

Racal-Vadic

VA3450P/S/G-SERIES MODEM INSTALLATION/OPERATION MANUAL



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VA3450P/S/G-SERIES MODEM

INSTALLATION/OPERATION MANUAL

JANUARY 1982

RACAL-VADIC INC. offers a free call-in diagnostic service to assist in the operation and testing of all RACAL-VADIC products. RACAL-VADIC Regional Service Center personnel are available to perform no-cost, over-the-telephone diagnostic tests of malfunctioning equipment, to clarify options and test procedures outlined in this manual, and to describe the operation of the controls and indicators on RACAL-VADIC products. Contact the nearest RACAL-VADIC Regional Service Center listed below before shipping any equipment in for repair.

EASTERN REGION	(301) 459-7430
NORTHEASTERN REGION	(617) 245-8790
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The information in this manual has been carefully compiled and checked for technical accuracy. However, RACAL-VADIC Inc. accepts no responsibility for inaccuracies which may occur. Comments or correspondence regarding this manual should be addressed to:

Racal-Vadic Inc.
Technical Publications
222 Caspian Drive
Sunnyvale, California 94086-9874
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Telex: 910-339-0207

FCC REQUIREMENTS

Connection of terminal equipment to the public switched-telephone network is regulated by the Federal Communications Commission (FCC) as defined by FCC Rules and Regulations, Part 68. These regulations require the following:

1. Before connecting this equipment to the switched-telephone network,¹ notify the telephone company of the following information:

Name of Manufacturer	RACAL-VADIC
Equipment Model Number	VA345x (P/S/G)
FCC Registration Number	AJ496M-67213-DM-N
Ringer Equivalence Number	0.9B

If other devices are to be connected with this equipment, equivalent information must be provided for each device.

2. When trouble is experienced, disconnect this equipment from the telephone line to determine if it is malfunctioning. If this equipment is determined to be malfunctioning, discontinue use until the problem has been corrected.²
3. Where such action is reasonably required in the operation of its business, the telephone company may make changes in its communications facilities, equipment, operations and procedures. If this occurs, you will be notified by the telephone company in writing.

¹Connection of this equipment to party lines and coin telephone service is prohibited.

²Should this equipment cause harm to the telephone network, the telephone company may temporarily discontinue service until the problem has been corrected.

WARNING

This equipment generates and uses radio frequency energy and, if not installed and used properly (in strict accordance with the manufacturer's instructions), may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- reorient the receiving antenna
- relocate the computer with respect to the receiver
- move the computer away from the receiver
- plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

“How to Identify and Resolve Radio-TV Interference Problems”

This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock No. 004-000-00345-4.

TABLE OF CONTENTS

SECTION 1	GENERAL INFORMATION.	1-1
	INTRODUCTION.	1-1
	FEATURES	1-2
	PHYSICAL DESCRIPTION	1-2
	DIAGNOSTICS	1-2
SECTION 2	INSTALLATION	2-1
	INTRODUCTION.	2-1
	PRELIMINARY PROCEDURES	2-1
	Unpacking and Inspection.	2-1
	Equipment Supplied	2-1
	Additional Equipment Required	2-1
	EQUIPMENT CONNECTIONS.	2-3
	VA3450P Connections	2-3
	VA3450S Connections	2-7
	VA3450G Connections	2-8
	PREINSTALLATION CHECKS.	2-9
	INSTALLATION PROCEDURE	2-9
SECTION 3	OPERATION	3-1
	CONTROLS AND INDICATORS.	3-1
	OPERATING PROCEDURES	3-4
	Manual Originate	3-4
	Manual Answer	3-5
	Automatic Answer	3-6
	Leased Line.	3-6
SECTION 4	TESTING.	4-1
	INTRODUCTION.	4-1
	TEST SWITCHES	4-2
	DLB/OFF/ALB	4-2
	ST/OFF	4-2
	FAULT ISOLATION	4-4
	AUTOMATIC SELF-TEST	4-5
	Overview	4-5
	Procedure.	4-5
	ANALOG LOOPBACK/SELF-TEST.	4-6
	Overview	4-6
	Procedure.	4-7
	ANALOG LOOPBACK/DATA TEST	4-8
	Overview	4-8
	Procedure.	4-9
	END-TO-END/SELF-TEST	4-10
	Overview	4-10
	Procedure.	4-11

TABLE OF CONTENTS (cont'd)

REMOTE DIGITAL LOOPBACK/SELF-TEST	4-12
Overview	4-12
Procedure	4-13
REMOTE DIGITAL LOOPBACK/DATA TEST	4-14
Overview	4-14
Procedure	4-15
SERVICE CENTERS	4-15

SECTION 5

OPTIONS	5-1
INTRODUCTION	5-1
Standard-Options Mode	5-1
Verifying Option Settings	5-2
OPTION DESCRIPTIONS	5-2
Line-Interface Options	5-2
Line Connection (strap a)	5-2
Mode Select (switch B3)	5-3
Transmit Level (straps e, l)	5-3
Receive Level (strap W4)	5-3
Amplitude Equalizer (strap W1)	5-3
Phase Equalizer (strap W2)	5-3
Line-Connect Switch (strap x)	5-3
Attended/Unattended Disconnect (switch A1)	5-4
Auto Disconnect/Abort Timer (switch B5)	5-4
Auto Disconnect/Loss of Carrier (switch A7)	5-4
Auto Disconnect/Received SPACE (strap b)	5-4
Send SPACE on Disconnect (strap c)	5-4
Terminal-Interface Options	5-5
Data Timing (switch B6)	5-5
Character Length (switches A3, A5)	5-5
Transmit/Receive Clock (straps t, v)	5-5
External Transmit Clock (strap j)	5-5
Slave Clock (strap d)	5-5
Force Data Terminal Ready (switch B2)	5-5
Delayed Carrier Detect (straps f, g)	5-5
Clear To Send Control (straps p, q)	5-5
Terminal Control of Data Rate (strap k)	5-5
Data Rate Indicator (strap r)	5-6
Maximum Data Rate (switch B4)	5-6
Signal Common Reference (strap m)	5-6
Test-Control Options	5-6
Terminal Control of Local Test/Busy Out (straps s, u, ab, ac)	5-6
Remote Test (DLB) Select (switch B1)	5-6
Respond To Remote Test (switch A2)	5-6
Terminal Control of Remote Test (strap n)	5-7
Received Data in Remote Test (straps h, w)	5-7
Data Set Ready in Test (switch B7)	5-7
Test Mode Indicator (strap aa)	5-7

TABLE OF CONTENTS (cont'd)

SECTION 6	SUPPLEMENTAL INFORMATION	6-1
	EQUIPMENT INTERFACES	6-1
	Terminal Equipment (RS232C) Interface	6-1
	TelCo Line Interface.	6-5
	VA3450P Interface	6-5
	VA3450S Interface	6-5
	VA3450G Interface	6-5
	SPECIFICATIONS	6-7

LIST OF TABLES

Table 2-1	Telephone Equipment Required	2-2
Table 2-2	VA871 Options (Model Summary)	2-2
Table 2-3	Telephone Options (503C, 2503C)	2-2
Table 3-1	Front-Panel Switches	3-2
Table 3-2	Front-Panel Indicators	3-3
Table 5-1	VA3450-Series Options	5-9
Table 6-1	RS232C (DTE) Interface Connector	6-4
Table 6-2	RJ11C Connector Pin Assignments	6-5
Table 6-3	RJ41S,45S Connector Pin Assignments	6-6
Table 6-4	TelCo Interface Signal Definitions	6-6

LIST OF FIGURES

Figure 2-1	P-Series Modem with Standard (Voice) Telephone	2-3
Figure 2-2	P-Series Modem with VA871 VADICphone	2-4
Figure 2-3	P-Series Modem with 503C or 2503C Telephone	2-5
Figure 2-4	P-Series Modem without Telephone (Auto-Answer Only). .	2-6
Figure 2-5	S-Series Modem with 503C or 2503C Telephone	2-7
Figure 2-6	G-Series Modem (Leased-Line)	2-8
Figure 3-1	Front-Panel Display	3-1
Figure 4-1	Test Switch Locations	4-3
Figure 4-2	Test Switch Functional Diagram	4-3
Figure 4-3	Analog Loopback Self-Test	4-6
Figure 4-4	Analog Loopback/Data Test.	4-8
Figure 4-5	End-To-End/Self-Test	4-10
Figure 4-6	Remote Digital Loopback/Self-Test	4-12
Figure 4-7	Remote Digital Loopback/Data Test.	4-14
Figure 5-1	VA3450-Series Switch and Strap Locations.	5-8

Section 1

GENERAL INFORMATION

INTRODUCTION

The VA3450-series modem is available in three basic models, as follows:

- VA3451—This top-of-line triple modem combines Bell 103, Bell 212, and RACAL-VADIC VA3400 technologies in a single package. The VA3451 provides full-duplex asynchronous operation at data rates from 0 to 300 bps (Bell 103 or RACAL-VADIC 3400 protocol) and full-duplex synchronous or asynchronous operation at 1200 bps (Bell 212 or RACAL-VADIC VA3400 protocol). Selection of operating speed and line-connect protocol is fully automatic in the answer mode, and a front-panel speed switch allows user selection of low-speed (300 bps) or high-speed (1200 bps) operation in the originate mode.
- VA3452—This dual modem combines Bell 212 and RACAL-VADIC VA3400 technologies to provide full-duplex asynchronous operation at data rates from 0 to 300 bps and full-duplex synchronous or asynchronous operation at 1200 bps. Automatic recognition of operating protocol is featured in both originate and answer modes.
- VA3453—This dual modem combines Bell 103 and RACAL-VADIC VA3400 technologies to provide full-duplex asynchronous operation at data rates from 0 to 300 bps and full-duplex synchronous or asynchronous operation at 1200 bps. Selection of operating speed and line-connect protocol is fully automatic in the answer mode, and a front-panel switch allows user selection of low-speed (300 bps) or high-speed (1200 bps) operation in the originate mode.

All models in the VA3450 series are available in two direct-connect versions for switched-network operation, and the VA3453 is also available in a leased-line version. The VA3451,52,53P versions are registered for permissive direct connect under Part 68 of the FCC Rules and Regulations; the VA3451,52,53S versions are registered for programmable direct connect; and the VA3453G version is designed for 2-wire leased-line operation.

The various models in the VA3450 series are identified by a label on the front panel. The P, S, and G versions can be identified by the type of connector on the attached telephone cable. The P version is supplied with a miniature 6-position (4-contact) connector; the S version is supplied with a miniature 8-position (6-contact) connector; the G version is supplied with a 6-position connector and a VA881 adapter.

