



JULY 1997

ME310A

ME315AE

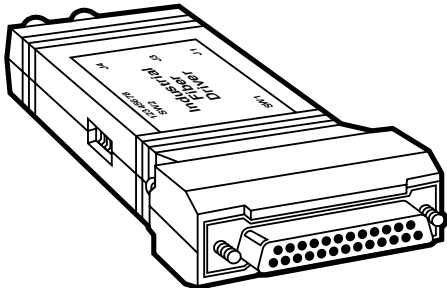
ME310AE

ME320A

ME315A

ME320AE

Industrial Fiber Drivers



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AND
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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.

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 Industry Canada.

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

NORMAS OFICIALES MEXICANAS (NOM)

ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

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

Speed —	Serial: 115.2 Kbps; Parallel: 230 Kbps in nibble mode
Distance —	Varies with fiber type and dB loss (fiber budget)
Data Format —	Serial Data: 7 data bits, even or odd parity; 8 data bits, no parity; Parallel Data: 8 data bits (host to peripheral)
Switches —	RS-232: (1) 8-position DIP switch, (1) Slide DTE/DCE switch; RS-485: (1) 8-position DIP switch, (1) Slide Terminated/Unterminated switch; Parallel: (1) 4-position DIP switch, (1) Slide Input/Output switch

- Connectors —** Fiber: (2) ST;
RS-232: DB25 female;
RS-485: DB9 male;
Parallel: DB25 female (PC standard pinout)
- Flow Control —** Serial to Serial will pass X-ON/X-OFF or hardware; parallel applications are hardware only; RS-485 applications pass data only
- Parallel Interface —** IBM® PC parallel interface compatible; operation complies with IEEE Std. 1284-1994, supporting Compatibility and Nibble Modes
- Serial RS-232 Interface —** EIA RS-232-C; CCITT V.24, V.28; ISO 2110
- Serial RS-485 Interface —** 2- or 4-wire (RS-422 or RS-485)

Optical	
Wavelength —	820 nm
Fiber Output	
Power —	100 μ W, or see Table 1-1
Fiber Input	
Receiver	
Sensitivity —	1 μ W or -30 dBm
Fiber	
Compatibility —	Single-mode: 8/125 μ ; Multi-mode: 50- μ to 200- μ core
MTBF —	>75,000 hours
Operating	
Temperature —	32 to 158°F (0 to 70°C)
Storage	
Temperature —	14 to 185°F (-10 to +85°C)
Humidity	
Tolerance —	10 to 95%, noncondensing

INDUSTRIAL FIBER DRIVERS

**Maximum
Altitude**

Tolerance — 15,000 feet (4570 m)

Power —

ME310A, ME315A, ME320A:
115 VAC, 12W (1.75W for
ME310A), Output of
9VDC, 500 mA; ME310AE,
ME315AE, ME320AE:
230 VAC, 12W, Output of
9VDC, 500 mA

Size —

1"H x 2.3"W x 3.7"D
(2.5 x 5.8 x 9.4 cm)

Weight —

1.4 lb. (0.6 kg)
with power supply

Table 1-1. Approximate Values into Multimode and Single-Mode Fiber (calculated)

Output Power	(In $\mu\text{W}/\text{dBm}$)		
	Maximum	Medium	Minimum
Multimode			
50 μ core	50/-13	30/-15.2	10/-20
62.5 μ core	110/-9.6	66/-12	22/-17
100 μ core	290/-5.4	174/-8	58/-12.2
Single mode			
8/125 μ	2.5/-26	1.7/-27.7	0.55/-33

2. Introduction

Industrial Fiber Drivers extend your serial RS-232 (ME320 models), serial RS-485 (ME310 models), or IBM® PC parallel (ME315 models) interfaces over single or multimode fiber.

The Fiber Drivers are available in sets, or you can order them separately to accommodate a mixed application. You can start with RS-232, then transmit over fiber to a parallel Fiber Driver at the remote end.

