

KEYBOARD, SYSTEM BOARD POWER SUPPLY

See Folder CSCS7

DISK DRIVE

See Folder CSCS7-A

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Howard W. Sams & Co., Inc.

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The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed.

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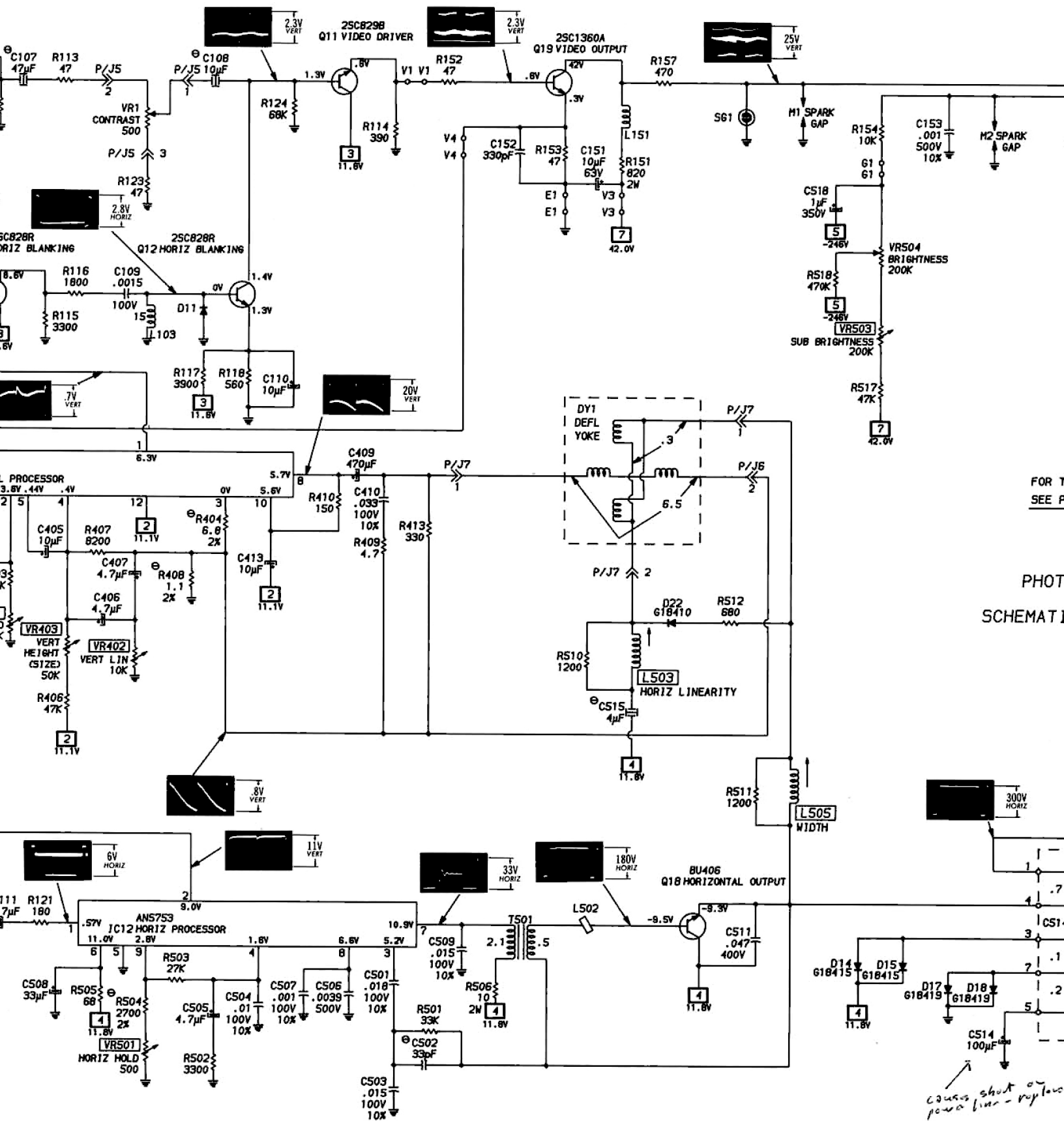
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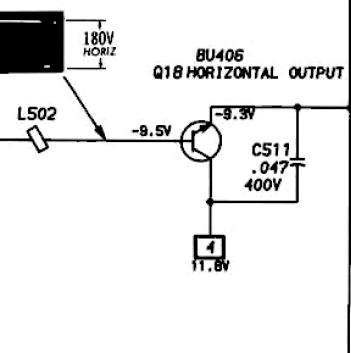
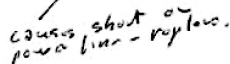
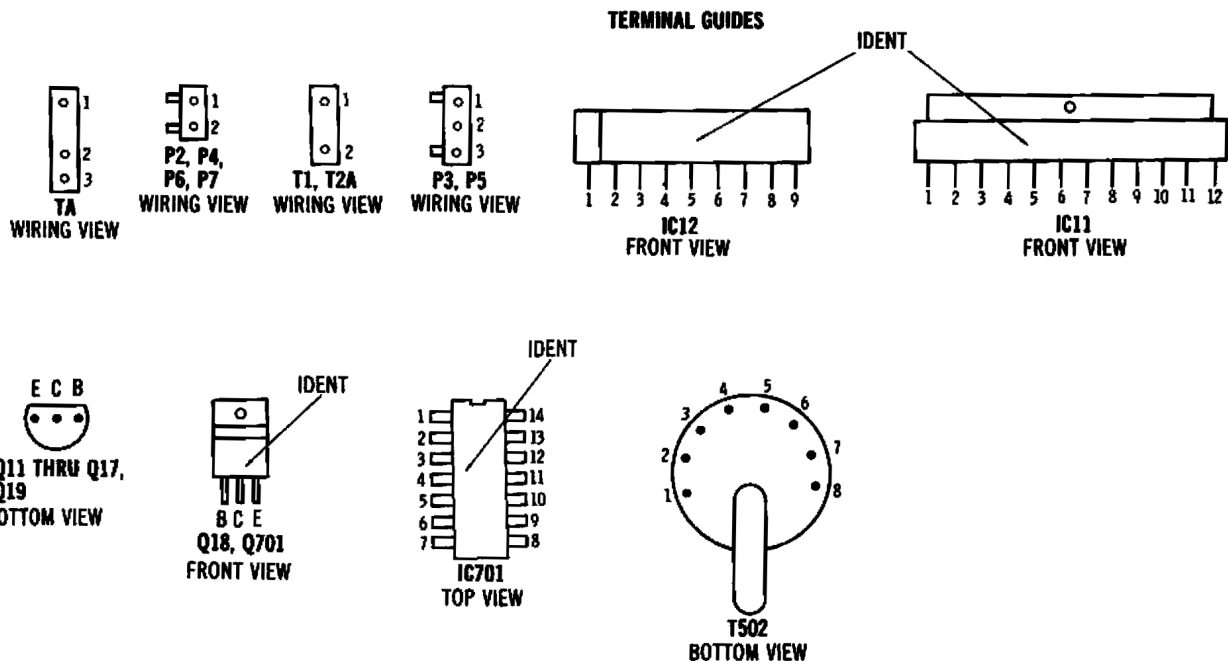


