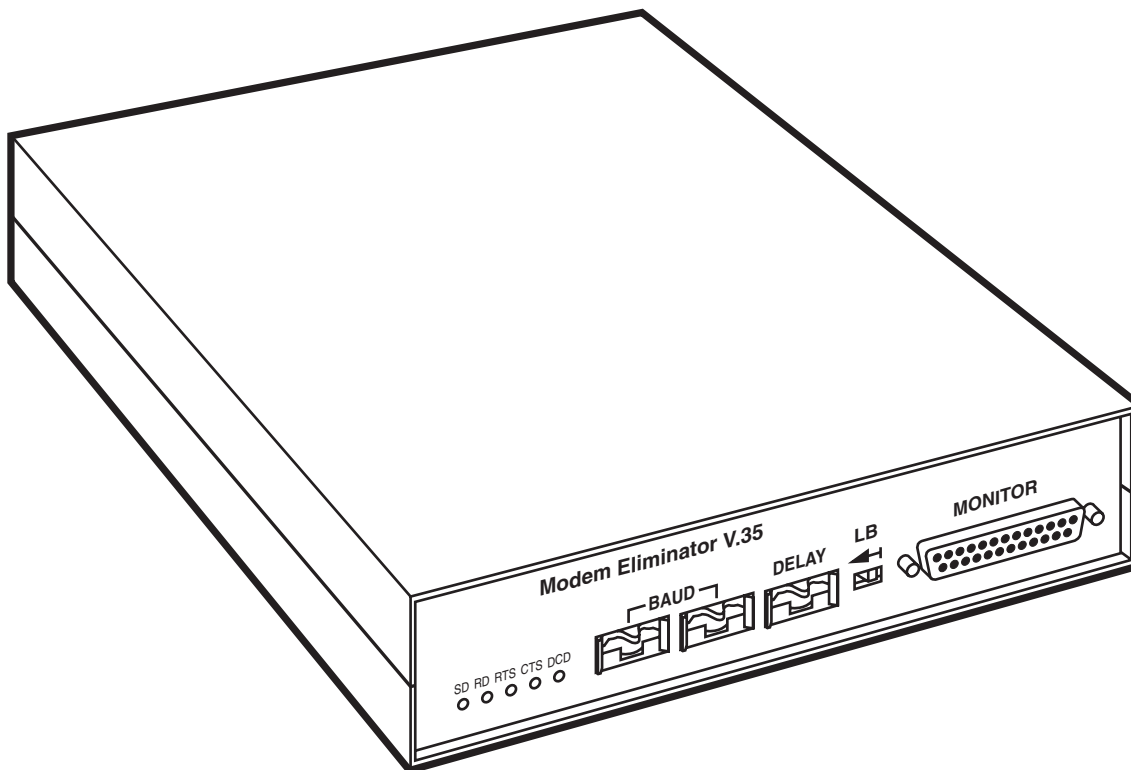




V.35, RS-530, and RS-232 Modem Eliminators



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RADIO-FREQUENCY INTERFERENCE STATEMENTS**

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A 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 when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

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Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

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INSTRUCCIONES DE SEGURIDAD (Normas Oficiales Mexicanas Electrical Safety Statement)

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
 - A: El cable de poder o el contacto ha sido dañado; u
 - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
 - C: El aparato ha sido expuesto a la lluvia; o
 - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
 - E: El aparato ha sido tirado o su cubierta ha sido dañada.

