BLACK BOX®
NETWORK SERVICES

V.35 Single Fiber Driver 256/ST
V.35 Single Fiber Driver 256/SMA
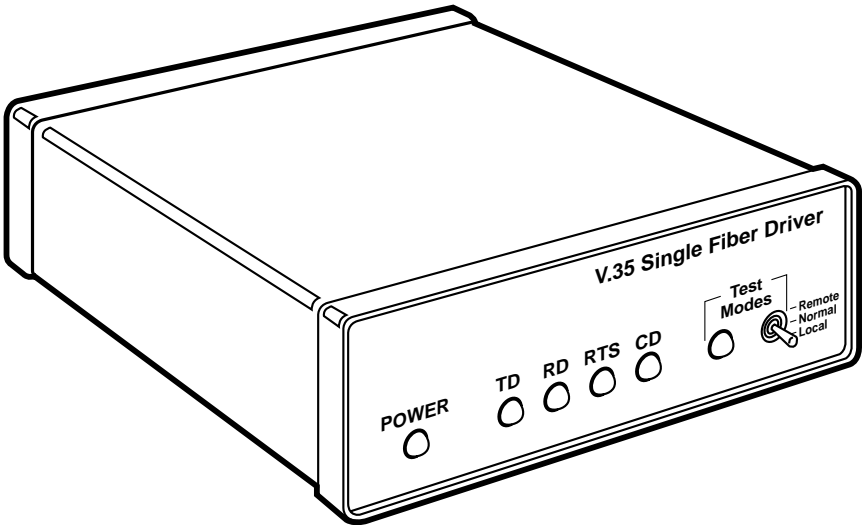
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FEDERAL COMMUNICATIONS COMMISSION
AND
INDUSTRY CANADA
RADIO FREQUENCY INTERFERENCE STATEMENTS

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 connectado 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 fisica 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 lineas de energia.

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 objectos liquidos 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: Objectos 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

Protocol —	Synchronous
Range —	1.5 miles (2.4 km) at data rates above 64 Kbps and 3 miles (4.8 km) at data rates below 64 Kbps
Data Rates —	2.4, 9.6, 14.4, 19.2, 28.8, 38.4, 48, 56, 64, 128, 144, 192, and 256 Kbps
Interface —	CCITT V.35 (M/34 female)
Transmit Mode —	Single 62.5- or 50-µ core, multimode fiber cable
Clocking —	Internal, external, or received recovered
Handshaking —	Software (X-ON/X-OFF) or hardware (RTS/CTS), both modes available at all times
Application —	Point to point
Typical Link Budget —	8 dB with a 50-µ cable; 12 dB with a 62.5-µ cable
Responsivity Minimum —	0.12 A/w
Indicators —	(6) LEDs: TD, RD, RTS, CTS, power, test
Diagnostics —	Local and remote loopback
Connectors —	(1) M/34 female; (1) ST® or SMA
MTBF —	224,205 hours (about 25.5 years)
MTTR —	1 hour
Operating Temperature —	32 to 140°F (0 to 60°C)
Relative Humidity —	95%, noncondensing
Altitude Tolerance —	Up to 10,000 feet (3048 m)
Compliance —	UL®, CSA, CE, TUV
Power Supply —	Wallmount, 7.5 VDC, 115 VAC, 60 Hz
Size —	1.5"H x 4.1"W x 5"D (3.8 x 10.4 x 12.7 cm)
Weight —	1 lb. (0.5 kg)

2. Introduction

The V.35 Single Fiber Drivers are high-speed fiber modems that support full-duplex, point-to-point V.35 communication over a single multimode fiber. Running at synchronous speeds up to 256 Kbps, the V.35 Single Fiber Drivers automatically adapt to hardware or software flow control, and can be set for internal, external, or received recover clocking.

Connect optical fiber to the Driver with an ST or SMA interface. The Driver's V.35 DTE interface is a female M/34 connector (see **Appendix B** for its pinout).

The V.35 Single Fiber Driver features local and remote loopback tests, six front-panel LEDs, and externally accessible configuration switches.