FEATURES

The VA3450-series modem provides many standard and optional features that allow custom tailoring to fit the needs of a particular installation. Features available on this modem series include:

- Full-duplex, 0 to 300 bps asynchronous, 1200 bps synchronous or asynchronous operation (user-selectable)
- Automatic identification of calling modem (103, 212, or VA3400) in answer mode, automatic identification of VA3400 or Bell 212 in originate mode; user terminal interface remains transparent to modem type in use
- Manual originate/manual and automatic answer capability, with attended or unattended disconnect options; front-panel line-connect switch for manual/automatic answer selection
- Automatic disconnect with abort timer, loss of carrier, or received SPACE (user-selectable)
- Standard-options mode for simple installation in most user environments
- Extensive user diagnostics, including local and remote test (Analog and Digital Loopback) capability; micro-processor-based design features automatic self-test; 8-element diagnostic display on front panel for rapid fault isolation
- FCC-registered for direct-connect, switched-network operation; UL-listed, CSA-certified, Canadian TAP-approved

PHYSICAL DESCRIPTION

The VA3450-series modem is a self-contained unit consisting of a dual printed circuit board assembly housed in a desk-top enclosure. The modem includes an integral power supply and a 7-foot telephone interface cable terminated in a miniature plug that mates with standard jack arrangements available from the telephone company (TelCo). A rear-mounted 25-pin female connector provides a standard RS232C interface to the terminal equipment.

DIAGNOSTICS

The VA3450 implements all standard RACAL-VADIC diagnostics for full-duplex modems. An 8-element display, visible from the front of the unit, monitors primary terminal interface signals. This display, together with built-in Analog and Digital Loopback tests, provides a simple, effective operational check of the modem.

Section 2

INSTALLATION

INTRODUCTION

This section provides installation procedures for VA3450-series modems. In case of difficulty during any of the following procedures, contact the nearest RACAL-VADIC Regional Service Center listed at the front of this manual.

CAUTION

Procedures in this section should be performed in the sequence and manner specified. Any deviation may damage the equipment.

PRELIMINARY PROCEDURES

Unpacking and Inspection

Inspect shipping carton immediately upon receipt. If the carton has been damaged, request that the carrier's agent be present during unpacking. Inspect contents for physical damage and/or missing parts. If contents have been damaged or parts are missing, immediately notify the nearest RACAL-VADIC sales office.

Equipment Supplied

The VA3450-series modem is supplied with an attached telephone interface cable and power supply. The basic model number for each unit is printed on the front label, and the version (P, S, or G) can be determined by the connector type, as described in Section 1.

Additional Equipment Required

The following items are required for installation:

1. Data terminal equipment (RS232C) interface cable—terminated with a 25-pin male D-type connector (Cinch or Cannon DB-19604-432).
2. Telephone line jack as specified in Table 2-1.
3. A standard telephone (VA872) or an optional voice/data telephone set (RACAL-VADIC VA871 VADICphone or TelCo 503C or 2503C data telephone) is required if manual operation is desired. See Table 2-2 for VA871 models, or see Table 2-3 for 503C and 2503C options. (Note that the VA871 can be used only with the VA3450P version.)

Table 2-1. Telephone Equipment Required

Model No.	USOC*	Description	Connection
VA3450P	RJ11C	Voice jack	Permissive (6-position plug)
	RJ41S	Universal data jack	
	RJ45S	Programmed data jack	
VA3450S	RJ41S	Universal data jack	Programmable (8-position plug)
	RJ45S	Programmed data jack	
VA3453G	N/A	Leased-line jack	Leased-line (2-wire)

* TelCo ordering code

Table 2-2. VA871 Options (Model Summary)

Model No.	Description
VA871AA	Dataset Control, Rotary Dial
VA871BA	Dataset Control, Touch-Tone® Dial
VA871AM	Telset Control, Rotary Dial
VA871BM	Telset Control, Touch-Tone® Dial

Table 2-3. Telephone Options (503C, 2503C)

Option	Description
A 1	Telset Controls Line*
A 2	Dataset Controls Line**
B 3	Aural Monitoring Not Provided
B 4	Aural Monitoring Provided
C 5	Touch-Tone® Dial
C 6	Rotary (Pulse) Dial
D 7	Switch-Hook Indication ***
D 8	Mode Indication

* Manual Answer only

** Auto Answer only

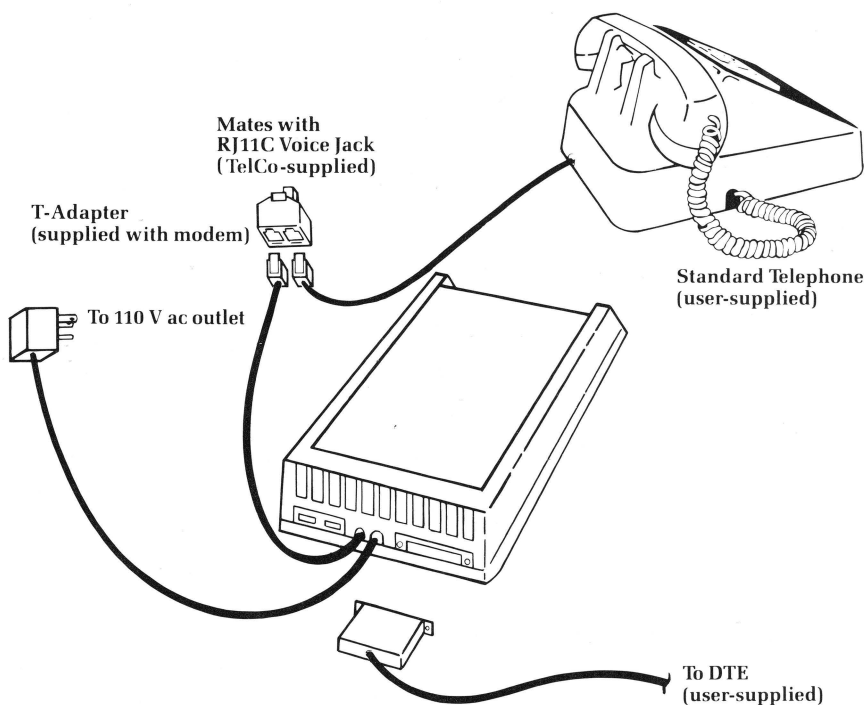
*** Required by modem

EQUIPMENT CONNECTIONS

VA3450P Connections

The P-series modem is designed for permissive connection to the switched-telephone network. This modem may be installed in the following configurations:

Voice Phone Connection—Figure 2-1 shows modem connections when used with a standard (voice) telephone. This configuration may be used for manual originate/manual or automatic answer operation with attended or unattended disconnect.



VA3450-03

Figure 2-1. P-Series Modem with Standard (Voice) Telephone

VADICphone Connection—Figure 2-2 shows modem connections when used with the optional VA871 VADICphone. If the VADICphone is connected for telset control (VA871AM,BM), the modem will operate in manual originate/manual answer modes only with attended disconnect; if the VADICphone is connected for dataset control (VA871AA,BA), the modem will operate in manual originate/automatic answer modes with either attended or unattended disconnect. See VA871 Installation/Operation guide (RACAL-VADIC Publication No. 18008-025) for further information.

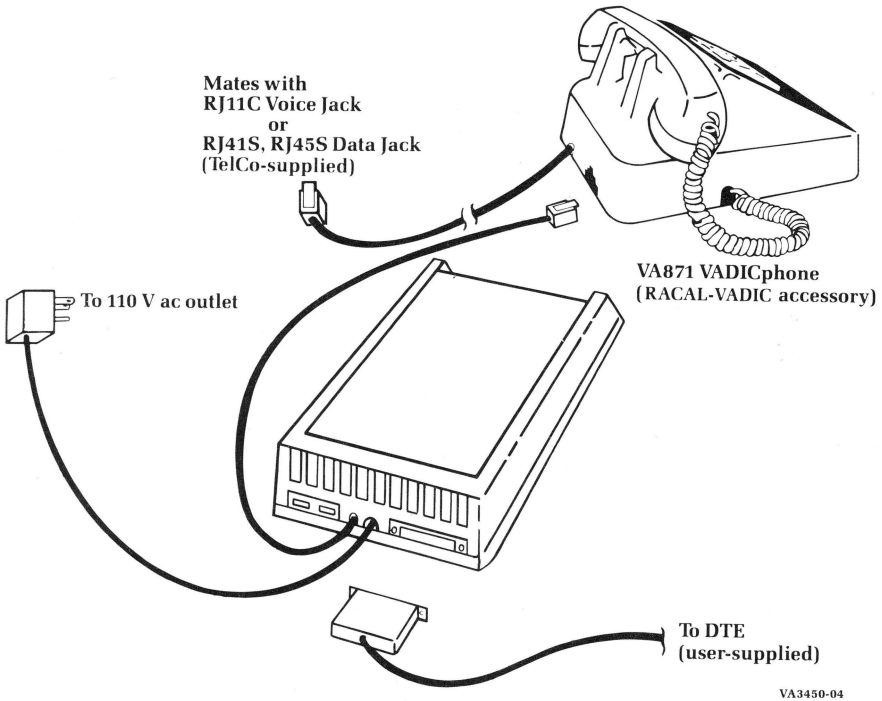
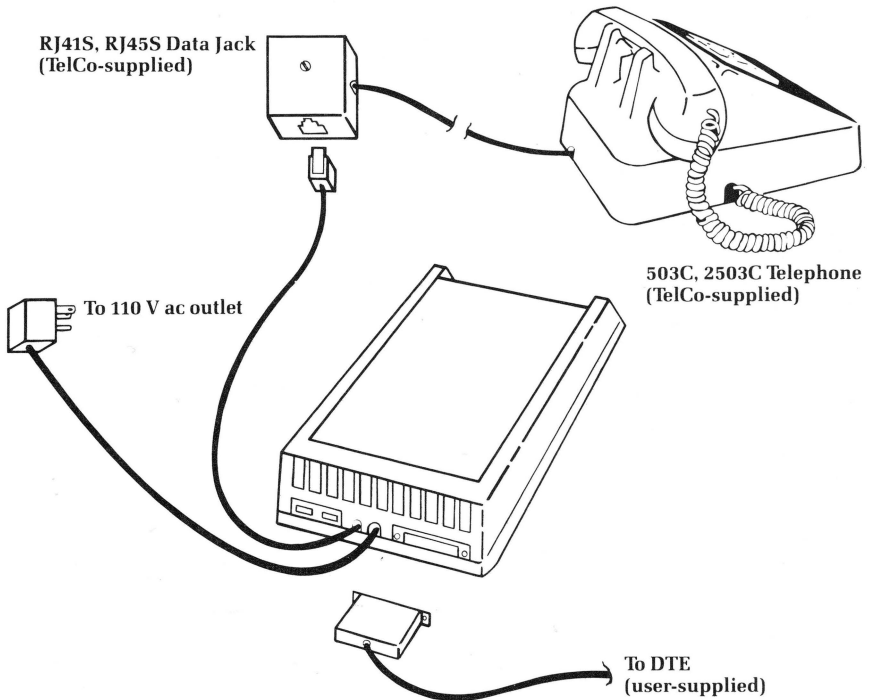


Figure 2-2. P-Series Modem with VA871 VADICphone

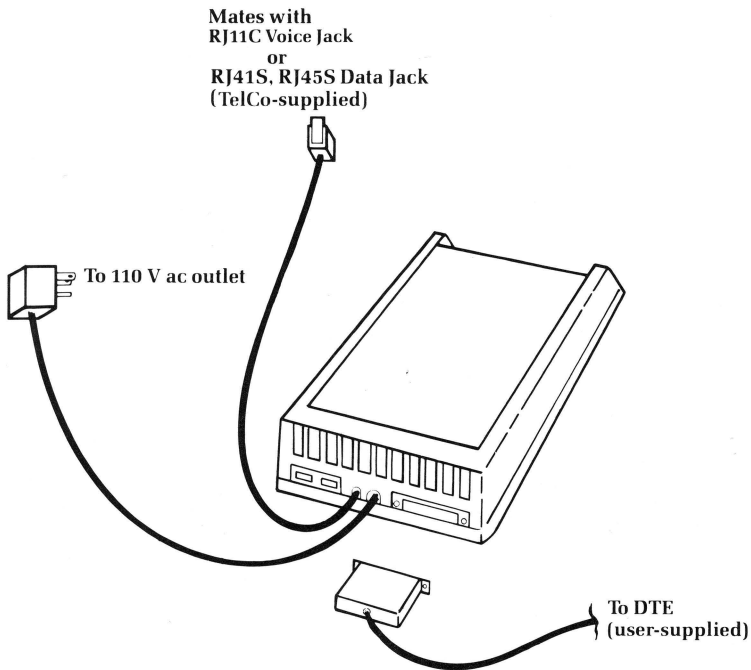
Data-Phone Connection—Figure 2-3 shows modem connections when used with a TelCo-supplied Data-Phone (503C/2503C). Operating modes available in this configuration are identical to those described under the previous VADIC-phone connection. See Table 2-3 for phone options.