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1. Specifications

Compliance:	FCC Part 15 Class A, IC Class/classe A
Interface:	ME110A: ITU V.35 (data ports standard, monitor port proprietarily pinned out on DB25); ME111A: ITU V.35, all ports proprietarily pinned out on DB25; ME112A: EIA/TIA RS-530; ME113A: EIA/TIA RS-232
Protocol:	Synchronous or asynchronous
Clock Source:	Internal or external from either DTE (user-selectable)
Data Format:	Synchronous: 8 data bits; Asynchronous: Transparent to data format
Flow Control:	Transparent to software flow control; does not support hardware flow control, but emulates RTS/CTS delay
Operation:	Point-to-point
Data Rate:	Any of 52 user-selectable data rates from 2.4 kbps to 6.144 Mbps (see Section 3.1.3)
Maximum Distance:	From data or monitor port to attached device: ME113A: Up to 50 ft. (15.2 m) at up to 20 kbps; with low-capacitance cables, it might be possible to run farther; All other models: 4000 ft. (1219.2 m) with 24-AWG cable at data rates up to 100 kbps; above 100 kbps, drops proportionally as data rate rises, down to 65 ft. (19.8 m) at 6.144 Mbps
User Controls:	(4) Front-mounted: (2) “BAUD” thumbwheel switches for data rate; (1) “DELAY” thumbwheel switch for RTS/CTS delay; (1) Recessed “LB” slide switch to start/stop bidirectional loopback; (2) Internal: (1) 8-position DIP switch for sync/async, clock source, RTS/CTS and RTS/DCD operation, and reclocking enable/disable; (1) Reclock-mode jumper
Indicators:	(5) Front-mounted LEDs that show the state of SD/TD, RD, CTS, RTS, and DCD on data port J1
Connectors:	Data ports: ME110A: (2) M/34 (“34-pin M-block”) female; All other models: (2) DB25 female; Monitor port (all units): (1) DB25 female
Leads Supported:	See Appendix

MTBF:	263,000 hours
Temperature Tolerance:	Operating: 32 to 104°F (0 to 40°C); Storage: -4 to +158°F (-20 to +70°C)
Humidity Tolerance:	Up to 95% noncondensing
Enclosure:	Steel
Power:	Input: 115 VAC at 50 to 60 Hz, directly from AC outlet through detachable 6-ft. (1.8-m) power cord, IEC 320 inlet, and internal power supply; Consumption: 5 watts
Size:	1.5"H x 6.9"W x 8.6"D (3.8 x 17.5 x 21.8 cm)
Weight:	5 lb. (2.3 kg)

2. Introduction

You can use your V.35, RS-530, or RS-232 Modem Eliminator to connect one DTE (host, PC, or terminal) directly to another without needing to use modems or line drivers, as shown in Figure 2-1. You'll just run cables from each of the DTEs and attach them to the Modem Eliminator's data ports.

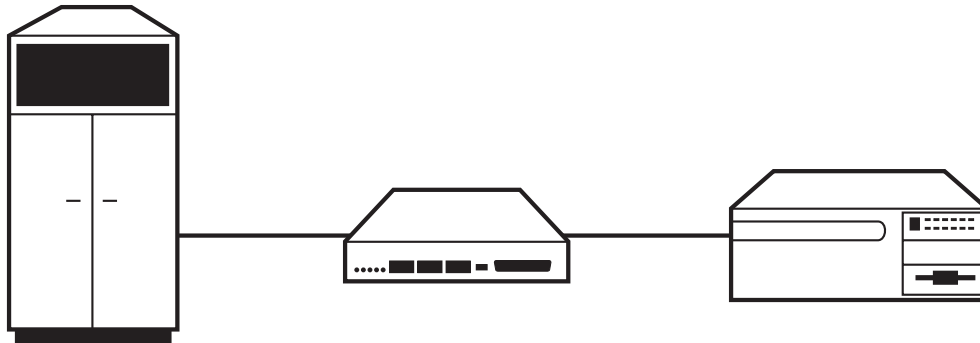


Figure 2-1. Typical application.