PHOTO CIRCUITRACE = 11
SCHEMATIC CIRCUITRACE = 11





RESISTANCE MEASUREMENTS

MEASUREMENTS TAKEN WITH LOW POWER OHMS METER														
ITEM	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9	PIN 10	PIN 11	PIN 12	PIN 13	PIN 14
IC11	26K	82K	8	7400	10.3K	552	0	10.3K(1)	18K(1)	10.1K	715	45		
IC12	20.8K	1NF	18.7K	30.5K	0	105	50	1NF	2960					
IC701	1NF	1NF	1NF	3350	1NF	1NF	0	1NF	0	1NF	1061	65	1NF	1NF
V1	470K	450K	28	0	2.2M	2M	1.4M							
ITEM	E	B	C		ITEM	E	B	C		ITEM	E	B	C	
Q11	387	68K	44		Q16	260	6760	858						
Q12	485	15	68K		Q17	2190	1008	44						
Q13	266	36K	44		Q18	1NF	1NF	38						
Q14	3300	1NF	44		Q19	47	434	1NF						
Q15	259	1233	861		Q701	65	1061	38						

(1) Reading may vary according to the condition of the electrolytic in the circuit.

SCHEMATIC NOTES

- *— Circuitry not used in some versions
- Circuitry used in some versions
- See parts list
- ⊕ Ground
- ⏏ Chassis

Waveforms and voltages taken from ground, unless noted otherwise

Voltages, logic readings and waveforms taken in Power Up mode, Caps Lock and 80/40 Column keys down, Keyboard Switch up, no diskette in the Disk Drive "Apple IIc" and "Check Disk Drive" displayed on the Monitor screen.

Waveforms taken with triggered scope and Sweep/Time switch in Calibrate position, scope input set for DC coupling on 0 reference voltage waveforms. Switch to AC input to view waveforms after DC reference is measured

when necessary. Each waveform is 7 cm. width with DC reference voltage given at the bottom line of each waveform.

Time in μ sec. per cm, given with p-p reading at the end of each waveform.

Item numbers in rectangles appear in the alignment/adjustment instructions.

Supply voltages maintained as shown at input.

Controls adjusted for normal operation.

Terminal identification may not be found on unit.

Capacitors are 50 volts or less, 5% unless noted.

Electrolytic capacitors are 50 volts or less, 20% unless noted.

Resistors are 1/2W or less, 5% unless noted.

Value in () used in some versions.

MISCELLANEOUS ADJUSTMENTS

ALIGNMENT TOOLS

L503	5000, 5009, 8276
L505	9440, 8282, 8606

GC ELECTRONICS

NOTE: Pattern generator with 1Vp-p into 75 ohms (VTR Standard) output used with appropriate pattern.

INITIAL MONITOR TEST

Connect a crosshatch generator to the Video In Jack. Turn the Monitor On and adjust the Brightness and Contrast controls for the best display. Check the adjustment of the Vert Hold, Horiz Hold, Vert Lin, Vert Size and Focus controls. If any of these controls produce erratic operation, clean that control with contact cleaner and recheck.

ADJUSTMENTS

NOTE: Connect a crosshatch generator to the Video In Jack for the following adjustments.

FOCUS ADJUSTMENT

Adjust the Focus Control (VR502) for sharp, well defined lines on the display.

VERT AND HORIZ HOLD ADJUSTMENT

Adjust the Vert Hold Control (VR401) and Horiz Hold Control (VR501) for the most stable display.

VERT SIZE ADJUSTMENT

Adjust the Vert Size Control (VR403) for the desired height on the display.

VERT LIN ADJUSTMENT

Adjust the Vert Lin Control (VR402) for even spacing between the vertical lines on the display.

VOLTAGE REGULATOR ADJUSTMENT

Connect a voltmeter to the collector of Voltage Regulator Transistor (Q701). Adjust the Voltage Regulator Control (VR701) for 12.0V.

SUB BRIGHTNESS ADJUSTMENT

Connect a crosshatch generator to the Video In Jack. Set the Brightness and Contrast Controls to Maximum clockwise position.

Adjust the Sub Brightness Control (VR503) for Maximum brightness without retrace lines.

CENTERING ADJUSTMENT

Center the CRT display by adjusting the two magnetic centering rings located on the deflection yoke rear cover.