VA3450-05

Figure 2-3. P-Series Modem with 503C or 2503C Telephone

No Phone Connection—For automatic answer only application, the modem may also be connected without a telephone as shown in Figure 2-4.

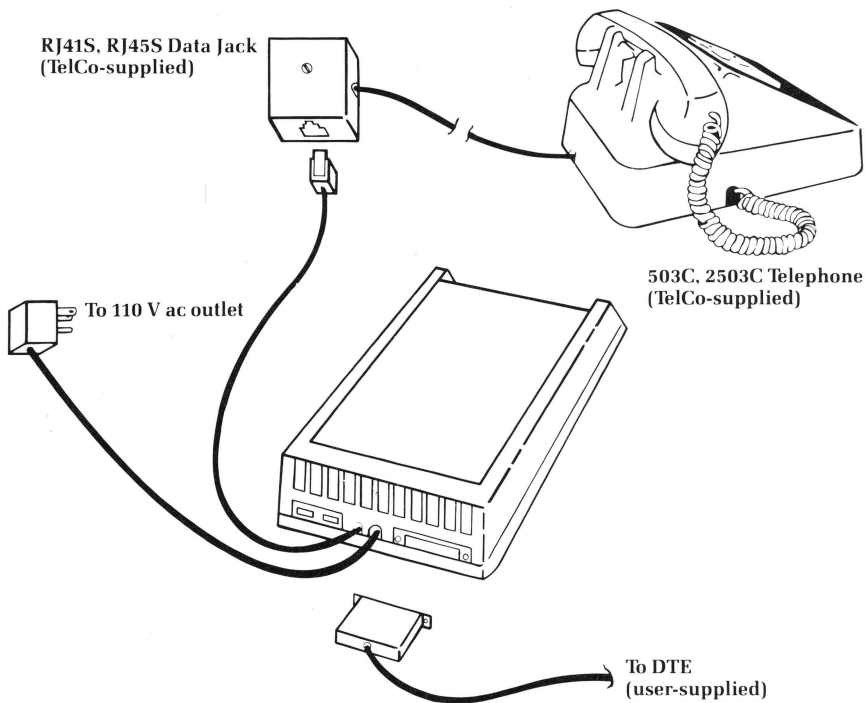


VA3450-06

Figure 2-4. P-Series Modem without Telephone (Auto-Answer Only)

VA3450S Connections

The S-series modem is designed for programmable direct connection to the switched-telephone network. This is normally used with a TelCo-supplied Data-Phone (503C/2503C) as shown in Figure 2-5. If the phone is connected for telset control, the modem will operate in manual originate/manual answer modes only with attended disconnect; if the phone is connected for dataset control, the modem will operate in manual originate/automatic answer modes with either attended or unattended disconnect. See Table 2-3 for phone options.



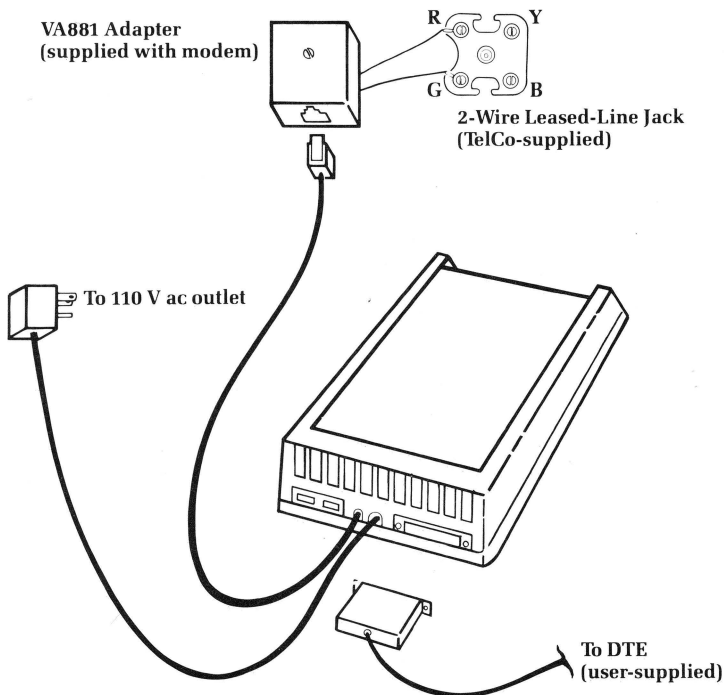
VA3450-07

Figure 2-5. S-Series Modem with 503C or 2503C Telephone

VA3450G Connections

The G-series modem is designed for 2-wire leased-line operation. This modem connects to a TelCo-supplied leased-line terminal block via the VA881 adapter as shown in Figure 2-6. The adapter's red and green wires connect to ring and tip of the telephone line, respectively; the black and yellow wires are not used.

NOTE: For leased-line operation, one modem must be in originate/answer mode and the other in answer-only mode (see Section 5).



VA3450-08

Figure 2-6. G-Series Modem (Leased-Line)

PREINSTALLATION CHECKS

Before installing modem, check the following to ensure system integrity:

- Refer to Section 5 of this manual and verify that correct switch and strap options have been selected.
- Refer to Table 2-1 and verify that proper TelCo equipment has been provided.

INSTALLATION PROCEDURE

To install the modem, proceed as follows:

1. Plug power-supply module into grounded wall receptacle (see preceding equipment connection diagrams). Secure power-supply receptacle with cover plate screw.
2. Connect RS232C interface cable from data terminal equipment (DTE) to 25-pin EIA connector on rear of modem.
3. Connect telephone interface cable to TelCo connection block.

NOTE

Prior to connecting any device to the switched-telephone network, Federal Communications Commission (FCC) regulations specify that the customer must provide the telephone company with the name of the manufacturer, equipment model number, FCC registration number, and ringer equivalence number of the device to be used. This information is listed at the front of this manual.

4. See next section for location of controls and indicators, then perform test procedures described in Section 5.

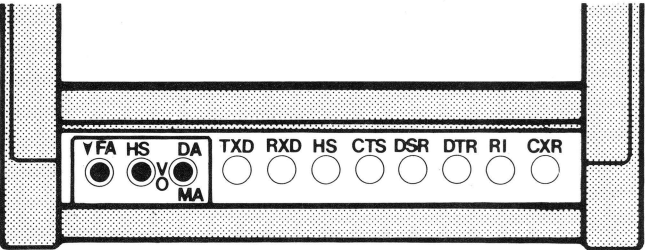
Section 3

OPERATION

CONTROLS AND INDICATORS

The VA3450-series modem displays the primary terminal interface (RS232C) signals on the front panel for diagnostic purposes. Also located on the front panel are the Force Answer, speed-select, and line-connect switches used for manual operation. Figure 3-1 shows the location of each front-panel control and indicator. The operation of each switch is described in Table 3-1 and the function of each indicator is described in Table 3-2.

Two test switches, located on the rear of the modem, provide user selection of local (ALB), remote (DLB), and self-test (ST) test modes. These switches are described in Section 4, together with detailed procedures for testing the modem. (Note: be sure that test switches are OFF for normal operation of the modem.)



VA3450-09

Figure 3-1. Front-Panel Display

Table 3-1. Front-Panel Switches





Switch	Description
FA	Force Answer switch. Initiates answer tone and forces modem into answer mode for duration of line connection (momentary-contact operation).
HS	Speed-select switch. Selects high-speed (1200 bps) or low-speed (300 bps) operation when originating a call.
DA/VO/MA	<p>Line-connect switch. Provides manual control of modem line connection as follows:</p> <ul style="list-style-type: none">● <u>DA (DATA) position</u>—Connects the modem to the telephone line during manual originate or manual answer operation. Set the switch to this position to select data mode, and replace the telephone handset during data communication. Be sure to set switch back to either VO or MA when data transfer is complete to avoid unnecessary telephone charges.● <u>VO (VOICE) position</u>—Selects automatic answer operation and allows the associated telephone to be used to originate calls when the modem is not in use. For manual originate/automatic answer or automatic answer only operation, set the switch to this position when not in data mode.● <u>MA (MANUAL) position</u>—Inhibits automatic answer operation and allows the associated telephone to be used for normal voice communication when the modem is not in use. For manual originate/manual answer or manual originate only operation, set switch to this position when not in data mode.

Table 3-2. Front-Panel Indicators

Indicator	Description
TXD	<u>Transmit Data</u> —Serial data from terminal equipment to input of modem transmitter. ON = SPACE.
RXD	<u>Receive Data</u> —Demodulated serial data from output of modem receiver to terminal equipment. ON = SPACE.
HS	<u>Speed Indicator</u> —Indicates high-speed (1200 bps) operation when illuminated.
CTS	<u>Clear To Send</u> —Control signal from modem to terminal equipment. Indicates modem is ready to transmit.
DSR	<u>Data Set Ready</u> —Control signal from modem to terminal equipment. Indicates modem is connected to telephone line during normal operation. Flashes during test.
DTR	<u>Data Terminal Ready</u> —Control signal from terminal equipment to modem. Enables line connection in auto answer and unattended disconnect mode.
RI	<u>Ring Indicator</u> —Control signal from modem to terminal equipment. Indicates modem has detected ring voltage on telephone line during normal operation. Flashes during self-test if an error is detected.
CXR	<u>Carrier Detect</u> —Control signal from modem to terminal equipment. Indicates modem receiver is unsquelched and receiving a valid carrier.

