



**NOVEMBER 2002**  
**ME3000A-F**  
**ME3001A-F**  
**ME3003A-F**

**Mini Line Driver**  
**Auto Powered Line Driver**  
**Line Driver with LCD**

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**FEDERAL COMMUNICATIONS COMMISSION  
AND  
CANADIAN DEPARTMENT OF COMMUNICATIONS  
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 B 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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

*This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.*

*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 le ministère des Communications du Canada.*

## **FCC REQUIREMENTS FOR TELEPHONE-LINE EQUIPMENT**

1. The Federal Communications Commission (FCC) has established rules which permit this device to be directly connected to the telephone network with standardized jacks. This equipment should not be used on party lines or coin lines.
2. If this device is malfunctioning, it may also be causing harm to the telephone network; this device should be disconnected until the source of the problem can be determined and until the repair has been made. If this is not done, the telephone company may temporarily disconnect service.
3. If you have problems with your telephone equipment after installing this device, disconnect this device from the line to see if it is causing the problem. If it is, contact your supplier or an authorized agent.
4. The telephone company may make changes in its technical operations and procedures. If any such changes affect the compatibility or use of this device, the telephone company is required to give adequate notice of the changes.
5. If the telephone company requests information on what equipment is connected to their lines, inform them of:
  - a. The telephone number that this unit is connected to.
  - b. The ringer equivalence number.
  - c. The USOC jack required: RJ-11C.
  - d. The FCC registration number.

Items (b) and (d) can be found on the unit's FCC label. The ringer equivalence number (REN) is used to determine how many devices can be connected to your telephone line. In most areas, the sum of the RENs of all devices on any one line should not exceed five (5.0). If too many devices are attached, they may not ring properly.

6. In the event of an equipment malfunction, all repairs should be performed by your supplier or an authorized agent. It is the responsibility of users requiring service to report the need for service to the supplier or to an authorized agent.

### **CERTIFICATION NOTICE FOR EQUIPMENT USED IN CANADA**

The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications-network protective, operation, and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single-line individual service may be extended by means of a certified connector assembly (extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility—in this case, your supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

**CAUTION:**

**Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.**

The LOAD NUMBER (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices, subject only to the requirement that the total of the load numbers of all the devices does not exceed 100.

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## 1.0 General Description

The ME3000A-F/ME3001A-F/ME3003A-F performs full-duplex transmission of asynchronous data over four wires (two twisted pairs). The data transmission between each line driver utilizes differential signaling that is immune to electrical interference and therefore makes it ideal for use in light manufacturing and industrial office areas. All models are compatible with each other up to speeds of 19.2 kbps, while the ME3003A-F operates up to 115 kbps.

### 1.1 DataSpy™ Feature (ME3003A-F)

Your new Black Box® product incorporates the Patent Pending DataSpy™ feature, an LCD display designed to assist with initial installation and check-out. Thereafter it can be used as a performance monitor. In the case of a system problem it provides information as to the status of the local link.



Figure 1: The DataSpy™ LCD display.

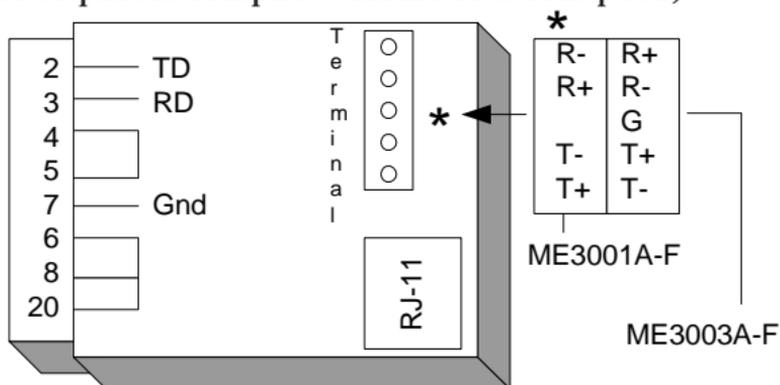
The display of TD and RD indicates that the unit is powered. The LCD display uses less than 1 milliwatt of power.

The data display on the LCD consists of graphical representations for TD (Transmit Data) and RD (Receive Data). These signals are displayed the way a bit-change waveform would appear on an oscilloscope. Ordinarily, TD and RD are low (a minus voltage) in the quiescent state. When data is transmitted, the transmit signal is brought high to a positive voltage. These two signal states are displayed on the LCD by either a low segment or a high segment. The low segment represents the minus voltage (i.e., the mark condition) while the upper segment represents a positive voltage (i.e., the space condition). The vertical bar connecting the lower segment to the upper segment is always on when power is applied.