The units have a full-featured front panel, shown in Figure 2-2. The DB25 “MONITOR” port is for connection to a data-line monitor. The “BAUD” and “DELAY” controls are thumbwheel switches for selecting clock speed and RTS/CTS delay. The “LB” control is a slide switch, recessed to prevent accidental movement, that you can use to start and stop bidirectional loopback signaling. The indicators are LEDs that reflect the states of five signals or signal pairs: “SD” (Send Data A & B, called Transmit Data [TD] A & B in RS-530 and RS-232), “RD” (Receive Data A & B), “RTS” (Request to Send—both A & B in RS-530), “CTS” (Clear to Send—both A & B in RS-530), and “DCD” (Data Carrier Detect, also called Received Line Signal Detector—both A & B in RS-530).

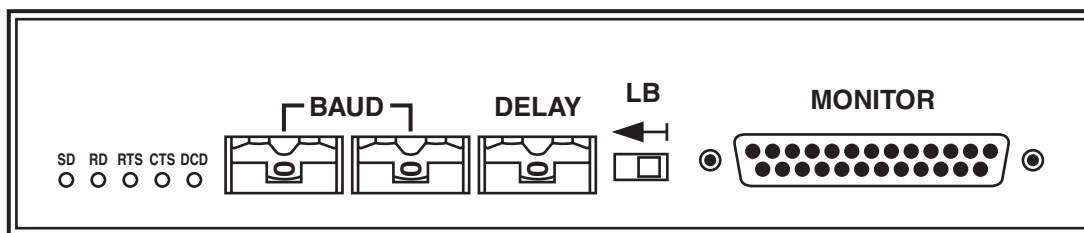


Figure 2-2. The front panel.

The standard Modem Eliminators are 110-VAC standalone (desktop) models. 220-VAC and rackmount models are available as special quotes. An X.21 version of the Modem Eliminator is also available as a special quote, as are adapter cables that patch the RS-530 (ME112A) model's DB25 data ports to DB37 connectors for fully compatible RS-449 communication.

3. Configuration and Installation

3.1 Switch Setting

Place the V.35, RS-530, or RS-232 Modem Eliminator between the DTE devices you want to connect, in a cool, dry place close to an AC outlet. Once you've done so, scan **Section 3.1.1** for the default settings of the unit's DIP-switch positions. If you need to change any of these settings, first make absolutely sure that the unit is disconnected from AC power, then open the unit: Unscrew the four side-mounted Phillips screws (two on each side) that secure the unit's top cover, then remove the cover. Set the internal 8-position DIP switch labeled "SW5" to the required settings for your application.

3.1.1 DIP SWITCH SW5

The first configuration variable you should set with DIP switch SW5 is the clocking. This is determined by the settings of positions 7 and 8:

- **Positions 7 and 8 both OFF (default setting):** The Modem Eliminator uses its own **internal clock** (data rate determined by front-panel BAUD thumbwheel) and expresses this signal on both its Transmit Clock and Receive Clock leads (V.35 SCT and SCR, RS-530 or RS-232 TSETC and RSETC; see Table 3-1). The DTEs must be configured to accept the clock signal from one of these leads.
- **Position 7 ON, position 8 OFF:** The Modem Eliminator gets **external clock from the DTE on port J1**; specifically, from the External Clock lead (V.35 SCTE, RS.530 or RS-232 TSETT; see Table 3-1). It expresses this signal on its Receive Clock lead on ports J1 and J2. The DTE on J1 must be configured to use internal clock, the DTE on J2 to accept receive clock.
- **Position 7 OFF, position 8 ON:** The Modem Eliminator gets **external clock from the DTE on port J2**; specifically, from the External Clock lead (V.35 SCTE, RS.530 or RS-232 TSETT; see Table 3-1). It expresses this signal on its Receive Clock lead on port J1 and J2. The DTE on J1 must be configured to accept receive clock, the DTE on J2 to use internal clock.
- **Positions 7 and 8 both ON:** The Modem Eliminator operates **asynchronously**, as must both DTEs (data rate determined by DTEs).

Table 3-1. Clocking-pin assignments.