OPERATING PROCEDURES

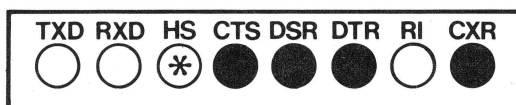
The VA3450-series modem can operate in manual originate and manual or automatic answer modes, depending on the hardware options selected and the type of telephone set used. As shipped from the factory, the P and S versions are configured for attended disconnect operation in the originate mode, and manual or automatic answer modes are user-selectable via the line-connect switch on the front panel. (The G version is factory set in pairs; one is set to originate, the other to answer-only mode.) The following procedures assume standard switch and strap options have been selected and a standard voice telephone is used. On the front-panel displays used in the following procedures, the status of the indicators is shown as:

 = ON  = FLASHING/BLINKING
 = OFF  = DEPENDS ON SPEED SELECTED

Manual Originate

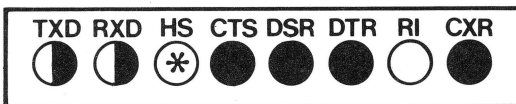
To originate a call, proceed as follows:

1. Set speed-select switch (HS) on front panel to proper speed for remote modem type. (Low speed is 103 compatible; high speed is 212/3400 compatible.)
2. With modem line-connect switch (DA/VO/MA) in VO or MA position, lift telephone handset, listen for dial tone, then dial number of remote modem.
3. Listen for high-pitched tone generated when remote modem answers, then set modem line-connect switch to DA position and hang up telephone. When the modem connects to line, the front-panel indicators will display the following:



VA3450-10

4. During data exchange, front-panel indicators will display the following:



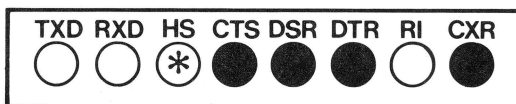
VA3450-11

5. When data communication is complete, be sure to disconnect modem by returning line-connect switch to VO or MA position.

Manual Answer

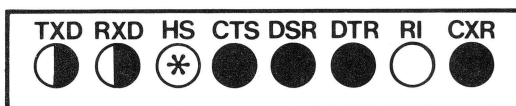
To select manual answer operation, set line-connect switch (DA/VO/MA) to MA position and ensure that DTR indicator is illuminated. Answer a call as follows:

1. When telephone rings, lift handset and establish voice communication. When ready to transfer data, set line-connect switch to DA position and hang up telephone. Immediately activate Force Answer switch (FA) by pulling the switch forward for approximately 3 seconds, then releasing. When the modem connects to line, front-panel indicators will display the following:



VA3450-12

2. During data exchange, front-panel indicators will display the following:



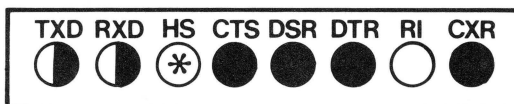
VA3450-13

3. When data communication is complete, be sure to disconnect modem by returning line-connect switch to VO or MA position.

Automatic Answer

To select automatic answer mode, set modem line-connect switch (DA/VO/MA) to VO position and ensure that DTR indicator is illuminated. No operator intervention is required in this mode.

1. When a call is received, RI (Ring Indicator) on front panel will flash and modem will answer automatically. During the data exchange, front-panel indicators will display the following:

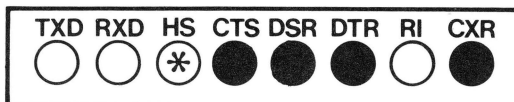


VA3450-14

2. The modem will automatically disconnect from line at end of call when the remote modem disconnects (if Loss of Carrier Disconnect option is enabled), or the local modem may be disconnected by turning off DTR from the terminal equipment.

Leased Line

The VA3453G modem is configured for leased-line operation at the factory and no operator intervention is required. When the modems are properly connected (one in originate, one in answer-only), front-panel indicators will display the following:



VA3450-15

Section 4

TESTING

INTRODUCTION

The microprocessor-based VA3450-series modem provides operator selection of up to six diagnostic loops from the local end of the data link. Individual tests are selected through various settings of two test switches located on the rear panel of the modem. This section describes the location and operation of the test switches, then presents a brief overview and a step-by-step procedure for performing each test. The procedures included in this section assume that the Remote DLB option is enabled on the local modem (see Test Control Options, Section 5) and that the far-end modem is capable of responding to a remote-test command.

TEST SWITCHES

Figure 4-1 shows the location of the two test switches and Figure 4-2 indicates the functional arrangement of the internal switch logic controlled by each test switch. The basic operation of each switch is described below:

DLB/OFF/ALB

Digital Loopback/Analog Loopback switch—As indicated in Figure 4-2, the ALB position of this switch controls internal logic switches on the line side of the modem. Selecting this position disconnects the modem from the telephone line and connects the output of the local transmitter to the input of the receiver. Test data (either from the terminal equipment or from the internal test generator) applied to the transmitter input is modulated by the transmitter, then immediately looped into the receiver and demodulated to verify operation of the local modem.

The DLB switch position performs two functions, depending on the operating speed selected. (1) If the front-panel speed-select switch is set to the high-speed (HS) position, selecting DLB on the local modem initiates a remote-test command to the far-end modem. Assuming that the far-end modem can respond to a remote-test command, the remote-test logic in the far-end modem will connect its receiver output to its transmitter input. (2) If DLB is selected while the local modem is operating in the low-speed mode instead, the remote-test logic connects the local receiver output to the local transmitter input. In this case, data received from the far-end modem is looped through the local modem and retransmitted to the far-end modem.

The OFF (center) position of the DLB/OFF/ALB switch selects normal operation of the modem.

ST/OFF

Self-Test switch—The ST position of this switch disconnects the local modem transmitter from the terminal equipment interface, connects an internal test generator to the transmitter input, and connects the local receiver output to an error detector (see Figure 4-2). Errors detected during self-test cause the RI indicator on the modem front panel to flash.

The OFF position of this switch selects normal operation of the modem.

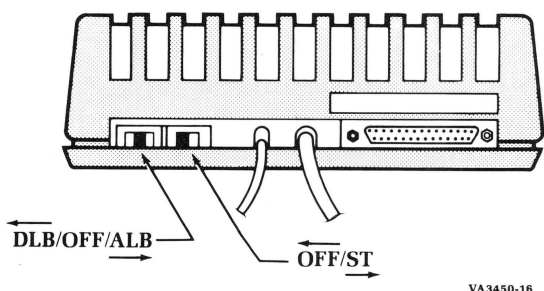


Figure 4-1. Test Switch Locations

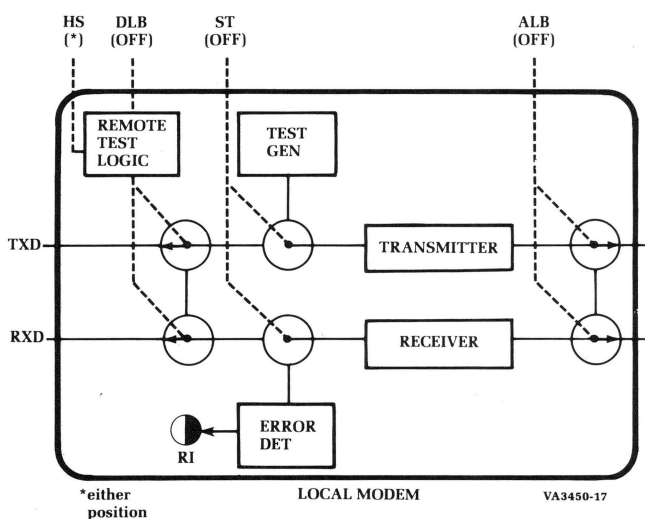


Figure 4-2. Test Switch Functional Diagram

FAULT ISOLATION

As mentioned previously, six test loops are available on the VA3450-series modem to facilitate system fault isolation. These are:

- Automatic Self-Test, which constantly monitors the status of the local modem when the unit is off-line and both test switches are OFF.
- Analog Loopback/Self-Test, which checks operation of the local modem with an internal test signal.
- Analog Loopback/Data Test, which checks operation of the local modem and the terminal equipment interface with data from the terminal.
- End-To-End/Self-Test, which checks operation of the data channel from both ends simultaneously, using independent test signals generated at each end of the link.
- Remote Digital Loopback/Self-Test, which checks operation of the data channel by looping a test signal generated at the local end through the remote modem, then checking for errors in the returned signal.
- Remote Digital Loopback/Data Test, which verifies a complete data path through the data channel by looping data from the local terminal through the remote modem, then checking for errors in the returned data at the local terminal.

To verify the operational integrity of a data link, proceed as follows:

1. Check diagnostic display on local modem and ensure that RI indicator does not flash when modem is idle. If RI is flashing, indicating an Automatic Self-Test failure, go to step 6.
2. Perform Analog Loopback/Self-Test on local modem to verify operation of local modem. If test fails, go to step 6.
3. Perform Analog Loopback/Data Test on local modem to verify operation of modem/terminal equipment interface. If test fails, check terminal equipment interface and terminal. If problem cannot be isolated, go to step 6.
4. Initiate Remote Digital Loopback/Self-Test to verify operation of local and remote modems and telephone link. If problems are encountered, ask remote operator to verify operation of the far-end modem. If remote modem appears to be operating properly, perform End-To-End/Self-Test procedure to isolate direction of failure, then go to step 6.
5. Initiate Remote Digital Loopback/Data Test to verify complete data path through the communications channel. If problems are encountered, perform Analog Loopback/Data Test to verify operation of the terminal equipment interface.
6. See SERVICE CENTERS at the end of this section.

AUTOMATIC SELF-TEST

Overview

When the modem is idle (not connected to line and both test switches set to OFF), the internal microprocessor continuously executes a self-test routine that checks operation of the transmitter, receiver, and microprocessor circuits. If an error is detected in the transmit/receive circuits or the microprocessor circuits fail, the RI indicator on the modem front panel will flash, indicating a fault in the local modem.

Procedure

Set both test switches to OFF and ensure that modem is on hook (not connected to line), then verify that RI indicator does not flash.

ANALOG LOOPBACK/ SELF-TEST

Overview

This test verifies operation of the local modem by internally looping a test signal through the transmitter and receiver and monitoring the response (see Figure 4-3). When this test is initiated, the following conditions are created:

- The modem is disconnected from the telephone line and the line is busied out.
- An internal test signal is applied to the modem transmitter and the transmitter output is looped back into the receiver.
- DTR (Data Terminal Ready) is forced ON within the modem.
- CTS (Clear To Send) to the terminal equipment is forced OFF.
- DSR (Data Set Ready) indicator flashes to indicate test mode.

If errors are detected during this test, the RI indicator will flash, indicating a fault in the local modem.

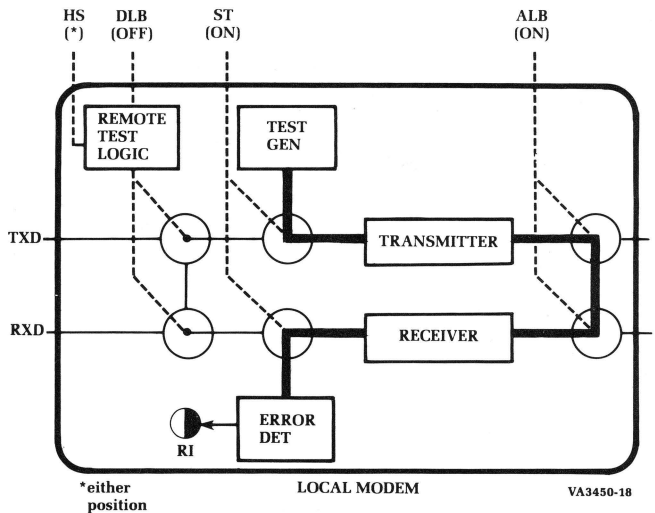


Figure 4-3. Analog Loopback Self-Test

Procedure

Perform the ALB/Self-Test as follows:

1. Ensure that modem is not in data mode, then set speed-select switch on front panel to high-speed (HS) position.
2. Set DLB/OFF/ALB switch on rear panel to ALB position and set ST/OFF switch to ST position.
3. Verify that front-panel indicators display the following:



VA3450-19

4. If front-panel display is correct, set test switches to OFF, set speed-select switch to low-speed position, and repeat test. Front-panel display will be identical to the above, except that the HS indicator will be OFF.
5. If RI indicator flashes or the display is incorrect, a modem fault has been detected. Contact nearest RACAL-VADIC center listed at the front of this manual.
6. To terminate test, set both test switches to OFF.

