computer Corp., Salt Lake City, UT
References: <1992Oct2.181113.27082@cs.uow.edu.au>
Date: Mon, 5 Oct 1992 21:17:58 GMT
Lines: 67
```

Shane:

Unfortunately, there isn't another ROM based routine for reading the joysticks. You'll have to write your own in machine language. It might seem like a problem, but it's really easy once you see it done.

First, you need to know what the paddle (joystick) hardware is doing. When you strobe the paddles, a charge is applied to a capacitor. A variable resistor (paddle) allows the capacitor to discharge to ground. By measuring the time for this to occur, you can gauge the setting of the paddle.

The ROM based paddle routines use the Apple II running at 1 MHz, with a known paddle resistance in the 0 to 150 ohm range (or was that 150 K-Ohm?) Even on a GS, the call still slows the machine down during this timing sensitive process.

Strobing the paddles, starts the process on all of the 4 possible paddles. If the paddle you are reading finishes quickly, and you try to read the next paddle (which hasn't finished), you will get faulty values for the second paddle.

Example:

```
PDL 0: +-----!
PDL 1: +-----!

      0           100           200           255
```

In the example above, you would get a value of 100 for PDL(0). If immediately try and read PDL(1) before it has a chance to finish, then you might get a value of 50 {150 - 100} for PDL(1).

A cheap way to correct for this is to check the paddle switch location to insure that the paddle has timed out before you strobe the paddle. It works, but it wastes time. There is a faster way to get both paddle values, without running

into timing problems like the one above.

Read Both Paddles at the Same Time

Insure both paddles are clear, then strobe the paddle switch.
 Start counting, and look at both paddles.
 As each paddle times out, save the counter value for the paddle.
 By strategicly placing NOP instructions into the loop paths, you can insure that the timing will stay constant for each pass of the counter.

When both paddles have timed out, you are done.

If you write in 65C816 code, you can read both paddle values with a single LDA instruction. In fact, the code gets a lot tighter in 65C816 code, so your resolution will be higher than the stock 0-254 of a 1 MHz 6502 call.

This factor can present some problems if the game is running on an accelerated GS. So you'll want to calibrate the joystick for various speeds, and divide the joystick results by an appropriate factor.

If you want the joystick routine to be of a consistent length, then you only need to add on a dummy loop that will waste the time that would have been used had both paddles been set to thier maximum (highest resistance) value.

I've got copies of routines (65C816) that do this type of thing. When I unpack my GS, I'll try and upload an example.

[MGM]

```
##### E N D O F F I L E
### paddles.info
##### E N D O F F I L E
```

```
#####
### FILE      : parallel.signals
#####
### Created   : Tuesday, November 16, 1999 Modified: Tuesday, November 16, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 6615 bytes   6 KB
#####
```

Article 154580 of comp.sys.apple2:
 Newsgroups: comp.sys.apple2
 Subject: Re: Apple II Centronics
 From: dempson@actrix.gen.nz (David Empson)
 Date: Tue, 16 Nov 1999 12:16:15 +1300
 Message-ID: <1e1dlby.o32d3016yewcN@dempson@actrix.gen.nz>
 References: <382FEC3A.52B9@club-internet.fr>
 <1elc7b2.1lu9lcalieq45cN@dempson@actrix.gen.nz> <3830570c.6648471@news>
 Organization: Empsoft
 User-Agent: MacSOUP/2.4.2
 NNTP-Posting-Host: 202.49.157.176
 X-Original-NNTP-Posting-Host: 202.49.157.176
 X-Trace: 16 Nov 1999 12:15:45 NZST, 202.49.157.176
 Lines: 150
 Path:
 newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!hammer.uoregon.edu!newsfeed.direct.calusenet.net.nz!news.iprolink.co.nz!news.actrix.gen.nz!dempson
 Xref: newsl.icaen comp.sys.apple2:154580

Jeff Blakeney <CUTblakeney@home.com> wrote:

```
> On Tue, 16 Nov 1999 00:55:52 +1300, dempson@actrix.gen.nz (David
> Empson) wrote:
>
> >Nicolas Rey <nicorey@club-internet.fr> wrote:
> >> printer) with a custom BASIC program. So far, I've used on/off feature
> >> of the serial ports (through PR#1 and PR#2) to command a two relays. I'd
> >> like to have more controls and I'm considering switching to a IIE using
> >> the parallel port.
> >
> >Apple IIC? There aint no parallel port, I'm afraid.
>
> Tsk, tsk, David. You should have read his message more closely. :-)
```

Whoops! I saw "IIC" and "parallel port", and the rest of the article went out the window. :-)

OK, lets backtrack and try again.

Nicolas Rey <nicorey@club-internet.fr> wrote:

```
> I'd like to have more controls and I'm considering switching to a IIE
> using the parallel port. I couldn't find the pin asignment of the
> Centronics plug in my documentation. Any one still has that information
> or knows where it can be found on the web ?
```

Given an Apple IIE and a parallel card, I suppose you could set up an external device with a female centronics connector, and plug the parallel cable into it from the IIE.

Another option (possibly cheaper) would be to bypass the parallel cable and connect directly to the DB-25 provided by the parallel card. The disadvantage with this method is that the pinout of Apple II parallel cards are different for different brands. The Grappler is similar to the PC's parallel port, but most other cards are completely different. The cable that is supplied with each parallel card will usually only work with that card.

I'd suggest sticking to the Centronics connector for now, since it lets you switch to another parallel card (or even another computer) without having to modify your cable or circuitry.

The Centronics pinout is documented in most older parallel printer manuals. Off the top of my head, I can remember the following:

- 1 STROBE (active low) from computer
- 2 Data bit 0
- 3 Data bit 1
- 4 Data bit 2
- 5 Data bit 3
- 6 Data bit 4
- 7 Data bit 5
- 8 Data bit 6
- 9 Data bit 7
- 10 ACK (active low) from printer
- 11 BUSY from printer

I've dug out a Panasonic printer manual, and it lists the rest of them as follows:

- 12 PAPER EMPTY (output from printer)
- 13 SELECT (output from printer)
- 14 AUTO FEED XT (input to printer, active low)
- 15 (unused)
- 16 Signal Ground
- 17 Frame Ground
- 18 +5V (output from printer, reference voltage only)

Pins 19 through 29 are ground lines, paired with each of the STROBE through BUSY lines (for use in a twisted pair or ribbon cable). Pin 30 is the ground return line for pin 31 (PRIME).

- 31 PRIME (reset input to printer, active low)
- 32 ERROR (output from printer, active low)
- 33 Signal Ground
- 34 (unused)
- 35 (unused)
- 36 (unused)

I happen to remember that some printers use pin 36 as a SELECT ENABLE input, but I don't recall the polarity.

All signals are TTL-compatible, with rise and fall times less than 0.2 microseconds.

The pins are numbered in the same manner as a DB-25 - along the top row and then in the same direction along the bottom row. What I'm not certain about is which end has pins 1 and 19. The diagram in this

printer manual implies that pin 1 is on the right when looking into the printer connector, thus on the left when looking at the plug on the cable. This would match a DB-25 (male on the plug, female on the printer).

To be on the safe side, plug the cable into the computer but not the other device, make sure the computer is switched off, and use a continuity tester to locate the block of ground lines at one end of the bottom row of pins.

When using a parallel cable with a PC, you have access to all the printer control and status signals (STROBE, ACK, BUSY, PAPER EMPTY, SELECT, AUTO FEED XT, PRIME, ERROR and SELECT). With an Apple II, a fair number of these signals may not be available, depending on the printer card.

For example, Apple's parallel interface card has eight outputs (plus strobe, which is generated automatically) and eight inputs. I don't know offhand where the inputs are supposed to be mapped, and can't locate the manual for the card just now, but the lack of additional outputs prevents control of AUTO FEED XT, PRIME and SELECT ENABLE.

The standard handshake logic for the parallel port is as follows:

1. The computer outputs 8 bits of data.
2. There is a minimum 0.5 microsecond delay before activating STROBE.
3. STROBE is pulsed low for at least 0.5 microseconds.
4. The printer BUSY signal goes high in response to strobe, within a maximum of 0.5 microseconds.
5. There is a minimum 0.5 microsecond delay before the data can be removed.
6. Once the printer has finished processing the data byte, it lowers BUSY again, then generates a low-going pulse on the ACK line. This is delayed by 4 microseconds after BUSY went high, and is approximately 3 microseconds wide.

The printer drives BUSY in response to STROBE, but I'm pretty sure the computer doesn't wait for BUSY before it sets STROBE high again.

The computer usually watches BUSY to identify when it is able to send the next byte. It may ignore the ACK signal completely. Some computers rely on the ACK signal, using a hardware latch to ensure it is not missed, possibly in conjunction with an interrupt trigger. If the computer's parallel port has an output buffer, the ACK signal would initiate transfer of the next byte.

The PAPER EMPTY signal goes active (high) as an advance warning of paper empty. If printing continues, the ERROR signal goes active (low), followed by the SELECT signal going inactive (low).

The SELECT signal can also go false if the printer is deselected.

The PRIME signal is pulsed low for a minimum of 1.0 microseconds to reset the printer.

--

David Empson
dempson@actrix.gen.nz
Snail mail: P O Box 27-103, Wellington, New Zealand

```
##### E N D O F F I L E  
### parallel.signals  
##### E N D O F F I L E
```

```
#####
### FILE      : parallel2ibm
#####
### Created   : Saturday, February 22, 1997  Modified: Saturday, February 22, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5332 bytes   5 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!chi-news.cic.net!EU.net!cpk-news-
hubl.bbnplanet.com!news.bbnplanet.com!feedl.news.erols.com!howland.erols.net!newsx
fer.itd.umich.edu!uunet!inl.uu.net!142.77.1.4!news.uunet.ca!news.on.rogers.wave.ca
!n4tor.istar!tor.istar!east.istar!newsl.istar.ca!news
From: i.hate.spam@no.junk.email (Honker)
Newsgroups: comp.sys.apple2,comp.sys.apple2.programmer
Subject: Messing around with a parallel i/o card
Date: 22 Feb 1997 06:11:39 GMT
Organization: -
Lines: 115
Message-ID: <5em2mr$olc@news.istar.ca>
NNTP-Posting-Host: ts20-10.vcr.istar.ca
Xref: newsl.icaen comp.sys.apple2:116933 comp.sys.apple2.programmer:8486
```

I've been having some fun with a home brew parallel i/o card for Apple2. It's a modified parallel printer card with a flat cable that plugs into an IBM-PC parallel port allowing the two computers to exchange data directly.

Using Borland C I wrote some preliminary software for the IBM to configure it as a file server for ProDos 8 but just as easily it could directly download programs, operating systems such as DOS 3.3, etc.

So far I've been using a MacroprintPlus card (by Macrotech Computer Products of BC, Canada) as it was designed for parallel i/o as well as printing.

However, the Grappler+ is much more widely available, especially the clone versions. Some time ago I posted instructions on how to modify a Grappler for this function and I've thought up an extension of the concept to make it more versatile by allowing the on-board firmware to be writable at run time. This is particularly handy for me because I use a 6502 cross-assembler on the IBM.

Basically the idea involves using both RAM and EPROM. The operating system, program and firmware would all be downloadable from the IBM which has much more storage resources than the usual II+ or //e system with 143k floppy drives. The ROM would contain only minimal boot code, used to download whatever firmware is needed at the moment.

It would be handy if the RAM were non-volatile, and Dallas Semiconductor makes a battery-backed 2k x 8 RAM, the DS1220.

Modifying the Grappler+

This card has the following hardware features:

- * socket for 2732 EPROM (more on this below)
- * 8-bit latched output port
- * output strobe (active low)
- * 8-bit input port, currently allocated as:
 - bit 0: printer ACK-
 - bit 1-3: printer status
 - bit 4-6: DIP switches
 - bit 7: interrupt pending
- * optional interrupt (IRQ-) generated by printer ACK-

The provision for a 2732 (4k x 8) EPROM is the basis for this scheme because this chip is replaced by a 2716 (2k x 8) EPROM and a 4116 static RAM of the same size. The high order address line, A11 normally used to select the Grappler's firmware banks becomes the device select line; low for EPROM and high for RAM.

The physical placement of the two chips is a minor consideration; The RAM can piggybacked on the ROM, pin for pin except CE- or it can be fitted somehow onto the solder side of the card. In my computer this card is in slot 7 so there's no problem with clearance room on the component side.

A slight modification is needed to make the RAM writable. I tried this tonight with a 4116 in the firmware socket and it seems to work:

1. Since this is RAM, it needs a WR- signal to accept data. I cut the trace to U9-21 (was A11 on the 2732 but now the WR- input for a 4116.) and connected a jumper wire from this pin to U3-3, ie. the RD/WR- line.
2. I cut the short trace from U9 pin 20 (OE-) that connects it to the line from U6-11 to U9-18. This pin needs to be connected to the invert of RD/WR-, ie. RD-. For my present purposes I don't need interrupts from this card, so the resources normally used for interrupts become available including the latch at U2A, etc., and RD- was derived from the NAND gate at U6A.

When I tried this with a card in slot 1 I could write and read to \$C100 - \$C1FF with no problem. However, \$C800 to \$C8FF seems to be mapped into this same space, so the expansion ROM space really starts at \$C900.

The Grappler+ soft switches are somewhat peculiar. According to the manual the nominal designations for an i/o write are as follows

\$C080,Y	output
\$C081,Y	Select ROM bank 2
\$C082,Y	reset interrupt Req and IRQ data bit
\$C084,Y	output/interrupt on ACK

What actually happens is this:

1. If A0 is high then ROM bank 2 is selected. (From IC U1C). Note: ROM bank 1 is selected on any access to the peripheral firmware

(ie \$C700 - C7FF for slot 7, etc.)

2. If A0 and A1 are both low then the data bus is written to the output latch and an output STB- is initiated. Also, the ACK latch at U2C is reset.

3. If A1 is high then the interrupt latch is reset. (U1B)

4. If A2 is high then the interrupt latch is set. (U1A)

Point 2. above is why the card also performs output on \$C084,Y.

Anyway, after all this messing about I'll be able to program an 2716 just once with some minimal interface code and from then on everything else will be downloadable from the IBM in a convenient way. So when I show my friends a highly modified board crawling with jumper wires and cables leading here and there and if anyone asks me what's the point, I'll just say -- hacking, that's what the Apple 2 was all about (originally) -- and despite mega this and giga that on the latest Pentiums, the spirit lives on.

```
##### E N D O F F I L E
### parallel2ibm
##### E N D O F F I L E
```

```
#####
### FILE      : parallelpro
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 794 bytes   1 KB
#####
```

Path:

blue.weeg.uiowa.edu!news.uiowa.edu!uunet!cs.utexas.edu!howland.reston.ans.net!agate!library.ucla.edu!psgrain!rainrgnews0!news.teleport.com!news.teleport.com!not-for-mail

From: nlayton@teleport.com (Neal Layton)

Newsgroups: comp.sys.apple2

Subject: Re: Parallel Pro : HELP

Date: 30 Jan 1995 05:36:56 -0800

Organization: Teleport - Portland's Public Access (503) 220-1016

Lines: 23

Message-ID: <3giqlp\$co@kelly.teleport.com>

References: <3ggbd6\$9kh@aristotle.algonet.se>

NNTP-Posting-Host: kelly.teleport.com

Here they are straight from my book.

Printer 1234

```
Epson      cccc
IBM        occc
NEC        cocc
C.Itoh     oocc
Toshiba    ccoc
Okidata    ococ
Okimate    cooc
AppleDMP   ooc
```

o = open/off

c = closed/on

Hope this helps

--

nlayton@teleport.com

WAC BBS (503) 363-0861

```
##### E N D O F F I L E
### parallelpro
##### E N D O F F I L E
```

```
#####
### FILE      : pc2a2.joystick
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 3285 bytes    3 KB
#####
```

```
Path: news.uiowa.edu!chi-
news.cic.net!news.math.psu.edu!news.cse.psu.edu!uwm.edu!math.ohio-
state.edu!howland.reston.ans.net!news-
e2a.gnn.com!newstf01.news.aol.com!newsbf02.news.aol.com!not-for-mail
From: rubywand@aol.com (RUBYWAND)
Newsgroups: comp.sys.apple2
Subject: Re: ADB port/game
Date: 28 Jun 1996 18:47:38 -0400
Organization: America Online, Inc. (1-800-827-6364)
Lines: 65
Sender: root@newsbf02.news.aol.com
Message-ID: <4rlnea$9t0@newsbf02.news.aol.com>
References: <4q75dl$115e@hearst.cac.psu.edu>
NNTP-Posting-Host: newsbf02.mail.aol.com
X-Newsreader: AOL Offline Reader
```

In article <Pine.OSF.3.91.960628092447.25462A-100000@unicorn.it.wsu.edu>, Sedgwick <sedgwick@wsunix.wsu.edu> writes:

```
>
>Can you post how to make these converters. I have a good PC stick siting
>on my desk right now that I would love to use.
>
```

Okay. The following is condensed from an article in the Spring issue of II Alive:

To PC Stick (15-pin female connector)	To Apple II (9-pin male connector)
[1] [4] and [5] -----	[2] +5V
[2] -----	[7] Button 0
[3] -----	[5] X-axis
[6] -----	[8] Y-axis
[7] -----	[1] Button 1
	[3] Ground

```
On the 9-pin Apple II side ...
add 680 Ohm resistor between [7] & [3]
add 680 Ohm resistor between [1] & [3]
add .01 uF cap between [5] & [3]*
optional: add 50K-100K trim pot in series with the cap
add .01 uF cap between [8] & [3]*
optional: add 50K-100K trim pot in series with the cap
```

*NOTE: The Capacitors compensate for smaller R range of PC sticks. The C values are approximate. For standard 100K Ohm PC sticks, .01 uF pretty well guarantees you will be able to cover the full Apple II X and Y range (0-255). Values of .01 uf (X-axis) and .005 uF (Y-axis) worked well on

the PC "FlightStick" when plugged into our Apple II+.

Most likely, you will find that the a stick tops-out too early in the X and/or Y max direction. For best control precision, what you want is for extreme values to occur near the extremes of stick movement:

```
X (horizontal)  Left= 0    Right= 255
Y (vertical)    Up= 0      Down= 255
```

For adjusting, use a program which continuously reads and displays X and Y stick values. The program below does this and displays "B0" when Button 0 is pushed and "B1" when Button 1 is pushed. Do a CTRL-C to exit.

```
20 PRINT "X= "; PDL(0); TAB(15); "Y= ";PDL(1); TAB(30);
30 IF PEEK(49249)>127 THEN PRINT "  B0";
40 IF PEEK(49250)>127 THEN PRINT "  B1";
50 PRINT: GOTO 20
```

Experiment with capacitance values between .002 uF and .01 uF to get the best 'spread'. For easier fine-tuning, add the 50K-100K trim pots in series with each capacitor.

The converter I built fit inside heat-shrink tubing. Putting it in a small plastic box may be better. You can mount the trim pots (and/or switches with fixed "trim resistors") and select between settings for a 'fast' (short swing) Game Stick and 'normal' (full swing) Graphics Stick.

Rubywand

```
##### E N D O F F I L E
### pc2a2.joystick
##### E N D O F F I L E
```

```
#####
### FILE      : pc2gs.hscable
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1539 bytes    1 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!uwm.edu!vixen.cso.uiuc.edu!newsfeed.internetmci.com!in2.uu.net!newsfeed.
pitt.edu!scramble.lm.com!pink.lm.com!not-for-mail
From: mportune@telerama.lm.com (Matt Portune)
Newsgroups: comp.sys.apple2
Subject: Re: Cable pinouts for...
Date: 25 Jun 1996 13:38:05 -0400
Organization: Telerama Public Access Internet, Pittsburgh, PA
Lines: 28
Message-ID: <4qp85t$clp@pink.lm.com>
References: <4qeuvr$5me@news-old.tiac.net>
NNTP-Posting-Host: pink.lm.com
X-Newsreader: TIN [version 1.2 PL2]
```

```
Andy Kress (kress@jar.com) wrote:
> ...a null modem cable between a GS and a PC? I could spend some time
> with a breakout box and figure it out, but if someone already has this
> I would appreciate it! Id like to transfer some files and when GS/TCP
> becomes available Id like to use my PC as a router (ppp). Thanks
> in advance for any help.
```

```
IIgs          PC
1             5
2             4
3             3
4             7
5             2
8             7 (ground)
```

A IIgs serial port pinout looks like this, looking at the back of the computer:

```
8 7 6
5 4 3
 2 1
```

(this is a simple hardware handshaking cable)

```
--
/--- Matt Portune ----- "Now Running: Buggie Power!" --\
| mportune@telerama.lm.com                               The Avatrax Studio |
| ae094@dayton.wright.edu                               Blue Monday BBS       |
\----- http://www.lm.com/~mportune -----/
```

```
##### E N D O F F I L E
### pc2gs.hscable
##### E N D O F F I L E
```

```
#####
### FILE      : pcjoystick.base64
#####
### Created   : Tuesday, January 1, 1980 Modified: Thursday, March 1, 1973
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 11058 bytes   10 KB
#####
```

This is a multi-part message in MIME format.

```
-----732255BBFFD35CC76A9F4B42
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
```

frankc writes ...

```
>
> Okay, I have looked at what it takes to convert a PC joystick
> to an Apple II joystick. I have found it to be suprisingly
> simple. I have seen some web sites that discuss using
> capacitors, resistors, etc... The problem is some of these
> tend to lose functionality if you do this. So I pulled apart
> a joystick that has both a PC connector and an Apple II (9
> pin) connector and found that the only thing that is being
> converted is the digital side, the buttons. The
> potentiometer is being fed 5 volts on one side and fed to the
> Apple and PC input pins. So I came up with a simple circuit
> that RETAINS THE RAPID FIRE functionality of some joysticks.
> I have built a schematic and have made it into a GIF file. I
> tried to upload it here, but the message never showed up.
```

The net seems to be messing up here and there recently. Your posting with the diagram came in okay on my server; thanks for posting it. Your diagram is reproduced below. (I added more line colors to help see what's going on.)

```
> So if anyone wants it they can have it if they mail me
> directly. I have not tested it just yet so be warned it may
> not be %100 percent. I will not take responsibility for you
> torching your computers! Anyway, it should work fine.
>
```

....

It looks like your design should be fairly torch free. It will not work properly as-is because the standard PC joystick's pots max out around 100k Ohms, 50k less than the pots on Apple II joysticks.

Adding a small capacitor (approx. 0.01uF) on each paddle lead going to Ground should compensate for the difference in max resistances.

Using a logic IC to invert Button/RapidFire signals is an interesting approach. (The design for doing this referenced on the FAQs KB&Joystick page uses PNP transistors.) Since there is about six feet of wire connected to each gate input on the IC, you may need to add pull-up resistors-- about 3.3k going to +5V-- on each input to avoid false triggering due to noise.

Rubywand

```
-----732255BBFFD35CC76A9F4B42
Content-Type: image/gif;
```

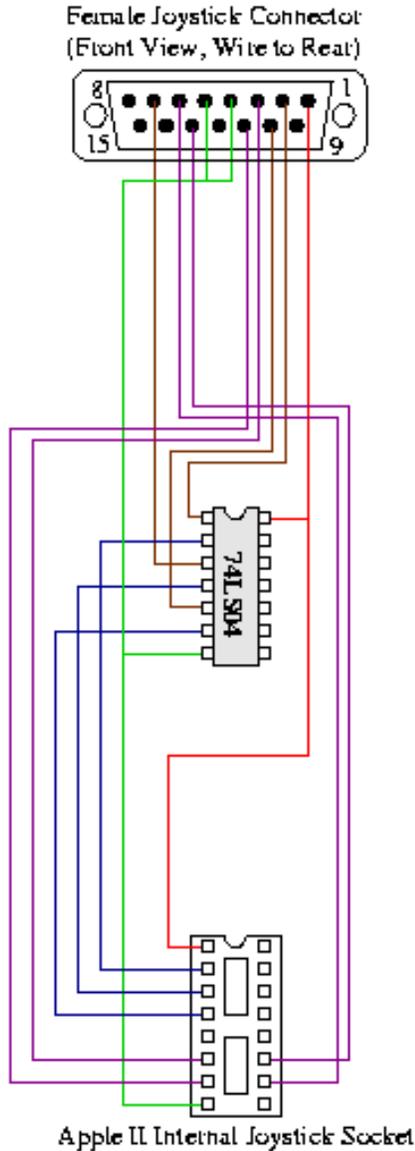

5XzF+rkLssSym/3saE+72tdedir7u5hUL4nVtdJqttv97ngvMtenvnmKg72/Yhc0mlvi8Z97
2+F/H3rgLWxUwvsc7n2veuKbTvSxJ9bx40764Vky95LUXZ+mxJroR0/60pv+9KfPPCKV/pLO
O93yww096mdP+9qrntqbX4nrKy/4Ovd7JdwGedAnf/WQfN4gPQZ+ynOvkt0vHsSXpzhLgs/6
r3+O7rAfvpSPV/m94ryP++p7Pvu+3rxLqM1/kxMd+7xtP/pSY3/ucT3/4lw/69qPk/Q2PP/hf
T3/ki5j7kDd8+8d7jFd/yVd+ywd/uid//FeA/kcT+Bd3JOF8xid+7HeA7peA+beAA/h8QRZ9
GHh/GiIBI0GBIHF8BRGCJxGBkSd3DEiA0Bd79reCI9iCE/iCHhfhZGeA/4eA3beBzYeDFdh/
KdiDGfiDjCgSjvgRkOh2AJhkSRgSS+gRTfhn0leDAogQxXeCFsiDEiIFSyEEXEiETshTF1MR
LjIFs6N+DliEL8IACMgAahGHCHgpaRiGHTiEbdheeEGHc+iHR7MQd9h6YsiEXfia/lhCh3Ko
FYq4iIUjdZqngEGYh204h5JEeoJRiPqjjiQCld5EIHOhHiYZIhpc4epmoiVHRiI7IFQ3Qiq74
irDYimBIiKJThYeYRn2hirroh514Z10HiixXiXlRhQxlFLt4jGaIdKt3fsGohWwYg9qXRse4
i3Y4i9bnjPNniWixjbpYjUhogYVYiLZiitviJzxIEYN4jWuYjdA4ftJoJorojQGIh9jYgO3I
fhMEj/EYiAqRjt9XjzD4gTI4TXahj7z4iJ64jJIYigCZgwhxRfhoNAYZh+jTj9b4j+u4EQGw
kRzZkQLQkSAZkh25RCIZkqc4kRV5e922kM2YkRoRAL11/o/1R5AAMJF12Iup9otRCG3iSBEP
CV0yOSJzYZNyYI8qKXz06JIZ8ZPLfZQSQpTyCIXGqIQ9ORFMqV3kOCJQiYYXqX8NiRFXCv8P
uYnkgyWleY4T4Y9eqZRGZMCGY1KMY1nGY9c+YlqaBBbaBFhCVdv6Y79UxSAGI+qmIyQcJDA
6HfCaJVuqYPRR5P7CJhyOJg4uXA6OZVSWJUSZcf1pcRyS1z+zifSZGTWXGVEZculxGaCWTx
dQCsyZpLlJqwgZs2xBVbiZC+yHemGXZtCZQQ0ZmJuI9yOZpvJ5W5CXi72ZS9OZN/GZqRyZyA
CE3KiHssiZhferGpeWMG4ZvY/qKJdeicqyRasmBlamXi+kQ2ukUzmmUaAmeXSmebGmd5dkQ
58mIFJkqkom07TmJ41kR12lr2amcbyiYwYmfDpmUeIma8ckQ89mHFmmdqAidhSmdhyl5iZmZ
CboQC5qL9cmgdGmbOYmbBnqaEfeAJFqiJnqiKJqiKnqiS7SiJnqSRcmhBx1Nt/mJO51tmGkQ
LrqjPKqiLcjqjMMqcZpmS0bmSE+qCfaqjD5AQ/TkRGcoWfgiPRBqhRnqj4ZaJBUGiTHqhCrGg
61mHUmGURyqUtlifCaGLCNGkEjGfphGY3BiVfmeZPJmkWbqkacq1CcGmGoqSdTmPZfqcE4Gm
B6Gm/hGhplBqk3BamiGqmwWhqAZBqM1ZlvXznZDZoWmZnwwJqArhqAUBqQ/hpanYoN0ZmQ9a
L0dzfRh5oCNqp4OKpwiRdwQQpKNKqpb6LBZZoH+qqhDBqQThqeaZd0FqjGC6nt8RnvpqWfK
qo/qqmBBmxtak8JaQ8WKqS2pqw/BqwPhqxwBo5Tqmd85rbiqjtbqENgqENpaIV8ao+n6rB2V
kBJqpmemQQRrhBwrr8SpQJaqxFhrJk6rglBr/bqEz8ppPd5qeGaqiK6q8raqcyqEQNrn+u5
r9RknciKEADbsBkRmus6o+x5sGvpr426sL2KsSkVqm5KjWJKpWQqrgl7/q0im60ku0OHGqXe
+q0Qwa/V2rIE4QA827M++7NAG7RCO7REW7TcSskVQk03O7EUOp5F+7RQG7V56wDBKQ0i6aGU
CaK5qrMDwbMW+7LmGrNRVJDSGq0cC65+yrKMCgFeexAXy5sCu7E1263tWqOGCa8csYRtq6Rb
CretVJSgm7YIU7z7W6d9i5xEAbgdK7gfy7UCUbJzCrb1KrZiobgS67HuCbJs6wBfe7hYiSmW
u7SYe6yaC7kD8baIeysba46E6a5VKqc4KoqmKxCo+7kgcbSsK5w4S7Gly7luK7n9qVrCO7xU
s6cGOaWuu7KDa5yP67t8e6dORbzSilm4+6a6/su0SOq0zmu40Ju622q8+oi8dvvuusHulsru9
keu5Yrmtq/umKZu8qNq4hIu+pwu8lIsVofSQu9u0gDq7EFC763u7+esQ+5u9/Uu/tGu/fhsS
zNKnxLmoZLu5ndu9t1sgBXyD5zvBrbrA/3HB4ZjBv6u+fEkghkyVIPy8G+y9HYy9GKy9Grys
HMwfJXyZJ8y9KVzBJMzCH+zCIUzBASzD0mzCPIzCMKzCQDy6/eq4EtzDN/zD+zHDCzrEN1zE
ODwgUBy7Upy+PjzCBBYLXvzFYBzGYizGQUzDWVY/IryZ+ssfyiu/Eey/AMzFDcFtPtHGmave
cKzARnyr+GHHpIvH/gj8v3pcxXPMxvF7x/P7wgbw3z8Gn6cxInMxFTsxCPzX4f8x5FMxIu8
x5XcE4+cs5k8xZtMyAxBx558yZD8xoEcX2pMwMXoKq/cKhfyxwLyIo8soysejICTC8yy6gM
yqp8yzCby8oISIVEkKB4jnHFAnIrXtas8yJRCzNjTOUqjzIq6taGsxU0sx6V8SVxzPkZjzVqr
tsEsyaMczAMzqx1Ykfy4Jr7MjLWczWi8xa18cE4ss63xztPJv70rzGFLzGPbuid0zBVBy/xs
y+aMy5yMz2ukz0fawgfsz5ML0CBjPhZh0Abczwk9zAs9ti/CKj1EERgN0RqtyQpNyhpC/kK8
vNIQMdi7HNEb/c8dXdFnWDjGHB40jbevVsPaPmncnNL5bNPTTKN1HMUwbdIcjdIb9c1CzdRE
jCTA3MzNK9ElWdVWfdUieC80OdQi/cvxXM5ILVr+STNObatBfdZdDc8HLC8JLBHYSdY1rTs3
Lb5FjcvHLcon8dYh3css/U8P4dJcFnc97RB6rdK42Ndy89devdZgJdeyNdZ77c3ILN1pvc8Z
jdBhrTe3Et1YyymAbcaCpC8QUdiHHddmrSgV49mLfdlsLchuDdmGrSjDpNwn7RCfbdQ1Xac9
utu8DaRc7Zm/LRG3bde5Hbm9fdzIXaK0Ddx1PRHDbb5nbBGk/nOVZW061Z3T5RuvPHOR083X
pm3d343dzEx50xvIFNHdl03dfp3Ytr3aJI3ZGYHeiD3bnN3S7v3Sxc3dsF3a1D3Z880Qz63d
0V0R8u3fBl7b4myj2Z23hei/573f/Z3MTR3eF33fgZ3f0g3h6r3cXE3XUP3VUr25UzviJA61
HH7dWmu4iKzKJd7iLu6zawLSKF7QFg7amjuO39vcIe3hKo7JEYzjFWIwdTtBCX63C77TzsoR
Bb7eml3has3aPz6MGp7J7jcr7j/kVOvuOd12duzx0u42it2k+05VGu5FOeOyde6F33+un/+
jFuePhMu4U/d46n85Xke5LHN3o8e4AxOpxi5J5e6ert3DWO22+u6HEe4aV+6Q+MzYm+EaQ+
meDt6sKd6sS96rS+6DSZ2pSNMYZ+5WWe5Zs+6Y7O6MEdeEaCO5BXb663e6HTOFZfmaGRzaH++
c9q+7dyec9K+JtXeanf+aF6OErU+46dN28NOE0x3EueeSZBy68Lu0DPR7pIe5plu6/QuE/bO
jsiO65297+Pt7r7O5KZO5cweUfw+eQTF6qeu72Ne7wx/72gu5ESa5imOZgsPE+8+7R7P3Hue
8DaBcCRf/vIH9+3Ss2zINvIm3/IuX28ozzUIoPLCxlgdr+7Bvuw/ptRnYfH0TemwjmCOj/BP
rVKkcvP1jeAZL/R6nierkvQ7X8/N2tBRz0j4btoSA+xVf785v/TJvvVanbli71g83uFgH71j
L/Z1j+5nz8A6H+Fr3/Y9D/QPo/Vy7/YWffe3K+Z6/ys7JSt9H/iCP/iEX/h3rx/HciZGMvQ5
wtC8A6Fe3x+I79378+iuRNMsHSeIbfrTQjFRM03ooj+E01AGbyYA3/j8zStUAe84IikzEvrI

oS+5USiWhCg7chiAMilCovpEwiO7L9BVviU9Qh4EHfrS4RhfkvxPMiagIR8639JOqK36URIs
WVibTfIvbZT8vyQvylEp1YEakuL87xEw0U9FOL3645MbwVH7mp8hhqL+4K8YtpotLeL8QJI/
zeH7s/8nSs/AhQEQECAAIAhAYEGDAw0WfNiQIUOHBAcePJgQosSJGREqbKjQIkSKHj9m9FgR
o8mTG0uKNFmx40uYMWXOpNkxocOaOXXu5LnzZk+gQYUOfqTJFGkSWeeVNrU6VOZTJlCpdpz
alWsWbVu5drV6lewYcW0JVvW7Fm0adWuZdvW7Vu4ceXOpVvX7128efXu5dvX71/AgQXzDAgA
Ow==

-----732255BBFFD35CC76A9F4B42--

E N D O F F I L E
pcjoystick.base64
E N D O F F I L E


```
#####
### FILE      : PCJoytoAppleII.gif
#####
### Created   : Tuesday, January 1, 1980 Modified: Thursday, March 1, 1973
### File Type: "GIFf"   File Creator: "ogle"
### File Size: 7861 bytes   7 KB
#####
```



Note: This circuit should allow you to use joysticks that have rapid fire circuits. This circuit can be completely enclosed within the Apple II case with a female connector exposed on the back of the Apple II.

```
##### END OF FILE
### PCJoytoAppleII.gif
##### END OF FILE
```

```
#####
### FILE      : pcstick
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 5584 bytes    5 KB
#####
```

Re: Need Joystick for GS

```
From: rubywand@aol.com (RUBYWAND)
Reply to: RUBYWAND
Date: 5 Aug 1996 05:00:07 -0400
Organization: America Online, Inc. (1-800-827-6364)
Newsgroups:
    comp.sys.apple2
Followup to: newsgroup(s)
References:
    <3202CF83.130A@inlink.com>
```

In article <3202CF83.130A@inlink.com>, "Doug S." <dougs@inlink.com> writes:

```
>
>Can anyone supply me with the pinout info for converting a PC joystick to
>Apple II? I have a spare PC stick, and the Apples are hard to find
locally.
>
>
```

Sure. The stuff below is condensed from an article in the Spring issue of II Alive:

To PC Stick (15-pin female connector)	To Apple II (9-pin male connector)
[1] [4] and [5] -----	[2] +5V
[2] -----	[7] Button 0
[3] -----	[5] X-axis
[6] -----	[8] Y-axis
[7] -----	[1] Button 1
	[3] Ground

```
On the 9-pin Apple II side ...
add 680 Ohm resistor between [7] & [3]
add 680 Ohm resistor between [1] & [3]
add .01 uF cap between [5] & [3]*
optional: add 50K-100K trim pot in series with the cap
add .01 uF cap between [8] & [3]*
optional: add 50K-100K trim pot in series with the cap
```

*NOTE: The Capacitors compensate for smaller R range of PC sticks. The C values are approximate. For standard 100K Ohm PC sticks, .01 uF pretty well guarantees you will be able to cover the full Apple II X and Y range (0-255).

Values of .01 uF (X-axis) and .005 uF (Y-axis) worked well on the PC "FlightStick" when plugged into our Apple II+.

Most likely, you will find that the a stick tops-out too early in the X-max and/or Y-max direction. For best control precision, what you want is for extreme values to occur near the extremes of stick movement:

```
X (horizontal)  Left= 0   Right= 255
Y (vertical)    Up= 0    Down= 255
```

This way, you have lots of active swing which makes graphics work and playing most games much easier.

For adjusting, use a program which continuously reads and displays X and Y stick values. The program below does this and displays "B0" when Button 0 is pushed and "B1" when Button 1 is pushed. Do a CTRL-C to exit.

```
20 PRINT "X= "; PDL(0); TAB(15); "Y= ";PDL(1); TAB(30);
30 IF PEEK(49249)>127 THEN PRINT " B0";
40 IF PEEK(49250)>127 THEN PRINT " B1";
50 PRINT: GOTO 20
```

Experiment with capacitance values between .002 uF and .01 uF to get the best 'spread'. For easier fine-tuning, add the 50K-100K trim pots in series with each capacitor.

The converter I built fit inside heat-shrink tubing. Putting it in a small plastic box may be better. You can mount the trim pots (and/or switches with fixed "trim resistors") and select between settings for a 'Fast', short swing, 'hot' Game Stick and a 'Normal', full swing, 'cool' Game/Graphics Stick.

Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-state.edu!uwm.edu!spool.mu.edu!newspump.sol.net!www.nntp.primenet.com!nntp.primenet.com!newsfeed.internetmci.com!newsxfer2.itd.umich.edu!portc01.blue.aol.com!newstf01.news.aol.com!newsbf02.news.aol.com!not-for-mail

From: rubywand@aol.com (RUBYWAND)

Newsgroups: comp.sys.apple2

Subject: Re: Kraft Joystick Question!

Date: 6 Sep 1996 11:28:10 -0400

Organization: America Online, Inc. (1-800-827-6364)

Lines: 56

Sender: root@newsbf02.news.aol.com

Message-ID: <50pfua\$mgd@newsbf02.news.aol.com>

References: <322ee39d.323258278@news.concentric.net>

NNTP-Posting-Host: newsbf02.mail.aol.com

X-Newsreader: AOL Offline Reader

In article <322ee39d.323258278@news.concentric.net>, wernst@cris.com (Warren "Llama" Ernst) writes:

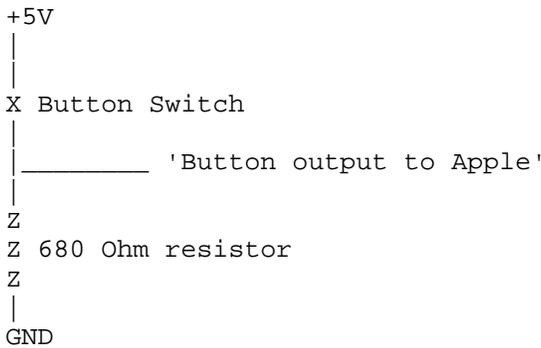
```
>.... What did you do about the buttons? I built one of these years ago,
but
>I found that the Apple expects the buttons to be "push to close
>connection" and the PC expects teh buttons to be "push to open
>connection" (or vice versa, its been a while). Someone suggested an
>inverter, but I just went out and bought the correct modem.
>
```

>Won't this converter still give you button problems?

To PC Stick (15-pin female connector)	To Apple II (9-pin male connector)
[1] [4] and [5] -----	[2] +5V
[2] -----	[7] Button 0
[3] -----	[5] X-axis
[6] -----	[8] Y-axis
[7] -----	[1] Button 1
	[3] Ground

On the 9-pin Apple II side ...
 add 680 Ohm resistor between [7] & [3]
 add 680 Ohm resistor between [1] & [3]
 add .01 uF cap between [5] & [3]*
 optional: add 50K-100K trim pot in series with the cap
 add .01 uF cap between [8] & [3]*
 optional: add 50K-100K trim pot in series with the cap

The 680 Ohm resistors take care of the problem. Each resistor is running from a Button to GND. The other end of each Button goes to +5V.



680 Ohms holds a button's output to a logical 0. Pressing a button sends +5V (logical 1) to the output.

Rubywand

```

##### E N D O F F I L E
### pcstick
##### E N D O F F I L E
  
```

```
#####
### FILE      : pcstick.conv
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 4759 bytes    4 KB
#####
```

Re: Need Joystick for GS

```
From: Edhel Iaur <drsmooth@baldcom.net>
Reply to: Edhel Iaur
Date: Wed, 07 Aug 1996 04:04:31 -0400
Organization: ART MATRIX - LIGHTLINK
Newsgroups:
    comp.sys.apple2
Followup to: newsgroup(s)
References:
    <31FD8EC2.6EBA@inlink.com>
    <4tpsn1$rno@newsbf02.news.aol.com>
    <3202CF83.130A@inlink.com>
    <dempson-0608962319210001@dempson.actrix.gen.nz>
```

David Empson wrote:

```
>
> In article <3202CF83.130A@inlink.com>, "Doug S." <dougs@inlink.com> wrote:
>
> >RUBYWAND wrote:
> >>
> >> Finding a good quality new Apple II joystick could be difficult. If
> >> you build a PC-to-Apple converter you can walk into any computer-stuff
> >> shop and pick out the PC stick you want.
> >>
> >> Rubywand
> >
> >Can anyone supply me with the pinout info for converting a PC joystick to
> >Apple II?
>
> It needs more than simply rewiring the joystick. The PC and Apple II
> joysticks use different resistances, so you need to add four capacitors to
> compensate.
>
> The switch is also wired to connect to the opposite power rail. A little
> careful experimentation may be needed to verify that the joystick is not
> attempting to use the power rail for something unexpected, and if not,
> then you can wire up the "wrong" power rail to get the button to work.
>
> I don't have the exact details handy (and I'm not likely to be able to
> find them - I'd have to work it out again from the circuit diagrams).
>
> --
> David Empson
> dempson@actrix.gen.nz
> Snail Mail: P.O. Box 27-103, Wellington, New Zealand
```

3-button Gravis joysticks are available from The Arc (1-800-753-0114).

Here is the conversion info, even tho I've never tryed it, myself:

From: rubywand@aol.com (RUBYWAND)
 Newsgroups: comp.sys.apple2
 Subject: Re: Joysticks for Newbie? IIC and IIE.

Re question: What joystick can I use on a IIC and where can I buy one?
 Same for a IIE. ...

When John Dobbins emailed a question about stick wiring, it suddenly dawned upon me that I've never seen a modern, pure PC stick converted for use on an Apple II or a "PC-to-Apple converter cable". It seemed like a good idea to actually try building a converter cable.

My PC stick is a standard CH Products "FlightStick". A resistance measurement produced a disconcerting revelation: the X and Y pots top-out around 100K Ohms-- 50K less than a standard Apple II stick! Fortunately, you can compensate for the difference just fine by adding a bit of capacitance. The finished converter is shown below:

To PC Stick (15-pin female connector)	To Apple II (9-pin male connector)
[1] and [4] -----	[2] +5V
[2] -----	[7] Button 1
[3] -----	[5] X-axis
[6] -----	[8] Y-axis
[7] -----	[1] Button 2
	[3] Ground
	add 680 Ohm resistor between [7] & [3]
	add 680 Ohm resistor between [1] & [3]
	add .01 uF cap between [5] & [3]*
	add .01 uF cap between [8] & [3]*

*NOTE: These C values are approximate. For standard 100K Ohm PC sticks, .01 uF pretty well guarantees you will be able to cover the full Apple II X and Y range (0-255).

However, you may find that the stick tops-out too early in the X and/or Y max direction. For best control precision, what you want is for extreme values to occur near the extremes of stick movement.

Use a program which continuously reads and displays X and Y stick values and experiment with capacitance values between .002 uF and .01 uF to get the best 'spread'.

Values of .01 uf (H-axis) and .005 uF (Y-axis) worked well on the PC "FlightStick" when plugged into our Apple II+.