Model	Interface	Connector	Transmit Clock	Receive Clock	External Clock
ME110A	V.35	M/34	SCT A, Pin Y SCT B, Pin AA	SCR A, Pin V SCR B, Pin X	SCTE A, Pin U SCTE B, Pin W
ME111A	V.35	DB25	SCT A, Pin 15 SCT B, Pin 14	SCR A, Pin 17 SCR B, Pin 12	SCTE A, Pin 24 SCTE B, Pin 23
ME112A	RS-530	DB25	TSETC A, Pin 15 TSETC B, Pin 12	RSETC A, Pin 17 RSETC B, Pin 9	TSETT A, Pin 24 TSETT B, Pin 11
ME113A	RS-232	DB25	TSETC, Pin 15	RSETC, Pin 17	TSETT, Pin 24

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Once you've finished setting positions 7 and 8, set the other positions of switch SW5 as necessary. Positions 1 and 2 determine how the Modem Eliminator handles the CTS signal:

- **Position 1 ON:** On data port J1, CTS is permanently ON (held high).
- **Position 1 OFF (default setting):** On data port J1, CTS follows RTS after a delay (user-selectable through the front-panel DELAY switch; see the next section) elapses.
- **Position 2 ON:** On data port J2, CTS is permanently ON (held high).
- **Position 2 OFF (default setting):** On data port J2, CTS follows RTS after a delay (user-selectable through the front-panel DELAY switch; see the next section) elapses.

Positions 3 and 4 determine how the Modem Eliminator handles the DCD (RLSD) signal:

- **Position 3 ON:** On data port J1, DCD is permanently ON (held high).
- **Position 3 OFF (default setting):** On data port J1, DCD follows RTS with no delay (default setting).
- **Position 4 ON:** On data port J2, DCD is permanently ON (held high).
- **Position 4 OFF (default setting):** On data port J2, DCD follows RTS with no delay (default setting).

NOTE

No matter what, the Modem Eliminator always keeps the DSR signal permanently ON (held high) on both data ports.

Use position 5 to set the unit for reclocking if necessary:

- **Position 5 ON (default setting):** Data reclocking disabled (normal operation).
- **Position 5 OFF:** Data reclocking enabled. Only select this if your equipment inverts the clock polarity. If you select this, you also need to invert the Modem Eliminator's data-reclocking circuitry; do so by moving the internal Reclock Mode jumper (located behind one of the other internal DIP switches, SW3) from posts 1 and 2 (normal, default) to posts 2 and 3 (inverted).

Position 6 is reserved.

Once you've entirely finished setting this switch, close the unit back up, screw the cover back on, and set the unit's external controls.

3.1.2 THE FRONT-PANEL DELAY THUMBWHEEL

If you've enabled RTS-to-CTS delay on either of the data ports by setting position 1 or 2 of SW5 to OFF, turn the DELAY thumbwheel on the Modem Eliminator's front panel to the single digit corresponding to your desired delay time. The delay value can be set in 10-ms increments, from "0" ($\times 10 \text{ ms} = 0 \text{ ms}$, no delay—the default setting) through "9" ($\times 10 \text{ ms} = 90\text{-ms}$ delay). For example, if you need at least a 55-ms delay, turn the wheel to "6" (for 60 ms). If RTS-to-CTS delay is turned ON for both data ports, they must both use the same delay value.

NOTE

This delay affects OFF-to-ON transitions of CTS only; ON-to-OFF transitions of CTS are never delayed (the Modem Eliminator always drops CTS immediately when it detects that the DTE has dropped RTS).

3.1.3 THE FRONT-PANEL BAUD THUMBWHEELS

If the Modem Eliminator is set for synchronous operation with internal clocking (DIP switch SW5 positions 7 and 8 both OFF—see **Section 3.1.1**), turn the unit’s two front-panel BAUD thumbwheels to the setting corresponding to your desired data rate. Refer to Table 3-2; to get any setting listed in the “BAUD-Switch Position” column, turn the left-hand wheel to the “tens” value and the right-hand wheel to the “ones” value. For example, to set the unit to communicate at 512 kbps (setting number 28), turn the left-hand wheel to “2” and the right-hand wheel to “8”.