**ANALOG
LOOPBACK/
DATA TEST**

Overview

This test verifies operation of the local modem and terminal equipment interface with data from the terminal. This test is similar to Analog Loopback/Self-Test except that the terminal equipment interface remains active and data from the terminal is used instead of the internal test signal (see Figure 4-4). Characters keyed from the terminal are modulated by the transmitter, looped back to the receiver and demodulated, then returned to the terminal. CTS to the terminal equipment is turned ON during this test mode, indicating that the modem will accept data. Errors detected during the test will appear as incorrect characters on the terminal display.

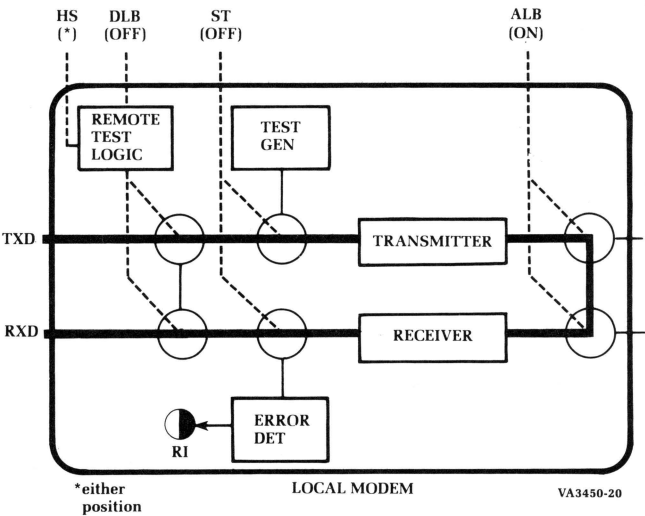
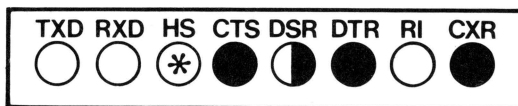


Figure 4-4. Analog Loopback/Data Test

Procedure

Perform the ALB/Data Test as follows:

1. Ensure that modem is not in data mode, then set speed-select switch on front panel to data rate selected at terminal (i.e., HS for 1200 bps, low-speed for 300 bps).
2. Set DLB/OFF/ALB switch on rear panel to ALB position and set ST/OFF switch to OFF position.
3. Verify that front-panel indicators display the following:



VA3450-21

4. If front-panel display is correct, type message on terminal keyboard and verify that message prints correctly on terminal display. If message is correct, terminate test by setting DLB/OFF/ALB switch to OFF position.
5. If the modem display is incorrect, perform Analog Loop-back/Self-Test procedure.

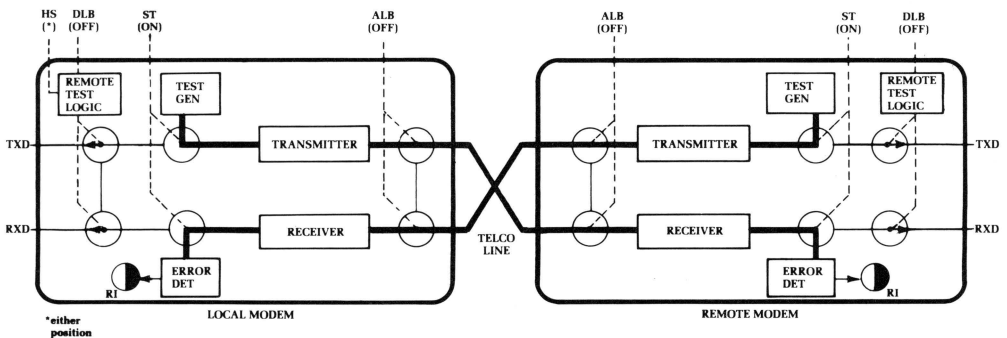
END-TO-END/ SELF-TEST

Overview

This test verifies operation of the transmit/receive functions of both modems and associated communication link with internal test signals generated at both ends of the link (see Figure 4-5). When this test is initiated, the following conditions are created:

- An internal test signal is applied to the local modem transmitter, sent through the line connection to the opposite end of the link, decoded in the remote receiver, and checked for errors.
- Simultaneously, an internal test signal is applied to the remote modem transmitter and sent through the line connection to the local receiver, where it is decoded and checked for errors.
- DTR is forced ON within both modems.
- CTS is forced OFF at both ends of the link.
- DSR indicator flashes on both modems to indicate test mode.

If an error is detected during this test, the RI indicator will flash at the receiving end.



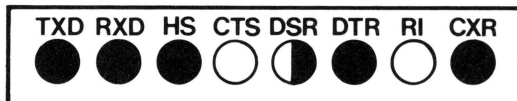
VA3450-22

Figure 4-5. End-To-End/Self-Test

Procedure

Perform the End-To-End/Self-Test as follows:

1. Set speed-select switch on front panel to high-speed (HS) position and establish line connection between modems.
2. Set DLB/OFF/ALB switch on rear panel to OFF and set ST/OFF switch to ST. Ask remote operator to select the same settings on remote modem.
3. Verify that front-panel indicators display the following (at both modems):



VA3450-23

4. If front-panel displays are correct, set test switches to OFF and set speed-select switch to low-speed position. Ask remote operator to do the same, and repeat the test.
5. To terminate test, set test switches to OFF.
6. If RI indicator flashes or the display is incorrect, perform Analog Loopback/Self-Test procedure on both modems to isolate fault.

REMOTE DIGITAL LOOPBACK/ SELF-TEST

Overview

This test verifies operation of both modems and the associated communication link by looping a locally generated test signal through the far-end receiver and transmitter and checking the returned signal for errors (see Figure 4-6). This test is available in the high-speed (HS) mode only and requires that the Respond-To-Remote-Test option be enabled in the far-end modem. When this test is initiated, the following conditions are created:

- An internal test signal is applied to the local modem transmitter and the local modem receiver is connected to a test decoder.
- The output of the far-end receiver is automatically looped back into the transmitter input and the remote terminal interface is disabled.
- DSR indicators on both modems will flash, indicating test mode.

If errors are detected during this test, the RI indicator will flash, indicating a fault in the received data.

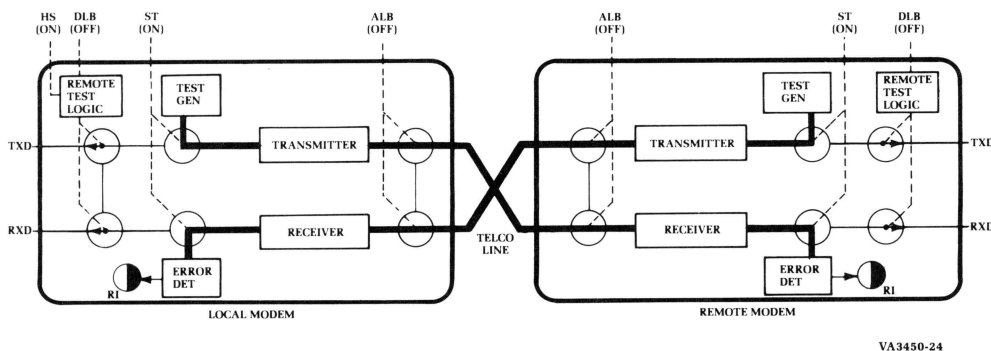
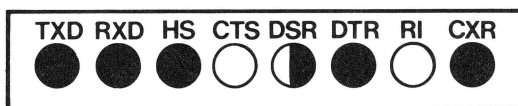


Figure 4-6. Remote Digital Loopback/Self-Test

Procedure

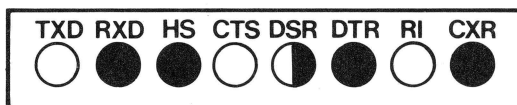
Perform the Remote DLB/Self-Test as follows:

1. Set speed-select switch on local modem to high-speed (HS) position and establish line connection between modems.
2. Set DLB/OFF/ALB switch on modem rear panel to DLB and set ST/OFF switch to ST.
3. Verify that front-panel indicators on local modem display the following:



VA3450-25

4. Ask remote operator to verify that front-panel indicators on remote modem display the following:



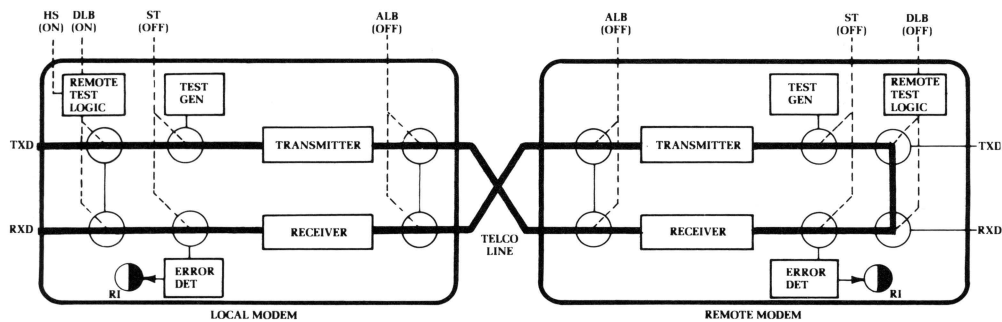
VA3450-26

5. If RI indicator on local modem flashes or either display is incorrect, an error has been detected. Perform Analog Loopback/Self-Test on both modems to isolate fault.
6. To terminate test, set both test switches to OFF.

REMOTE DIGITAL
LOOPBACK/
DATA TEST

Overview

This test verifies operation of both modems, the associated telephone link, and local terminal equipment interface with data from the local terminal. This test is similar to Remote Digital Loopback/Self-Test except that data from the local terminal is used instead of the internal test signal (see Figure 4-7). Characters keyed in from the terminal are modulated by the local transmitter, looped through the far-end modem, and returned to the local terminal via the receiver. Remote Digital Loopback/Data Test may be initiated from the local modem as described previously (provided that the local modem is in high-speed mode and the Respond-To-Remote-Test option is enabled in the far-end modem), or this test may be enabled manually at the remote end in the low-speed mode. Errors detected during the test will appear as incorrect characters on the local terminal display.