HORIZ LIN ADJUSTMENT

Adjust the Horiz Lin Coil (L503) for even spacing between the horizontal lines on the display.

WIDTH ADJUSTMENT

Adjust the Width Coil (L505) for the desired width on the display.

SUB CONTRAST

Set the Brightness and Contrast Controls to Maximum clockwise position. Adjust the Sub Contrast Control for best display with no distortion.

CSCS7-B
APPLE
MODEL IIC

TROUBLESHOOTING AID

Note: Waveforms taken with triggered scope, Keyed-Rainbow generator. Schematic voltages measured with digital meter, no signal. Controls adjusted for normal operation.

PICTURE OR SOUND

NO PIC, NO RASTER: Check AC power supply, sources generated from Horizontal Output Transformer (T502) and Video circuit. Refer to "Troubleshooting" Power Supply, Video and Horizontal circuits.

NO PIC, HAS RASTER: Refer to "Troubleshooting" Video circuit.

LOW OR EXCESSIVE BRIGHTNESS: Check Video and Luminance circuits. Refer to "Troubleshooting" Video circuit.

SWEEP

NO RASTER: Check HV Rectifier, Rectifiers D20 and D21 and Horizontal circuit. Refer to "Troubleshooting" Horizontal circuit.

NO VERT DEFLECTION: Refer to "Troubleshooting" Vertical circuit.

POOR VERT LIN OR FOLDOVER: Refer to "Troubleshooting" Vertical circuit.

POOR HORIZ LIN OR FOLDOVER: Refer to "Troubleshooting" Horizontal circuit.

NARROW PICTURE: Refer to "Troubleshooting" Horizontal circuit.

VERT OFF FREQUENCY: Refer to "Troubleshooting" Vertical circuit.

HORIZ OFF FREQUENCY: Refer to "Troubleshooting" Horizontal circuit.

SYNC

NO VERT/HORIZ SYNC: Refer to "Troubleshooting" Sync circuit.

MONITOR BOARD GridTrace LOCATION GUIDE

C101	F-3	C516	I-13	P4	A-11	R403	I-5	VR501	G-4
C102	E-4	C517	F-8	P5	A-10	R404	H-7	VR502	A-12
C103	C-4	C518	J-9	P6	H-8	R405	H-5	VR503	H-9
C104	B-5	C701	A-3	P7	A-11	R406	I-5	VR504	K-10
C105	C-6	C702	D-1	Q11	A-9	R407	J-7	VR701	D-1
C106	D-6	C703	A-2	Q12	B-8	R408	H-7		
C107	A-7	C704	G-3	Q13	A-5	R409	I-8		
C108	A-9	D10	C-7	Q14	C-6	R410	G-7		
C109	B-7	D11	C-8	Q15	C-5	R411	G-7		
C110	B-9	D12	G-6	Q16	E-3	R412	F-7		
C111	C-4	D13	F-8	Q17	D-4	R413	H-8		
C401	I-8	D14	F-13	Q18	D-12	R501	D-7		
C402	I-8	D15	F-13	R01	A-10	R502	F-4		
C403	J-7	D16	J-11	R101	J-12	R503	F-5		
C404	I-6	D17	G-9	R102	D-4	R504	F-5		
C405	I-5	D18	G-9	R103	E-4	R505	E-7		
C406	J-6	D19	F-8	R104	C-4	R506	D-9		
C407	I-7	D20	I-13	R105	C-5	R507	I-12		
C408	H-6	D21	H-9	R106	C-5	R508	I-20		
C409	G-8	D22	C-13	R107	B-4	R510	C-12		
C410	H-8	D701	E-2	R108	B-4	R511	D-11		
C411	H-5	D702	F-2	R109	C-5	R512	C-13		
C412	G-5	D703	F-2	R110	A-6	R513	F-8		
C413	G-6	D704	F-1	R111	B-6	R514	I-12		
C501	D-6	F701	H-3	R112	A-6	R515	G-13		
C502	D-7	IC11	H-6	R113	A-9	R516	G-9		
C503	D-7	IC12	E-5	R114	B-9	R517	H-9		
C504	E-5	IC701	B-2	R115	B-7	R518	J-10		
C505	E-5	J1	K-11	R116	B-6	R519	D-9		
C506	F-5	L101	C-3	R117	C-7	R701	B-1		
C507	E-5	L102	A-5	R118	B-8	R702	C-1		
C508	F-7	L103	B-8	R119	D-4	R703	E-1		
C509	E-6	L501	A-4	R120	C-4	R704	C-2		
C510	D-10	L502	E-9	R121	D-5	T2A	G-1		
C511	E-12	L503	B-13	R123	B-10	VR101	F-4		
C513	I-10	L505	C-11	R124	B-7	VR401	K-6		
C514	B-10	P2	G-2	R401	I-8	VR402	I-4		
C515	A-11	P3	D-2	R402	J-8	VR403	K-8		

TROUBLESHOOTING

POWER SUPPLY

Check the AC Line Fuse (F771) and the DC Fuse (F701). If Fuse F771 is open, check Diodes D701 thru D704, Capacitor C771 and Electrolytic C701 for possible shorts. Also check Power Transformer (T2) for shorted windings. If Fuse F701 is open, check Electrolytics C704 and C412 for shorts. Also check Electrolytic C514 in the Horizontal Sweep Circuit for a possible short. If both fuses are good, check for 18.8V DC at the emitter of Voltage Regulator Transistor (Q701). If 18.8V is missing at the emitter of Q701, check for an open Diode D701 thru D704, an open Power Transformer T2 winding or an open Line Choke L771. Also check Power Switch SW1 and the power cord.

If the 18.8V is present at the emitter of Q701, check for 12V at the collector of Q701. If the voltage is missing or incorrect at the collector of Regulator Transistor Q701, check Transistor Q701, Resistor R705, Error Amplifier (IC701) and associated components. If 12V is present at the Collector of Q701, check Resistor R405 and Choke L101.

