

# ME351A-M/F

## SPECIFICATIONS:

Cable Required: For modem-to-modem line: Four-wire unconditioned twisted-pair, 19 to 26 AWG.

Interfaces: Serial EIA RS-232/ITU-TSS [CCITT] V.24  
Line: Two- or Four-wire telco.

Protocol: Synchronous or Asynchronous.

Clock Source: Internal, External (from DTE), or Received (from other unit) (user-selectable).

Data Format: Word length (including start bit, data bits, stop bits, and parity bit) must equal 8, 9, 10, or 11 bits (user-selectable).

Flow Control: Transparent to all types of software (X-ON/X-OFF, robust X-ON/X-OFF, etc.) flow control; can be set to support hardware flow control.

Operating Mode: 4-wire full-duplex, point-to-point or multipoint (user-selectable).

Data Rates: 64, 56, or 32 Kbps (user-selectable).

Maximum Distance: 6 miles (9.7 km).

Isolation: 1500 volts RMS minimum using custom transformers

Surge Protection Method: Silicon Avalanche Diodes.

Surge Response Time: 1 pico second.

Maximum Surge Protection: 600 watts dissipated after 1 milli second.

User Controls: (2) Top-mounted toggle switches:  
Loop (Remote Digital or Local Analog loopback),  
Bert (511 or 511/E V.52 diagnostics);  
(2) Internal 8-position DIP switches:  
(1) for DTE loopback control, protocol, signaling-rate range, word length, and diagnostics;  
(1) for data rate, clock source, carrier control, and RTS/CTS delay.

Indicators: (5) Top-mounted LED's: PWR, TD, CD, BERT, and LOOP.

Diagnostics: ITU-TSS V.54 remote digital and local analog loopbacks; ITU-TSS V.52 BERT testing.

Connectors: (1) DB25 male/female (depending on model chosen); (1) RJ-45 female modular jack.

Power: From wallmount power supply: INPUT = 115 VAC, 47-63 Hz; OUTPUT = 9 VDC, 500 ma.  
Consumption = 17 ma @ 7V (119 mW).

## INTRODUCTION:

The Async/Sync Line Driver 56/64 (A/SLD) is a high-speed short-range modem that supports synchronous and asynchronous data rates of 32, 56, and 64 Kbps. It also supports internal, external, or received synchronous clocking. Since it has a 7.5-volt power supply, it can drive data up to a maximum range of 6 miles (9.7 km) over unconditioned twisted-pair. The Line Driver has several features that enhance its overall performance, including transformer isolation and Silicon Avalanche Diode surge protection. The unit also has strong diagnostics: It features V.52-compliant bit-error-rate (BERT) pattern tests and two V.54 test modes.

## CONFIGURATION:

The Async/Sync Line Driver 56/64 has two 8-position DIP switches---SW1 and SW2---mounted inside. These configuration switches allow you to select data rates, clocking methods, V.52 and V.54 tests, word lengths, extended signaling rates, sync or async protocol, and other options.

### **Configuration Switch "SW1"**

Use the individual positions on DIP switch SW1 to set data rate, clock source, sync vs. async protocol, and carrier-control method. The factory default settings are summarized in the Table.

<u>POSITION:</u>	<u>FUNCTION</u>	<u>DEFAULT SETTING:</u>
SW1-1	DTE CTRL. of Analog Loopback	ON Enabled
SW1-2	DTE CTRL. of Digital Loopback	ON Enabled
SW1-3	Not Used	N/A
SW1-4	Protocol	OFF Synchronous
SW1-5	Signaling-Rate Range	OFF -2.5% to +1%
SW1-6	Word Length	OFF 10 bits
SW1-7	Word Length	OFF 10 bits
SW1-8	V.52, V.54 Tests	OFF Tests Enabled

**SW1-1: DTE Initiation of Local Analog Loopback Test** determines whether the Line Driver's local analog loopback (LAL) test can be initiated by raising the signal on Pin 18 at the DTE.

<u>SW1-1</u>	<u>Setting:</u>
ON	Enabled (default)
OFF	Disabled

**SW1-2: DTE Initiation of Remote Digital Loopback Test** determines whether the Line Driver's remote digital loopback (RDL) test can be initiated by raising the signal on Pin 21 at the DTE.