```
--
=====
--=37th Wisest Wizard Edhel Iaur==                               -=APPLE // FOREVER=-
Geek Code(C)v2.1: GCS/AT -d+@ H s-: g+ p0 !au(-) a-- w@ v@ C++(+++) L 3
                E? N K W+(++) M+(++) !V pO@ Y@ t+ !5 j R+(++) G+ D- e
                tv@ b++ B-- u@ h!(++) f !r n+ !y+
```

*For info on the Geek Code(C) v2.1 standards, Netscape yourself over to
http://www.cs.swarthmore.edu/~binde/teatime/Miscellaneous/geek_code.txt
-OR DO A NET SEARCH! (I use www.lycos.com & www.altavista.digital.com)
"My dependable Dell computer never cras

=====

```
##### E N D O F F I L E  
### pcstick.conv  
##### E N D O F F I L E
```

```
#####
### FILE      : pcsticks
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 4026 bytes    3 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!cs.utexas.edu!news.sprintlink.net!news-peer.sprintlink.net!news-
peer.gsl.net!news.gsl.net!portc01.blue.aol.com!newstf01.news.aol.com!newsbf02.news
.aol.com!not-for-mail
From: rubywand@aol.com (RUBYWAND)
Newsgroups: comp.sys.apple2
Subject: Re: Looking for connecting Pc game port and Joystick IIe
Date: 19 Sep 1996 09:46:58 -0400
Organization: America Online, Inc. (1-800-827-6364)
Lines: 109
Sender: root@newsbf02.news.aol.com
Message-ID: <51risi$g3d@newsbf02.news.aol.com>
References: <323F0F16.20B1@union-fin.fr>
NNTP-Posting-Host: newsbf02.mail.aol.com
X-Newsreader: AOL Offline Reader
```

In article <323F0F16.20B1@union-fin.fr>, Philippe Collard
<pcollard@union-fin.fr> writes:

```
>
>Has anybody the wiring sheme to adapt an Apple Joystick IIe to a PC game
>port ?
>
>
```

Below are pin-outs and info for Apple II and PC joysticks. As you can see, there are three major points of difference:

1. The Apple II stick uses a 9-pin plug vs. the PC's 15-pin plug. (Older Apple II sticks may use a 16-pin plug which fits in an IC socket.)
2. The Apple II stick's X, Y controller potentiometers are a bit larger.
3. The buttons are wired differently.

You can use an Apple-to-PC adaptor to handle plug conversion; or, you can replace the entire cable with one from an old PC stick.

The PC will work with 150k pots; but, in some applications, you may notice a tendency to max out early in the stick swing. You can correct this by connecting a 300k resistor across each pot (from the center to the end with a wire going to it).

The difference in button wiring is the main reason an Apple-to-PC conversion involves opening the joystick and making changes. (The Apple stick has a slightly more complex, less flexible circuit. Apple-to-PC is not as easy as PC-to-Apple.)

Basically, you need to change the Apple stick's button wiring so that

it looks like the PC stick's button wiring.

The mods mentioned above are not difficult, especially if you swap in a PC cable. If you want to be able to use the stick on an Apple II, then some kind of switching will be required.

Apple II Joystick (9-pin male connector)		(Old 16-pin IC-style plug)
---	--	----------------------------

[2]-----	+5V	----- 1
[7]-----	Button 0	----- 2
[5]-----	X-axis	----- 6
[8]-----	Y-axis	----- 10
[1]-----	Button 1	----- 3
[3]-----	Ground	----- 8

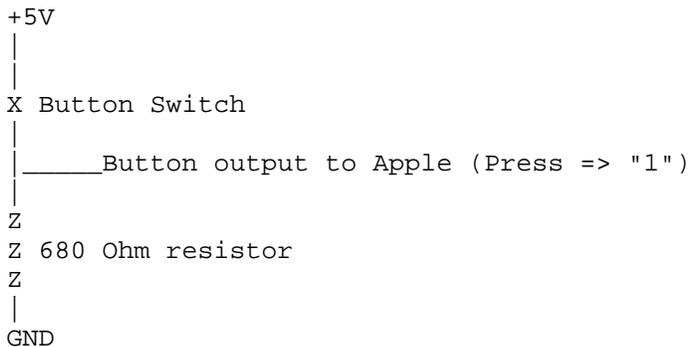
PC Joystick
(15-pin female connector)

[1]-----	+5V	
[2]-----	Button 0	
[3]-----	X-axis	
[6]-----	Y-axis	
[7]-----	Button 1	
[4]-----	and/or [5] Ground	

Both sticks tie one end of each X, Y potentiometer to +5 and send the center (wiper) to the an output. (Or the wiper may go to +5V and an end to the output; it doesn't much matter.) The standard Apple II pot is 150K Ohms; most PC sticks use 100k Ohm pots.

The buttons are wired differently.

On the Apple II stick (see below), each button switch goes to +5V. The other end goes to GND through a resistor (one resistor for each button). A button's Output is from the junction of the switch and its resistor. When the button switch is not closed, its Output is near 0V (=logic 0). Pressing a button sends +5V to the output (= logic 1).



As shown below, a PC stick button Output is normally an unconnected wire. Most likely, inside the computer, a PC or compatible Game Port has this line tied to a 1k-3k resistor going to +5V. So, the line will normally be at something close to +5V (= logic 1). Pressing the button grounds the line and pulls it down near to 0V (= logic 0).

_____Button output to PC (Press => "0")

|
|
X Button Switch
|
|
GND

Rubywand

E N D O F F I L E
pcsticks
E N D O F F I L E

```
#####
### FILE      : pctconnections
#####
### Created   : Monday, November 9, 1998 Modified: Monday, November 9, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2572 bytes   2 KB
#####
```

```
Newsgroups: comp.sys.apple2
Subject: Re: Question, PC Transporter...again
From: dempson@actrix.gen.nz (David Empson)
Date: Mon, 9 Nov 1998 02:32:35 +1300
Message-ID: <ldi7fta.luzxlp62oN@dempson.actrix.gen.nz>
References: <labelas-0711980224420001@lcust91.tnt23.atl2.da.uu.net> <labelas-0711980340260001@lcust91.tnt23.atl2.da.uu.net>
<19981107131556.27006.00000643@ngl03.aol.com> <labelas-0711981822360001@lcust19.tnt23.atl2.da.uu.net>
Organization: Empsoft
X-Newsreader: MacSOUP 2.3
NNTP-Posting-Host: 202.49.157.176
X-Trace: 9 Nov 1998 02:31:19 -1300, 202.49.157.176
Lines: 54
Path:
news1.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!vixen.cso.uiuc.edu!howland.erol
s.net!newsfeed.berkeley.edu!news-
stock.gip.net!news.gsl.net!gip.net!news.iprolink.co.nz!news.actrix.gen.nz!dempson
Xref: news1.icaen comp.sys.apple2:141496
```

Labelas Enoreth <labelas@hotmail.com> wrote:

```
> So then, I'm guessing that the 5-pin plug at J5 is where I'd hook up the
> IBM keyboard adaptor if I had one?
```

As Supertimer says, you don't really need this, especially if you have an extended keyboard on the IIgs.

Anyway, in case you want to try it, I have in my hand the IBM keyboard adaptor.

Going on the same numbering scheme as the IIc serial ports, the DIN 5 is numbered as follows, looking into the surface of the plug:

```

T
5      1
4      2
      3
```

The tag (shield) is not connected.

The other end of the cable is a 5-pin molex connector, with a ribbon cable between the two. Looking into the face of the molex connector (the side that goes onto the pins on the card), the pins are closer to one edge than the other. Holding the plug so that narrow edge is along the top (so the locking clips for the molex pins are on the bottom), the pins are numbered 1 to 5 from left to right.

(Let me know if you want a diagram of this in case it isn't clear enough from my description.)

The cable doesn't go straight through. The wiring is rearranged at the DIN-5 end. The end result is:

Molex		DIN-5
1	-----	1
2	-----	3
3	-----	5
4	-----	2
5	-----	4

> Hmm. Wish I had schematics for wiring a cable for either the RGB from J6
> or the keyboard from J5...I mean, I can do the two wires for the composite
> signal, but...the rest...

I don't have the CGA cable, but the picture of it in the manual looks like a straight-through 10-way ribbon cable to a DE-9 female connector. I can't tell you which wire doesn't go through (either 1 or 10).

--

David Empson
dempson@actrix.gen.nz
Snail mail: P.O. Box 27-103, Wellington, New Zealand

E N D O F F I L E
pctconnections
E N D O F F I L E

```
#####
### FILE      : pctdrive.pinout
#####
### Created   : Friday, November 13, 1998 Modified: Friday, November 13, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2735 bytes   2 KB
#####
```

Path:

news1.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!nyd.news.ans.net!newsfeeds.ans.net!news.idt.net!newsfeed.cwix.com!192.26.210.166!sunqbc.risq.qc.ca!news.uow.edu.au!david

From: david@uow.edu.au (David Wilson)

Newsgroups: comp.sys.apple2

Subject: Re: PC transporter drives

Date: 13 Nov 98 02:00:48 GMT

Organization: University of Wollongong, Australia

Lines: 54

Message-ID: <david.910922448@wraith>

References: <B271239E96682783E@testarossa.clubi.ie>

NNTP-Posting-Host: wraith.cs.uow.edu.au

X-Trace: wyrm.its.uow.edu.au 910923223 17278 130.130.64.1 (13 Nov 1998 02:13:43 GMT)

X-Complaints-To: usenet@wyrm.its.uow.edu.au

NNTP-Posting-Date: 13 Nov 1998 02:13:43 GMT

X-Newsreader: NN version 6.5.0 #15 (NOV)

Xref: news1.icaen comp.sys.apple2:141718

gospodin@clubi.ie (Vincent Quinn) writes:

>As there have been a few postings about PC Transporter recently, I thought

>I'd make my contribution.

>_Firstly_, I want to hook up a standard PC 360K, 5.25 floppy drive as drive B

>(I have an Apple 3.5 as drive A). Problem is, I don't have a complete pinout.

Mini/Micro Floppy Interface

Pin#	Description	Alternate Functions
----	-----	-----
1	GND	Eject, Disk Change Reset
3-33	Odd pins are GND	
2	High Density	
4	Head Load	In Use, Eject
6	Drive Select 3	
8	Index Pulse +	
10	Drive Select 0	Motor On A \ IBM twisted
12	Drive Select 1	Drive Select B \ cable - both
14	Drive Select 2	Drive Select A / drives are
16	Motor On	Motor On B / strapped DS1
18	Direction	
20	Step	
22	Write Data	
24	Write Enable	
26	Track Zero +	
28	Write Protect +	
30	Read Data +	
32	Select Head	
34	Disk Changed +	Ready +

+ signal from drive to controller

```
>I'm assuming that the pinout of the PCT 19-pin drive connector is the same
>as
>that of the IIGS SmartPort (that's logical, since Apple 3.5 drives work
>perfectly with the PCT) and that the 5.25 drive comes first in the chain
>(as
>indicated by the PCT manual). So a 19-pin pass-through connector needs to
>be
>added at the rear of the PC drive for chaining the Apple 3.5" drive to. OK.
```

Hang on, there is no way you are going to be able to connect a PC 360KB drive to an Apple 19 pin disk port (well, I do have a drive that is a standard PC style drive with an adapter board that makes it emulate a Disk][drive) and read PC 360KB disks.

Apple 5.25" drives use the 4 step lines to manually step the head in or out. IBM 5.25" drives hold the Direction line high or low and send a single pulse on the Step line to move the head in or out. Ditto for IBM 3.5" drives. Apple 3.5" drives use the 4 step lines to select a comand and another line to strobe it into the drive (or something like that).

--

David Wilson School of IT & CS, Uni of Wollongong, Australia david@uow.edu.au

```
##### E N D O F F I L E
### pctdrive.pinout
##### E N D O F F I L E
```

```
#####
### FILE      : pctvideo
#####
### Created   : Saturday, November 7, 1998 Modified: Saturday, November 7, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2234 bytes   2 KB
#####
```

Path:

```
newsl.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!nyd.news.ans.net!newsfeeds.ans.
net!news.idt.net!cpk-news-
hubl.bbnplanet.com!news.news.gtei.net!portc02.blue.aol.com!audrey03.news.aol.com!n
ot-for-mail
```

From: supertimer@aol.com (Supertimer)

Newsgroups: comp.sys.apple2

Subject: Re: Question, PC Transporter...again

Lines: 35

NNTP-Posting-Host: ladder03.news.aol.com

X-Admin: news@aol.com

Date: 7 Nov 1998 18:12:53 GMT

Organization: AOL http://www.aol.com

References: <labelas-0711980224420001@lcust91.tnt23.atl2.da.uu.net>

Message-ID: <19981107131253.27006.00000642@ngl03.aol.com>

Xref: newsl.icaen comp.sys.apple2:141453

labelas@hotmail.com (Labelas Enoreth) wrote:

```
>Hey, I was looking at my PCT card again and noticed some things I'd ask
>questions about, since I have no manual and such...besides, everyone's
>been so helpful so far...
>on the rear of the card, there is a 40-pin empty socket...what option or
>upgrade utilized this? an optional z80, or...?
```

That's for the math co-processor. Just plug in an 8087, boot the PCT, enter its control panel, configure it to use the 8087, and you are done.

```
>next to the keyboard and modulator connections, there is a 5-pin
>connector, what is this for? There is also a 20-pin plug to attach a cable
>of some kind to as well. Which of these is where the ColorSwitch attached?
>(Not that I have one, though I would quite like one) and which is for the
>CGA-out cable? I was under the impression the CGA out would be 2 pins. Or
>am I supposed to attach the CGA out to the pins that are coming out to the
>modulator?
```

Both CGA and ColorSwitch video connect to J6, the plug that's on the upper right hand corner of the card. The ColorSwitch board simply takes the CGA video and converts it into analog RGB so that it works with the AppleColor RGB monitor. If you got a CGA monitor, you can just plug it into this connector (with the right cable).

The two pin connector at J2 is for COMPOSITE VIDEO. That's the same kind of monitor the IIE uses. This is probably the best bet...hook up a IIE monitor to the PCT and you can run the PCT on your IIGS without a ColorSwitch card.

J2 is located near the top of the card and half way between the center and the right edge of the card.

```
##### E N D O F F I L E  
### pctvideo  
##### E N D O F F I L E
```

```
#####
### FILE      : peaking.coil
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5077 bytes   4 KB
#####
```

```
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!zaphod.mps.ohio-
state.edu!caen!uunet!cs.utexas.edu!qt.cs.utexas.edu!yale.edu!yale!not-for-mail
From: elvey-matthew@cs.yale.edu (Matthew Elvey)
Newsgroups: comp.sys.apple2
Subject: Re: Solid red monitor screen
Date: 30 Nov 1992 17:22:51 -0500
Organization: Yale U.
Lines: 111
Distribution: world
Message-ID: <1fe47rINNSch@SCORPION.ZOO2.CS.YALE.EDU>
References: <9211231450.AA00178@TIS.COM>
NNTP-Posting-Host: scorpion.zoo2.cs.yale.edu
```

Here's a more detailed possible solution:
 I still have to get around to doing this.
 The following message is from last year sometime.

```
From: dennis mcclain-furmanski <mccla_d@cs.odu.edu>
I never did have time to get to my RGB monitor. But I found
this on AOL this week:
```

"It isn't easy, being green..."

Kermit, ca. 1982

I'd started to think my Apple 2GS RGB monitor was immortal. It had always worked for me just as it did when I first turned it on in 1987 or thereabouts. Then without any precursor warnings my monitor's screen lit up with a hurt-your-eyes green raster and no video. 50-dollar bills flashed before my eyes.

I'm no stranger to tv servicing, so there was no question but that I 'd give it my best effort before spending the big bucks for repair or replacement. I hit the wall without service data. The local electronics-supply dealer told me, "Nah, there is no Sams Photofact for the Apple 2GS monitor... Apple never did sell many 2GSs, so Sams didn't do anything for the 2GS!" I drew myself to my full height, started to tell him about the millions of Apple 2GS computers still in use then said, "Ok..." and left the store. I'm tired of arguing the point.

I made my own Sams by tracing out the pc-board circuitry. A boring but necessary step. The paper schematic helped to make sense out of the voltage readings on the pc board's various test points.

The excess greenness was the result of an open peaking coil. Peaking coils are small inductors used to extend the

frequency response of video amplifiers. A transistor amplifier has unavoidable capacitance that bypasses high-frequency video components. It's these high-frequency signals that enable the CRT to change brightness quickly as it forms sharp edges. Inductance, such as that found in a peaking coil, cancels capacitance. If you choose just the right amount of inductance you can compensate for the unwanted capacitance, which is exactly what happens when a peaking coil is doing its thing.

The open inductor in my monitor's circuitry allowed the green cathode on the CRT to drop about 100 volts lower than normal, and this action biased the green gun into saturation.

It was obvious that something was amiss once I'd determined that the peaking coil had 100 volts across its terminals. I had two good peaking coils for comparison in the red and blue circuitry. Each of these good coils measured about 10-ohms resistance. The flakey coil was open. Shorting the open coil for a test eliminated the excess green on the screen but at the expense of poor green bandwidth.

How do I get a replacement peaking coil? The local electronics supply dealer was about as helpful as he'd been with the Sams Photofact deadend. "Peaking coils almost never fail. You have to go back to the manufacturer to get a replacement! Forget it!" This time I stood up to him, asked to see his stash of peaking coils. I needed a 20-microHenry inductor, and he did have a 22-microHenry unit. \$1.95.

The 10% excess made no noticeable difference and my monitor seems as good as new.

Being green is not so bad if your monitor can also be red and blue.

I wrote him and asked if the part was labeled L6G2, a small blue component with a red and black dot, just above the transistor Q6G2, on the board hanging on the back of the CRT. This is the reply:

Subj: Re: RGBlues
Date: 92-08-26 11:25:01 EDT
From: AFA DonB
To: DynaSoar01

You have the right part... It's a small blue component with one black dot on the side, a black and a red dot on top...

Measure the dc voltage across the component. If it's open (defective), you'll measure somewhere around 100 volts... If it's good, the voltage drop will be negligible.

Another way to check: Measure the voltage at each of checkpoints on the CRT socket. All three should measure

about 175 volts, referenced to the ground trace on the pc board that rides on the back of the tube. If the peaking coil is open for one of the three color circuits, that color's testpoint will measure about 70 or 80 volts...

This is turning out to be a really common problem. Your report is not the first I've heard! Fortunately, once you know what to look for, it's an easy fix!

Don (Apple Hardware AFA)

--

```
Matthew Elvey          Print "Hello, World!"
elvey@yale.edu or elvey@minerva.cs.yale.edu or      Input (response)
elvmatr@yalevm or Matthew_Elvey@quickmail.ycc.yale.edu  if response = nil
Box 5186; Yale U.; New Haven, CT 06520-5186 (203)436-1251  Print "Uh-Oh!"
```

```
##### E N D      O F      F I L E
### peaking.coil
##### E N D      O F      F I L E
```

```
#####
### FILE      : pinouts
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 11494 bytes   11 KB
#####
```

```
Xref: news.weeg.uiowa.edu comp.sys.apple2:62853 misc.wanted:26311
comp.sys.ibm.pc.hardware:79907
Path:
news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!moe.ksu.ksu.edu!crcnis
1.unl.edu!wupost!uwm.edu!cs.utexas.edu!uunet!munnari.oz.au!metro!news.cs.uow.edu.a
u!news.cs.uow.edu.au!not-for-mail
From: david@wraith.cs.uow.edu.au (David E A Wilson)
Newsgroups: comp.sys.apple2,misc.wanted,comp.sys.ibm.pc.hardware
Subject: Re: ** WANTED: PINOUTS....Please read!
Date: 17 Sep 1993 09:53:10 +1000
Organization: University of Wollongong, NSW, Australia.
Lines: 71
Message-ID: <27au96$asio@wraith.cs.uow.edu.au>
References: <bitzm.361.2C964727@columbia.dsu.edu>
NNTP-Posting-Host: wraith.cs.uow.edu.au
```

```
bitzm@columbia.dsu.edu (MICHAEL BITZ) writes:
>Hello. I am in need of a list of pin configurations for the following ports:
>* Centronics parallel printer (such as a Panasonic KX-P1123, etc)
>* Standard RS-232 Serial port
>* Laser 128 Parallel printer port (15-pin)
>* Laser 128 Serial modem port (5-pin round)
```

The Laser pinouts would require a Laser manual (which I do not have).
The first two are available in any good reference. For example I have a catalog
from CommsWare and in the data section at the back we find:

RS-232/V.24 Interface

EIA	CCITT	To	Description	Pin number
RS-232		V.24		
AA	101		Frame Ground	1
BA	103	DCE	Transmit Data	2
BB	104	DTE	Receive Data	3
CA	105	DCE	Request To Send	4
CB	106	DTE	Clear To Send	5
CC	107	DTE	Data Set Ready	6
AB	102		Signal Ground	7
CF	109	DTE	Data Carrier Detect	8
			+Test Voltage	9
			-Test Voltage	10
			Unassigned	11
SCF	122	DTE	2nd Data Carrier Detect	12
SCB	121	DTE	2nd Clear To Send	13
SBA	118	DCE	2nd Transmit Data	14
DB	114	DTE	Transmit Clock (DCE)	15
SBB	119	DTE	2nd Receive Data	16
DD	115	DTE	Receive Clock (DCE)	17

		DCE	Receiver Dabit Clock	18
SCA	120	DCE	2nd Request To Send	19
CD	108.2	DCE	Data Terminal Ready	20
CG	110	DTE	Signal Quality Detect	21
CE	125	DTE	Ring Indicator	22
CH/I	111/2	DCE	Data Rate Select	23
DA	113	DCE	External Transmit Clk	24
		DCE	Busy	25

For DCE read Modem and for DTE read Terminal.

=====
Centronics/Parallel Interface

Signal		36 way connector	IBM 25 way connector	To
Data Strobe	1			Printer
Data Bit 1-8	2-9		2-9	Printer
Acknowledge	10	10		Computer
Busy	11	11		Computer
Paper End	12	12		Computer
Select	13		13	Computer
AutoFeed	14 (may be Gnd)		14	Printer
OSCXT	15			
Logic Gnd	16			
Chassis Gnd	17			
+5	18			
Data Strobe Gnd	19			
Data Bit Gnds	20-27		18-25	
Acknowledge Gnd	28			
Busy Gnd	29			
Input Prime Gnd	30			
Input Prime	31	16		Printer
Fault	32	15		Computer
Unassigned	33-35			
Select Input	36		17	Printer

--
David Wilson +61 42 213802 voice, +61 42 213262 fax
Dept Comp Sci, Uni of Wollongong david@cs.uow.edu.au
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!caen!dmag
From: dmag@engin.umich.edu (Daniel Demaggio)
Newsgroups: comp.sys.apple2
Subject: Re: Super Serial Card Usage
Date: 2 Apr 1994 01:29:55 GMT
Organization: University of Michigan Engineering, Ann Arbor
Lines: 188
Distribution: world
Message-ID: <2nihqjINN7dr@srvr1.engin.umich.edu>
References: <1994Mar30.182757.14280@muug.mb.ca>
NNTP-Posting-Host: ga.engin.umich.edu
Keywords: Apple2 Serial

In article <1994Mar30.182757.14280@muug.mb.ca> krussell@muug.mb.ca (Kirk Russell) writes:

```
> I have a Super Serial Card for my AppleII+, but have lost the
> documentation :(
```

The following is archived in /pub/apple2/hardware on
apple2.archive.umich.edu: (The original info was stolen off the net)

Name: Apple SSC
 Type: Super Serial Card

Short description:

The SSC gives the Apple][a serial port (RS232). Up to 19200 baud are possible. Full handshake is supported.

Installation:

The card plugs into Slot 1, 2 or 3 of the Apple. Slot 1 is usually for a serial printer (Imagewriter), Slot 2 for a modem and Slot 3 for a terminal.
 The DB25 connector goes to the printer/modem/terminal line, the 10-pin connector on the other side of the cable goes into the cable socket at the rear side of the card.

Jumper settings:

The card has two jumpers and a additional jumper block.
 The jumper block can be installed two ways:

- 1) Arrow pointing towards the word TERMINAL
- 2) Arrow pointing towards the word MODEM

Jumpered as MODEM, it will wire thru, jumpered as TERMINAL, it will twist 2-3, 4-5 and 6-20 (called null modem).
 The jumper switches are called SW1 and SW2, the switches are numbered SW1-1 to SW1-7 and SW2-1 to SW2-7 from left to right.

SW1-1	SW1-2	SW1-3	SW1-4	
off	off	off	off	19200 baud
off	off	off	on	9600 baud
off	off	on	off	7200 baud
off	off	on	on	4800 baud
off	on	off	off	3600 baud
off	on	off	on	2400 baud
off	on	on	off	1800 baud
off	on	on	on	1200 baud
on	off	off	off	600 baud
on	off	off	on	300 baud
on	off	on	off	150 baud
on	off	on	on	135 baud
on	on	off	off	110 baud
on	on	off	on	75 baud
on	on	on	off	50 baud
SW2-1	off	2 stopbits		
SW2-1	on	1 stopbit		
SW2-2	off	no delay on carriage return		
SW2-2	on	1/4 sec delay		
SW2-3	SW2-4			
off	off	132 chars/line, apple screen off		
off	on	80 chars/line, apple screen off		
on	off	72 chars/line, apple screen off		
on	on	40 chars/line, apple screen on		
SW2-5	off	no line feed after carriage return		
SW2-5	on	line feed		

```

SW2-6 off          ignore interrupts
SW2-6 on           generate interrupts

SW1-7 on and SW2-7 off  pin 4 or 20 (clear to send)
SW1-7 off and SW2-7 on  in 19 (secondary clear to send)

```

```

From
caen!batcomputer!munnari.oz.au!metro!news.cs.uow.edu.au!news.cs.uow.edu.au!not-
for-mail Thu Sep 23 21:59:45 EDT 1993
Article: 62305 of comp.sys.apple2
Path:
caen!batcomputer!munnari.oz.au!metro!news.cs.uow.edu.au!news.cs.uow.edu.au!not-
for-mail
From: david@wraith.cs.uow.edu.au (David E A Wilson)
Newsgroups: comp.sys.apple2,misc.wanted,comp.sys.ibm.pc.hardware
Subject: Re: ** WANTED: PINOUTS....Please read!
Date: 17 Sep 1993 09:53:10 +1000
Organization: University of Wollongong, NSW, Australia.
Lines: 71
Message-ID: <27au96$zio@wraith.cs.uow.edu.au>
References: <bitzm.361.2C964727@columbia.dsu.edu>
NNTP-Posting-Host: wraith.cs.uow.edu.au
Xref: caen comp.sys.apple2:62305 misc.wanted:32415 comp.sys.ibm.pc.hardware:80049

```

bitzm@columbia.dsu.edu (MICHAEL BITZ) writes:

```

>Hello. I am in need of a list of pin configurations for the following ports:
>* Centronics parallel printer (such as a Panasonic KX-P1123, etc)
>* Standard RS-232 Serial port
>* Laser 128 Parallel printer port (15-pin)
>* Laser 128 Serial modem port (5-pin round)

```

The Laser pinouts would require a Laser manual (which I do not have).
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from CommsWare and in the data section at the back we find:

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EIA	CCITT	To	Description	Pin number
RS-232	V.24			
AA	101		Frame Ground	1
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BB	104	DTE	Receive Data	3
CA	105	DCE	Request To Send	4
CB	106	DTE	Clear To Send	5
CC	107	DTE	Data Set Ready	6
AB	102		Signal Ground	7
CF	109	DTE	Data Carrier Detect	8
			+Test Voltage	9
			-Test Voltage	10
			Unassigned	11
SCF	122	DTE	2nd Data Carrier Detect	12
SCB	121	DTE	2nd Clear To Send	13
SBA	118	DCE	2nd Transmit Data	14
DB	114	DTE	Transmit Clock (DCE)	15
SBB	119	DTE	2nd Receive Data	16
DD	115	DTE	Receive Clock (DCE)	17

		DCE	Receiver Dibit Clock	18
SCA	120	DCE	2nd Request To Send	19
CD	108.2	DCE	Data Terminal Ready	20
CG	110	DTE	Signal Quality Detect	21
CE	125	DTE	Ring Indicator	22
CH/I	111/2	DCE	Data Rate Select	23
DA	113	DCE	External Transmit Clk	24
		DCE	Busy	25

For DCE read Modem and for DTE read Terminal.

=====
Centronics/Parallel Interface

Signal	36 way connector	IBM 25 way connector	To
Data Strobe	1	1	Printer
Data Bit 1-8	2-9	2-9	Printer
Acknowledge	10	10	Computer
Busy	11	11	Computer
Paper End	12	12	Computer
Select	13	13	Computer
AutoFeed	14 (may be Gnd)	14	Printer
OSCXT	15		
Logic Gnd	16		
Chassis Gnd	17		
+5	18		
Data Strobe Gnd	19		
Data Bit Gnds	20-27	18-25	
Acknowledge Gnd	28		
Busy Gnd	29		
Input Prime Gnd	30		
Input Prime	31	16	Printer
Fault	32	15	Computer
Unassigned	33-35		
Select Input	36	17	Printer
--			
David Wilson		+61 42 213802 voice, +61 42 213262 fax	
Dept Comp Sci, Uni of Wollongong		david@cs.uow.edu.au	

Hey I just happen to have my Apple II SSC Installation and Operating Manual with me.

On page 98, under the section called Connector Pin Assignment:

10-pin header	DB-25 Connector	Signal name
1	1	Frame Ground
2	2	Transmit Data (TXD)
3	3	Receive Data (RXD)
4	4	Request to Send (RTS)
5	5	Clear to Send (CTS)
6	6	Data Set Ready (DSR)
7	19	Secondary Clear to Send (SCTS)
8	7	Signal Ground
9	20	Data Terminal Ready (DTR)
10	8	Data Carrier Detect (DCD)

--

dmag@umich.edu | When laws are outlawed, | Ono-Sendai: the best
Dangerous Dan | only outlaws will have laws. | Sim Stim decks

E N D O F F I L E
pinouts
E N D O F F I L E

FILE : power.fix

Created : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
File Type: "TEXT" File Creator: "LMAN"
File Size: 1169 bytes 1 KB
#####

Path:

news.uiowa.edu!news.uiowa.edu!uunet!inl.uu.net!newsfeed.internetmci.com!tank.news.pipex.net!pipex!dispatch.news.demon.net!demon!mail2news.demon.co.uk!toshibai.demon.co.uk

From: Mike Smith <mikes@toshibai.demon.co.uk>

Newsgroups: comp.sys.apple2

Subject: Re: Power supply for Apple GDSII

Date: Tue, 29 Aug 1995 08:44:50 GMT

Organization: None

Lines: 16

Message-ID: <479083031wnr@toshibai.demon.co.uk>

References: <DDz24q.720@actrix.gen.nz> <817049950wnr@toshibai.demon.co.uk>

Reply-To: mikes@toshibai.demon.co.uk

X-NNTP-Posting-Host: toshibai.demon.co.uk

X-Broken-Date: Tuesday, Aug 29, 1995 08.44.50

X-Newsreader: Newswin Alpha 0.7

David, thank you for the reply.

I found the problem this weekend, there was a 100k bias resistor in the front end of the inverter. The resistor was open circuit. Sympton was that one of the elctrolytic capacitors was at 260 volt & the other was at 30 volt. When running correctly they are both at same voltage (approx 140 volt) and within the 200 volt working rating of the capacitor.

For information, from my memory, its a 6 pin molex type connector.

Thank you for your comment.

-- Best Regards, Mike Smith=====

E N D O F F I L E
power.fix
E N D O F F I L E

```
#####
### FILE      : power.plug
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1214 bytes   1 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path: news.uiowa.edu!chi-
news.cic.net!newsfeed.internetmci.com!howland.reston.ans.net!agate!ames!waikato!co
mp.vuw.ac.nz!actrix.gen.nz!dempson
From: dempson@atlantis.actrix.gen.nz (David Empson)
Subject: Re: Dying GS power supply?
Message-ID: <DIMKEH.Iwt@actrix.gen.nz>
Sender: news@actrix.gen.nz (News Administrator)
Organization: Actrix - Internet Services
Date: Sun, 26 Nov 1995 00:37:26 GMT
References: <48ubla$52f@gap.cco.caltech.edu> <49lntp$jqa@newsbf02.news.aol.com>
<497q68$413@gap.cco.caltech.edu>
X-Nntp-Posting-Host: atlantis.actrix.gen.nz
Lines: 22
```

In article <497q68\$413@gap.cco.caltech.edu>, Nathan Mates <nathan@cco.caltech.edu> wrote:

>
> Now, if someone could post the pinouts for the GS motherboard's
> connector, I can pull out my soldering iron and go about putting a
> better power supply on it.

```
7  -5V          0.25 A
6  -12V         0.25 A
5  +12V         1.0 A
4  +5V          4.0 A
3  No connection
2  GND
1  GND
```

The pins are numbered as above when you are sitting in front of the computer, i.e. 7 is closest to the back of the motherboard.

```
--
David Empson
dempson@actrix.gen.nz
Snail mail: P.O. Box 27-103, Wellington, New Zealand
```

```
##### E N D O F F I L E
### power.plug
##### E N D O F F I L E
```

```
#####
### FILE      : power.problems
#####
### Created   : Friday, October 10, 1997 Modified: Friday, October 10, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 6515 bytes   6 KB
#####
```

Path:

```
newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!newsrelay.iastate.edu!vixen.cso.
uiuc.edu!howland.erols.net!news2.digex.net!digex!swbell!not-for-mail
From: Rubywand <rubywand@swbell.net>
Newsgroups: comp.sys.apple2
Subject: Re: Power supplies
Date: Wed, 08 Oct 1997 17:37:51 +0000
Organization: Southwestern Bell Internet Services, Richardson, TX
Lines: 136
Message-ID: <343BC4EF.7019@swbell.net>
References: <97281.113842JCA31@MAINE.MAINE.EDU>
NNTP-Posting-Host: ppp-207-193-16-54.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Trace: nnrpl.rcsntx.swbell.net 876353636 3807 (None) 207.193.16.54
X-Complaints-To: usenet@nnrpl.rcsntx.swbell.net
X-Mailer: Mozilla 2.02E (Win16; I)
```

JCA31@MAINE.MAINE.EDU writes ...

```
>
> I now have in my possession several II's that have dead power supplies.
> ....
>
> Since they all seem to be the same design, and about the same age, i'm
> suspicious that there's something that typically goes wrong in these
> beasties. If anyone can provide hints on what that might be, not only
> could i repair the supplies (and thus the machines) i do have, but when
> the others inevitably go, it won't be an irreversible loss.
> ....
```

Maybe my earlier email got lost; so, just in case, below is a kind of general purpose fix-it guide ...

First, it's a good idea to check for shorting caused by Coke spills etc. Open the case and look for gunk on the motherboard and power supply. If everything looks okay, fine. If not clean away the mess. After cleaning (and drying), turn ON the power to see if the problem is fixed.

Bad or Cross-socketed Slot Card

Pull all cards from Slots and turn ON power. If the machine 'comes alive' one or more of your cards may have a short or may have been cross-socketed. Clean the contacts on each card (e.g. with alcohol). With power OFF, replug a card (be sure to line-up card and Slot contacts) and turn ON power. Do this for each card. If a card causes the machine to fail, it is, probably messed up. If no card produces a failure the original problem was, likely, a card which was not properly inserted.

Bad Power Cord

Unplug and replug the power cord at the point where it connects to the IIe. Turn ON power. Try wiggling the power cord. If the Power Supply comes ON at any time, try substituting a power cord from a known-working IIe. If this fixes the problem, you can be pretty sure that the problem was a power cord with a broken wire.

Poor Power Supply Connector Connection

Unplug and re-plug the Power Supply cable to the motherboard. Turn ON power. If the machine seems to respond, or responds when the connector is wiggled, you probably have a dirty or loose connection.

Clean the power supply plug and socket with an alcohol swab. Using long-nosed pliers slightly re-crimp the 'holes' on the socket (or, insert a jeweler's screwdriver into the space between each hole and the plastic casing and twist). The idea is to restore a firm grip for all contacts.

Another possibility is a loose or broken socket solder connection to the motherboard. The repair is to remove the motherboard and re-solder the connections to the socket.

Bad Switch

It is fairly easy to identify a bad switch-- it will, usually, not snap cleanly into position, feel crunchy, and/or have a burn spot. The repair is to replace the switch with some AC power switch that will fit. Or, you can permanently connect the switched lines and add an in-line switch to the power cord.

Blown Fuse

Some power supplies may have a fuse. Open the power supply. Look for a fuse mounted to the circuit board. If there is one, check it. An Ohm meter can be used to check for continuity if it is not obvious that the fuse is blown. If the fuse is blown, replace it.

Bad "Globar" Element

Look toward the end where the power cord is connected. Somewhere close to the place where wires from the switch go to the circuit board there should be a small disk-shaped component which is not a disk capacitor. Probably, it will be black with no markings. This is a "globar" resistor. Check it to be sure that it is not cracked and that both leads are really connected to the disk.

If the globar element is broken or if a lead has popped off, you will need to get a replacement from an electronics supply shop. (Tell the shop person where the globar resistor comes from and describe its size.)

Blown Electrolytic Capacitor(s)

On the end of the circuit board near the Switch are some relatively large electrolytic capacitors (typically these are tubular aluminum things with shrink-wrapped grey or light-green covers on which there are markings). Usually, they are the same size and have the same uF value and Voltage rating. One (or more) of these may be obviously blown or may just show some

slime near the base.

If you find something like this, the suspect capacitor should be replaced by one of the same (or slightly larger) uF value with the same (or larger) Voltage rating. Size and shape are, also, important in order to get a good fit.

When removing the bad cap, be sure to mark the "+" side on the board-- use the markings on the cap's cover to identify the "+" side. Install the replacement cap with its "+" lead in the marked hole.

Messed-up or 'Dirty' Adjustment

The power supply may have a mini-potentiometer mounted on the circuit board for fine-tuning voltage output. Usually, it will be somewhere near the end opposite the Switch and will have a slotted plastic 'knob'.

If there is such an adjustment, mark its current position and, then, turn it back and forth. (If you have some Radio Shack, etc. 'Circuit Cleaner', into the mini-pot first is a good idea.)

Set the adjustment a bit to one side of the original setting and plug in the power supply. If it now seems to work the problem was a 'dirty' voltage adjustment control.

Check the voltage on the +5V line with a meter and adjust it to 5 Volts. (Note: no output due to a dirty adjustment control seems unlikely. Incorrect output is more probable; and, this could cause a IIe to not work.)

Beyond the above, you are, most likely, looking at a bombed electrolytic capacitor which is not obviously bad or a blown main power transistor (the big silvery thing mounted on a heatsink). Unless you enjoy more involved electronic testing and repair work, your best course is, probably, to get a replacement power supply.

Rubywand

```
##### E N D O F F I L E
### power.problems
##### E N D O F F I L E
```

```
#####
### FILE      : power.supply
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3826 bytes   3 KB
#####
```

Path:

blue.weeg.uiowa.edu!news.uiowa.edu!uunet!tcsi.tcs.com!agate!msuinfo!harbinger.cc.m
onash.edu.au!yarrina.connect.com.au!werple.apana.org.au!boombox.apana.org.au!tlp!p
eterm

From: peterm@tlp.apana.org.au (Peter Maloney)
Newsgroups: comp.sys.apple2
Subject: Re: IIE power supply problems
Message-ID: <JVg1Rclwl65w@tlp.apana.org.au>
Date: Fri, 02 Sep 94 16:53:18 PDT
References: <1994Aug31.162618.1101@sandia.gov>
Organization: The Lower Planes BBS
Lines: 45

kjhass@sandia.gov (Joe Hass) writes:

```
>
> Wizards of the Net:
>
> I'm trying to help a local elementary school keep their IIE's running and
> have found what appears to be a bad power supply.
>
> The machine will boot properly when it's warm but the power supply won't
> come up if it's cool. When it's cool the +5 output is at about 1.1V, the
> -5 is at about -1.1V and the +/- 12V outputs are proportionately low.
> Sometimes, if it's not too cool, the voltages will slowly rise and then
> the supply will suddenly come to life and be fine. I know it's the supply
> and not the motherboard because I've swapped them with another machine,
> and I've tried heating the supply alone with a hair dryer. Also, when the
> supply is cool but disconnected from the motherboard the positive voltages
> are about 1% above nominal and the negative voltages are about 10% more
> positive than nominal.
>
> I can't see any cold solder joints or obviously bad components. The
> machine is of 1985 vintage and the supply was made by Astech.
>
> Any diagnostic suggestions would be appreciated, as well as pointers to
> a low-cost vendor for a new supply. I'm an EE so I have a passing
> familiarity with switching power supplies, but I don't have the schematics
> for this guy.
>
> TIA,
> Joe
>
> --
> Joe Hass          | library clever_sigs;          | My opinions are my o
> kjhass@sandia.gov | use rock_and_roll.verses.ALL; | not Sandia's and
> Sandia National Labs | use lineprinter.art.ALL;      | not the DOE's
```

This problem is usually caused by a failed capacitor (220uf/16V?)

that sits near the big power transistor. Test it by warming it up before you power on.

Regds,
Peter M.

peterm@tlp.apana.org.au
Peter Maloney
A2 Hardware Freak

TLP - The only *REAL* A2 BBS in
Melbourne

Path: blue.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!usc!bloom-beacon.mit.edu!senator-bedfellow.mit.edu!pbauer
From: pbauer@ATHENA.MIT.EDU (Paul H Bauer)
Newsgroups: comp.sys.apple2
Subject: Apple II Power Supplies
Date: 28 Nov 1994 04:09:04 GMT
Organization: Massachusetts Institute of Technology
Lines: 21
Message-ID: <3bbl50\$2lj@senator-bedfellow.MIT.EDU>
NNTP-Posting-Host: puttanesca.mit.edu

For those of you that have had power supply problems!

This week-end I decided to clean up my work bench and either repair or throw out a few AII power supplies I had in various states of disrepair. I made an interesting discovery on two supplies, one an aztec (?) unit, and the other a dead unit from a late model platinum 2e. The supply from the platinum unit was dead. After checking almost all of the semi-conductors and finding them good I finally started looking at the resistors and found a 100k 1 watt unit that kick starts the supply was open. Replacing this resistor fixed the supply. I then looked at the aztec unit. This unit woul sometimes start but most of the time it would not. I looked at the same resister (R3) which is a 150k 1 watt resister. I changed this to a 100k 1 watt unit and the supply works like a champ.

If you have a dead supply you might check these resisters as they could be the culprit. The resister goes from the + rectified line side to low voltage oscillator that drives the power switching transistor.

pbauer@mit.edu

E N D O F F I L E
power.supply
E N D O F F I L E

```
#####
### FILE      : power.supplyfix
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2454 bytes   2 KB
#####
```

```
Path: blue.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!usc!howland.reston.ans.net!agate!msuinfo!harbinger.cc.monash.edu.au!news
.cs.su.oz.au!metro!obl.uws.edu.au!lancelot.st.nepean.uws.edu.au!adrianw
From: adrianw@guinevere.st.nepean.uws.edu.au (Adrian Whichello)
Newsgroups: comp.sys.apple2
Subject: Re: Apple II+ power supply woes
Date: 13 Aug 1994 17:09:31 +1000
Organization: University of Western Sydney
Lines: 40
Message-ID: <adrianw.776761728@lancelot.st.nepean.uws.edu.au>
References: <adrianw.776562249@lancelot.st.nepean.uws.edu.au>
NNTP-Posting-Host: 137.154.148.15
Keywords: power supply woes
```

adrianw@kay.st.nepean.uws.edu.au (Adrian Whichello) writes:

>Hi Netland

>I have an old 2+ which runs the model railway, among other things.
>Last week it's power supply gave up. I wasn't there at the time,
>I've found that leaving the computer permanently switched on is
>good insurance - the power supplies tend to die between cycles if
>eft off for long periods. Anyway, I opened it up and found that
>an electrolytic had swelled up so much that it had torn it's connections
>out of the circuit board. I replaced it, but all the power supply
>wants to do now is go click click click ie it won't oscillate
>properly. It does this if plugged into the motherboard or not.
>Any suggestions about what else could be wrong. I'm not wild
>about diving into a circuit that is connected directly to the
>house supply without some clues.

>Adrian.

>ps surely this must be a FAQ by now - I have several old supplies
>that are dead for one reason or another.

Hi Netland

had a go at the power supply over the weekend. I was successful, because I typed this on the Apple. There was nothing wrong with the bridge rectifier and input side - there was over 300V on the collector of the big transistor. None of the inductors had burnt out and all the diodes and transistors checked out OK with a simple multimeter check. In fact nothing looked wrong at all, physically. There was just hardly any (~0.5VDC) voltage on the output side. I was getting desperate! I decided to check out the voltage reference section - I faked 5VDC (from the bench power supply) on the anode of the TL-431C and up came the power! So then the penny dropped, the capacitor the temporarily shorts out the 4.7K 1% resistor at power on wasn't doing it's job. I replaced it and away we went, all systems go. Anyone else found this?

Adrian.

```
##### E N D   O F   F I L E  
### power.supplyfix  
##### E N D   O F   F I L E
```

```
#####
### FILE      : powerfix.cap
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2343 bytes   2 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!newsfeed.internetmci.com!news.sprintlink.net!herm
es.is.co.za!news.pix.za!digitec!stephen.shaw
From: stephen.shaw@digitec.co.za (STEPHEN SHAW)
Newsgroups: comp.sys.apple2
Subject: My //e fails to turn on!
Message-ID: <8B8A08A.02210015A8.uuout@digitec.co.za>
Date: Thu, 11 Jan 96 02:18:00 +0200
Distribution: world
Organization: Digitec Online - South Africa
Reply-To: stephen.shaw@digitec.co.za (STEPHEN SHAW)
X-Newsreader: PCBoard Version 15.22
X-Mailer: PCBoard/UUOUT Version 1.20
Lines: 41
```

Hello Alberto!

On 01/02/96, Alberto Roffe wrote to All:

```
AR> I am having some problems with my Apple //e! It fails to turn on! I
> have to turn its power switch on and off several times and sometimes
> wait a long time till it finally powers up!
```

Are you using an uninterruptable power supply (UPS). The output should be sine wave but some components in them change with age giving a square wave that Apple power supplies don't like.

```
AR> What could be the problem? The power supply? Would replacing it solve
> the problem?
> Someone suggested me that the power switch might be wearing off so I
> decided to leave the computer turned on and just turn off the
> regulator where I connect the computer and all its peripherals but the
> problem persists! So that can't be the problem, or can it?
```

If you open the power supply up (WITH THE MAINS PLUG OUT!) you will find a capacitor C7 near the transformer in the middle of the printed circuit board (a 220 uF 16V capacitor if I remember correctly) change it for a 220uF 25V 85 degree Centigrade rated capacitor and it should clear the problem up.

```
AR> I also checked the computer's power cord at both ends, connecting and
> disconnecting it several times without success, and I checked inside
> the computer; the power supply seems properly connected to the
> motherboard. Thanks for any advice.
```

```
AR> -----
> ----- Alberto Roffe Illades           You never know what you
> have Roffe@delphi.com                   until you lose it
> -----
```

> -----

* 2qwk! 2.0 * Insomnia isn't anything to lose sleep over!

```
##### E N D O F F I L E  
### powerfix.cap  
##### E N D O F F I L E
```

```
#####
### FILE      : powerglove
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3004 bytes   2 KB
#####
```

Path:

```
news.uiowa.edu!uunet!in2.uu.net!usc!news.cerf.net!mvb.saic.com!news.mathworks.com!
newsfeed.internetmci.com!swrinde!sdd.hp.com!vixen.cso.uiuc.edu!ux7.cso.uiuc.edu!ta
ubert
```

From: taubert@ux7.cso.uiuc.edu (Derek Anthon Taubert)

Newsgroups: comp.sys.apple2

Subject: Re: Power Glove quest...

Date: 21 Nov 1995 21:02:49 GMT

Organization: University of Illinois at Urbana

Lines: 61

Message-ID: <48tepp\$58b@vixen.cso.uiuc.edu>

References: <48e3ej\$did@terrazzo.lm.com>

NNTP-Posting-Host: ux7.cso.uiuc.edu

mportune@telerama.lm.com (Matt Portune) writes:

```
>Well, I found a bunch of text on the web concerning hooking up a power
>glove to a PC, but what fun is that? BORING. I could have sworn I once
>saw something with the GS. So, if anybody can help me with this, I'd be
>grateful! Here is what I snagged from one of the sites...
```

Matt seems to have brought me out of lurk mode by sending me some e-mail, so here goes. I wrote the chessy little "driver" for the GS that lets you use the joystick as an alternate mouse (JoyMouse or something like that). It was actually the first GS specific program I ever wrote, and since I didn't have an assembler at the time, I hand coded it and bsaved it (it isn't in OMF format). Then I wrote an init in TML Pascal to load the thing.

Somewhere in the docs for that I must have mentioned my work on a power glove driver. I never did get around to finishing it, but I have a folder here of misc 65816 code and schematics needed to make it all work.

```
>Now, can this be easily rigged to the GS joystick (db9) port? I'm dying
>to do this. Thanks for any help!
```

No, but you can rig it up to the internal port and use the annunciators and button inputs to communicate with it. Unfortunately, I never pursued it enough to learn how to communicate with it in a "raw" mode to get X-Y-Z info from it, I just know how to use it like a regular Nintendo joystick.

The standard nintendo connector looks like this:

```
          o1 - Ground
+5 volts - o7  o2 - Data clock
          NC - o6  o3 - Latch
          NC - o5  o4 - Data out
```

So, from the I/O port, hook up +5V (pin 1) and GND (pin 8), connect SW2 (pin 4) to Data out, ANN1 (pin 14) to Data clock, and ANN0 (pin 15) to Latch.

Then you can use this Applesoft (I know, eww) program to read the data back

from whatever Nintendo controller you wish.

```

10 REM Set latch to 0 and clock to 1
20 POKE 49240,0
30 POKE 49243,0
40 TEXT : HOME
50 VTAB 12
60 POKE 49241,0: POKE 49240,0
70 FOR A = 1 TO 8
80 D(A) = INT ( PEEK (49251) / 128)
90 POKE 49242,0: POKE 49243,0
100 NEXT A
110 FOR A = 1 TO 8
120 PRINT D(A);" ";
130 NEXT A
140 PRINT
150 GOTO 50

```

That should be enough to get you started. Enjoy, let me know what you come up with...

Derek Taubert		
taubert@uiuc.edu		Ask me about TCP/IP for the Apple IIgs!
http://www.ceg.uiuc.edu/~taubert		Really, I'm serious!
FAX:(217) 359-0010		
GS/TCP info: http://www.winternet.com/~taubert/gstcp.html		

```

##### E N D O F F I L E
### powerglove
##### E N D O F F I L E

```

```
#####
### FILE      : powersuppley.caps
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 865 bytes    1 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path: news.uiowa.edu!chi-
news.cic.net!newsfeed.internetmci.com!inl.uu.net!usc!newshub.cts.com!crash!pro-
palmtree!jpoore
From: jpoore@pro-palmtree.cts.com (James Poore)
Subject: Re: Apple IIe malfunctions! Help?
Organization: The Palmtree BBS - 310/453-8726 - Santa Monica, CA
Date: Sat, 27 Jan 96 12:15:58 PST
Message-ID: <ar45656@pro-palmtree.cts.com>
In-Reply-To: drissman@detroit.freenet.org (Avi Drissman)
Lines: 13
```

That problem that you talk about is a classic power-supply problem. The filter capacitors off the line rectifier are going south. These capacitors are the largest tubular devices in the power supply. There are most likely 2 of them. Damage estimate...about \$2.50 to \$5.00 a piece. The values are something like 680 Mf @ 200 VDC.

Jim

```
-----
The Palmtree BBS 310-453-8726 v.32
Inet: jpoore@pro-palmtree.cts.com
```

```
##### E N D O F F I L E
### powersuppley.caps
##### E N D O F F I L E
```


FILE : powersupply.fix

Created : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
File Type: "TEXT" File Creator: "LMAN"
File Size: 996 bytes 1 KB
#####

Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!usenet.ins.cwru.edu!cleveland.Freenet.Edu!co057
From: co057@cleveland.Freenet.Edu (Steven H. Lichter)
Newsgroups: comp.sys.apple2
Subject: Re: Power Supply Problems. HELP!
Date: 8 Apr 1994 14:50:33 GMT
Organization: Case Western Reserve University, Cleveland, Ohio (USA)
Lines: 10
Message-ID: <2o3qvp\$s22@usenet.INS.CWRU.Edu>
NNTP-Posting-Host: nextsun.ins.cwru.edu

90% of the problem with the power supply is the low end diode that
was used. Replace that and you have a good power supply, but make
sure it is rated higher and also know what you are doing or have
them fixed by someone who does.

--

| --- Sysop: Apple Elite II --- an Ogg-Net Hub BBS |
| (909) 359-5338 12/24/96/14.4 V32/V42bis |

E N D O F F I L E
powersupply.fix
E N D O F F I L E

```
#####
### FILE      : powersupply.test
#####
### Created   : Wednesday, October 13, 1999   Modified: Wednesday, October 13, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3602 bytes   3 KB
#####
```

```
Path:
news1.icaen!news.uiowa.edu!news.physics.uiowa.edu!hammer.uoregon.edu!newsfeed.dire
ct.ca!su-news-
hub1.bbnplanet.com!news.gtei.net!cyclone.pbi.net!151.164.30.35!cyclone.swbell.net!
typhoon01.swbell.net.POSTED!not-for-mail
Message-ID: <38045325.DFA8B0E5@swbell.net>
From: Rubywand <rubywand@swbell.net>
Reply-To: rubywand@swbell.net
X-Mailer: Mozilla 4.51 [en] (Win95; U)
X-Accept-Language: en
MIME-Version: 1.0
Newsgroups: comp.sys.apple2
Subject: Re: power supplies
References: <3803BAEC.7B0C1599@c-creative.com>
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
Lines: 56
Date: Wed, 13 Oct 1999 04:38:45 -0500
NNTP-Posting-Host: 207.193.9.73
X-Complaints-To: abuse@swbell.net
X-Trace: typhoon01.swbell.net 939807506 207.193.9.73 (Wed, 13 Oct 1999 02:38:26
PDT)
NNTP-Posting-Date: Wed, 13 Oct 1999 02:38:26 PDT
Organization: SBC Internet Services
Xref: news1.icaen comp.sys.apple2:153351
```

```
tb writes ...
>
> how can you tell if your power supply is bad?
....
```

Aside from a completely 'dead' machine, one quick indicator of a defunct power supply may be the absence of some sound-- like you hear no high-pitched whine-- when power is turned ON.

Unusual sounds can indicate a short (you may hear clicks) or no-load from a broken or bad connection (you may hear clicks and/or squealing). Before declaring a power supply dead it's a good idea to check for things like a poor power supply connector connection, a blown ON/OFF switch, and an AC line cord which has developed a break.

One approach to checking is to measure voltages in the computer or whatever is supposed to be powered by the power supply.

For example, in an Apple IIe, you could turn ON the computer and check voltages across a few 74xxxx series IC's-- like a 74LS02, 74LS139, etc.. Your Voltmeter's Positive lead would touch pin 14 (on 14-pin 74xxxx IC's) and Negative would go to pin 7 (again, on 14-pin 74xxxx IC's). The reading should be 5 Volts DC.

If the reading is below 4.8V (and your Voltmeter reads accurately), you are into 'problem' territory. Possibly, the power supply is being overloaded by Slot cards; or, it may have developed a defect.

A different approach is to disconnect the power supply from whatever it's powering. Connect or clip on a load-- like, say, a 20 watt 3 Ohm resistor-- from +5V to GND and measure Voltage across where the clips connect to the power supply. (3 Ohms connected with good heavy clips will draw about 1.7 Amps.) If the power supply is a typical Apple II power supply it should have no problem delivering +5V into this sort of load.

Note: In general, you want to measure output as close to the power supply as possible. Clips often introduce resistance and so measuring across the load resistor could indicate a falsely low output.

Note: Switching power supplies should not be turned ON with no load. Something like at least 10% of rated load should be connected across the the high-current output (usually +5V) whatever other outputs you are checking. For an Apple II power supply, this would be something like a 20 watt 10 Ohm resistor. For larger switching power supplies such as used in a PC, you may need to place a load across other outputs, too. (Usually, for a computer power supply, this would be the +12V output.)

A really good load test needs to pull current reasonably close to the rated output of the power supply for the Voltage leads you are checking. Like, for a power supply rated at 4 Amps on the +5V output, you would want something like a 1.5 Ohm load connected from the +5V output to GND.

Rubywand

```
##### E N D O F F I L E
### powersupply.test
##### E N D O F F I L E
```

```
#####
### FILE      : powersupplyfix.resistors
#####
### Created   : Sunday, January 14, 1996  Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1378 bytes   1 KB
#####
```

```
Path: news.uiowa.edu!chi-
news.cic.net!news.uoregon.edu!news.emf.net!overload.lbl.gov!news.kreonet.re.kr!use
net.kornet.nm.kr!ames!news.tulane.edu!darwin.sura.net!spool.mu.edu!bloom-
beacon.mit.edu!senator-bedfellow.mit.edu!pbauer
From: pbauer@athena.mit.edu (Paul H Bauer)
Newsgroups: comp.sys.apple2
Subject: Re: IIGS power supply
Date: 17 Nov 1995 01:24:08 GMT
Organization: Massachusetts Institute of Technology
Lines: 27
Message-ID: <48go7o$6tu@senator-bedfellow.MIT.EDU>
References: <48dfqm$lan@madeline.INS.CWRU.Edu>
NNTP-Posting-Host: arcadia.mit.edu
```

< I recently bought a Rom 01 GS from a friend of my brother. The only
<problem with it is a bad power supply.

Greg Smith

Greg;

I have had several Apple 2e and GS power supplies that have gone south and in every case it has been a single failed resister. The resister in question is a 1/2 watt 100k resister that is approximately in the middle of the power supply board. It is a kind of starting resister for the supply and usually what happens is it probably runs hot, the reason for the 1/2 watt, andeventually opens up. You can only measure it by taking it out of the board. If I remember correctly it is the only 100k 1/2 watt resister on the supply. I would check this item first right after making sure the fuse hasn't blown.

Paul pbauer@mit.edu

```
##### E N D O F F I L E
### powersupplyfix.resistors
##### E N D O F F I L E
```

```
#####
### FILE      : pwrfix
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1013 bytes    1 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!usc!newshub.cts.com!crash!pro-palmtree!jpoore
From: jpoore@pro-palmtree.cts.com (James Poore)
Subject: Re: Apple III Power Supply
Organization: The Palmtree BBS - 310/453-8726 - Santa Monica, CA
Date: Tue, 19 Mar 96 07:48:23 PST
Message-ID: <cj28495@pro-palmtree.cts.com>
In-Reply-To: else@cray.com (Derek Else {x66676 CF/SYS})
Lines: 15
```

I am not familiar with the Apple /// Power supplies, but the following info is good for most switching supplies. Most switcher problems are capacitor related. The capacitors dry-up from heat and age and lose effectiveness. The capacitors that are the #1 failure are the raw DC filters at input from the AC line. These are the largest tubular devices in the power supply. There are usually 2 of these with a value of 470 mf 200 volt or similar. Changing these will usually clear up the problem.

Jim

```
-----
The Palmtree BBS 310-453-8726 v.32
Inet: jpoore@pro-palmtree.cts.com
```

```
##### E N D O F F I L E
### pwrfix
##### E N D O F F I L E
```

```
#####
### FILE      : pwrsppl.leads
#####
### Created   : Friday, October 3, 1997   Modified: Friday, October 3, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 8051 bytes   7 KB
#####
```

```
Path: news.uiowa.edu!iagnet.net!205.197.247.129!digex!news2.digex.net!swbell!not-
for-mail
From: Rubywand <rubywand@swbell.net>
Newsgroups: comp.sys.apple2
Subject: Power Supply Mods Kit (was Re: Apple IIgs upgrades)
Date: Fri, 03 Oct 1997 09:28:03 +0000
Organization: Southwestern Bell Internet Services, Richardson, TX
Lines: 169
Message-ID: <3434BAA3.1DD2@swbell.net>
References: <34340450.38B8@home.com>
NNTP-Posting-Host: ppp-207-193-8-78.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Trace: nnrp3.rcsntx.swbell.net 875892178 17112 (None) 207.193.8.78
X-Complaints-To: usenet@nnrp3.rcsntx.swbell.net
X-Mailer: Mozilla 2.02E (Win16; I)
Xref: news.uiowa.edu comp.sys.apple2:127573
```

Jeff Tacy writes ...

