



AT&T
Information Systems



USER'S MANUAL 202T MODEM

FCC WARNING STATEMENT

Federal Communications Commission (FCC) Rules require that you be notified of the following:

- This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications.
- It has been tested and found to comply with the limits for Class A computing device pursuant to Subpart J of Part 15 of the FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.
- Operation of this equipment in a residential area is likely to cause interference in which case the user at their own expense will be required to take whatever measures may be required to correct the interference.

USER'S MANUAL

202T MODEM

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INTRODUCTION

This manual gives you the information needed to install and test the 202T modem. Operating procedures are limited to the use of the test switches and lights. A brief physical and functional description is provided and is intended for those who understand data communications in general.

How to Use This Manual

To make the best use of this manual, take the time to read it through completely to become familiar with its contents and organization. Then, for quick access to information needed to answer most questions, you will only have to refer to that specific section.

To answer questions requiring more information than this manual contains, consult your Account Executive.

This manual is divided into six sections.

- **Description**—This section gives you a general description of the modem and briefly describes its capabilities. Also included is a description of the lights, switches, and optional units.
- **Installation Preparation**—This section tells you the environmental considerations, power and wiring requirements, and how to identify and choose the proper options for your modem.
- **Installation Procedures**—This section gives step-by-step instructions on how to install the options and the modem in a single or up to five modems in a multiple arrangement.
- **Testing Procedures**—This section allows you to verify the proper operation of the modem by telling you how to do various test procedures using the modem test switches and lights.
- **Service Information**—This section tells you how to obtain service for your modem.
- **Appendix**—The Appendix includes supplemental information including tables showing the Data Terminal Equipment (DTE) and private line pin assignments.

DESCRIPTION

This section provides a brief functional and physical description of the 202T modem. The functional description also provides the features available to the user. The physical description will enable the user to locate the various lights, switches, and options.

Functional Description

The 202T modem is a data communications device; permitting your data terminal to send and receive data up to 1400 bits per second (bps) without reverse channel and up to 1200 bps with reverse channel over your basic 3002 private lines. The modem sending data at speeds between 1400 and 1800 bps, require C2-conditioned 3002 private lines with or without reverse channel. In 2-wire service, the modem can be equipped with a reverse channel circuit pack for signaling speeds up to 5 bps in the opposite direction to the primary channel. In 2-wire service, the modem operates in the half-duplex mode (2-way nonsimultaneous). In 4-wire service, the modem operates in the full-duplex mode (2-way simultaneous). This operation is achieved by frequency shift keying (FSK) modulation techniques.

Features of the 202T Modem

The modem features include the following:

- Half-duplex (2-wire) or full-duplex (4-wire) operation
- Data rates from 0 to 1800 bps.
 1. With reverse channel, 0 to 1200 bps.
 2. Without reverse channel, 0 to 1400 bps.
 3. With or without reverse channel over C2-conditioned 3002 private lines, 0 to 1800 bps.
- Asynchronous, binary, and serial data operation.
- FSK modulation.
- Designed to be terminated with the 829 Network Interface in a single or multiple arrangement, 549A Jack, or 42A Connecting Block.
- Electronic Industries Association (EIA) standard RS-232-C Interface.
- Test switches and lights for performing self-tests and monitoring the status of the modem.
- Reverse channel (optional) that can be ordered separately.

Physical Description

The 202T modem is contained on a printed circuit wiring board and can be installed in a variety of configurations. The modem may be mounted in an aluminum 47B1 (stand-alone) data mounting with removable plastic front and rear covers, or in a 40B1 (multiple) data mounting housed in a data cabinet.

47B1 Data Mounting

The 47B1 data mounting measures 5.8 inches wide, 10.8 inches long, and 2.2 inches high. The weight with the modem installed without reverse channel is about 3.5 pounds. It weighs about 4 pounds with reverse channel. The 47B1 data mounting comes with a 6-foot power cord that plugs into a standard 117 Vac, 3-wire grounded outlet not under the control of a switch. The modem uses a maximum of 7 watts of power. Figure 1 shows a 202T modem installed in a 47B1 data mounting.

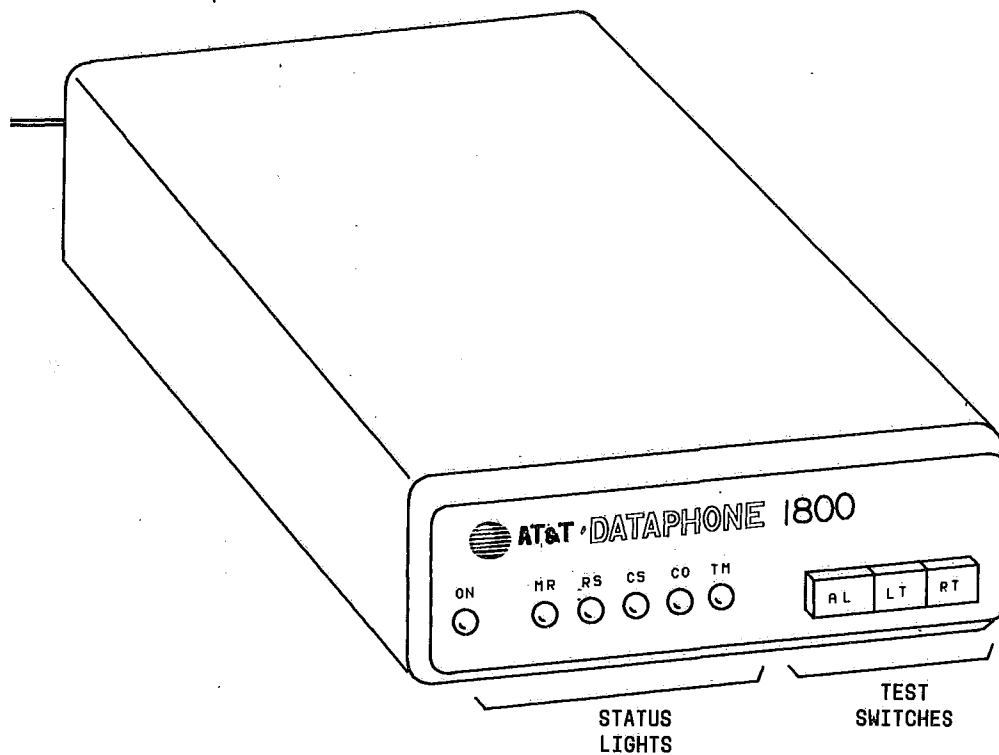


Figure 1. 202T Modem Front View

The 47B1 has cut-outs for two interface connectors and a power cord on the rear. One connector provides the interface between the modem and your Data Terminal Equipment (DTE). The other connector provides the interface between the modem and the private line network. Figure 2 shows the rear view of a 202T modem installed in a 47B1 data mounting.

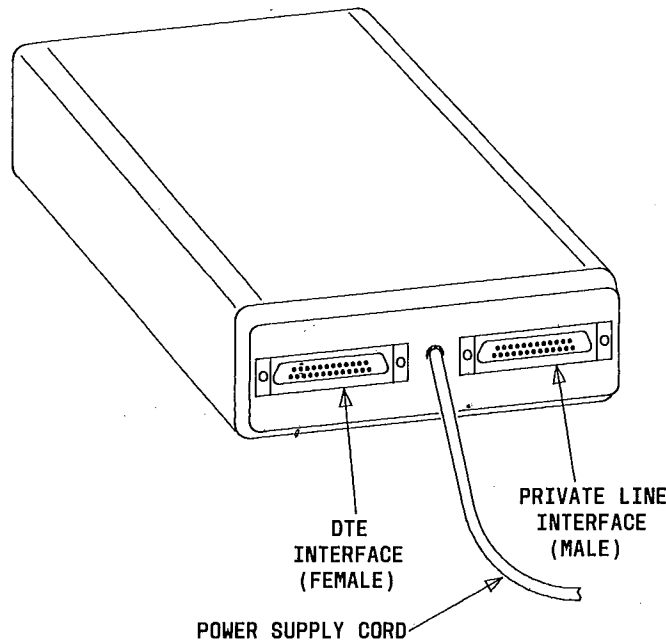


Figure 2. 202T Modem Rear View

40B1 Data Mounting

The 40B1 data mounting is installed on 23-inch framework within a data cabinet. The data mounting measures 23 inches wide (including mounting bracket), 13.5 inches long, and 7 inches high. The weight of the data mounting is about 21 pounds without any modems installed.

The 40B1 data mounting includes a 4-foot power cord with a 3-wire male plug on one end and a 3-wire twist-lock female connector on the other end.

Every slot in the data mounting is wired, making it possible to install up to 16 modems without reverse channel and 8 modems with reverse channel.

202T Modem Lights

The 202T modem has six status lights behind the front cover. Each light, when on illuminates a portion of the front cover displaying a 2-letter graphic. The lights and their functions are described below:

- **ON**—The ON light is illuminated as long as power is available at the modem, and must be lighted for the modem to function.