For proper operation, these Drivers must be used in pairs.

3. Configuration

The V.35 Single Fiber Driver uses an eight-switch package that can configure a wide range of synchronous applications. Since all eight switches are externally accessible (see the illustrations below), there's no need to open the Driver's case for configuration.
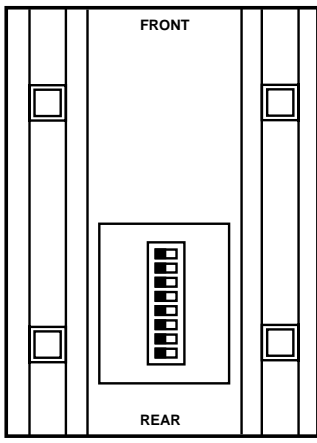

Figure 3-1. The 8-switch package is located underneath the Driver.
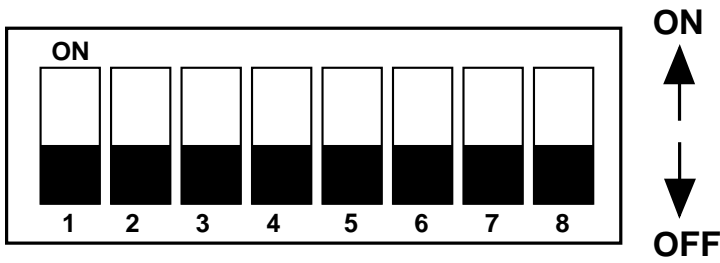

Figure 3-2. A closeup of the switches. All eight switches are shown in the "ON" position.

V.35 SINGLE FIBER DRIVERS

The eight configuration switches set data rate (distance), sync clock source, and DTE control of the RDL and LAL test modes. The table below shows which switches control each function, and the factory-default settings.

Table 3-1. DIP-switch default settings and functions

Switch Number	Function	Factory-Default Setting	
S1-1	Data Rate (Distance)	Off	
S1-2	Data Rate (Distance)	Off	64 Kbps (2X)
S1-3	Data Rate (Distance)	Off	
S1-4	Data Rate (Distance)	On	
S1-5	Clock Source	On	Internal
S1-6	Clock Source	On	
S1-7	DTE Control of RDL	On	Enabled
S1-8	DTE Control of LAL	On	Enabled

Switches S1-1 through S1-4: Data Rate (Distance)

Switches S1-1 through S1-4 are set in combination to determine synchronous data rate and maximum distance. Maximum distance is determined by the space between data packets in the communication stream between two V.35 Single Fiber Drivers. The "2X" setting *doubles* the space between data packets, when compared with the normal "1X" setting, and therefore doubles the maximum distance. A setting of "2X" supports communication distances up to 3 miles, and is available at certain data rates up to 64 Kbps. A setting of "1X" supports communication at the normal distance of 1.5 miles.

S1-1	S1-2	S1-3	S1-4	Data Rate (Distance)
On	On	On	Off	2.4 (1X)
Off	**On**	**On**	**On**	**9.6 (2X)**
On	Off	On	Off	14.4 (1X)
On	**Off**	**On**	**On**	**19.2 (2X)**
Off	Off	On	Off	28.8 (1X)
Off	**Off**	**On**	**On**	**38.4 (2X)**
On	**On**	**Off**	**On**	**48 (2X)**
Off	On	Off	Off	56 (1X)
Off	**Off**	**Off**	**On**	**64 (2X)**
Off	On	On	Off	72 (1X)
Off	Off	Off	Off	128 (1X)
On	On	Off	Off	144 (1X)
Off	On	Off	On	192 (1X)
On	On	On	On	256 (1X)

S1-5 and S1-6: Clock Source

Switches S1-5 and S1-6 are set in combination to determine the source of the transmit clock.

S1-5	S1-6	Setting
Off	Off	Received Recover Clock
On	Off	Internal Clock
Off	On	External Clock
On	On	Internal Clock

S1-7: DTE Control of RDL

The setting for switch S1-7 determines whether DTE control of remote digital loopback test is enabled or disabled. If DTE control is disabled, the RDL test can only be initiated by the front-panel switch.