The Fiber Driver's input or output operation is selectable to prevent the problem of having two modules that are transmitting (input) devices and no receiving (output) device.

The serial RS-232 modules are switch-selectable for either DTE or DCE application, eliminating the need for special cables.

ST® style connectors provide single-mode or multimode (fiber optic cable) compatibility and ensure ease of installation in most applications and environments.

3. Installation

Before you begin, make sure all equipment is off and the Fiber Drivers are not powered on.

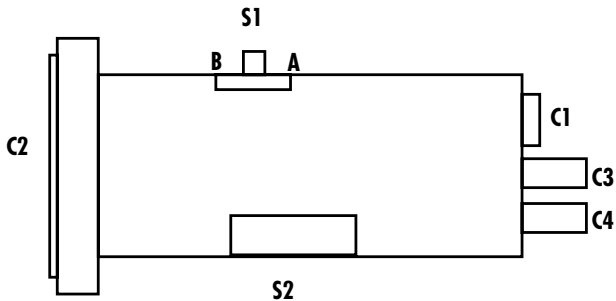
3.1 Serial RS-232 Fiber Drivers

In a Serial-to-Serial application, use the charts in this section to set switch setting (S2) for baud rate and transmission length (optical power). Set S1 for either DCE (to connect to a PC) or DTE (to connect to a modem).

Attach the two devices with single-mode or multi-mode fiberoptic cable with ST style connectors. Make sure to connect the transmitter output of each unit to the receiver input of the other unit.

Once all connections are made, connect DB25 cables to the equipment and power up the Fiber Drivers. Now you can apply power to your equipment.

For testing purposes, a self-test has been incorporated into the Fiber Driver. To enable the test, S2-4 needs to be placed in the up (open) position. The self-test will be transmitted to the serial port. If a PC is the receiving device, a terminal-emulation program will need to be running.



**Figure 3-1. Serial RS-232 Fiber Driver
Switch and Connector Layout.**

Connectors

- C1 — DC Power Jack (9 VDC @ 500 mA)
- C2 — DB25 Female RS-232
- C3 — (Receiver Input) ST style fiberoptic connector
- C4 — (Transmitter Output) ST style fiberoptic connector

Table 3-1. Connector C2 pinout

Pin - Signal	DCE Interface Function (S1-A)	DTE Interface Function (S1-B)
2 - Transmitted Data	Input	Output
3 - Received Data	Output	Input
4 - Request To Send	Connected to pin 5	Connected to pin 5
5 - Clear To Send	Connected to pin 4	Connected to pin 4
6 - Data Set Ready	Output	Input
7 - Common	Ground	Ground
8 - Data Carrier Detect	Open	Open
9 - + (optional)	7 to 12 VDC @ 250 mA	7 to 12 VDC @ 250 mA
20 - Data Terminal Ready	Input	Output
22 - Ring Indicator	Open	Open

DCE — Data Carrier Equipment
(can connect to a PC)

DTE — Data Terminal Equipment
(configured the same as a PC)

NOTE: The Fiber Driver may be powered with either power jack
(connector C1 or pin 9 of the DB25 female, C2).

Switches

S1 — (Receiver Input) 2-Position Slide switch

S2 — 8-Position DIP switch (Up is open, Down is closed)

Table 3-2. Switch S1

Position	Function
A	Configure as DCE for connection to PC serial port.
B	Configure as DTE to simulate PC serial port output.