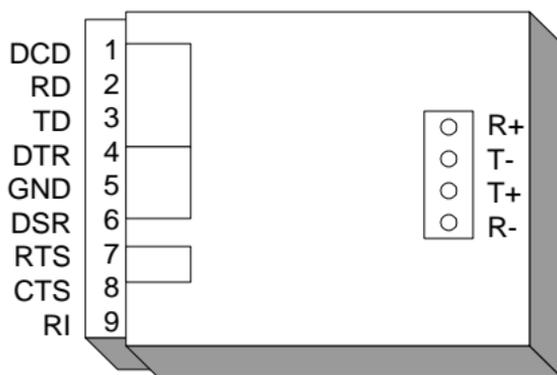
If the transmit signal is in the quiescent state (continuously low) only the lower segments and the vertical bar are illuminated. This is an indication of a constant negative state. If the transmit or receive inputs to the device are streaming (in the positive mode continuously), the LCD display shows the vertical segment and the upper segments only. For those cases where there is valid data transmission, both the upper and lower segments are displayed simultaneously. A variation in display intensity between lower and upper segments gives the user a perception of the amount of data being transmitted.

The LCD display also shows the status of the following control signals: CTS, RTS, DSR, DCD, and DTR. These signals are displayed as mnemonic symbols, composed of three letters each, on the bottom line of the display. The presence of the three-letter mnemonic indicates that the respective control signal is high (positive).

If the control signal is negative, the three-letter mnemonic is not displayed. For most full-duplex data-only modems, CTS and RTS are connected together while DSR, DCD, and DTR are connected together. For handshaking modems there is a relationship among the various control signals on both ends of the link. This relationship is dependent upon the control signals utilized. All units conform to EIA RS-232 and CCITT V.24 specifications (except for Model ME3000A-F where the connector pinout complies with IBM PC com ports).



Model ME3001A-F, ME3003A-F



ME3000A-F

## 2.0 Specifications

### 2.1 Interface

#### Connectors

##### RS-232:

Model ME3000A-F: DB-9 Female

Model ME3001A-F: DB-25 Female

Model ME3003A-F: DB-25 Female

##### Analog:

Model ME3000A-F: RJ-11 or four screw terminals, as ordered.

Model ME3001A-F: RJ-11 and four screw terminals.

Model ME3003A-F: RJ-11 and five screw terminals.

- ① The ME3000A-F can be ordered with an RJ-45 installed, in place of the RJ-11, by adding “RJ45” to the end of the respective model number (e.g., ME3000A-F-RJ45).

### 2.2 Data Rate

Model ME3001A-F/ME3000A-F: 0 to 19.2 kbps.

Model ME3003A-F: 0 to 115.2 kbps.

### 2.3 Transmission

Asynchronous full duplex over four wires (two twisted pairs).

## 2.4 Switches

Each modem is equipped with a DTE/DCE switch to allow reversal of the TD and RD signals on the RS-232 interface.

## 2.5 Indicators

The Model ME3003A-F is equipped with an LCD display for data, five control signals and power.

## 2.6 Operating Distance

The table gives maximum distance as a function of Baud rate (over 24 AWG wire).

## 2.7 Power

Power is derived from interface.

The ME3000A-F/ME3001A-F/ME3003A-F attempts to derive its power from any one of the control signals which are expected to be at least +5.5 V or -5.5 V in the quiescent state. If there are no control signals available to the modem, then power is derived from the Data Input pin. The Data Input pin must be at least -5.5 V in the quiescent state.

Baud Rate	Distance (miles/km)	
	ME3001A-F ME3000A-F	ME3003A-F
115 kbps	NA	.6/1
19.2 kbps	1.2/1.9	1.2/1.9
9.6 kbps	3.1/5	3.1/5
4.8 kbps	4.9/7.9	4.9/7.9
2.4 kbps	6.2/10	6.2/10

Model ME3001A-F/ME3003A-F: If Pin 4, 5, 6, 8 or 20 is powered, the unit takes power from that pin.

Model ME3000A-F: If Pin 1, 4, 6, 7, or 8 is powered, the unit takes power from that pin.

## **2.8 Size**

Model ME3000A-F:

1.3" W x 3" L x 0.75" H

(33.02 mm x 76.2 mm x 19.05 mm)

Model ME3001A-F:

2" W x 2.75" L x 0.75" H

(50.8 mm x 69.85 mm x 19.05 mm)

Model ME3003A-F:

2" W x 4.15" L x .79" H

(50.8 mm x 105.4 mm x 20.1 mm)

## **2.9 Environment**

0 to 50° C, 5 to 95% relative humidity.