```
>
> Hi all, does anyone here remember the Mac SE upgrade kit that included
> 18-ga wire, a bunch of new caps and other fun stuff, that increased the
> computer's amperage and allowed more upgrades, also fixed many problems?
> Is there anything like this for the Apple IIgs that someone has
> constructed? ....
```

Okay; here is your very own

A2-2000 On-Line Power Supply Mods Kit!

Swapping-in fat leads is, technically speaking, a pretty simple job. You pop out the power supply, open it, unsolder old +5, +12, and Ground leads, solder in the new leads, close and replace the power supply. The tricky part is what hackers call the "mechanics".

First, #12 or #14 gauge wire is not very flexible. Getting stranded wire (instead of solid) helps. Probably, #14 gauge is more than fat enough for all three leads. One case where #12 or #10 gauge may be worth the extra trouble is the +5V lead.

Use wires colored the same as those you replace. On the standard connector, the first two leads are Ground. Almost always, these are black. Next, there is a space, then, in order +5, +12, -12, -5.

Depending on the bother involved, you can unwedge the wire bundle where it passes through the supply case and remove the three old wires (+5V, +12V, and one Ground wire). Or, you can just cut away each old lead. Leave the -5V and -12V leads and one Ground lead alone.

Getting to the PS circuit board involves some work. After removing the mounting bolts, you will have to scooch up the board in order to get to the bottom side. This will be easier if the wire bundle has been unwedged.

Another hurdle is soldering to the circuit board. Once the old leads and excess solder are removed, you will probably find that the holes are too small! A jeweler's screwdriver makes a good hand drill for enlarging holes. (Drill from the circuit side. Be careful not to tear or dislodge the printed circuit.)

The new leads should be routed through the unused fan slots. (If a fan is attached, remove it. It's in the wrong place to do much good in cooling your GS.)

Note: If you have a fan mounted to the PS and you wish to keep it, then, it will be necessary to enlarge the original cable exit hole. A sheet metal "munching" tool should let you do this without having to entirely remove the PS circuit board. (Just be sure to catch all of the munched pieces!)

When routing the leads be careful not to place a twisting force on a lead where it is soldered to the circuit board.

To get to each spronger (contact) in the plug, press on it through the slot on the side near the wire end. This pushes up a small retaining tab so that pulling on the attached lead will pull out the spronger.

Cut off the old lead, clean the end, and solder on the new lead. Press the spronger back into the plug. To avoid mixups, it's best to complete the process for each lead before doing the next.

When plugging in the power supply, take time to shape and arrange the wires to minimize stress on the motherboard.

Motherboard Mod

Fatter +5, +12, and Ground leads should protect you power supply and reduce circuit noise.

If audio noise in your stereo card output and/or system bombing due to noise glitches were problems, they may be eliminated. A lot depends upon which cards you've installed, which slots they are in, and whether your IIgs is a ROM-01 or ROM-03.

The motherboard circuit traces supplying power to each Slot are fairly skimpy, especially on ROM-01 boards. A heavy power user in Slot 7 can produce significant noise up and down the entire Slot 'backplane'.

The cure is to remove the motherboard and run leads to a couple Slots
....

First, flip over the motherboard and get oriented. Below is a quickie sketch showing the Power Connector points as well as key power pins for a Slot. The view is from the Bottom with the Back of the motherboard facing you:

Bottom of Motherboard

Power Connector Socket

Slot

```

X  GND                +12V (pin 50) X   X (pin 1)
X  GND                                X   X
                                     .
X  +5V                                .
X  +12V                             .
X
X                                     X   X
                                     GND (pin 26) X   X (pin 25) +5V

```

.... Ground Plane Area (plug shields, etc. connected here)

|_____ Back Edge of Motherboard _____|

A good way to make sure you know what's where is to use an Ohm meter to check Resistance from pin 26 (GND) to a metal plug shield near the back of the motherboard. (Set your meter to Ohms X1. Touch one meter lead to pin 26 and the other to a metal plug shield. Resistance should read nearly zero. Reverse the leads and repeat the check. Again, Resistance should read nearly zero.)

Repeat the check for R between pin 26 and the GND points on the Power Connector socket. R should be nearly zero. Using a marker pen or white-out, mark pin 26 (GND) on Slots 3 and 7. Also mark the GND points of the Power Connector socket.

GND: On the bottom side of the motherboard, connect a Black #16 gauge wire from one of the Ground points of the Power Connector socket to the Ground plane area near the back of the motherboard. Run a short Black #16 gauge wire from pin 26 of Slot 3 to the Ground plane; run a short Black #16 gauge wire from pin 26 of Slot 7 to the Ground plane. (You may need to scrape through green insulating lacquer to solder to the Ground plane area.)

+5V: On the bottom side of the motherboard, connect two #16 gauge Red wires to the +5V point of the Power Connector socket. Connect the other end of one +5V Red wire to pin 25 of Slot 3; connect the other end of the second +5V Red wire to pin 25 of Slot 7.

+12V: If you have any cards which are likely to draw heavily on the +12V line, then, on the bottom side of the motherboard, run a #18 gauge White wire from the +12V point of the Power Connector socket to pin 50 of the Slot in which the card is normally located. Otherwise, just run an #18 gauge White wire from the +12V point of the Power Connector socket to pin 50 of Slot 7.

Check your connections. One quick check is that the GND and +5V wiring to Slots 3 and 7 should be Black, Red (moving left to right) and Slots 3 and 7 should 'look the same'. Any +12V wire should be on the same side of the Slot (i.e. the same column of pins) as GND. None of the wires should be connected to a middle pin on any Slot.

Notes:

1. All wires are insulated.
2. When cutting wires, allow enough slack to permit routing each wire. You want to avoid having a wire rest against pointy connections on the motherboard. Route wires away from motherboard mounting holes and around places where the bottom of the case supports the motherboard.

3. The case's bottom and back metal shields are something of a shorting hazard. Replacing the motherboard is much easier if these shields are popped out and ditched.

Once everything checks out, replace the motherboard taking care that no wires are caught between a support point and the motherboard.

Rubywand

```
##### E N D O F F I L E  
### pwrsppl.leads  
##### E N D O F F I L E
```

```
#####
### FILE      : pwrsply.fixes
#####
### Created   : Saturday, June 14, 1997   Modified: Saturday, June 14, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5412 bytes   5 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!chi-
news.cic.net!205.197.247.129!news2.digex.net!news7.digex.net!newsl.rcsntx.swbell.n
et!usenet
From: Rubywand <rubywand@swbell.net>
Newsgroups: comp.sys.apple2
Subject: Re: IIE problems. (power?)
Date: Sat, 14 Jun 1997 03:10:15 +0000
Organization: Southwestern Bell Internet Services
Lines: 94
Message-ID: <33A20B97.4207@swbell.net>
References: <866164244.648266@moon.aa.net> <33A1336D.ADF@swbell.net>
<866249990.83885@moon.aa.net>
NNTP-Posting-Host: ppp-207-193-8-216.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Mailer: Mozilla 2.02E (Win16; I)
```

G. Johnson or K. Hartman writes ...

```
>
> ....
>
> Let me rephrase my question. Some of our IIEs work and some don't. I
> use the same out let to test them. We don't have power strips for IIEs
> (no room in budget). Is it something internal? Does the power source
> need to be replaced? Are they unfixable and should be used for parts?
>
```

If "don't work" means you plug in a IIE, flip ON the power switch, and 'nothing happens', then, there are a few quickie fix tries ...

1. Open the case and check inside for indications of Coke spills, debris, etc.. If everything looks okay, continue on. If not clean away the mess; it could be causing a short. After cleaning (and drying), turn ON the power to see if the problem is fixed.

2. If there is a fuse socket, pull the fuse and check it. (If it's blown, try replacing it. If the new fuse blows, replace it, pull all Slot cards and try powering ON again. If the fuse does not blow, hop to #7 below. If the fuse blows with no cards installed your best course is, probably, to forget about repairs and get a replacement power supply.)

3. Unplug and replug the power cord at the point where it connects to the IIE. Turn ON power. Try wiggling the power cord.

4. Substitute a power cord from a known-working IIE and turn ON power.

5. Turn ON the power. Jiggle the power switch. If the machine shows signs of life, the switch is probably bad.

6. Open the case. Unplug and re-plug the Power Supply cable to the motherboard. Turn ON power. If the machine seems to respond, try cleaning the power supply plug and socket.

7. Pull all cards from Slots and turn ON power. If the machine 'comes alive' one or more of your cards may have a short or may have been cross-socketed. Clean the contacts on each card (e.g. with alcohol). With power OFF, replug a card (be sure to line-up card and Slot contacts) and turn ON power. Do this for each card. If a card causes the machine to fail, it is, probably messed up. If no card produces a failure the original problem was, likely, a card which was not properly inserted.

If the above tries get you nowhere, remove the power supply from the 'dead' machine and swap in one removed from a good machine. (Removing power supplies is pretty easy.) If the 'dead' machine now works you will know that the original power supply is, probably, bad.

IIE power supplies can be repaired. The bother involved varies considerably with the cause of malfunction. For example, it is fairly easy to identify a bad switch-- it will, usually, not snap cleanly into position, feel crunchy, and/or have a burn spot. The repair is to replace the switch with some AC power switch that will fit. Or, you can permanently connect the switched lines and add an in-line switch to the power cord.

Open the "bad" power supply. Look toward the end where the power cord is connected. Somewhere close to the place where wires from the switch go to the circuit board there should be a small disk-shaped component which is not a disk capacitor. Probably, it will be black with no markings. This is a "global" resistor. Check it to be sure that it is not cracked and that both leads are really connected to the disk. If it is broken, you will need to get a replacement from an electronics supply shop. (Tell the shop person where the global resistor comes from and describe its size.)

Look for a fuse mounted to the circuit board. If there is one, check it. An Ohm meter can be used to check for continuity if it is not obvious that the fuse is blown. If the fuse is blown, replace it. Continue as outlined in #2 above.

If the power supply has a slotted adjustment, mark its current position and, then, turn it back and forth. Set the adjustment a bit to one side of the original setting and plug in the power supply. If it now seems to work the problem is/was a 'dirty' voltage adjustment control. It's a good idea to spritz the adjustment with circuit cleaner. Check the voltage on the +5V line with a meter and adjust it to 5 Volts. (Note: no output due to a dirty adjustment control seems unlikely. Incorrect output is more probable; and, this could cause a IIE to not work.)

Beyond the above, you are, most likely, looking at a bombed electrolytic capacitor or a blown main power transistor (the big silvery thing). Unless you enjoy electronic repair work, your best course is, probably, to get a replacement power supply.

Naturally, no][hardware hacker would just dump a defective power supply unless he/she were already neck-deep in junk parts. Whether or not a bad power supply may have some value for replacement parts to a school depends upon who may be available to do repairs.

Rubywand

```
##### E N D O F F I L E  
### pwrsply.fixes  
##### E N D O F F I L E
```

```
#####
### FILE      : pwrsuppl.globar
#####
### Created   : Tuesday, September 30, 1997   Modified: Tuesday, September 30, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3264 bytes   3 KB
#####
```

Path:

```
newsl.icaen!news.uiowa.edu!iagnet.net!207.22.81.9!europa.clark.net!206.229.87.25!n
ews-peer.sprintlink.net!news-sea-19.sprintlink.net!news-in-
west.sprintlink.net!news.sprintlink.net!Sprint!151.164.1.34!swbell!not-for-mail
From: Rubywand <rubywand@swbell.net>
Newsgroups: comp.sys.apple2
Subject: Re: GS Power Supply: Warning signal?
Date: Mon, 29 Sep 1997 21:20:50 +0000
Organization: Southwestern Bell Internet Services, Richardson, TX
Lines: 54
Message-ID: <34301BB2.2415@swbell.net>
References: <60oiq6$rrjk@login.freenet.columbus.oh.us>
NNTP-Posting-Host: ppp-207-193-12-19.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Trace: nnrpl.rcsntx.swbell.net 875589387 27199 (None) 207.193.12.19
X-Complaints-To: usenet@nnrpl.rcsntx.swbell.net
X-Mailer: Mozilla 2.02E (Win16; I)
```

Dave Althoff writes ...

```
>
> Just wanted to relate my experience with GS power supply failures on
> upgraded ROM 00 GSes. My GS at work is a ROM 00 upgraded to a ROM 01. It
> is now on its third power supply
>
> ....
> Anyway, I have noticed what seems to be a warning signal when the power
> supply is about to die. ....
>
> It seems that when the power supply is about to go, the crackling becomes
> more frequent and more pronounced. .... Then, when I returned a bit later,
> the supply was dead. In fact, I cracked the thing open and there is this
> nice crunchy ceramic cap, and a couple of clearly overheated spots on the
> board.
>
> .... I thought I would pass that along in case there are GS
> users out there watching for telltale signs of power supply failure...
```

Thanks for the info.

Your GS seems to be eating power supplies. Ours is a Woz ROM-00 machine (one of the first three purchased in Houston) which went through the ROM-01 upgrade and a few motherboard swaps. It is still on the original (no internal fan) power supply, except that, before adding a Zip-GSx accelerator, 4MB RAM, etc., we fattened-up the PS leads.

If there is something odd about the line voltage at your workplace--

like it is too low or too high and/or you get frequent surges-- you may want to get an UPS. Otherwise, the thin leads on your power supply could be contributing to instability, over-currents, and failure.

You mention finding a "nice crunchy ceramic cap". Are you sure it was a cap?

A common failure point on Apple II supplies is a capacitor-looking thing called a "global". It is a disc-shaped resistance element which is in series with the AC line input. When power is turned ON, the global is cold and has a resistance of, very roughly, 50 Ohms. A second or so after turn-ON, it has heated up and its resistance drops to just a few Ohms. The idea is to limit initial surge voltages.

A global can fail quickly-- a lead pops off or the element cracks and separates; either way, the AC input line is broken and everything stops cold. Or, a global may fail slowly-- a lead connection fractures or the element develops cracks but does not separate. A slow-failing global could produce the audio noise you mention.

Anyway, try beefing-up the +5V, +12V, and one GND lead to #10 or #12 gauge. This may help save your present power supply.

Rubywand

E N D O F F I L E
pwrsuppl.global
E N D O F F I L E

```
#####
### FILE      : pwrsuppl.iie2iigs
#####
### Created   : Thursday, September 10, 1998 Modified: Thursday, September 10,
1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3501 bytes   3 KB
#####
```

Path:

```
newsl.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!nyd.news.ans.net!newsfeeds.ans.
net!news.idt.net!dcal-hubl.news.digex.net!digex!lynx.unm.edu!ben15.unm.edu!buggie
From: buggie@ben15.unm.edu (stephen e buggie)
Newsgroups: comp.sys.apple2
Subject: IIGS INTERNAL P.S.: Transplant IIE ps innards
Date: 5 Sep 1998 14:55:24 GMT
Organization: University of New Mexico, Albuquerque
Lines: 69
Message-ID: <6srjcs$8au$1@lynx.unm.edu>
NNTP-Posting-Host: ben15.unm.edu
X-Newsreader: TIN [version 1.2 PL2]
Xref: newsl.icaen comp.sys.apple2:139033
```

RESURRECTING A DEAD IIGS INTERNAL POWER SUPPLY WITH THE
MECHANISM OF A IIE INTERNAL POWER SUPPLY
=====

"One small step for an Apple one giant leap for AppleDom!"

Bugg-Power remains the BEST Apple II power supply: abundant power,
freedom from heat, reliability, low \$27 cost.

The ONLY advantage that the internal (standard IIGs or IIE) power supply
has is PORTABILITY --- if you move your computer system frequently, then
the tiny internal unit is more convenient than the external Bugg-Power,
which rests on the floor and connects via a 5 ft cable.

The problem for IIGs users is that the Apple IIGs internal units are in
short supply. But IIE power supplies are abundant (Crow Fred of
Scottsdale AZ sells IIE power supplies for just \$5 each.)

This past weekend, I successfully transplanted a working IIE power supply
mechanism into the CASING of a IIGs internal unit. IT WORKS!

PROCEDURE: Open both units. Remove the six mounting screws, and clip
the wires going to the rocker switch and to the female IEC power socket.
Two of the mounting holes on the IIE mechanism are in the wrong place, so
carefully drill out of the IIE power supply motherboard two holes at the
right places. (There are no critical traces at those places). Glue
cardboard insulation along the inner length of the IIGs casing. Solder
the rocker switch and IEC female power socket to the IIE unit.
Reassemble. THAT'S IT!

I tested it on a IIGs for a half day before returning the IIGs resurrected
power supply to its local owner.

The only question is whether the IIE unit will generate enough amps to


```
#####
### FILE      : pwrsupply
#####
### Created   : Saturday, June 5, 1999   Modified: Saturday, June 5, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3442 bytes    3 KB
#####
```

Path: newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!news.cis.ohio-
state.edu!newsfeed.berkeley.edu!cyclone.swbell.net!typhoon01.swbell.net.POSTED!not
-for-mail

Message-ID: <3756E2D7.C310E7AD@swbell.net>

From: Rubywand <rubywand@swbell.net>

Reply-To: rubywand@swbell.net

X-Mailer: Mozilla 4.51 [en] (Win95; U)

X-Accept-Language: en

MIME-Version: 1.0

Newsgroups: comp.sys.apple2

Subject: Re: //e pwr suply to //gs pwr supply convert

References: <7j5907\$7f9\$l@remarQ.com>

Content-Type: text/plain; charset=us-ascii

Content-Transfer-Encoding: 7bit

Lines: 64

Date: Thu, 03 Jun 1999 15:17:27 -0500

NNTP-Posting-Host: 207.193.17.29

X-Complaints-To: abuse@swbell.net

X-Trace: typhoon01.swbell.net 928440964 207.193.17.29 (Thu, 03 Jun 1999 13:16:04
PDT)

NNTP-Posting-Date: Thu, 03 Jun 1999 13:16:04 PDT

Organization: SBC Internet Services

Xref: newsl.icaen comp.sys.apple2:148298

Brad Weelborg writes ...

```
>
> can anyone tell me the color codes or whatever to change a file://e power
> supply to work on a
> file://gs i know it has been done by steve bungie and others....and i also
> know that a // plus or // e
> power supply has enough power to run a // gs motherboard ( i have been
> running an online telnetable
> apple file://gs off a t1 as a door off my main system for 2yrs and the gs
> has been up 10yrs plus...if
> interested in telneting into my 80's bbs just go to www.lost-gonzo.com and
> telnet into my system)
>
> so....that aside..i need a quick/sloppy fix for this...i was thinking of
> simply cutting off the file://gs plug and attaching it with wire nuts to the
> file://e power supply and just having it sit outside the system
>
> i should just get steve bungies converted ibm power supply setup...(what is
> his email/www site again if anyone knows)
>
```

....

If a power supply does not show lead color and voltage somewhere on the

casing, your best bet is to make your own chart. You can get a Volt meter and measure the outputs to ground-- usually, black or green = GND.

For Apple II power supplies with the old II--//e connector, the following will help identify which leads carry which voltage:

Apple II+/IIe Power Socket (on motherboard)

			Power Supply Output Ratings
	5	6	+5V @ 2.50 Amps (continuous)
-12V			-5V
	3	4	-5V @ 0.25 Amps (continuous)
+5V			+12V
	1	2	+12V @ 1.50 Amps (continuous)
GND			-12V
			-12V @ 0.25 Amps (continuous)
		GND	

With the typical small power supply, clipping a 50 Ohm resistor across your Volt meter leads is likely to supply enough load for measurements. For a larger power supply-- like a 100-250 watt unit from a PC-- you will want to load the +5V output with a 2-5 Ohm 20 watt resistor connected from +5V to GND. (GND will almost always be Black and +5V will be the heaviest lead or the lead repeated most often-- probably red or yellow.)

You can find several low-cost power supplies suitable for fitting into a IIgs in the Jameco catalog. Use good heavy leads (like at least 14 gauge) for +5V, +12V, and GND. This will help to prevent power supply failure. If you are going to load the IIgs with boards, the +5V and GND leads should be 12 gauge or heavier.

A Buggie (505-863-2390) external power supply is another option.

Rubywand

```
##### E N D O F F I L E
### pwrsupply
##### E N D O F F I L E
```

```
#####
### FILE      : pwrsupply.fixes
#####
### Created   : Thursday, April 8, 1999   Modified: Thursday, April 8, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 7717 bytes   7 KB
#####
```

Path: newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!news.cis.ohio-
state.edu!newsfeed.berkeley.edu!cyclone.swbell.net!typhoon01.swbell.net.POSTED!not
-for-mail

Message-ID: <370BA2FC.CE633107@swbell.net>

From: Rubywand <rubywand@swbell.net>

Reply-To: rubywand@swbell.net

X-Mailer: Mozilla 4.51 [en] (Win95; U)

X-Accept-Language: en

MIME-Version: 1.0

Newsgroups: comp.sys.apple2

Subject: Re: //e power supply

References: <3704c09f.22344937@news.zipworld.com.au>

Content-Type: text/plain; charset=us-ascii

Content-Transfer-Encoding: 7bit

Lines: 170

Date: Wed, 07 Apr 1999 13:25:00 -0500

NNTP-Posting-Host: 207.193.9.84

X-Complaints-To: abuse@swbell.net

X-Trace: typhoon01.swbell.net 923509360 207.193.9.84 (Wed, 07 Apr 1999 11:22:40
PDT)

NNTP-Posting-Date: Wed, 07 Apr 1999 11:22:40 PDT

Organization: SBC Internet Services

Xref: newsl.icaen comp.sys.apple2:146657

Jlogo writes ...

>

> Just recently one of my Platinum //e's power supplies appears to have
> failed. When I switched on my //e the system responded normally but
> after I turned it off then turned it on again (rather quickly - maybe
> this caused the problem?) it no longer shows any power on indicator
> from the front keyboard. Is it possible that the power supply is
> overloaded or short-circuited?
>

> BTW, The power supply is a silver coloured one and looks very similar
> to the IIgs one. I just wish these power supplies weren't so flaky -
> this is the second //e power supply that I've used which quit working.

....

Here is some information which may help ...

>>

Apple II power supplies can often be repaired. The bother involved varies
considerably with the cause of malfunction.

Note: The following refers more or less directly to II+ and IIe supplies; however,
many of the ideas will work with the IIgs power supply as well.

Bad Power Cord

Unplug and replug the power cord at the point where it connects to the IIE. Turn ON power. Try wiggling the power cord. If the Power Supply comes ON at any time, try substituting a power cord from a known-working IIE. If this fixes the problem, you can be pretty sure that the problem was a power cord with a broken wire.

Poor Power Supply Connector Connection

Unplug and re-plug the Power Supply cable to the motherboard. Turn ON power. If the machine seems to respond, or responds when the connector is wiggled, you probably have a dirty or loose connection.

Clean the power supply plug and socket with an alcohol swab. Using long-nosed pliers slightly re-crimp the 'holes' on the socket (or, insert a jeweler's screwdriver into the space between each hole and the plastic casing and twist). The idea is to restore a firm grip for all contacts.

Another possibility is a loose or broken socket solder connection to the motherboard. The repair is to remove the motherboard and re-solder the connections to the socket.

Bad Switch

It is fairly easy to identify a bad switch-- it will, usually, not snap cleanly into position, feel crunchy, and/or have a burn spot. The repair is to replace the switch with some AC power switch that will fit. Or, you can permanently connect the switched lines and add an in-line switch to the power cord.

Blown Fuse

Some power supplies may have a fuse. Open the power supply. Look for a fuse mounted to the circuit board. If there is one, check it. An Ohm meter can be used to check for continuity if it is not obvious that the fuse is blown. If the fuse is blown, replace it.

Bad "Globar" Element

Look toward the end where the power cord is connected. Somewhere close to the place where wires from the switch go to the circuit board there should be a small disk-shaped component which is not a disk capacitor. Probably, it will be black with no markings. This is a "globar" resistor. Check it to be sure that it is not cracked and that both leads are really connected to the disk.

If the globar element is broken or if a lead has popped off, you will need to get a replacement from an electronics supply shop. (Tell the shop person where the globar resistor comes from and describe its size.)

Blown Electrolytic Capacitor(s)

On the end of the circuit board near the Switch are some relatively large electrolytic capacitors (typically these are tubular aluminum things with shrink-wrapped grey or light-green covers on which there are markings). Usually, they are the same size and have the same uF value and Voltage rating. One (or more) of these may be obviously blown or may just show some slime near the base.

If you find something like this, the suspect capacitor should be replaced by

one of the same (or slightly larger) uF value with the same (or larger) Voltage rating. Size and shape are, also, important in order to get a good fit.

When removing the bad cap, be sure to mark the "+" side on the board-- use the markings on the cap's cover to identify the "+" side. Install the replacement cap with its "+" lead in the marked hole.

Note: Also see the C7 fix discussion in next Question.

Messed-up or 'Dirty' Adjustment

The power supply may have a mini-potentiometer mounted on the circuit board for fine-tuning voltage output. Usually, it will be somewhere near the end opposite the Switch and will have a slotted plastic 'knob'.

If there is such an adjustment, mark its current position and, then, turn it back and forth. (If you have some Radio Shack, etc. 'Circuit Cleaner', into the mini-pot first is a good idea.)

Set the adjustment a bit to one side of the original setting and plug in the power supply. If it now seems to work the problem was a 'dirty' voltage adjustment control.

Check the voltage on the +5V line with a meter and adjust it to 5 Volts. (Note: no output due to a dirty adjustment control seems unlikely. Incorrect output is more probable; and, this could cause a IIe to not work.)

Beyond the above, you are, most likely, looking at a bombed electrolytic capacitor which is not obviously bad or a blown main power transistor (the big silvery thing mounted on a heatsink). Unless you enjoy more involved electronic testing and repair work, your best course is, probably, to get a replacement power supply.

From: O Aaland

012- My Apple IIe fails to turn on! I have to turn its power switch on and off several times and sometimes wait a long time before it finally powers up!

If the power supply you are working on is an ASTEC brand the most common problem is the 10V 220 uf capacitor located about 1 inch to the rear and left of the transformer. I find this to be the cause in about 80 percent of the ones I repair. Use a 25V 220uf capacitor as a replacement and chances are real good that it will not fail again.

From: Stephen Shaw

If you open the power supply up (WITH THE MAINS PLUG OUT!) you will find a capacitor C7 near the transformer in the middle of the printed circuit board (a 220 uF 16V capacitor if I remember correctly) change it for a 220uF 25V 85 degree Centigrade rated capacitor and it should clear the problem up.

From: Jeff Allen

I've been trying to fix several dead Apple II power supplies from a local school and have managed to bring back one from the dead now. The fix was to replace the 10V, 220uF electrolytic cap with a new one. (I used a 35V piece). Assuming that the board markings are useful, this was C7, on an Astec board with the datecode "T8312" on it. I'm curious if anyone else that has replaced that cap has noticed any browning of the pc board where the leads enter from that 27ohm 2W 'R4' beast.

<<

Rubywand

```
##### E N D O F F I L E
### pwrsupply.fixes
##### E N D O F F I L E
```

```
#####
### FILE      : pwrsupply.globar
#####
### Created   : Sunday, January 14, 1996  Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1325 bytes   1 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!news-
ela.megaweb.com!newstf01.news.aol.com!newsbf02.news.aol.com!not-for-mail
From: rubywand@aol.com (RUBYWAND)
Newsgroups: comp.sys.apple2
Subject: Re: My //e fails to turn on!
Date: 12 Jan 1996 07:14:46 -0500
Organization: America Online, Inc. (1-800-827-6364)
Lines: 17
Sender: root@newsbf02.news.aol.com
Message-ID: <4d5jbm$dlj@newsbf02.news.aol.com>
References: <8B8A08A.02210015A8.uuout@digitec.co.za>
NNTP-Posting-Host: newsbf02.mail.aol.com
X-Newsreader: AOL Offline Reader
```

On 01/02/96, Alberto Roffe wrote to All:

```
AR> I am having some problems with my Apple //e! It fails to turn on! I
> have to turn its power switch on and off several times and sometimes
> wait a long time till it finally powers up!
```

If you decide to open up your PS, another thing to check is the 'start-up resistor'. Usually, this is a disk-shaped object in series with the AC input located on the circuit board near the switch and AC cord socket. It should have a designation like R1 (not C1 or C-anything). This device-- sometimes called a "globar" resistor-- is supposed to suppress turn-ON surge and then quickly drop in resistance. If it is cracked or a lead is barely making contact, then the PS might behave the way you describe.

```
##### E N D O F F I L E
### pwrsupply.globar
##### E N D O F F I L E
```

```
#####
### FILE      : pwrsupply.pinout
#####
### Created   : Tuesday, April 7, 1998 Modified: Tuesday, April 7, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1310 bytes   1 KB
#####
```

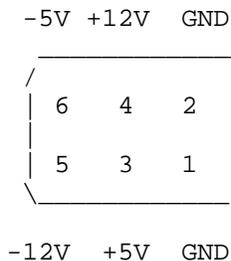
Path:

```
news1.icaen!news.uiowa.edu!news1.chicago.iagnet.net!qual.net!iagnet.net!newsfeed.i
nternetmci.com!169.132.11.200!news.idt.net!newsgate.swbell.net!151.164.30.35.MISMA
TCH!cyclone.swbell.net!swbell!not-for-mail
From: Rubywand <rubywand@swbell.net>
Newsgroups: comp.sys.apple2
Subject: Re: A2 Pwr Supply pin outs?
Date: Tue, 07 Apr 1998 03:47:22 -0500
Organization: Southwestern Bell Internet Services, Richardson, TX
Lines: 24
Message-ID: <3529E81A.DA7ADE4C@swbell.net>
References: <6gc80b$1r7$1@news.d.umn.edu>
Reply-To: rubywand@swbell.net
NNTP-Posting-Host: ppp-207-193-8-221.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Trace: (null) 891938455 8180 (None) 207.193.8.221
X-Complaints-To: usenet@nnrp3
X-Mailer: Mozilla 4.04 [en] (Win95; I)
Xref: news1.icaen comp.sys.apple2:132135
```

blair aakre writes ...

```
>
> Hi there! I have a power supply out of an Apple II+ that I would like to use
> for another project. I was wondering if anyone out there had the pin out of
> the motherboard connector? ....
```

Apple II+ Motherboard Power Socket
(from Apple II Reference)



Rubywand

```
##### E N D O F F I L E
### pwrsupply.pinout
##### E N D O F F I L E
```

```
#####
### FILE      : raml6k.card
#####
### Created   : Tuesday, January 1, 1980 Modified: Thursday, March 1, 1973
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1935 bytes    1 KB
#####
```

Patrick Schaefer writes ...

```
>
> CuteGirl schrieb:
>
> > I have an apple II with a 16k card. The card used to work ONLY after
> > being in the computer for an hour or so (to warm up?!) and now does
> > not work at all. There is a variable resistor ('pot') on the top that
> > can be moved 1/2 turn, labled VR1.
>
> This is a self-refreshing 16k card, I own 2 of these.
>
> The classic 16k card made by Microsoft grabbed its refresh addresses from
> the mainboard. You had to remove a 4116 RAM chip, put it onto the 16k
> card and run a ribbon cable from the card to the empty socket on the
> mainboard.
>
> Your 16k card has its own refresh counter, therefore the flat cable is
> missing. VR1 controls the refresh frequency. You will find an oscillator
> (based on 74LS00 or so) that drives a 7493, 74393 or something like
> that. Multiplexers (74LS157) feed the counter's outputs into the address
> lines oh the 4116.
>
> Frequency too low-> RAM loses information due to leakage currents
> Frequency too high -> System hangs because refresh interferes with
> regular access.
>
```

What neat info! Thanks for posting it.

```
> Your system hangs when cold and runs when warmed up, therefore I guess
> your refresh frequency is too high. The RAM cells get 'faster' when
> warmed up.
>
```

Using a 74LS00 in a non-crystal RC circuit is a pretty poor way to get an oscillator to do refreshing. It's fairly likely that the dumb thing is not oscillating at all.

Since individual chips vary as to how well they work as oscillators, swapping in a new 74LS00 or 7400 or 74S00 could fix osc startup problems. With VR1 being part of the osc control, a spritz of Control Cleaner could help a lot, too.

```
> And at first you should follow Joseph's advice to re-seat all chips. 99%
> of all Apple II problems are contact problems within the chip sockets.
>
```

Yes; this 'magically' fixes all sorts of computer stuff.

Rubywand

```
##### E N D O F F I L E  
### ram16k.card  
##### E N D O F F I L E
```

```
#####
### FILE      : ramfast
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3906 bytes   3 KB
#####
```

```
Path: ns-mx!hobbes.physics.uiowa.edu!zaphod.mps.ohio-
state.edu!mips!spool.mu.edu!agate!dog.ee.lbl.gov!ucbvax!gnh-
cathouse.cts.com!ferret
From: ferret@gnh-cathouse.cts.com (Brendan Hoar)
Newsgroups: comp.sys.apple2
Subject: posts from America Online from CVTech Re: RamFASTs
Message-ID: <m01Yk19-0000UCC@crash.cts.com>
Date: 9 Apr 92 08:31:24 GMT
Sender: usenet@ucbvax.BERKELEY.EDU
Organization: The Internet
Lines: 87
X-Unparsable-Date: Tue Apr 07 92 at 19:48:19 (EST)
```

```
Taken from America Online:
Path: CV Technologies/RamFast SCSI
```

```
Subj: Another fix..                      92-04-05 16:52:32 EDT
From: TGrams
```

If you think the pseudo mapping in P8 is hurting you with the RamFast, this patch to the P8 file will disable it. Be sure to save a copy of the file before you patch it.

Block 5, byte \$1A3, change \$A5 to \$00 (or anything)

Let me know if it helps.

Tim

```
-----
Path: CV Technologies/RamFast SCSI
```

```
Subj: A Note...                          92-04-06 01:49:36 EDT
From: JP1
```

The patch seems to work great--thanks a bunch, Tim!! It's nice to be able to use the RF's ability to 'locate' partitions, again.

Now, for those who use Deliverance for byte editing, please note that when Chris Warner wrote it, he followed the 'computer convention' that the first block of a file is Block 0. So, when you go looking for the value \$A5 via Deliverance, look for it in Block 4 of the P8 file.

The string of characters in the region is 10 BF C9 A5 D0 07...

This is the one to change to 00 -----|

John P.

Path: CV Technologies/RamFast SCSI

Subj: Rom revisions.....
From: CVTech

92-04-06 11:47:46 EDT

We seem to have found the problem.

RF rom revisions prior to version 2.01a maintain a device list of 12 volumes and flip them online/offline at will. We did this so that we could mount/dismount volume under Finder without having to play with creating a new device entry on the fly. People with early 2.0 roms and Prosel will recall the complaints we got about having double digit device numbers and a device list full of offline volumes. Welllllllllllllll, in version 2.01a we fixed that and didn't mount offline volumes in either Gs/OS or P8. Previous to version 2.01a the RF software had the potential to map an offline volume into the P8 table and that seems to be causing the appleworks crash. Tim's patch will fix this until you upgrade to either 2.01c (free) or 3.00a (\$15). Sorry we didn't catch this but 2.01a was release 10 months ago and we didn't test 6.0 with the previous versions of the RF board. Version 3.0 gives you your choice on which method of device table mapping you want to use. If you map any of the spare partitions then we tell P8v2 that we only have 2 devices and they won't "double map" our extra partitions. If you do not map any of the extra volumes then we assume you want to use the P8v2 method and we tell P8v2 that we have as many volumes as we have and P8v2 maps them where they want them. Personally I like our method better because you don't have to map in volumes you don't want and you have a visible representation of your P8 table.

Drew

p.s. We are throwing in the rom 3.0 for free for people that want to upgrade their boards from rev C to rev D. (\$69)

p.p.s. We are taking orders for rom 3.0. Send us a check for \$15 and include a shipping address and the SERIAL NUMBER ON YOUR BOARD. The serial number is very important.

(sorry about the formatting - bgh)

badbunny@gnh-starport.cts.com

ferret@gnh-cathouse.cts.com

Cyborgs From Saturn Landed In My Garden and Injured Eighty-Nine Bananas.

- Insists Cindy Lauper

You are in a maze of tiny little net.sigs, all different.

E N D O F F I L E
ramfast
E N D O F F I L E

```
#####
### FILE      : ramfast.docs
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1017 bytes   1 KB
#####
```

```
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!vixen.cso.uiuc.edu!mrcnext.cso.uiuc.edu!bazyar
From: bazyar@mrcnext.cso.uiuc.edu (Jawaid Bazyar)
Newsgroups: comp.sys.apple2.programmer
Subject: RamFAST Technical Documentation
Date: 14 Dec 1993 17:34:58 GMT
Organization: University of Illinois at Urbana
Lines: 13
Message-ID: <2ektg2$7g7@vixen.cso.uiuc.edu>
NNTP-Posting-Host: mrcnext.cso.uiuc.edu
```

RamFAST Technical Documentation is now available on the Sequential Systems BBS.. (303) 666-7797., 300-14400 baud.

The documentation includes a text file describing the 8-bit SmartPort interface, and a bit of sample source code which accesses the RamFAST interface directly from GS/OS.

--

Jawaid Bazyar		Like UNIX? Like your Apple IIGS? Then ask
Procyon, Inc.		me about GNO/ME for the Apple IIgs!
bazyar@cs.uiuc.edu		P.O Box 620334
--Apple II Forever!--		Littleton, CO 80162-0334 (303) 781-3273

```
##### E N D O F F I L E
### ramfast.docs
##### E N D O F F I L E
```

```
#####
### FILE      : ramworksexpander
#####
### Created   : Tuesday, January 1, 1980   Modified: Thursday, March 1, 1973
### File Type : "TEXT"      File Creator: "LMAN"
### File Size : 1332 bytes    1 KB
#####
```

I don't have one of those Expander cards, but the RWIII manual indicates that pins 1, 2, 3 & 13 on the row of 24 pins (1 is at the bottom) should be cut for a Rev-B 512K Expander that is being used on a RWbasic, RWII or RWIII.

It also states that this modification is not required for the Rev-C 512K or 2M expander.

A comical note says to count the pins carefully as they take a long time to grow back. :)

I guess you need to know what Revision the Expander it is first, or hopefully someone has a manual on the Expander (if there ever was one), but there is no mention of pins 20 & 21 so I suspect they SHOULD be there.

Mark

BAD wrote in message <8j23ftsjf2os12mkv4v7dgg3iuk4ges07r@4ax.com>...

>Hi;

>

>I recently received an Applied Engineering 512K Expander board for a
>RamWorks III memory card. On the back of the card are two sets of
>connector pins. One set is a single row of eight pins. The other
>connector is a single row of 24 pins.

>

>On the row of 28 pins, pins 20 and 21 are cut off half way down the
>pins. They look like deliberate cuts instead of just having broken
>off.

>

>My question is: was there a problem with the card that required these
>pins to be cut? I am reluctant to try the card in this damaged
>condition with out knowing more.

>

>Any help or insight would be appreciated.

>

>BrianD

>

>

>

```
##### E N D O F F I L E
### ramworksexpander
##### E N D O F F I L E
```

```
#####
### FILE      : resistor.codes
#####
### Created   : Sunday, June 21, 1998   Modified: Sunday, June 21, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2248 bytes   2 KB
#####
```

Path:

```
news1.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!jamie!Qual.Net!nyd.news.ans.net
!newsfeeds.ans.net!news.idt.net!nntp.giganews.com!newsgate.swbell.net!151.164.30.3
5.MISMATCH!cyclone.swbell.net!swbell!not-for-mail
From: Rubywand <rubywand@swbell.net>
Newsgroups: comp.sys.apple2
Subject: Re: NEEDED: Color-code for carbon-film resistors
Date: Sun, 21 Jun 1998 15:44:05 -0500
Organization: Southwestern Bell Internet Services, Richardson, TX
Lines: 42
Message-ID: <358D7095.FF0020F6@swbell.net>
References: <6mjhli$oie$2@lynx.unm.edu>
Reply-To: rubywand@swbell.net
NNTP-Posting-Host: ppp-207-193-18-2.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Trace: (null) 898461794 8142 (None) 207.193.18.2
X-Complaints-To: usenet@nnrp3
X-Mailer: Mozilla 4.04 [en] (Win95; I)
Xref: news1.icaen comp.sys.apple2:135942
```

stephen e buggie writes ...