<u>SW1-2</u>	<u>Setting:</u>
ON	Enabled (default)
OFF	Disabled

SW1-3: Not Used

**SW1-4: Protocol** determines whether the Line Driver operates Synchronously or Asynchronously.

<u>SW1-4</u>	<u>Setting:</u>
ON	Asynchronous
OFF	Synchronous (default)

**SW1-5: Signaling-Rate-Range** determines the degree of asynchronous data-rate fluctuation that the Line Driver will accept (that is how much variance from a given frequency level the Line Driver will tolerate).

<u>SW1-5</u>	<u>Setting:</u>
OFF	-2.5% to +1% (default)
ON	-2.5% to +2.3%

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**SW1-6 and SW1-7: Word Length** determines the word length that the Line Driver will expect for synchronous or asynchronous data. For example, if you are using the most common data format (1 start bit, 8 data bits, 1 stop bit, and no parity), you would use the factory-default word-length setting (10 bits).

<u>SW1-6</u>	<u>SW1-7</u>	<u>Setting:</u>
OFF	ON	8 bits
ON	ON	9 bits
OFF	OFF	10 bits (default)
ON	OFF	11 bits

**SW1-8: V.52 and V.54 Diagnostic Testing** determines whether the Line Driver diagnostic tests are enabled or disabled.

<u>SW1-8</u>	<u>Setting:</u>
OFF	Tests Enabled (default)
ON	Tests Disabled

### **Configuration Switch "SW2"**

Use the individual positions on DIP switch S2 to set data rate, clock source, carrier control, and RTS/CTS delay, or 2- or 4-wire operation, as well as to control diagnostic testing. The factory-default settings are summarized in the table below.

<u>POSITION</u>	<u>FUNCTION</u>	<u>DEFAULT SETTING:</u>
SW2-1	Data Rate	OFF
SW2-2	Data Rate	ON 56 Kbps
SW2-3	Data Rate	OFF
SW2-4	Clock Source	ON Internal
SW2-5	Clock Source	ON Internal
SW2-6	Carrier Control	OFF Constantly ON
SW2-7	RTS/CTS Delay	ON 7 ms
SW2-8	RTS/CTS Delay	ON 7 ms

**SW2-1, SW2-2, and SW2-3: Data Rate** determines the data rate (valid for both synchronous and asynchronous protocols) of the Line Driver.

<u>SW2-1</u>	<u>SW2-2</u>	<u>SW2-3</u>	<u>Setting:</u>
ON	OFF	OFF	64 Kbps
OFF	ON	OFF	56 Kbps
OFF	OFF	ON	32 Kbps

**SW2-4 and SW2-5: Clock Source** determines which transmit-clock source the Line Driver uses.

<u>SW2-4</u>	<u>SW2-5</u>	<u>Setting:</u>
ON	ON	Internal Transmit Clock (default)
OFF	ON	Receive-Recover Clock
ON	OFF	External Transmit Clock

**SW2-6: Carrier-Control Method** determines whether the carrier is "constantly ON" or "controlled by RTS". In the "controlled by RTS" setting, the Switch can support switched-carrier, multipoint, or hardware flow-control applications.

<u>SW2-6</u>	<u>Setting:</u>
OFF	Constantly ON (default)
ON	Controlled by RTS

**SW2-7 and SW2-8: RTS/CTS Delay** determines the amount of time the Line Driver waits after it "see" RTS before it sends CTS.

<u>SW2-7</u>	<u>SW2-8</u>	<u>Setting:</u>
ON	ON	7 ms (default)
ON	OFF	53 ms
OFF	ON	No Delay
OFF	OFF	No Delay

## INSTALLATION:

### **The Modem-to-Modem Line Cables and Connectors:**

The Line Driver supports data-only communication between two RS-232 devices at distances to 6 miles (9.7 km) and data rates to 64 Kbps. There are two essential requirements for installing the Line Driver:

1. They work in pairs; you must have one at each end of the twisted-pair cable.
2. The Line Driver operates half-duplex over two twisted pairs of wire. In all applications, the twisted-pair wire must be between 19 and 26 AWG (higher gauges might limit the distance that can be run), unconditioned, dry, and metallic. Both shielded and unshielded cable yield favorable results.

#### **Note:**

**The Line Driver can only communicate in a closed data circuit with another like Line Driver. It will not work with dial-up analog circuits, such as those used with standard modems.**

For your convenience, a RJ-45 connector is available on the Line Driver. The modem-to-modem cable must be specially cross-pinned, as shown below. If your cabling includes punchdown blocks, you can easily do the cross-pinning at a punchdown block. If you'll be running cable directly between two Line Drivers, you can get a custom cable from Black Box as a special quote, or you can use regular straight-through-pinned cable and repin one of the RJ connectors (that is, rearrange the wiring connections between the terminal block and the actual contacts). You might need special crimping tools or new connectors; call Black Box for these items, or for technical support if you have difficulty.