- MR—(Modem Ready): Illuminated when the data-set-ready lead is **high**. Modem ready **on** means the modem is ready for data communications.
- RS—(Request-to-Send): Illuminated when the request-to-send lead is **high**. The request-to-send indication is a signal to the modem from the terminal equipment to transmit data.
- CS—(Clear-to-Send): Illuminated when the clear-to-send lead is **high**. The clear-to-send indication is a signal to the terminal equipment from the modem to begin transmission.
- CO—(Carrier On): Illuminated when the received-line-signal detector lead is high. Carrier On means a proper line signal is being received by the modem.
- TM—(Test Mode): Illuminated when any of the test switches are pressed, but will extinguish if an error is detected in the local self-test mode.

Note: The TM, MR, RS, CS, and CO lights are illuminated when the Remote Test (RT) or Local Self-Test (LT) switch is pressed, if the modem is being used for 2-wire operation. If the modem is being used for 4-wire operation, only the TM light is illuminated when the remote test (RT) switch is pressed; however, all lights are illuminated when the Local Self-Test (LT) switch is pressed.

202T Modem Switches

The 202T modem has three switches on the front panel. The Analog Loopback (AL) test and Remote Test (RT) switches are push-to-operate, push-to-release, and are used for local and remote testing of the modem. The Local Self-Test (LT) switch is nonlocking, and is used for local testing of the modem. For normal data operation, all of these switches should be in the out (released) position. When operated, the switches condition the modem as follows:

- AL—(Analog Loopback): This switch connects the output of the modem transmitter to the input of the modem receiver. The line is disconnected from the modem, and the modem-ready circuit is held OFF.
- LT—(Local Self-Test): This switch connects the transmitter output to the receiver input and conditions the modem to operate with built-in word generator and word comparator circuits. The line is disconnected from the modem, and all the modem output circuits at the DTE interface are held OFF.
- RT—(Remote Test): The functions performed by the RT switch depend on whether the modem is arranged for 2-wire or 4-wire operation. In both 2- and 4-wire operation, the output circuits to the DTE interface are held OFF.

With 2-wire operation, the modem is conditioned similar to the local self-test mode except the modem is connected to the line. This allows the modem to be tested from a remote location.

With 4-wire operation, the output of the demodulator is connected to the input of the modulator to loopback incoming signals from a remote location.

INSTALLATION PREPARATION

This section provides information for preparing to install a 202T modem in a single arrangement or up to 48 modems in a multiple arrangement.

Power

Electrical power is supplied to single modem installations by an external transformer which plugs into a 105- to 129-volt, at 57- to 63-Hz nonswitched 3-wire outlet that you must provide. The transformer is protected internally against overload. Multiple modem installations (rack or cabinet) are powered by an ac power supply in the data mounting that connects to the nonswitched 3-wire outlet that you provide. These power outlets should be easily accessible to the modem and should be served from the same ac distribution panel as the DTE. The power outlets should not share power with other electrical devices that may cause noise. The power required per modem is about 7 watts. The power outlet(s) should not be under the control of a switch.

Caution: Your power outlet should have a plastic cover. However, if your outlet has a metal cover do not remove the center screw to mount the transformer. When this screw is removed it is possible for the metal cover to fall across the prongs of the transformer.

Components requiring outlets include:

- The 202T modem.
- An 829 network interface.
- Your DTE.

Tools Required

A standard screwdriver, wire cutters, and wire stripper are required if you use a 42A Connecting Block or 505A Jack / 549A Plug private line network interface. No special tools are required if you use an 829 Network Interface. A standard screwdriver is required when you change the modem options. Cords are installed, in general, by connecting cables and cords to the modem connectors. Refer to the illustration for installation instructions for that station arrangement.

Environmental Requirements

The modem should be located on a table, shelf, or in a data cabinet within 50 feet of its DTE. The modem will operate over an ambient temperature range of 40 degrees Fahrenheit with a relative humidity of 20 to 95 percent at 70 degrees Fahrenheit and 20 to 40 percent at 120 degrees Fahrenheit.

Note: These environmental conditions apply only if condensation does not accumulate on the internal modem components.

Cabling

You must provide a DTE interface cord not to exceed 50 feet in length equipped with a Cinch or Cannon DB-19604-432 plug equipped with a DB-51226-1 hood (or equivalent). This cord is connected to the 25-pin female connector at the rear of the modem.

The private line must meet the transmission requirements of the 3002 channel. As part of the private line channel service, an 829 network interface, or 549A Jack, or 42A Connecting Block is provided. The 202T modem may be located as far as 1000 feet from its network interface.

To minimize inductive interference to data signals on the private (data) line channel, the channel should not be located in the same run as the cable between the modem and the DTE, or lines connected to teletypewriter services. If this condition cannot be met, it will be necessary to run the channel wiring in shielded cable between the modem and the cable distribution terminal or building entrance. The shield should be grounded at the distribution terminal only.

Cabinets

The cabinets used for multiple modem arrangements are designated 17-inch data cabinet (one 40B1 data mounting), 30-inch data cabinet (two 40B1 mountings), and 72-inch data cabinet (three or four 40B1 data mountings). Each cabinet is made of aluminum with a clear anodized finish and a perforated rear panel of black anodized aluminum. The front panel is tinted plastic, so the modem lights can be seen from outside the cabinet. A data cabinet is shown in Figure 3.

The outside dimensions and weight of the data cabinets are as follows.

- 17-inch data cabinet - 17 inches high, 24 inches wide, and 19 inches deep. It weighs 23 pounds.
- 30-inch data cabinet - 30 inches high, 24 inches wide, and 19 inches deep. It weighs 34 pounds.
- 72-inch data cabinet - 72 inches high, 28.5 inches wide, and 26 inches deep. It weighs 230 pounds.

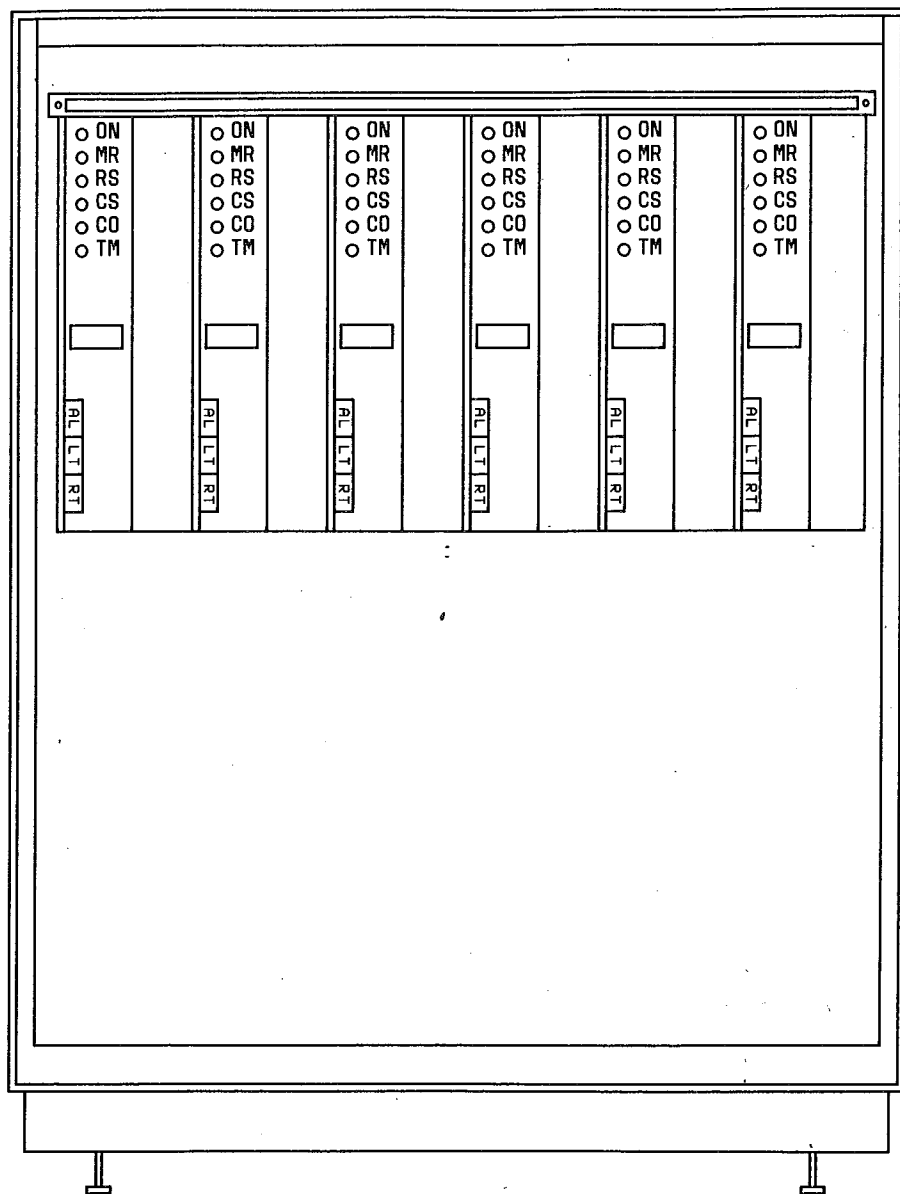


Figure 3. Data Cabinet

The 202T Modem Options

The 202T modem is provided with numerous options that should be selected prior to placing the modem in service. These options must be compatible with your DTE. Check your DTE manual for options that may be required. Figure 4 shows the location of the option switches. Removal of the reverse channel circuit pack is described in the INSTALLATION PROCEDURES section under Installing 202T Modem Options.