```
>
> COLOR CODE NEEDED FOR RESISTORS
> =====
>
> I've misplaced my color-code for the standard round carbon-film resistors.
>
> If anyone has it handy, could you type it in? Then I'll print it and
> tape it to each of my boxes containing resistors.
>
```

Color	Digit	Multiplier (when 3rd band)	Example
Black	0	x1	-- Red Red Black = 22 Ohms
Brown	1	x10	-- Blue Grey Brown = 680 Ohms
Red	2	x100	-- Orange White Red = 3900 Ohms
Orange	3	x1000	-- Yellow Violet Orange = 47k Ohms
Yellow	4	x10000	-- Red Green Yellow = 250k Ohms
Green	5	x100000	-- Orange Orange Green = 3.3M Ohms
Blue	6	x1000000	-- Red Yellow Blue = 24M Ohms
Violet	7	x10000000	-- ...
Grey	8	x100000000	
White	9	x1000000000	
Gold	-	x 0.1	-- Brown Brown Gold = 1.1 Ohms
Silver	-	x 0.01	-- Orange White Silver = 0.39 Ohms

Tolerance (4th band)

Gold is 5%
Silver is 10%
no color is 20%

Example: Grey Red Orange Gold is 82k Ohms +/- 5%
Example: Brown Black Green Silver is 1M Ohms +/- 10%

Note: carbon resistors almost always err on the high side.

Rubywand

```
##### E N D   O F   F I L E  
### resistor.codes  
##### E N D   O F   F I L E
```

```
#####
### FILE      : rgb.cable
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 948 bytes    1 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path:
news.weeg.uiowa.edu!news.uiowa.edu!uunet!cs.utexas.edu!torn!utgpc!utstat!philip
From: philip@utstat.uucp (Philip McDunnough)
Subject: Re: Has the 2GS been dropped?
Message-ID: <1992Aug19.050645.12833@utstat.uucp>
Organization: University of Toronto, Dept. of Statistics
References: <14367@mindlink.bc.ca>
Date: Wed, 19 Aug 1992 05:06:45 GMT
Lines: 14
```

In article <14367@mindlink.bc.ca> Herbert_Fung@mindlink.bc.ca (Herbert Fung) writes:

```
[ ]
>
>I can't remember where, but I recall reading somewhere that Apple added a
>special cable to it's price list about a year ago that would let one hook
>up the Mac LC's monitor to a GS. If this is so, then that excuse about not
>being able to get GS RGB monitors is just that, an excuse.
```

Well I don't recall Apple claiming they couldn't get GS monitors, but I do recall the cable. The part # is A9M0333 Retail price is \$29.

Philip McDunnough
philip@utstat.toronto.edu

```
##### E N D O F F I L E
### rgb.cable
##### E N D O F F I L E
```

```
#####
### FILE      : rgb.connect
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 8669 bytes    8 KB
#####
```

```
Path: blue.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!news.sprintlink.net!nwnexus!rook!eugene.welcome
From: EUGENE.WELCOME@rook.wa.com (eugene welcome)
Newsgroups: comp.sys.apple2
Subject: RGB-connection question??
Message-ID: <10DC16A9@rook.wa.com>
Date: Fri, 09 Dec 1994 06:15:34 GMT
Organization: Knight-Line! (206) 565-0594
Distribution: world
Lines: 61
```

>Hello, I have a friend with an Apple 2c+. I asked me what the pin
>configuration is, but I honestly have no idea.

Hi Joe: Here is what I have on the IIC and Laser128 as they were the
same. I took this from a larger posting that shows all the Apple II
series Serial connectors from DB25 to the newer Mini-Din8 connectors
plus their signal identifications. This happens to include the IIGs
RGB but not the IIE RGB info I am presently tracking down to update
this part of my file. If anyone is interested I can post the entire
serial connectors with pin outs. Gene. K7EEK
eugene.welcome@rook.wa.com

Apple RGB Connections

The RGB port on the IIGs has the following output: This is not the
same for the IIE. I do not have info on the IIE RGB port and do
not know if the IIC RGB port is the same.

The Apple IIC and Laser 128 are also shown.

Apple IIGs RGB		Apple IIC and Laser-128 RGB	
Pin	Signal	Pin	Signal
===	=====	===	=====
1	Ground	1	Intensity signal
2	Red analog video	2	F14M - 14 MHz
3	Composite sync	3	Red - signal
4	Not connected	4	Blue - signal
5	Green analog video	5	Spkr sound output
6	Ground	6	Load Pulse for LCD
7	-5 volts	7	Dispen for LCD
8	+12 volts	8	+12 volts DC
9	Blue analog video	9	Horizontal Sync Signal
10	Not connected	10	Composite Video Sync Signal
11	Sound	11	Serial out - Data for LCD
12	Composite video (NTSC, PAL, or SECAM)	12	Composite Video Output
13	Ground	13	Ground
14	Not connected	14	Vertical Sync Signal
15	Not connected	15	Green - Signal

Note LCD = Liquid Crystal Display

Female DB-15. Chassis Connector

```

      8 7 6 5 4 3 2 1          1 2 3 4 5 6 7 8
      ( 0 0 0 0 0 0 0 0 )    ( 0 0 0 0 0 0 0 0 )
      \_0_0_0_0_0_0_0_0_/    \_0_0_0_0_0_0_0_0_/

      1 1 1 1 1 1 0          0 1 1 1 1 1 1
      5 4 3 2 1 0 9          9 0 1 2 3 4 5
      Socket View            Soldered End
  
```

Male DB-15. Cable Connector

```

      1 2 3 4 5 6 7 8          8 7 6 5 4 3 2 1
      ( o o o o o o o o )    ( 0 0 0 0 0 0 0 0 )
      \_o_o_o_o_o_o_o_o_/    \_0_0_0_0_0_0_0_0_/

      0 1 1 1 1 1 1          1 1 1 1 1 1 0
      9 0 1 2 3 4 5          5 4 3 2 1 0 9
      Pin View                Soldered End
  
```

Newsgroups: comp.sys.apple2

Path: blue.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-state.edu!howland.reston.ans.net!wupost!waikato!comp.vuw.ac.nz!actrix.gen.nz!dempson

From: dempson@atlantis.actrix.gen.nz (David Empson)

Subject: Re: RGB-connection question???

Message-ID: <D0JLvC.J8x@actrix.gen.nz>

Nntp-Posting-Host: atlantis.actrix.gen.nz

Sender: news@actrix.gen.nz (News Administrator)

Organization: Actrix - New Zealand Internet Service Providers

Date: Fri, 9 Dec 1994 12:11:35 GMT

References: <3c7034\$oh3@styx.uwa.edu.au>

Lines: 25

In article <3c7034\$oh3@styx.uwa.edu.au>,

Joseph Turner <jturner@tartarus.uwa.edu.au> wrote:

```

> Hello, I have a friend with an Apple 2c+. I asked me what the pin
> configuration is, but I honestly have no idea. Is there anyone who help us
> to determine the pin configuration? ANY help will be appreciated.
  
```

First, I should correct a misconception: the video port on the back of the IIC+ is not an RGB port. It is a video expansion port, which provides all of the internal video generation signals used by the IIC/IIC+ which can be used to generate an alternative video output signal.

To produce RGB output (or anything else) from this port, you need an external adaptor box which generates the appropriate video signals.

I believe there is (or was) an RGB output adaptor for the IIC, which should also work on the IIC+.

This adaptor is not simple: it has to decode the colour information from the NTSC video signal (or generate it by detecting the graphics mode and monitoring bit patterns), generate appropriate sync signals, etc.

--

David Empson
dempson@actrix.gen.nz
Snail mail: P.O. Box 27-103, Wellington, New Zealand
Newsgroups: comp.sys.apple2
Path:
blue.weeg.uiowa.edu!news.uiowa.edu!uunet!gatech!howland.reston.ans.net!wupost!waik
ato!comp.vuw.ac.nz!actrix.gen.nz!dempson
From: dempson@atlantis.actrix.gen.nz (David Empson)
Subject: Re: RGB-connection question??
Message-ID: <D0JnBL.Lnt@actrix.gen.nz>
Nntp-Posting-Host: atlantis.actrix.gen.nz
Sender: news@actrix.gen.nz (News Administrator)
Organization: Actrix - New Zealand Internet Service Providers
Date: Fri, 9 Dec 1994 12:42:56 GMT
References: <10DC16A9@rook.wa.com>
Lines: 73

In article <10DC16A9@rook.wa.com>,
eugene welcome <EUGENE.WELCOME@rook.wa.com> wrote:
> >Hello, I have a friend with an Apple 2c+. I asked me what the pin
> >configuration is, but I honestly have no idea.
>
> Hi Joe: Here is what I have on the IIC and Laser128 as they were the
> same. [snip]

The information in your post about the IIC video port is WRONG!

It may be correct for the Laser 128. The IIC's video port has a set
of internal signals. The pins listed here might be correct for an RGB
adaptor attached to the IIC video port, but the video port itself does
NOT have any of the signals expected by an RGB monitor (they have to be
generated by an adaptor).

The following table (from your post) is correct for the IIGs, but most
of the listed signals for the IIC are wrong.

Apple IIGs RGB		Apple IIC and Laser-128 RGB	
Pin	Signal	Pin	Signal
===	=====	===	=====
> 1	Ground	1	Intensity signal
> 2	Red analog video	2	F14M - 14 MHz
> 3	Composite sync	3	Red - signal
> 4	Not connected	4	Blue - signal
> 5	Green analog video	5	Spkr sound output
> 6	Ground	6	Load Pulse for LCD
> 7	-5 volts	7	Dispen for LCD
> 8	+12 volts	8	+12 volts DC
> 9	Blue analog video	9	Horizontal Sync Signal
> 10	Not connected	10	Composite Video Sync Signal
> 11	Sound	11	Serial out - Data for LCD
> 12	Composite video (NTSC, PAL, or SECAM)	12	Composite Video Output
> 13	Ground	13	Ground
> 14	Not connected	14	Vertical Sync Signal
> 15	Not connected	15	Green - Signal

Note LCD = Liquid Crystal Display

The actual functions of the IIC video port are as follows:

1 TEXT Indicates text mode is active (special function in DHR mode)

- 2 14M 14 MHz clock sigal
- 3 SYNC Horizontal and vertical sync
- 4 SEGB Vertical counter signal from IOU, or lo-res indication
- 5 1VSOUND Sound output (one volt peak-to-peak)
- 6 LDPS Video shift load enable
- 7 WNDW Active area display blanking
- 8 +12V +12 volts DC
- 9 PRAS RAM row address strobe
- 10 GR Graphics mode enable
- 11 SEROUT Serialized character generator output
- 12 NTSC Composite NTSC video output
- 13 GND Ground reference
- 14 VID7 Bit 7 of video shift latch (for hires mode colour shifting)
- 15 CREF Colour reference timing signal

These come from the IIC Technical Reference, both first and second editions.

It is odd that your listing for the IIC is correct for some of the signals, but has RGB outputs in place of the IIC's timing signals.

You cannot connect a monitor directly to the IIC video port (with the possible exception of the the LCD display, or an NTSC monitor). An adaptor is required to generate the appropriate video signals for an RGB monitor.

--
 David Empson
 dempson@actrix.gen.nz
 Snail mail: P.O. Box 27-103, Wellington, New Zealand

```
##### E N D O F F I L E
### rgb.connect
##### E N D O F F I L E
```

```
#####
### FILE      : rgb.flyback.fix
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3560 bytes   3 KB
#####
```

```
Path:
blue.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!newsrelay.iastate.edu!
news.iastate.edu!irsman
From: irsman@iastate.edu (Ian Schmidt)
Newsgroups: comp.sys.apple2
Subject: Re: Dead IIGS Monitor ???
Date: 23 Jun 1994 18:38:47 GMT
Organization: Iowa State University, Ames, IA
Lines: 62
Distribution: world
Message-ID: <2uckrn$skqs@news.iastate.edu>
References: <9406231518.AA23056@joshua.sybgate.sybase.com>
NNTP-Posting-Host: vincent1.iastate.edu
```

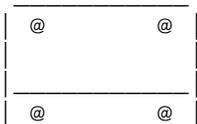
In article <9406231518.AA23056@joshua.sybgate.sybase.com> rankins@SYBASE.COM (Ray Rankins) writes:

```
>When I turn the monitor on, I can here the high frequency sound that a
>normal monitor makes, but the picture is completely black and the LED
>power indicator on the front doesn't light up.
>
>Does anyone have any idea what may be wrong with it? Has something
>possibly just come loose that needs to be reseated or resoldered?
>Anyone else experience similar problems with their monitor?
>
>Maybe I should just give it up for dead. It is about seven years old.
>Maybe it has just expired after a normal lifespan?
```

This is classic flyback-solder-itits. Following is my usual set of instructions on how to fix it; if you don't understand something I'll be happy to clarify.

---begin Ian's Standard Fix, with thanks to Scott Gentry---

Opening up the RGB is a bit nasty, but not TOO bad. remove the 4 screws on the back: (the one on the bottom doesn't matter).



Next, carefully pull on the back a little, making sure to feed the power cord thru the hole in the case. After not too long, the case will be caught on 2 different connectors. The first one is from the power switch to the left side (facing from the back still) of the main board. Go ahead and unplug it (both connectors you need to remove are keyed so they only go one way :). The case will then pull off a bit more and you can (carefully) remove the cable from the brightness and contrast knobs to the board on the back of the CRT. Make

sure not hit flip the 'service/normal' switch on the board next to the connector. After this, the case should come almost completely away (the power plug won't fit thru the hole, oh well).

Now you can locate the flyback. It's the largish component on the right side (from the back) with a cable coming out of it leading to the CRT. Turn the monitor upside down so you can see the solder side of the board. The flyback has 10 connections arranged in a semicircle. Ground each one of the connections to the nearby chassis frame (I just used a screwdriver, if you'd like to avoid any scary snaps and pops, use like a 100k resistor). Go ahead and resolder each of the 10 connections, making sure to do a clean job (any solder bridges here could be fatal to your monitor).

Once you finish, put the case back on in the opposite order, being careful not to try and force the 2 connectors the wrong way. You may want to try the monitor to make sure its all okay before retightening the screws. If you turn it on and the picture's just a horizontal line in the middle of the screen, it means you bumped the service/normal switch I mentioned before, and you should flip it back to 'normal' :)

After you do this, your RGB should be good-as-new.

---end standard fix, permission is given to do whatever you like with this as long as you don't change it---

--

Ian Schmidt / irsman@iastate.edu / irsman@cs.iastate.edu

"The look in your eyes as you head for the door is a cold fire" - Neil Peart

```
##### E N D O F F I L E
### rgb.flyback.fix
##### E N D O F F I L E
```

```
#####
### FILE      : rgb.pinouts
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5836 bytes   5 KB
#####
```

```
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!zaphod.mps.ohio-
state.edu!sdd.hp.com!nigel.msen.com!yale.edu!yale!gumby!destroyer!cs.ubc.ca!unixg.
ubc.ca!kakwa.ucs.ualberta.ca!ersys!crs-sys!traider!fkarmali
From: fkarmali@traider.ersys.edmonton.ab.ca (faisal karmali)
Newsgroups: comp.sys.apple2
Subject: Re: Apple2 RGB color monitor help!!!
Message-ID: <kF393B3w165w@traider.ersys.edmonton.ab.ca>
Date: Sat, 08 May 93 15:19:43 PDT
References: <1993May4.105921.24391@aristo.tau.ac.il>
Reply-To: fkarmali@traider.ersys.edmonton.ab.ca (faisal karmali)
Organization: Traiders of the Lost .ARC! - Edmonton, Alberta, Canada
Lines: 44
```

koby01@ccsg.tau.ac.il (gabai jacob) writes:

```
>
> hello all
>
> a friend of mine has a problem the monitor cable was cut
> if any one can help with the pin out connector
>
>
> APPLE II RGB COLOR MONITOR      (model A9M0208      written at the back of monito
> (the monitor is the amicran ytppe 110V with a motor switch to adjust the
> screen )
>
>
> does anyone have the pinout list of the 15 Pin D-TYPE Connector
> please Email the answer because he doesn't have access to the net
> at the apple center in France they ignored the request even tho the U.S.A
> center transfred the request there
>
>
> email to koby01@ccsg.tau.ac.il
>
> thanks
>
```

APPLE RGB MONITOR PORT

```
@08 @07 @06 @05 @04 @03 @02 @01
  @15 @14 @13 @12 @11 @10 @09

01 - Signal GND (red)           10 - NC
02 - Analog RED                 11 - Sound 1 volt peak to peak
03 - Composite sync             12 - Monochrome video out
04 - NC                          13 - Signal GND (blue)
05 - Analog GREEN               14 - NC
06 - Signal GND (green)         15 - NC
```

07 - -5 volts DC Shield - System GND
 08 - +12 volts DC GND = Ground
 09 - Analog BLUE

Fkarmali @Traider.ersys.edmonton.ab.ca -or- @ersys.edmonton.ab.ca

My quotation collection is 288 strong. Please e-mail me with more!

"Suicide (n.): What to do if Macs take over the world"

Newsgroups: comp.sys.apple2

Path:

blue.weeg.uiowa.edu!news.uiowa.edu!uunet!newsflash.concordia.ca!canopus.cc.umanitoba.ca!mona.muug.mb.ca!jfenske

From: jfenske@muug.mb.ca (John Fenske)

Subject: Re: Need IIGs to Amiga Magnavox Pinouts

Message-ID: <1994Jul26.020953.643@muug.mb.ca>

Organization: Manitoba Unix User Group, Winnipeg, Manitoba, Canada

References: <30nnpj\$m3s@xmission.xmission.com>

Date: Tue, 26 Jul 1994 02:09:53 GMT

Lines: 98

In <30nnpj\$m3s@xmission.xmission.com> Brian Wiser <brwiser@xmission.com> writes:

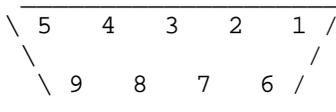
>I am trying to connect my IIGs to my Amiga 1084 monitor (also known as
 >Magnavox 8CM515). Does anyone know the pinouts for either end? Thanks
 >and please respond my email if possible.

from a previous post...

> Is anyone use the Commodore's 1084s monitor for their IIGs ?
 > If you know the pinout of the RGB connection please send me mail
 > about the connection.

pin assignment of 1084S monitor:

pin #	analog RGB signal
1	ground
2	ground
3	red
4	green
5	blue
6	not used
7	composite sync.
8	horizontal sync.
9	vertical sync.



pin assignment of IIGS RGB connector:

pin #	signal
1	ground (for red ?)
2	red
3	composite sync. (in German:

Farbmischsynchronisation)


```
##### E N D O F F I L E  
### rgb.pinouts  
##### E N D O F F I L E
```

```
#####
### FILE      : RGB.repair
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3911 bytes   3 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path:
news.weeg.uiowa.edu!news.uiowa.edu!uunet!europa.eng.gtefsd.com!paladin.american.ed
u!howland.reston.ans.net!cs.utexas.edu!utnut!helios.physics.utoronto.ca!neufeld
From: neufeld@helios.physics.utoronto.ca (Christopher Neufeld)
Subject: Re: Bouncing screen...
Message-ID: <CK4GKn.AoC@helios.physics.utoronto.ca>
Sender: news@helios.physics.utoronto.ca (News Administrator)
Organization: University of Toronto Physics/Astronomy/CITA
References: <C011894125213.949@damage.cleve.fnet.org>
Date: Mon, 24 Jan 1994 06:55:32 GMT
Lines: 71
```

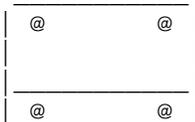
In article <C011894125213.949@damage.cleve.fnet.org>,
<Damin@damage.cleve.fnet.org> wrote:

```
>
>>The screen on my IIgs monitor (standard Apple issue) has begun to bounce
>>from top to bottom a bit shortly after I turn it on. If I thump the sides
>>the problem usually goes away, but that doesn't seem like a good long-term
>>solution. Any helpful advice will be appreciated.
>
>I have the exact same problem with my GS monitor as does Dr. Quack! The fix is
>simple! We hit it.
>
>Is this "doom bearing down" on the monitor?
>
```

If it's what I think it is, then yes, it is doom bearing down. One day that monitor is going to die for good, and that day may be sooner than you would like. I'm including the fixup procedure here, courtesy of Ian Schmidt. I fixed my monitor successfully this way. Needless to say, don't do this if you don't know what you're doing. If there's any doubt, bring the monitor and this procedure to a person who has experience soldering.

--- BEGIN INCLUDED FILE ---

Opening up the RGB is a bit nasty, but not TOO bad. remove the 4 screws on the back: (the one on the bottom doesn't matter).



~~~~~

Next, carefully pull on the back a little, making sure to feed the power cord thru the hole in the case. After not too long, the case will be caught on 2 different connectors. The first one is from the power switch to the left side (facing from the back still) of the main board. Go ahead and unplug it (both connectors you need to remove are keyed so they only go one way :). The case will then pull off a bit more and you can (carefully) remove the cable from

the brightness and contrast knobs to the board on the back of the CRT. Make sure not hit flip the 'service/normal' switch on the board next to the connector. After this, the case should come almost completely away (the power plug won't fit thru the hole, oh well).

Now you can locate the flyback. It's the largish component on the right side (from the back) with a cable coming out of it leading to the CRT. Turn the monitor upside down so you can see the solder side of the board. The flyback has 10 connections arranged in a semicircle. Ground each one of the connections to the nearby chassis frame (I just used a screwdriver, if you'd like to avoid any scary snaps and pops, use like a 100k resistor). Go ahead and resolder each of the 10 connections, making sure to do a clean job (any solder bridges here could be fatal to your monitor).

Once you finish, put the case back on in the opposite order, being careful not to try and force the 2 connectors the wrong way. You may want to try the monitor to make sure its all okay before retightening the screws. If you turn it on and the picture's just a horizontal line in the middle of the screen, it means you bumped the service/normal switch I mentioned before, and you should flip it back to 'normal' :)

After you do this, your RGB should be good-as-new.

Ian Schmidt  
irsman@iastate.edu

--- END INCLUDED FILE ---

--  
Christopher Neufeld...Just a graduate student   neufeld@physics.utoronto.ca  
"Don't edit reality for   | "The nerd projection operator recovers most of his  
the sake of simplicity"   | amplitude." Insult, probably self-referential.  
                              |       -rw-rw-rw- : the file permission of the beast

##### E N D       O F       F I L E  
### RGB.repair  
##### E N D       O F       F I L E

```
#####
### FILE      : RGBcable
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 4099 bytes   4 KB
#####
```

Path:

```
news.weeg.uiowa.edu!news.uiowa.edu!uunet!olivea!korie!male.EBay.Sun.COM!eb5ts4.EB
ay.Sun.COM!keithhar
From: keithhar@eb5ts4.EBay.Sun.COM (Keith Hargrove)
Newsgroups: comp.sys.apple2
Subject: Re: What use is a Taxan Monitor? Apple2? Vcr Monitor?
Date: 14 Dec 1993 16:35:10 GMT
Organization: Sun Microsystems, Mt. View, Ca.
Lines: 101
Message-ID: <2ekpvu$7k3@male.EBay.Sun.COM>
References: <C121393123103.486@damage.cleve.fnet.org>
NNTP-Posting-Host: eb5ts4.ebay.sun.com
```

In article <2egqkk\$6o2@charm.magnus.acs.ohio-state.edu> you write:

>In article <jspinnowCHwnnG.HD5@netcom.com> jspinnow@netcom.com (John S. Pinn  
ow)

> writes:

>>I had a taxan monitor sitting in my closet for awhile and would love  
>>to do something with it.

>>

>>

>>It has the following settings.

>>

>>IT has a switch:

>>

>> Position I: IBM P/C

>> Position II: Apple II & NEC PC 8001

>> Position III: Apple III

>>

>> Two plugs:

>>

>> A circular outlet that will accept 8 prongs.

>>

>> Another a flat connecter similar to this:

>>

```
>>  ---
>>  | * * * * |
>>  | * * * * |
>>  |         |
>>  |         |
>>  |         |
>>  |         |
```

>>

>>

>>One of two possible things that I want to do with it.

>>

>>One: Use it as a possible Apple IIgs monitor.

>>Two: Use it for a vcr monitor and turn it into sortof a tv.

>>

>>

>>I would really love to know of a way to get this thing to allow input

>>of NTSC video.

>>

>>

>>Any recommendations? Thank you!

>That big rectangular connector is a 'classic' VCR connector. Those eight pins  
>include Audio IN, Audio OUT, Video IN (NTSC), and Video OUT. That particular  
>connector was often used for industrial and professional VCRs. The upshot o  
f

>all this is that, YES, you can get the monitor to accept NTSC video. Just  
>connect the tip and ring of an RCA cable to the appropriate pair of pins.  
>Unfortunately, I can't seem to find my copy of that data right now. Try  
>setting the switch to the Apple ][ position, then experiment with connecting

>the tip of an RCA cable (connected to the VIDEO OUT on the computer) to each  
of

>the eight pins, and connecting the sleeve to the pin opposite. Meanwhile, I  
'll

>look around and find out for sure what those pinouts are.

>

>--Dave Althoff, Jr.

I think this is the RGB version I have this plug on two of my monitors  
and it is RGB for pc CGA card. The cable for this plug is sold at Fry's  
a local computer shop. I have used this plug on one monitor to go to my GS  
but it was a pain the sync out of the GS is not TTL.  
The other monitor would not work at all due to fact that all inputs run into  
a digital buffer. I think the din would be the best way to go for a GS.  
If the monitor does not have digital buffers in it, it should make a good gs  
monitor.

Boot the GS and put up a white screen to use while making the cable.

Find a din plug and plug it in. Find the ground pin ohm it out with the  
monitor or unplugged.

Use the 3rd prong if it has one else check to the screws in the back  
or the din shell.

After ground is located power up the monitor and check ground to all pins  
if any of the pins have power on them (ie +5v or +12v)

make a note NOT TO TOUCH THEM!!

now connect monitor ground to gs ground pin 1,6,13

crank up the contrast and bright

now connect gs sync pin 3 to a wire use this wire to touch the pins in the din  
you should be able to tell when you hit the sync you might have two connect  
this to two pins one for Horz. and one for Vert connect it.

Now connect red pin 2 on the GS to a wire and touch the din pins when you get  
the red screen connect it.

Now connect green pin 5 on the GS to a wire and touch the din pins when you get  
the yellow screen connect it.

Now connect blue pin 9 on the GS to a wire and touch the din pins when you get  
the white screen connect it.

I have had done this to many different monitor and it works very good.

You might think about making a a,b box too, for a sega or snes both the  
sega and the snes have rgb outputs like the GS and look great on a rgb monitor.

good luck

```
##### E N D O F F I L E  
### RGBcable  
##### E N D O F F I L E
```

```
#####
### FILE      : romproject-cgo.html
#####
### Created   : Thursday, November 12, 1998 Modified: Thursday, November 12, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1210 bytes   1 KB
#####
```

From: "Terence J. Boldt" <apple2@cgocable.net>

Newsgroups: comp.sys.apple2

References: <364919f0.0@news.cgocable.net> <364A692F.CBB9289B@cyberhighway.net>

Subject: Re: Hardware Project

Date: Thu, 12 Nov 1998 01:27:51 -0500

Lines: 17

X-Newsreader: Microsoft Outlook Express 4.72.3110.1

X-MimeOLE: Produced By Microsoft MimeOLE V4.72.3110.3

NNTP-Posting-Host: cgowave-77-24.cgocable.net

Message-ID: <364a8024.0@news.cgocable.net>

X-Trace: 12 Nov 1998 01:28:52 -0500, cgowave-77-24.cgocable.net

Path:

news1.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!nyd.news.ans.net!newsfeeds.ans.net!ptdnetP!newsgate.ptd.net!cyclone.news.idirect.com!island.idirect.com!news1.tor.metronet.ca!news.cgocable.net!cgowave-77-24.cgocable.net

Xref: news1.icaen comp.sys.apple2:141695

Frank Carney wrote in message <364A692F.CBB9289B@cyberhighway.net>...

>Do you have a web page describing what you are doing?

I do now as of about 15 minutes ago. Thanks for the idea. There's not much there. I have to photograph and scan a bunch of stuff some weekend. Maybe I'll spend more than 10 minutes on the html as well. :-)

<http://www.cgocable.net/~apple2>

apple2@cgocable.net

-- Terence J. Boldt

```
##### E N D O F F I L E
### romproject-cgo.html
##### E N D O F F I L E
```

```
#####
### FILE      : scandoubler.rgb
#####
### Created   : Tuesday, September 21, 1999  Modified: Tuesday, September 21, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2918 bytes   2 KB
#####
```

Article 152731 of comp.sys.apple2:

Path:

newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!hammer.uoregon.edu!newsfeed.dir  
ct.ca!newsfeed.mathworks.com!remarQ-  
east!supernews.com!remarQ.com!news.mindspring.net!firehose.mindspring.com!chakotay  
.ncc74656.org!salfter

From: salfter@chakotay.ncc74656.org (Scott Alfter)

Newsgroups: comp.sys.apple2

Subject: VGA monitors and the IIGS

Date: 18 Sep 1999 19:11:13 GMT

Organization: USS Voyager NCC-74656, Delta Quadrant

Lines: 44

Message-ID: <7s0o4h\$6as\$1@chakotay.ncc74656.org>

NNTP-Posting-Host: dl.8a.26.18

X-Server-Date: 18 Sep 1999 19:10:33 GMT

Xref: newsl.icaen comp.sys.apple2:152731

For a few months now, I've had an NEC MultiSync 3D hooked into my IIGS. It's one of the few VGA monitors capable of syncing to the relatively low 15.75-kHz scan rate used by the GS. Mine seems to exhibit strange behavior when you first switch it on, though...the picture starts out tall, then disappears, then comes back in the proper size. This takes about 5 minutes from when you first switch it on if it hasn't been used in a while. I haven't observed this behavior when the monitor is cold-started and fed a VGA signal from one of my x86 boxen.

I'll soon be at a point where I'd like to take this monitor and throw it in a closet with some servers, which means I'll be without a color display for the GS (my only other monitor for it is a Monitor II green-screen that came with it in 1985...the computer was originally a IIe, but was upgraded in 1992).

I know the Second Sight exists, but software support for its extra features is almost non-existent and it's said to have trouble with some special modes (either 3200-color mode or fill mode; can't remember which).

It seems that scan doublers are in common use among Amiga users, though. A search of "scan doubler" on AltaVista turned up several Amiga hardware vendors selling scan doublers at reasonable prices. As the name indicates, a scan doubler takes one line of video in at 15.75 kHz and outputs it twice at 31.5 kHz, which corresponds to the standard 640x480 60-Hz VGA mode. Doesn't the Amiga spit out the same kind of RGB video as the IIGS? If it does, then it seems that this would be a more affordable (and better) way to hook any random VGA monitor to a IIGS. Has anybody tried using one of these with a IIGS, and if so, how well did they work? (I'm guessing that a special cable might need to be made to hook the scan doubler into a IIGS; those of you who are using Commodore monitors might know something about this.)

Here are a couple of URLs I found...the models without the "flicker fixer" should be sufficient since the IIGS doesn't generate interlaced video:

<http://www.alexnc.com/hw.htm>  
<http://www.softhut.com/apollo.html>

(Both seem to be selling the same products.)

\_/\_  
 / v \  
(IIGS( Scott Alfter (salfter at (yo no quiero spam) delphi dot com)  
 \\_^\_/ <http://people.delphi.com/salfter>

##### E N D O F F I L E  
### scandoubler.rgb  
##### E N D O F F I L E

```
#####
### FILE      : scc
#####
### Created   : Tuesday, November 12, 1996 Modified: Tuesday, November 12, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 5091 bytes    4 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.erols.net!newspump.sol.net!news.mindspring.com!L2Co
From: L2Co@mindspring.com (Larry Knight)
Newsgroups: comp.sys.apple2.programmer
Subject: Re: Apple II Email (Network Connections)
Date: Thu, 10 Oct 1996 21:19:08 -0400
Organization: The L2 Company
Lines: 82
Message-ID: <199610102119086450077@user-168-121-33-105.dialup.mindspring.com>
References: <32546DD2.7CF3@wctc.net> <3255CE3F.4C16@uwrf.edu>
<3255D023.4090@wctc.net> <53e6i8$493@cisu2.jsc.nasa.gov> <325B944D.2414@wctc.net>
NNTP-Posting-Host: user-168-121-33-105.dialup.mindspring.com
X-Server-Date: 11 Oct 1996 01:18:32 GMT
X-Newsreader: MacSOUP 2.2b3
```

OK, I am new to this discussion, and completely ignorant of Apple II hardware, but I think I can be of some service.

I am a hardware engineer that designs cache cards for Power Macs, and in a former life spent a little time with LocalTalk issues when I worked for Hayes (the modem guys).

A few comments/questions:

1: At the physical layer, LocalTalk (or PhoneNet) boxes are little more than transformers (open one up sometime and look). They allow the RS-422 (NOT RS-232!) outputs of the Mac serial ports to drive the signal onto the "bus" which is the two-wire LocalTalk or PhoneNet cabling that is shared by multiple devices. RS-422 is a "push-pull" differential output and input system which has superior noise cancellation properties than "single-ended" drive types like RS-232. Don't worry though, the conversion between RS232 and RS422 is very simple and cheap.

2: LocalTalk runs at 230,400 bps, and not at any slower speeds. Not only that, but it is driven by a particular modulation scheme called Manchester II encoding, and moreover it uses a SYNCHRONOUS protocol (I think it is SDLC, but don't quote me on that). Basically, to do LocalTalk easily, you pretty much should use the chip that Apple uses on their motherboards - The SCC (Serial Communications Controller), or 8530, available commercially from either Zilog (are they still around??) or AMD (definitely still around!).

3: Does the Super Serial Card have the SCC on it, or just a simple UART? If anyone has one handy that they can look at, just read the numbers on the largest chips on the board, and I can probably tell you what kind of communications chip that they have there. If it is NOT an SCC (just look for "8530" somewhere on the chip markings), you will have big obstables to overcome in implementing AppleTalk. If the Super Serial Card DOES have an SCC on it, then you're far along the path. The only remaining obstable is the proper programming of the part, etc. (I'm not saying that is trivial, but at least the hardware support is

there).

4: If the Super Serial Card does NOT have an SCC on it, the most straightforward path seems to get Apple to allow someone to make the Apple II workstation board again, license-free (which I will guarantee without even looking at it that it has an SCC on it).

I own a small hardware company (we engineer and manufacture cache cards for Power Macs), and would possibly be interested in manufacturing this board again, but certainly would need Apple's blessing.

Can anyone loan me a Apple II workstation board for a few days so I can take a look at one to see what the manufacturing costs would be? It can be dead or alive. If you have a dead one, could I keep it?

Comments? Does anyone have a clue as to whom should be contacted within Apple about this? Anyone out there know WOZ? He may be supportive of this movement to give the venerable Apple IIs another shot of life. There are lots of schools with these things just lying around gathering dust, and they could make great email stations for students!

By the way, in this discussion, I have not heard OfficeMail mentioned. It is from Claris, and is an Email POP server for a LAN. Any POP client can talk to it over LocalTalk OR TCP/IP - either will work. Of course, Claris would like you to use EMailer, which is a client for OfficeMail, and is also a great Eudora competitor as a general internet and online service email reader.

OfficeMail would make a nice server for the Apple II clients. Moreover, since it is from Claris, which is owned by Apple, there could be the remote possibility of some help from them in this adventure! It is also CHEAP - \$275 or so for the server software, and there are NO license fees for adding clients (if you use a freeware mail program like Eudora).

Gee, I wonder if Claris would make a freeware Apple II version of EMailer that is HIGHLY stripped down? Wouldn't THAT be a kick! And a hell of a public service to the many schools owning these machines. TCP/IP would not be necessary, since the Apple II would be using LocalTalk.

Hey, WOZ, wherever you are! Can you chat up some of your friends at Claris? Can you give us some guidance here?

Larry Knight

--

The L2 Company                                   http://www.mindspring.com/~l2co  
3544 Jefferson Township Pkwy           eMail: L2Co@mindspring.com  
Marietta, GA, USA, 30066-1782  
International: +1 770 641 9650 FAX : +1 770 641-9433

##### E N D     O F     F I L E  
### scc  
##### E N D     O F     F I L E

```
#####
### FILE      : shiftkeymod
#####
### Created   : Monday, January 20, 1997 Modified: Monday, January 20, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5011 bytes   4 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!chi-
news.cic.net!feeder.chicago.cic.net!arclight.uoregon.edu!feedl.news.erols.com!howl
and.erols.net!news.sprintlink.net!news-
peer.sprintlink.net!visi.com!ns.qnis.net!not-for-mail
From: Steve Jensen <sjensen@ns.qnis.net>
Newsgroups: comp.sys.apple2
Subject: Re: Videx U/L-case board
Date: 20 Jan 1997 07:42:36 GMT
Organization: (missing)
Lines: 92
Message-ID: <5bv71c$mfs@darla.visi.com>
References: <travis-1601970039570001@dream-king.cisco.com>
<5busst$jf9@borg.svpal.org>
NNTP-Posting-Host: ns.qnis.net
X-Newsreader: TIN [UNIX 1.3 unoff BETA release 961203]
```

```
Paul Creager <wily@svpal.svpal.org> wrote:
: Ward C. Travis (travis@cluracan.org) wrote:
: : I opened an Apple II+ the other day and two things surprised me...
: : First, there was a board labeled "VIDEX" tacked under the keyboard;

: The official name is the Videx Keyboard Enhancer. It replaces Apple's
: keyboard encoder board underneath the keyboard. Besides providing true
: U/L capability (with the Shift Key), it had a small (10-20 character)
: buffer and supported programmable macro keys.

: I had one on my ][+, until it went south. I can't remember all that much
: about installation, dip switches, etc. I do remember a couple of wires
: had to be run to the motherboard. One enabled true Shift key usage. The
: other I can't remember. If you don't have a wire running to an IC on the
: motherboard, that explains why your Shift key isn't working. It could
: very well be the same spot where the "traditional" Shift key mod is made,
: if that's any help.
```

Here's 3 files I have on the 'shift key mod':

```
II+ SHIFT KEY MOD
=====
```

Here is the "shift key mod" for a II+. A wire should run from the second pin from the edge opposite the power supply on the connector between the keyboard and its piggy-back board (pin 24 if counting from the other end). It should go to one of the game port pins (pin 4) or to pin 1 of a nearby 74LS251 (at board location "H14").

This wire connects the SHIFT keys to the "Switch 2" input on the game port (which is infrequently used). It allows programs to sense the state of the shift key by watching the SW2 I/O location (\$C062). If bit 7 is set, then the shift key is up. If bit 7 is clear, then the shift key is down.

## HOW TO DO A "SHIFT KEY MOD"

To install the "shift key mod" on a II+ what you need to do is connect a wire from the shift key pin on the keyboard aux. circuit board (this hangs below the keyboard) to annunciator 3 on the joystick port. The shift key pin is the second pin from the right on the "piggy-back" circuit board under the keyboard. You will probably need to solder it on. Pin 4 on the joystick connector is where you stick the other end. You can just push the wire in and then probably replace the joystick (if there is one) right on top of it.

In case that was unclear, 2nd from the right means as you look under the keyboard from the front, and pin 4 is the fourth pin down on the left with the notch at the top (on the joystick connector). Now, when the shift key is pressed, it sets (or clears?) AN3. Some programs look for this. However, DOS and Applesoft don't, as far as I know.

## APPLE II SHIFTKEY MODIFICATION

-----  
The one wire shiftkey mod is the oldest and simplest fix that can be made to the Apple II to get true upper and lower case operations with the shift key. Most good word processors have input routines that check the PB2 input on the game I/O port to determine if the shift key is being pressed. Some programs that have these routines are Wordstar, Write-on, Apple Pascal 1.1 and many others. Follow the steps below to install the shift key mod.

parts:

- 1 mini-grabbette clip (Radio Shack PN 270-370)
- 1 15 in. piece of small guage wire
- 1 16 pin socket

- 1) Solder one end of the wire to the mini-grabbette clip.
- 2) Solder the other end of the wire to pin 4 of the 16 pin socket as close to the body of the socket as possible.
- 3) Turn the Apple II off and remove the cover.
- 4) Remove anything plugged into the game I/O socket.
- 5) Attach the mini-grabbette clip to pin 24 of the keyboard encoder connector. This connector is located inside the Apple II directly beneath the RESET key. Pin 1 is nearest the power supply and pin 25 is nearest the right edge of the Apple II. Use the grabbette clip to attach to the standoff pin 24 (second from the end).
- 6) Lead the other end of the wire with socket attached along the right edge of the motherboard and plug it into the game I/O port. Be careful to plug pin 1 to pin 1 when putting this socket in. Pin 1 of the game I/O port is towards the front of the computer.
- 7) Replace the cover and start using lower case characters.

eof

--

sjensen@qnis.net

##### E N D O F F I L E

### shiftkeymod

##### E N D O F F I L E

```
#####
### FILE      : sider.tapes
#####
### Created   : Thursday, March 18, 1999 Modified: Thursday, March 18, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1632 bytes   1 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.erols.net!news.maxwell.syr.edu!newscore.univie.ac.at!newsmaster-
01.vbs.at!newsfeed03.univie.ac.at!newsrouter.chello.at!news.chello.at!not-for-mail
From: "gasper" <gasper@teleweb.at>
Newsgroups: comp.sys.apple2.marketplace
References: <5gHH2.348$V14.13553@newsfeed.slurp.net>
Subject: Re: sider tape units ...what kinda tapes
Lines: 33
X-Newsreader: Microsoft Outlook Express 4.72.3155.0
X-MimeOLE: Produced By Microsoft MimeOLE V4.72.3155.0
Message-ID: <yBeI2.6995$_k1.4862@news.chello.at>
Date: Thu, 18 Mar 1999 21:53:34 GMT
NNTP-Posting-Host: 212.17.115.58
X-Complaints-To: news@telekabel.at
X-Trace: news.chello.at 921794014 212.17.115.58 (Thu, 18 Mar 1999 22:53:34 MET
DST)
NNTP-Posting-Date: Thu, 18 Mar 1999 22:53:34 MET DST
Organization: Chello Austria
Xref: newsl.icaen comp.sys.apple2.marketplace:27775
```

Hallo,

Pls look for the following tapes for the SIDER Tape drive:

```
TEAC CT600H
VERBATIM ST600
MAYNSTREAM (MAYNARD) DATA CASSETTE 600
```

hope this helps

Bye Michael

```
brad weelborg schrieb in Nachricht
<5gHH2.348$V14.13553@newsfeed.slurp.net>...
>found and old sider hd compatible tape unit (remember those) they use a
>wierd tape looks like a cassette
>tape in a hi fi they were white i think..what kinda tape were they called
>????
>
>wondering if i can still get them someplace was gonna try the puppy out..
>
>(in sad need of a life)
>
>brad
>sysop@lost-gonzo.com
>www.lost-gonzo.com
>checkout my bbs i have 2 apple bbs systems running as doors off my www site
>apple file area plus extras telnetter's get 90min a day free.
>
>
```

>  
>

##### E N D O F F I L E  
### sider.tapes  
##### E N D O F F I L E

```
#####
### FILE      : sirius.ram
#####
### Created   : Saturday, May 30, 1998 Modified: Saturday, May 30, 1998
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 2656 bytes    2 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!uwm.edu!chicago-news-
feed2.bbnplanet.com!news.bbnplanet.com!newsfeed.enteract.com!news.enteract.com!net
news.com!news.idt.net!nyd.news.ans.net!newsfeeds.ans.net!newsxfer.itd.umich.edu!ne
ws2.acs.oakland.edu!cwis-20.wayne.edu!moose!pschultz
From: Paul Schultz <pschultz@med.wayne.edu>
Newsgroups: comp.sys.apple2
Subject: Re: Question:ZipGS/RAMfast SCSI/ROM 3 GS
Date: Fri, 29 May 1998 17:05:43 -0400
Organization: Wayne State University
Lines: 80
Message-ID: <Pine.SOL.3.96.980529164903.22013A-100000@moose>
References: <1998052801021600.VAA24188@ladder01.news.aol.com>
<1998052802082600.WAA03446@ladder01.news.aol.com>
NNTP-Posting-Host: 146.9.3.20
Mime-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII
X-Sender: pschultz@moose
To: LJSILICON <ljsilicon@aol.com>
In-Reply-To: <1998052802082600.WAA03446@ladder01.news.aol.com>
Xref: newsl.icaen comp.sys.apple2:134620
```

On 28 May 1998, LJSILICON wrote:

```
> Supertimer,
> Yes, the control panel was set to YOUR CARD.
>
> I hadn't seen the post on removing the first bank of SIMS. I did not get much
> doc with the card. There are 5 sets of 3 jumpers on the front of the Sirius
> card. Do any of these jumpers need changed if the SIMM is pulled? Do you have
> any idea what these jumpers control.
>
```

If you have the Sirius with the set of jumpers then you have version 2.0 of the memory card. The previously quoted comments of mine were in regard the the version 1.0 Sirius card which had no jumpers since it could 'self detect' SIMMs in its slots. It is version 1.0 which works better if you have a SIMM in the 8th slot even if it is being used on a ROM 3.

As for your version 2.0 card and the jumpers....

The jumpers are used to configure the card so it knows how many SIMMs you have installed and whether they are 256KB or 1MB SIMMs. You can have the following set-ups according to the docs (1 sheet of paper!): (assumes 1 MB SIMMs unless explicitly noted)

1 Meg:

7.5C o=o o

D4 o o=o D6  
1024K o=o o 256K  
L o o=o CRow0  
H o o=o CRow1

2 Meg:

7.5C o=o o  
D4 o o=o D6  
1024K o=o o 256K  
L o o=o CRow0  
H o=o o CRow1

4 Meg:

7.5C o=o o  
D4 o o=o D6  
1024K o=o o 256K  
L o o=o CRow0  
H o o=o CRow1

8 Meg:

7.5C o o=o  
D4 o o=o D6  
1024K o=o o 256K  
L o o=o CRow0  
H o o=o CRow1

1 Meg (256K SIMMs):

7.5C o=o o  
D4 o=o o D6  
1024K o o=o 256K  
L o o=o CRow0  
H o o=o CRow1

2 Meg (256K SIMMs):

7.5C o o=o  
D4 o=o o D6  
1024K o o=o 256K  
L o o=o CRow0  
H o o=o CRow1

I hope this is helpful.

Paul.

pschultz@med.wayne.edu  
Paul Schultz

##### E N D O F F I L E  
### sirius.ram  
##### E N D O F F I L E

```
#####
### FILE      : slots.iievsgs
#####
### Created   : Friday, November 19, 1999 Modified: Friday, November 19, 1999
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 3480 bytes    3 KB
#####
```

jruschme@exit109.com (John Ruschmeyer) wrote:

```
>>      If yours will fit, then, yes, if you put it in Slot 4 and set the Slot
to
>>"Your Card" you give up the mouse as long as the card is in use. Also, it
seems
>>that you would need to set IIgs Speed to "Normal" (slow) speed.
>
>Okay. Out of curiosity, where does one usually put a coprocessor card in a
>IIgs (i.e., what slot?)?
```

They can go into any slot except slot 3 and the memory expansion slot. The PC Transporter (provides an IBM XT processor at "Turbo XT" speed for a hardware/software IBM XT emulator) for example I've used in several different slots.

```
>Do we all keep turning slots on and off, depending
>on what we're running at the time?
```

No. Some cards, especially IIGS specific cards, do not require that you switch a slot to "Your Card." This means that for these cards, you get to use your slot and keep your built in function. Sound cards and accelerator cards work this way as do most video cards. The Second Sight card for example. You can plug a Second Sight into any slot on a ROM 3 IIGS and you do not have to set the slot to "Your Card." Same thing with the Visionary GS frame grabber card.

On the flip side, it is often possible to switch a slot to "Your Card" and still keep the built in function. On a ROM 3 IIGS, you can plug a card into slot 4, set the slot to "Your Card" and keep using your mouse.

Under both a ROM 01 and a ROM 3, you can plug a card into slot 2 and set that slot to "Your Card" without losing the modem port in most terminal programs (ProTERM 3.1, for example).

Finally, under System 6.0.1, you can have a card in slot 5, set that slot to "Your Card" and still keep your built in slot 5 RAM disk.

```
>Okay, I admit it, I'm confused. Any good tutorials on the use of slots in
>a IIgs?
```

Nothing to be confused about. The following rules are all you need to know:

1. For IIGS cards that say they don't need the slot set to "Your Card" (Second Sight, sound cards, accelerator cards, Visionary GS card come to mind), just plug in the card and DO NOT set the slot to "Your Card." You do not lose the built in function associated with the slot.

2. For IIE cards, you plug the card into a slot, set the slot to "Your Card" and usually lose the built in function associated with the slot. The exceptions are as follows. You usually never lose the modem port even with the slot set to "Your Card" because most IIGS aware comm software such as ProTERM 3.1 will access the modem port regardless of the slot setting. On a ROM 3 IIGS, you do not lose the mouse if slot 4 is set to "Your Card." Under System 6.0.1, you do not lose the RAM disk if slot 5 is set to "Your Card."

So, if you have a choice between IIE card and IIGS card (for example, a IIE Phasor sound card versus a IIGS Sonic Blaster sound card), choose the IIGS one because it works without the slot set to "Your Card" so that you'll never have to give up the built in function of the slot. If you must use a IIE card, the first choice is slot 2 because most software can still see the modem port with slot 2 set to "Your Card" so you keep the built in function. If you have System 6.0.1, slot 5 is the second choice, especially if the card you are plugging in is an enhanced 3.5 disk controller (Blue Disk or SuperDrive card) because you keep the RAM disk. However, if you have a ROM 3, slot 4 suddenly is the first slot you'd choose because you don't lose the mouse if you set this slot to "Your Card."

```
##### E N D O F F I L E
### slots.iievsgs
##### E N D O F F I L E
```

```
#####
### FILE      : sonicblaster
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 2077 bytes    2 KB
#####
```

```
Path: news.uiowa.edu!chi-
news.cic.net!newsfeeder.sdsu.edu!newspump.sol.net!spool.mu.edu!noc.nyx.net!nyx10.c
s.du.edu!not-for-mail
From: wbaguhn@nyx10.cs.du.edu (Will Baguhn)
Newsgroups: comp.sys.apple2
Subject: Sonic Blaster
Date: 26 Jun 1996 23:21:14 -0600
Organization: I am the error in apps of delight
Lines: 38
Message-ID: <4qt5oa$hqm@nyx10.cs.du.edu>
NNTP-Posting-Host: nyx10.nyx.net
```

Some time ago, I got an AE Sonic Blaster, but didn't get the cable/backplate that went with it (i.e. I just had the card, and nothing through which I could attach it to speakers). A little poking around, and that annoying Brian Hammack (:) sent me the "magic" pinouts of how to build the cable. I'm sharing the info with the world, just in case someone else gets a Sonic Blaster... (or, in case someone wants to re-build their current audio backplate to have sheilded cable...)

>Here's the schematic according to my limited ability:

```
>MOLEX-6 ON CARD      OUT (1/8" stereo jack)
> ----
> || .1                Barrel - 2
> || .2                Mid - 1
> || .3                Tip - 3          IN (1/8" stereo jack)
> || .4
> || .5                Barrel - 5
> || .6                Mid - 4
> ----                Tip - 6
>
```

>The original plate & cable is as such when looking from the keyboard  
>end, top to bottom, blue red white blue red white off the molex-6 with  
>the top three going to the OUT and the bottom three going to the IN,  
>with the two "sets" both in heatshrink tube.

>The plate the two jacks are on is metal, and is screwed down into the  
>metal frame inside the GS's outlet as grounding; I'll assume that since  
>they are "internal" jacks the barrel contacts do the actual work. :)  
>The manual really stresses that the plate MUST be touching the metal  
>shield inside the case for proper operation so take heed.

>Hope this all helps...

<< mushroom >>

> \* 2qwk! 2.02 \* "You go online, you get techno-weenievision." - J.Harris

--

--- SPQR (wbaguhn@nyx.net)

```
##### E N D O F F I L E  
### sonicblaster  
##### E N D O F F I L E
```

#####  
### FILE : sound.caps  
#####  
### Created : Wednesday, December 9, 1998 Modified: Wednesday, December 9, 1998  
### File Type: "TEXT" File Creator: "LMAN"  
### File Size: 4213 bytes 4 KB  
#####

Path:  
newsl.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!nyd.news.ans.net!newsfeeds.ans.net!news.idt.net!nntp.giganews.com!cyclone.swbell.net!typhoon01.swbell.net.POSTED!  
not-for-mail  
Message-ID: <366D7DB8.A108FA6B@swbell.net>  
From: Rubywand <rubywand@swbell.net>  
Reply-To: rubywand@swbell.net  
X-Mailer: Mozilla 4.06 [en] (Win95; I)  
MIME-Version: 1.0  
Newsgroups: comp.sys.apple2  
Subject: Re: SuperSonic  
References: <366d5143.0@news.pacifier.com>  
Content-Type: text/plain; charset=us-ascii  
Content-Transfer-Encoding: 7bit  
Lines: 76  
Date: Tue, 08 Dec 1998 13:27:52 -0600  
NNTP-Posting-Host: 207.193.9.50  
X-Complaints-To: abuse@swbell.net  
X-Trace: typhoon01.swbell.net 913145089 207.193.9.50 (Tue, 08 Dec 1998 11:24:49 PDT)  
NNTP-Posting-Date: Tue, 08 Dec 1998 11:24:49 PDT  
Organization: SBC Internet Services  
Xref: newsl.icaen comp.sys.apple2:142768

Ronald Clark writes ...

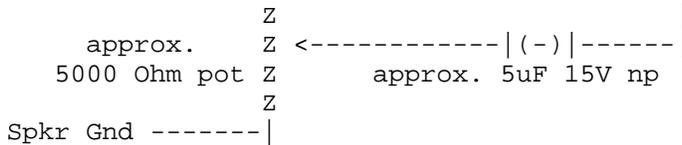
>  
> Is there a way to make sounds not from the sound chip to go in the card?

If you are connecting your Stereo Board outputs to a stereo amplifier or to speakers with built-in amplifiers, a simple way to mix in 'Old Apple' sounds is to connect a capacitor from the signal ("+" or non-ground) Spkr lead to one of the Stereo Card outputs.

This connection mixes in combined (mono) IIgs sound, too. This is why a pot is included in the circuit. It lets you adjust how much of the Old Apple and mono GS sound to mix in so that, when sound is coming through the Stereo Board, the Stereo Board sound will predominate.

The pic below shows a 5uF 15V non-polarized electrolytic cap running from a pot across the Spkr leads to the center of the Right Output socket. (You can use a couple regular 10uF caps connected back to back.)



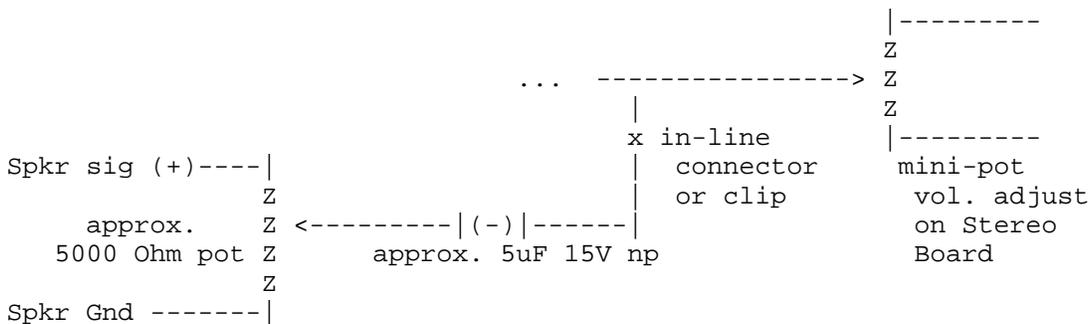


None of the values shown is especially critical and it does not matter which channel output you connect to. The in-line connector or clip is to allow disconnecting the Old Apple Sound wire when you wish to remove the Stereo Board for cleaning, etc.. It can be just a place where the wires are twisted together and covered with tubing which fits snugly.

A handy place to connect the pot leads is on the Speaker connector at the right front corner of the motherboard. You can tap on wires near the bottom of the pins to leave room for reconnecting the Speaker plug.

Note: As you face the front, the Left pin is +. It does not matter which outside leads of the pot go to which pins unless you care about having a clockwise turn = more volume. Otherwise, just connect the end leads and set the pot for the output level you like.

If your Stereo Board has outputs which can drive speakers and you want to connect plain (unamplified) speakers to the board, the above connection will not do the job. If you do not mind poking around on your Stereo Board, you can probably find a couple of mini pots which set output volume for each channel. (I do not know if the SuperSonic board has these. It's a fairly common feature on sound boards with power amp outputs.) The middle lead of one of the pots (either one) is a pretty good bet as the place to connect the lead coming from the in-line connector.



Rubywand

```

##### E N D O F F I L E
### sound.caps
##### E N D O F F I L E
  
```

```
#####
### FILE      : sound.cards
#####
### Created   : Thursday, August 13, 1998  Modified: Thursday, August 13, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 8273 bytes   8 KB
#####
```

```
Path: news1.icaen!news.uiowa.edu!uunet!in3.uu.net!128.230.129.112!news-
spurl.maxwell.syr.edu!news.maxwell.syr.edu!sunqbc.risq.qc.ca!newsflash.concordia.c
a!not-for-mail
From: spec@vax2.concordia.ca (Mitchell Spector)
Newsgroups: comp.sys.apple2
Subject: Re: What is the Best Sound card for the IIGs?
Date: 24 Sep 1997 02:13 -0500
Organization: Concordia University
Lines: 48
Distribution: world
Message-ID: <24SEP199702130245@vax2.concordia.ca>
References: <604j2a$bap$2@mentor.telis.org>
NNTP-Posting-Host: vax2.concordia.ca
NNTP-Posting-User: SPEC
News-Software: VAX/VMS VNEWS 1.50AXP
```

In article itsme <quantum@telis.org> writes...

```
>What is the best sound card for the IIGs?  I would like options like
>stereo, microphone input, software controllable output...
>
>What are some good sound cards, and what features do they have?
```

The best one out there is probably Applied Engineering's Audio Animator. That consisted of an interface board with a Z8530 serial chip that connected up to an external sound mixer box. It used its own ADC (inside the shielded box) to digitize sound at a much higher quality than the Ensoniq's own ADC, and with the ability to capture in true stereo (some cards did not offer this). The mixer included two 1/4" phono connectors and four RCA connectors for input/output, as well as volume sliders to control sound levels. Another nice touch was that it also provided MIDI compatibility and had three standard DIN5 connectors for that.