NOTES

In some cases, the Modem Eliminator’s internal clock deviates slightly from the optimal data rates. These deviations will not cause any clocking problems with common DTEs, nor will they result in any measurable throughput differences.

Positions #52 through 99 are reserved for custom data rates. If you need an Eliminator to communicate at a data rate you don’t see in Table 3-2, call Black Box Technical Support. We’ll see if we can provide you with a unit that meets your needs.

Table 3-2. Data-rate settings.

BAUD-Switch Position	Data Rate, kbps
00*	2.40
01	3.59
02	4.80
03	7.19
04	9.60
05	14.37
06	16.80
07	19.20
08	28.00
09	28.75
10	38.40
11	48.00
12	56.00
13	64.00
14	71.86
15	112.00
16	128.00
17	143.36
18	168.00
19	192.00
20	224.00
21	228.77
22	256.00
23	279.27
24	336.00
25	384.00
26	396.39
27	448.00
28	512.00
29	558.55
30	565.89
31	614.40
32	672.00
33	722.82
34	768.00
35	827.08
36	896.00
37	945.23
38	1024.00
39	1075.20
40	1117.09
41	1228.80
42	1344.00
43	1536.00
44	2048.00
45	4096.00
46	6144.00
47	96.00
48	57.60
49	76.80
50	114.84
51	3072.00

*The default setting.

3.2 Cabling

After you've finished setting the V.35, RS-530, or RS-232 Modem Eliminator's controls, run cables from the two DTEs to the J1 and J2 connectors on the unit's rear panel. The length of these data cables should not exceed the maximum recommended in the respective interface specifications. For RS-530 and V.35 specifications, the maximum is 4000 feet (1219.2 meters) with 24-AWG twisted-pair wire at data rates up to 100 kbps. Above 100 kbps, the maximum recommended distance drops in inverse proportion as the data rate rises:

Data Rate	Max. Distance
128 kbps	3125 ft. (952.5 m)
192 kbps	2083 ft. (634.9 m)
256 kbps	1562 ft. (476.1 m)
384 kbps	1041 ft. (317.3 m)
512 kbps	781 ft. (238 m)
768 kbps	520 ft. (158.5 m)
1024 kbps	390 ft. (118.9 m)
1536 kbps	260 ft. (79.2 m)
2048 kbps	195 ft. (59.4 m)
3072 kbps	130 ft. (39.6 m)
6144 kbps	65 ft. (19.8 m)

The RS-232 specification recommends a maximum distance of 50 ft. (15.2 m) at data rates up to 20 kbps; greater distances and higher data rates aren't officially supported by the specification. But the specification does allow for longer distances as long as the cable capacitance doesn't exceed 2500 pF, so if you use low-capacitance twisted-pair cable, you might be able to run farther. How far you can run will depend on your application and environment, and can probably only be determined by trial and error.

Attach the AC power cord to the Modem Eliminator's rear-mounted IEC 320 male inlet, then plug it into an AC outlet. The unit should begin operating immediately (it has no ON/OFF switch). It should now be ready for continuous operation.

4. Operation

4.1 The LEDs

While your V.35, RS-530, or RS-232 Modem Eliminator is operating, you can watch its five front-panel LEDs to monitor the data and control signals sent from, and received by, data port J1. The five LEDs indicate the states of these signals:

LED	V.35 Signal	RS-530 Signal	RS-232 Signal
SD	SD A	TD A	TD
RD	RD A	RD A	RD
RTS	RTS	RTS A	RTS
CTS	CTS	CTS A	CTS
DCD	DCD (RLSD)	DCD (RLSD) A	DCD (RLSD)

4.2 The Monitor Port

There is also a DB25 female connector on the front panel to which you can attach a data-line monitor in order to keep tabs on the device connected to data port J2. On V.35 (ME110A and ME111A) models, this connector is proprietarily pinned to carry V.35 monitor outputs; on the other models, it's pinned to the interface standards.