The option switches or strap is used to select the various options. The options for the 202T modem are listed in Table A. The options marked "factory-provided" are the most commonly used. The recommended options for 2-wire private line and 4-wire private line with talk-back using the 202T series modems are listed in Table B. The recommended options for 4-wire point-to-point and multipoint without talk-back using the 202T series modems are listed in Table C.

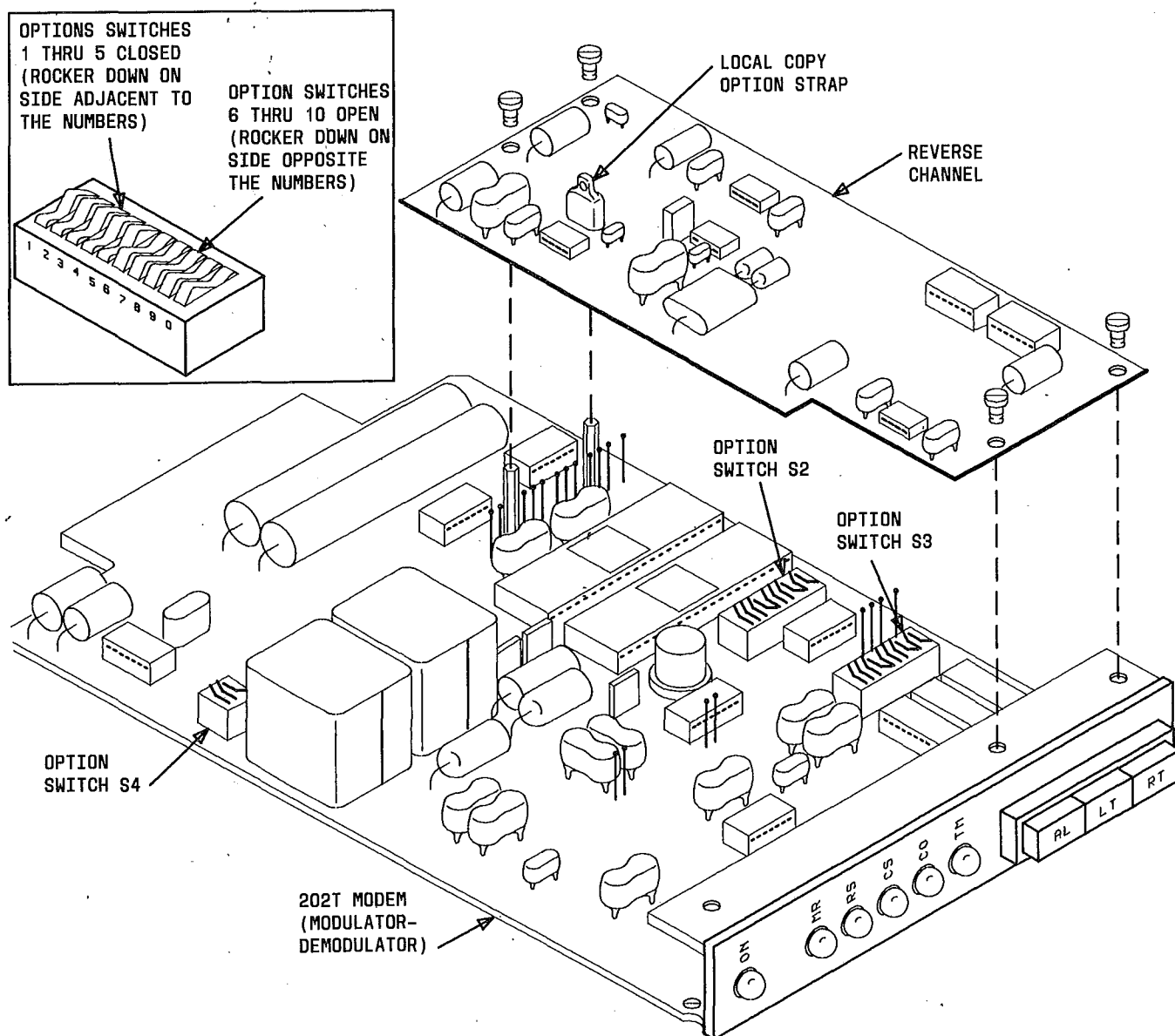


Figure 4. Location of Option Switches

TABLE A
202T MODEM OPTIONS

FEATURE	OPTION	DESCRIPTION		SWITCH SETTING										PROVIDE
				S3 SWITCH CONTACT SETTING ON TRANSMITTER-RECEIVER										
				1	2	3	4	5	6	7	8	9	0	
4-Wire Operation	ZK*			0	-	-	0	-	X	X	X	X	X	One Per Modem
2-Wire Operation	ZD	w/o Reverse Channel		X	-	-	X	-	X	0	0	0	0	
	ZC†	With Reverse Channel		X	-	-	X	-	0	0	0	0	0	
Compromise Delay Equalization	ZV	Minimum		-	X	-	-	-	-	-	-	-	-	One Per Modem
	ZU*	Maximum		-	0	-	-	-	-	-	-	-	-	
Compromise Amplitude Equalization	ZX	Minimum		-	-	-	-	X	-	-	-	-	-	One Per Modem
	ZW*	Maximum		-	-	-	-	0	-	-	-	-	-	
Channel Condition	ZZ	C2		-	-	X	-	-	-	-	-	-	-	One Per Modem
	ZY*	Basic		-	-	0	-	-	-	-	-	-	-	
				S2 SWITCH CONTACT SETTING ON TRANSMITTER-RECEIVER										
				1	2	3	4	5	6	7	8	9	0	
4-Wire Operation	ZK*			X	-	-	-	-	-	-	-	-	-	One Per Modem
Local Copy on Primary Channel in 2-Wire	ZA	In		X	-	-	-	-	-	-	-	-	-	
	ZB†	Out		0	-	-	-	-	-	-	-	-	-	
Soft Turnoff and Squelch Intervals		SOFT TURNOFF	SQUELCH											One Per Modem
	Z	0	0	-	X	-	-	-	0	X	0	-	-	
	Y*	8 ms	0	-	X	-	-	-	0	0	0	-	-	
	X	24 ms	0	-	X	-	-	-	0	0	X	-	-	
	W	0	9 ms	-	0	-	-	-	0	X	0	-	-	
	V	0	156 ms	-	0	-	-	-	X	X	0	-	-	
	T	8 ms	9 ms	-	0	-	-	-	0	0	0	-	-	
	S	8 ms	156 ms	-	0	-	-	-	X	0	0	-	-	
R	24 ms	156 ms	-	0	-	-	-	X	0	X	-	-		
Fast Carrier Detection	Q*	In		-	-	0	-	-	-	-	-	-	-	One Per Modem
	N	Out		-	-	X	-	-	-	-	-	-	-	
Clear-to-Send Interval	M*	8 ms		-	-	-	0	-	-	-	-	-	0	One Per Modem
	K	30 ms		-	-	-	0	-	-	-	-	-	X	
	J	60 ms		-	-	-	X	-	-	-	-	-	0	
	G	180 ms		-	-	-	X	-	-	-	-	-	X	

TABLE A (Contd)
202T MODEM OPTIONS

FEATURE	OPTION	DESCRIPTION	SWITCH SETTING										PROVIDE
External Control of CC (Data Set Ready)	B*	In	-	-	-	-	-	-	-	0	-	One Per Modem	
	A	Out	-	-	-	-	-	-	-	X	-		
Clamp	F*	In	-	-	-	-	0	-	-	-	-	One Per Modem	
	E	Out	-	-	-	-	X	-	-	-	-		
			S4 SWITCH CONTACT SETTING ON TRANSMITTER-RECEIVER										
			1	2	3								
Carrier Detector Reset	ZL	In	-	X	-								One Per Modem
	ZM*	Out	-	0	-								
Continuous Carrier	ZN	In	X	-	-								One Per Modem
	ZO*	Out	0	-	-								
State of CC (Data Set Ready) During Analog Loopback	YB	On	-	-	X								One Per Modem
	YA*	Off	-	-	0								
Local Copy on Reverse Channel	ZE ZF†	In Out	STRAPPING ON REVERSE CHANNEL CP										One Per Modem
			Install E21-E22 Install E21-E23										
Grounding Option (Modem)	ZG* ZH	Signal Ground Connected to Frame Ground Signal Ground Not Connected to Frame Ground	SCREW SWITCH S1 SETTING ON INTERFACE CIRCUIT										One Per Modem
			S1 Closed S1 Open										
Grounding Option (Data Mounting)	ZI* ZJ	Signal Ground Connected to Frame Ground Signal Ground Not Connected to Frame Ground	STRAPPING ON 40B1 DATA MOUNTING										
			Wire Strap if Power Supply In Wire Strap if Power Supply Out										

X Rocker down on side adjacent to numbers.

0 Rocker up on side adjacent to numbers.

- Rocker may be in either position.

* Factory furnished.

† Factory furnished instead of 4-wire option when reverse channel CP is installed.