Another good card (and probably just as good as the AE AA) was the Applied Visions FutureSound card. It too used its own ADC to digitize sound and gave very clean stereo output, though these are a little on the rare side to find.

Other options worth checking into are the MDIdeas SuperSonic Stereo card, which gave clean output (if you jumpered the card using the 'LN' output) and had a piggyback digitizer option. However that used the ADC from the Ensoniq and generally was very hissy and noisy from my own experience with at least three of these boards. There was the 'Digitizer Pro' option which was a full sized card, and like the others above used its own ADC, but this is extremely rare and hard to find (so few people have owned them I have no idea how well it worked). Although it was decent, I was never fond of the MDIdeas card because all the connectors were internal, forcing you to run

wires and speaker connectors inside the GS's case (I damaged a pair of speakers having to wedge the 1/8" phono's tail up against the back of the case).

The only stereo/digitizer board you can still purchase new is the Alltech (formely Econ) SoundMeister card. It's an average card, it works but nothing to say beyond that. I list it here because you can still buy it, not because it was an exceptional card. There are of course other cards out there, but they're mostly mediocre ones (speaking of mediocre, avoid the AE SonicBlaster, that was a poorly designed card that wasn't properly shielded and had problems with output at certain levels I recall).

Mitchell Spector

spec@vax2.concordia.ca

Path:

news1.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!nyd.news.ans.net!newsfeeds.ans.net!news.idt.net!news-peer-east.sprintlink.net!news.sprintlink.net!sunqbc.risq.qc.ca!newsflash.concordia.ca!not-for-mail

From: spec@vax2.concordia.ca (Mitchell Spector)

Newsgroups: comp.sys.apple2

Subject: Re: Sound Boards

Date: 13 Aug 1998 02:53 EDT

Organization: Opus One

Lines: 85

Distribution: world

Message-ID: <13AUG199802534868@vax2.concordia.ca>

References: <35D20115.11F9@terra.cira.colostate.edu>

NNTP-Posting-Host: vax2.concordia.ca

News-Software: VAX/VMS VNEWS 1.50AXP

Xref: news1.icaen comp.sys.apple2:138054

In article Jeff Lemke <lemke@terra.cira.colostate.edu> writes...

>Can anybody give me a comparison of the sound capabilities of the  
>Applied Engineering Phasor and the native sound capabilities of the IIgs?

The Phasor:

Well the Phasor was an optional plug-in board designed for the Apple II Plus and IIe (which had no sound capabilities built-in, other than a speaker which could be toggled on/off to produce a click or beep like PC's). It used 4 General Instrument AY-3-8913 sound chips, an SSI-263 speech chip (with the option of adding a second) and had a built-in 4 watt amplifier which could output in true stereo. There were DIP switches on the card which would allow it to emulate other Apple II sound cards, such as the old Mockingboard or Echo+ speech card (I was never able to get the latter emulation to function).

Each AY-3-8913 (identical to the AY-3-8910 as far as I know, only it came in a smaller package) could produce 3 independant voices, plus a 4th channel for a white noise generator. With all the chips combined, that gave it 12 voices, 4 white noise channels and 1 or 2 synthesized speech channels. The AY-3-8910 could be used to produce sounds and music and was commonly used in old arcade machines in the 80's (not to mention a couple of computers, like the TI99/4a, Intellivision, Atari ST, etc). It was limited

though in that it could only produce sound using pre-calculated waveforms (squarewave, sinewave, tringlewave and so on) so it was rather artificial sounding. It was similar to IBM sound cards like the AdLib and SoundBlaster, only those were much more advanced and used FM synthesis.

The Apple IIgs:

The IIgs came standard with a sound coprocessor chip built-in every machine. That chip was the Ensoniq 5503 Digital Oscillator Chip (Ensoniq DOC). It had 32 oscillators, which could either be used independantly or paired with others to create richer sound. The Apple IIgs paired them (with two reserved, for timing control I believe) and had 15 voices. Some programs unpaired them to get near 32 voices (e.g. Diversi-Tune) while others paired them twice to get better sound (e.g. synthLAB, which has 7 voices). Unlike the Phasor and other sound chips, the Ensoniq could do wavetable synthesis. In otherwords, it could use an unlimited spectrum of waveforms to create all sorts of sound variations and of course, very realistic ones (you could digitize the sound of a real piano or real violin as a basis for your waveform. Nothing exciting today, but back in 1986 this was unheard of in a personal computer).

The Ensoniq 5503 worked in 8-bit sound resolution, and could play back at sampling rates up to 44.1 kHz and even much higher [I'll leave out any comments about the low pass filter as I'm a little confused about it presently, as half the people out there say it is bad, while the other half say its good. Oh, and no need to repost those article clippings, Supertimer and Scott G. ;-)] It had both a DAC and ADC built-in, so you could play back and record digital sound recordings. It also had 8 independant stereo channels through which each of the 32 oscillators could play through, potentially giving the GS the ability to have stereo sound came out of multiple speakers (sound in front, back, sides, up and down). Unfortunately Apple wired all 8 channels into one monorail channel through the 1/8" headphone jack, but they made the signals available through a molex connector on the mainboard. All existing third party stereo cards only decoded two channels, so you only got left/right stereo, like most computers and home audio equipment today.

In summary, while you could do interesting sound and speech with the Phasor card, the Ensoniq chip in the IIgs complete blew it away (as well as all other computers back in the 80's--and most in the early 90's). The Ensoniq was a professional music synthesizer chip, the same one used in the Mirage keyboard. It could do everything the Phasor was capable of, including speech synthesis, not to mention even emulate the Phasor's AY-3-8913 chips. Today its fairly obsolite compared with modern versions of the Ensoniq and other wavetable chips and technologies (you can see that if you try to use it to play MIDI files ;- ) though still quite impressive for a 12 year old machine! For example, you can play 8 voice MOD files using a stock 2.6 MHz Apple IIgs as the chip acts as a coprocessor (the Macintosh Plus and SE, with its more powerful 68000 but lesser 4 channel DAC, cannot play MODs at all).

Mitchell Spector  
spec@vax2.concordia.ca

```
##### E N D O F F I L E  
### sound.cards  
##### E N D O F F I L E
```

```
#####
### FILE      : sound.digitizer
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1397 bytes   1 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!newsfeed.internetmci.com!in2.uu.net!newsflash.con
cordia.ca!not-for-mail
From: spec@vax2.concordia.ca (Mitchell Spector)
Newsgroups: comp.sys.apple2
Subject: Re: Sound Input on IIGS
Date: 3 Aug 1996 05:18 -0500
Organization: Concordia University
Lines: 18
Sender: spec@vax2.concordia.ca (vax2.concordia.ca)
Distribution: world
Message-ID: <3AUG199605184864@vax2.concordia.ca>
References: <4tstqs$$s61@milo.vcn.bc.ca> <4tsv92$plv@login.freenet.columbus.oh.us>
NNTP-Posting-Host: vax2.concordia.ca
News-Software: VAX/VMS VNEWS 1.50AXP
```

In article dmasters@freenet.columbus.oh.us (Dan Masterson) writes...

```
>
>Al Crout (acrout@vcn.bc.ca) wrote:
>: An interesting article by Roland Gustavson (I think) appeared in an issue
>: of A+ or inCider on how to use a Radio Shack intercom as a microphone to
>: connect to the 7 pin connector on the motherboard of the IIGS for sound
>: sampling.
>
>Which issue?
```

A+ Magazine, April 1987 issue, on page 93. There is also a follow-up in the September 1987 issue (page 84) with a brief mention of the what's involved, complete with photo diagrams. The page before it has an Applesoft BASIC listing for a real-time oscilloscope which you can test it with (I'm fairly sure MDIdeas shipped it with their SuperSonic digitizer card :)

Mitchell Spector  
spec@vax2.concordia.ca

```
##### E N D O F F I L E
### sound.digitizer
##### E N D O F F I L E
```

```
#####
### FILE      : soundin
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2085 bytes   2 KB
#####
```

Re: Sound Input on IIGS

From: dempson@actrix.gen.nz (David Empson)  
 Reply to: David Empson  
 Date: Tue, 06 Aug 1996 01:02:22 +1200  
 Organization: Empsoft  
 Newsgroups:  
     comp.sys.apple2  
 Followup to: newsgroup(s)  
 References:

<4tsc5k\$r7l@news.vanderbilt.edu>  
 <3AUG199606073181@vax2.concordia.ca>  
 <4u3tos\$ian@news.vanderbilt.edu>

In article <4u3tos\$ian@news.vanderbilt.edu>, lesherjt@vuse.vanderbilt.edu  
 (Tilghman Leshner) wrote:

```
>Mitchell Spector (spec@vax2.concordia.ca) wrote:
>: In article lesherjt@vuse.vanderbilt.edu (John Leshner) writes...
>: >
>: > How can I get the IIGS to sample sound? When I had
>: >my //e, I had this nifty little program to sample sound via
>: >the cassette port, but the IIGS has no cassette port. Is
>: >there a simple method? Or must I buy a peripheral card?
>
>[snip]
>
>: As I mention above, sound sampling is built-in to the chip (ADC),
>: but Apple didn't add any conventional way to plug in your sound source.
>: They did however provide a set of molex I/O pins. You basically have
>
>[snip]
>
>Where on the motherboard are these pins and (if > 2) what are the
>pinouts?
```

It is the 7-pin molex connector in the lower right corner of the motherboard, next to the Ensoniq. All stereo cards plug into this connector.

Most of the pins are used for sound output and associated demultiplexing. Pin 1 is the sound input and pin 2 is analog ground. (Pin 1 is the one closest to the back of the computer, right next to the legend "J25" on the ROM 1 motherboard.)

The sound input expects a signal which has a maximum range of 2.5V peak to peak. The input impedance is 3000 ohms.

I'm not all that clear on audio impedances and voltages, so I'm not sure

if it is safe to connect anything directly to this pin. It may be necessary to use a simple amplifier circuit to handle impedance matching.

Can anyone elaborate on this?

--

David Empson  
dempson@actrix.gen.nz  
Snail Mail: P.O. Box 27-103, Wellington, New Zealand

##### E N D O F F I L E  
### soundin  
##### E N D O F F I L E

```
#####
### FILE      : speaker.plug
#####
### Created   : Friday, May 1, 1998   Modified: Friday, May 1, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2882 bytes    2 KB
#####
```

Path:

```
newsl.icaen!news.uiowa.edu!news2.chicago.iagnet.net!qual.net!iagnet.net!newsreader
.digex.net!dcal-
hubl.news.digex.net!digex!howland.erols.net!netnews.com!news.idt.net!nntp.giganews
.com!newsgate.swbell.net!151.164.30.35.MISMATCH!cyclone.swbell.net!swbell!not-for-
mail
From: Rubywand <rubywand@swbell.net>
Newsgroups: comp.sys.apple2
Subject: Re: Apple speaker
Date: Thu, 30 Apr 1998 23:50:22 -0500
Organization: Southwestern Bell Internet Services, Richardson, TX
Lines: 48
Message-ID: <3549548E.7DDA2A4B@swbell.net>
References: <1998042605430701.BAA23437@ladder01.news.aol.com>
Reply-To: rubywand@swbell.net
NNTP-Posting-Host: ppp-207-193-11-206.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Trace: (null) 893997620 17195 (None) 207.193.11.206
X-Complaints-To: usenet@nnrp3
X-Mailer: Mozilla 4.04 [en] (Win95; I)
Xref: newsl.icaen comp.sys.apple2:133175
```

TomMage writes ...

```
>
> Hello, I tried it, bought a cable with an RCA plug at one end and two > bare
wires on the other end. Tried hooking it up by splicing into the > speaker wires
and also disconnecting the speaker wires at the post and > hooking up directly to
the posts. Neither method seems to work, do you > have any idea why??
```

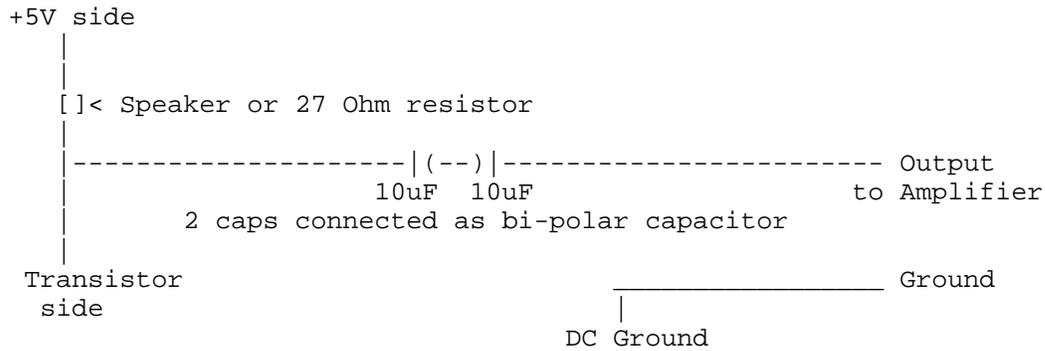
....

Yes. The speaker is in the Collector circuit of the output transistor-- one end of the spkr goes to a resistor and capacitor connected to the output transistor Collector and the other goes to +5V (not ground). To get an audio output signal, the spkr must be in place; or, you can substitute a 1 watt resistor-- something in the 22-39 Ohm range.

The output should come from the side of the spkr (or 1 watt resistor) going to the resistor & capacitor connected to the transistor-- i.e. the side which is not the +5V side. The output goes through a coupling capacitor to the center lead of your RCA plug. The Ground side of the RCA plug goes to ground.

"Ground" is DC ground = any motherboard trace area which is connected to the ground side of the power supply. For example, the outside "shell" of the composite video output is soldered to ground.

Here is a rough picture ...



You can get a bi-polar coupling capacitor at Radio Shack (2uF-5uF is fine) or make one by connecting two 10uF caps neg end to neg end. (The value is not critical, two 5uF caps connected back to back is fine.)

Rubywand

```
##### E N D   O F   F I L E
### speaker.plug
##### E N D   O F   F I L E
```

```
#####
### FILE      : speed.demon
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1008 bytes   1 KB
#####
```

Path:

```
blue.weeg.uiowa.edu!news.uiowa.edu!uunet!MathWorks.Com!news.kei.com!eff!wariat.org
!malgudi.oar.net!mercury.wright.edu!college.antioch.edu!adbbs!John_L._Graham
Message-ID: <-525008930.485734@adbbs.adbbs.antioch.edu>
Date: 05 Sep 1994 01:35:29 -0000
From: John_L._Graham@adbbs.antioch.edu (John L. Graham)
Organization: Apple Dayton Users Group, Dayton OH
Reply-To: John_L._Graham@adbbs.antioch.edu
Subject: Re: Zip question (not Zip GS)
Distribution: world
Newsgroups: comp.sys.apple2
Lines: 12
```

Yeah, I have a IIC+, but every time I need to run it at 1 MHz I have to look the key sequence up. The Zip is a LOT easier. When you turn on an Apple II with a Zip there's a slight pause (about 1 sec) before you hear the startup beep. If you press the "escape" key during the pause it comes up at 1 MHz. Older Speed Demon cards worked the same way, but you had to continue the boot with a control-reset. I have IIs with both Zips and Speed Demons in them, and they just keep chugging away!

Have fun!

John

```
##### E N D O F F I L E
### speed.demon
##### E N D O F F I L E
```

```
#####
### FILE      : speeddemon
#####
### Created   : Thursday, December 5, 1996  Modified: Thursday, December 5, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3376 bytes   3 KB
#####
```

Path:

nexus.uiowa.edu!uunet!cs.utexas.edu!howland.reston.ans.net!agate!library.ucla.edu!  
news.mic.ucla.edu!ctc.com!news.cs.umb.edu!hsdndev!dartvax.dartmouth.edu!saturn.cap  
s.maine.edu!maine.maine.edu!io10677

Organization: University of Maine System

Date: Fri, 24 Dec 1993 18:52:09 EST

From: Douglas M. Howell <IO10677@MAINE.MAINE.EDU>

Message-ID: <93358.185209IO10677@MAINE.MAINE.EDU>

Newsgroups: comp.sys.apple2

Subject: Re: Speed Demon Dip Switches...

References: <estabroo.756598365@maroon.tc.umn.edu>

Lines: 64

This is from the 1-page manual that comes with the card:

For owners without a Bank Switch Language Card in thire Apple, the first seven DIP switches control the access speed of the following:

```
switch 1 -- controls -- slot 1
switch 2 --      "    -- slot 2
switch 3 --      "    -- slot 3
switch 4 --      "    -- paddle/joystick port
switch 5 --      "    -- slot 5
switch 6 --      "    -- slot 6
switch 7 --      "    -- slot 7
```

OFF indicates slot/port is accessed at High Speed.

ON indicates slot/port is to Slow Down for access.

All slots that can be accessed at High Speed and all empty slots should have the corresponding Dip switch set to "OFF" (this is the non-bank switch setting).

Special Note about Switch 4:

Switch 4 on the SpeedDemon DIP switch no longer controlsthe access speed to slot 4. It now controls how the joystick and paddles are read.

If switch 4 is in the "ON" position, the SpeedDemon will slow down to normal Apple speed for 50 milliseconds each time the joystick is accessed. This allows the software to read the joystick or paddles correctly. If switch 4 is in the "OFF" position, the SpeedDemon will not slow down when they are accessed.

Access to slot 4 is always at SLOW (normal) Apple speed.

Certain programs, such as Appleworks, use the joystick location, even when the joystick is not in use. If dip switch 4 is set to "ON" then these programs will not show any speed for some functions, such as calculations and sorts. Therefor, unless you need youysticks for your applications, switch 4 should be set in the "OFF" position.

If you have a Bank Switch Card (extended 80-col card, Ramworks II, Titan Saturn 128k card, excetera..) set switch 8 to the "ON" position.

Bank Switch Language Card Location:

Dip Switches 1-3 encode the location of your Bank switch language card. Use the following table to find the appropriate setting for your machine:

| Dip Switch |     |     | Bank Switch Card Location |
|------------|-----|-----|---------------------------|
| 1          | 2   | 3   | Slot #                    |
| off        | off | off | 0                         |
| off        | off | on  | 1                         |
| off        | on  | off | 2                         |
| off        | on  | on  | 3                         |
| on         | off | off | 4                         |
| on         | off | on  | 5                         |
| on         | on  | off | 6                         |
| on         | on  | on  | 7                         |

If you have two bank switch cards in your system, one must reside in slot 0. The other must be in the slot selected by DIP switches 1-3 above.

Special Note: Because the first three switches are used to encode the location of the Bank Switch Language Card, you can no longer control the speed of all the slots. Specifically you can not control slots 1,3, or 6. These slots will now always run Fast except for slot 6 which will always run Slow.

Special Note: The slot that the SpeedDemon card resides in should be set to the "Off" position

Note: The above information is for version 3.03, your milage may vary.

```
##### E N D O F F I L E
### speeddemon
##### E N D O F F I L E
```

```
#####
### FILE      : ssc.cable
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1293 bytes   1 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path:
blue.weeg.uiowa.edu!news.uiowa.edu!uunet!comp.vuw.ac.nz!actrix.gen.nz!dempson
From: dempson@atlantis.actrix.gen.nz (David Empson)
Subject: Re: Request 4 SSC cable diagram
Message-ID: <Czsl6J.Eox@actrix.gen.nz>
Nntp-Posting-Host: atlantis.actrix.gen.nz
Sender: news@actrix.gen.nz (News Administrator)
Organization: Actrix - New Zealand Internet Service Providers
Date: Thu, 24 Nov 1994 14:49:29 GMT
References: <59437-785633280@mindlink.bc.ca>
Lines: 28
```

```
In article <59437-785633280@mindlink.bc.ca>,
Allan Crout <Allan_Crout@mindlink.bc.ca> wrote:
> Greetings,
>
> I would be grateful if some one would post the Super Serial Card cable
> wiring: IDC (10pin at the card end) to DB25 (male) connector?
```

The DB-25 is female, not male.

From the original SSC manual:

| IDC-10 | DB-25 | Function (with block in MODEM position) |
|--------|-------|-----------------------------------------|
| 1      | 1     | Frame Ground                            |
| 2      | 2     | Transmit Data                           |
| 3      | 3     | Receive Data                            |
| 4      | 4     | Request To Send                         |
| 5      | 5     | Clear To Send                           |
| 6      | 6     | Data Set Ready                          |
| 7      | 19    | Secondary Clear To Send                 |
| 8      | 7     | Signal Ground                           |
| 9      | 20    | Data Terminal Ready                     |
| 10     | 8     | Data Carrier Detect                     |

```
--
David Empson
dempson@actrix.gen.nz
Snail mail: P.O. Box 27-103, Wellington, New Zealand
```

```
##### E N D O F F I L E
### ssc.cable
##### E N D O F F I L E
```

```
#####
### FILE      : ssc.cts.etc
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 4232 bytes   4 KB
#####
```

## Path:

news.weeg.uiowa.edu!news.uiowa.edu!uunet!decwrl!waikato.ac.nz!comp.vuw.ac.nz!actrix!  
David.Empson

Newsgroups: comp.sys.apple2

Subject: Re: Apple SSC and CTS/RTS choking on the 6551

Message-ID: <1992Nov22.120942.24952@actrix.gen.nz>

From: David.Empson@bbs.actrix.gen.nz

Date: Sun, 22 Nov 1992 12:09:42 GMT

Sender: David.Empson@actrix.gen.nz (David Empson)

References: <uerics.721932539@mcl> <1992Nov16.215050.13861@cs.UAlberta.CA>  
<1992Nov20.210357.24001@mintaka.lcs.mit.edu>

Organization: Actrix Information Exchange

Lines: 25

In article <1992Nov20.210357.24001@mintaka.lcs.mit.edu> johnp@silver.lcs.mit.edu  
(John Palaima) writes:

```
> Does anyone know a hardware cure for fixing the screwy 6551 on the
> SSC card other than replacing it with the CMOS..it fixes the problem
> but the timing ould be too far off
```

Please elaborate. What do you mean by "the timing would be too far  
off"? The 6551 and 65C51 have nearly identical bus interface  
timings characteristics.

I gather your problem with the 6551 is that CTS kills the trasmitter,  
RTS kills the transmitter, DTR kills the receiver AND the transmitter,  
and DCD kills the receiver.

On the 65C51, CTS still kills the transmitter, but it lets a partial  
byte through. Similarly, DCD kills the receiver but lets a partial  
byte through.

The other signals behave as before - turning off RTS will disable the  
transmitter, turning off DTR will disable all transmit and receive (and  
interrupts).

--

David Empson

Internet: David.Empson@bbs.actrix.gen.nz EMPSON\_D@kosmos.wcc.govt.nz

Snail mail: P.O. Box 27-103, Wellington, New Zealand

Path: news.weeg.uiowa.edu!news.uiowa.edu!uunet!cs.utexas.edu!ut-  
emx!ccwf.cc.utexas.edu

From: foegelle@ccwf.cc.utexas.edu (Michael Foegelle)

Newsgroups: comp.sys.apple2

Subject: Re: Fast modems and the SSC

Message-ID: <84168@ut-emx.uucp>

Date: 22 Nov 92 22:21:19 GMT

References: <01GR5CHJVLQAB7AW8E@RCNVMS.RCN.MASS.EDU>

<1992Nov14.220135.23211@netcom.com> <1992Nov16.074456.13677@actrix.gen.nz>

Sender: news@ut-emx.uucp
Organization: The University of Texas at Austin, Austin TX
Lines: 46

In article <1992Nov16.074456.13677@actrix.gen.nz> David.Empson@bbs.actrix.gen.nz writes:

>Regarding the Super Serial Card, which uses a 6551:
>

>The 6551 has two very nasty features with its flow control inputs. If
>the CTS input goes inactive, the transmit data signal is IMMEDIATELY
>cut off.

>
>Stuff about DCD and DSR deleted<

>The CMOS 6551 (65C51) is somewhat better: CTS cuts off the transmitter
>after the current byte has been completely transmitted. It has the
>same behaviour for DCD.

>Its other advantage is that disabling receive interrupts also disables
>the DCD and DSR change of state interrupt. This cannot be disabled on
>the original 6551, which is why a IIE will usually hang if you unplug
>the modem from the SSC while you aren't in a comms program.

Be careful with your descriptions. The 65C51A works as you describe, but the
65C51 works identically to the 6551 in terms of CTS. At least that's the way
the GE/Harris/RCA version works. I believe there's also a 6551A available
which may solve the problem as well.

>BUT, I don't think you can simply replace a 6551 with a 65C51. We
>tried this in one of the products my company produces, and it didn't
>work reliably, because the two chips expect different types of crystals.
>--

I'm using a 65C51A in my SSC with my 14.4Kbaud Supra with no problems. It
also solved the problem that the 6551 had with RTS low forcing CTS low
internally (a problem mentioned several months back).

For about six bucks from a mail order electronics house, it's a pretty easy
fix.

>David Empson
>
>Internet: David.Empson@bbs.actrix.gen.nz EMPSON\_D@kosmos.wcc.govt.nz
>Snail mail: P.O. Box 27-103, Wellington, New Zealand

--

-----
Michael Foegelle | You want it | foegelle@ccwf.cc.utexas.edu
University of | WHEN? | foegelle@utaphy.ph.utexas.edu
Texas at Austin | | GENie: M.FOEGELLE2
Wunderland BBS (512) 472-0544
14.4kbaud, v.32/bis: Sysop

##### E N D O F F I L E
### ssc.cts.etc
##### E N D O F F I L E

```
#####
### FILE      : ssc.dips
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 6670 bytes   6 KB
#####
```

```
Newsgroups: comp.sys.apple2.programmer
Path: news.uiowa.edu!chi-
news.cic.net!news.gryffin.com!news.ece.uc.edu!babbage.ece.uc.edu!news.kei.com!news
.mathworks.com!tank.news.pipex.net!pipex!news.sprintlink.net!in2.uu.net!news1.digi
tal.com!decwrl!waikato!comp.vuw.ac.nz!actrix.gen.nz!dempson
From: dempson@atlantis.actrix.gen.nz (David Empson)
Subject: Re: Apple Super Serial Cards
Message-ID: <DFrs8D.H5v@actrix.gen.nz>
Sender: news@actrix.gen.nz (News Administrator)
Organization: Actrix - Internet Services
Date: Sun, 1 Oct 1995 12:33:48 GMT
References: <447dhe$a33@server05.icaen.uiowa.edu>
X-Nntp-Posting-Host: atlantis.actrix.gen.nz
Lines: 203
```

In article <447dhe\$a33@server05.icaen.uiowa.edu>, 2230 <brockman> wrote:  
> I have 2 apple IIe's that I'm trying to get to communicate with each other...  
> And I need doc's on the card, or some info...  
> Specifically, What should I set the dips to... Modem or Terminal, and  
> finally.. what about the Software....

Below is an extract from a mail message I sent to someone a while ago which should contain enough information to get you started.

To connect two super serial cards together for communications, your best option is to set both of them for a MODEM connection in Communications mode, and use a null-modem cable wired as follows:

```
2 ----- 3
3 ----- 2
4,5 ----- 8
8 ----- 4,5
7 ----- 7
6 ----- 20
20 ----- 6
```

Note that the cable is symmetrical.

You can probably get away with a few less flow control signals, but this will guarantee that everything works properly.

If you only have a straight through ribbon cable available, change one of the jumper blocks to the TERMINAL position, which reverses all of the data and flow control pins (see below for details).

Software: any IIe-based communications software should do the trick. There are some freeware and shareware programs around, e.g. Z-Link (shareware) and Kermit (freeware).

--- Begin extract ---

The plug on the card can be in either of two configurations. If you look near the back of the card, you will see a large black block with an arrow on it, and the words MODEM above and TERMINAL below it. The arrow will be pointing to either of these words. You can remove the block (it is socketed) and reverse it.

With the arrow pointing to TERMINAL, the card is configured to plug directly into a terminal or printer with a straight-through serial cable. With the arrow pointing to MODEM, the card is configured to plug directly into a modem with a straight-through serial cable.

In the MODEM position, the connector is wired as a DTE. It uses the following pins:

- 1 Frame Ground
- 2 Transmit Data
- 3 Receive Data
- 4 RTS
- 5 CTS
- 6 DSR
- 7 Signal Ground
- 8 DCD
- 20 DTR

In the TERMINAL position, the connector is wired as a DCE. It uses the following pins:

- 1 Frame Ground
- 2 Receive Data
- 3 Transmit Data
- 4 (incoming flow control, goes to DCD input of 6551 if switch enabled)
- 5 (looped back from pin 4)
- 6 (outgoing flow control, comes from DTR output of 6551)
- 7 Signal Ground
- 8 (outgoing flow control, comes from RTS output of 6551, also goes to CTS input of 6551)
- 20 (incoming flow control, goes to DSR input of 6551)

A switch can also be used to connect the SCTS pin (19) to the DCD input of the 6551, instead of the RTS/CTS pins.

Here are the switch settings.

Switch SW1-1 through 1-4: Set the default bit rate

| 1-1 | 1-2 | 1-3 | 1-4 | Default bit rate |
|-----|-----|-----|-----|------------------|
| ON  | ON  | ON  | ON  | undefined        |
| ON  | ON  | ON  | OFF | 50               |
| ON  | ON  | OFF | ON  | 75               |
| ON  | ON  | OFF | OFF | 109.92 (110)     |
| ON  | OFF | ON  | ON  | 134.48 (134.5)   |
| ON  | OFF | ON  | OFF | 150              |
| ON  | OFF | OFF | ON  | 300              |
| ON  | OFF | OFF | OFF | 600              |
| OFF | ON  | ON  | ON  | 1200             |
| OFF | ON  | ON  | OFF | 1800             |
| OFF | ON  | OFF | ON  | 2400             |

```

OFF ON  OFF OFF    3600
OFF OFF ON  ON     4800
OFF OFF ON  OFF    7200
OFF OFF OFF ON    9600
OFF OFF OFF OFF   19200

```

Switch SW1-5 and 1-6 set the operation mode of the card.

```

1-5 1-6  mode
ON  ON   Communications
OFF ON   Printer
ON  OFF  Emulate Apple Serial Interface Card with P8 PROM
OFF OFF Emulate Apple Serial Interface Card with P8A PROM

```

Switches SW1-7 and SW2-7 select between the standard and secondary  
Clear To Send signals when the jumper block is set to TERMINAL.

```

1-7 2-7  pin
ON  OFF  CTS
OFF ON   SCTS

```

If the jumper block is set to MODEM, SW1-7 should always be ON and  
SW2-7 should always be OFF.

Switches SW2-1 through SW2-4 have different functions if "Printer" or  
"Communications" mode is enabled.

In "Printer" mode, the functions are as follows:

```

SW2-1    Default data format
ON       8 data, 1 stop
OFF      8 data, 2 stop

SW2-2    Delay after sending out a RETURN character
OFF      None
ON       32 milliseconds

```

SW2-3 and SW2-4 set line width and video output

```

2-3 2-4  Function
ON  ON   40 column output, video on
ON  OFF  72 column output, video off
OFF ON   80 column output, video off
OFF OFF 132 column output, video off

```

In "Communications" mode, the functions are as follows:

```

SW2-1    Default number of stop bits
ON       1 stop bit
OFF      2 stop bits

SW2-2    Default number of data bits
ON       8 data bits
OFF      7 data bits

SW2-3    Default parity mode (if parity is enabled)
ON       odd parity

```

OFF even parity

SW2-4 Default parity enable  
ON parity disabled  
OFF parity enabled

Switch SW2-5 enables automatic line feed generation after sending a carriage return (both modes).

SW2-5 Automatic line feed  
ON Yes  
OFF No

Switch SW2-6 enables interrupts.

SW2-6 Interrupts  
ON Yes  
OFF No

Switch SW2-7 was described above (SCTS enable).

Communications software will usually override most of the switch settings. The important settings are:

SW1-5 ON  
SW1-6 ON  
SW1-7 ON  
SW2-6 ON (assuming the software supports interrupts)  
SW2-7 OFF

Note: if the software does not support interrupts, you must set SW2-6 OFF, or the computer will crash as soon as the serial card is enabled.

If you are using the card to connect to a printer, all of the switches should be set correctly - most software will use the card's settings and will not override them.

Note that "Communications" and "Printer" mode is a switch selection. It is independent of the MODEM or TERMINAL setting of the jumper block.

In "Communications" mode, the card expects commands starting with a Control-A character (by default). In "Printer" mode, the card expects commands starting with with a Control-I character (by default).

--

David Empson  
dempson@actrix.gen.nz  
Snail mail: P.O. Box 27-103, Wellington, New Zealand

##### E N D O F F I L E  
### ssc.dips  
##### E N D O F F I L E

```
#####
### FILE      : ssc.example
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3676 bytes   3 KB
#####
```

```
Path: ns-mx!uunet!wupost!waikato.ac.nz!comp.vuw.ac.nz!actrix!David.Empson
From: David.Empson@actrix.gen.nz (David Empson)
Newsgroups: comp.sys.apple2
Subject: Re: memory mapped locations ($0CXXX) needed for printer, serial ports.
Message-ID: <1991Aug31.143948.10353@actrix.gen.nz>
Date: 31 Aug 91 14:39:48 GMT
References: <3275@pdxgate.UUCP>
Organization: Actrix Information Exchange, Wellington, New Zealand
Lines: 91
Comment-To: kevins@eecs.cs.pdx.edu
```

```
In article <3275@pdxgate.UUCP> kevins@eecs.cs.pdx.edu (Kevin Stanton) writes:
>
> I am attempting to use my Apple II+ as a printer buffer (serial in,
> parallel out). However, my Super Serial Card manual is rather sparse on
> details, as it is strictly a users manual.
```

I'm assuming you are using assembly language here.

Is this a real Apple Super Serial Card, or a clone of it? Even the clone SSCs that I've seen come with a full manual.

> It gives certain entry points, but they are blocking, not polling.

Which entry points are these? The BASIC interface is entirely blocking (JSR \$Cn00 to set up, then use COUT and RDKEY to get or send bytes). The Pascal interface's I/O calls are also blocking, but there is a status call, which you can ask 'are you ready for output' and 'do you have any input available'.

To confirm that your card has the Pascal interface, check the following bytes (assuming the card is in slot 's'):

Signature bytes: \$Cs05 = \$38, \$Cs07 = \$18, \$Cs0B = \$01.

The entry points for the Pascal interface are contained in a lookup table starting at \$Cs0D. Each table entry contains the low byte of the start address of the corresponding routine. The high byte is \$Cs.

```
$Cs0D offset to INITIALIZE routine
$Cs0E offset to READ routine
$Cs0F offset to WRITE routine
$Cs10 offset to STATUS routine
```

For example, if \$Cs0D contains the number \$44, the initialize routine starts at \$Cs44.

All the routines must be called with X containing \$Cs and Y containing \$s0 (e.g. \$C2 and \$20 for slot 2).

WRITE: A contains byte to write  
 READ: Byte read is returned in A  
 STATUS: A=0 for 'are you ready for output', A=1 for 'do you have input ready'. In both cases, the SSC will return with carry set if the answer to the question is 'yes'.

You could go down to the hardware level if you want. Use the serial firmware to initialize the card (baud rate, etc.)

To transmit:

```
LDX  #s0          ; s is slot number, e.g. $20 for slot 2
LDA  $C089,X     ; read status register
AND  #$10        ; test Transmitter Empty flag
BEQ  IsBusy
LDA  Byte_to_send ; get the byte you want to transmit
STA  $C088,X     ; stick it in the transmit data register
```

To receive:

```
LDX  #s0          ; s is slot number, as above
LDA  $C089,X     ; read status register
AND  #$08        ; test Receive Full flag
BEQ  NoByte
LDA  $C088,X     ; get the received byte
STA  Byte_received
```

> I also seem to be unclear in regard to initializing the devices (can  
 > both the printer card and the SSC be active at the the same time?

Using the BASIC interface, you can only have one input device and one output device. For example, in Applesoft BASIC, you can do a PR#1 to output to slot 1, and an IN#2 to input from slot 2.

If you use the PASCAL interface or talk to the hardware directly, you can do simultaneous I/O to as many slots as you like.

> The printer card is an Apple Dumpling, and is equally spare in  
 > details. All it gives is a sample 12 line driver which I can't seem  
 > to get to work.

Sorry, I know nothing about this card. Check the above ID bytes to see if it supports the Pascal interface. If it does, you're home free. If it doesn't,... I've given you half the solution, anyway.

--

David Empson

USENET: David.Empson@bbs.actrix.gen.nz

```
##### E N D O F F I L E
### ssc.example
##### E N D O F F I L E
```

```
#####
### FILE      : ssc.info
#####
### Created   : Friday, December 4, 1998 Modified: Friday, December 4, 1998
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 12093 bytes   11 KB
#####
```

```
Path: news.uiowa.edu!chi-news.cic.net!io.org!van-
bc!news.mindlink.net!uniserve!news.sol.net!daily-
planet.execpc.com!sundog.tiac.net!imci3!imci2!newsfeed.internetmci.com!inl.uu.net!
nwnews.wa.com!nwfocus.wa.com!golden.ncw.net!bing.ncw.net!progreen
From: progreen@ncw.net (Chuck Orem)
Newsgroups: comp.sys.apple2.comm
Subject: Re: Super Serial Card Dip Pin Settings Help Needed!
Date: 17 Nov 1995 18:27:34 GMT
Organization: North Central Washington Network
Lines: 101
Message-ID: <48ik6m$bsm@golden.ncw.net>
References: <erpeters.816561530@copper>
NNTP-Posting-Host: bing.ncw.net
X-Newsreader: TIN [version 1.2 PL2]
```

Eric J.Peters (erpeters@copper.ucs.indiana.edu) wrote:

```
> If anybody could help, I've got an Apple Super Serial card and
> need to know what the dip switches do. *(Yeah, I said pin in the
```

APPLE SUPER SERIAL CARD DIP SWITCH FUNCTIONS

| Switch Block #1 |            |     |     |               |            |                   |
|-----------------|------------|-----|-----|---------------|------------|-------------------|
| Switch number   | Definition |     |     | Switch number | Definition |                   |
| 1               | 2          | 3   | 4   | 5             | 6          | Mode Setting      |
| ON              | ON         | ON  | ON  | ON            | ON         | Communications    |
| ON              | ON         | ON  | OFF | OFF           | ON         | Printer           |
| ON              | ON         | OFF | ON  | ON            | OFF        | SIC P8 emulation  |
| ON              | ON         | OFF | OFF | OFF           | OFF        | SIC P8A emulation |
| ON              | OFF        | ON  | ON  |               |            |                   |
| ON              | OFF        | ON  | OFF |               |            |                   |
| ON              | OFF        | OFF | ON  |               |            |                   |
| ON              | OFF        | OFF | OFF |               |            |                   |
| OFF             | ON         | ON  | ON  |               |            |                   |
| OFF             | ON         | OFF | ON  |               |            |                   |
| OFF             | ON         | OFF | OFF |               |            |                   |
| OFF             | OFF        | ON  | ON  |               |            |                   |
| OFF             | OFF        | ON  | OFF |               |            |                   |
| OFF             | OFF        | OFF | ON  |               |            |                   |
| OFF             | OFF        | OFF | OFF |               |            |                   |

| Switch Block #2 |             |        |          |        |            |                  |
|-----------------|-------------|--------|----------|--------|------------|------------------|
| Switch          | Definition  | Switch | Def      | Switch | Definition |                  |
| 1               | Data Format | 2      | CR delay | 3      | 4          | Line width/video |

## Apple II Computer Info

|                                         |                      |                                                                                                                              |
|-----------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------|
| ON 8 data, 1 stop<br>OFF 8 data, 2 stop | ON 32 ms<br>OFF none | ON ON 40 columns, video ON<br>ON OFF 72 columns, video OFF<br>OFF ON 80 columns, video OFF<br>OFF OFF 132 columns, video OFF |
|-----------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------|

| Switch Block #2 cont'd |                 | Handshaking |                 |
|------------------------|-----------------|-------------|-----------------|
| Switch                 | Definition      | Switch      | Definition      |
| 5                      | Linefeeds       | 6           | Interrupts      |
| ON                     | add LF after CR | ON          | Interrupts on   |
| OFF                    | don't add LFs   | OFF         | No interrupts   |
|                        |                 | 1-7/2-7     | CTS             |
|                        |                 | ON/OFF      | Normal (Pin 20) |
|                        |                 | OFF/ON      | Alt (Pin 19)    |

| Connector Pin Assignments |                 |             | Jumper Block Wiring                                                                                               |             |                |  |
|---------------------------|-----------------|-------------|-------------------------------------------------------------------------------------------------------------------|-------------|----------------|--|
| 10 Pin Header             | DB-25 Connector | Signal Name | SSC signal                                                                                                        | MODEM (pin) | TERMINAL (pin) |  |
| 1                         | 1               | Frame GND   | TXD                                                                                                               | TXD 2       | RXD 3          |  |
| 2                         | 2               | TXD         | RXD                                                                                                               | RXD 3       | TXD 2          |  |
| 3                         | 3               | RXD         | RTS                                                                                                               | RTS 4       | DCD 8          |  |
| 4                         | 4               | RTS         | CTS                                                                                                               | CTS 5       | DCD 8          |  |
| 5                         | 5               | CTS         | DSR                                                                                                               | DSR 6       | DTR 20         |  |
| 6                         | 6               | DSR         | DCD                                                                                                               | DCD 8       | RTS 4          |  |
| 7                         | 19              | SCTS        | DCD                                                                                                               | DCD 8       | CTS 5          |  |
| 8                         | 7               | Signal GND  | DTR                                                                                                               | DTR 20      | DSR 6          |  |
| 9                         | 20              | DTR         | Note that RS-232-C signals on the SSC use negative-true logic; that is, they are true at 0v and false at +5 volts |             |                |  |
| 10                        | 8               | DCD         |                                                                                                                   |             |                |  |

| Explanation Of Signals                                                                                                                                                                                                    | Jumper Block                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GND Ground, either Frame or Signal<br>TXD Transmit Data<br>RXD Receive Data<br>RTS Request To Send<br>CTS Clear To Send<br>DSR Data Set Ready<br>SCTS Secondary CTS<br>DTR Data Terminal Ready<br>DCD Data Carrier Detect | MODEM<br><div style="border: 1px solid black; width: 100px; height: 100px; margin: 10px auto; display: flex; align-items: center; justify-content: center;"> <span style="font-size: 2em;">/\</span><br/> <span style="font-size: 2em;">/_\</span> </div> TERMINAL<br>(Printer) |

Pins 1-7 and 2-7 are set together to determine the SSC pin to be read for the Hardware Handshaking signal. Generally set to monitor Pin #20.

Common Configurations: [Don't Forget The JUMPER Block]

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  |                  |                 |                 |                  |           |         |             |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|-----------------|-----------------|------------------|-----------|---------|-------------|--|
| <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Hi Speed Modem</td> <td style="text-align: center;">ImageWriter I/II</td> </tr> <tr> <td style="text-align: center;">1234567 1234567</td> <td style="text-align: center;">1234567 1234567</td> </tr> <tr> <td style="text-align: center;">ON XXXXXX XXXXXX</td> <td style="text-align: center;">X XX X XX</td> </tr> <tr> <td style="text-align: center;">OFF X X</td> <td style="text-align: center;">XXX X XX XX</td> </tr> </table> | Hi Speed Modem   | ImageWriter I/II | 1234567 1234567 | 1234567 1234567 | ON XXXXXX XXXXXX | X XX X XX | OFF X X | XXX X XX XX |  |
| Hi Speed Modem                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ImageWriter I/II |                  |                 |                 |                  |           |         |             |  |
| 1234567 1234567                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1234567 1234567  |                  |                 |                 |                  |           |         |             |  |
| ON XXXXXX XXXXXX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | X XX X XX        |                  |                 |                 |                  |           |         |             |  |
| OFF X X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | XXX X XX XX      |                  |                 |                 |                  |           |         |             |  |

--

```
Need BinSCII? Need Shrinkit? [] progreen@ncw.net   c.orem@genie.geis.com []
Need an Apple II Comm Soft?  [] ^^^^^^^^^^^^^^^^^ ^^^^^^^^^^^^^^^^^ [ ]
E-mail / Finger me for info! [] ***New Address**   If nothing else works [ ]
```

Path:

```
news1.icaen!news.uiowa.edu!NewsNG.Chicago.Qual.Net!nyd.news.ans.net!newsfeeds.ans.
net!news.idt.net!news.maxwell.syr.edu!news.mel.connect.com.au!news.syd.connect.com
.au!news.bri.connect.com.au!not-for-mail
```

From: Warren Spink <wspink@winshop.com.au>

Newsgroups: comp.sys.apple2

Subject: Re: Apple IIgs and Super Serial card

Date: Sat, 05 Dec 1998 01:31:18 +1000

Organization: ICQ#22790704

Lines: 179

Message-ID: <36680045.D9F5C1ED@winshop.com.au>

References: <748g37\$t5i\$l@nnp1.dejanews.com>

NNTP-Posting-Host: dg-1-p28.winshop.com.au

Mime-Version: 1.0

Content-Type: text/plain; charset=us-ascii

Content-Transfer-Encoding: 7bit

X-Mailer: Mozilla 4.5 [en] (Win95; I)

X-Accept-Language: en

Xref: news1.icaen comp.sys.apple2:142588

A little trick, hold down the option key when you turn the gs on and you get a menu come up. press 1 and enter the set-up. move to slots and change the modem slot to your card. then all you have to do is plug your card into slot 2. before you do that, you have change the switch to terminal haven't you? if not right next to where the cable attaches to the card there should be a black square thingy with a white triangle on it. make sure the triangle is pointing to terminal (next to the black square thingy on the board is modem and terminal written) also use the following info to set up your SSC

Warren

Someone very nice sent me this:

=====

Here's something that I found on the web that may help:

-- Begin extract ---

The plug on the card can be in either of two configurations. If you look near the back of the card, you will see a large black block with an arrow on it, and the words MODEM above and TERMINAL below it. The arrow will be pointing to either of these words. You can remove the block (it is socketed) and reverse it.

With the arrow pointing to TERMINAL, the card is configured to plug directly into a terminal or printer with a straight-through serial cable. With the arrow pointing to MODEM, the card is configured to plug directly into a modem with a straight-through serial cable. In the MODEM position, the connector is wired as a DTE. It uses the following pins:

- 1 Frame Ground
- 2 Transmit Data

- 3 Receive Data
- 4 RTS
- 5 CTS
- 6 DSR
- 7 Signal Ground
- 8 DCD20 DTR

In the TERMINAL position, the connector is wired as a DCE. It uses the following pins:

- 1 Frame Ground
- 2 Receive Data
- 3 Transmit Data
- 4 (incoming flow control, goes to DCD input of 6551 if switch enabled)
- 5 (looped back from pin 4)
- 6 (outgoing flow control, comes from DTR output of 6551)
- 7 Signal Ground
- 8 (outgoing flow control, comes from RTS output of 6551, also goes to CTS input of 6551)
- 20 (incoming flow control, goes to DSR input of 6551)

A switch can also be used to connect the SCTS pin (19) to the DCD input of the 6551, instead of the RTS/CTS pins.

Here are the switch settings.

Switch SW1-1 through 1-4: Set the default bit rate

| 1-1 | 1-2 | 1-3 | 1-4 | Default bit rate |
|-----|-----|-----|-----|------------------|
| ON  | ON  | ON  | ON  | undefined        |
| ON  | ON  | ON  | OFF | 50               |
| ON  | ON  | OFF | ON  | 75               |
| ON  | ON  | OFF | OFF | 109.92 (110)     |
| ON  | OFF | ON  | ON  | 134.48 (134.5)   |
| ON  | OFF | ON  | OFF | 150              |
| ON  | OFF | OFF | ON  | 300              |
| ON  | OFF | OFF | OFF | 600              |
| OFF | ON  | ON  | ON  | 1200             |
| OFF | ON  | ON  | OFF | 1800             |
| OFF | ON  | OFF | ON  | 2400             |
| OFF | ON  | OFF | OFF | 3600             |
| OFF | OFF | ON  | ON  | 4800             |
| OFF | OFF | ON  | OFF | 7200             |
| OFF | OFF | OFF | ON  | 9600             |
| OFF | OFF | OFF | OFF | 19200            |

Switch SW1-5 and 1-6 set the operation mode of the card.

| 1-5 | 1-6 | mode                                              |
|-----|-----|---------------------------------------------------|
| ON  | ON  | Communications                                    |
| OFF | ON  | Printer                                           |
| ON  | OFF | Emulate Apple Serial Interface Card with P8 PROM  |
| OFF | OFF | Emulate Apple Serial Interface Card with P8A PROM |

Switches SW1-7 and SW2-7 select between the standard and secondary Clear To Send signals when the jumper block is set to TERMINAL.

| 1-7 | 2-7 | pin |
|-----|-----|-----|
| ON  | OFF | CTS |

OFF ON SCTS

If the jumper block is set to MODEM, SW1-7 should always be ON and SW2-7 should always be OFF.

Switches SW2-1 through SW2-4 have different functions if "Printer" or "Communications" mode is enabled.

In "Printer" mode, the functions are as follows:

|       |                                            |
|-------|--------------------------------------------|
| SW2-1 | Default data format                        |
| ON    | 8 data, 1 stop                             |
| OFF   | 8 data, 2 stop                             |
| SW2-2 | Delay after sending out a RETURN character |
| OFF   | None                                       |
| ON    | 32 milliseconds                            |

SW2-3 and SW2-4 set line width and video output

| 2-3 | 2-4 | Function                     |
|-----|-----|------------------------------|
| ON  | ON  | 40 column output, video on   |
| ON  | OFF | 72 column output, video off  |
| OFF | ON  | 80 column output, video off  |
| OFF | OFF | 132 column output, video off |

In "Communications" mode, the functions are as follows:

|       |                                            |
|-------|--------------------------------------------|
| SW2-1 | Default number of stop bits                |
| ON    | 1 stop bit                                 |
| OFF   | 2 stop bits                                |
| SW2-2 | Default number of data bits                |
| ON    | 8 data bits                                |
| OFF   | 7 data bits                                |
| SW2-3 | Default parity mode (if parity is enabled) |
| ON    | odd parity                                 |
| OFF   | even parity                                |
| SW2-4 | Default parity enable                      |
| ON    | parity disabled                            |
| OFF   | parity enabled                             |

Switch SW2-5 enables automatic line feed generation after sending a carriage return (both modes).

|       |                     |
|-------|---------------------|
| SW2-5 | Automatic line feed |
| ON    | Yes                 |
| OFF   | No                  |

Switch SW2-6 enables interrupts.

|       |            |
|-------|------------|
| SW2-6 | Interrupts |
| ON    | Yes        |
| OFF   | No         |

Switch SW2-7 was described above (SCTS enable).

Communications software will usually override most of the switch settings. The important settings are:

SW1-5 ON  
SW1-6 ON  
SW1-7 ON  
SW2-6 ON (assuming the software supports interrupts)  
SW2-7 OFF

Note: if the software does not support interrupts, you must set SW2-6 OFF, or the computer will crash as soon as the serial card is enabled.

If you are using the card to connect to a printer, all of the switches should be set correctly - most software will use the card's settings and will not override them.

Note that "Communications" and "Printer" mode is a switch selection. It is independent of the MODEM or TERMINAL setting of the jumper block.