### **3.1 Digital Interface**

3.1.1 The digital interface for the Model ME3001A-F/ME3003A-F is a DB-25 female connector.

3.1.2 The digital interface for the Model ME3000A-F is a DB-9 female connector.

### **3.2 Analog Interface**

- ① The four-wire line between modems must be two twisted pairs. On each modem, the wires marked T+ and T- must be members of the same twisted pair and those marked R+ and R- must be members of the other pair.

#### **3.2.1 Screw Terminals**

The Model ME3001A-F/ME3000A-F is supplied with four screw terminals marked T+, T-, R+ and R-. The Model ME3003A-F is supplied with five screw terminals marked T+, T-, R+, R- and GND. When connecting two line drivers together the T+ terminal of one unit goes to the R+ terminal of the other; the T- terminal goes to the R- terminal.

#### **3.2.2 Phone Plug**

The unit is equipped with a standard RJ-11 modular phone connector. Only four of the six positions are used. If ordered with the RJ-45 option (RJ45) only the four middle pins are used. The designation of the wires is shown on the next page.

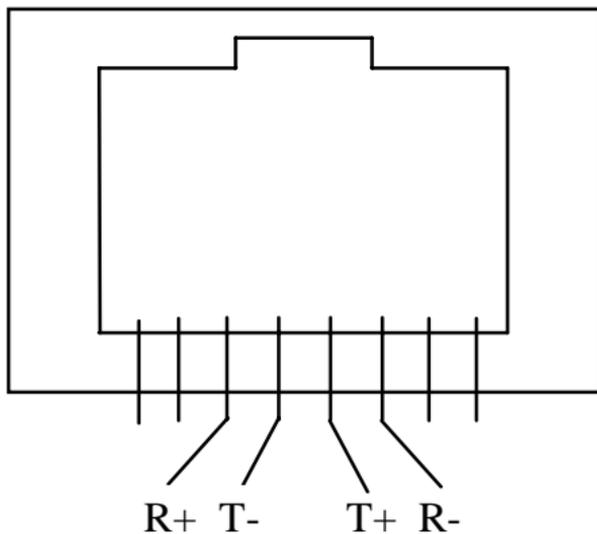
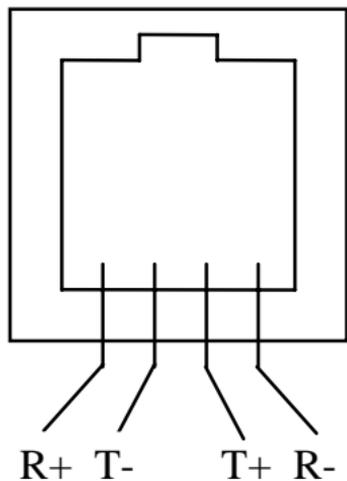


Figure 3: Female RJ-11 and RJ-45 wire designations.

## **4.0 Operation**

### **4.1 Model ME3001A-F/ME3003A-F**

This model is equipped with a DTE/DCE switch that allows for reversal of Pins 2 and 3 of the RS-232 connector. When the switch is in the DTE position, Pin 2 of the RS-232 connector is an output (transmit-to-host device) and Pin 3 is an input. When the switch is reversed to the DCE connection, Pin 2 becomes an input and Pin 3 an output. When interfacing to a terminal or PC the switch should be in the DCE position.

### **4.2 Model ME3000A-F**

This model is equipped with a rotary DTE/DCE switch that allows for the reversal of Pins 2 and 3 of the RS-232 connector. When the switch is in the DTE position, Pin 3 of the RS-232 connector is an output (transmit-to-host device) and Pin 2 is an input. When the switch is reversed to the DCE connection, Pin 3 becomes an input and Pin 2 an output. When interfacing to a terminal or PC, the switch should be in the DCE position. A small screwdriver is supplied to facilitate the switching.

### **4.3 Model ME3003A-F**

The LCD display verifies operation.