TABLE B

**RECOMMENDED OPTIONS FOR 2-WIRE PRIVATE LINE AND
4-WIRE PRIVATE LINE WITH TALK-BACK USING THE 202T-SERIES MODEM**

OPTION	NEAR END	FAR END 202C, 202D, OR 202R (NOTE)
Received Data Squelch	156 ms	IN
Clear-to-Send Delay	180 ms	200 ms
Fast Carrier Detection	OUT (Normal) (23 ms)	40 ms
Soft Carrier Turnoff	24 ms	IN
Received Data Clamp	IN	IN
Alternate Voice	Optional	Optional
Switched Network Backup	Optional	Optional
Reverse Channel	Optional in 2-Wire Private Line	Optional in 2-Wire Private Line*
Carrier Detector Reset	Not Used	Not Offered
Local Copy	Optional in 2-Wire Private Line	Always Provided for 2-Wire Modem
Continuous Carrier	OUT—Carrier Under Control of Request-to-Send	Carrier Controlled by Request-to- Send†

Note: If far-end modem is a 202T-series the recommended options are the same as those for the near end.

* Not offered with the 202R modem.

† Not offered with the 202C or D modem.

TABLE C

**RECOMMENDED OPTIONS FOR 4-WIRE POINT-TO-POINT AND
MULTIPOINT WITHOUT TALK-BACK USING THE 202-SERIES MODEM**

OPTION	RECOMMENDATION
Clear-to-Send Delay	8 ms if remote modem is a 202T-series with fast mode carrier detection. 30 ms if remote modem is a 202T-series with normal mode carrier detection or a 202R, 202D5, or D6 with 40-ms carrier detector timing. 60 ms if remote modem is a 202C, 202D3, 202D4, or a 202R, 202D5, or 202D6 with the 40-ms carrier detector timing.
Fast Carrier Detection	IN (fast mode) if remote modem is a 202T-series with 8-ms clear-to-send delay. OUT (normal mode) if remote modem is optioned for 30- 60- 180- or 200-ms clear-to-send delay.
Soft Carrier Turnoff	24 ms if remote modem is a 202C, 202D3, D4, D5, D6, 202R, or 202T with normal mode fast carrier detection.* 8 ms if remote modem is a 202T-series with fast carrier detection option. Quick turnoff if remote modem uses carrier detector reset option.
Received Data Clamp	IN
Carrier Detector Reset	IN—at master station of broadcast polling or bridge — multipoint system when remote modem use the quick carrier turnoff and master station is able to implement this circuit. OUT—all other times.
Continuous Carrier	IN—for point-to-point applications and for modem as master station of split bridge multipoint systems. OUT—may be used for above applications and should be used for modem at the remote station of split bridge multipoint system.
Alternate Voice	Optional (with 829 network interface).
Switched Network Backup	Optional (with 829 network interface).

* The 202T-series modem must be optioned for the 8-ms or quick turnoff interval when the interval between consecutive turnoffs of the request to send circuit is less than 165 ms.

The options and their functions are described next:

- **2-Wire Operation:** This option is used when 2-wire facilities are selected and half-duplex service is satisfactory. The 2-wire option can be selected with reverse channel (ZC) or without reverse channel (ZD). If option ZC is selected, the modem must be equipped with a reverse channel circuit pack, and option ZE or ZF must be selected. If option ZD is selected, the reverse channel circuit pack must be physically removed from the modem.
- **4-Wire Operation:** This option is used when 4-wire point-to-point or multipoint facilities are selected. The 4-wire option used with 4-wire facilities provides duplex capability.

- **Compromise Delay Equalization:** Option ZV (minimum compromise delay equalization) provides reduced envelope delay distortion compensation to eliminate an overequalization condition on channels with low envelope delay distortion. Option ZU (maximum compromise delay equalization) provides the same delay equalizer characteristics provided on modems without the delay equalizer options. For data bit rates above 1200 bps, it is necessary to perform a data distortion test to determine the proper delay equalizer option setting.

Note: If the necessary equipment to perform the compromise delay and compromise amplitude equalization tests is not available, the optimum setting where minimum errors occur should be used.

- **Compromise Amplitude Equalization:** Option ZX (minimum compromise amplitude equalization) effectively removes compromise amplitude equalization, and is required on lines with high-end delay distortion near the upper limit and amplitude distortion near the lower limit of the 3002 specification. Without this option, this combination of distortions may cause parity errors at 1200 bps. Option ZW (maximum compromise amplitude equalization) provides the same amplitude equalization as the 202T modem.
- **Channel Condition:** These options modify the demodulator for operation over C2-conditioned lines (ZZ) or basic lines (ZY).
- **Local Copy on Primary Channel in 2-Wire:** With this option installed, the receiver continuously monitors the transmitted line signal while in the data mode and provides a local copy on the received data circuit.
- **Soft Turnoff and Squelch Intervals:**

1. When a data terminal turns request-to-send **off** at the end of a message, transients occur which may cause spurious signals to be received at a distant station. With the soft carrier turnoff option, the modem transmits out-of-band carrier (900 Hz) for a period of either 24 or 8 ms after request-to-send is turned **off**. This option should be used in conjunction with the received data clamp option and results in a steady mark on the received data circuit of the remote modem. The 8-ms option should be used when the remote modem has the fast received line signal detector option. The 24-ms option should be used when the remote modem is 202D, 202R, or 202T series with the normal received line signal detector option. However, the 24-ms option must not be used when the interval between consecutive turnoffs of request-to-send circuits is less than 165 ms. Neither the 8- nor 24-ms option should be used at the remote stations of a multipoint system when intermessage intervals are less than 10 ms. For this case, the 0-ms (quick turnoff) option should be used (at the remote stations) in conjunction with the received data clamp and the carrier detector reset options (at the master station). With the 0-ms (quick turnoff) option, carrier will be turned off in less than 1 ms after the request-to-send circuit is turned **off**.

Note: In 2-wire applications for terminals which immediately turn **on** request-to-send as soon as the received line signal detector goes **off**, the 8-ms soft turnoff option is incompatible with the 8-ms clear-to-send interval option, and the 24-ms soft turnoff option is incompatible with the 8- and 30-ms clear-to-send interval options.

2. In half-duplex operation on 2-wire facilities, when a station that has been transmitting has its request-to-send circuit turned **off**, the telephone line may reflect signals (echoes) back to that station for a period up to the

round trip delay of the circuits (about 1 ms per 100 miles each way). The squelch option when used with the received data clamp option prevents the demodulator of the station that has been transmitting from delivering these reflections as data to the received data circuit. The 202T-series modems provide for either 9-, 156-, or 0-ms (no squelch) options. The 156-ms option is recommended for use on 2-wire private line facilities and on 4-wire private lines with talk-back. The 9-ms option may be used on 2-wire private line facilities less than 50 miles. On facilities longer than 50 miles, the 9-ms option may be used only if the customer terminal is able to ignore echoes. The no squelch (0-ms) option should be used on 4-wire modems and may be used on 2-wire modems if the data terminal is able to ignore echoes.

- **Fast Carrier Detection:** The 202T modem is provided with an option for either normal or fast response of the carrier detector to an incoming data signal. With the fast carrier detection-out option (N), the received line signal detector turns **on** in less than 20 ms if data signals are received and turns **off** in about 10 ms if data signals are not received. This option is compatible with the clear-to-send interval options in the 202C, 202D, 202E, and 202R modems and is recommended when the distant modem has either the 180-, 60-, or 30-ms clear-to-send interval. With the fast carrier detection-in option (Q), the received line signal detector circuit turns **on** in about 6 ms if marking carrier is received. The circuit will turn **off** in about 5 ms for carrier frequencies between 860 Hz and 940 Hz (soft carrier turnoff). If the carrier frequencies are outside of these limits, but are within the limits for the normal mode, the normal mode response times will occur. This option must be used when the remote modem uses the 8-ms clear-to-send interval option.
- **Clear-To-Send Interval:** The **on** condition of the clear-to-send circuit from the modem is a response to an **on** condition on the request-to-send circuit delay by a time interval which permits the modem to establish operations with the remote receiver. The 202T modem provides four clear-to-send interval options: 180, 60, 30, and 8 ms.
 1. **180 ms:** This option is recommended for use on 2-wire private line facilities greater than 400 miles round trip and is required when the remote modem has the 156-ms squelch option.
 2. **60 and 30 ms:** The 60- and 30-ms options should be used on 4-wire point-to-point and multipoint facilities to be compatible with the turn-on time of the received line signal detector of the 202C, 202D, and 202R modems.
 3. **8 ms:** This option is recommended for use on full-duplex multipoint systems requiring fast start-up of the modem and is compatible only with the 202T modem at the distant end. With this option, the data terminal must keep the transmitted data circuits in the mark state when request-to-send is **on** until the clear-to-send indication is given. The distant modem must be optioned for fast carrier detection.
- **External Control of CC (Data Set Ready):**
 1. When this option is installed, the data set ready (CC) lead is externally controlled by the 829 network interface, or equivalent line terminating unit. This indicates to the DTE when the private line channel is in a maintenance mode or other test condition.
 2. When this option is not installed, the data set ready lead is always **on** except when the modem is in one of the three test modes.
- **Clamp:** With the received data clamp installed, the clamp circuit will squelch the received data circuit when the received line signal detector is **off**. If desired by the

customer, the clamp circuitry associated with the received line signal detector may be disabled. The 202T modem with option E (clamp out) installed is less affected by noise.