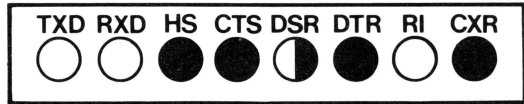
VA3450-27

Figure 4-7. Remote Digital Loopback/Data Test

Procedure

Perform the DLB/Data Test as follows:

1. Set speed-select switch on front panel to high-speed (HS) position and establish line connection between modems.
2. Set DLB/OFF/ALB switch on rear panel to DLB and set ST/OFF switch to OFF.
3. Verify that front-panel indicators display the following:



VA3450-28

4. If front-panel display is correct, type message on terminal keyboard and verify that message prints correctly on terminal display. If message is correct, terminate test by setting DLB/OFF/ALB switch to OFF position.
5. If test fails, perform Analog Loopback/Self-Test procedure on both modems to isolate fault.

SERVICE CENTERS

If the modem appears to be faulty or the problem cannot be isolated, contact the nearest RACAL-VADIC Regional Service Center listed at the front of this manual.

Section 5

OPTIONS

INTRODUCTION

The VA3450-series modem can be configured to meet the needs of a particular installation by selecting appropriate hardware options within the unit. These options are implemented with miniature switches and solder straps (jumpers) located on the printed circuit board assemblies under the top cover. (Removable jumpers rather than solder straps are used on the top board.) Figure 5-1 and Table 5-1 at the end of this section indicate the location and function of switches and straps and a description of each option is presented on the following pages.

Standard-Options Mode

A special feature of this microprocessor-based modem is the ability to configure the unit for standard 10-bit asynchronous switched-network operation by setting a single switch. If option switch A6 (bottom board) is set to the OFF position, most of the remaining option switches and straps are ignored by the internal microprocessor, and the following option settings are selected:

Option Name	Selected Setting
Attended/Unattended Disconnect	Attended
Respond To Remote Test	Enabled
Character Length	10 bits
103 Operation	Enabled
Auto Disconnect/Loss of Carrier	Enabled
Remote Test Select	Remote DLB
Mode Select	Originate/Answer
Maximum Data Rate	1205 bps
Auto Disconnect/Abort Timer	Enabled
Data Timing	Asynchronous
Data Set Ready in Test	DSR ON in Test
Line Connection	Switched-Network
Auto Disconnect/Received SPACE	Disabled
Send SPACE on Disconnect	Disabled
Slave Clock Control	Disabled
Terminal Control of Local Test/ Busy Out	Disabled
Transmit Clock Select	Internal
Terminal Control of Data Rate	Disabled
Terminal Control of Remote Test	Disabled

The standard options listed above are identified in Table 5-1 with a single asterisk (*). Options not included in the standard list should be verified by the user when the standard-options mode is selected.

Verifying Option Settings

Each modem type (P, S, G) is configured for “standard” operation when shipped from the factory, as indicated in Table 5-1. Before installing the unit, it would be prudent to read the option descriptions, mark Table 5-1 with the settings necessary for your installation, then verify the switch and strap settings selected on the board. Follow the steps below to verify option settings:

- The top cover is held in place by plastic latches located near the bottom center on each side of the modem. To remove the cover, press inward on both sides of the cover to release the latches and carefully pry open the cover at each corner.
- To remove the top board, remove the screw located in the upper-left corner of the board (near the test switches) and remove the plastic shipping strap installed in the standoff located between P4 and P5. Release each standoff retainer by pushing in on the small catch while pulling upward gently on the board. When the board is released from each standoff, gently pull the upper board loose.
- After checking the options selected on both boards, reassemble the unit in reverse order. While replacing the top board, ensure that pins on P4 and P5 are properly seated.

OPTION DESCRIPTIONS

The seemingly endless array of switches and straps used on VA3450-series modems can be categorized by function into three basic groups:

- Line-interface options that select either switched-network or leased-line operation and control line-connect/disconnect protocol when switched-network operation is selected.
- Terminal-interface options that select data timing and operating protocol on the terminal interface.
- Test-control options that determine modem operation during test mode.

Each group of options is described below.

Line-Interface Options

Line Connection
(strap a)

This option configures the modem line interface for either leased-line or switched-network operation. If the leased-line setting is selected, the off-hook relay is bypassed and the modem is always connected to line. If the switched-network setting is selected, modem line connection is controlled by the off-hook relay.

Mode Select (switch B3)	For switched-network application, the originate/answer setting allows the modem to automatically switch between originate and answer modes during the line-connect sequence. For leased-line application (where the modems are always connected to line), the answer-only setting forces one of the modems into the answer mode, and the originate/answer setting forces the other modem into the originate mode.
Transmit Level (straps e, l)	This option selects the proper transmitter output level for leased-line and switched-network applications. The 0 dBm setting is used for leased-line, the -10 dBm setting for permissive direct-connect (switched-network, P-type modem), and the programmable setting for programmable direct-connect (switched-network, S-type modem) operation.
Receive Level (strap W4)	This option selects the proper receiver dynamic range for leased-line and switched-network applications. The 0 to -35 dBm setting is used for leased-line, the -13 to -48 dBm setting for switched-network operation. (Note: located on top board.)
Amplitude Equalizer (strap W1)	This option inserts an amplitude equalizer in the received data path to compensate for poor-quality phone lines. (Note: located on top board.)
Phase Equalizer (strap W2)	This option inserts a phase equalizer in the received data path to compensate for poor-quality phone lines. (Note: located on top board.)
Line Connect Switch (strap x)	If this option is enabled, the line-connect switch (labeled DA/VO/MA on front of the modem) is operational. A standard telephone may be used on the same line with the modem to manually originate or manually answer calls, and the modem can be connected to line (i.e., taken off hook) with the line-connect switch, thus eliminating the need for a data telephone with an exclusion key. (This switch should be disabled if a data telephone is used.) Operation of the line-connect switch depends on the setting of the attended/unattended disconnect option, discussed below.

Attended/
Unattended
Disconnect
(switch A1)

When the modem is used to originate calls, it will operate in one of two ways, depending on this option setting:

- If the attended disconnect setting is selected, modem line connection is controlled directly with the line-connect switch on the front of the unit. (Note: the line-connect switch option must also be enabled.) In this case, the modem will connect to line whenever the switch is set to the DA position and disconnect when the switch is returned to either the VO or MA position. (If an optional data telephone—either dataset control or telset control—is used, the modem will connect to line whenever the telephone exclusion key is placed in the DATA position and disconnect when the exclusion key is placed in the VOICE position.)
- If the unattended disconnect setting is selected, the modem will connect to line when the line-connect switch is first set to the DA position, then returned to either the VO or MA position. (If an optional data telephone—dataset control only—is used, the modem connects to line when the telephone is hung up.) The modem will automatically disconnect from line at the end of the call through one of the disconnect options described below.

NOTE: This option does NOT affect modem operation when answering calls. For manual answer operation, set the line-connect switch to the MA position when the modem is not in data mode; for automatic answer operation, set the line-connect switch to VO position.

Auto Disconnect/
Abort Timer
(switch B5)

With this option enabled, an internal abort timer automatically disconnects the modem from line if no carrier signal is received from the remote modem within approximately 25 seconds.

Auto Disconnect/
Loss of Carrier
(switch A7)

With this option enabled, the modem will automatically disconnect from line if the carrier signal from the remote modem is lost for more than 1 second.

Auto Disconnect/
Received SPACE
(strap b)

With this option enabled, the modem will automatically disconnect from line if a continuous SPACE signal is received for a period of 1.5 seconds.

Send SPACE on
Disconnect
(strap c)

This option is the complement of receive SPACE disconnect; it causes the modem to transmit a continuous SPACE signal for a period of 3 seconds when Data Terminal Ready (DTR) from the terminal equipment is turned OFF.

Terminal-Interface Options

Data Timing (switch B6)	This option selects either asynchronous or synchronous data format. If asynchronous operation is selected, ensure that Character Length option setting corresponds to character length used by the terminal. If synchronous operation is selected, select appropriate clock options discussed below.
Character Length (switches A3, A5)	This option is used for asynchronous operation to select character length (includes start, stop, and parity bits) used on the interface. See Table 5-1 for settings.
Transmit/Receive Clock (straps t, v)	This option connects Serial Clock Transmit and Serial Clock Receive to the interface for high-speed synchronous operation. If this option is enabled, SCT is connected to interface pin 15 and SCR is connected to pin 17.
External Transmit Clock (strap j)	This option connects External Serial Clock Transmit to the interface for applications where the terminal provides a 1200 Hz transmit clock. Used only for high-speed synchronous operation.
Slave Clock (strap d)	This option phase-locks Serial Clock Transmit to Serial Clock Receive for applications where the local modem transmitter timing must be slaved to the received data timing. Used only for high-speed synchronous operation.
Force Data Terminal Ready (switch B2)	If the terminal equipment does not control DTR (Data Terminal Ready), this option may be used to force DTR ON within the modem to enable unattended disconnect and/or automatic answer operation.
Delayed Carrier Detect (straps f, g)	The delayed setting inhibits CXR (Carrier Detect) until CTS (Clear To Send) is ON. The immediate setting causes the modem to set the CXR line as soon as it detects a valid signal from the remote modem.
Clear To Send Control (straps p, q)	For standard full-duplex protocol, CTS (Clear To Send) follows CXR (Carrier Detect). The CTS-follows-RTS setting allows controlled-carrier operation.
Terminal Control of Data Rate (strap k)	This option provides terminal control of data rate via pin 23 during call origination. With this option enabled and the front-panel speed-select switch set to the low-speed position, turning ON interface pin 23 will select high-speed (1200 bps) and turning OFF pin 23 will select low-speed (0-300 bps) mode.

Data Rate Indicator (strap r)	This option provides a data rate indication on interface pin 12. When this option is enabled, the modem turns ON pin 12 when operating at high speed and turns OFF pin 12 when operating at low speed.
Maximum Data Rate (switch B4)	This option sets the maximum input data rate to either 1204 bps (nominal) or 1219 bps. The higher data rate may be required where multiplexers or other peripheral equipment transmit above the nominal data rate.
Signal Common Reference (strap m)	This option connects signal common (interface pin 7) to chassis ground (interface pin 1) within the dialer if required by the installation.