If DTE control is not available, switch S1-7 should be set to off.

| S1-7	Setting
On	DTE control of RDL enabled
Off	DTE control of RDL disabled

S1-8: DTE Control of LAL

The setting for switch S1-8 determines whether DTE control of local analog loopback test is enabled or disabled. If DTE control is disabled, the LAL test can only be initiated by the front-panel switch.

If DTE control is not available, switch S1-8 should be set to off.

S1-8	Setting
On	DTE control of LAL enabled
Off	DTE control of LAL disabled

4. Installation

The V.35 Single Fiber Driver is easy to install. Once you've configured the DIP switches (described in **Chapter 3**), simply connect the single fiber cable, hook up the V.35 interface, and plug the power-supply adapter into the Driver. The illustration below shows the interface connections on the back of the V.35 Single Fiber Driver.
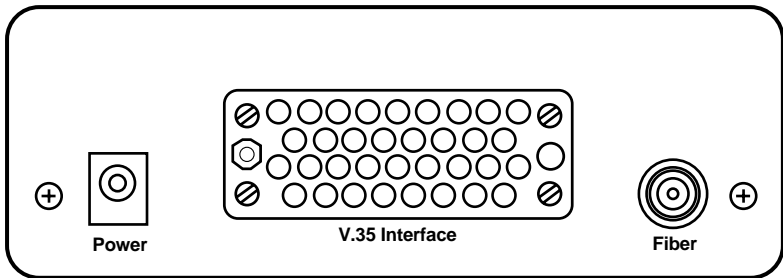
Figure 4-1. The Driver's rear panel.

4.1 Single-Fiber Connection

These short-range modems are designed to work in pairs. You will need one at each end of the single multimode fiber cable. Depending which data-rate setting you select, your cable may be a maximum of 1.5 or 3 miles long. The fiber cable connects to each V.35 Single Fiber Driver using either an ST or an SMA connector. The illustration on the next page shows a closeup of both connectors.
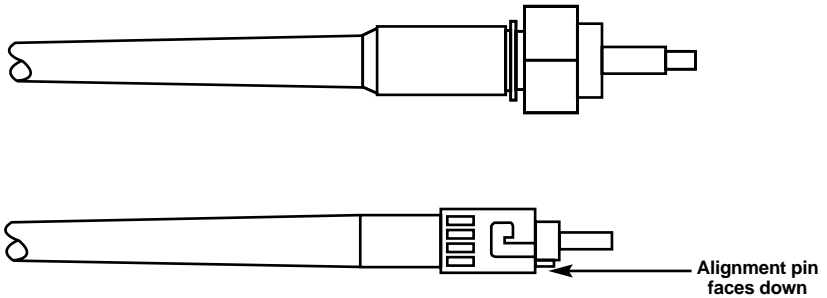
Alignment pin faces down

Figure 4-2. ST and SMA connectors.

4.2 V.35 Connection

The V.35 Single Fiber Driver is configured as a DCE. Therefore, it "wants" to connect to DTE hardware such as a PC, host, or terminal, using a straight-through cable. Connecting the Driver to DCE hardware, such as a modem, multiplexor, or printer, requires a null-modem V.35 cable. Contact your supplier for more information about constructing the appropriate null-modem cable for your application.

5. Operation

Once you've configured each V.35 Single Fiber Driver and connected the fiber and V.35 cables, you're ready to operate the units.

5.1 LED Status Monitors

The Driver has six front-panel status LEDs that indicate the condition of the modem and communication link. The illustration below shows the location of each LED.
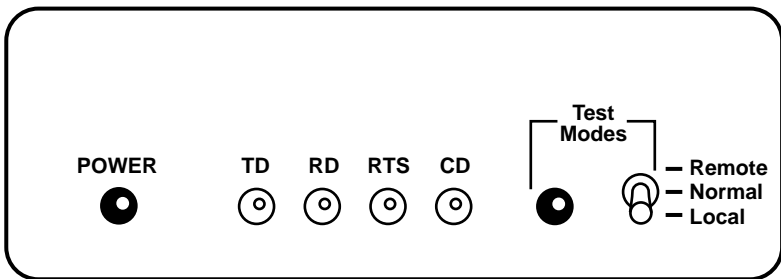
Figure 5-1. The front of the V.35 Single Fiber Driver.