- **Carrier Detector Reset:** The 202T modem provides a carrier detector reset interface circuit on pin 25 of the DTE interface. This interface circuit is provided for turning **off** the received line signal detector circuit in less than 0.2 ms for those cases where the 0-ms soft turn-off interval of the distant modem is used to minimize the time between received messages at the master station of a split bridge multipoint system. If this circuit is not used by the DTE, this option should not be installed in the modem, because noise may trigger the circuit if it is not held **off** by the DTE.
- **Continuous Carrier:** With the continuous carrier option installed, carrier is transmitted as long as the modem is in the data mode. The clear-to-send circuit remains **on**; therefore, options M, K, J, and G (clear-to-send intervals) are inoperative. This option may be used on full-duplex facilities and in transmit-only service over 2-wire facilities. With the carrier under control of request-to-send, carrier is transmitted in less than 1 ms after the request-to-send circuit is turned **on**. This option is required to control the direction of data transmission in half-duplex operation over 2-wire facilities. It may also be used in full-duplex services to provide a means of signaling the remote terminal (for example, carrier-off could be used as an out-of-service indication).
- **State of CC (Data Set Ready) During Analog Loopback:** With option YB (ON), the data set ready circuit turns **on** during the analog loopback test mode when the DTE ready circuit is turned **on**. This permits testing with the DTE. With option YA (OFF), the data set ready circuit is clamped **off** during the analog loopback test mode.
- **Local Copy on Reverse Channel:** With the option installed, the receiver monitors the reverse channel transmitter and provides a local copy on the secondary received line signal detector (SCF) circuit. The local copy signal is delayed less than 50 ms.
- **Compromise Equalization:** Option ZV (minimum compromise equalization) provides reduced envelope delay distortion compensation to eliminate an overequalization condition on channels with low envelope delay distortion. Option ZU (maximum compromise equalization) provides the same equalizer characteristics provided on modems without the equalizer options (series 5 and lower). For data bit rates above 1200 bps, it is necessary to perform a data distortion test to determine the proper equalizer option setting.
- **Grounding Options:** Protective and signal grounds are normally cross-connected together by means of a screw switch on the interface circuit, located at the inside rear of the housing or by strapping on data mounting power supplies. This arrangement is intended to provide additional margin for longitudinal power line noise. The screw switch or strapping may be opened with due consideration given to possible noise conditions, ground potential differences, safety conditions, local electrical codes, and the data terminal manufacturer's recommendations.

Note: A long screwdriver (6-inch) is needed to operate the screw switch that controls the grounding option. If the appropriate screwdriver is not available, the backplane may be taken out of the housing by removing the two screws on the bottom of the housing.

INSTALLATION PROCEDURES

This section provides instructions for installing a 202T modem in a single arrangement and up to 48 modems in a multiple arrangement. There are three standard terminations for a 3002 data channel in AT&T Information Systems. They are the 829 Network Interface, 549A Jack, and the 42A Connecting Block as shown in the connection diagrams. Two arrangements show locally engineered private line terminations.

Connections to the private lines must be made with the cords to the network interface shown in the connection diagrams in this section.

The network interface cord should not be placed close to the DTE cord or any other cord that may provide interference to the data signals.

The DTE interface connector pin assignments and the telephone connector pin assignments are listed in Tables D and E, respectively, located in the Appendix.

Installing 202T Modem Options

The 202T modem is provided with numerous options that must be selected before using the modem. These options, listed in Table A, must be compatible with your DTE.

Options for the 202T modem are installed primarily by setting switches and an option strap on the reverse channel circuit pack (Figure 4).

After the units are unpacked and protective coverings are removed, the option switches on the 202T modem, without reverse channel, are already exposed. To gain access to and set option switches on the modem with reverse channel, it will be necessary to do the following:

Note: When the modem is not in its mounting, place on a clean, dry, nonconductive surface.

1. Remove the reverse channel circuit pack by removing the four screws and exerting steady upward pressure at the front and rear of the circuit pack (see Figure 4).
2. Set option switches according to Table A.
3. Replace reverse channel circuit pack by aligning the female connectors on the bottom of the circuit pack with the contact posts on the modem.
4. Press down on the circuit pack until it makes good contact with the posts and front edge is resting on top of the faceplate.
5. Insert and tighten the retaining screws.
6. Remove the front cover of the mounting by gently squeezing it at the top and rotating it down and out of the data mounting.
7. Slide the circuit pack into the data mounting.
8. Align and tighten the retaining screw under the left-front side of the data mounting, if provided.
9. Hook the tabs on the bottom of the front cover into the detents in the bottom of the data mounting.
10. Gently rotate the top of the front cover into the data mounting until it snaps into place.

To remove the modem from its mounting, reverse the procedure outlined above.

The options installation procedure is complete.

The installation procedures using the three standard terminations and two locally engineered methods are provided next.

4-Wire Modem Terminated by a 42A Connecting Block

The installation procedure is as follows:

1. Verify that all parts required are available as shown in Figure 5.
2. Unpack the equipment and cords, and remove any protective coverings.

Note: Tighten the screws provided on all connections to ensure good electrical contact and to hold the connections in place.

3. Insert the DTE cable into the 25-pin female interface connector located on the rear of the modem.
4. Insert the M8K cord into the other 25-pin male interface connector located on the rear of the modem.
5. Remove the top cover of the 153C adapter by removing the hood anchoring screws, and move the hood forward to expose the pressed-board liner.
6. Remove the pressed-board liner.
7. Connect the station wire to the appropriate screw terminals on the 153C adapter as shown in the connection diagram.
8. Replace the pressed-board liner, metal hood, and tighten the hood anchoring screw and cord entrance clamping screw.
9. Connect the other end of the station wire to the screw terminals on the 42A connecting block.
10. Plug the 202T modem transformer into a power outlet. The modem light should be on. If the modem light is off and power is applied, refer to the SERVICE INFORMATION section to correct the problem.
11. Perform the self-test procedures described in the TESTING PROCEDURES section.

The installation procedure is complete.

3. Insert the DTE cable into the 25-pin female interface connector located on the rear of the modem.
4. Insert the M8K cord into the other 25-pin male interface connector located on the rear of the modem.
5. Remove the top cover of the 153C adapter by removing the hood anchoring screw, and move the hood forward to expose the pressed-board liner.
6. Remove the pressed-board liner.
7. Connect one end of the station wire to the appropriate screw terminals on the 153C adapter as shown in the connection diagram.
8. Replace the pressed-board liner, metal hood, and tighten the hood anchoring screw and cord entrance clamping screw.
9. Remove the cap of the 505A Plug by removing the screw in the center of the cap.
10. Remove the cord fastener by pulling it out of the grooves in the cord channel.
11. Position the station wire into the cord channel of the plug.
12. Fit the cord fastener into the groove in the cord channel and press until it snaps into position.
13. Connect the other end of the station wire into the socket-type terminals as shown in the connection diagram.
14. Dress the conductors so they will not obstruct the center of the cord tip guide.
15. Position the cap assembly on cord tip guide and plug; check that the cord leads are not pinched and replace screw.
16. Insert the 505A plug into a 549A jack.
17. Plug the 202T modem transformer into a power outlet. The modem light should be on. If the light is off and power is applied, refer to the SERVICE INFORMATION section to correct the problem.
18. Perform the self-test procedures described in the TESTING PROCEDURES section.

The installation procedure is complete.