Pin	V.35 Signal	Pin	RS-530 Signal	Pin	RS-232 Signal
1	SHIELD	1	SHIELD	1	SHIELD
2	SD A	2	TD A	2	TD A
3	RD A	3	RD A	3	RD A
4	RTS	4	RTS A	4	RTS
5	CTS	5	CTS A	5	CTS
6	DSR	6	DCR A	6	DSR
7	SGND	7	SGND	7	SGND
8	DCD (RLSD)	8	DCD (RLSD) A	8	DCD (RLSD)
12	SCR B	9	RSETC B	12	SDCD (SRLSD)
13	SD B	10	DCD (RLSD) B	13	SCTS
14	SCT B	11	TSETT B	14	STD
15	SCT A	12	TSETC B	15	TSETC
16	RD B	13	CTS B	16	SRD
17	SCR A	14	TD B	17	RSETC
23	SCTE B	15	TSETC A	18	LL
24	SCTE A	16	RD B	19	SRTS
		17	RSETC A	20	DTR
		18	LL	21	RL or SQD
		19	RTS B	22	RI
		20	DTR A	23	DSRST or DSRSC
		21	RL	24	TSETT
		22	DCR B	25	TM
		23	DTR B		
		24	TSETT A		
		25	TM		

4.3 The Loopback Switch

The front panel also contains a slide switch marked “LB” (“loopback”). If ever your data doesn’t seem to be getting across the Modem Eliminator link properly, you can temporarily move this switch to the left-hand (ON) position to have the unit loop the data signals from the devices attached to data ports J1 and J2 back to those devices. That is, on both data ports, the Modem Eliminator takes the data it receives on its RD lead (Pin 3) and echoes it back to the sending device on its SD/TD lead (Pin 2). In loopback mode, you can compare the version of the data that the devices get back (if any) against the version they sent out. If the data a device gets back has been corrupted, or if no data comes back at all, check the cables involved first, then the device’s transmitter hardware and circuitry; if these are OK, there might be a problem with the Modem Eliminator—call Black Box for technical support (see **Section 5.1**).

This loopback switch is recessed into the front panel to prevent it from being moved accidentally.

5. Troubleshooting

5.1 Contacting Black Box

If you determine that your V.35, RS-530, or RS-232 Modem Eliminator is malfunctioning, *do not attempt to alter or repair it*. It contains no user-serviceable parts. Contact Black Box Technical Support at 724-746-5500.

Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.
- the results of any testing you've already done.

5.2 Shipping and Packaging

If you need to transport or ship your Modem Eliminator:

- Package it carefully. We recommend that you use the original container.
- If you are shipping the unit for repair, make sure you include its power cord. If you are returning the unit, make sure you include everything you received with it. Before you ship the unit back to us for whatever reason, contact Black Box to get a Return Authorization (RA) number.

Appendix: Connector Pinouts

The tables in this Appendix show the pin assignments for the Modem Eliminator's interfaces and connectors:

The data ports of the ME110A models are M/34 female connectors pinned for V.35; the monitor port is a DB25 female connector pinned for V.35. See Table A-1.

The data ports and monitor port of the ME111A models are DB25 female connectors pinned for V.35. See Table A-1.

The data ports and monitor port of the ME112A models are DB25 female connectors pinned for RS-530. See Table A-2.

The data ports and monitor port of the ME113A models are DB25 female connectors pinned for RS-232. See Table A-3.

Table A-1. Pinouts of the V.35 Modem Eliminator's (ME110A and ME111A) connectors.