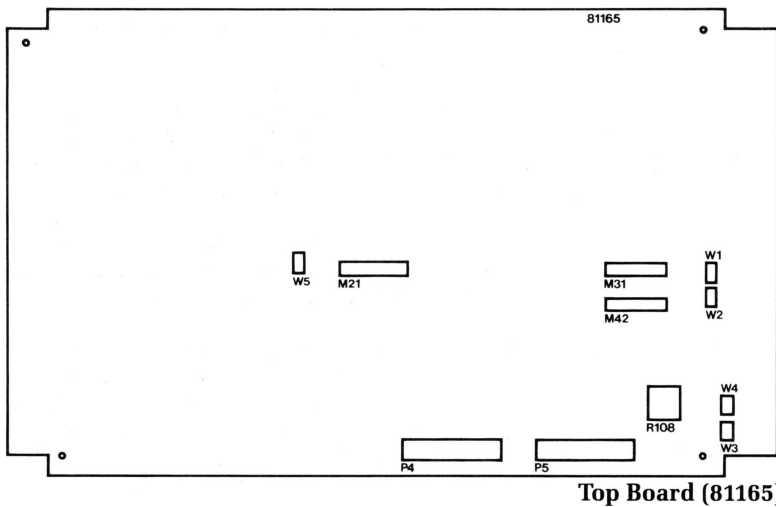
Test-Control Options

Terminal Control of Local Test/Busy Out (straps s, u, ab, ac)	<p>This option provides control of local test and/or busy out from the user terminal equipment in four ways, as follows:</p> <ol style="list-style-type: none"> 1. If the first setting (see Table 5-1) is selected, turning ON interface pin 18 causes the modem to busy out (go off hook) only, provided that Data Terminal Ready (DTR, pin 20) is OFF. If DTR is turned ON while pin 18 is ON, the modem will also enter ALB (local test). 2. If the second setting is selected, interface pin 25 performs the same function described above for pin 18. 3. If the third setting is selected, turning ON interface pin 18 will cause the modem to busy out the modem and enter ALB, independent of DTR. 4. If the fourth setting is selected, pin 25 will perform the same function as described for pin 18 in step 3 above.
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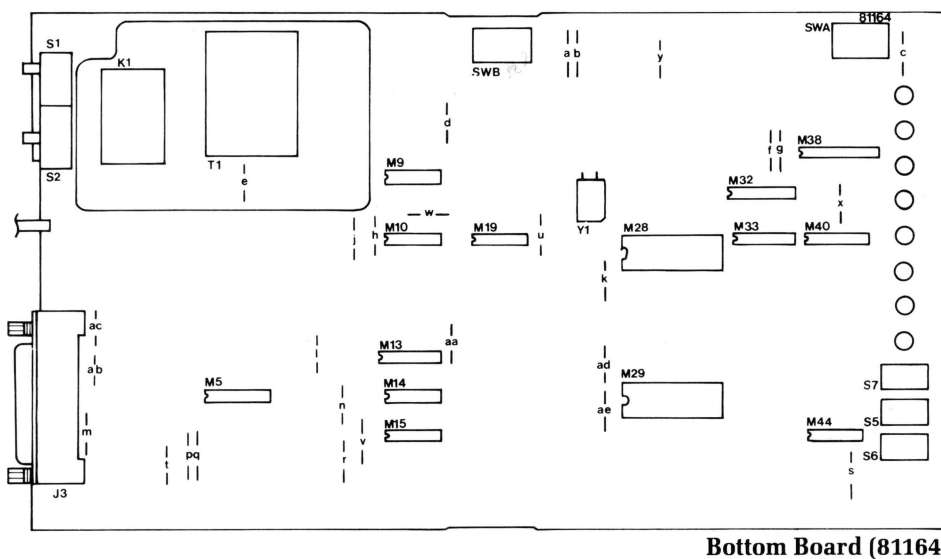
If this option is disabled, ALB and busy out are controlled from the rear-panel test switch only.

Remote Test (DLB) Select (switch B1)	This option selects either remote Digital Loopback (DLB) or local Digital Loopback (see Section 4) in high-speed mode. If remote DLB is selected, the local modem will initiate a test sequence on the remote modem when DLB is commanded (provided that the Respond-To-Remote-Test option is enabled on the remote modem.) If local DLB is selected, the local modem will loop received data back out through the transmitter when DLB is commanded.
Respond To Remote Test (switch A2)	This option is the complement of remote DLB described above; it allows the local modem to respond to a remote test initiated by the remote modem.

Terminal Control of Remote Test (strap n)	When this option is enabled, remote DLB may be initiated from the terminal equipment by turning ON interface pin 21.
Received Data in Remote Test (straps h, w)	This option provides user selection of received data (RXD) during remote test (DLB). If enabled, RXD is sent to the terminal equipment (at the receiving end) during DLB. If disabled, RXD is held at constant MARK during DLB.
Data Set Ready in Test (switch B7)	This option is used to turn ON Data Set Ready (DSR) in test mode (both ALB and DLB) for terminal equipment that requires DSR ON to function.
Test Mode Indicator (strap aa)	This option provides a test mode indication on interface pin 25. When this option is enabled, the modem turns ON pin 12 during test mode (both ALB and DLB). Terminal control of local test/busy out is available only via pin 18 if this option is enabled.



VA3450-02



VA3450-01

Figure 5-1. VA3450-Series Switch and Strap Locations

Table 5-1. VA3450-Series Options

Option Name	Switch/Strap Setting
Bottom Board (81164)	
<u>Attended/Unattended Disconnect</u> Attended* Unattended	A1 ON (P,S,G) OFF
<u>Respond To Remote Test</u> Enable* Disabled	A2 ON (P,S,G) OFF
<u>Character Length</u> 8 bits 9 bits 10 bits* 11 bits	A3 A5 ON ON OFF ON ON OFF (P,S,G) OFF OFF
<u>103 Operation</u> Enabled* Disabled	A4 ON (P,S,G) OFF
<u>Standard-Options Mode</u> Enabled* Disabled	A6 OFF (P,S) ON (G)
<u>Auto Disconnect/Loss of Carrier</u> Enabled* Disabled	A7 ON (P,S,G) OFF
<u>Remote Test (DLB) Select</u> Remote DLB* Local DLB	B1 ON (P,S,G) OFF
<u>Force Data Terminal Ready</u> Forced Controlled by Terminal	B2 ON (G) OFF (P,S)
<u>Mode Select</u> Answer only Originate/Answer*	B3 ON** OFF (P,S)
<u>Maximum Data Rate</u> 1205 bps* 1219 bps	B4 OFF (P,S,G) ON
<u>Auto Disconnect/Abort Timer</u> Enabled* Disabled	B5 ON (P,S) OFF (G)
<u>Data Timing</u> Synchronous Asynchronous*	B6 ON OFF (P,S,G)
<u>Data Set Ready in Test</u> DSR ON in Test* DSR OFF in Test	B7 OFF (P,S,G) ON
<u>Line Connection</u> Switched-Network* Leased-Line	a OUT (P,S) IN (G)

Table 5-1. VA3450-Series Options (cont'd)

Option Name	Switch/Strap Setting
Bottom Board (81164) (cont'd)	
<u>Auto Disconnect/Received SPACE</u> Enabled Disabled*	b OUT IN (P,S,G)
<u>Send SPACE on Disconnect</u> Enabled Disabled*	c OUT IN (P,S,G)
<u>Slave Clock</u> Enabled Disabled*	d IN OUT (P,S,G)
<u>Transmit Level</u> 0 dBm - 10 dBm Programmable	e l IN OUT (G) OUT IN (P) OUT OUT (S)
<u>Delayed Carrier Detect</u> Delayed Immediate	f g OUT IN IN OUT (P,S,G)
<u>Received Data in Remote Test</u> Enabled Disabled	h w OUT IN (P,S,G) IN OUT
<u>External Transmit Clock</u> Connected Disabled*	j IN OUT (P,S,G)
<u>Terminal Control of Data Rate</u> Controlled via pin 23 Disabled*	k IN OUT (P,S,G)
<u>Signal Common Reference</u> Connected to Chassis Ground Isolated from Chassis Ground*	m IN OUT (P,S,G)
<u>Terminal Control of Remote Test</u> Enabled Disabled*	n IN OUT (P,S,G)
<u>Clear To Send Control</u> CTS follows CXR CTS follows RTS	p q OUT IN (P,S,G) IN OUT
<u>Data Rate Indicator</u> Enabled Disabled	r IN OUT (P,S,G)
<u>Terminal Control of Local Test/Busy Out</u> Busy-out via pin 18 Busy-out via pin 25 ALB via pin 18 ALB via pin 25 Disabled*	s u ab ac OUT OUT OUT IN OUT OUT IN OUT IN OUT OUT IN IN OUT IN OUT — IN — — (P,S,G)

Table 5-1. VA3450-Series Options (cont'd)

Option Name	Switch/Strap Setting
Bottom Board (81164) (cont'd)	
<u>Transmit/Receive Clock</u> Connected to Terminal Disabled	t v IN IN (P,S,G) OUT OUT
<u>Line-Connect Switch</u> Connected Disabled	x IN (P,S) OUT (G)
<u>Mfg. Test/Memory Access</u> Internal ROM External ROM	y IN OUT (P,S,G)
<u>Test Mode Indicator</u> Enabled Disabled	aa IN OUT (P,S,G)
<u>Mfg. Test/Memory Size</u> 2K ROM 4K ROM	ad ae OUT IN (P,S,G) IN OUT
Top Board (81165)	
<u>Amplitude Equalizer</u> Enabled Disabled	W1 IN OUT (P,S,G)
<u>Phase Equalizer</u> Enabled Disabled	W2 IN OUT (P,S,G)
<u>Mfg. Test/Equalizer Bypass</u> Test (flat response) Normal operation	W3 IN OUT (P,S,G)
<u>Receiver Level</u> 0 to - 35 dBm - 13 to - 48 dBm	W4 IN OUT (P,S,G)
<u>Mfg. Test/Disable AGC</u> Test (AGC Disabled) Normal operation	W5 IN OUT (P,S,G)

NOTES: (P,S,G) Factory settings for each modem type

* Options selected when switch A6 is OFF (standard options mode)

** For leased-line application, one modem must be in answer-only, the other in originate/answer

— Indicates don't care

Section 6

SUPPLEMENTAL INFORMATION

EQUIPMENT INTERFACES

Terminal Equipment (RS232C) Interface

The terminal equipment interface consists of a 25-pin D-type connector located on the rear of the modem. This connector provides an RS232C connection between modem and terminal. Table 6-1 lists pin assignments for the interface connector, and each signal is described below by pin number. The modem displays eight of these signals for diagnostic use. These eight signals are identified by asterisks in the following list:

1. FG (Chassis Ground)—Common return to ac protective ground.
2. TXD (Transmitted Data)*—Serial data from terminal equipment to modem transmitter. Data will be accepted by the modem when the CTS (Clear To Send) signal is ON. When CTS is OFF, TXD is internally forced to the MARK condition. MARK = -3 to -25 V; SPACE = $+3$ to $+25$ V.
3. RXD (Received Data)*—Demodulated serial data from modem receiver to terminal equipment, active when the CXR (Carrier Detect) signal is ON. Held in MARK condition when CXR is OFF.
4. RTS (Request To Send)—Not used normally for full-duplex operation, this control signal from the terminal equipment may be optionally tied to CTS (Clear To Send) for controlled-carrier operation.
5. CTS (Clear To Send)*—Control signal from modem to terminal equipment indicating that modem is ready to transmit data. Normally active when CXR (Carrier Detect) signal is on, CTS is disabled during Digital Loop-back test mode.
6. DSR (Data Set Ready)*—Control signal from modem to terminal equipment indicating that modem is off hook (connected to the TelCo line). DSR may be ON or OFF in test mode, depending on user option selected.
7. SG (Signal Common)—Common ground reference point for all terminal interface circuits except chassis ground. May also be connected to chassis ground with user option.