#### **Line-Cable Pinouts:**

Signal:	Pin#:	Pin#:	Signal:
N/C	1	8	N/C
GND	2	7	GND
RCV-	3	5	XMT-
XMT+	4	6	RCV+
XMT-	5	3	RCV-
RCV+	6	4	XMT+
GND	7	2	GND
N/C	8	1	N/C

### **RS-232 Serial Connection:**

The DB25 connector of the Line Driver are standard RS-232 port pinouts. The Line Driver can be either connected to a DTE (Data Terminal Equipment) such as PC/Printer or a DCE (Data Communications Equipment) such as a modem/multiplexor.

#### **Connecting the Line Driver to a DTE Device:**

This is the normal application for the Line Driver, which is wired as a DCE. Connect it to a DTE (PC, printer, terminal, etc.) by plugging it right into the DTE's DB25 male RS-232 port. If the DTE has a DB9 male serial port, use a DB9-female-to-DB25-male adapter (our product code FA520). If you must use a cable to connect the Line Driver to a DTE, make sure that the cable is pinned **straight through** and that it is as short as possible.

#### **Connecting the Line Driver to a DCE Device:**

Because the Line Driver is wired as a DCE device, you can't plug it directly into another RS-232 DCE (modem, multiplexor, etc.) device. If you must make such a connection, use a **null-modem** cable pinning.

#### **NOTE:**

**When you connect the Line Driver to another DCE device, you should configure the Line Driver for the "external" clock source.**

### **Multipoint Applications:**

The Line Driver supports multipoint applications if position 6 of switch SW2 is turned ON (moved to the "controlled by RTS" setting). Maximum distance between the units will vary based on the number of drops, data rate, wire gauge, etc.

## OPERATION and DIAGNOSTICS:

Once you have configured each Async/Sync Line Driver 56/64 and connected the cables, you are ready to operate the units. They should operate transparently, as if there were a standard cable connection between the two destination devices. The Line Driver draws its power from a 9-VDC or 7.5-VDC power-supply transformer. It has no "ON/OFF" switch; to power up the unit, plug the power supply's output cord into the Line Driver, then plug the power supply into an outlet. The Line Driver will stay on until the power supply is unplugged.

### **Status LED's:**

The Line Driver has five top-panel status LED's. "PWR" stays lit while the unit is receiving power. "TD" flickers while the unit is receiving data. "CD" stays lit while the unit detects carrier. "LOOP" stays lit while the unit is in a loopback test mode. "BERT" lights whenever bit errors occur in 511 testing; it stays lit for the duration of 511/E testing.

### **Test Switches:**

The Line Driver has two top-panel slide switches. During normal operation, these switches should be in the center ("NORMAL") position. You can move them to different positions to trigger various tests.

### **V.54 and V.52 Diagnostic Tests:**

The Line Driver offers two V.54 test modes and two V.52 test modes to evaluate the condition of the Line Driver's and the communication link. Both sets of tests can be activated physically from the top panel. The V.54 test can also be activated from the RS-232 interface.

### **NOTE:**

**V.54 and V.52 test modes on the Line Driver are available for point-to-point applications only.**

### **Local Analog Loopback (LAL):**

The Local Analog Loopback (LAL) test checks the operation of the local Line Driver, and is performed separately on each unit. Any data sent to the local Line Driver in this test mode will be echoed back (returned) to the user device. For example, characters typed on the keyboard of a terminal will appear on the terminal's screen. To perform an LAL test, follow these steps:

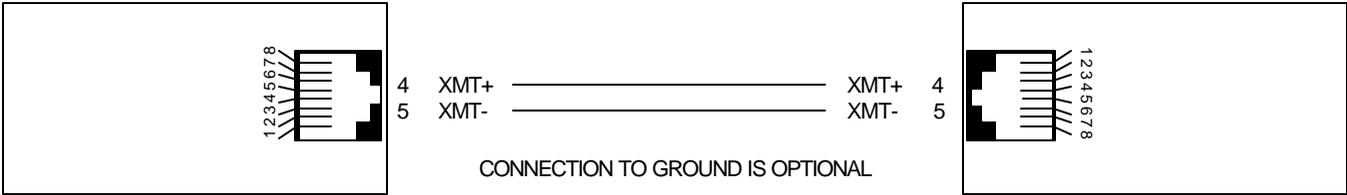
1. Activate LAL. You can do this in either of two ways. One is to move the right-hand top-panel slide switch (the one under the "LOOP" LED) to the "LAL" (down) position. The other is to raise the signal on Pin 18 of the RS-232 interface (switch SW1 position 1 must be "ON" and switch SW1 position 8 must be "OFF"?). Once LAL is activated, the Line Driver's transmit output is connected to its own receiver. The LOOP LED should light.
2. Verify that the attached DTE is operating properly and can be used for a test.
3. Move the left-hand top-panel slide switch (the one under the "BERT" LED) to the "511" (down) position. This will activate the V.52 BERT test mode and inject a 511 test pattern into the local loop. If any errors are present in the loop, the BERT LED will blink sporadically.
4. If the BERT test indicates no errors are present, move the BERT switch to the "UP" position to activate the "511/E" test with periodic errors. If this test is working properly, the BERT LED will blink regularly. A successful 511/E test will confirm that the loop is in place, and that the Line Driver's built-in 511 generator and detector are working properly.
5. If the BERT test indicates that errors are present, make sure that the Line Driver is plugged into the DTE properly. (If the Line Driver is connected to a DTE across a length of cable, make sure the cable is pinned straight through, is properly plugged in on both ends, and is not longer than 6 ft. (1.8m). If the Line Driver is connected to an RS-232 DCE, make sure that the connecting cable is properly cross-pinned, and is properly plugged in on both ends, and is not longer than 6 ft. Also, make sure that the Line Driver is configured properly. Then recheck your DTE equipment. If you still get errors and can't find the cause, call Black Box Technical Support.

### **Remote Digital Loopback (RDL):**

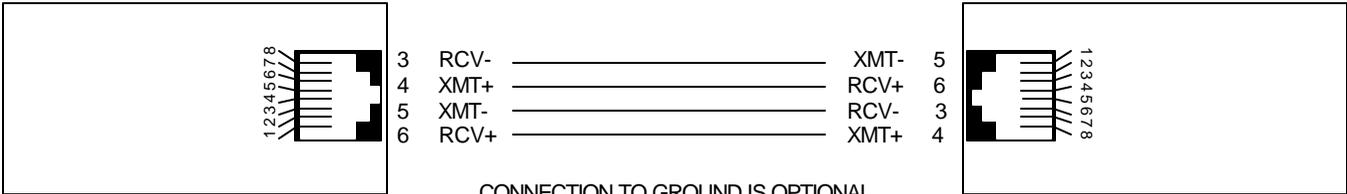
The Remote Digital Loopback (RDL) test checks the performance of both the local and remote Line Drivers, and the communication link between them. Any characters sent to the remote Line Driver in this test mode will be echoed (returned) back to the originating device. For example, characters typed on the keyboard of the local terminal will appear on the local terminal's screen after having been passed to the remote Line Driver and looped back. To perform an RDL test, follow these steps:

1. Activate RDL. You can do this in either of two ways. One is to move the local unit's right-hand front-panel slide switch (the one under the "LOOP" LED) to the "RDL" (up) position. The other is to raise the signal on Pin 21 of the RS-232 interface (positions 2 and 8 of switch SW1 must be "ON"?). Once RDL is activated, the remote Line Driver's receive input is connected to its own transmitter. The LOOP LED should light on both Line Drivers.
2. Verify that the DTE attached to the local Line Drivers is operating properly and can be used for a test.
3. Move the left-hand top-panel slide switch (the one under the "BERT" LED) to the "511" (down) position. This will activate the V.52 Bert test mode and inject a 511 test pattern into the local loop. If any errors are present in the loop, the BERT LED will blink sporadically.
4. If the BERT test indicates no errors are present, move the BERT switch to the "UP" position to activate the "511/E" test with periodic errors. If this test is working properly, the BERT LED will blink regularly. A successful 511/E test will confirm that the loop is in place, and that the Line Driver's built-in 511 generator and detector are working properly.
5. If the remote BERT test indicates that errors are present, but the local analog loopback BERT tests showed that both Line Driver's were functioning properly, there is probably a problem with the twisted-pair communication line connecting the two modems. A common problem is improper crossing of the pairs. Also, check the cable's pinning and continuity. If you still get errors and can't find the cause, call Black Box Technical Support.

2-W POINT-to-POINT APPLICATION



4-W POINT-to-POINT APPLICATION



4-W POINT-to-MULTIPOINT APPLICATION