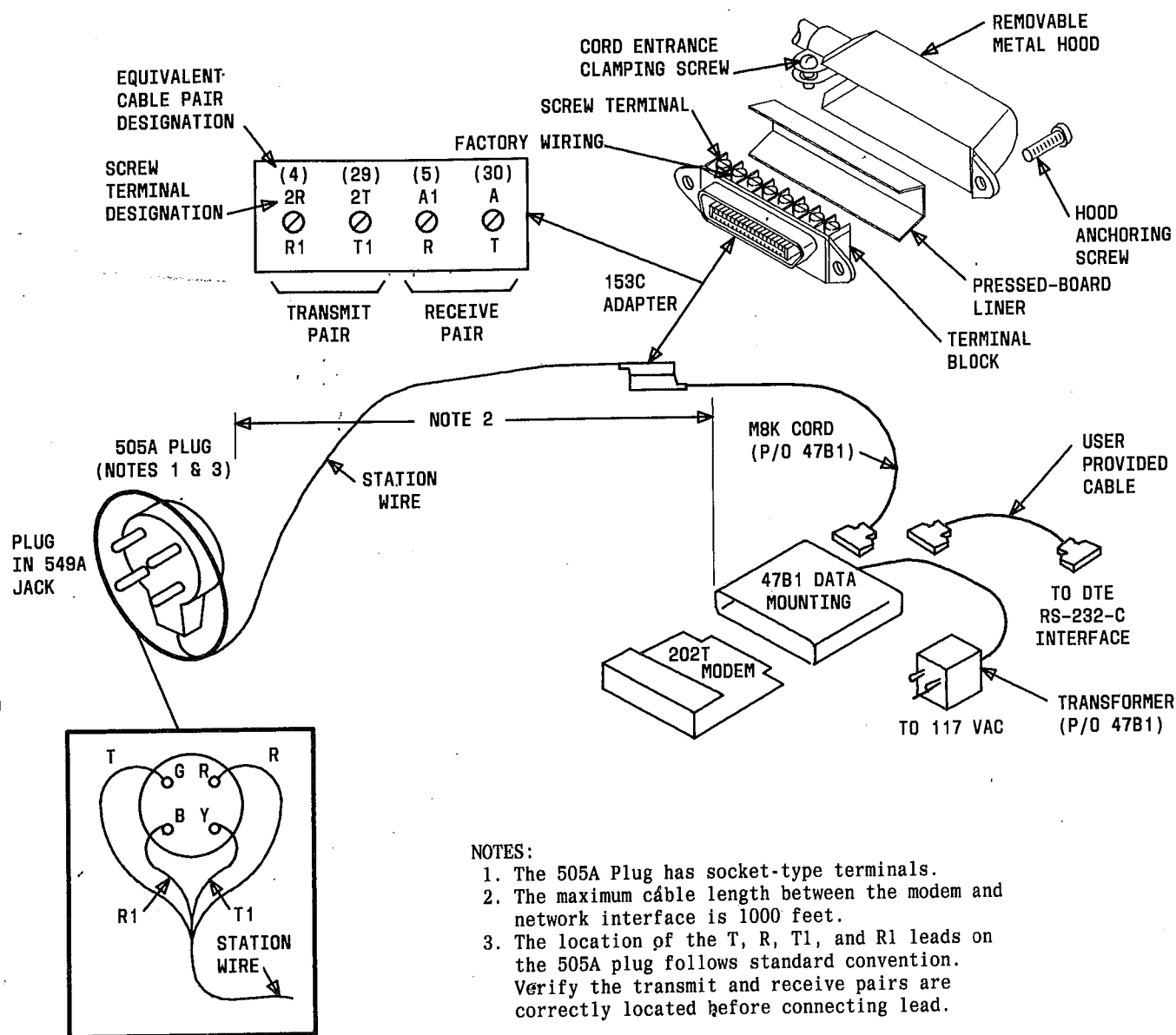


Figure 6. 4-Wire Modem Terminated by a 549A Jack

4-Wire Modem on 4-Wire Private Line With the 829 Network Interface Data Only

The installation procedure is as follows:

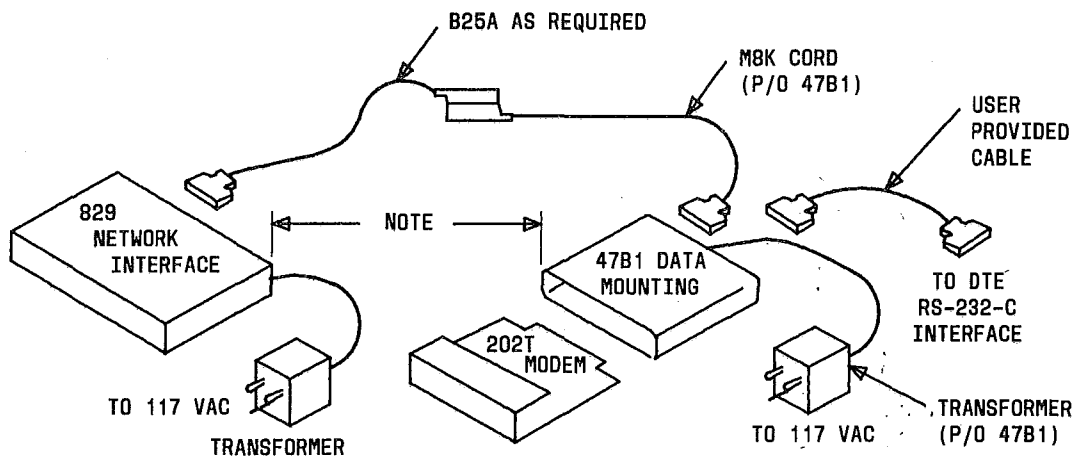
1. Verify that all parts required are available as shown in Figure 7.

Note: Tighten the screws provided on all connections to ensure good electrical contact and to hold the connections in place.

2. Insert the DTE cable into the 25-pin female interface connector located on the rear of the modem.

3. Insert the M8K cord into the other 25-pin male interface connector located on the rear of the modem. Use B25A cable as required.
4. Insert the other end of the M8K cord into the male interface connector located on the rear of the 829 network interface.
5. Connect the 6-foot power cord with the transformer attached, to the appropriate screw terminals on the 829 network interface. Refer to the connection diagram.
6. Plug the 202T modem transformer into a power outlet.
7. Plug the transformer of the network interface in a power outlet. The modem light should be on. If the light is off and power is applied, refer to the SERVICE INFORMATION section to correct the problem.
8. Perform the self-test procedures described in the TESTING PROCEDURES section.

The installation procedure is complete.



NOTE:

This distance is limited to a maximum of 1000-feet for the 202T modem.

Figure 7. 4-Wire Modem on 4-Wire Private Line With the 829 Network Interface, Data Only

4-Wire Modem Connected to Locally Engineered Private Line Termination Without the 829 Network Interfaces

The installation procedure is as follows:

1. Verify that all parts required are available as shown in Figure 8.

Note: Tighten the screws provided on all connections to ensure good electrical contact and to hold the connections in place.

2. Insert the DTE cable into the 25-pin female interface connector located on the rear of the modem.
3. Insert the M8K cord into the other 25-pin male interface connector located on the rear of the modem.
4. Insert the other end of the D25D-61 cord into the 66E3 connecting block.
5. Plug the 202T modem transformer into a power outlet. The modem light should be on. If the light is off and power is applied, refer to the SERVICE INFORMATION section to correct the problem.
6. Perform the self-test procedures described in the TESTING PROCEDURES section.

The installation procedure is complete.

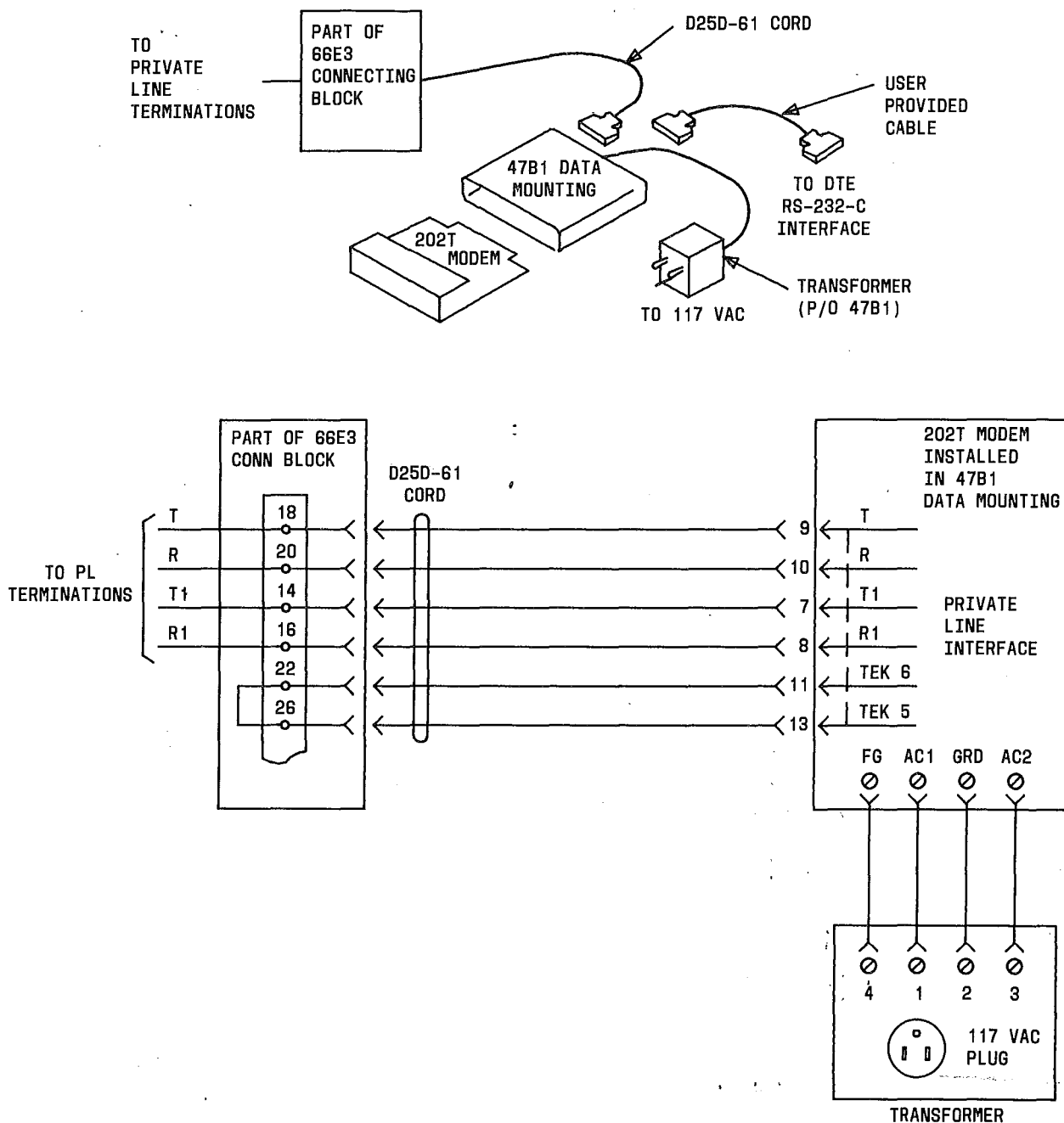


Figure 8. 4-Wire Modem Connected to Locally Engineered Private Line Termination

2-Wire Modem Connected to Locally Engineered Private Line Termination

The installation procedure is as follows:

1. Verify that all parts required are available as shown in Figure 9.

Note: Tighten the screws provided on all connections to ensure good electrical contact and to hold the connections in place.