Table 3-3. Switch S2

Position	Function	Description
1	Baud Rate Select	(see Table 3-7)
2	Baud Rate Select	(see Table 3-7)
3	Baud Rate Select	(see Table 3-7)
4	Test Mode Enable	Up—Test mode enabled Down—Normal operation
5 (Note 1)	Transmitting/ Receiving	Up—Transmitting (Input) Device; Down—Receiving (Output) Device
6 (Note 2)	Optical power	See Table 3-11
7 (Note 2)	Optical power	See Table 3-11
8	Not Used	

NOTES:

1. S2-5 configures the device as a Transmitting (Input) Device or a Receiving (Output) Device. An Input Device can only communicate with an Output Device.
2. The optical transmitter is enabled when power is applied. Close switches S2-6 and S2-7 as necessary to achieve accurate data transfer. Try to achieve accurate data transfer by selecting the lowest

transmitter power combination which accurately passes data. These high-quality Industrial Fiber Drivers are very sensitive, so it is common to overdrive signal and saturate the receiver. See Table 3-11.

3.2 Serial RS-422/RS-485 Fiber Drivers

In a Serial-to-Serial application, use the charts in this section to set switch setting S2 for baud rate and transmission length (power). Set S1 for either four-wire or two-wire RS-485 interface.

Attach the two devices with single-mode or multi-mode fiberoptic cable with ST style connectors. Make sure to connect the transmitter output of each unit to the receiver input of the other unit.

Once all connections are made, connect DB9 cables to the equipment and power up the Fiber Drivers. Now you can apply power to your equipment.

For testing purposes, a self-test has been incorporated into the Fiber Driver. To enable the test, switch S2-4 to the Up (open) position. The self-test will be transmitted to the serial port. If a PC is the receiving device, a terminal-emulation program will need to be running.

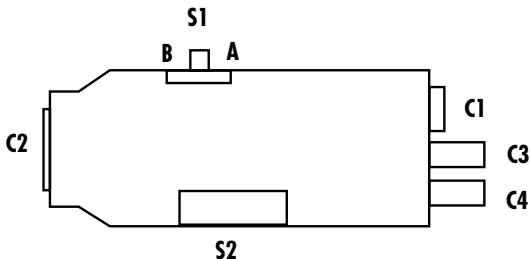


Figure 3-2. Serial RS-485 Fiber Driver Switch and Connector Layout.

Connectors

- C1 — DC Power Jack (9 VDC @ 500 mA)
- C2 — DB9 Female RS-485
- C3 — (Receiver Input) ST style fiberoptic connector
- C4 — (Transmitter Output) ST style fiberoptic connector

Table 3-4. Jumper J2 pinout

Pin - Signal	4-Wire RS-422/RS-485 Interface (S2-5 Up)	2-Wire RS-485 Interface (S2-5 Down)
1 - Unused	Unused	Unused
2 - Pair 1+	Receive+	Receive/Transmit+
3 - Pair 1-	Receive-	Receive/Transmit-
4 - Unused	Unused	Unused
5 - Ground	Ground	Ground
6 - Pair 2+	Transmit+	Transmit+
7 - Pair 2-	Transmit-	Transmit-
8 - Unused	Unused	Unused
9 - + (optional)	7 to 12 VDC @ 250 mA	7 to 12 VDC @ 250 mA

NOTE: The Fiber Driver may be powered with either power jack (connector C1 or pin 9 of the DB25 female, C2).

Switches

S1 — (Receiver Input) 2-Position Slide switch

S2 — 8-Position DIP switch (Up is open, Down is closed)

Table 3-5. Switch S1

Position	Function
A	RS-485 Interface Terminated (120 ohm)
B	RS-485 Interface Unterminated

Table 3-6. Switch S2

Position	Function	Description
1	Baud Rate Select	(see Table 3-7)
2	Baud Rate Select	(see Table 3-7)
3	Baud Rate Select	(see Table 3-7)
4	Test Mode Enable	Up—Test mode enabled Down—Normal operation
5 (Note 1)	4 Wire/2 Wire	Up—4-wire RS-485 Interface Down—2-wire RS-485 Interface
6 (Note 2)	Optical power	See Table 3-11
7 (Note 2)	Optical power	See Table 3-11
8	Not used	

NOTES:

1. S2-5 configures the device with a 4-wire or 2-wire RS-485 interface.

NOTES (continued):

2. Optical transmitter is enabled when power is applied. Close switches S2-6 and S2-7 as necessary to achieve accurate data transfer. Try to achieve accurate data transfer by selecting the lowest transmitter power combination which accurately passes data. These high-quality Industrial Fiber Drivers are very sensitive, it is common to overdrive signal and saturate the receiver. See Table 3-11.