HORIZONTAL

If there is no high voltage, inject a horizontal drive signal at the base of Horizontal Output Transistor (Q18). If the high voltage returns, check Horizontal Driver Transformer (T501), Horizontal Processor (IC12), Resistors R505 and R506. Also check other components associated with the Horizontal Driver circuit and the Horizontal Processor IC. If the high voltage does not return when a horizontal drive signal is injected at the base of Horizontal Output Transistor (Q18), check Q18, Horizontal Output Transformer (T502), Deflection Yoke (DY1) and Diodes D14, D15, D17 and D18. Also check Horizontal Linearity Coil (L503), Width Coil (L505), Capacitors C511 and C516, Electrolytics C513, C514, C515, and C517. Check for possible shorts at the outputs of Diodes D20 and D21 that could load down the Horizontal Output Transformer.

Poor horizontal linearity or foldover problems may be caused by Capacitor C511, Electrolytics C514 or C515, Deflection Yoke DY1, Horizontal Linearity Coil L503 or Width Coil L505. Also check Resistor R510, R511 and R512 and Diode D22. If the horizontal sweep is off frequency, check the adjustment of the Horizontal Hold Control (VR501). If horizontal sync cannot be obtained with the Horizontal Hold Control, check the Horizontal Processor (IC12) and its associated components. If the monitor has a narrow raster, check the 11.8V source in the power supply. If the 11.8V source is normal, check the waveform at the base of the Horizontal Output Transistor (Q18). If the drive waveform at the base of Q18 has insufficient amplitude, check the voltages on the Horizontal Processor IC12. Also check Capacitors C501, C502, C503 and C509 in the Horizontal Drive circuit. If the waveform at the base of the Horizontal Output Transistor is normal, check Resistors R510 and R511, Coils L503 and L505 and Electrolytic C515 in the horizontal yoke circuit.

VIDEO

Inject a video signal at the Video Input Jack (J1) and check the waveform at the emitter of the Video Preamp Transistor (Q16). If the waveform is missing at the emitter of Q16, check Resistor R103, Capacitor C101, Electrolytic C102 and Transistor Q16. If the waveform is present at the emitter of Q16, check the waveform at the base of Video

Amplifier Transistor (Q13). If the waveform is missing at the base of Q13, check Video Amplifier Transistor (Q15), Resistors R104, R106, R108 and R109 and Electrolytic C104. If the waveform is present at the base of Transistor Q13, check the waveform at the base of Video Driver Transistor (Q11). If the video signal is missing at the base of Q11, check Transistor Q13, Resistors R110, R112 and R113, Electrolytics C107 and C108, Contrast Control (VR1) and Horizontal Blanking Transistor (Q12).

If the video waveform is present at the base of Q11, check the waveform at the base of Video Output Transistor (Q19) on the CRT Board. If the waveform is missing on the base of Q19, check Transistor Q11 and Resistor R114. If the waveform is present at the base of Q19, check the waveform at pin 2 of the CRT. If the video signal is missing at pin 2 of the CRT, check Transistor Q19, Resistors R151, R153 and R157, Coil L151, and Electrolytic C151. If the video signal is present at pin 2 of the CRT, check the voltages on pins 5, 6 and 7 of the CRT. If all voltages on the CRT are normal, check the CRT. If the monitor has low brightness or excessive brightness, check the voltages on Transistors Q11 and Q19.

SYNC

If there is no horizontal or vertical sync, check the composite video waveform at pin 1 of Horizontal Processor (IC12). If the waveform is missing at pin 1 of IC12, check for the composite video signal at the base of Sync Amplifier Transistor (Q17). If the composite video signal is present at the base of Q17, check Transistor Q17, Resistors R120 and R121 and Electrolytic C111. If the composite video signal is missing at the base of Q17, check Resistor R119 and Transistor Q16. If the composite signal is present at pin 1 of the Horizontal Processor IC12, check IC12 by substitution.

If there is no horizontal sync, check Horizontal Processor IC12 and its associated components. If there is no vertical sync, check for vertical sync pulses at pin 2 of IC12. If the vertical sync pulses are missing at pin 2 of IC12, check IC12. If there are vertical pulses present at pin 2 of IC12, check for vertical sync pulses at pin 1 of the Vertical Processor (IC11). If the vertical sync pulses at pin 1 of IC11 are missing or have low amplitude, check Resistors R401 and R402, Capacitors C401, C402 and C403. If the vertical sync pulses are normal at pin 1 of Vertical Processor IC11, check IC11 by substitution.

VERTICAL

If there is no vertical sweep, check the waveform at pin 8 of Vertical Processor (IC11). If the vertical sweep signal is present at pin 8 of IC11, check Electrolytic C409 and Deflection Yoke (DY1). If the vertical sweep signal is missing at pin 8 of IC11, check Vertical Processor IC11 and associated components. Poor vertical linearity or foldover may be caused by a defective component in the vertical feedback circuit. Check Resistors R404, R406, R407, R408 and R409, Controls VR402 and VR403 and Electrolytics C404, C406, C407, C408, C411 and Capacitor C410. If the vertical sweep is off frequency, check Vertical Hold Control (VR401), Resistor R403 and Electrolytic C404. If these components check good, check IC11 by substitution. If vertical retrace lines appear in the raster, check Resistors R411 and R412, Diodes D13 and D19 and Capacitor C152 on the CRT Board.