2. Insert the DTE cable into the 25-pin female interface connector located on the rear of the modem.
3. Insert the D25D cord into the other 25-pin male interface connector located on the rear of the modem.
4. Insert the other end of the D25D cord into the 66E3 connecting block.
5. Plug the 202T modem transformer into a power outlet. The modem light should be on. If the light is off and power is applied, refer to the SERVICE INFORMATION section to correct the problem.
6. Perform the self-test procedures described in the TESTING PROCEDURES section.

The installation procedure is complete.

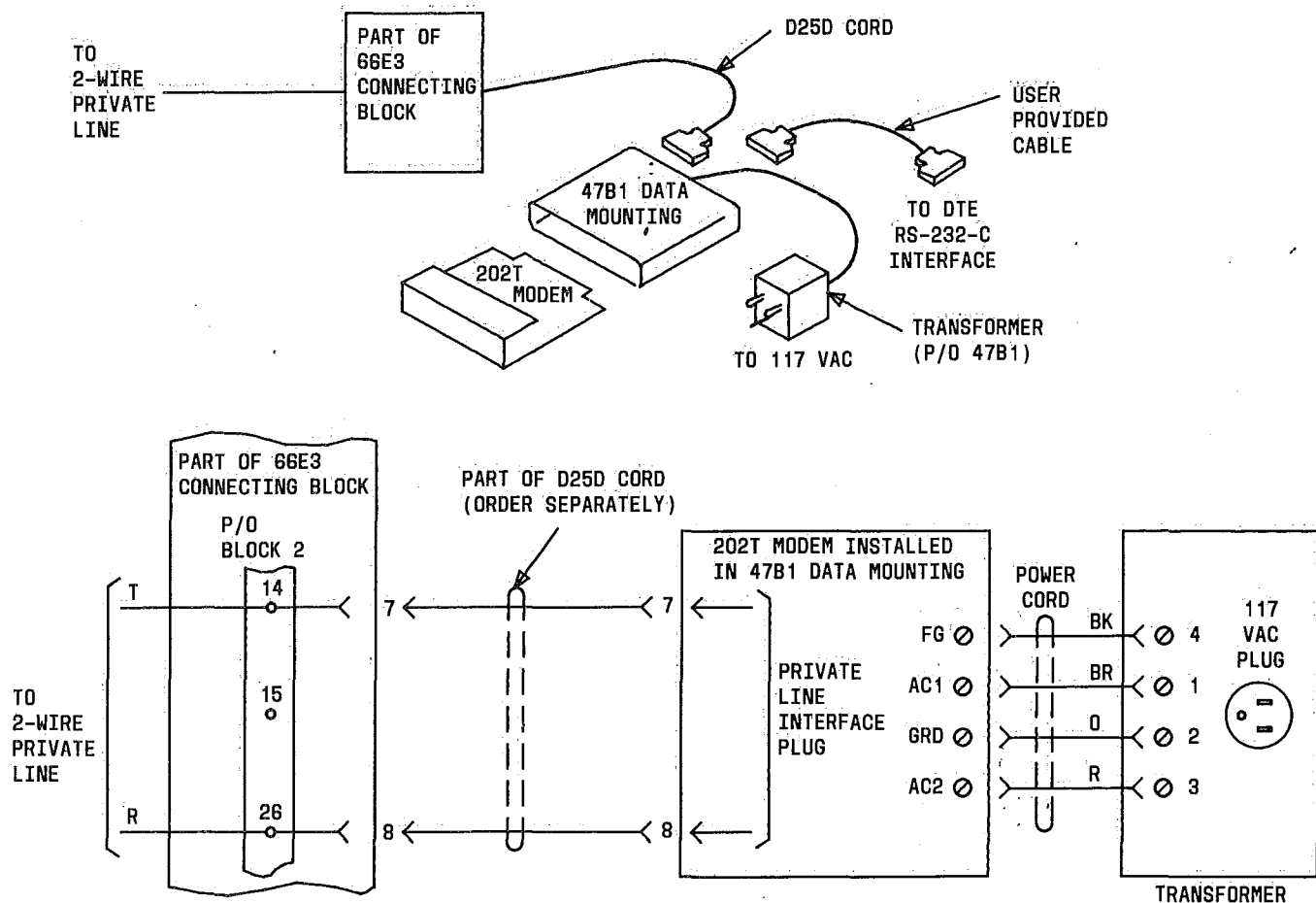


Figure 9. 2-Wire Modem Connected to Locally Engineered Private Line Termination

Multiple Modem Installation

A private line data station with eight modems in a 30-inch data cabinet is shown in Figure 10. A grouping adapter is used to combine up to eight M8K cables (from the modems) into one B25A cable. The B25A cable is used if the distance between the modem and the 829

network interface exceeds the length of the M8K cables. Another grouping adapter is then used to expand the B25A cable back into eight cables for connection to eight network interfaces.

Follow these procedures for installing modems in a 17-, 30-, and 72-inch data cabinet.

Do the following:

1. Verify the modems, M8K cords, B25A cables, grouping adapters, and cabinet necessary to complete the installation are available.
2. Unpack the cabinet, and remove any protective coverings.
3. Position the cabinet near your power outlet and DTE cables. A minimum 2 inches is required between the cabinet and the wall for enough ventilation.
4. Install the power strip in the 6- or 12-modem cabinet. The 24-modem cabinet comes equipped with a power strip.
5. Fasten the grouping adapters, if required, on the rear panel of the 6-modem cabinet or near the bottom of the mounting racks of the 24-modem cabinet.
6. Secure the data mounting to the front flange of both uprights with four 12-24 by 1/2-inch screws (supplied with the data mounting).
7. Remove the retainer strip from the data mounting by pulling out on the black knob at each end.
8. Set the modem options and insert the modems into the appropriate slot; press firmly into place. Repeat this step until all modems are installed.
9. Replace the retainer strip.
10. Connect one DTE cable to the 25-pin DTE interface connector of each modem at the rear of the cabinet. Secure the DTE cables with cable ties, and route downward and out of the cabinet.
11. Connect one M8K cord to the other 25-pin connector of each modem. Route cords to the top of the data mounting, and fasten with cable ties. Then route three M8K cords each to the right and left.
12. Connect the M8K cords to the network interface, or to the grouping adapter. If you are using the grouping adapter, connect a B25A cable to the grouping adapter and to a similar adapter at the network interface location. Connect M8K cords from this adapter to the network interface for each modem.
13. Connect the power cord to each twist-lock connector on each modem. Connect the power cord to the power strip.
14. Connect the power strip to the power outlet. Observe each modem ON light is on. If an ON light is off and power is applied, refer to the SERVICE INFORMATION section.
15. Perform the self-test procedures described in the TESTING PROCEDURES section.
16. Repeat Steps 8 through 15 for each data mounting within your cabinet.

The installation procedure is complete.