• The green "Power" LED glows if power is applied to the modem.

• The green "Test Modes" LED indicates that the modem is in test mode (local analog or remote digital).

• The "TD" and "RD" indicators blink red and green with data activity. Red indicates a low V.35 logic level; green indicates a high V.35 logic level. V.35 devices idle in a low state, so the LED will glow red if the connections are correct and the V.35 device is in an idle state.

• The "RTS" and "CD" indicators are also tri-state and will glow red for a "low" signal or green for a "high" signal. RTS lights for an incoming signal on V.35 pin C. CD lights for an incoming signal on the line side, and the resulting output signal on V.35 pin F.

5.2 Power-up/Synchronization

Apply AC power to the V.35 Single Fiber Driver by plugging the separate AC power adapter first into the rear-panel outlet of the Driver (refer to Figure 4-1 in **Chapter 4**) and then into the acceptable AC power outlet. There is no power switch on the Driver; when the Power LED is glowing steady, the Driver is powered up.

IMPORTANT!

Make sure the front-panel toggle switch on both V.35 Single Fiber Drivers is set to NORMAL.

After both the local and remote Drivers are powered up, a synchronization process must occur between the two modems before a link can be established. Depending upon a number of factors, this synchronization process can take as long as 60 seconds. Any time one or the Drivers loses power (in a lightning storm, for example), the local and remote units must re-synchronize before they can resume data transmission.

NOTE

If your application cannot tolerate a 60-second synchronization phase, turning on the front-panel "Test Modes" switch to REMOTE and then back to NORMAL will synchronize the units within 250 ms.

When both Drivers are powered up and passing data normally, the following LED conditions will exist:

- PWR = green

- TD and RD = flashing red and green

- RTS and DCD = green

- TEST = off

5.3 Loopback Test Modes

The V.35 Single Fiber Driver offers two loopback test modes to evaluate the condition of the modems and the communication link. These tests are activated from the front panel.

5.3.1 LOCAL LOOPBACK

The local loopback test checks the operation of the local V.35 Single Fiber Driver, and is performed separately on each unit. Any data sent to the local Driver in this test mode will be echoed back to the user device. For example, characters typed on the keyboard of a terminal will appear on the terminal screen.

To perform a local loopback test, follow these steps:

 a) Activate local loopback by moving the front-panel toggle switch down to "Local." Once local loopback is activated, the Driver transmit output is connected to its own receiver. The "test" LED should glow. (Note: Even though the local Driver cannot communicate with the remote Driver in this mode, the synchronized connection between the two modems remains intact.)

 b) Verify that the data terminal equipment is operating properly and can be used for a test. If a fault is indicated, call a technician or replace the unit.

 c) Perform a BERT (bit error rate) test on each unit. If the BERT test equipment indicates no faults and the data terminal indicates a fault, follow the manufacturer's checkout procedures for the data terminal. Also check the V.35 interface cable between the terminal and the V.35 Single Fiber Driver.

5.3.2 REMOTE LOOPBACK

The remote loopback test checks the performance of the local and remote Drivers, *and* the communication link between them. (See the illustration on the next page.) Any characters sent to the remote Driver in this test mode will be returned to the originating device. For example, characters typed on the keyboard of the local terminal will appear on the local terminal screen *after* having been passed to the remote Driver and looped back.