In "Communications" mode, the card expects commands starting with a Control-A character (by default). In "Printer" mode, the card expects commands starting with with a Control-I character (by default).

##### E N D O F F I L E  
### ssc.info  
##### E N D O F F I L E

```
#####
### FILE      : ssc.jumper
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1788 bytes   1 KB
#####
```

Newsgroups: comp.sys.apple2.comm  
 Path: blue.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-  
 state.edu!howland.reston.ans.net!wupost!waikato!comp.vuw.ac.nz!actrix.gen.nz!dempson  
 on  
 From: dempson@actrix.gen.nz (David Empson)  
 Subject: Re: How to replace the "triangle chip" on Apple Super Serial Card?  
 Message-ID: <Cx91B2.DtE@actrix.gen.nz>  
 Organization: Actrix Information Exchange  
 References: <36ut57\$ruk@news1.digex.net> <dchiuCx8DpC.CCJ@netcom.com>  
 Date: Thu, 6 Oct 1994 11:30:38 GMT  
 Lines: 47

In article <dchiuCx8DpC.CCJ@netcom.com>,  
 David C.W. Chiu <dchiu@netcom.com> wrote:  
 > In article <36ut57\$ruk@news1.digex.net>,  
 > Christoph Berendes <berendes@access4.digex.net> wrote:  
 >  
 > >I'd rather not replace the whole Super Serial card. Anyone have any leads  
 > >on where I might find just that little chip? I suspect it's apple  
 > >proprietary, and a first round of phone calls to local repair shops  
 > >supports this.  
 >  
 > That isn't a chip, but a jumper block. I no longer recall the internal  
 > wiring, but you can probably figure it out using a multimeter...

Or look at the original (Apple II+ generation) manual for the card,  
 which has a full circuit diagram, and shows the internal wiring of the  
 jumper block.

It is a 16-pin jumper block, wired as follows:

```
1 --\ /-- 16
   | |
2 --/ \-- 15

3 --\ /-- 14
   | |
4 --/ \-- 13

5 ----- 12

6 ----- 11

7 ----- 10

8 ----- 9
```

i.e. 1-2, 3-4, 13-14, 15-16, 5-12, 6-11, 7-10, 8-9.

The arrow points to the right side (pins 9-16) in the above diagram.

With the jumper block inserted into the card and the arrow pointing to MODEM (up), the card is in its "standard" configuration, with pin 1 in the lower left corner.

--

David Empson  
dempson@actrix.gen.nz  
Snail mail: P.O. Box 27-103, Wellington, New Zealand

##### E N D O F F I L E  
### ssc.jumper  
##### E N D O F F I L E

```
#####
### FILE      : ssc.regs
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 8558 bytes   8 KB
#####
```

```
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!howland.reston.ans.net!usc!news.service.uci.edu!cerritos.edu!wilbur!qed!
quor
Newsgroups: comp.sys.apple2.programmer
Subject: Re: SSC info wanted (again)
Message-ID: <s04y7B4wl65w@qedbbs.com>
From: quor@qedbbs.com (Matthew Ghio)
Date: 20 Jul 93 06:37:51 GMT
Sender: bbs@qed.UUCP
References: <199307152147.AA18084@ghostwheel.bga.com>
Organization: The QED BBS, Lakewood CA
Lines: 96
```

khym@ghostwheel.bga.com (Dave Huang) writes:

```
> OK, try #3.. if this doesn't work I'll have to steal someone's NNTP
> server :-) (and apologies if you've seen this before :)
>
> I was wondering, what do $C088 + n0 through $C08B + n0 on a Super
> Serial Card do?
```

Ok, here's something I dug up from my archives (you're not the first person to ask that question)...

-----  
Programming the Apple Super Serial Card and compatible serial interfaces:  
These docs brought to you by Quor, March 27, 1993.

The SSC has four registers beginning at \$C088 plus the slot number of the SSC multiplied by 16. They are described below:

\$C0x8: Send/receive register

When a byte is received, it is placed in this register, and can be read. Writing a byte to this register sends it out.

\$C0x9: Status Register (read only)

- bit 0: This is set when a parity error has been detected.
- bit 1: This is set when a framing error has been detected.
- bit 2: This is set when an overrun occurred (data was not read and has been lost)
- bit 3: This is set when a new byte has been received and is waiting in the receive register.
- bit 4: This is set when the transmit register is empty, and therefore is ready to send another byte.
- bit 5: This reports the status of the data carrier detect (DCD)
- bit 6: This reports the status of the data set ready (DSR)

bit 7: This is set when an interrupt (IRQ) was generated by the SSC

\$C0xA: Command register (read/write)

bit 0: Setting this bit turns on the Data Terminal Ready

bit 1: Setting this bit will cause an interrupt to be generated every time a byte is received.

bits 2&3: Control the transmitter as follows:

bit 2 bit 3

|   |   |                                                        |
|---|---|--------------------------------------------------------|
| 0 | 0 | transmit interrupt disabled, RTS high, transmitter off |
| 0 | 1 | transmit interrupt disabled, RTS low, transmitter on   |
| 1 | 0 | transmit interrupt enabled, RTS low, transmitter on    |
| 1 | 1 | transmit interrupt disabled, RTS low, transmit break   |

bit 4: If this bit is set, and bits 2 and 3 are both zero, all data received will automatically be echoed back to the sender.

bits 5-7: If bit 5 is set, parity will be checked and transmitted based on the following settings of bits 6 & 7:

bit 6 bit 7

|   |   |                                     |
|---|---|-------------------------------------|
| 0 | 0 | odd parity transmitted and checked  |
| 1 | 0 | even parity transmitted and checked |
| 0 | 1 | mark transmitted, no check          |
| 1 | 1 | space transmitted, no check         |

\$C0xB: Control register

bits 0-3: Baud rate:

bit 3 bit 2 bit 1 bit 0

|   |   |   |   |                    |
|---|---|---|---|--------------------|
| 0 | 0 | 0 | 0 | Use external clock |
| 0 | 0 | 0 | 1 | 50 bps             |
| 0 | 0 | 1 | 0 | 75 bps             |
| 0 | 0 | 1 | 1 | 109.92 bps         |
| 0 | 1 | 0 | 0 | 134.58 bps         |
| 0 | 1 | 0 | 1 | 150 bps            |
| 0 | 1 | 1 | 0 | 300 bps            |
| 0 | 1 | 1 | 1 | 600 bps            |
| 1 | 0 | 0 | 0 | 1200 bps           |
| 1 | 0 | 0 | 1 | 1800 bps           |
| 1 | 0 | 1 | 0 | 2400 bps           |
| 1 | 0 | 1 | 1 | 3600 bps           |
| 1 | 1 | 0 | 0 | 4800 bps           |
| 1 | 1 | 0 | 1 | 7200 bps           |
| 1 | 1 | 1 | 0 | 9600 bps           |
| 1 | 1 | 1 | 1 | 19200 bps          |

bit 4: Receiver clock source. When set (1), use baud rate generator, when clear (0), use external clock

bits 5-6: Word length:

bit 6 bit 5

|   |   |        |
|---|---|--------|
| 0 | 0 | 8 bits |
| 0 | 1 | 7 bits |
| 1 | 0 | 6 bits |
| 1 | 1 | 5 bits |

bit 7: If clear, send one stop bit, if set, send two.

Final note: On the Apple SSC, \$C0x1 and \$C0x2 report the status of the DIP switches on the card.

Newsgroups: comp.sys.apple2.programmer

Path:  
blue.weeg.uiowa.edu!news.uiowa.edu!uunet!comp.vuw.ac.nz!actrix.gen.nz!dempson  
From: dempson@actrix.gen.nz (David Empson)  
Subject: Re: Need info re accessing serial card  
Message-ID: <CtyK8t.4wH@actrix.gen.nz>  
Organization: Actrix Information Exchange  
References: <3l2eat\$ls0@nic-nac.csu.net> <CtLMtG.246@actrix.gen.nz>  
<3lcfcr\$orr@kodak.rdc.kodak.COM> <Cttr07.3vz@griffin.cuc.ab.ca>  
Date: Wed, 3 Aug 1994 12:05:16 GMT  
Lines: 103

In article <Cttr07.3vz@griffin.cuc.ab.ca>,  
Sean Dockery <dockery@griffin.cuc.ab.ca> wrote:

>  
> I always thought that the DIP switch on the SSC was similar to the power  
> bar concept for your computer: It doesn't prevent you enabling interrupts  
> through software when it is OFF (power bar OFF, computer ON), but it also  
> doesn't force you to enable interrupts when it is ON (power bar ON,  
> computer OFF). Someone please correct me if this is not the case.

Sorry, but that isn't correct. The interrupt enable switch (SW2-6)  
must be ON for any interrupts to get through from the ACIA. It  
disconnects the IRQ line if it is OFF.

Some of the ACIA's interrupt sources (DSR and DCD change) cannot be  
disabled through software if you want to use the serial card (they are  
disabled if the DTR output of the ACIA is turned off, but that disables  
the whole chip). If the interrupt switch was on and you enabled the  
DTR line (e.g. PR#2), any change on DSR or DCD would crash unless you  
had an interrupt handler to catch it.

See my other posting on this thread for further details.

> Hmmm... I don't see the problem why everyone is so concerned about  
> unlikely (or impossible) interrupts. Consider:  
>  
> The 6551 is only generating interrupts during the following situations when  
> both receipt and transmission interrupts are enabled:  
>  
>     o receipt register full  
>     o transmission register full  
>     o DCD state change  
>     o DSR state change  
>  
> The first two can be explicitly disabled on the 6551 through software.  
>  
> The third one will only occur if you are online and your host hangs up on  
> you, or if you have your modem set to auto-answer and someone phones in  
> with a modem carrier.  
>  
> The last one won't ever occur if you are not transmitting.

Either DCD or DSR may change state if you unplug the modem, or switch  
it on/off.

> Remember the following two quirks about the 6551 as well:  
>  
>     o You cannot send if you have the DTR signal set to false.

You can't do ANYTHING - it turns off everything in the chip (all interrupt sources, transmit and receive).

> o You cannot receive if the DCD signal is false.

You also cannot transmit if RTS is turned off.

> CONTROL REGISTER (\$C08B + \$n0)

> 4 - receiver clock source  
 > 0 = external receiver clock

Don't use this setting on the SSC - there is no external receiver clock.

> 3210 - internal baud rate generator  
 > 0 0 0 0 = external receiver clock x 16

Don't use this setting on the SSC - it only works if the ACIA is being clocked by a square wave input, not a crystal.

> COMMAND REGISTER (\$C08A + \$n0)

> 32 - transmitter controls (RTS signal)  
 > 0 0 = transmit IRQ disabled, RTS high

That is "transmitter AND transmit IRQ disabled, RTS high"

> STATUS REGISTER (\$C089 + \$n0)

> 7 - IRQ pending status  
 > 0 = no interrupt  
 > 1 = interrupt has occurred

Be very careful when reading the status register with interrupts enabled: if the IRQ bit is set, it is cleared by reading this register. This means, for example, if you you are are using receive interrupts but are polling the status register to detect when you can next transmit a character, you may cause an IRQ to be lost if it happens to be read by the transmit routine first.

To avoid this, you must check the IRQ flag whenever this register is read.

This is really only a problem if you're relying on the IRQ flag to detect an interrupt from the SSC - the interrupt will still occur, but the interrupt handler will not see the IRQ flag set. If it is a receive or transmit interrupt, there is a separate flag you can check, but you cannot identify a state change interrupt for DCD or DSR unless the IRQ bit is set. You can save the previous state for DCD and DSR, but a three-way toggle on one of the lines may cause two interrupts but go undetected.

--

David Empson  
 dempson@actrix.gen.nz  
 Snail mail: P.O. Box 27-103, Wellington, New Zealand

```
##### E N D O F F I L E
### ssc.regs
##### E N D O F F I L E
```

```
#####
### FILE      : ssc2null.modemcbl
#####
### Created   : Tuesday, January 1, 1980  Modified: Thursday, March 1, 1973
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1354 bytes   1 KB
#####
```

Tom:

First thing you should do is test the two ports, the PC side and the Apple II side. Put both computers into terminal mode. Use a paperclip and short holes 2 and 3 together and type. If you get the characters on the screen, the send and receive work on that computer. If both computers show good transmit and receive, then it is your cable that is not quite right. Of course I'd immediately suspect one of the handshaking lines didn't get crossed.

If the IIe is actually not sending out, replace the 1488 chip at A6.

Assuming you look at the end of the SS card where the cable plugs in, right side up, there is a black plug, rectangle 10 pins which I will number as follows.

- 1 2
- 3 4
- 5 6
- 7 8
- 9 0

DB25s are normally numbered front and back, gender is irrelevant. The Signal labels assume the SSC is in the MODEM mode.

Apple SSC to DB25

- 1 brown 1 ??
- 2 red 2 TX
- 3 orange 3 Rx
- 4 yellow 4 RTS
- 5 green 5 CTS
- 6 blue 6 DSR
- 7 purple 19 ??
- 8 grey 7 GND
- 9 white 20 DTR
- 0 black 8 CD

Proper Null modem Wire DB25 to 25

- Tx 2 - 3 Rx
- Rx 3 - 2 Tx
- RTS 4 - 5 CTS
- CTS 5 - 4 RTS
- DSR&CD 6&8 - 20 DTR
- GND 7 - 7 GND
- DTR 20 - 6&8 DSR&CD

Proper Null modem Db25 to 9

- 2 - 2 RX
- 3 - 3 TX
- 4 - 8 CTS
- 5 - 7 RTS
- 6&8 - 4 DTR

7 - 5 GND  
20 - 6&1 DSR&CD

Thankx,  
Ed  
eeastmanNO@SPAMapple2.com

##### E N D O F F I L E  
### ssc2null.modemcbl  
##### E N D O F F I L E

```
#####
### FILE      : ssc6551
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 8463 bytes   8 KB
#####
```

```
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!zaphod.mps.ohio-
state.edu!swrinde!news.dell.com!math.utexas.edu!ut-emx!ccwf.cc.utexas.edu
From: foegelle@ccwf.cc.utexas.edu (Michael Foegelle)
Newsgroups: comp.sys.apple2
Subject: Re: SSC - //e - High Speed Modem - ProTERM question
Message-ID: <79953@ut-emx.uucp>
Date: 17 Sep 92 17:10:48 GMT
References: <3310@carroll11.cc.edu>
Sender: news@ut-emx.uucp
Organization: The University of Texas at Austin, Austin TX
Lines: 49
```

```
In article <3310@carroll11.cc.edu> acct069@carroll11.cc.edu (Ron) writes:
>I've been having a little bit of trouble with my set up, and am wondering
>if anyone else is having the same problems. I've been in contact with the
>author of ProTERM v3.0 about this, and would like to confirm that this
>isn't just my problem before persuing it further.
>
>I'm looking for people that are running a high speed modem ( >9600 ) and a
>Super Serial Card with ProTERM v3.0.
>
>What I'd like to know is if you are having trouble with Zmodem sends to a
>remote system at a transfer rate faster than 9600 bps. (Hardware flow
>control is needed for this operation)
>
>The problem I'm seeing is that I get errors in the transfer when the CTS
>light flashes.
>
>Greg Schaefer explains the problem as a 6551 problem. He says that when
>the CTS line goes low, the 6551 chip stops transmitting data, even if it's
>in the middle of a character!
```

There are two different types of the 6551 ACIA, a 6551 and a 6551A. The difference is in the way they handle the CTS. The 6551 stops sending immediately, even if in the middle of a character, while the 6551A sends the whole data byte and then stops. (I believe the 6551 resends the aborted character after CTS resumes.) A 6551A (or 65C51A) only runs about \$6 or so from most electronics dealers, so it's no big deal to go buy one and pull the offending 6551 and replace it with a 6551A. I also discovered that some 6551's tend to for some reason drop CTS internally when you drop RTS. That means if your program is telling the modem not to send anything because it's too busy to receive, then the program can't send anything OUT to the modem either! I'm using a 65c51A from GE/Harris/RCA (all the same semiconductor company now) which solves all these problems for me.

```
>
>Anyone else having trouble?
```

```
>--
```

```
>Ron | Lightning Systems, INC. | Apple // Forever!
```

```
>acct069@carroll11.cc.edu | (414) 363-4282 62megs | Van Halen Rules!
>carroll11!acct069@uwm.edu | 14.4k HST/V.32bis | Bill & Ted are cool!
```

Michael Foegelle

--

```
-----
Michael Foegelle | You want it | foegelle@ccwf.cc.utexas.edu
----- | | foegelle@utaphy.ph.utexas.edu
University of | WHEN? | GENie: M.FOEGELLE2
Texas at Austin | | Wunderland BBS (512) 472-0544
| | 14.4kbaud, v.32/bis: Sysop
```

Newsgroups: comp.sys.apple2.programmer

Path: blue.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-state.edu!howland.reston.ans.net!gatech!newsxfer.itd.umich.edu!nntp.cs.ubc.ca!unix.g.ubc.ca!quartz.ucs.ualberta.ca!acs.ucalgary.ca!cpsc.ucalgary.ca!debug!griffin!dockery

From: dockery@griffin.cuc.ab.ca (Sean Dockery)

Subject: Re: Need info re accessing serial card

Message-ID: <Cttr07.3vz@griffin.cuc.ab.ca>

Organization: Griffin Software Development

References: <3l2eat\$ls0@nic-nac.csu.net> <CtLMtG.246@actrix.gen.nz>

<3lcfcr\$orr@kodak.rdcs.Kodak.COM>

Date: Sun, 31 Jul 1994 21:43:18 GMT

Lines: 145

scott@image.Kodak.COM wrote the following article:

```
| or disable the interrupts. I am not familiar with the ACIA used on the
| SSC, although I have programmed the 6850 ACIA several times, which
| allows the CPU to tell it to enable/disable all types of interrupts,
| rather than just the transmit/receive interrupts. If I leave the
| SSC interrupt switch turned on, and I turn the modem power on/off
| while running non-interrupt-aware software, the computer crashes. The
| CCS 7710 serial card used the 6850 ACIA and so it didn't have this problem,
| but unfortunately it uses DIP switches to set the bit rate.
```

```
| Does anyone know of a different serial card which both allows software
| control of the bit rate AND software control of interrupt enable/disable?
```

I always thought that the DIP switch on the SSC was similar to the power bar concept for your computer: It doesn't prevent you enabling interrupts through software when it is OFF (power bar OFF, computer ON), but it also doesn't force you to enable interrupts when it is ON (power bar ON, computer OFF). Someone please correct me if this is not the case.

Hmmm... I don't see the problem why everyone is so concerned about unlikely (or impossible) interrupts. Consider:

The 6551 is only generating interrupts during the following situations when both receipt and transmission interrupts are enabled:

- o receipt register full
- o transmission register full
- o DCD state change
- o DSR state change

The first two can be explicitly disabled on the 6551 through software.

The third one will only occur if you are online and your host hangs up on

you, or if you have your modem set to auto-answer and someone phones in with a modem carrier.

The last one won't ever occur if you are not transmitting.

Remember the following two quirks about the 6551 as well:

- o You cannot send if you have the DTR signal set to false.
- o You cannot receive if the DCD signal is false.

For those with the expertise to understand how to program ACIA's, here is a little informatin about the 6551 specifically on a Super Serial Card or inside an Apple //c and Apple //c Plus taken from Leventhal, 6502 Assembly Language Programming, McGraw Hill, ISBN 0-07-881216-X:

CTRLREG (\$C08B + \$n0) (read/write)

- 7 - stop bits
  - 0 = 1 stop bit
  - 1 = 2 stop bits, or
    - 1 stop bit if word length = 8 bits and parity, or
    - 1.5 stop bits if word length = 5 bits and no parity
- 65 - word length (data byte size)
  - 0 0 = 8
  - 0 1 = 7
  - 1 0 = 6
  - 1 1 = 5
- 4 - receiver clock source
  - 0 = external receiver clock
  - 1 = internaal baud rate generator
- 3210 - internal baud rate generator
  - 0 0 0 0 = external receiver clock x 16
  - 0 0 0 1 = 50 bps
  - 0 0 1 0 = 75 bps
  - 0 0 1 1 = 109.92 bps
  - 0 1 0 0 = 134.58 bps
  - 0 1 0 1 = 150 bps
  - 0 1 1 0 = 300 bps
  - 0 1 1 1 = 600 bps
  - 1 0 0 0 = 1200 bps
  - 1 0 0 1 = 1800 bps
  - 1 0 1 0 = 2400 bps
  - 1 0 1 1 = 3600 bps
  - 1 1 0 0 = 4800 bps
  - 1 1 0 1 = 7200 bps
  - 1 1 1 0 = 9600 bps
  - 1 1 1 1 = 19200 bps

CMNDREG (\$C08A + \$n0) (read/write)

- 765 - parity generator
  - - 0 = parity disabled, parity check disabled
  - 0 0 1 = odd parity
  - 0 1 1 = even parity
  - 1 0 1 = mark parity, parity check disabled
  - 1 1 1 = space parity, parity check disabled
- 4 - normal/echo mode for receiver
  - 0 = normal
  - 1 = echo all received characters

- 32 - transmitter controls (RTS signal)
  - 0 0 = transmit IRQ disabled, RTS high
  - 0 1 = transmit IRQ enabled, RTS low
  - 1 0 = transmit IRQ disabled, RTS low
  - 1 1 = transmit IRQ disabled, RTS low, send break
- 1 - receive IRQ enable
  - 0 = enabled
  - 1 = disabled
- 0 - data terminal ready
  - 0 = disable receiver/transmitter (DTR high)
  - 1 = enable receiver/transmitter (DTR low)

STATREG (\$C089 + \$n0) (read/write -- write causes master reset)

- 7 - IRQ pending status
  - 0 = no interrupt
  - 1 = interrupt has occurred
- 6 - data ready (DSR)
  - 0 = DSR low (ready)
  - 1 = DSR high (not ready)
- 5 - carrier detect (DCD)
  - 0 = DCD low (detected)
  - 1 = DCD high (not detected)
- 4 - transmission register empty
  - 0 = not empty
  - 1 = empty
- 3 - receipt register full
  - 0 = not full
  - 1 = full
- 2 - overrun error (two receives since last IRQ servicing)
  - 0 = no overrun
  - 1 = overrun
- 1 - framing error (word length mismatch)
  - 0 = no framing error
  - 1 = framing error detected
- 0 - parity error (NOTE: mark and space parity are not checked)
  - 0 = no parity error
  - 1 = parity error detected

RDREG (\$C088 + \$n0) (read only)

TDREG (\$C088 + \$n0) (write only)

The addresses are the base mapping to the I/O registers on an Apple II added to the slot in which the card resides multiplied by sixteen.

| Kevin Scott  
| scott@image.kodak.com

--

|                                    |                                 |
|------------------------------------|---------------------------------|
| Sean Dockery                       | Tickle us, do we not laugh?     |
| Griffin Software Development Group | Prick us, do we not bleed?      |
| dockery@griffin.cuc.ab.ca          | Wrong us, shall we not revenge? |

```
##### E N D O F F I L E
### ssc6551
##### E N D O F F I L E
```

```
#####
### FILE      : sscclone.manual
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 8358 bytes    8 KB
#####
```

```
Path: news.uiowa.edu!chi-
news.cic.net!newsfeeder.sdsu.edu!hookup!usenet.eel.ufl.edu!news.bright.net!news
From: Rick Kerman <rkerman@brutus.bright.net>
Newsgroups: comp.sys.apple2
Subject: Re: Super Serial Card II DIP switches
Date: Tue, 09 Jul 96 17:13:10 EDT
Organization: BrightNet Ohio
Lines: 219
Message-ID: <NEWTNews.836946907.6619.rkerman@rkerman.bright.net>
References: <31D8C593.4244@ais.net>
NNTP-Posting-Host: kalil-cs-15.dial.bright.net
Mime-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII
X-Newsreader: NEWTNews & Chameleon -- TCP/IP for MS Windows from NetManage
```

In Article<31D8C593.4244@ais.net>, <jobrien@ais.net> wrote:

```
> An Apple IIe that I rescued a couple months ago had an Apple Super
> Serial Card II installed with two banks of DIP switches but no manual
> (Why do people throw out the manuals?! What are they thinking?!?) to
> describe what the switches handle. Does anybody have this information
> or know where I could find it??
>
> Jon
```

The following should help.

```
*=====*
* Super Serial Clone 1.0 Operation Guide *
*=====*
```

```
CONTENTS:
CHAPTER 1 -- General Switches and Commands
CHAPTER 2 -- Printer Mode
CHAPTER 3 -- Communications Mode
CHAPTER 4 -- Emulation Modes
CHAPTER 5 -- Use with BASIC
CHAPTER 6 -- DB-25 pinout
```

```
=====
CHAPTER 1 -- General Switches and Commands
```

| BAUD      | SW1-1 | SW1-2 | SW1-3 | SW1-4 | CTL-I/A     |
|-----------|-------|-------|-------|-------|-------------|
| undefined | ON    | ON    | ON    | ON    | 0B=switches |
| 50        | ON    | ON    | ON    | OFF   | 1B          |
| 75        | ON    | ON    | OFF   | ON    | 2B          |
| 109.92    | ON    | ON    | OFF   | OFF   | 3B          |
| 134.58    | ON    | OFF   | ON    | ON    | 4B          |
| 150       | ON    | OFF   | ON    | OFF   | 5B          |

|       |     |     |     |     |     |
|-------|-----|-----|-----|-----|-----|
| 300   | ON  | OFF | OFF | ON  | 6B  |
| 600   | ON  | OFF | OFF | OFF | 7B  |
| 1200  | OFF | ON  | ON  | ON  | 8B  |
| 1800  | OFF | ON  | ON  | OFF | 9B  |
| 2400  | OFF | ON  | OFF | ON  | 10B |
| 3600  | OFF | ON  | OFF | OFF | 11B |
| 4800  | OFF | OFF | ON  | ON  | 12B |
| 7200  | OFF | OFF | ON  | OFF | 13B |
| 9600  | OFF | OFF | OFF | ON  | 14B |
| 19200 | OFF | OFF | OFF | OFF | 15B |

|                |       |       |
|----------------|-------|-------|
| MODE           | SW1-5 | SW1-6 |
| Communications | ON    | ON    |
| Printer Mode   | OFF   | ON    |
| P8 Emulation   | ON    | OFF   |
| P8A Emulation  | OFF   | OFF   |

|                |       |        |         |                                                                                                                                                              |
|----------------|-------|--------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DATA FORMAT    | SW2-1 | SW2-2* | CTL-I/A | *SW2-2 serves a different purpose in printer mode, and only 8 data, 1 stop or 8 data, 2 stop are available by setting switches. CTL-I/A commands still work. |
| 8 data, 1 stop | ON    | ON     | 0D      |                                                                                                                                                              |
| 7 data, 1 stop | ON    | OFF    | 1D      |                                                                                                                                                              |
| 6 data, 1 stop |       |        | 2D      |                                                                                                                                                              |
| 5 data, 1 stop |       |        | 3D      |                                                                                                                                                              |
| 8 data, 2 stop | OFF   | ON     | 4D      |                                                                                                                                                              |
| 7 data, 2 stop | OFF   | OFF    | 5D      |                                                                                                                                                              |
| 6 data, 2 stop |       |        | 6D      |                                                                                                                                                              |
| 5 data, 2 stop |       |        | 7D      |                                                                                                                                                              |

|                  |        |         |                                                                                    |
|------------------|--------|---------|------------------------------------------------------------------------------------|
| DELAY AFTER CR   | SW2-2* | CTL-I/A | *SW2-2 affects delay after <CR> only in Printer Mode. CTL-I/A commands still work. |
| none             | OFF    | 0C      |                                                                                    |
| 32 ms            | ON     | 1C      |                                                                                    |
| 250 ms (1/4 sec) |        | 2C      |                                                                                    |
| 2000 ms (2 sec)  |        | 3C      |                                                                                    |

|        |        |        |          |                                                                                                 |
|--------|--------|--------|----------|-------------------------------------------------------------------------------------------------|
| PARITY | SW2-3* | SW2-4* | CTL-I/A  | *SW2-3 and SW2-4 are used for a different purpose in Printer Mode. CTL-I/A commands still work. |
| none   |        | ON     | 0,2,4,6P |                                                                                                 |
| odd    | ON     | OFF    | 1P       |                                                                                                 |
| even   | OFF    | OFF    | 3P       |                                                                                                 |
| mark   |        |        | 5P       |                                                                                                 |
| space  |        |        | 7P       |                                                                                                 |

|                 |       |         |
|-----------------|-------|---------|
| <LF> AFTER <CR> | SW2-5 | CTL-I/A |
| yes             | ON    | L E     |
| no              | OFF   | L D     |

|            |       |
|------------|-------|
| INTERRUPTS | SW2-6 |
| yes        | ON    |
| no         | OFF   |

JUMPER BLOCK

Terminal -- performs the function of modem eliminator.  
 Modem -- standard function (RS-232 pinout).

=====  
 CHAPTER 2 -- Printer Mode

|                 |       |       |
|-----------------|-------|-------|
| RS-232 SIGNALS: | SW1-7 | SW2-7 |
| Normal CTS      | ON    | OFF   |
| Secondary CTS   | OFF   | ON    |

|                    |       |       |
|--------------------|-------|-------|
| LINE WIDTH/VIDEO   | SW2-3 | SW2-4 |
| 40 char/video on   | ON    | ON    |
| 72 char/video off  | ON    | OFF   |
| 80 char/video off  | OFF   | ON    |
| 132 char/video off | OFF   | OFF   |

SOFTWARE COMMANDS -- CTL-I <CMD> <RETURN>

| CMD  | FUNCTION        | VALUES                                                                                           |
|------|-----------------|--------------------------------------------------------------------------------------------------|
| <n>B | Set Baud Rate   | See Ch.1                                                                                         |
| <n>C | Set CR Delay    | 0=none, 1=32mS, 2=250mS, 3=2S                                                                    |
| <n>D | Set Data Format | See CH.1                                                                                         |
| <n>F | Set FF Delay    | 0=none, 1=32mS, 2=250mS, 3=2S                                                                    |
| <n>L | Set LF Delay    | 0=none, 1=32mS, 2=250mS, 3=2S                                                                    |
| <n>N | Set Line Width  | 40 to 255                                                                                        |
| <n>P | Set Parity      | 0,2,4,6 none, 1=odd, 3=even, 5=mark, 7=space                                                     |
| <n>T | Translate LC    | 0=change LC to UC<br>1=leave LC<br>2=change LC to UC inverse<br>3=change LC to UC, UC to inverse |

C Column overflow  
 I Video on, Line Width 40  
 K Disable Auto LF  
 R Reset the SSC  
 Z Zap (disable commands)  
 F\_<n> Find keyboard E or D  
 L\_<n> Auto LF after CR E or D  
 M\_<n> Mask LF after CR E or D  
 T\_<n> Tab in BASIC E or D  
 X\_<n> Use XON/XOFF E or D

Special: <Ctrl-I> <Ctrl-something else> changes the default command character.  
 Also: <Ctrl-I> <Ctrl-I> sends a Ctrl-I to output.

=====

CHAPTER 3 -- Communications Mode

|                   |       |       |       |
|-------------------|-------|-------|-------|
| SPECIAL SWITCHES: | SW1-7 | SW2-6 | SW2-7 |
| Interrupts off    |       | OFF   |       |
| Interrupts on     |       | ON    |       |
| RS-232C Signals   | ON    |       | OFF   |

|                 |       |       |
|-----------------|-------|-------|
| <LF> AFTER <CR> | SW2-5 | CTL-A |
| yes             | ON    | L E   |
| no              | OFF   | L D   |

SOFTWARE COMMANDS -- CTL-A <CMD> <RETURN>

| CMD  | FUNCTION        | VALUES                                                                                           |
|------|-----------------|--------------------------------------------------------------------------------------------------|
| <n>B | Set Baud Rate   | See Ch.1                                                                                         |
| <n>C | Set CR Delay    | 0=none, 1=32mS, 2=250mS, 3=2S                                                                    |
| <n>D | Set Data Format | See Ch.1                                                                                         |
| <n>F | Set FF Delay    | 0=none, 1=32mS, 2=250mS, 3=2S                                                                    |
| <n>L | Set LF Delay    | 0=none, 1=32mS, 2=250mS, 3=2S                                                                    |
| <n>P | Set Parity      | 0,2,4,6 none, 1=odd, 3=even, 5=mark, 7=space                                                     |
| <n>S | Slot to chain   | 0 - 7                                                                                            |
| <n>T | Translate LC    | 0=change LC to UC<br>1=leave LC<br>2=change LC to UC inverse<br>3=change LC to UC, UC to inverse |

```

B      Break
Q      Quit terminal mode
R      Reset the SSC
T      Terminal mode
Z      Zap (disable commands)
E_<n>  Echo           E or D
F_<n>  Find keyboard  E or D
L_<n>  Send LF after CR E or D
M_<n>  Mask LF after CR E or D
S_<n>  Special chars  E or D
X_<n>  Use XON/XOFF   E or D

```

Special -- <Ctrl-A> <Ctrl-something else> changes the default command character.  
 <Ctrl-A> <Ctrl-A> sends Ctrl-A to output.

TERMINAL MODE

In Communications Mode, a dumb terminal mode is available. Enter this mode by typing <Ctrl-A>T. Exit by typing <Ctrl-A>Q. Also supports old Apple Communications Interface Card commands <Ctrl-T> enter terminal mode and <Ctrl-R> exit terminal mode.

=====

CHAPTER 4 -- Emulation Modes

SW1-5 and SW1-6 select these modes (see ch.1).  
 Emulates P8 or P8A versions of Apple ][ Serial Interface Card (SIC).

COMPATIBILITY

Partial Peek & Poke compatibility with SIC.  
 Supports ETX/ACK software handshake.

DOES NOT SUPPORT

P8 SIC block moves.  
 Baud rates or data formats other than those listed.  
 <ESC>U or <ESC>L commands for upper and lower case.  
 Current loop operation.

=====

CHAPTER 5 -- Use with BASIC

PRINTER MODE: Use PR#s where s is the slot of the card to activate, use CTL-I commands to reset parameters.

COMMUNICATIONS MODE: Use PR#s and IN#s where s is the slot of the card to activate, use CTL-A commands to reset parameters.

JUMPER BLOCK: In terminal position, performs the function of modem eliminator. In modem position, expects full RS-232 signals.

=====

CHAPTER 6 -- DB-25 pinout

- 1 Frame Ground
- 2 Transmit Data
- 3 Receive Data
- 4 Request To Send
- 5 Clear To Send
- 6 Data Set Ready

7 Signal Ground  
8 Data Carrier Detect  
19 Secondary Clear To Send  
20 Data Terminal Ready

##### E N D O F F I L E  
### sscclone.manual  
##### E N D O F F I L E

```
#####
### FILE      : sva
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1374 bytes   1 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path: news.weeg.uiowa.edu!news.uiowa.edu!uunet!cis.ohio-
state.edu!pacific.mps.ohio-state.edu!linac!sunova!sunova.ssc.gov!cchang
From: cchang@quasar.ssc.gov (Charles Chang)
Subject: Need help on Megabyter 8" floppy drive
Message-ID: <1992Sep9.233150.22647@sunova.ssc.gov>
Sender: usenet@sunova.ssc.gov (News Admin)
Nntp-Posting-Host: dssgl
Reply-To: cchang@quasar.ssc.gov
Organization: Superconducting Super Collider Laboratory, Dallas, Texas
Date: Wed, 9 Sep 1992 23:31:50 GMT
Lines: 15
```

I recently acquired an 8" floppy disk drive called MegaByter made by Sorrento Valley Associates. It has a controller came with it. I hooked it up to my //e, it won't boot up itself on slot 6, and it is not recognized at all if I use it on slot 5 along with a Disk II card on slot 6. Would some of you happen to know this heavy monster? Any information would be greatly appreciated. I don't have manuals or any diskettes (need drivers maybe?) came with it. Thanks in advance.

--

```
/*-----*\
| Charles Chang, System Development Group, Physics Research Division |
| Superconducting Super Collider Laboratory, Dallas, Texas 75237 |
| Internet: cchang@quasar.ssc.gov Phone: (214) 708-6100 |
\*-----*/
```

```
##### E N D O F F I L E
### sva
##### E N D O F F I L E
```

```
#####
### FILE      : sva8
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3307 bytes   3 KB
#####
```

```
Path: news.weeg.uiowa.edu!news.uiowa.edu!uunet!cis.ohio-
state.edu!ucbvax!blkbox.com!jdb8042
From: jdb8042@blkbox.com ("John D. Baker")
Newsgroups: comp.sys.apple2
Subject: trouble with EXECing files
Message-ID: <9208100202.aa02465@blkbox.COM>
Date: 10 Aug 92 07:02:42 GMT
Sender: daemon@ucbvax.BERKELEY.EDU
Lines: 69
```

This may seem like a strange help request, but this problem's got me baffled.

I just got the BINSII v1.0.3 Executioner-format file from wuarchive.wustl.edu.

It seems simple enough--just EXEC <filename> from BASIC.SYSTEM to create the executable form of BINSII.

However, after the initial 'CALL-151' statement, I am greeted with beeps from the monitor apparently indicating that the line it was given to act on was invalid.

following this, BASIC.SYSTEM complains about "NO BUFFERS AVAILABLE" for the simplest tasks even asking for a catalog of the disk.

I also have a BASIC program saved as a text file intended for EXECing into executable form. Attempting to do so results in an infinite string (well, until the file is exhausted) or SYNTAX ERRORS and when it has finished, I again get "NO BUFFERS AVAILABLE".

The BASIC program EXEC trick is one I've used many times in the past and I can't for the life of me understand why it doesn't work now. YES, I've examined th files in question and they look like valid ProDOS text files to me (I used the file viewer in Shrinkit v3.0.3 which was left on the used Hard Disk I recently added to my //e) .

Fro the Record:

```
Apple //e, Extended Keyboard (platinum case)
  AUX: Apple Extended 80-column card
  SLOT1: 64K Buffered Grappler+
  SLOT2: <empty>
  SLOT3: CardZ180 Z-System processor
  SLOT4: Apple II SCSI Card, Rev. C
  SLOT5: Apple UniDisk 3.5 controller
  SLOT6: Apple Disk ][ controller
  SLOT7: SVA ZVX4 Dual-Density 8" Disk Controller
```

ProDOS 8 v2.0.1 (w/FTA launcher installed)

BASIC.SYSTEM v1.2

The SCSI Card and v2.0.1 of ProDOS are the only things that have changed on my system since I last EXECed a BASIC program into memory. The prefix set at the time was "/DH0/WORK" on the first partition of my hard disk (/DH0).

I tried the same operations under v1.8, and v1.4 of ProDOS each using v1.2 and v1.1 of BASIC.SYSTEM. Each had exactly the same result as described above.

At the same time, I found I was unable to launch many programs by specifying the full path to them. I tried to launch Shrinkit 3.0.3 while prefixed to /DH0/WORK by issuing "-/DH0/UTILITIES/PACKERS/SHRINKIT" (which is a correct path) and was again rewarded with "NO BUFFERS AVAILABLE". At one point I couldn't even re-start prodos while prefixed to the root directory!

However, once re-started, I could always launch any type SYS file from the FTA launcher.

This is all very strange behaviour to me and any enlightenment and or solutions will be greatly appreciated.

John D. Baker ->An Apple 3.5", 5.25", 8", HD5.25" CardZ180 Z-System nut//  
 Internet: jdb8042@blkbox.com jdbaker@taronga.com  
 UUCP: nuchat!blkbox!jdb8042 ...!taronga!jdbaker  
 BBSs: JOHN BAKER on Z-Node #45 [(713) 937-8886],  
 The Vector Board [(716) 544-1863], PIC of the Mid-Town [(713) 527-8939]  
 Karnage: "I am certainly very happy for you, but--WHAT ARE YOU TALKING ABOUT?!"

##### E N D O F F I L E  
 ### sva8  
 ##### E N D O F F I L E

```
#####
### FILE      : syssaver.fan
#####
### Created   : Sunday, November 24, 1996 Modified: Sunday, November 24, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5195 bytes   5 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.erols.net!portc02.blue.aol.com!cpk-news-
hubl.bbnplanet.com!news.bbnplanet.com!cam-news-
hubl.bbnplanet.com!news.mathworks.com!enews.sgi.com!arclight.uoregon.edu!news.bc.n
et!info.ucla.edu!nnp.info.ucla.edu!usenet
From: pubpcl7@library.ucla.edu
Newsgroups: comp.sys.apple2
Subject: csa2 chronicles: hacker's corner
Date: 23 Nov 1996 20:40:50 GMT
Organization: University of California, Los Angeles
Lines: 92
Message-ID: <577ngi$1qig@uni.library.ucla.edu>
NNTP-Posting-Host: dyn-biomed0-206.library.ucla.edu
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Mailer: Mozilla 1.2N (Windows; I; 16bit)
```

Hacker's Corner

Replacing the System Saver IIGS Fan

Does your Kensington System Saver IIGS sound like a broken record? It may be that the fan inside the unit is showing wear. The good news is that replacing the fan is an easy and rewarding task.

I knew my fan was starting to die when it sounded like it was wheezing during spin-up. The fan, a Sprite model SU2C7, uses sleeve bearings, whose lifespan is determined by the lubricating oil supply in the bearings. When enough of the oil evaporates, metal will grind against metal resulting in heat and resistance that cause the fan to quickly lock-up. Better quality fans use ball-bearings, but Kensington apparently used the cheapest component available. Even among the models with sleeve bearings, the SU2C7 is the least capable. It can only move 15 cubic feet of air a minute (half what a typical PC fan moves) and has a 55,000 hour rating.

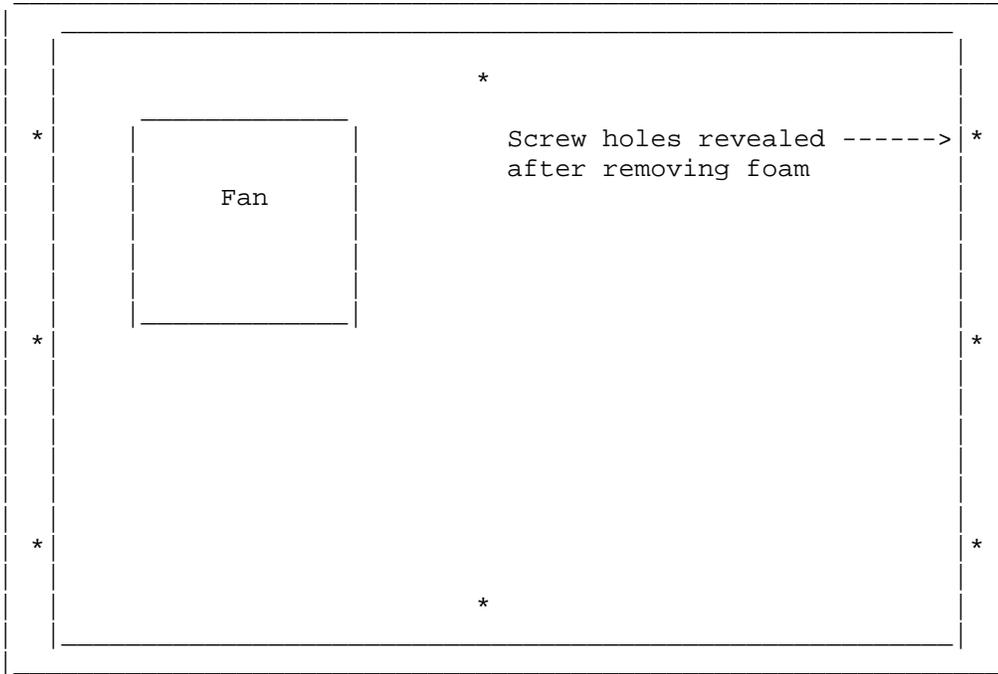
In looking for a replacement for my dying fan, I chose to use a better model. The Sprite model SU2B1 has the same dimensions as the SU2C7 used in the System Saver and is readily available from Digi-Key corporation. It uses ball bearings for long life (the fan is rated for 73,000 hours) and can move 28 cubic feet of air a minute. The higher quality is readily apparent: the replacement is currently noticeably quieter than the original even though it is moving more air per minute.

Make sure the System Saver is unplugged before opening the case.

Opening the System Saver case involves removing eight screws. You must remove the foam weatherstripping along the periphery of the case to expose

the screws. Once the weatherstripping is removed, you should be able to see the screw access holes. They are arranged as shown in the following diagram (bottom view of the System Saver):

FRONT



BACK

Once inside, the fan can be removed by unplugging the power cord that connects it to the circuit board. A grounding wire that is attached by a screw must also be removed. The fan itself is held to the case by two screws. Once you remove the SU2C7, you can replace it with the SU2B1. Now mount everything back together again with the screws. Apply new foam weatherstripping to the periphery of the bottom of the system saver.

The refurbished System Saver is now better than a factory new model! Notice the difference in sound: a quiet hum rather than a load rumble. If you have a lot of cards, you will notice that the inside of the IIGS is a lot cooler too. An upgraded System Saver is a great way to counteract accelerator instability caused by heat.

Sources and parts needed:

- 1) Part: Sprite model SU2B1 (Digi-Key Part No. CR103-ND)  
Source: Digi-Key Corp. (1-800-344-4536/www.digikey.com)
- 2) Part: Foam weatherstripping tape (3/8th inch width, 3/16th inch thick)  
Source: Home Depot (or a comparable hardware store)

```
##### E N D O F F I L E
### syssaver.fan
##### E N D O F F I L E
```

```
#####
### FILE      : thermistor
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2605 bytes   2 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path: news.uiowa.edu!chi-
news.cic.net!newsxfer2.itd.umich.edu!gatech!swrinde!elroy.jpl.nasa.gov!lll-
winken.llnl.gov!fnnews.fnal.gov!nntp-
server.caltech.edu!news.ridgecrest.ca.us!owens!croton
From: Cyrus Roton <croton@ridgecrest.ca.us>
Subject: Re: read temperature from i/o port
In-Reply-To: <4hi4ds$5ej@acme.freenet.columbus.oh.us>
X-Sender: croton@owens
X-Nntp-Posting-Host: owens
Content-Type: TEXT/PLAIN; charset=US-ASCII
Message-ID: <Pine.SUN.3.91.960306080547.2216A-100000@owens>
Sender: usenet@ridgecrest.ca.us (Ridgenet Usenet admin)
Organization: RidgeNet - SLIP/PPP Internet, Ridgecrest, CA. (619) 371-3501
References: <4hgjnd$jls@cloner4.netcom.com>
<4hi4ds$5ej@acme.freenet.columbus.oh.us>
Mime-Version: 1.0
Date: Wed, 6 Mar 1996 16:37:55 GMT
Lines: 39
```

On 5 Mar 1996, Dave Althoff wrote:

```
>
> A thermistor is a resistor which has a variable resistance related to
> ambient temperature. I've seen them at Radio Shack in the parts cards,
> and those indicate what the resistance is at a particular temperature.
>
> The paddle ports on an Apple ][ are 150k ohm (or was it 150 ohm...I don't
> recall off-hand). So that is the range of resistances you need to work
> with. ----- snip -----
```

You can connect a resistor to a paddle input and supply a voltage to the other end. Current flows through the resistor to charge a .022 mfd capacitor inside the apple2. When the paddle is read, the apple2 discharges the capacitor and resets a timer. Then the cap is allowed to charge. When the charge reaches the trigger level (3.2 volts) the timer is stopped and the count is read out.

The lower the value of the resistor, the faster the charge and the lower the count. Also, the higher the voltage, the faster the charge. A resistance of about 120K with a 5 Volt supply will give a count of about 250. You can add an external capacitor across the paddle input (to ground) to increase the charging time (if needed)

The formula is  $(\text{charge}) = (\text{input volts}) * (1 - \exp(-t/RC))$

So, you can use a supply voltage and external capacitor as required to fit the resistance value of the thermistor (or other resistive component). Probably, the best way to find the correct values would be to try a

variety of values and plot the "count" as a function of the variable resistance. Then compare the plot against the resistance curves for the thermister (probably not linear), and work out some conversion formula to use in your program to correlate "count" to temperature.

Cyrus Roton croton@ridgecrest.ca.us  
Ridgecrest Apple User Group

```
##### E N D O F F I L E  
### thermistor  
##### E N D O F F I L E
```

```
#####
### FILE      : timemastii
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2894 bytes   2 KB
#####
```

Newsgroups: comp.sys.apple2.comm

Path:

blue.weeg.uiowa.edu!news.uiowa.edu!uunet!news.mathworks.com!udel!gatech!psuvax1!news.ecn.bgu.edu!newspump.wustl.edu!news.starnet.net!wupost!waikato!comp.vuw.ac.nz!actrix.gen.nz!dempson

From: dempson@atlantis.actrix.gen.nz (David Empson)

Subject: Re: Still having problems...

Message-ID: <D30HvI.4tE@actrix.gen.nz>

Sender: news@actrix.gen.nz (News Administrator)

Organization: Actrix - New Zealand Internet Service Providers

Date: Thu, 26 Jan 1995 12:11:40 GMT

References: <D2rz3z.EEH@sue.cc.uregina.ca> <D2t09q.BIM@actrix.gen.nz>

<D2xIE4.BnD@sue.cc.uregina.ca>

X-Nntp-Posting-Host: atlantis.actrix.gen.nz

Lines: 61

In article <D2xIE4.BnD@sue.cc.uregina.ca>, charles macdonald <macdon@HERCULES.CS.UREGINA.CA> wrote:

>

> The problem was a Time][ card installed in slot#7 (given to me about > 9 years ago). It was wreaking havoc with the interrupts.

Aha!

Easy solution there: change the switches on the Time ][ so that it doesn't have any interrupts enabled. (It shouldn't have, unless you have written some software to use them.)

I see from a later posting that you don't have a manual. Luckily, I do.

There are eight switches on the card. To disable all interrupts, set all the switches to the OFF or OPEN position (towards the edge of the board).

In case you ever want to use the interrupts, the switches operate as follows:

```
1  1 Hour   NMI
2  1 Minute NMI
3  1 Second NMI
4  1024 Hz  NMI
5  1 Hour   IRQ
6  1 Minute IRQ
7  1 Second IRQ
8  1024 Hz  IRQ
```

NMI and IRQ refer to the Non Maskable Interrupt and Interrupt ReQuest signals.

Only one of the four interrupts in each group may be enabled. The 1 hour, 1 minute and 1 second interrupts generate a pulse of 122.1 millisecond duration on the appropriate interrupt line. The 1024 Hz interrupt generates a pulse of 488 microseconds every 976 microseconds.

It is a very bad idea to have NMI enabled, because an NMI can occur at any time, even while the processor has interrupts disabled. The worst example of this is during a disk write operation: an NMI can cause part of the disk's contents to be destroyed!

The IRQ is less dangerous. If the processor has interrupts enabled, an IRQ from the card will cause the interrupt handler to be called immediately (you can install up to four interrupt handlers if you are running ProDOS).

It is normal practice for an interrupt handler to check that the interrupt comes from its device. This is a little difficult to do with the Time ][ card, but not impossible.

If no interrupt handler has been installed for the Time ][, an interrupt from the card will immediately crash the computer (as you have discovered). Interrupts are normally disabled (within the processor) until you run a communications program or boot ProDOS-8 1.2 or later.