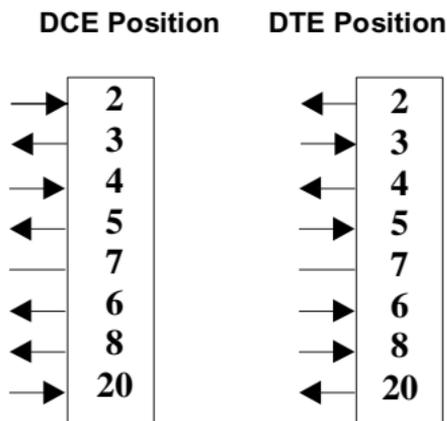
## 5.0 Troubleshooting

The following is a list of problems that may occur during the installation and some suggested solutions.

### 1. The data being received is garbled.

- The DTE/DCE switches are not set properly (see section 4.0, “*Operation*”).
- The equipment the unit is connected to does not have the same communication parameter settings as the unit.
- T+ and T- are reversed going to R+ and R-.
- One of the four wires is broken.
- Wires are not paired properly. - T+ and T- should be one twisted pair and R+ and R- should be the other.

### Signal Flow with Respect to Each Unit



All Models Except ME3000A-F

## **2. No data is being received.**

- a) The customer equipment is not connected to the unit.
- b) The DTE/DCE switches are not set properly (see section 4.0, “*Operation*”).
- c) Verify that hardware handshaking (control lines) is not required.
- e) One or more wires between the modems are open.
- f) The link connection exceeds the maximum specified distance.

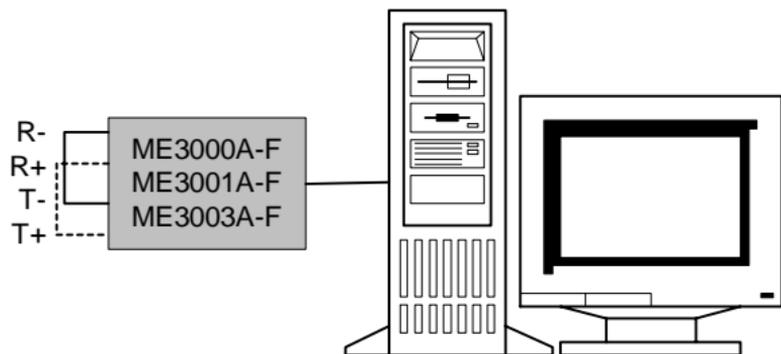
## **3. The Data is clear at first and then becomes garbled.**

- a) Verify that software handshaking (XON/XOFF) is being used.

If the unit is believed to be defective, operation can be verified if one of the devices to which the modems are attached is capable of operating in a full-duplex mode (e.g., a terminal or a PC using a communications package such as Procomm). Connect the unit to the terminal via the RS-232 connector and make the following loopback connections at the analog interface:

T+ to R+ and T- to R-

If the modem is functioning correctly, any data entered on the keyboard should appear on the screen.



## 6.0 Connector Pin Assignments

### 6.1 Model ME3001A-F/ME3003A-F

Pin	EIA	CCITT	Name	
2	BA	103	Transmit Data	*
3	BB	104	Receive Data	*
4	CA	105	Request to Send	**
5	CB	106	Clear to Send	**
6	CC	107	Data Set Ready	***
7	AB	102	Signal Ground	Gnd
8	CF	109	Data Carrier Detect	***
20	CD	108.2	Data Terminal Ready	***

\* These signals can be reversed using the selector switch.

\*\* , \*\*\* Connected together.

## 6.2 Model ME3000A-F

Pin	EIA	CCITT	Name	
3	BA	103	Transmit Data	*
2	BB	104	Receive Data	*
7	CA	105	Request to Send	**
8	CB	106	Clear to Send	**
6	CC	107	Data Set Ready	***
5	AB	102	Signal Ground	Gnd
1	CF	109	Data Carrier Detect	***
4	CD	108.2	Data Terminal Ready	***

\* These signals can be reversed using the selector switch

\*\* , \*\*\* Connected together

### **7.1 Model ME3001A-F/ME3003A-F**

This model can be powered in one of two ways:

1. The unit attempts to derive positive power from Pins 4, 5, 6, 8 or 20 (if available) and negative power from the Data Input pin (must be at least -5.5 V in its quiescent state).
2. If any device that the ME3001A-F/ME3003A-F is connected to does not support the control signals, all power is then derived from the data-input signal (must be at least -5.5 V in the quiescent state).

### **7.2 Model ME3000A-F**

This model can be powered in one of two ways:

1. The unit attempts to derive positive power from Pins 1, 4, 6, 7 or 8 (if available) and negative power from the Data Input pin (must be at least -5.5 V in its quiescent state).
2. If any device the ME3000A-F is connected to does not support the control signals, all power is then derived from the Data Input signal (must be at least -5.5 V in the quiescent state).



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