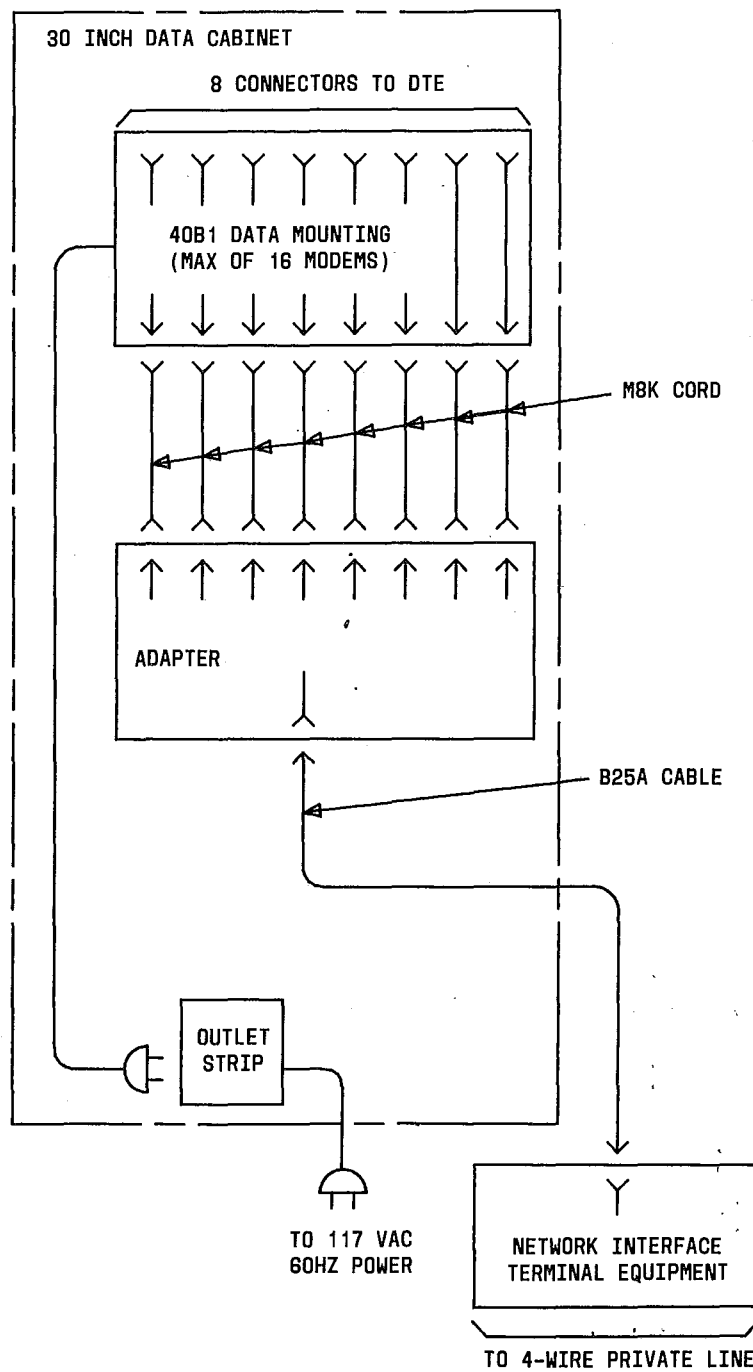


Figure 10. Block Diagram of 30-Inch Data Cabinet Equipped With Eight Modems

TESTING PROCEDURES

To ensure that your equipment is operating properly, the 202T modem has local self-test, analog loopback, and remote test modes. These test modes can also help to identify and isolate equipment trouble.

The test modes operate by pressing the particular test switches to the IN position and observing the lights on the front of the modem. Provided is a brief description of each test followed by the procedure.

Local Self-Test

The local self-test checks for proper operation of the modem modulator and demodulator. Perform the test as follows:

- Press, and hold the Local Self-Test (LT) switch for about 15 seconds.

All lights should be on.

- Observe the Test Mode (TM) lights while the LT switch remains pressed.

If the TM light stays on, the modem passes this test, and the test is completed.

If the TM light goes off, indicating that an error has occurred, repeat the test by releasing and pressing the LT switch again. The modem should pass (TM light remains on) four out of five 15-second tests. If these tests fail, refer to the SERVICE INFORMATION section.

- Release the LT switch at the end of the test.

The modem is restored to normal operation.

Analog Loopback Test

When the locking AL switch is pressed, the modem may be tested by applying signals to the DTE interface and monitoring the outputs and status lights. Perform the test as follows:

- Press the locking AL switch.

The TM light should be on.

The MR light should be off during the entire test.

- Press, and release the AL switch when the test is complete.

Remote Test (4-Wire Operation)

This test allows a data terminal or a test center at the other end of the private line channel to send and receive test sequences to check the operation of the modem and the transmission facilities. Perform the test as follows:

- Press the locking RT switch when instructed to do so by the station or test center performing the test.

The TM light should be on. The modem is in a digital loopback mode. In this mode, a data signal received from the other end is returned (looped back) to that end.

- Press, and release the RT switch when instructed to do so.

The TM light should go off.

Remote Test (2-Wire Operation)

When the locking RT switch is pressed, the modem transmits a 63-bit random word to the test center or remote station to test the transmitter and the transmission facilities. The word is also looped back internally and compared to the original word. The test center may introduce an error by transmitting a signal to the modem. Perform the test as follows:

- Press the locking RT switch when instructed to do so by the station or test center performing the test.

All the lights should be on.

- Press, and release the RT switch when instructed to do so.

The lights should return to their normal condition.

SERVICE INFORMATION

The ON light on the front of the modem is on when power is applied. If the ON light is off and power is applied, check the fuse located on the back of the modem next to the 117 Vac connector. Remove the cap, and replace the fuse, if required, with the attached spare fuse.

In addition to checking the fuse, the modem does not require routine maintenance or adjustments. If the ON light on the front of the modem is not on after the new fuse is replaced and power is applied or if other trouble is traced to the modem, follow the directions below.

Defective Units

If the unit fails and is under lease or warranty or covered under an AT&T Information Systems Maintenance contract, call your AT&T service number.

If the unit is not under lease or warranty and not covered by an AT&T Information Systems maintenance contract, call your AT&T branch office for advice.

APPENDIX

TABLE D

DTE INTERFACE

LEAD NO.	FUNCTION	EIA DESIGNATION (RS-232-C)
1	Protective Ground*	AA
2	Transmitted Data	BA
3	Received Data	BB
4	Request-to-Send	CA
5	Clear-to-Send	CB
6	Data Set Ready	CC
7	Signal Ground	AB
8	Received Line Signal Detector	CF
9	Positive 14 Volts	-†
10	Negative 14 Volts	-†
11 & 19	Secondary Request-to-Send	SCA
12	Secondary Received Line Signal Detector	SCF
25	Carrier Detector Reset	Unassigned

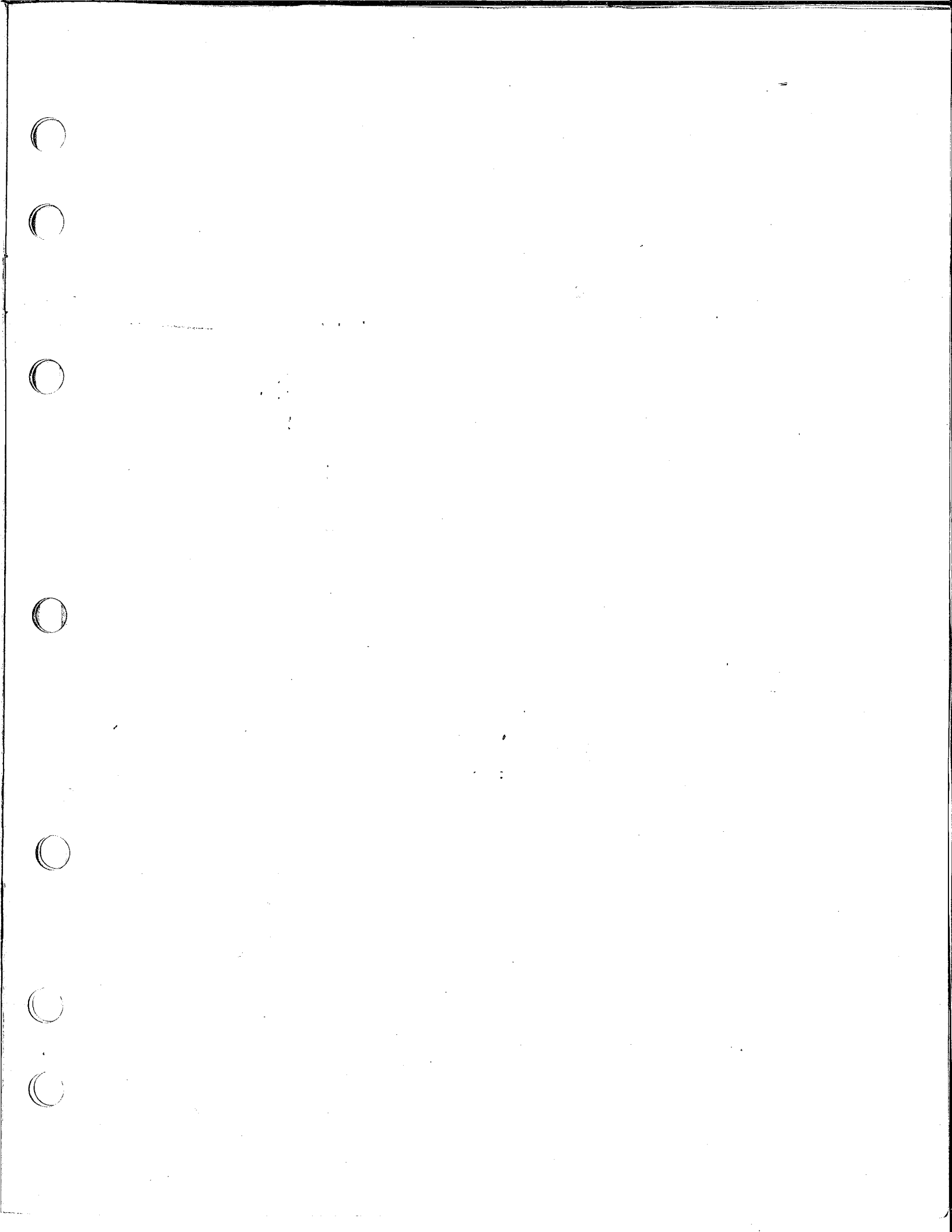
* Not provided on later models of the 202T modem.

† Reserved for modem testing.

TABLE E

PRIVATE LINE INTERFACE

PIN NUMBER	DESIGNATION	DESCRIPTION
7	T1	First tip and ring pair. In 2-wire operation, the data signals are transmitted and received through these terminals. In 4-wire operation, data signals are transmitted through these terminals.
8	R1	
9	T	Second tip and ring pair. In 2-wire operation, these terminals are not used. In 4-wire operation, data signals are received through these terminals.
10	R	
11	TEK6	A relay contact (provided by the 829 network interface) may be connected to these terminals to remotely control the data set ready (CC) and clear-to-send (CB) DTE interface drivers.
13	TEK5	



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