PARTS LIST AND DESCRIPTION

When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFG. PART No.	REPLACEMENT DATA					
			GENERAL ELECTRIC PART No.	NTE PART No.	ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
D10	3.9B2		GEZD-3.9	NTE5007A	ECG5007A	SK3A9/5007A	WEP1407/5007	
D11								
D12	G18410							
D13								
D14 thru	G18415							
D16								
D17, D18	G18419							
D19								
D20	G18337							
D21	G18419							
D22	G18410							
D701 thru	G2DG1							
D704								
IC11	AN5763							
IC12	AN5753							
IC701	L123CB		GE IC-260	NTE923D	ECG923D	SK3165/923D	WEP2331/923D	221-29020
Q11	2SC829B		GE-20*	NTE85	ECG85	SK3122	WEP829	121-29021
Q12	2SC828R		GE-61	NTE85	ECG85	SK3931/90	WEP828	121-972
Q13	2SC829B		GE-20*	NTE85	ECG85	SK3122	WEP829	121-29021
Q14	2SC828R		GE-61	NTE85	ECG85	SK3931/90	WEP828	121-972
Q15, Q16	2SC829B		GE-20*	NTE85	ECG85	SK3122	WEP829	121-29021
Q17	2SC828R		GE-61	NTE85	ECG85	SK3931/90	WEP828	121-972
Q18	BU406			NTE379	ECG379	SK9085/379	WEP379/379	121-29111
Q19	2SC1360A		GE-62	NTE199	ECG199	SK3132	WEP66/199	121-972
Q701	BD534L		GE-69A	NTE153	ECG153	SK3274/153	WEP746/153	121-988-03

* Lead configuration may vary from original.

WIRING DATA

High Voltage Lead	Use BELDEN No. 8869 (17 KV) or 8868 (24 KV)
Shielded Hook-up Wire	Use BELDEN No. 8401 or 8421 (Single-Conductor)
General-use Unshielded Hook-up Wire	8208 (Two-Conductor)
75-Ohm Tuner Input Lead	8529 (Solid) Available in 13 Colors
	8522 (Stranded) Available in 13 Colors
	Use BELDEN No. 8241

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

ELECTROLYTIC CAPACITORS Items Not Listed Are Normally Available At Local Distributors.

ITEM No.	RATING	MFGR. PART No.
C102	47 16V NP	
C107	47 16V NP	

ITEM No.	RATING	MFGR. PART No.
C108	10 16V NP	
C515	4 25V NP	

CAPACITORS Items Not Listed Are Normally Available At Local Distributors.

ITEM No.	RATING	MFGR. PART No.
C101	22 N220 50V	

ITEM No.	RATING	MFGR. PART No.
C502	33 NPO 500V 5%	

CONTROLS (All wattages 1/2 watt, or less, unless listed)

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
VR1	Contrast	500		
VR101	Sub Contrast	500		
VR401	Vert Hold	100K		
VR402	Vert Linearity	10K		
VR403	Vert Height (Size)	50K		
VR501	Horiz Hold	500		
VR502	Focus	2M		
VR503	Sub Brightness	200K		
VR504	Brightness	200K		
VR701	Voltage Regulator	1000		

APPLE
MODEL IIC

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
R404	6.8 2% 1.4W Metal Film		QW6D8	22-2246
R405	6.8 2% 1/4W Metal Film		QW6D8	
R408	1.1 2% 1/4W Metal Film		QW1D1	
R504	2700 2% 1/4W Metal Film		QW227	
R507	6.8 2% 1/4W Metal Film		QW6D8	
R516	6.8 2% 1/4W Metal Film		QW6D8	
R705	27 5% 10W WW		10W027	

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.
L101	RF Choke	
L102	RF Choke	
L103	RF Choke	

ITEM No.	FUNCTION	MFGR. PART No.
L151	RF Choke	
L771	Line Filter	

COILS & TRANSFORMERS

ITEM No.	FUNCTION	MFGR. PART No.	OTHER IDENTIFICATION	NOTES
DY1	Yoke Horiz 156uH	TMD-2728(1)		
L502	90° Vert 9.9mH	HW-440(1)		
L503	Width	2449-717-0109(1)		
T2	Horiz Linearity	2869-239-0104(1)		
T501	Power	027-0108-DD156(1)		
T502	Driver	TMF-2222(1)		
	Horiz Output			

For SAFETY use only equivalent replacement part.
(1) Number on unit.