Table 3-7. Baud Rate

Baud Rate (in Kbps)	S2-3	S2-2	S2-1
115.2	Down	Down	Down
57.6	Down	Down	Up
38.4	Down	Up	Down
28.8	Down	Up	Up
19.2	Up	Down	Down
14.4	Up	Down	Up
9.6	Up	Up	Down
2.4	Up	Up	Up

3.3 Parallel Fiber Drivers

In a Parallel-to-Parallel application, use Table 3-11 to set switch setting (S2). Set S1 for either Transmitting (Input) Device to connect to a PC or Receiving (Output) Device to connect to a printer.

Attach the two devices with a single-mode or multi-mode fiberoptic cable with ST style connectors. Make sure to connect the transmitter output of each unit to the receiver input of the other unit.

Once all connections are made, connect DB25 cables to equipment and power up the Fiber Drivers. Now you can apply power to your equipment.

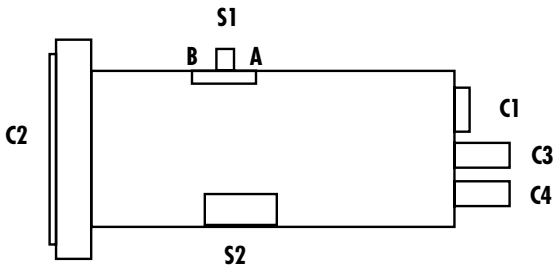


Figure 3-3. Parallel Fiber Driver Switch and Connector Layout.

Connectors

- C1 — DC Power Jack (9 VDC @ 500 mA)
- C2 — DB25 Female IBM Parallel Port
- C3 — (Receiver Input) ST style fiberoptic connector
- C4 — (Transmitter Output) ST style fiberoptic connector

Table 3-8. C2 DB25 Female Pinout

Pin - Signal	Input Device Function (S1-A)	Output Device Function (S1-B)
1 - nStrobe	Input	Output
2 - Data 1	Input	Output
3 - Data 2	Input	Output
4 - Data 3	Input	Output
5 - Data 4	Input	Output
6 - Data 5	Input	Output
7 - Data 6	Input	Output
8 - Data 7	Input	Output
9 - Data 8	Input	Output
10 - nAck	Output	Input
11 - Busy	Output	Input
12 - PError	Output	Input
13 - Select	Output	—
14 - nAutoFd	Input	Output
15 - nFault	Output	Input
16 - nInit	Input	Output
17 - nSelectIn	Input	Output
18 - Ground	Ground	Ground
19 - Ground	Ground	Ground
20 - Ground	Ground	Ground
21 - Ground	Ground	Ground
22 - Ground	Ground	Ground
23 - Ground	Ground	Ground
24 - Ground	Ground	Ground
25 - Ground	Ground	Ground

NOTE: Input Device is intended to be connected to a PC.

Output Device is intended to be connected to a printer
(configured like a PC parallel port).

Switches

S1 — (Receiver Input) 2-Position Slide switch

S2 — 4-Position DIP switch (Up is open, Down is closed)

Table 3-9. S1 switch

Position	Function
A	Configure as Input Device for connection to a PC
B	Configure as Output Device for connection to a printer

NOTE: S1 configures the device as an Input Device or an Output Device.
An Input Device can only communicate with an Output Device.