--  
David Empson  
dempson@actrix.gen.nz  
Snail mail: P.O. Box 27-103, Wellington, New Zealand

##### E N D O F F I L E  
### timemastii  
##### E N D O F F I L E

```
#####
### FILE      : titanii
#####
### Created   : Tuesday, April 8, 1997  Modified: Tuesday, April 8, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3020 bytes   2 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!uwm.edu!newsfeeds.sol.net!ix.netcom.com!news-peer.sprintlink.net!news-
peer.sprintlink.net!news.sprintlink.net!sprint!uunet!in3.uu.net!206.63.63.70!nwnew
s.wa.com!rook.wa.com!brian.hammack
From: brian.hammack@rook.wa.com (Brian Hammack)
Newsgroups: comp.sys.apple2
Subject: Re: Titan Accelerator II
Date: Mon, 07 Apr 1997 18:17:00 GMT
Message-ID: <1378104229-970407111700@rook.wa.com>
Distribution: world
Lines: 50
```

Mitchell spewed forth:

```
SCC(|      I picked up some odds and ends on the weekend (still going
| through it) and one interesting item is a Titan Accelerator II
```

I have two, I think they're pretty neat.

```
SCC(|      First off, how did this accelerator differ from the TransWarp
| and ZipChip in terms of functionality and compatibility? I would
| like to install it in my Apple IIe and use with recent software,
| like ProTERM. There is a bank of eight switches and seven jumpers
```

Simply put: The two blocks correspond to the slots in a //e. The first block is for time-dependant slots (drives, printer, etc.) -- flip these switches OFF if there's something time sensitive in it. The second is for any memory you have in (if you are using a ][/][+ the card goes in the aux slot 0, and goes in any other slot on a //e, so there is no jumper for slot 0) -- pull the jumper OFF for any slot with memory.

```
SCC(|      As for working with the card, when I plug it in most software
| will refuse to run. An "Unable to load ProDOS" message appears if
| I try and start most things up (removing the boards fixes this).
```

I have no clue. The Titan card replaces having a 65C02 in some applications but not others (Angel likes it, Shrink It does not).

```
| Also odd, if I press control-reset, I see garbage off the to side
| of the screen, like this:
```

The card does retain a charge; my experience says that one has to power down for 15-20 seconds before rebooting to not get garbage. As for a control-reset, I haven't done that much lately. :)

```
SCC(|      Is the board not properly configured or does it sound
| defective? All the chips are socketed (minus the silver "Titan
| Technologies" box in the corner) but I'm not sure which chips
```

The only thing I know is that you have to slow the thing down -- speed is 3.5MHz -- to reset any system clock you have, and some programs don't really like it (this happened with some BBS program I was setting up). The POKE there is: 49286,x where x=5 for fast and x=1 for 1MHz, and x=10 to turn the thing off completely (a dangerous choice).

The card does wonders for me in Publish It! 4, speeds up the pagination in AppleWorks, and doesn't do anything special in ProTerm except change the tone of the "connect" sounds. :)

\* 2qwk! 2.03 \* "Cold meat, mutton pies/Tell me when your mother dies" -boy  
--  
yet another annoying post by brian.hammack@rook.wa.com -- deal with it.

##### E N D O F F I L E  
### titanii  
##### E N D O F F I L E

```
#####
### FILE      : titaniie
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 7664 bytes   7 KB
#####
```

```
Path: news.uiowa.edu!chi-news.cic.net!newsxfer.itd.umich.edu!bloom-
beacon.mit.edu!senator-bedfellow.mit.edu!pbauer
From: pbauer@athena.mit.edu (Paul H Bauer)
Newsgroups: comp.sys.apple2
Subject: Re: accelerator's slot?
Date: 8 Oct 1995 00:24:39 GMT
Organization: Massachusetts Institute of Technology
Lines: 149
Message-ID: <4575o7$all@senator-bedfellow.MIT.EDU>
References: <44ucs3$haa@mordred.cc.jyu.fi>
NNTP-Posting-Host: arcadia.mit.edu
```

TITAN ACCELERATOR IIe

Section 1

- STEP 1. DON'T TAKE THE ACCELERATOR IIe OUT OF THE PINK ANTI-STATIC BAG YET.
- STEP 2. Turn off the power to your Apple.
- STEP 3. Put a piece of aluminum foil on the table next to your Apple.
- STEP 4. Take the cover off the Apple.
- STEP 5. Make a list of the contents of each slot in a table like the one below:

|               |              |
|---------------|--------------|
| Slot 0 _____  | Slot 4 _____ |
| (or aux slot) |              |
| Slot 1 _____  | Slot 5 _____ |
| Slot 2 _____  | Slot 6 _____ |
| Slot 3 _____  | Slot 7 _____ |

- STEP 6. If you have an Apple II or II Plus, we recommend that you put your Accelerator IIe in slot 0. If you have a memory board in slot 0 now move it to another slot or just take it out. The Accelerator IIe contains its own built-in language card with 16k of memory, so you don't really need another 16k memory board.
- STEP 7. On your slot table, mark the slot number(s) that contain DISK CONTROLLER CARD(S), MODEM INTERFACE, VIDEO DIGITIZER CARD, or other interfaces to time-sensitive devices. A time-sensitive device is one whose controlling software makes iterative timing calculations. This does not include memory boards, 80 column cards, or printer interfaces.
- STEP 8. Touch the Apple's power supply to discharge any static electricity on your fingers. Then remove the Accelerator IIe from its pink bag and put the board on the aluminum foil. Make sure each pin is touching the aluminum foil to prevent static buildup.
- STEP 9. Find the block of small switches on your Accelerator IIe board. Switches 1 to 7 correspond to slots 1 to 7. For each slot with a time sensitive device (refer to your slot table), set the

corresponding switch OFF. Set switch 8 OFF. Set all the other switches ON.

- STEP 10. Find the block of jumpers on the upper right of the Accelerator IIE. Refer to figure 2. There are 7 jumper positions. The top jumper goes with slot 1, the next with slot 2, etc. The bottom jumper goes with slot 7. Now for each slot where you have any type of memory board, remove the corresponding jumper (small plastic gadget). If you have an Apple IIE, ignore the auxiliary slot. For an Apple II or II Plus, the Accelerator IIE will not recognize a memory board in slot 0. Thus there is no jumper for slot 0. We recommend that you put the Accelerator IIE in slot 0 of an Apple II or II Plus.
- STEP 11. Make sure the power is turned off for your Apple. Touch the power supply again. Now plug the Accelerator IIE into the slot 0 on your Apple II or II Plus, or into any available slot on your Apple IIE. Slot 3 is a good choice for the Apple IIE, since the Accelerator IIE will work in slot 3 whereas most other cards won't.
- STEP 12. Replace the cover to the Apple.
- STEP 13. If you do NOT have a Z-80 card, skip this step. If you have a Microsoft Z-80 Softcard or another Z-80 card which uses DMA, you must use the preboot disk which came with your Accelerator IIE before you run any Z-80 (CP/M) software. You do not need the pre-boot if you have a Z-80 card which does not use DMA. Consult your Z-80 card manual if in doubt.

To use the pre-boot, just boot the Accelerator IIE pre-boot disk. It is already set for the "desireable" option, which is what you need. Now remove the pre-boot disk, insert your regular CP/M disk, and press the space bar. Run your programs as usual. Your CP/M software will not speed up, since it is not using the Accelerator's 6502. To get back to 6502 operation for DOS or Pascal, you must reboot the system. Just turn off the power and back on to get the accelerated 6502 operation.

- STEP 14. All your software (except CP/M programs requiring a Z-80 card) will now run approximately 3-1/2 times faster! If you want to slow down (in order to play games, perhaps), you can use the pre-boot disk provided with your Accelerator IIE board. Just boot this disk before you run your game. Move the cursor to the "slow down" position with the right arrow key. Now remove the pre-boot disk, insert a regular DOS or Pascal disk, and press the space bar. Run your program as usual.
- Step 15. For more information, read Section II at your convenience

**LIMITATIONS:**

1. The Accelerator IIE will not speed up CP/M software running on a Z-80 card. All other applications will run approx. 3-1/2 times faster.
2. The Accelerator IIE is not compatible with the Corvus Omninet or other DMA (direct memory access) devices.
3. The Accelerator IIE will not access the second bank of a Saturn 32k RAM Board, although the built in language card on the Accelerator IIE effectively replaces this second bank.
4. A few programs are not compatible with the CMOS 6502 because they treat newly implemented op-codes as no-ops.

SECTION 2 - Accelerator IIe INFORMATION

PROCESSOR

The Accelerator IIe is based on a CMOS 6502 microprocessor running at 3-1/2 MHZ. This replaces the Apple's 1 MHz 6502 processor for all computation. The Accelerator's clock is derived from the 7M signal on the expansion bus. The frequency is divided by 2 for normal operation of the Accelerator. Synchronization of off-board cycles is accomplished by cycle stretching.

CMOS parts are particularly sensitive to static electricity, and for this reason the Accelerator IIe should be handled with some care. Ground yourself by touching the Apple's power supply before removing the Accelerator IIe from its anti-static bag. Place the board on a piece of aluminum foil or other conductor to set the switches and jumpers. Be sure every pin on the back of the board is touching the conductor during the operation. Once the board is plugged in, never touch it without first touching the power supply. Avoid excess handling of the Accelerator IIe. The board should always be kept either in its anti-static bag or in one of the Apple's slots.

MEMORY

CONTROL PORT

The Accelerator IIe operating mode may be controlled by execution of a machine language write cycle or BASIC poke according to table 1:

Table 1

| Address | Data to write | Function                                            |
|---------|---------------|-----------------------------------------------------|
| C086    | 05H           | High speed (normal operating mode, set on power-up) |
| C086    | 01H           | Low speed                                           |
| C086    | 0AH           | Disable                                             |

I think this should give enough information to write a simple basic program to set the speed of the card or disable it.

Paul pbauer@mit.eduTo:

```
##### E N D O F F I L E
### titaniie
##### E N D O F F I L E
```

```
#####
### FILE      : Trackstar
#####
### Created   : Tuesday, January 1, 1980 Modified: Thursday, March 1, 1973
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 6759 bytes   6 KB
#####
```

Bart wrote:

```
> I have two questions governing the Diamond Trackstar if anyone knows:
> 1. in the FAQ it speaks of a site that at one time had downloads of the 3
> varriants of the Trackstar software. Alos it talks of a fellow who wrote a
> improved version of one utility for it. Are these totally lost or, does anyone
> out there still have a trackstar floppy or other software?
```

I have the original Floppy for the Tracksar E version 1.5

```
> 2. on the upper right side of the Trackstar board is a 8 lin in line molex
> connector for the CGA input from the PC ( Looks to me this works similar to
> the color switch board on a PC Transporter and what you need is a wire to
> connect it to the PC EGA out. I seriously doubt anyone has this wire these
> days and was wondering if anyone knew the pin-outs for the connector so I
> could build my own.
```

```
Molex - - db9
1 - - - - - 1
2 - - - - - 7
3 - - - - - 3
4 - - - - - 4
5 - - - - - 5
6 - - - - - 6
7 - - - - - 8
8 - - - - - 9
```

there's also a ground wire that goes to the outside of the db9 plug  
pin2 of the db9 has no connection

```
> ok a 3rd question:
> the circuit board and ribbion wire thing you plug into the Floppy Controller
> of the PC, then into a 360k floppy and a output connector on the lower left of
> the Trackstar: Anyone know a source for these or again, pin outs and how the
> board works??
```

I never actually used that cable. I used the Trackstar briefly a couple of years ago on a borrowed 286. Someone recently gave me a 486 so I've been thinking of trying it out again assuming the board functions in a 486.

Wayne.

Bart wrote:

```
> Thank You Wayne! and a further query:
> >I have the original Floppy for the Tracksar E version 1.5
>
> Wayne could we mayhaps get together on this?
```

> email to --- barpri followed by an uppercase 2 on a QWERTY board with a  
> suffix of wvi period com will reach me

Don't know if I'm addressing this correctly so I'll post it as well on comp.sys  
apple2

if I don't reach you by email, you can email me at waynes@intergate.ca

> >Molex - - db9  
> >1 - - - - - 1  
> >2 - - - - - 7  
> >3 - - - - - 3  
> >4 - - - - - 4  
> >5 - - - - - 5  
> >6 - - - - - 6  
> >7 - - - - - 8  
> >8 - - - - - 9  
> >there's also a ground wire that goes to the outside of the db9 plug  
> >pin2 of the db9 has no connection  
>  
> IS this facing the plug (ie from the side that plugs in or, is it from the  
> solder side?

The pins on all db9 plugs should all be numbered. Male DB9 plugs  
are always numbered on the pin side from left to right starting at the top  
left with the longer row at the top.

Wayne

Here you go Bart!

<http://www.grin.net/~cturley/USA2WUG/TrackStar/>

Cheers,  
Tom

Bart writes ...

>  
> I have two questions governing the Diamond Trackstar if anyone knows:  
> 1. in the FAQ it speaks of a site that at one time had downloads of the 3  
> variants of the Trackstar software. Alos it talks of a fellow who wrote a  
> improved version of one utility for it. Are these totally lost or, does anyone  
> out there still have a trackstar floppy or other software?  
>

Thanks to you and Wayne, the Trackstar FAQs files have been updated. One  
change was to update links to Trackstar resources.

As Tom notes, you can find Trackstar stuff on USA2WUG. You can also find it  
in the GS WorldView archive at <http://206.14.25.120/~cturley/a2zine/Utils/> .

> 2. on the upper right side of the Trackstar board is a 8 lin in line molex  
> connector for the CGA input from the PC ( Looks to me this works similar to  
> the color switch board on a PC Transporter and what you need is a wire to  
> connect it to the PC EGA out. I seriously doubt anyone has this wire these  
> days and was wondering if anyone knew the pin-outs for the connector so I  
> could build my own.

Here is a snip from the new version of the Trackstar FAQs Resource file

which uses the info supplied by Wayne Stewart and adds a few extra details:

>>

What are the connections for a CGA video cable to the molex connector on the TrackStar E?

The cable has an 8-pin female molex connector going to a 9-pin Dsub9 male plug.

```

-key-      1 2 3 4 5
]oooooooo[ ' ' ' ' '
87654321   ' ' ' ' '
           6 7 8 9
    
```

(connectors viewed from front)

```

Molex      Dsub9
on TS      to PC CGA video output
    
```

```

1* - - - - - 1 Ground
2 - - - - - 7 Reserved
3 - - - - - 3 Red
4 - - - - - 4 Green
5 - - - - - 5 Blue
6 - - - - - 6 Intensity
7 - - - - - 8 Horizontal Drive
8 - - - - - 9 Vertical Drive
    
```

\*Pin 1 is usually marked "1" on circuit board.

Pin2 of the Dsub9 has no connection. There's also a ground wire that goes to the outside of the Dsub9 plug.

Pins on board viewed looking at the front (chip side) of the board:

```

--- keyway ---
. . . . .
1 2 3 4 5 6 7 8
    
```

Wayne Stewart  
11 March 2001

<<

>

> ok a 3rd question:  
> the circuit board and ribbon wire thing you plug into the Floppy Controller  
> of the PC, then into a 360k floppy and a output connector on the lower left of  
> the Trackstar: Anyone know a source for these or again, pin outs and how the  
> board works??  
>

....

I do not have info on the pinouts. The Trackstar E manual has a few pictures showing setups using a big ribbon cable and small adaptor board which originally

came with the Trackstar. Basically, what you're doing is connecting the PC controller to the disk drive via the adaptor board.

The adaptor board has molex and edge connectors to allow some flexibility regarding the connectors used on the PC controller and/or disk drive. It also has a small ribbon cable which goes to the Trackstar.

The big ribbon cable seems to be a moderately standard edge connector-to-molex connector cable for connecting a PC disk drive to a controller card. The adaptor board is the 'mystery part'. My guess is that the lines going to the Trackstar are for switching in just data R/W lines (plus, maybe, the Write Protect line) and that the PC controller card is used to handle head movement and drive on/off.

You may feel like figuring out how to make the adaptor board; but, it probably isn't worth the bother. Even if your PC 5.25" drive is old enough to be one which is Trackstar-compatible, a PC drive is not supposed to be able to handle many copy-protected diskettes.

It's much easier to just plug an Apple Disk ][ drive into the Trackstar. That will take care of real Apple II diskettes. Plus you can have virtual drives (using "Trackstore" files) and a virtual hard disk.

Rubywand

##### E N D O F F I L E  
### Trackstar  
##### E N D O F F I L E

```
#####
### FILE      : transwarp
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3610 bytes   3 KB
#####
```

```
Path: blue.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!usc!howland.reston.ans.net!europa.eng.gtefsd.com!newsxfer.itd.umich.edu!
isclient.merit.edu!msuinfo!harbinger.cc.monash.edu.au!news.cs.su.oz.au!metro!news.
ci.com.au!wabbit.cc.uow.edu.au!wabbit.cc.uow.edu.au!not-for-mail
From: david@zircon.cs.uow.edu.au (David E A Wilson)
Newsgroups: comp.sys.apple2
Subject: Re: Any Transwarp (//e) users out there?
Date: 22 Sep 1994 10:57:40 +1000
Organization: University of Wollongong, NSW, Australia.
Lines: 53
Message-ID: <35qkq4$e3l@zircon.cs.uow.edu.au>
References: <CwG474.JzM@pts.mot.com>
NNTP-Posting-Host: zircon.cs.uow.edu.au
```

kburtch@pts.mot.com (Kevin Burtch) writes:

```
>I just got a //e, and was wondering a few things about the Transwarp card
>that came with it. I already found, by experimentation, that by hitting the
>ESC twice as "Transwarp" is displayed at powerup I can switch it back to low
>gear. (so to speak)
```

Also you can press 0 or 9 while the logo is displayed and it will run the built in self test (the 9 puts up a copyright message first). Now why does this not get a mention in the manual??

```
>First, just how fast is this thing? I can't find a clock on the card, so I'm
>guessing it uses the 3.5MHz signal from the slots. (am I even close?)
```

The manual says 3.6MHz (near enough to 3.58 I guess) while the self test shows 3.3 for full speed and 2.1 for half speed (strange - I would have expected less than 1.7).

```
>Second, am I right about using ESC twice at bootup being the only way to slow
>it down? After I hit CONTROL-RESET, it speeds back up, just like it says when
>you use the ESC trick. ;^) Is there a POKE or anything I can use from BASIC, or
>assy? How do I speed it back up? Is CONTROL-RESET and power-off/on the only way
>to change the speed? (I'd rather not have to cycle the power every time...)
```

Pressing ESC disables the Transwarp completely. A poke of 3 to \$c074 does the same. The two switch #8 select the default speed (1/1.7/3.6MHz). A poke of 1 to \$c074 will slow the TW down to 1MHz using the TW CPU.

```
>Third, what are the switches for? What are the options? (this one is important)
>I know there are two sets of eight swiches, but I really need to know. I assume
>that some are for disabling the accellorator when accessing certain slots, like
>the floppy controller, etc. I really appreciate this one!
```

Yes. The left bank tells the TW which slots have RAM cards (16k/128k etc). The right bank tells the TW which slots have slow cards (floppy disks, clocks etc). Slot number as per switch number. Off means full speed (I think - I will

double check the manual when I get home).

>Fourth, it has 256k onboard, is this used in a "shadow" fashion, or can I use the  
>extra RAM somehow? A lot of programs that came with this machine are configured  
>for the 1Meg Ramworks II card in the AUX slot. Is it possible to use both the  
>Transwarp's 256k and the Ramworks II's 1Meg in addition to the 64k onboard?

Yes, it shadows all of the m/b RAM (64k), the ROM (16k), the aux RAM (multiple banks of 64k). I guess if you have more than 128k of aux RAM it will have to start caching. If you have a ][+ you can put the TW in slot zero and use it as your language card (provided you do not disable it with ESC or the poke).

>Finally, is there a disk that should have come with the Transwarp? Drivers, or utilities or something? (I don't have one, or a manual)

I bought mine at ICONfest and it only had the manual. I like my Zip chip a little better as it saves me a slot and runs at 8MHz. Now I have two genuine //e computers that are accelerated.

```
##### E N D O F F I L E  
### transwarp  
##### E N D O F F I L E
```

```
#####
### FILE      : turbo.mouse
#####
### Created   : Monday, July 7, 1997 Modified: Monday, July 7, 1997
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1322 bytes    1 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!chi-
news.cic.net!newsfeed.internetmci.com!uunet!in3.uu.net!199.171.6.16!li.net!bookworm!mwade
From: Mark Wade <mwade@suffolk.lib.ny.us>
Newsgroups: comp.sys.apple2
Subject: Re: How do you hook kensington turbomouse up to IIgs?
Date: Fri, 4 Jul 1997 18:11:07 -0400
Organization: LI Net (Long Island Network)
Lines: 30
Message-ID: <Pine.SOL.3.95.970704175313.15905A-100000@bookworm>
References: <5phnls$f8f$2@mentor.telis.org> <5pj46g$i7o$l@mentor.telis.org>
Reply-To: Mark Wade <mwade@suffolk.lib.ny.us>
NNTP-Posting-Host: bookworm.suffolk.lib.ny.us
Mime-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII
X-Sender: mwade@bookworm
In-Reply-To: <5pj46g$i7o$l@mentor.telis.org>
```

On 4 Jul 1997, itsme wrote:

```
>
> P.S. It is kensington turbo mouse adb model
```

Version 3.0 Kensington Turbo Mouse ADB works fine on a IIgs. V4+ will not.

Dip switches:

```
Right handed use: (Left button click, right button click lock) SW1 Up
Left handed use:  (Right button click, left button click lock) SW1 Down
```

The other switches are for what they call "chording" and are listed as:

|           | SW2 | SW3 | SW6 |
|-----------|-----|-----|-----|
| Command N | Dn  | Dn  | Up  |
| Command O | Dn  | Up  | Dn  |
| Command W | Dn  | Up  | Up  |
| Command S | Up  | Dn  | Dn  |
| Command P | Up  | Dn  | Up  |
| Command Q | Up  | Up  | Dn  |
| Command Z | Up  | Up  | Up  |

```
Mark Wade
mwade@suffolk.lib.ny.us
m.wade7@genie.com
mswade@delphi.com
```

```
##### E N D O F F I L E
### turbo.mouse
```

##### E N D O F F I L E

```
#####
### FILE      : turboasb
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3797 bytes   3 KB
#####
```

```
Path: news.uiowa.edu!news.physics.uiowa.edu!math.ohio-
state.edu!howland.erols.net!newsfeed.internetmci.com!newshub.csu.net!cello.gina.ca
lstate.edu!cello.gina.calstate.edu!not-for-mail
From: sjensen@cello.gina.calstate.edu (Steve Jensen)
Newsgroups: comp.sys.apple2
Subject: Re: Please Reprint
Date: 12 Sep 1996 19:06:30 -0700
Organization: GINA and CORE+ Services of The California State University
Lines: 89
Message-ID: <51afj6$28i@cello.gina.calstate.edu>
References: <5141ap$6d2@nntp.seflin.lib.fl.us>
NNTP-Posting-Host: cello.gina.calstate.edu
```

cybdiver@bcfreenet.seflin.lib.fl.us (Robert Rait) writes:

```
>
> Someone posted a great artical about Modems for the //e,
> with information that showed that a //e with a super serial
> card could handle upto 14400. Could you please repost that.
> Thanks
```

Here 'tiz:

Lightning Systems Product Information Sheet

Lightning Systems offers two (2) products for the Apple // line of computers.

6551-ACIA

-----  
This is a replacement chip for the 6551 ACIA (Asynchronous Communications Interface Adapter) that is standard on most Serial Interface cards for the Apple //.

Why do you need a replacement chip? Simple, the 6551 chip that is on most Serial Interface cards has a design flaw in it that causes it to lose a character every time the CTS line is switched.

In most cases, this is not a problem. However, with modem speeds continuing to rise, people have started using Hardware Handshaking cables to connect their computers to their modems to achieve even higher speeds. This is where the problem lies.

In typical Hardware Handshaking installations, the computer is sending and receiving data faster than the modem can receive and transmit data. This means that the computer and the modem need a way to communicate between themselves to tell each other when it's ok to send or receive data. When the modem's buffer fills up, the modem switches the CTS (Clear To Send) line to notify the

computer that it is no longer ok to send data. At this point the 6551 chip stops sending data immediately! This is bad. The 6551 may have been right in the middle of sending a character (normally 10 bits). That character is now lost causing an error in the transmission.

This is where the 6551-ACIA comes in. This new 6551 chip fixes the problem. This is a direct replacement for the 6551 chip you now have.

Turbo ASB  
-----

Do you have a high-speed modem, or other high-speed serial communications device?  
Did you know that most Serial Interface Cards for the Apple // are limited to only 19.2k bps?

Well, they don't have to be anymore. The Turbo ASB can blow away that nasty 19.2k bps barrier. With the Turbo ASB, your serial communications can run as fast as 230,400 bps!!!

The Turbo ASB is an add-on card replaces that pokey old 6551 chip on your Serial Interface Card and transforms it into a speed demon.

The Turbo ASB supports all the standard bps rates you are used to, (slow...) and adds 38.4k, 57.6k, 115.2k and 230.4k!

At this time the Turbo ASB is supported by ProTERM, Spectrum and ANSITerm. The Turbo ASB includes a 6551-ACIA chip.

Pricing  
-----

The 6551-ACIA is \$4.00 each. The Turbo ASB is \$27.00 each.

Shipping and handling is as follows:

Within the U.S., \$3.00 per order.  
Canada and Mexico, \$5.00 per order.  
Everywhere else, \$10.00 per order.

Include an E-Mail address if you have one. Monies need to be sent in US funds.

Lightning Systems  
P.O. Box 4  
Mukwonago, WI 53149-0004  
(414) 363-4282 BBS

sjensen@qnis.net  
sjensen@cello.gina.calstate.edu

##### E N D O F F I L E  
### turboasb  
##### E N D O F F I L E

```
#####
### FILE      : twgs
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1783 bytes   1 KB
#####
```

```
Path: news.uiowa.edu!news.uiowa.edu!chi-
news.cic.net!brutus.bright.net!usenet.eel.ufl.edu!news.mathworks.com!solaris.cc.vt
.edu!news.genie.net!news2.genie.net!usenet
From: harold.h@genie.com
Newsgroups: comp.sys.apple2
Subject: re: "TWGS not friendly with Appletalk???"
Date: 19 Sep 1995 08:51:54 GMT
Organization: via GENie Services (1-800-638-9636 or info@genie.com)
Lines: 36
Sender: harold.h@genie.com (Harold Hislop)
Message-ID: <43m0ba$se3@rockl04.genie.net>
NNTP-Posting-Host: rockl03.is.ge.com
```

FWIW,

For the last two months I have been running a 14Mhz TWGS in a "Turbo-28" (prototype ROM\_03 IIgs (with production roms installed)) on an AppleTalk network, with =ZERO= problems (not one single crash / lockup that I have been able to attribute to the hardware (many I could attribute to bugs in code while developing ;))

My 65C816 is a 14Mhz rated part, not a -E (eng sample) etc.  
The cache in use is ISSI IS61C256AH-15N (15ns) installed on a modified original (8k) cache daughterboard (no series resistors in the adr lines) with a v1.8 TWGS rom installed.

The GALs on this TWGS are as follows:

| AE #     | Lattice #  | Lot #  |
|----------|------------|--------|
| TWGS1A-I | 16V8A 15LP | 891532 |
| TWGS2A-I | 16V8A 15LP | 891532 |
| TWGS3B-I | 20V8 25LP  | 891514 |
| TWGS4A-I | 20V8 25LP  | 891112 |
| TWGS5A-I | 20V8 25LP  | 891811 |
| TWGS6A-I | 16V8 25LP  | 892520 |
| TWGS7A-I | 16V8 25LP  | 892407 |
| TWGS8A-I | 16V8A 15LP | 891535 |

I have modified two other TWGS's in like manner, all three have proven themselves reliable to me.

Memory - CVTech Rev-A 4Mb board w/3Mb installed, Apple 1Mb in back pocket  
SCSI - Rev-C RamFast w/3.01e roms, loaded SCI chain  
Case - Full sized tower w/300w supply.

-Harold  
Hardware Coordinator  
Apple II RoundTable, GENie.

```
##### E N D O F F I L E  
### twgs  
##### E N D O F F I L E
```

```
#####
### FILE      : twgs.osc.and misc
#####
### Created   : Tuesday, October 5, 1999 Modified: Tuesday, October 5, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 7843 bytes   7 KB
#####
```

```
Path: newsl.icaen!news.uiowa.edu!ord-
feed.news.verio.net!feed.news.verio.net!vixen.cso.uiuc.edu!howland.erols.net!newsf
eed.mathworks.com!portc04.blue.aol.com!audrey01.news.aol.com!not-for-mail
From: supertimer@aol.com (Supertimer)
Newsgroups: comp.sys.apple2
Subject: Re: GS II booted!
Lines: 187
NNTP-Posting-Host: ladder05.news.aol.com
X-Admin: news@aol.com
Date: 05 Oct 1999 04:26:24 GMT
References: <37f96dd2.90580798@news.pacifier.com>
Organization: AOL http://www.aol.com
Message-ID: <19991005002624.20934.00000861@ng-fol.aol.com>
Xref: newsl.icaen comp.sys.apple2:153127
```

wcbland@pacifier.com (Bill Bland) wrote:

>supertimer@aol.com (Supertimer) wrote:

>

>>>I imagine the other card is an accelerator. It's a Transwarp (there's  
>>>a clue) GS with a smaller card mounted on it marked "Rev TW GS V1.18H"  
>>It is indeed. You lucked out. This card is often sold in the  
>>\$K+ range and can easily be upgraded to around double

First of all, as I wrote in email, let me apologize for the  
"\$K+" above. I meant hundreds+ not thousands+.  
More embarrassing than that, I think I said it three or  
four times in different threads. ;-|

>>the speed (after which its value will increase even more)!  
>>Cool! If you ever want to speed up this card, just post the  
>>question on csa2.

>

>Well, that's an offer too good to refuse. :-)  
>How do I go about speeding up the card? Yes, I know. I just figured  
>out how to boot it, an already I want more speed. That's what 'puter's  
>and cars do to people, I guess.

Look at one of the corners of the TWGS card. There  
is a shiny metal box. This is the oscillator. It is the  
CPU's clock. It runs at a Mhz rating 4x that of the  
CPU. The TWGS normally has a 28Mhz oscillator.  
The CPU can often be overclocked a Mhz or two, so  
try a 32Mhz oscillator followed by a 36Mhz one.

The oscillator is socketted so replacing it is easy.  
There are two oscillator sizes, full size and half size.  
The TWGS card uses the half sized ones (which are  
square rather than rectangular).

To get above 9Mhz usually requires a new CPU chip. These cost about \$20 from a company called Western Design Center which is in Mesa Arizona. The chip is the 65C816S8PL-14, rated at 14Mhz (but the design has gone much faster than this due to the fact that WDC only tests them to 14Mhz).

The CPU is located near the center of the card in a socket and has the numbers 65C816 printed on it (there may be other numbers and letters too, but 65C816 is on there).

For the >9Mhz mod, simply replace the CPU with the 14Mhz part and then plug in a faster oscillator 4x the Mhz you want to clock the CPU.

Ok, I found my old DigiKey catalog. Here are the DigiKey part numbers:

CTS Clock Oscillators, Half Size

|       |           |        |
|-------|-----------|--------|
| 40Mhz | CTX175-ND | \$3.25 |
| 50Mhz | CTX176-ND | \$3.25 |
| 64Mhz | CTX177-ND | \$4.45 |

You can order them at the DigiKey web site at this URL: <http://www.digikey.com/>

An oscillator of a particular Mhz will clock the TWGS CPU at 1/4 of the oscillator Mhz, so the 50Mhz oscillator will make the CPU go at 12.5Mhz, for example.

If price is not an issue, I suggest getting one of each and experimenting to see what speed the TWGS tops off at.

If not, I suggest getting the 50Mhz and 40Mhz units. 12.5Mhz TWGS (50Mhz oscillator) almost always works, but with a 40Mhz unit, you can fall back on 10Mhz operation if necessary.

The 64Mhz oscillator (16Mhz operation) is a bit more iffy, since cache RAM speeds come into play. Grab this oscillator too if you want to experiment, but it may or may not work.

Good luck!

```
>>I recommend internal Focus drive from
>>http://www.alletec.com/ Alltech Electronics for the
>
>I checked, and some additional questions arise, if I may.
>
>Add AppleWorks 3.0 or AppleWorks GS V1.1 (Disks only) for $10.00
>
>I'm unfamiliar (other than believing they're like Claris or MS Works)
>with these two applications. Is there a substantive difference between
```

>them?

AppleWorks 3.0 is an 8-bit IIE program that runs in a text environment. AppleWorks GS V1.1 is a GUI program that runs under the 16-bit GS operating system GS/OS. Given that you have a IIGS with enough memory and a TWGS for a speed boost, I recommend the 16-bit version. It can do more things (like page layout and putting scanned graphics in database records).

It in fact resembles an early version of MS Works for Mac very much. AppleWorks GS V1.1, that is. It has a word processor with spell check and thesaurus, a data base, a spreadsheet, a page layout module, a communications module, and a combination paint and draw module. It is a pure GUI based program.

To get the most out of it, you'll also want Pointless and Harmonie from <http://www.crl.com/~joko> Shareware Solutions II. This allows you to use TrueType fonts and print to ink jet and laser printers. Pointless and Harmonie work extremely well with AWGS 1.1. When you get everything set up and install a good library of TrueType fonts, the IIGS can produce output to an ink jet or laser printer identical to word processing and simple page layout on the PC or Mac.

I still use my IIGS to do word processing a lot. It is connected to the same ink jet printer as my PC. I move from one 'puter to the other. The output is identical between the two. The PC has more diverse programs, but the IIGS boots much faster. I do not leave my PC on all the time because experience has shown that this kills the hard disk drives faster (even if they go into a lower power mode after a time). Besides, the environment you know. ;-)

>Focus Drives are 100% Extended Smartport compatible meaning  
>partititons are automatically mapped for your ProDOS 8 use (up to  
>12 depending on system configuration, existing disk controllers,  
>floppy drives, etc) and all partitions are available for GS/OS. A  
>DOS 3.3 Emulator (FocusDOS 3.3) is available on request.

>

>This is way over my head. Do I want a DOS 3.3 Emulator?

If you use very old Apple II or II+ software that runs under DOS 3.3 and would like to install them onto the Focus, then yes. But most software you will encounter that's 8-bit is for the IIE that runs under ProDOS which is very hard drive aware so you do not need the DOS 3.3 Emulator for these. And for the native 16-bit GS/OS based IIGS software such as AppleWorks GS, this is of course not needed.\*

Basically, you won't need it for the majority of stuff.

With a TWGS in your IIGS and the amount of memory you have you'll probably want to run mostly IIGS native 16-bit GS/OS based stuff in the first place. Who wants to hear the pathetic 8-bit Apple II beeps when you can hear the power of the 16-bit software that uses the IIGS' 32-channel Ensoniq wavetable synthesis chip's. And who wants to look at old 8-bit lores Pong-like stuff when you can play with 16-bit stuff like 3200 color graphics and games such as Out of this World, Lemmings, and Wolfenstein 3D on the IIGS.

\* DOS 3.3 is an old OS that supports only 5.25" drives without a hack of some sort. This is what the "DOS 3.3 Emulator" does. It also does not support subdirectories and is very slow.

ProDOS is an operating system introduced with the 8-bit IIe and IIc. It supports hard drives and CD-ROMs and other mass storage devices. It supports subdirectories but is limited to 32MB per partition.

GS/OS is the Apple IIGS 16-bit operating system. It supports any device with the right driver and it works under a GUI that it is distributed with. It is also file system independent. Using the HFS file system, GS/OS can use partition sizes up to 2GB. The latest distribution is called System 6.0.1, which comes with an application called Finder. The IIGS Finder resembles the Mac Finder a lot. The IIGS works best when used with 16-bit software. When using 8-bit software under an 8-bit OS, it is essentially running a IIe emulation.

```
##### E N D O F F I L E
### twgs.osc.and misc
##### E N D O F F I L E
```

```
#####
### FILE      : twgs.speed
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 8883 bytes   8 KB
#####
```

```
Newsgroups: comp.sys.apple2.programmer
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!cs.utexas.edu!uunet!olivea!pagesat!news.cerf.net!crash!pro-desert!gregd
From: gregd@pro-desert.cts.com (Greg DaCosta)
Subject: Re: TransWarp GS - how to get/set speed?
Organization: ProLine [pro-desert], Greg DaCosta (Sysop)
Date: Tue, 12 Oct 93 20:29:20 PDT
Message-ID: <jc73776@pro-desert.cts.com>
References: <user0213-101093184557@150.203.102.28>
Lines: 345
```

Ian,

What follows is the Merlin source to an EXE file to control the speed of the TWGS. I wrote this about 4 years ago, so it doesn't know anything about the Cache size. I hope it helps.

lst off ;lose the playback!

```
*=====*
*
* SPEED ..... ver. 1.0
*
*   written by Greg A. DaCosta / copyright 1989, Desert Sun Software
*           GENie: [G.DACOSTA]
*
* This program may be distributed freely as long as these credits remain
* intact and unmodified.
*
* No fee may be charged for this program other than a minimal distri-
* bution fee (not to exceed $10). The only exception is distribution on
* the Merlin 16+ disk.
*=====*
*
* This source code based on the DUMP command by Glen Bredon. It's not too
* pretty, but it works well. Thanks to Eric Mueller for his InstDA file
* which was a valuable aid in making this work.
*=====*
```

```
ttl      "SPEED"

xc
xc          ;Turn on full 65816 assembly
mx %00

cas in          ;case insensitive
```

```

rel
dsk 6/speed.1
typ     exe

```

```

tr
tr      adr
exp     off

```

```
*=====
```

```
CSWH = $37
```

```
PNT = $60           ;Misc use
STACKPNT = $68
```

```
KEY = $E0C000
STROBE = $E0C010
```

```
SetSpeed = $BCFF2C ;TWGS memory location
CheckTW = $BCFF00  ;ditto here
```

```
*=====
```

```

Tool      MAC
          IF MX
          ERR 1
          ELSE
          LDX #11
          JSL $E10000
          FIN
<<<

```

```

WriteChr MAC
Tool $180C
<<<

```

```

print2 MAC
JSR SENDMSG2
ASC 11,00
<<<

```

```

PRINT MAC
JSR SENDMSG
ASC 11,00
mx %11 ;eight bit
<<<

```

```
*-----
```

```
*=====
```

```
* Optional header on EXE files:
*-----
```

```

START    BRL      Speed  ;Initialization entry
          BRL      Speed  ;Secondary entry
          BRL      Speed  ;Other required entry
          BRL      Speed  ; vectors, not used by Speed.
          BRL      Speed
          BRL      Speed

```

```

BRL      Speed
BRL      Speed

DA       0           ;= ID of transient commands

ASC      'MERLIN'   ;= ID of special EXE file

```

```

*=====
* End of optional structure for EXE file.
*-----

```

```

Speed    PHK
         PLB

         TSC
         STA      STACKPNT

         TYA
         CLC
         ADC      #8           ;Bypass the "MERLINGS"
         STA      PNT         ; identifier - it is not
         TXA              ; checked for in this
         ADC      #0           ; example
         STA      PNT+2

         lda      #$8d
         jsr      OUTPUT
         jsr      RtnSpcs
         print   "SPEED shell command by Greg A. DaCosta"
         jsr      RtnSpcs
         print   "Copyright 1989, Desert Sun Software"

         SEP      %00110000
         LDY      #0
]LOOP    LDX      #0           ;Look for "SPEED" in order
         PHY              ; to align index to the
]LUP     LDA      [PNT],Y     ; following part of cmd.
         BEQ      :EX        ;Something wrong if taken
         AND      #%01011111
         CMP      cmdWORD+1,X
         BEQ      :NX
         PLY
         INY
         BRA      ]LOOP

:NX      INX
         INY
         CPX      #5           ;all letters?
         BLT      ]LUP
         PLA              ;Pop pushed Y
         DEY
]LUP     INY
         LDA      [PNT],Y
         AND      #$7F        ;Not needed
         BEQ      :EX        ;Nothing after "SPEED" so
         CMP      #'*'       ; do nothing.
         BLT      ]LUP        ;Bypass delimiter & spaces
         LDX      #0
]LUP     LDA      [PNT],Y

```

```

        AND    #$7F
        CMP    #$60
        BLT    :SB
        AND    #%01011111
:SB     STA    BUFFER,X
        BEQ    :GOTIT        ;Branch if no more input
        CMP    #'*'
        BEQ    :IX
        CMP    #'.'
        BLT    :GOTIT        ; or if excess input
:IX     INX
        INY
        BRA    ]LUP

:EX     BRL    EXIT

        mx     %11          ;back to eight bit to store the filename

:GOTIT  STX    Speedname    ;Store length
        DEX
        BMI    :EX
:MOV    LDA    BUFFER,X
        STA    speedname+1,X ;Save the speed which
        DEX    ; the user wants installed.
        BPL    :MOV
        rep   #$30
        jsr   IsATwgs      ;Check to see if A TWGS is installed
        bcc   :NoTW
        sep   #$30        ;back to 8 bits for checking
        ldx   #0
        lda   BUFFER,x
        and   #$DF
        cmp   #'F'        ;Is it an "F"?
        beq   :fast
        cmp   #'S'        ;Is it an "S"?
        beq   :slow
        bra   :max        ;Otherwise just set the Max Speed

:NOtW   rep   #$30
        jsr   RtnSpcs
        print "Sorry, a TWGS is not installed in this System."
        brl   EXIT

:slow   jsr   Slow
        brl   EXIT

:fast   jsr   Fast
        brl   EXIT

:max    jsr   Warp
        brl   EXIT

EXIT    SEP    %00110000
        LDAL  CSWH
        CMP    #$C3
        BNE   EXIT2        ;Exit if not screen output
        lda   #$8d
        jsr   OUTPUT

```

```

        jsr      RtnSpcs
        print   "Press RETURN."

]LUP   LDAL     KEY      ;Else wait for key
        BPL     ]LUP
        XBA
        LDAL   STROBE
        XBA
        CMP     #$8D
        BNE    ]LUP
EXIT2  print   8D8D
        rep     #$30
        LDA    STACKPNT
        TCS
        LDA    #0          ;No error
        RTL     ;All done

        mx     %00

* print some spaces

RtnSpcs rep    #$30
        lda    #$8d      ;print a return first
        jsr   OUTPUT
Spcs    ldx    #20
:loop  phx
        lda    #$a0
        jsr   OUTPUT
        plx
        dex
        bne   :loop
        rts

*=====

SENDMSG2 REP    %00100001
        LDA    1,S
        INC
        STA    1,S
        SEP    %00110000
        LDY    #0
        LDA    (1,S),Y
        BEQ    :back
        JSR    OUTPUT
        BRA    SENDMSG2
:back  rep     #$30          ;back to full 16 bit
        rts

SENDMSG REP     %00100001
        LDA    1,S
        INC
        STA    1,S
        SEP    %00110000
        LDY    #0
        LDA    (1,S),Y
        BEQ    BACK
        JSR    OUTPUT
        BRA    SENDMSG

```

```

OUTPUT PHA
        PHX
        PHY
        PHP
        REP      %00110000
        PHA
        WriteChr
        PLP
        PLY
        PLX
        PLA
BACK    RTS

```

```
*=====
```

```
cmdWord str 'SPEED'
```

```
*=====
```

```

IsATWgs mx      %00
        lda      >CheckTW          ;check Low word of ID
        cmp      #'TW'             ;does it say TW?
        bne      :bad               ;if not, get outta here
        lda      >CheckTW+2        ;check high word
        cmp      #'GS'
        beq      :rts
:bad    clc
:rts    rts

```

```

Slow    mx      %00
        rep      $30
        php
        ldx      #0
        jsl      SetSpeed
        jmp      rts1

```

```

Fast    mx      %00
        php
        rep      $30
        ldx      #1
        jsl      SetSpeed
        jmp      rts1

```

```

Warp    mx      %00
        php
        rep      $30
        ldx      #2
        jsl      SetSpeed

```

```

rts1    plp
        rts

```

```
*=====
```

```
BUFFER DS      $80,$8D
```

```
Speedname ds   $80
```

```
--
```

/ \_ | \ Greg DaCosta, Sysop - Pro-Desert BBS  
\\_ | \_/ Internet: gregd@pro-desert.cts.com

##### E N D O F F I L E  
### twgs.speed  
##### E N D O F F I L E

```
#####
### FILE      : twgs.upgrade
#####
### Created   : Tuesday, February 17, 1998 Modified: Tuesday, February 17, 1998
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 13207 bytes   12 KB
#####
```

Path:

```
newsl.icaen!news.uiowa.edu!newsl.chicago.iagnet.net!qual.net!iagnet.net!feed2.news
.erols.com!howland.erols.net!newscon04!prodigy.com!not-for-mail
From: "nolinParticular" <compuser@prodigy.net>
Newsgroups: comp.sys.apple2
Subject: TWGS
Date: Sun, 15 Feb 1998 13:17:10 -0800
Organization: Prodigy Services Corp
Lines: 295
Message-ID: <6c7m59$6lc$1@newssvr07-int.news.prodigy.com>
NNTP-Posting-Host: slip-32-100-154-213.ca.us.ibm.net
X-Post-Time: 15 Feb 1998 21:19:37 GMT
X-Auth-User: 002489759/61834314d6447871
X-Problems-To: abuse@prodigy.com
X-Newsreader: Microsoft Outlook Express 4.71.1712.3
X-MimeOLE: Produced By Microsoft MimeOLE V4.71.1712.3
Xref: newsl.icaen comp.sys.apple2:130231
```

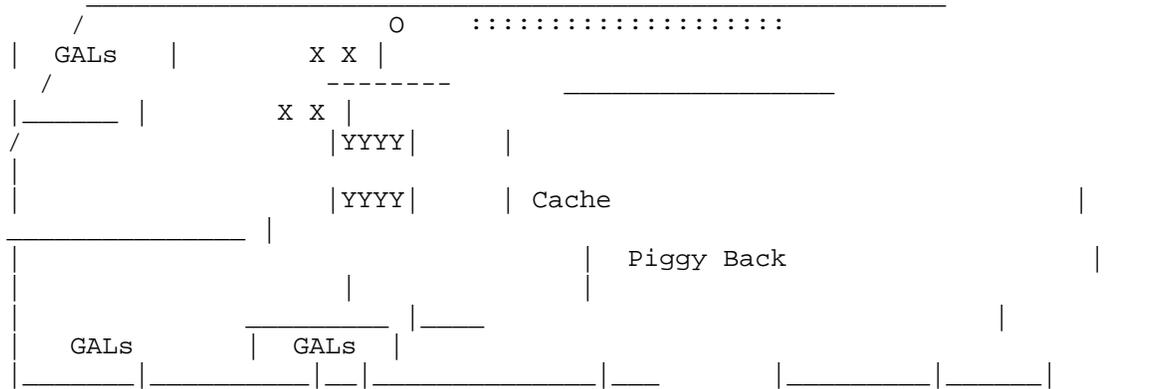
Might have wrong information. I was aiming at a good Replacement for the complicated instructions in the \*FAQ\* Most of this information is provided in one way or another already, in other artciles or texts. I drew the ASCII picture of the TWGS, and Cut and pasted some other information from CSA2. All of the FAQ articles are in TEXT And that is why I have created this article. I reccommend the HyperCard Stack about Upgrading the Transwarp, because it has Alot more information, and a Graphic picture of the TWGS (instead of TEXT) I TAKE NO CREDIT For the Following Information. I tried to Include where I got all of the Info.

```
U      U      P P P P P      G G G G      R R R R      A      D D D      I I I I I I I I I      N
N      G G G G
U      U      P      P      G      R      R      A      A      D      D      I
NN     N      G
U      U      P P P P      G G G G      R R R R      A A A      D      D      I      N N N
G G G G
U      U      P      G      G      R R      A      A      D      D
I      N      N N      G      G
UUUU   P      G G G G      R      R      A      A      D D D      I I I I I I I I I
N      N      G G G G

T T T T T T T T      W      W      W      G G G G G G G G      S S S S S S S S
      T T      W      W W      W      G G      S S
      T T      W      W      W      G G G G G G G G      S S S S S S S S
      T T      W      W      W      G G      G G      G G
SS
      T T      W      W      G G G G G G G G
S S S S S S S S
```

Instructions on how to Speed up/Information about the TWGS Accelerator card

for the Apple IIgs UPGRADING a Transwarp Cards' speed is EASY. \*2\* parts need to be replaced.



|||||

XX = Clock Oscillator, 1/2 size. The speed of the Accelerated  
 XX = Transwarp IIgs is equal to the Oscillator speed Divided by  
 4

YYYY = Fast Processor Chip. This is the CPU of the TWGS.  
 YYYY = It is a 65816 CPU and is Upgradeable to 10-15 MHZ

GALs = Chips you don't have to worry about.

Cache = You need at least ROM version 1.5 to go faster.

Piggy = This board Has the SRAM, and ROM. You can  
 Back = Upgrade the Cache on this board (32k maximum)

-----

WHAT YOU NEED TO UPGRADE:

- 1) Transwarp IIgs with ROM version 1.5 or greater (With the IIGS turned on, press CONTROL-Apple-ESCAPE And go to the Transwarp CDA)
- 2) A high speed 65816 chip
- 3) A 1/2 size Clock Oscillator that is 4X the megahertz you want to your TWGS to run.

| Digikey Part # | Clock Oscillator speed | TWGS speed |
|----------------|------------------------|------------|
| CTX175-ND      | 40 mhz                 | 10 mhz     |
|                | 48 mhz                 |            |
|                | 60 mhz                 |            |
|                | 12 mhz                 |            |
|                | 15 mhz                 |            |

-----

You can get the 65c816 -14 PLCC chip from the Western Design Center Their URL is <http://www.wdesignnc.com/>

You can buy 1/2 size Oscillators from Digikey. Their URL is <http://www.digikey.com/>  
You can also get these Oscillators from many Electronics suppliers.

Information about Upgrading the Cache on your Transwarp is near the end of this document.

-----  
-----  
The following is cut from a post from CSA2 that was made by Scott G  
-----

You really should update the out of date info in your accelerator FAQ. I invite the original poster of the question to point their web browser to:  
<http://ground.isca.uiowa.edu/apple2/apple16/Hypermedia/Hypercard/>  
And download: TWGSupgrade.SHK (or TWGSupgrade.BSQ if you require 7-bit transfer).  
Any 65C816 high speed chip manufactured today (and recently [years]) does not require an upgrade to the GALs. Those were only required with the old "Engineering" chips that WDC used to sell. I've upgraded a TWGS card by just changing the half-size oscillator in the corner. No GAL upgrade or ROM upgrade needed. The info is in my Transwarp GS upgrade stack.  
Also, again, your Zip GS upgrade info in the accelerator FAQ is also in error. Not everyone needs to replace the gates there for high speed operation. I did not need to for 13.75MHz. Matt Portune's Zip would not work WITH the replacement gates. And my stack, ZipUpgrade.SHK and ZipUpgrade.BSQ from ground, also shows where to get parts for upgrading without soldering the board. Upgrading both accelerators is easy. Easier than the dated accelerator FAQ makes it out to be.  
-Scott G.