V.24 Circ. Ref.	V.35 Signal Name	Abbr.	M/34 Pin (ME110A)	DB25 Pin (ME111A)
101	Shield	SHD	A	1
102	Signal Ground	SGND	B	7
103	Send Data A	SD A	P	2
	Send Data B	SD B	S	13
104	Receive Data A	RD A	R	3
	Receive Data B	RD B	T	16
105	Request to Send	RTS	C	4
106	Clear to Send	CTS	D	5
107	Data Set Ready	DSR	E	6
108.2	Data Terminal Ready	DTR	H	20
109	Received Line Signal Detector Detector	RLSD	F	8
113	Serial Clock Transmit External A	SCTE A	U	24
	Serial Clock Transmit External B	SCTE B	W	23
114	Serial Clock Transmit A	SCT A	Y	15
	Serial Clock Transmit B	SCT B	AA	14
115	Serial Clock Receive A	SCR A	V	17
	Serial Clock Receive B	SCR B	X	12

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Table A-2. Pinouts of the RS-530 Modem Eliminator's (ME112A) connectors.

V.24 Circ. Ref.	RS-530 Signal Name	Abbr.	DB25 Pin
101	Shield	SHD	1
102	Signal Ground	SGND	7
103	Transmit Data A Transmit Data B	TD A TD B	2 14
104	Receive Data A Receive Data B	RD A RD B	3 16
105	Request to Send A Request to Send B	RTS A RTS B	4 19
106	Clear to Send A Clear to Send B	CTS A CTS B	5 13
107	DCE Ready A DCE Ready B	DCR A DCR B	6 22
108.2	DTE Ready A DTE Ready B	DTR A DTR B	20 23
109	Received Line Signal Detector A Received Line Signal Detector B	RLSD A RLSD B	8 10
113	Transmitter Signal Element Timing (DTE Source) A Transmitter Signal Element Timing (DTE Source) B	TSETT A TSETT B	24 11
114	Transmitter Signal Element Timing (DCE Source) A Transmitter Signal Element Timing (DCE Source) B	TSETC A TSETC B	15 12
115	Receiver Signal Element Timing (DTE Source) A Receiver Signal Element Timing (DTE Source) B	RSETC A RSETC B	17 9
140	Remote Loopback	RL	21
141	Local Loopback	LL	18
142	Test Mode	TM	25

Table A-3. Pinouts of the RS-232 Modem Eliminator's (ME113A) connectors.

V.24 Circ. Ref.	RS-232 Signal Name	Abbr.	DB25 Pin
101	Shield	SHD	1
102	Signal Ground	SGND	7
103	Transmit Data	TD	2
	Secondary Transmit Data	STD	14
104	Receive Data	RD	3
	Secondary Receive Data	SRD	16
105	Request to Send	RTS	4
	Secondary Request to Send	SRTS	19
106	Clear to Send	CTS	5
	Secondary Clear to Send	SCTS	13
107	Data Set Ready	DSR	6
108.2	Data Terminal Ready	DTR	20
109	Received Line Signal Detector	RLSD	8
	Secondary Received Line Signal Detector	SRLSD	12
110*	Signal Quality Detector	SQD	21
111*	Data Signal Rate Selector (DTE Source)	DSRST	23
112*	Data Signal Rate Selector (DCE Source)	DSRSC	23
113	Transmitter Signal Element Timing (DTE Source)	TSETT	24
114	Transmitter Signal Element Timing (DCE Source)	TSETC	15
115	Receiver Signal Element Timing (DTE Source)	RSETC	17
125	Ring Indicator	RI	22
140*	Remote Loopback	RL	21
141	Local Loopback	LL	18
142	Test Mode	TM	25

*Either (but not both) of two signals might be carried on Pins 21 and 23 depending on the attached equipment. Pin 21 might carry either circuit 110 or circuit 141. Pin 23 might carry either circuit 111 or circuit 112.

NOTES



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