Table 3-10. S2

Position	Function	Description
1 (Note)	Optical power	See Table 3-11
2 (Note)	Optical power	See Table 3-11
3	Not used	
4	Not used	

NOTE: The optical transmitter is enabled when power is applied. Close switches S2-1 and S2-2 as necessary to achieve accurate data transfer. Try to achieve accurate data transfer by selecting the lowest transmitter power combination which accurately passes data. These high-quality Industrial Fiber Drivers are very sensitive, so it is common to overdrive signal and saturate the receiver. See Table 3-11.

Table 3-11. Optical Transmitter Power

Transmitter Power	Serial S2-7 Parallel S2-2	Serial S2-6 Parallel S2-1
Low Power	Up	Up
Medium Power	Up Down (either combination is acceptable)	Down Up
High Power	Down	Down

3.4 Mixed Operation

In a serial-to-parallel application or a parallel-to-serial application, the same setup is necessary for each unit as described in the previous sections. Note that only hardware handshaking can be used when mixing units. Each unit must be set for either transmitter or receiver.

3.4.1 INTERCONNECTION

Parallel to Parallel

1. One device must be configured as a transmitting (input) device, and one device must be configured as a receiving (output) device.
2. The transmitter power must be the same between the transmitting and receiving devices.

Serial to Serial

1. One device must be configured as a transmitting (input) device, and one device must be configured as a receiving (output) device.
2. The transmitter power must be the same between the transmitting and receiving devices.
3. Each device must be configured as a DCE or DTE as appropriate for the interfacing equipment.
4. The baud rate of each device must be set the same as the interfacing equipment.

Parallel Input to Serial Output

1. The parallel device must be configured as a transmitting (input) device, and the serial device must be configured as a receiving (output) device.

2. The transmitter power must be the same between the transmitting and receiving devices.
3. The serial device must be configured as a DCE or DTE as appropriate for the interfacing equipment.
4. The baud rate of serial device must be set the same as the interfacing equipment.
5. The parallel port SelectIn signal is used to control the serial Data Terminal Ready (DTR) signal, and the serial Data Set Ready (DSR) signal is used to control the parallel port Busy signal.

Serial Input to Parallel Output

1. The serial device must be configured as a transmitting (input) device, and the parallel device must be configured as a receiving (output) device.
2. The transmitter power must be the same between the transmitting and receiving devices.
3. The serial device must be configured as a DCE or DTE as appropriate for the interfacing equipment.

4. The baud rate of serial device must be set the same as the interfacing equipment.
5. The serial Data Terminal Ready (DTR) signal is used to control the parallel port SelectIn signal, and the parallel port Busy signal is used to control the serial Data Set Ready (DSR) signal.

3.4.2 DIFFERENCES BETWEEN SERIAL RS-232 AND SERIAL RS-485

1. RS-485 devices don't distinguish between DTE and DCE interface.
2. RS-485 devices don't pass any status signals; they pass data only.
3. RS-485 devices don't distinguish between input device and output devices.
4. RS-485 4-wire point-to-point is RS-422.

4. Troubleshooting

If the Fiber Drivers fail to operate, check these things before calling for technical support.

1. Are the units powered on? Check to see if the power supplies are plugged into a working AC outlet.
2. Check to see if the interconnect fiberoptic cable is connected properly (transmitter to receiver).
3. Make sure that one Fiber Driver is set up for transmitting and the other for receiving.
4. Check transmitter power settings. Try to achieve accurate data transfer by selecting the lowest transmitter power combination that accurately passes data. These high-quality Industrial Fiber Drivers are very sensitive, so it is common to overdrive signal and saturate the receiver.

4.1 Calling BLACK BOX

If you determine that your Fiber Driver is malfunctioning, *do not attempt to alter or repair* the unit. 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.

4.2 Shipping and Packaging

If you need to transport or ship your Fiber Driver:

- Package it carefully. We recommend that you use the original container.
- If you are shipping the Fiber Driver for repair, make sure you include everything that came in the original package. Before you ship, contact Black Box to get a Return Materials Authorization (RMA) number.

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