To perform a remote loopback test, follow these steps:

a) Activate remote loopback by moving the front-panel toggle switch up to "Remote." The "test" LED should glow.

b) Perform a BERT (bit error rate) test on the system.

c) If the BERT test equipment indicates a fault, and the local loopback test was successful for both V.35 Single Fiber Drivers, there may be a problem with the fiber communication line connecting the modems. You should test the fiber line for proper connections and continuity.
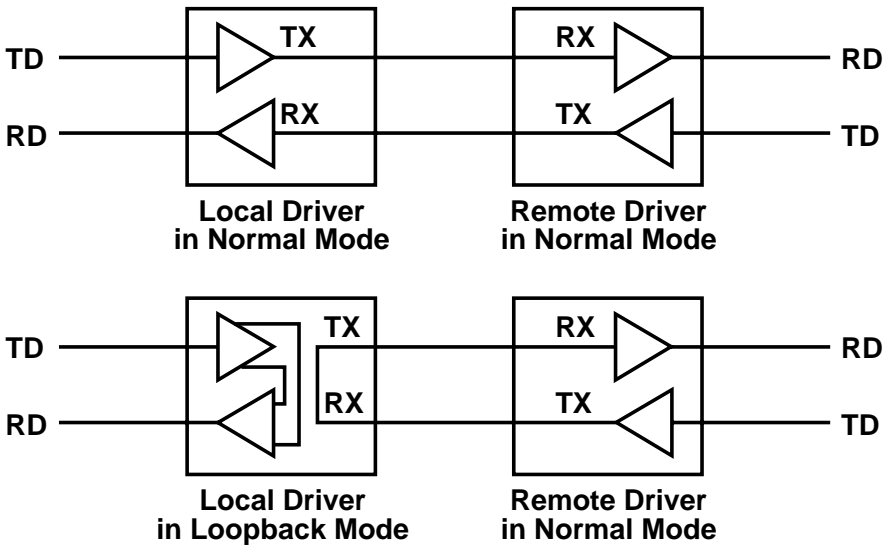

Figure 5-2. Local and remote loopback test modes.

5.4 Power-down

Turn off the V.35 Single Fiber Driver by simply unplugging the AC power adapter from the wall. There is no power switch on the Driver.

Appendix A: Troubleshooting

Symptom	Problem	Solution
LEDs do not light when the AC power transformer is plugged into the wall.	1. Loose power connection.	1. Make sure the AC connection is flush.
	2. Outlet is defective.	2. Try a different outlet.
	3. AC power cord is defective.	3. Remove the cord from the outlet and check for continuity.
	4. AC transformer is not plugged into the Driver.	4. Plug it in.
Carrier Detect (CD) LED is low or Carrier Detect (CD) LED is high, but the Drivers aren't communicating.	1. If CD is low, possible synchronization loss.	1. Check for ongoing power loss or break in fiber if CD does not go high within 60 seconds.
	2. Test Mode switch is in the wrong position.	2. Be sure the Test Mode switch is set to NORMAL on both Drivers.
	3. DIP switches are set improperly.	3. Check all DIP-switch settings, especially Reset and Data Rate, against those listed in Chapter 3. Make sure both Drivers are set the same way.
	4. Fiber link is connected improperly.	4. Check the ST or SMA connection on the back of both Drivers.
	5. V.35 connections are faulty or cables are pinned wrong.	5. Check V.35 cable continuity and pinning.

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Symptom	Problem	Solution
Data passes, but hardware flow control doesn't work.	1. Incorrect DIP-switch setting.	1. Switch 7 must be in the ON position for hardware flow-control signals to pass between the Drivers; both units must be set the same way.
Drivers work in async mode, but not sync mode.	1. Incorrect DIP-switch setting.	1. Switch 8 (internal/external clock) must be set the same way for both Drivers.

Appendix B: Interface Pin Assignment

V.35 Single Fiber Driver—Female M/34 Connector (V.35)

Pin Number	Signal
A	Frame Ground
B	SGND (Signal Ground)
C	RTS
D	CTS
E	DSR
F	CD
H	DTR
L	LL (Local Loop)
M	TM (Test Mode)
N	RL (Remote Loop)
P	TD
R	RD
S	TD/
T	RD/
U	XTC
V	RC
W	XTC/
X	RC/
Y	TC
AA	TC/

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