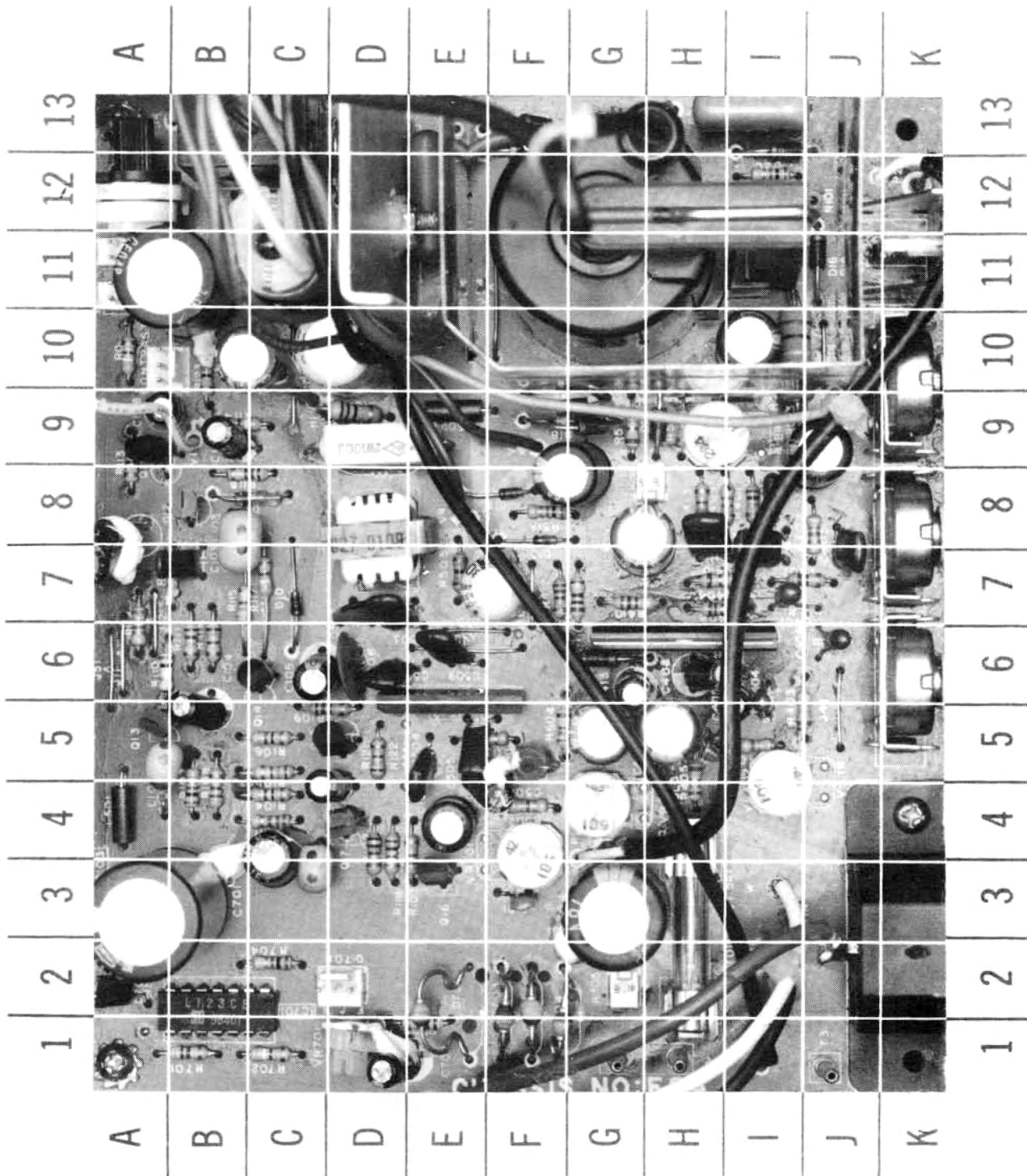
FUSE DEVICES

ITEM NO.	DESCRIPTION	MFGR. PART NO.		NOTES
		DEVICE	HOLDER	
F701	1.5A @ 250V			
F771	Fast-Acting			
	750mA @ 250V			
	Fast-Acting			

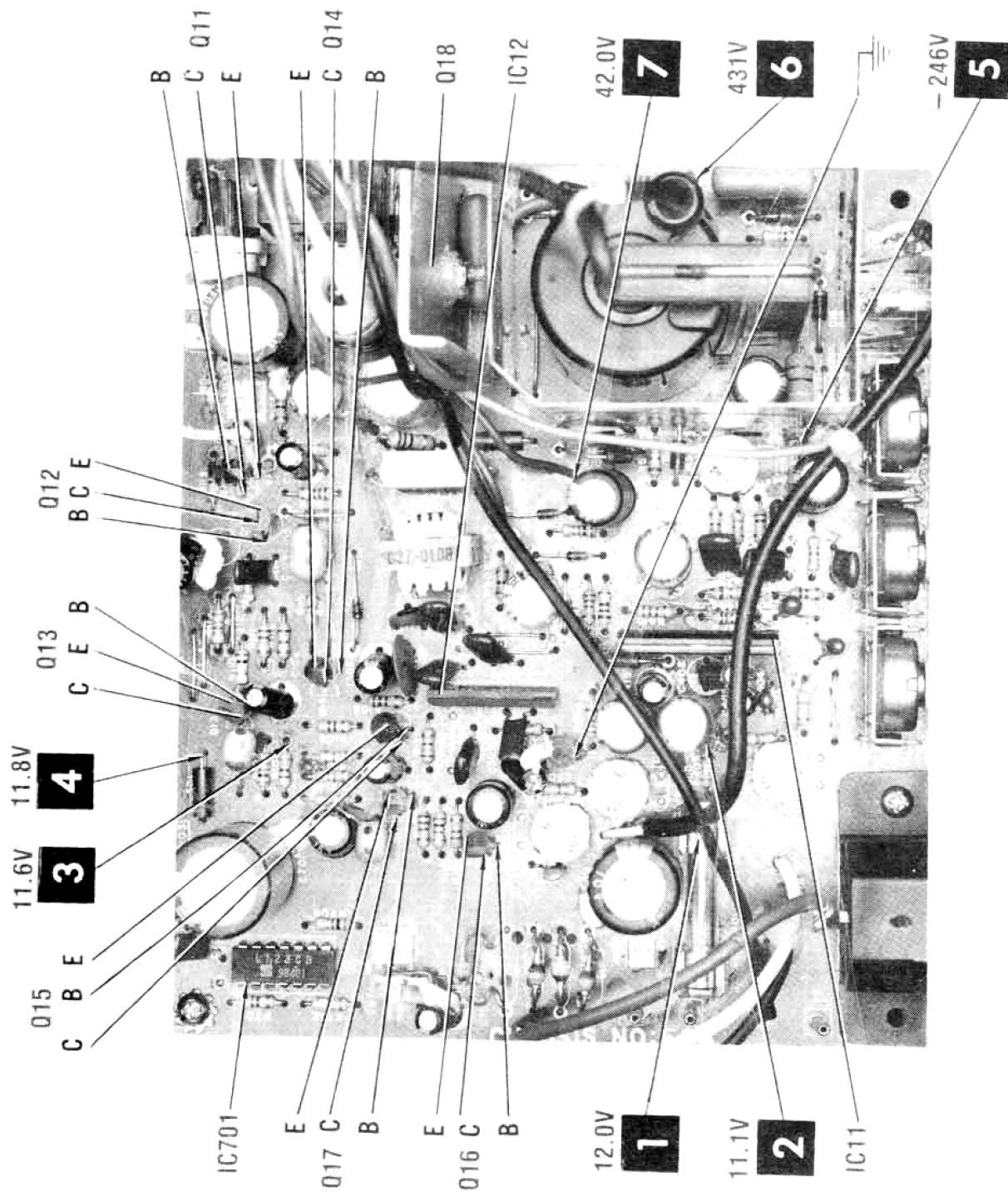
MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
D01	LED		Power, Green
L501	Ferrite Bead		
L502	Ferrite Bead		
M1	Spark Gap		
Thru			
M5			
P1	Cord		AC Power
SG1	Lamp		Neon
SW1	Switch		Power
V1	CRT		C10M42P31(D)-ARF-SB
	PC Board		Main
	PC Board		Power Supply
	PC Board		CRT Socket