8. CXR (Carrier Detect)*—Control signal from modem to terminal equipment indicating that the modem is receiving valid energy suitable for demodulation. Also called Receive Line Signal Detector.
9. +V (+12 V Test)—Positive dc test voltage, 1 kohm, nominal.
10. −V (−12 V Test)—Negative dc test voltage, 1 kohm, nominal.
11. Not used.
12. CI (Speed Indication)*—Control signal from modem to terminal equipment indicating operating speed of modem. If ON, modem is in high-speed data mode; if OFF, modem is in low-speed mode.
13. Not used.
14. Not used.
15. SCT (Serial Clock Transmit)—Timing signal from modem to terminal equipment indicating center of each transmitted signal element (data bit) when modem is operating in high-speed (1200 bps) synchronous mode. Data on TXD is sampled by modem on each negative (ON to OFF) transition of SCT. If the Slave Clock Control option is enabled, SCT is phase-locked to SCR. If the Transmit Clock Select is set to external, SCT is phase-locked to SCTE.
16. Not used.
17. SCR (Serial Clock Received)—Timing signal from modem to terminal equipment indicating center of each received signal element when modem is operating in high-speed synchronous mode. The negative transition of SCR specifies valid sample point for data on RXD.
18. CN (Test/Busy Out)—Optional control signal from terminal equipment to modem used to busy out modem and/or initiate local test mode. See Terminal Control of Local Test/Busy Out option in Section 5 for applications.
19. Not used.
20. DTR (Data Terminal Ready)*—Control signal from terminal equipment to modem indicating that terminal is ready for data communication. Prepares modem for (automatic) connection to the telephone line and maintains connection once established. In automatic answering application, the modem will connect to line when the trailing edge of the ring signal (RI) is received if this signal is ON.

21. RDL (Remote Digital Loopback)—Optional control signal from terminal equipment to modem used to initiate remote test mode. See Terminal Control of Remote Test option in Section 5 for applications.
22. RI (Ring Indicator)*—Control signal from modem to terminal equipment indicating that a ring signal has been detected (i.e., a call is being received).
23. SS (Speed Select)—Optional control signal from terminal equipment used to select data rate for originating a call. See Terminal Control of Data Rate option in Section 5.
24. SCTE (External Serial Clock Transmit)—Optional timing signal from terminal equipment to modem that clocks transmitted data as described previously under SCT. The clock must have a frequency of 1200 Hz $\pm 0.01\%$ with peak distortion of negative transitions no greater than 0.5% as per RE-334.
25. TM (Test Mode) or CN (Test/Busy Out)—This line may be configured as a test-mode indicator from the modem to the terminal, or as a local test control line from the terminal to the modem, depending on the user options selected. See Test Mode Indicator and Terminal Control of Local Test options in Section 5.

Table 6-1. RS232C (DTE) Interface Connector

Pin	VADIC Designation	EIA Designation	CCITT Designation	Function	Active State*
1	FG	AA	101	Chassis Ground	—
2	TXD	BA	103	Transmitted Data	E
3	RXD	BB	104	Received Data	E
4	RTS	CA	105	Request To Send	PL
5	CTS	CB	106	Clear To Send	PL
6	DSR	CC	107	Data Set Ready	PL
7	SG	AB	102	Signal Common	—
8	CXR	CF	109	Carrier Detect	PL
9	+ V	+ P	—	+ 12 Vdc through 1 kohm (test)	—
10	– V	+ P	—	– 12 Vdc through 1 kohm (test)	—
11	—	—	—	Not used	—
12	CI	CI	112	Speed Indication	PL
13	—	—	—	Not used	—
14	—	—	—	Not used	—
15	SCT	DB	114	Serial Clock Transmit	—
16	—	—	—	Not used	—
17	SCR	DD	115	Serial Clock Received	—
18	CN	CN	—	Busy out	PL
19	—	—	—	Not used	—
20	DTR	CD	108.2	Data Terminal Ready	PL
21	RDL	RL	—	Remote Digital Loopback	PL
22	RI	CE	125	Ring Indicator	PL
23	SS	CH	111	Speed Select	PL
24	SCTE	DA	113	External Serial Clock Transmit	—
25	TM/CN	TM/CN	—	Test Mode Indicator/Busy Out	PL

* PL = Positive TRUE logic

NL = Negative TRUE logic

E = Either state

TelCo Line Interface

The VA3450-series modem is supplied with an attached telephone interface cable terminated at one end with a miniature telephone connector that mates with standard jacks supplied by the telephone company. Pin assignments for standard telephone jacks are listed in Tables 6-2 and 6-3. Signal mnemonics used on the TelCo interface are defined in Table 6-4.

VA3450P Interface

The VA3450P cable is terminated in a 6-position connector that mates with a USOC RJ11C voice jack (or a RJ41S universal data jack) to form a permissive connection as defined by Part 68 of the FCC Rules and Regulations. Tables 6-2 and 6-3 list pin assignments for the RJ11C and RJ41S connectors, respectively.

VA3450S Interface

The VA3450S cable is terminated in an 8-position connector that mates with a USOC RJ41S or RJ45S data jack to form a programmed connection as defined by Part 68 of the FCC Rules and Regulations. Table 6-3 lists pin assignments for the RJ41S,45S TelCo interface connectors.

VA3450G Interface

The VA3453G model connects to a TelCo-supplied leased-line connection block with the VA881 adapter supplied with the modem. The cable terminates in spade lugs that connect to the telephone line as follows:

Red —Ring (one side of telephone line)
Green —Tip (other side of telephone line)
Yellow—Not used
Black —Not used

Table 6-2. RJ11C Connector Pin Assignments

Pin	Mnemonic	Function
1	—	Not used
2	MI	Mode Indicator
3	R	Ring
4	T	Tip
5	MIC	Mode Indicator Common
6	—	Not used

Table 6-3. RJ41S,45S Connector Pin Assignments

Pin	Mnemonic	Function
1	—	*
2	—	*
3	MI	Mode Indicator
4	R	Ring
5	T	Tip
6	MIC	Mode Indicator Common
7	PR	Programming Resistor
8	PRC	Programming Resistor Common

* Pins 1 and 2 are Ring and Tip for Fixed-Loss Loop (FLL) connections and are not used in RACAL-VADIC modems.

Table 6-4. TelCo Interface Signal Definitions

Mnemonic	Signal Name	Function
R	Ring	Connection to one side of telephone line.
T	Tip	Connection to other side of telephone line.
MI	Mode Indicator	Mode indication from voice/data telephone (if used). When closed to MIC, indicates that telephone is off hook and in DATA mode.
PR	Programming Resistor	Connection to resistor in TelCo data jack that sets modem gain for programmable connection (VA3450S version only).
MIC/PC	MI/PR Common	Common return for Mode Indicator and Programming Resistor signals.

SPECIFICATIONS

OPERATING CHARACTERISTICS		
Operating Modes	VA3450P/S	Manual originate, manual or automatic answer
	VA3453G	Constant or controlled carrier
Data Format	Serial, binary, synchronous or asynchronous	
Data Rate	Synchronous	
	3400 or	
	212 mode	1200 bps \pm 0.05%
	Asynchronous	
	3400 mode	1186 to 1024 bps or 1196 to 1219 bps, switch selectable, or 0 to 300 bps
	212 mode	1182 to 1212 bps
	103 mode	0 to 300 bps
Modulation	3400 and	Quadrature Amplitude Modulation (four-level PSK)
	212 mode	
	103 mode	Phase-coherent frequency-shift keyed (FSK)
Operating Frequencies		Transmit/Orginate
		Receive/Answer modes
		Receive/Orginate
		Transmit/Answer modes
	3400 mode	2250 Hz \pm 0.05%
	213 mode	1200 Hz \pm 0.05%
	103 mode	1270 Hz \pm 0.2% MARK
		1070 Hz \pm 0.2% SPACE
		2025 Hz \pm 0.2% SPACE
Transmit Level	VA3450P	- 10.5 dBm + 1 dB
	VA3450S	0 to - 12 dBm (set by TelCo jack)
	VA3450G	0 dBm \pm 1 dB

INTERFACES		
Terminal (DTE) Interface	Per EIA RS232C	
Line (TelCo) Interface	VA3450P	Permissive direct-connect per FCC Rules, Part 68
	VA3450S	Programmable direct-connect per FCC Rules, Part 68
	VA3450G	2-wire leased-line

LINE-CONTROL FUNCTIONS			
Carrier Detect (CXR) Delay		<u>OFF to ON</u>	<u>ON to OFF</u>
	3400 mode	25-35 ms	280 ms
	212 mode	231-238 ms	280 ms
	103 mode	100-200 ms	280 ms
Clear To Send Delay	3400 mode	50 ± 10 ms after Carrier Detect	
	212 mode	774 ± 27 ms after Carrier Detect	
	103 mode	265 ± 60 ms after Carrier Detect	
Abort Timer Detect	22 to 24 seconds ± 10% after billing delay if no Carrier Detect; user option		
Loss of Carrier Detect	1 second ± 10% after loss of Carrier Detect; user option		
Receive SPACE Disconnect	After 1.5 seconds ± 10% of continuous SPACE; user option		

ENVIRONMENTAL REQUIREMENTS			
Temperature	Operating:	0° to 50° C	
	Nonoperating:	– 20° to 70° C	
Humidity	Up to 90% relative humidity, without condensation		

PHYSICAL CHARACTERISTICS	
Height	2.55 in. (65 mm)
Width	7 in. (178 mm)
Depth	12 in. (305 mm)
Weight	4.81 lb. (2.17 kg) with power supply

POWER REQUIREMENTS
117 Vac ± 10%, 47 to 63 Hz, 12 watts maximum

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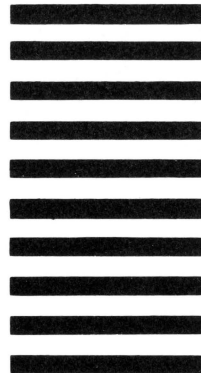
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During this warranty period, RACAL-VADIC INC. will, at no cost, promptly repair or replace any defective equipment returned to RACAL-VADIC INC., transportation charges prepaid by Buyer, and will return such equipment, transportation charges prepaid via the same or like method as received, except where special handling or shipment is requested by Buyer, in which case Buyer shall pay all such charges.

This warranty shall not apply to damage resulting from abuse, negligence, accident or loss or damage in transit. The warranty shall be voided should the Buyer attempt any repairs or alterations without prior written permission of RACAL-VADIC INC.

RACAL-VADIC INC. makes no other warranty, expressed or implied, and RACAL-VADIC INC. DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

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Repairs and/or replacement under the terms of this warranty SHALL NOT EXTEND THE WARRANTY LIFE OF THE ORIGINAL EQUIPMENT SUPPLIED.

Equipment returned to the factory should be accompanied by the following information: the reason for return, with a comprehensive description of the malfunction; shipping instructions; and the name and telephone number of a contact in the event of problems. Further inquiries may be directed to RACAL-VADIC's Customer Service Departments listed below.

RACAL-VADIC INC.
18W100-22nd Street, Suite 113
Oakbrook Terrace, Illinois 60181
Phone: (312) 932-9268

RACAL-VADIC INC.
12 Lakeside Office Park
Wakefield, Massachusetts 01880
Phone: (617) 245-8790

* RACAL-VADIC INC.
4720J Boston Way
Lanham, Maryland 20706
Phone: (301) 459-7430

* RACAL-VADIC INC.
2115 Arlington Downs Road
Arlington, Texas 76011
Phone: (817) 277-2246

* RACAL-VADIC INC.
222 Caspian Drive
Sunnyvale, California 94086-9874
Phone: (408) 744-0810

* Repair Center Location