-----  
The following is cut from a post from CSA2 that was made by Rubywand  
-----

Yes indeed. A 10MHz Transwarp GS I tested matches a 12.5MHz Zip GS in most tasks.  
.....  
I invite the original poster of the question to point their web browser to:  
<http://ground.isca.uiowa.edu/apple2/apple16/Hypermedia/Hypercard/>  
And download: TWGSupgrade.SHK (or TWGSupgrade.BSQ if you require 7-bit transfer).  
  
Any 65C816 high speed chip manufactured today (and recently [years]) DOES NOT require an upgrade to the GALs. Those were only required with the old "Engineering" chips that WDC used to sell. I've upgraded a TWGS card by just changing the half-size oscillator in the corner. No GAL upgrade or ROM upgrade needed. The info is in my Transwarp GS upgrade stack.  
..... Not everyone needs to replace the gates there for

high speed operation. I did not need to for 13.75MHz. Matt Portune's Zip\_would not work\_WITH the replacement gates. And my stack, ZipUpgrade.SHK and ZipUpgrade.BSQ from ground, also shows where to get parts for upgrading without soldering the board. Upgrading both accelerators is easy. ....

<<

Thanks for re-posting this info with the appropriate headlines-- pretty interesting stuff! (I had overlooked the original.) It seems that Scott is becoming the IIGs Accelerators Guru.

Rubywand

SPEED COMPARISON OF 8K VS 32K CACHE

-----  
 -----  
 The following is cut from an email from Joachim Lange of ///SHH Systeme, who sells the 8-->32k upgrade board  
 -----

-----  
 The larger cache size gives you more speed without the need of increasing the processor's clock frequency. The overall gain in speed is about 20..30 per cent, however the Finder feeling is a lot more "snappy".  
 -----

-----  
 The following is cut from a post from CSA2 that was made by Rubywand  
 -----

John Link charted some comparisons in 1991 involving nine setups: no-TWGS, and 7, 8, 9, 10MHz boards before and after the 8kB-to-32kB cache upgrade. He used three benchmarks:

1. time to calculate page breaks in a 218-page Appleworks document
2. time to scroll through a 39-page Awks-GS document
3. time to compile 4800 lines of MD-BASIC source code

The chart shows that a 7mHz TWGS with the 32kB cache performs slightly better than a 10mHz TWGS with 8kB cache on tests 1 and 3; it is a bit slower on test 2.

For a 7mHz 8kB TWGS, the speed gain for the 32kB cache upgrade is roughly 33% to nearly x2.5 plain GS speed.

For a 10mHz 8kB TWGS, the speed gain for the 32kB cache upgrade is roughly 33% to about x3.25 plain GS speed.

One nice feature of upgrading cache is that you get a good performance boost without the concerns usually assorted with a significant increase in clock speed.

The AE cache upgrade kit was priced at \$109 in 1991. Now that AE is gone, the kit may be harder to find than a TWGS with the 32kB upgrade installed.

As Scott G has noted, SHH Systeme, Germany sells 32kB cache upgrade materials.

SHH Systeme, Germany ( <http://users.ids.net/~kerwood/shh.html> email: [jlange@tasha.muc.de](mailto:jlange@tasha.muc.de) )

The catch is that, according to information currently displayed at their web site, you can get everything you need \_except\_ the v1.7 or v1.8 ROM. Here is what they say ...

>>

Another important note

=====

The TransWarp GS firmware version 1.5 that came with the TransWarp 8K version does not work with 32K cache boards. You absolutely need v1.7 or v1.8 for 32K cache operation. Since the firmware is copyrighted material, we cannot supply copies of the firmware. ....

<<

Of course, when it comes to such matters, one never knows for sure what is available until the seller is contacted.

SHH does list several options ranging from a bare board through one with everything installed except the v1.7 or v1.8 ROM. The info below is from their web site:

=====

Option A: Bare boards ("do-it-yourself")

=====

What you get:

-----

Two-layer piggyback boards for the TransWarp GS with solder resist, ready for soldering all components. A sheet of paper with short but reliable instructions how to assemble the board. NOTHING ELSE.

Heavy soldering required!

US \$15 per board plus \$14 shipping/handling

(six boards minimum, 22 boards maximum for this s/h fee).

=====

Option B: Populated boards, without semiconductors ("dirty-work-done")

=====

Since it is much cheaper to buy expensive semiconductors (such as cache RAMs) in your own country, you might prefer this version.

What you get:

-----

A two-layer piggyback board for the TransWarp GS with solder resist. All non-semiconductor components (sockets, resistors, capacitors, header connectors) mounted and ready for use. A sheet of paper with short instructions how to add the components not included with the board. All board functions verified. No soldering required.

US \$32 plus \$14 shipping/handling

(four boards maximum for this s/h fee).

=====

Option C: Fully populated boards, without Firmware EPROM ("almost plug-and-play")

=====

What you get:

-----

A two-layer piggyback board for the TransWarp GS with solder resist. All components but the firmware EPROM soldered and ready for use. The board includes all sockets and three 32K cache RAMs 62256-15 or equivalent (fast enough for processor clock values of 14 MHz and more). A sheet of paper with short instructions how to add the components not included with the board. All board functions verified.

US \$69 plus \$14 shipping/handling  
(four boards maximum for this s/h fee).

So, if you can get the v1.7 or v1.8 ROM (or EPROM), your additional cost for a ready-to-go upgrade is \$83. If you have the ROM, then, \$83 for a 33% performance increase sounds good, especially since you can also boost clock speed relatively cheaply and end up with a TWGS running at x3 or better a non-TWGS IIgs!

If there's a local Apple Club with users interested in souping-up their TWGS's, option A looks like a good way to go. Cost per board would be way below \$83, 'finding' the needed ROM (or EPROM) could be easier, and boards could be checked out by a knowledgeable club member.

Rubywand

```
##### E N D O F F I L E  
### twgs.upgrade  
##### E N D O F F I L E
```

```
#####
### FILE      : twiie.dips
#####
### Created   : Sunday, January 14, 1996  Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 2374 bytes   2 KB
#####
```

```
Path: news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-state.edu!magnus.acs.ohio-
state.edu!usenet.ins.cwru.edu!gatech!howland.reston.ans.net!swrinde!news.uh.edu!ne
ws.sccsi.com!nuchat!yob!jeff.brielmaier
From: jeff.brielmaier@yob.com (Jeff Brielmaier)
Newsgroups: comp.sys.apple2
Subject: Re: Setting up a Transwarp IIe
Message-ID: <10213.678.uupcb@yob.com>
Date: 27 Sep 95 05:19:00 GMT
Distribution: world
Organization: Ye Olde Bailey BBS - Houston, TX - 713-520-1569
Reply-To: jeff.brielmaier@yob.com (Jeff Brielmaier)
References: <530165541wnr@klatch.demon.co.uk>
Lines: 50
```

JL>Well, my TransWarp //e arrived yesterday. Plugged it in and it works  
 JL>great! It too came without any documentation, so just for  
 JL>completeness, what are the settings for the 2 x 8 dip switches?

JL>Mine is a Rev 1.3, (c) 1985, and has a 65c02p4 chip.

JL>Switches are as follows, assuming bank 1 is lower left furthest from  
 JL>the edge connector.

| JL>Bank1    | Bank2    |
|-------------|----------|
| JL>1 closed | 1 open   |
| JL>2 closed | 2 closed |
| JL>3 closed | 3 closed |
| JL>4 closed | 4 closed |
| JL>5 closed | 5 open   |
| JL>6 closed | 6 open   |
| JL>7 closed | 7 closed |
| JL>8 open   | 8 open   |

Bank1: Sw 1-7 -> Change to OPEN if there is a memory card that uses the  
 "Langauge Card bank switching technique". {Normally CLOSED}  
 Bank1: Sw 1-7 -> Change to OPEN if the plug in card must be accessed at 1 MHz  
 {Normally CLOSED. OPEN for Floppy diskette controllers}

Switch 8 on both Banks: Sets the power up speed of Transwarp

| Bank1   | Bank2                |
|---------|----------------------|
| 3.6 MHz | OPEN OPEN <<Normal>> |
| 1.7 MHz | CLOSED OPEN          |
| 1 MHz   | OPEN CLOSED          |
| 1 MHz   | CLOSED CLOSED        |

JL>Is there a way of disabling it for games (i.e. key press at  
 JL>power-up/re-boot?)

Press <Esc> at power-up will disable Transwarp completely until the next power

off/on cycle.

A better way is to write a 01 to \$C074. This will slow Transwarp down to 1 MHz without disabling it completely. Writing a 00 to \$C074 will restore Transwarp to it's 'fast' speed.

\* KingQWK 1.05 # [PK] \* 2Qwk! v2.00:The up-&-coming QWK reader for the Apple //

----

```
+-----+
|Ye Olde Bailey BBS Zyxel 713-520-1569(V.32bis) USR 713-520-9566(V.34/FC)|
| Houston,Texas                yob.com                Home of alt.cosuard  |
+-----+
```

```
##### E N D O F F I L E
### twiie.dips
##### E N D O F F I L E
```

```
#####
### FILE      : twiie.upgrade
#####
### Created   : Tuesday, June 15, 1999  Modified: Tuesday, June 15, 1999
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1571 bytes   1 KB
#####
```

Path:

newsl.icaen!news.uiowa.edu!news.physics.uiowa.edu!hammer.uoregon.edu!newshub.north  
east.verio.net!cpk-news-  
hubl.bbnplanet.com!news.gtei.net!portc02.blue.aol.com!audrey03.news.aol.com!not-  
for-mail

From: supertimer@aol.com (Supertimer)

Newsgroups: comp.sys.apple2

Subject: Re: transwarp gs running at 14MHZ?

Lines: 19

NNTP-Posting-Host: ladder06.news.aol.com

X-Admin: news@aol.com

Date: 14 Jun 1999 05:12:32 GMT

References: <19990612142531.05651.00000745@ng-fml.aol.com>

Organization: AOL <http://www.aol.com>

Message-ID: <19990614011232.18811.00001575@ng-bal.aol.com>

Xref: newsl.icaen comp.sys.apple2:148610

obsbedia2@aol.com (Obsbedia2) wrote:

>There was posting on this a few weeks ago that also mentioned pumping up a  
>regular Transwarp on a IIE to 14Mhz by replacing one chip and maybe some  
>others. Does anyone know just what is necessary?

Though few users have done it, some have posted remarkable successes.

The Transwarp IIE is pretty easy to accelerate. You'll need a 14Mhz 65C02 available from Western Design Center. You'll need a faster oscillator, 4x the speed you want the CPU to run. The hardest part of the upgrade is to replace all the RAM chips with faster ones. I think the Transwarp IIE uses regular RAM, not SRAM, which is harder to find at faster speeds, but the speed of these has improved drastically, so such an upgrade should not be that hard.

Are the RAM chips on the Transwarp IIE socketed or soldered? If they are soldered, you need to be comfortable with soldering and desoldering to replace them and upgrade your Transwarp IIE.

```
##### E N D O F F I L E
### twiie.upgrade
##### E N D O F F I L E
```

```
#####
### FILE      : VGAmonitors
#####
### Created   : Tuesday, January 1, 1980  Modified: Thursday, March 1, 1973
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5252 bytes   5 KB
#####
```

In <1ema25d.110cdyulmflxykN@dempson@actrix.gen.nz>, dempson@actrix.gen.nz (David Empson) writes:

```
>Allen Bong <sfbong@tm.net.my> wrote:
>
>> What are the differences between a GS rgb monitor and a PC SVGA monitor?
>
>The IIGs RGB monitor uses TV-compatible scan frequency: about 15.75 kHz.
>
>VGA and higher resolution monitors operate at a higher scan frequency:
>at least 30 kHz.
>
>The IIGs can only output video at 15.75 kHz, and modern RGB monitors
>cannot synchronize to such a slow signal, so they won't display the
>image correctly.
>
>> I ask this because I want to mail order a used IIGs without monitor from
>> ebay and modify a SVGA monitor to work with it.  Could it be done?
>
>In theory, you could get a scan doubling device which would take the
>IIGs video signal as input and produce a double speed video signal as
>output.  This would work with many current monitors.
>
>For some monitors, it is possible to modify their internals to work with
>the lower frequency, but I don't know the details.
```

An easier and cheaper solution is to pick up an old VGA monitor at a flea market or surplus store that can scan down to 15 kHz. I found the following list of monitors so capable:

```
Model Manufacturer
Size
Horiz (inch)
Hz Vert
Frequency
KHz
Frequency

7015 ACER
?
?
?

AML-1402
Adara Technology
14
15-36
45-90
```

MS-8431  
Amazing Tech.  
14  
15-36  
?

CM-324 AOC  
International  
14  
15-36  
50-90

CM-324H/M  
AOC International  
14  
15-36  
50-90

CM-326 AOC  
International  
14  
15-38  
50-90

Auto-Trak  
714 Conrac Display  
13  
15.5-37  
45-80

Auto-Trak  
9250 Conrac Display  
13  
15-37.5  
48-90

Model 7126S  
Conrac Display  
26  
15-32  
48-75

Model 7211  
Conrac Display  
13  
15-37.5  
47-80

Model 7211  
Conrac Display  
19  
15-37.5  
47-80

Model 7241  
Conrac Display  
19  
15-37  
47-80

Model 9214  
Conrac Display  
13  
15-38  
50-80

Multiscan  
3436 CTX International  
14  
15-38  
50-90

TSM-1431  
Darius Technology  
14  
15.5-39  
50-90

ECM 1410  
Electrohome, Ltd.  
14  
15-40  
45-90

ECM 2010  
Electrohome, Ltd.  
20  
15-38  
45-120

Eversync  
Color Everex Systems  
14  
15.5-35  
50-70

FMS Falco  
Data  
14  
15-38  
47-90

MTS-9608S  
Forefront Technology  
14  
15-38  
50-90

TY-1411  
Golden Dragon  
14  
15.5-30  
50-120

Idek  
MF-5017 IDEK/Iiyama North Amer.  
17  
15-40

50-90

Idek

MF-5021 IDEK/Iiyama North Amer.

21

15.5-38

50-90

C21LV-65MAX

Image Systems Corp.

21

15-65

55-90

C24LV-65MAX

Image Systems Corp.

24

15-65

55-90

CM-1403

Intra Electronics USA

14

15-38

40-100

GD-H4220US

JVC Information

19

15-37

45-87

CMON M

Leading Edge

14

15.75-39

50-90

MagicVIEW

20 Mac

20

15.75-36

50-100

Model

2014/LP Microvitec

14

15-40

45-100

Model 2020

Microvitec

20

15-38

?

Model 710MH

Mitsuba Corp.

14

15-38  
50-90

Diamond Pro  
26M Mitsubishi Electronics  
25  
15-38  
45-90

HC-3505SK  
Mitsubishi Electronics  
26  
15.7-38  
45-90

XC-3315C  
Mitsubishi Electronics  
33  
15-38  
40-120

XC-3715C  
Mitsubishi Electronics  
37  
15-36  
45-120

AM-2752A  
Mitsubishi Electronics  
27  
15.6-36  
45-90

AM-3151A  
Mitsubishi Electronics  
31  
15.6-36  
45-90

AM-3501R  
Mitsubishi Electronics  
35  
15-35.5  
45-70

MG-3430  
Modgraph  
9  
15-35  
50-70

DM-2710 NEC  
Technologies  
27  
15-38  
40-100

NEC 2 NEC  
Technologies

?  
?  
?

NEC 3D NEC  
Technologies  
?  
?  
?

PanaSync  
C1391 Panasonic Communication  
13  
15.5-36  
40-80

Ultra 1200  
Princeton Graphic Syst.  
12  
15-38  
45-120

Ultra 1400  
Princeton Graphic Syst.  
14  
15-38  
45-120

Ultra 1600  
Princeton Graphic Syst.  
16  
15-38  
45-120

CN4551  
Samsung  
?  
?  
?

AlphaScan  
Sampo Corp. of America  
14  
15.75-36  
50-87

CE-8  
Sceptre Technologies  
14  
15-38  
50-90

CM-3  
Sceptre Technologies  
14  
15.5-36  
50-70

CPD-1302

SONY Corporation of Am.  
13  
15.75-36  
50-100

GVM-1310  
SONY Corporation of Am.  
13  
15.75-36  
50-100

GVM-2020  
SONY Corporation of Am.  
20  
15.75-36  
50-100

Tuff/CRT  
Talon Technology Corp.  
14  
15-35  
47-73

Omniscan  
CM-1495H Tatung Co. of America  
14  
15-37  
40-120

MultiVision  
770+ TAXAN America  
14  
15-37  
50-90

MediaScan  
3+ TVM Professional Monitor  
14  
15-38  
46-100

TM-5414 TW  
Casper Corp.  
14  
15.5-35  
50-70

MM20E45  
Toshiba  
?  
?  
?

I have a Sony 1302-CPD and an NEC Multisync II, and they both work fine in this application.

Louis

##### E N D O F F I L E

### VGAmonitors

##### E N D O F F I L E

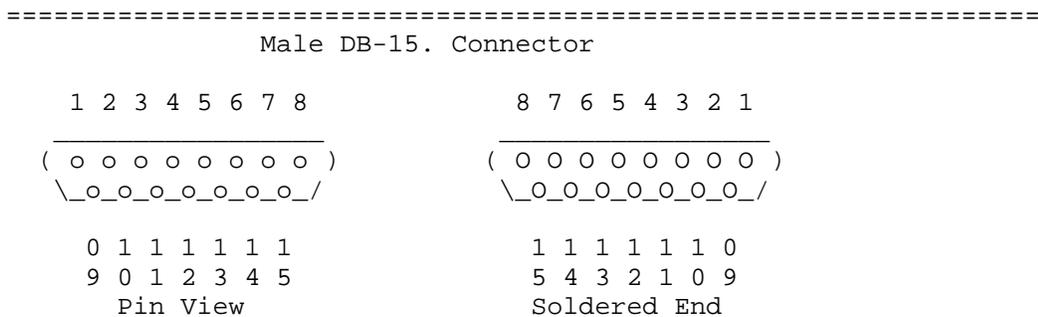
```
#####
### FILE      : video.pinouts
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3228 bytes   3 KB
#####
```

```
Path: news.uiowa.edu!uunet!nwnexus!nwnexus!rook!eugene.welcome
From: EUGENE.WELCOME@rook.wa.com (eugene welcome)
Newsgroups: comp.sys.apple2
Subject: Need info on monitor
Message-ID: <1EE9796A@rook.wa.com>
Date: Fri, 31 Mar 1995 06:05:34 GMT
Organization: Knight-Line! (206) 565-0594
Distribution: world
Lines: 74
```

>>I recently got an AppleColor RGB Monitor model A2M6014 (manufactured >>Feb. 1987) for ten bucks, and I'd like to know how to hook it up to >>either an Apple IIc, a Laser 128,

The AppleColor RGB Monitor model A2M6014 is for the IIgs. It is not wired for the IIc, IIe or the Laser-128. I do have this same monitor on my IIgs and I have a Laser-128EX in limbo for now. It has a 15 pin socket for video connection to RGB. I believe it is the same for the IIc but not sure what the IIe uses. I also believe the IIe RGB monitor requires more signal lines such as Intensity, Horiz. sync and vertical sync. I know the IIe RGB will not work on the IIgs. The IIgs RGB monitor uses less connections and may not work with what you hope. Try it if you are handy with the solder. I believe the CGA connection requirements are similar to the IIgs RGB requirements.

Gene, K7"EEK" !! a Mouse !!!  
eugene.welcome@rook.wa.com



The RGB Monitor Cable for the IIgs:

| Pin | Signal                                    |
|-----|-------------------------------------------|
| === | =====                                     |
| 1   | Red coax Ground (braided shield)          |
| 2   | Red composite video (center wire of coax) |
| 3   | Composite sync                            |

```

4      Not connected
5      Green composite video (center wire of coax)
6      Green coax Ground (braided shield)
7      Not connected
8      Not connected
9      Blue composite video (center wire of coax)
10     Not connected
11     Not connected
12     Not connected
13     Blue coax Ground (braided shield)
14     Not connected
15     Not connected
Shell  Outer cable shield ground

```

=====  
Here is the Pinout of the Laser-128 Video port.

```

Pin      Signal
===      =====
1        Intesity signal
2        F14M - 14mHz
3        Red signal
4        Blue signal
5        Speaker sound out
6        Load Pulse for LCD
7        Dispen for LCD
8        +12 volts
9        Horizontal sync
10       Composite sync
11       Serial out data for LCD
12       Composite video (connection for a composite monitor)
13       Ground
14       Vertical sync
15       Green signal
Shell    Outer cable shield ground

```

=====

```

##### E N D O F F I L E
### video.pinouts
##### E N D O F F I L E

```

```
#####
### FILE      : video.rgb
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 5302 bytes   5 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path: news.uiowa.edu!uunet!comp.vuw.ac.nz!actrix.gen.nz!dempson
From: dempson@atlantis.actrix.gen.nz (David Empson)
Subject: Re: Need info on monitor
Message-ID: <D69AJD.Jq4@actrix.gen.nz>
Sender: news@actrix.gen.nz (News Administrator)
Organization: Actrix Information Exchange
Date: Thu, 30 Mar 1995 13:52:23 GMT
References: <3lag7l$75m@crl12.crl.com> <Pine.SUN.3.91.950329093407.29258A-100000@owens>
X-Nntp-Posting-Host: atlantis.actrix.gen.nz
Lines: 101
```

In article <Pine.SUN.3.91.950329093407.29258A-100000@owens>, Cyrus Roton <croton@ridgecrest.ca.us> wrote:

```
>
> There used to be a RGB converter for the IIc, but I have not
> seen one for years. It is not a simple matter of finding the right cable.
> I was not aware that the IIc or the Laser 128 puts out a RGB signal.
```

I don't know about the Laser. The IIc doesn't have built-in RGB output. Its video port provides several low-level timing signals which allow RGB data to be decoded from the composite video signal (which is also provided on the port), but this requires external hardware.

The "standard" IIc RGB adaptor (assuming there was one) would probably have produced digital RGB output, the same as the Apple III and the Apple IIe memory expansion cards with RGB output. With a digital RGB monitor, standard digital logic levels (TTL) indicate whether a colour (or colour weighting) is present or absent. One wire is required for each bit of each primary colour.

The IIgs, on the other hand, produces an analog RGB signal - a voltage on the Red, Green and Blue outputs represents the intensity of each primary colour. Any number of shades of each colour can be supported, by providing a finer resolution digital to analog converter within the computer. The IIgs has 4-bit D-to-A for each primary colour. High-end video cards on the Mac and PC (SVGA) use 8-bit D-to-A for each primary colour.

Digital RGB monitors cannot be used with an Analog RGB signal (unless comparators are used to generate a digital signal from the analog one).

Analog RGB monitors cannot normally be used with a Digital RGB signal, but generating an analog signal is possible with a resistor network (an example of this is given in the Apple III Owner's Guide). In some cases, it may be possible to plug an Analog RGB monitor into a Digital RGB output, but it won't produce the correct colours (when compared

with a Digital RGB monitor).

There are two common types of digital RGB monitor: one type will work with the Apple III, Apple IIe (with RGB card), Apple IIc (with RGB adaptor) and CGA on an IBM PC (different cables or adaptors are required). This type has intensity and one bit each for red, green and blue (16 colours in total).

The second type is usable with EGA. This has two bits each for red, green and blue (64 colours in total). These monitors also have a higher scan frequency than the first type, and cannot be used with an Apple II (unless a card has been specially designed to use them).

Analog RGB monitors are mainly classified by the scan frequency and resolution. The IIgs RGB monitor (A2M6014X) operates at similar frequencies to television - around 15 kHz. Macintosh and VGA/SVGA RGB monitors do not support such low scan rates, and typically work at about 30 kHz or higher. The Mac cannot use the IIgs RGB monitor, and the IIgs cannot use Mac/VGA RGB monitors.

Some third-party multisync monitors will work on the Mac/VGA and IIgs, but these are very rare now. Most multisyncs do not go as low as 15 kHz.

"15 kHz" and "30 kHz" refers to the horizontal scan frequency - Apple II video output has a horizontal retrace roughly 15,000 times per second.

Vertical retrace is a different issue (it is much slower - usually 50 to 100 retraces per second), and most monitors are very flexible in the supported vertical retrace rate, as far as I know.

This is also where "interlacing" comes in. Interlacing is a technique which doubles the effective vertical resolution of the monitor, by performing two vertical scans (fields) per frame, with a slight vertical shift in the second field. The scan lines for the second field are interleaved between the scan lines for the first field.

An interlaced display has more noticeable flicker than a non-interlaced display with double the frame rate, because the phosphor is only lit half as often.

For example, the Second Sight card will support a 400 line interlaced mode with the IIgs RGB monitor. There will probably be noticeable flicker in this mode (especially out of the corner of your eye).

This mode will have 60 fields (i.e. 30 frames) per second, whereas the standard IIgs video output is non-interlaced with 60 frames per second (but only 200 lines vertical resolution).

(I'm assuming 60 Hz mode - the IIgs also support 50 Hz mode, for use in countries with 50 Hz mains supplies and TVs.)

Television also uses interlacing - with NTSC, there are 525 lines per interlaced frame and 30 frames per second, with alternating lines being scanned on each pass of the electron beam (262.5 lines per field, 60 fields per second).

PAL uses 625 lines per frame, usually at 50 frames per second (312.5 lines per field, 25 fields per second).

--

David Empson  
dempson@actrix.gen.nz  
Snail mail: P.O. Box 27-103, Wellington, New Zealand

##### E N D O F F I L E  
### video.rgb  
##### E N D O F F I L E

```
#####
### FILE      : video.softswitches
#####
### Created   : Tuesday, January 1, 1980 Modified: Thursday, March 1, 1973
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 2932 bytes    2 KB
#####
```

Here are some softswitches:

MEMORY MANAGEMENT SOFT SWITCHES

```
$C000 W      80STOREOFF  Allow page2 to switch video page1 page2
$C001 W      80STOREON   Allow page2 to switch main & aux video memory
$C002 W      RAMRDOFF    Read enable main memory from $0200-$BFFF
$C003 W      RAMDRON     Read enable aux memory from $0200-$BFFF
$C004 W      RAMWRTOFF   Write enable main memory from $0200-$BFFF
$C005 W      RAMWRTON    Write enable aux memory from $0200-$BFFF
$C006 W      INTCXROMOFF Enable slot ROM from $C100-$CFFF
$C007 W      INTCXROMON  Enable main ROM from $C100-$CFFF
$C008 W      ALZTPOFF    Enable main memory from $0000-$01FF & avl BSR
$C009 W      ALTZPON     Enable aux memory from $0000-$01FF & avl BSR
$C00A W      SLOTC3ROMOFF Enable main ROM from $C300-$C3FF
$C00B W      SLOTC3ROMON Enable slot ROM from $C300-$C3FF
```

VIDEO SOFT SWITCHES

```
$C00C W      80COLOFF    Turn off 80 column display
$C00D W      80COLON     Turn on 80 column display
$C00E W      ALTCHARSETOFF Turn off alternate characters
$C00F W      ALTCHARSETON Turn on alternate characters
$C050 R/W    TEXTOFF     Select graphics mode
$C051 R/W    TEXTON      Select text mode
$C052 R/W    MIXEDOFF    Use full screen for graphics
$C053 R/W    MIXEDON     Use graphics with 4 lines of text
$C054 R/W    PAGE2OFF    Select panel display (or main video memory)
$C055 R/W    PAGE2ON     Select page2 display (or aux video memory)
$C056 R/W    HIRESOFF    Select low resolution graphics
$C057 R/W    HIRESON     Select high resolution graphics
```

SOFT SWITCH STATUS FLAGS

```
$C010 R7    AKD          1=key pressed    0=keys free    (clears strobe)
$C011 R7    BSRBANK2    1=bank2 available  0=bank1 available
$C012 R7    BSRREADRAM  1=BSR active for read  0=$D000-$FFFF active
$C013 R7    RAMRD       0=main $0200-$BFFF active reads  1=aux active
$C014 R7    RAMWRT      0=main $0200-$BFFF active writes  1=aux writes
$C015 R7    INTCXROM    1=main $C100-$CFFF ROM active  0=slot active
$C016 R7    ALTZP       1=aux $0000-$1FF+auxBSR  0=main available
$C017 R7    SLOTC3ROM   1=slot $C3 ROM active  0=main $C3 ROM active
$C018 R7    80STORE     1=page2 switches main/aux  0=page2 video
$C019 R7    VERTBLANK   1=vertical retrace on  0=vertical retrace off
$C01A R7    TEXT        1=text mode is active  0=graphics mode active
$C01B R7    MIXED       1=mixed graphics & text  0=full screen
$C01C R7    PAGE2       1=video page2 selected or aux
$C01D R7    HIRES       1=high resolution graphics  0=low resolution
$C01E R7    ALTCHARSET  1=alt character set on  0=alt char set off
```

```
$C01F R7      80COL      1=80 col display on      0=80 col display off
\=====
=/  

```

```
Bob Sturges <sturges@vt.edu> wrote in article <3A14423B.E677F4F0@vt.edu>...
> Hello, there.
>
> I'm still mucking about with a couple of //e's and I heard from a friend
>
> that one can use the AUX mem switches to effectively create two
> independent 64k applesoft environments. I'm out of room and don't want
> to go the chaining route.
>
> If any of you can give me a pointer to how that's done, I'd appreciate
> it. I'd rather not reinvent the wheel .
>
> Cheers,
>
> Dr. Bob
>
>
```

```
##### E N D O F F I L E
### video.softswitches
##### E N D O F F I L E
```



--

Norman LJ

```
##### E N D O F F I L E  
### video7  
##### E N D O F F I L E
```

```
#####
### FILE      : voc.pots
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"   File Creator: "LMAN"
### File Size: 1534 bytes    1 KB
#####
```

Path:

```
blue.weeg.uiowa.edu!news.uiowa.edu!uunet!salliemae!kinky.eng.gtefsd.com!europa.eng
.gtefsd.com!howland.reston.ans.net!swrinde!news.uh.edu!jetson.uh.edu!st3bl
From: st3bl@jetson.uh.edu (Fretz, David)
Newsgroups: comp.sys.apple2
Subject: Re: VOC Screen FIX!!!
Date: 26 Jan 1995 00:28 CST
Organization: University of Houston
Lines: 23
Distribution: world
Message-ID: <26JAN199500282027@jetson.uh.edu>
References: <8sVcZc9w165w@ersys.edmonton.ab.ca>
NNTP-Posting-Host: rosie.uh.edu
News-Software: VAX/VMS VNEWS 1.41
```

In article <8sVcZc9w165w@ersys.edmonton.ab.ca>, herbertf@ersys.edmonton.ab.ca (Herbert Fung) writes...

```
>Previously hchan@neptune.uucp (Violens Schultz) wrote:
>
>>Didn't your try the MONITOR'S picture adjustment controls first? That's
>>what I would've done instead of tinkering with the VOC first.
>
>Now that I know there is something I can adjust, I'll try it the next
>time I open up my GS.
```

In case anybody want to know, I went to find out what some of those pots are. Here is the list I got so far:

- R13 RGB Intensity
- C86 Horizontal Position on RGB
- C85 NTSC Color Hue Adjustment
- C45 NTSC Frequency Adjustment

```
*****
University of Houston | "And so we are told this is the golden age
                       | and gold is the reason for the wars we wage." (U2)
GS Games SIG Coordinator | Houston Apple Area User Group Apple II Forever!
*****
```

```
##### E N D O F F I L E
### voc.pots
##### E N D O F F I L E
```

```
#####
### FILE      : voc.setup
#####
### Created   : Sunday, January 14, 1996 Modified: Sunday, January 14, 1996
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 1650 bytes   1 KB
#####
```

```
Path: news.weeg.uiowa.edu!news.uiowa.edu!hobbes.physics.uiowa.edu!math.ohio-
state.edu!zaphod.mps.ohio-
state.edu!darwin.sura.net!sgiblab!adagio.panasonic.com!chorus.mei!oskgate0.mei!wno
c-kyo!sh.wide!cawgw!canongw!cbswsl!ushiroda
From: ushiroda@cbs.canon.co.jp (Ushiroda, Atsushi)
Newsgroups: comp.sys.apple2
Subject: Re: Deep Thoughts => More than 3200 or More than 16 grays
Message-ID: <2050@cbswsl.cbs.canon.co.jp>
Date: 25 May 93 02:05:09 GMT
References: <1993May11.034555.20918@fawlty.towers.oz.au>
           <1993May11.222300.28453@fawlty.towers.oz.au>
           <jmk3.737313028@cruxl.cit.cornell.edu>
           <1993May16.222335.3385@fawlty.towers.oz.au>
           <lta50kINNmof@gap.caltech.edu>
           <jmk3.737740731@cruxl.cit.cornell.edu>
           <ltcrt4INNpl0@gap.caltech.edu>
Sender: ushiroda@cbs.canon.co.jp
Organization: Canon Inc., Tokyo, JAPAN
Lines: 24
```

Two years ago, I found that how to take away bank \$E0 memory from GS/OS. I use a special startup disk. It includes following startup programs. This process is tricky, but it works fine.

```
----- save as STARTUP (Applesoft) -----
10 LET D$ = CHR$(4)
20 PRINT D$;"EXEC VOC.SETUP"
30 END
```

```
----- save as VOC.SETUP (EXEC) -----
CALL -151
#
\10 04 00 00 00 00 00 00 40 00 00 00 C0 03 00 E0 60 00 09 02\u
\10 04 00 00 00 00 00 00 40 00 00 10 C0 03 00 E0 60 00 09 02\u
Cn00G
```

In last line, n is slot number of SCSI Card.

Copy these files, P8 (rename to ProDOS), and BASIC.System to startup floppy disk. Boot from this floppy disk. Then you can get \$E0/6000-9FFF of memory. Its effect continue until power down.

ushiroda@cbs.canon.co.jp (Ushiroda, Atsushi)

```
##### E N D O F F I L E
### voc.setup
##### E N D O F F I L E
```





Current will flow through R1 and R2, with the voltage at point B beind calculated by

$$V_b = 12 \text{ V} * (R_2 / (R_1 + R_2))$$

When R2 is at its maximum value of 100 K, the voltage at point B will be half that of the original 12 V, resulting in a Base lead voltage of 6 V. The voltage at the Emitter lead of the transistor will follow that of the Base, but it will be ~ .6 to .7 less. As a result, the MAXIMUM voltage at the output should be 5.3 - 5.4 volts. This should prevent you from "accidently" giving your expensive CPU too much power.

R2 can be manually tuned to vary the voltage from 0 to MAXIMUM. Start with 5V, and move up slowly. You'll want to have a good digital voltmeter attached when you are doing this. An anolog voltmeter will do OK, if it has a high-precision scale (and you have good eyes).

R3 represents the output load from the transistor circuit. You can omit this if desired, but it will be necessary to have some load when the circuit is being tested prior to hooking this up to your CPU.

R3 and R4 are matched, so a complete failure of T will result in a maximum voltage of ~ 6.0 V. By increasing the value of R3 relative to R4, you can reduce this down even further. With a new CPU being so expensive, why take chances that a 20 cent part might fail?

When purchasing your parts, you can get small 1/8 Watt resistors, because the power level you are working with is small. 1/4 and 1/2 Watt resistors are OK, but they are larger and bulkier, and will be a slight overkill for this application.

If you purchase a transistor with a metal package (not platic), you will see a small square tab next to one of the leads. The lead neares the tab is the Emitter, and if you look at the transistor from the top (wires exiting at the bottom), then you can orient the device as shown in the illustration above to locate the Collector and Base leads.

If you go to a local electronics shop, you can purchase everything needed for less than a dollar. Radio shack will expect you to hand over several \$\$ for the same parts.

Built the circuit seperately from you computer. Use and external power supply (car battery or charger will do) to test the circuit. When you know it works right, cut the 5 V power to your CPU and replace it with your new 'boosted' source. Start increasing the frequency and only increase the power if the CPU can't run at the current voltage.

I hope this helps you get going. You may want to increase the resistor values to reduce the overall power drain. I don't know how much current the CPU will require, but it couldn't be much.

[MGM]

[MGM]

```
##### E N D O F F I L E
### voltage
##### E N D O F F I L E
```





```
#####
### FILE      : xl0.software
#####
### Created   : Monday, January 12, 1998  Modified: Monday, January 12, 1998
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3439 bytes   3 KB
#####
```

Path:

```
newsl.icaen!news.uiowa.edu!newsl.chicago.iagnet.net!iagnet.net!newsfeed.internetmc
i.com!206.229.87.25!news-
peer.sprintlink.net!news.sprintlink.net!Sprint!worldnet.att.net!newsadm
From: Art Coughlin <Art.Coughlin@worldnet.att.net>
Newsgroups: comp.sys.apple2,comp.sys.apple2.marketplace,comp.sys.apple2.usergroups
Subject: Re: GS Home Control System
Date: Mon, 12 Jan 1998 09:02:09 -0800
Organization: AT&T WorldNet Services
Lines: 63
Message-ID: <69d77f$shah@mtinsc02.worldnet.att.net>
References: <691j2n$blk$1@newssvr04-int.news.prodigy.com>
NNTP-Posting-Host: 12.68.48.251
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Mailer: Mozilla 3.0C-WorldNet (Win16; U)
Xref: newsl.icaen comp.sys.apple2:129064 comp.sys.apple2.marketplace:22477
comp.sys.apple2.usergroups:2892
```

ToasterKing wrote:

```
>
> One of the things IBM is really pushing in the marketing of their IBM
> Craptiva is the "home control system," which supposedly controls the
> thermostat and security system in your house and can also turn lights on
> and off and stuff.
> I recall that a home control system, or at least several home control
> devices, were available as peripherals for the Apple IIGS. Does anyone
> have any of these or remember what they did, or can give me more info on
> them?
>
> Thanks
> TK
>
> --
> Please send a copy of your reply via e-mail, if it's not too much
> trouble.  :>
> --
>
>               -ToasterKing-
>               SpongyToast@prodigy.net
> "This is your sponge in the toaster. Enough said."
```

TK,

X-10 Inc. makes the 'Computer Interface Model CP290' (part of their PowerHouse line). This device connects to a serial port and allows direct control of up to 256 devices (connected to X-10 modules) and can store up to 128 timer events. X-10 Inc. sells packages for Mac and IBM/WinTel and used to sell packages for Apple IIe/IIfx and

Commodore 64. The CP290 unit in each package is identical, the only difference between packages is the supplied software and cable.

Unfortunately, there never was a IIgs specific package and the software and cable(s) in the IIe/IIc package wouldn't work with the IIgs serial ports (but would work with a IIgs using a Super Serial Card). The Mac package contains the correct cable for the IIgs, but of course, the software won't work.

Since 1992, I've been selling the 'X10 Survival Kit', which allows you to control a CP290 connected via either IIgs serial port. The 'Kit' contains several GUI elements:

- X10House - an NDA that takes full advantage of the CP290.
- X10Doctor - a Desktop utility app that lets you backup and restore timer events, run the CP290 self test and control the 3 Inits in the 'Kit'.
- X10ACE - an Init that applies sunrise/sunset corrections to specified timer events stored in the CP290.
- PowerScreen - an Init that 'blanks' your screen by turning your monitor off.
- Virtual10 - an Init that is an automated schedule loader.

For more info about X-10, use your favorite search engine. There are several sites dealing with X-10 (including X-10 Inc.'s site). I don't know the URLs offhand, sorry. For more info about the 'X10 Survival Kit' email me at:

art\_coughlin @ delphi . com (note: spaces inserted to foil robo-spammers. Remove all

spaces)

Art

```
##### E N D O F F I L E
### x10.software
##### E N D O F F I L E
```

#####  
### FILE : x10.suppliers  
#####  
### Created : Wednesday, June 3, 1998 Modified: Wednesday, June 3, 1998  
### File Type: "TEXT" File Creator: "LMAN"  
### File Size: 1668 bytes 1 KB  
#####

Path:  
news1.icaen!news.uiowa.edu!iagnet.net!iagnet.net!ais.net!newsfeed.internetmci.com!  
205.139.74.16!news.nccn.net!news  
From: TWS <adoyson@nccn.net>  
Newsgroups: comp.sys.apple2  
Subject: Control your house with X-10 (Apple II!!)  
Date: Tue, 02 Jun 1998 09:01:03 -0700  
Organization: Nevada County Community Network  
Lines: 33  
Message-ID: <357421BF.81C8A944@nccn.net>  
NNTP-Posting-Host: tc3-181.nccn.net  
Mime-Version: 1.0  
Content-Type: text/plain; charset=us-ascii  
Content-Transfer-Encoding: 7bit  
X-Mailer: Mozilla 4.05 [en] (Win95; I)  
Xref: news1.icaen comp.sys.apple2:134721

Wow! I didn't realize that there was information about using x-10 with the Apple II!

Find an article about using your Apple II to control your house with X-10 home automation products at:  
<http://www.grin.net/~cturley/A2.2000/Sept.Preview/ARTICLES/A2.GS.Home.Automation.txt>

Here is the URL of a company that still sells the APPLE II version of the x-10 controller kit (cp-290, cable, software)  
<http://www.bfree.on.ca/vmall/hometech/active.htm> \*\*\*\*\*apple II!\*\*\*\*\*

If you want to find x-10 appliance modules, light dimmers, telephone controller, and other APPLE II compatible parts, go to:

<http://www.worthdist.com/WDpg32.html>  
or  
<http://www.smarthome.com/1130.html>

\*\*\*\*\*!@#\$%^&@# \$!\$#@^@\$%&@# \$%^@# \$%

Can someone let me know where an X-10 NDA can be found? I am looking for IIGS SPECIFIC software to control X-10 equipment

\*\*\*\*\*#\$%^&@# \$!\$%!!!!%#\$@# \$^\$%\*&#%^(

Once you set up your system, post a description here!

I have my x-10 system connected to the IIGs, controlling the computer itself, all lights in my house, and a few appliances. It is a really neat setup!

```
##### E N D O F F I L E  
### x10.suppliers  
##### E N D O F F I L E
```

```
#####
### FILE      : zipgs.fast
#####
### Created   : Friday, September 27, 1996 Modified: Friday, September 27, 1996
### File Type : "TEXT"      File Creator: "LMAN"
### File Size : 5547 bytes   5 KB
#####
```

```
Newsgroups: comp.sys.apple2
Path: news.uiowa.edu!chi-
news.cic.net!ddswl!news.mcs.net!nntp04.primenet.com!news.shkoo.com!nntp.primenet.c
om!news.cais.net!hunter.premier.net!news-
res.gsl.net!news.gsl.net!news.mathworks.com!newsfeed.internetmci.com!newsreader.sp
rintlink.net!news.sprintlink.net!news-fw-
22.sprintlink.net!howland.reston.ans.net!agate!dog.ee.lbl.gov!newshub.nosc.mil!new
shub.cts.com!crash!pro-palmtree!rder
From: rder@pro-palmtree.cts.com (Richard Der)
Subject: FAQ-Zip GS upgrade: The 10MHz alternative
Organization: The Palmtree BBS - 310/453-8726 - Santa Monica, CA
Date: Sat, 3 Aug 96 10:54:53 PDT
Message-ID: <h339308@pro-palmtree.cts.com>
Lines: 134
```

Question: How fast can the Zip GS be pushed without getting new SRAMs or a new CPU? If I do need new parts, where can I find them at the lowest prices?

Answer  
----->

You may be able to get it to run at up to 10MHz by just replacing the oscillator with a faster one for less than two dollars!

I have a Zip GS that came as a 7/32 and was used at 7MHz for a long time. The board came with a socketed oscillator, so one day I swapped the 28MHz oscillator with a 36MHz one. The computer booted up at 9MHz. When the 36MHz osc was replaced with a 40MHz osc, the Zip ran at an amazing 10MHz!

Your mileage may vary, though. The GS that this upgraded Zip resides has a high output power supply.

Still, considering these oscillators cost \$1.39 each, it is worth trying an oscillator swap alone first.

If a faster oscillator alone won't do the trick, then a faster CPU and/or faster cache chips may be necessary. The following are sources for the parts (osc, CPU, and cache).

-----  
Here's what you need to upgrade to 10MHz:

```
>From JDR Microdevices:
    Phone 1-800-538-5000
    Fax   1-800-538-5005
```

BBS 1-408-494-1430  
 Web <http://www.jdr.com>

Get a TTL Output Oscillator rated 4 times the speed you want the Zip to run. For example, if you want 8MHz, get a 32MHz osc. For 10MHz, use a 40MHz.

You will actually probably need a 30MHz, a 32MHz, a 36MHz, and a 40MHz oscillator:

Part #'s: OSC30.0, OSC32.0, OSC36.0, and OSC40.0

because you want to test the Zip to see how fast it will go. It may top out below 10MHz. If it does, then you need a faster CPU and faster cache RAM if you want 10MHz or faster.

-----

You can get 64K's of fast cache from JDR Microdevices:

Get 4 Static Cache RAM chips,  
 Part #: HM62256LP-70  
 Price: \$4.69 per chip (you need 4 of these for 64K)

You can get a 14MHz fast CPU from:  
 The Western Design Center (<http://www.wdesignnc.com>)  
 2166 E. Brown Road (email: [information@wdesignnc.com](mailto:information@wdesignnc.com))  
 Mesa, AZ 85213

Part #: W65C816SPL-14 (for Zip GS or Transwarp GS accelerator  
 cards for the Apple IIgs computer)  
 Price: \$19.80 + \$4.00 shipping & handling

(Western Design Center requires payment by Money Order)

Once you get the cache chips and the CPU, remove the 4 (or 2) old cache chips and plug in the 4 new ones, making sure the orientation of the new chips is the same as the old ones were (you've just replaced slow 32K of cache with fast 64K cache). Remove the CPU chip and plug in the new CPU. Finally, experiment with different oscillators, replacing the original, and find the fastest one that works.

DIP switch settings have to be changed when changing cache size. There are two banks of DIP switches on the Zip card.

Switches 7 and 8 on DIP bank 1 determine the cache size. Bank 1 is the bank of DIP switches nearer the top of the card.

The settings are as follows.

| size | switch 7 | switch 8 |
|------|----------|----------|
| 8K   | on       | on       |
| 16K  | on       | off      |
| 32K  | off      | on       |
| 64K  | off      | off      |

With a faster cache and 14MHz CPU, you may be able to go above 10MHz by plugging in a 48MHz oscillator (for 12MHz Zip), or 64MHz oscillator (for 14MHz).

Note: Even if you need a new cache and CPU in addition to a new oscillator, you can still upgrade a 7/32 to a 10/64 and beyond for around \$40. If you are satisfied with 10MHz and are lucky and don't need the new cache and CPU, then you'd get a 10/32 upgrade for the price of a \$1.39 oscillator!

-----  
Good luck.

(Note: The speed of these SRAMs will be sufficient to around 10MHz. The advantage of these particular chips are that they are available cheap and in the wide 600 mil package that the Zip sockets require.

For 15MHz operation, even faster SRAMs may be required. Unfortunately, they are mostly available only in the skinny 300 mil packages. To use them, half sockets must be soldered into the Zip. They are also more expensive.

Also consider that the performance advantage going from 10MHz to 15MHz is far less dramatic than from 7MHz to 10MHz. Factor in the risk of seriously damaging the Zip during soldering.

Conclusion: the 10MHz operation is safer, requires no permanent modification of the Zip, and the chips of the right size are available and costs a lot less.)

Please distribute this document freely. Apple II Forever.

-----  
The Palmtree BBS 310-453-8726 v.32  
Inet: rder@pro-palmtree.cts.com

##### E N D O F F I L E  
### zipgs.fast  
##### E N D O F F I L E

```
#####
### FILE      : zipgs.prblms
#####
### Created   : Tuesday, November 4, 1997  Modified: Tuesday, November 4, 1997
### File Type: "TEXT"      File Creator: "LMAN"
### File Size: 3189 bytes   3 KB
#####
```

```
Path: news1.icaen!news.uiowa.edu!news1.chicago.iagnet.net!iagnet.net!cpk-news-
hubl.bbnplanet.com!news.bbnplanet.com!news-peer.sprintlink.net!news-
pull.sprintlink.net!news-in-
east.sprintlink.net!news.sprintlink.net!Sprint!151.164.1.34!swbell!not-for-mail
From: Rubywand <rubywand@swbell.net>
Newsgroups: comp.sys.apple2
Subject: Re: Apple IIGS ZipChip
Date: Tue, 04 Nov 1997 03:53:42 -0600
Organization: Southwestern Bell Internet Services, Richardson, TX
Lines: 62
Message-ID: <345EF0A6.11F1@swbell.net>
References: <345E9949.4C1B@pacbell.net>
Reply-To: rubywand@swbell.net
NNTP-Posting-Host: ppp-207-193-8-53.hstntx.swbell.net
Mime-Version: 1.0
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit
X-Trace: nnrp3.rcsntx.swbell.net 878637174 20651 (None) 207.193.8.53
X-Complaints-To: usenet@nnrp3.rcsntx.swbell.net
X-Mailer: Mozilla 3.01C-SBXA (Win95; I)
```

Ron McGowan writes ...

```
>
> Help!
>
> I have a IIGS with a stock zip chip that, until recently,
> would pass the GS self test, but now fails with
> SYSTEM BAD 05012A00 ....
>
```

The DIP switches on at least some versions of the ZipGS are not especially reliable. On one board, I finally just popped off the switch assembly cover and removed the switch pieces to guarantee that the switches that should be open really were. Solder connects were used to close switches.

If SW-4 is not closing, the ZipGS will not pass the Self-Test. On the other hand, your ZipGS will run a bit slower; which is probably why the default setting is OFF.

You can use an Ohm meter (set to the x 1000 range to limit current) to check the switches on your board by measuring across each mini-switch while you open and close it.

Another possible problem is Zip Init. Some users install it on their hard disks because it is available to be installed and forget that it's there. Zip Init's settings will automatically over-ride your on-board settings when your system is booted. It is intended for installation on bootable diskettes for changing settings to match the

booted software (e.g. to keep it from running too fast).

Some users believe that settings made to the Zip CDA panel (or to the CDEV panel) get saved to BatRAM. They don't. When you turn OFF the power they disappear. Also, the checked, "default", settings are not, necessarily, the 'official' factory defaults. They are just the current switch settings on the board.

If you are having problems with a stock ZipGS board, some things to check are ...

1. that the board's connector tabs are making contact with the Slot sprongers. This happens pretty close to the bottom of the card; so, be sure the bottom 1/8 inch is clean.
2. that the ribbon cable from the board to the uP socket does not have any breaks.
3. that the ZipGS plus other cards are not pulling more current than your power setup can handle without producing noise glitches (i.e. fatten the leads on your power supply and consider adding power jumpers to the bottom of the motherboard).

```
> if I put in the stock 65c816 all is good
> the switch 4 setting on bank 1 of the Zip has no effect on this
>
```

Where are you plugging in the stock 65C816?

Rubywand

```
##### E N D O F F I L E
### zipgs.prblms
##### E N D O F F I L E
```

END OF DOCUMENT