CABINET & CABINET PARTS (When ordering specify model, chassis & color)



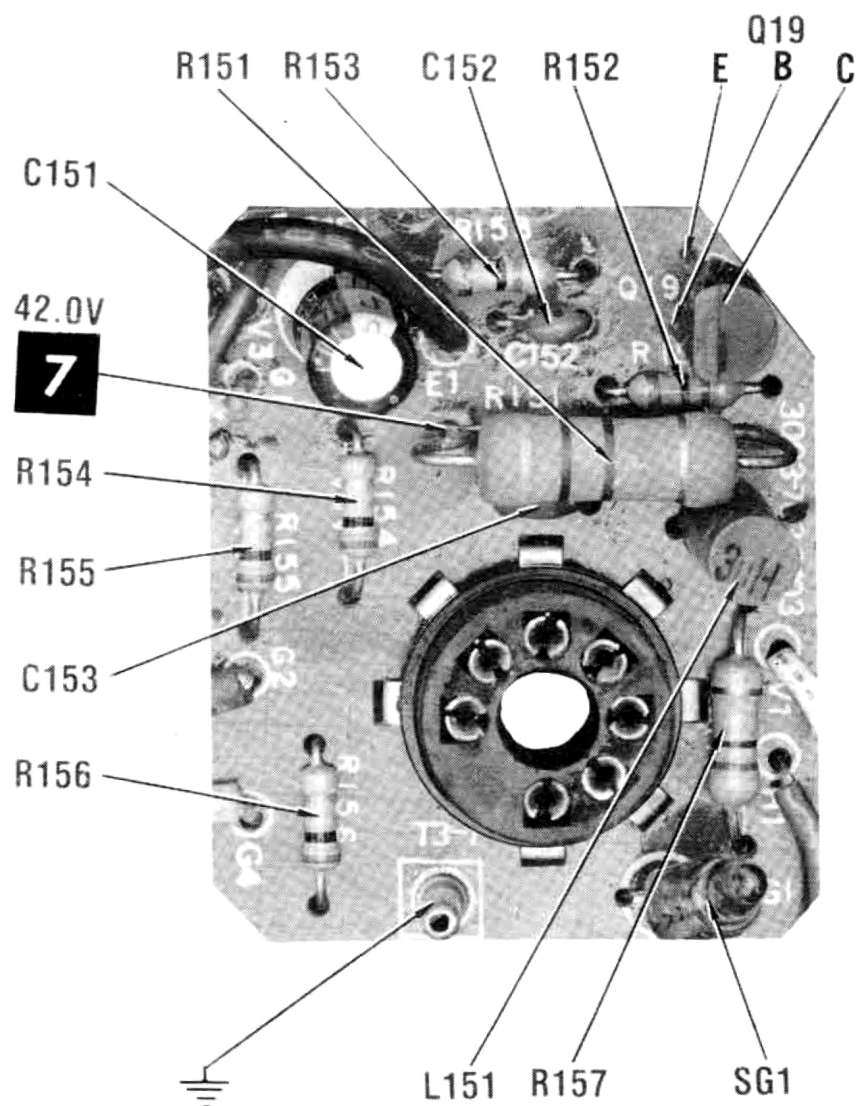
APPLE
MODEL IIc

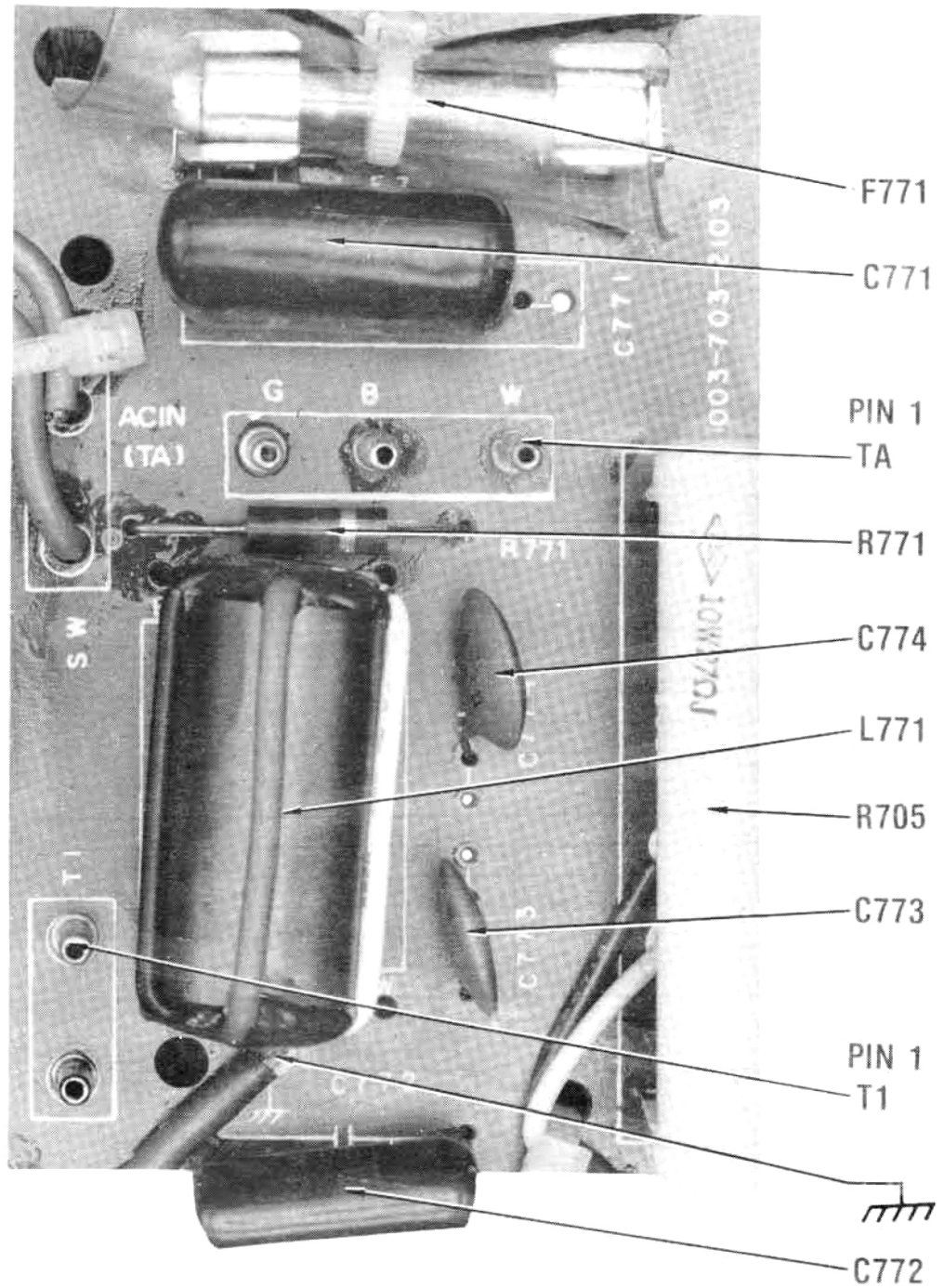


ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED

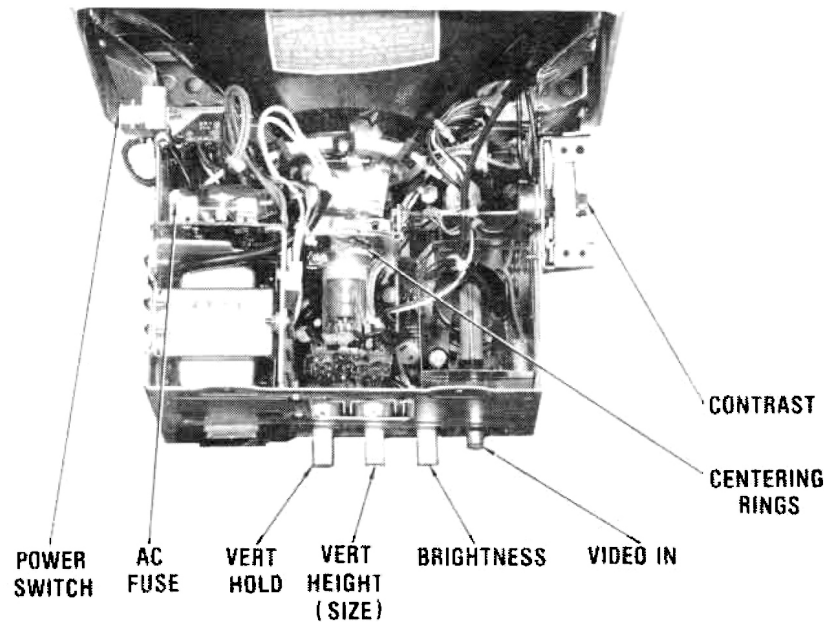
MONITOR BOARD

A Howard W. Sams **CIRCUITRACE®** Photo





MONITOR POWER SUPPLY BOARD



CABINET VIEW DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

Remove two screws holding rear panel. Pull the lower part of the rear panel out and lift up to remove panel. Remove two screws holding top vent panel and slide panel out. Remove two screws holding recessed handle section and remove handle. Remove two screws holding contrast control and two screws holding cabinet bottom and remove cabinet bottom. Remove four screws holding the front cabinet and remove front cabinet from CRT.

MAIN BOARD REMOVAL

Remove ten screws holding bottom shield and remove shield. Remove two screws from bottom of Main board and

two screws from sides of chassis holding front brackets to Main board. Pull the Main board down. Disconnect CRT socket and HV anode lead. Disconnect eight connectors from Main board and one connector from AC input board. Remove Main board.

CRT REMOVAL

Follow the "Cabinet Removal" procedure. Disconnect CRT socket, HV anode lead and the deflection yoke. Remove four screws holding CRT to cabinet front. Remove the CRT. Loosen and remove the deflection yoke from neck of CRT.

SERVICING IN THE FIELD

CRT IMPLOSION PROTECTION AND CLEANING

Implosion protection is an integral part of the picture tube, cleaning accomplished without CRT removal.

FUSE DEVICES

A 1.5-amp fuse is used for low-voltage power-supply protection.

A .75-amp fuse is used for AC line protection.

HORIZONTAL OSCILLATOR

Adjustment of the horizontal hold is accomplished by the proper setting of the Horizontal Hold Control.

WIDTH

The width may be varied by adjusting the width coil.

FOCUS

The focus may be varied by a focus control.

CENTERING

Centering is accomplished by proper adjustment of two magnetic rings located on the yoke rear cover.