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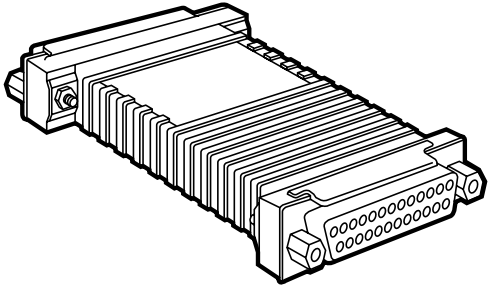
BLACK BOX®
NETWORK SERVICES

NOVEMBER 1999
SP340A-R2
SP400A-R3
PS576

# High-Speed Opto-Isolator
# Opto-Isolator



## CUSTOMER SUPPORT INFORMATION

Order **toll-free** in the U.S. 24 hours, 7 A.M. Monday to midnight Friday: **877-877-BBOX**
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# CE Notice

The CE symbol on your Opto-Isolator indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the Union European (EU).

# Trademarks Used In This Manual

Any trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.

# 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 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 the Canadian Department of Communications.*

*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 le ministère des Communications du 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.

# 1. Specifications

| | |
|---|---|
| **Data Rates —** | SP400A-R3: Up to 19.2 kbps; SP340A-R2: Up to 115.2 kbps |
| **Interface —** | EIA RS-232-E |
| **Transmission Format —** | Asynchronous, full or half-duplex |
| **Connectors —** | Opto-Isolators: (2) DB25 female; PS576: (2) DB25— 1 male, 1 female |
| **Isolation —** | 2500 VRMS |
| **Compliance —** | 89/336/EEC, FCC Part 15, Class A |
| **Temperature Range —** | 32 to 122°F (0 to 50°C) |
| **Humidity Tolerance —** | 5 to 95%, noncondensing |
| **Altitude Tolerance —** | Up to 10,100 feet (3078.5 m) |

| | |
|---|---|
| **Power Supply —** | Interface-powered; Optional power (PS576) supplied to pin 9 (either side) at +9 VDC ±5% @100 mA (≈945 mW) |
| **Size —** | Opto-Isolators: 0.8"H x 2.1"W x 3.8"D (2 x 5.3 x 9.7 cm); PS576: 2.7"H x 1.2"W x 0.7"D (6.9 x 3 x 1.8 cm) |
| **Weight —** | 0.8 lb. (0.4 kg) |

# 2. Introduction

Opto-Isolators guard your asynchronous data and equipment from the hazards of ground looping. Plugging directly into your DTE hardware, the Opto-Isolators provide 2500 VRMS of DTE/DCE isolation. The Opto-Isolator (SP400A-R3) supports data rates to 19.2 kbps; the High-Speed Opto-Isolator (SP340A-R2) supports up to 115.2 kbps.

The Opto-Isolators isolate four RS-232 signals. In addition to two data lines (TD, RD), the Opto-Isolator passes one user-configurable control signal in each direction. That makes it perfect for applications that require hardware flow control. Just plug it in between DTE and DCE equipment—no external power required. Standard DB25 female connectors on both sides connect to the equipment ports.

# 3. Configuration

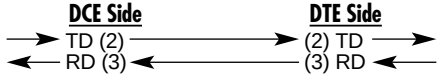
The Opto-Isolator is equipped with two 8-position DIP switches that allow configuration to a wide range of applications. This section describes all possible configuration settings, including the factory-default settings.

## 3.1 Checking the Default Configuration

The Opto-Isolator passes four optically isolated signals between the connected RS-232 DCE and DTE devices. The data signals, TD (pin 2) and RD (pin 3), have been dedicated and cannot be changed. Use two sets of DIP switches to set the control.

### 3.1.1 Data Signals: Transmit Data (TD) and Receive Data (RD)

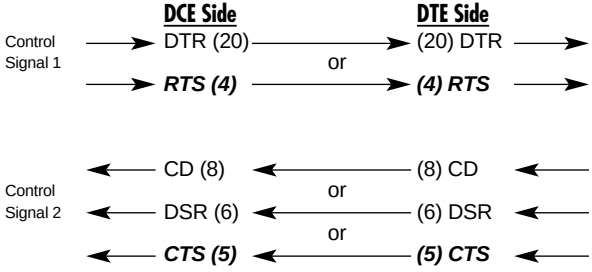
The Transmit Data and Receive Data signals cannot be altered. The diagram below shows the TD and RD signal directions.



### 3.1.2 Control Signals: DTR/RTS and CD/DSR/CTS

The Opto-Isolator passes *one* control signal in each direction. That allows you to use it in applications that require hardware flow control. You may select either DTR or RTS in one direction, and CD, DSR, or CTS in the other direction.

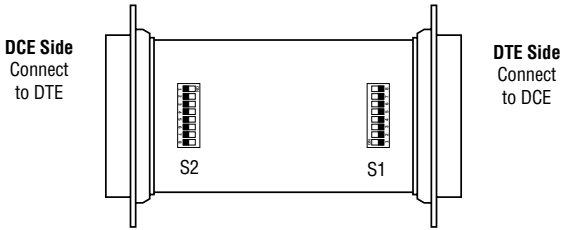
*Before* opening the Opto-Isolator's case, check the default control-signal settings (shown below). If the default configuration is correct, go to **Chapter 4**. Otherwise, go to **Section 3.2** to change the control-signal settings.




NOTE: Default control signals are shown above in bold italics.

## 3.2 Setting the Internal Switches

All switches and jumpers are located on the top side of the Opto-Isolator PC board. To access the PC board, open the case by inserting a small flat-blade screwdriver in the slot on either side of the case and twisting gently. As the illustration below shows, the DIP switches are on the main PC board.




The two sets of DIP switches will be referred to as S1 and S2. The illustration below shows the orientation of DIP-Switches S1 and S2 with respect to ON and OFF positions.

### 3.2.1 Selecting the DTE Output Signals (DTR or RTS)

Use Switches S1-1, S1-2, S2-1, and S2-2 to connect either Data Terminal Ready (DTR, pin 20) or Request to Send (RTS, pin 4). In the Isolated setting, the selected signal passes through Opto-Isolator isolated up to 2500 VRMS.

| Connect DTR Signal (Pin 20) | | |
|---|---|---|
| **Switch** | **Isolated Signal** | **Setting** |
| S1-1 | DTR | On |
| S1-2 | DTR | Off |
| S2-1 | DTR | On |
| S2-2 | DTR | Off |

Note: Default Settings

| Connect RTS Signal (Pin 4) | | |
|---|---|---|
| **Switch** | **Isolated Signal** | **Setting** |
| S1-1 | RTS | Off |
| S1-2 | RTS | On |
| S2-1 | RTS | Off |
| S2-2 | RTS | On |

### 3.2.2 Selecting the DCE Output Signals (CTS, DSR, or CD)

Use Switches S1-3, S1-4, S1-5, S2-3, S2-4, and S2-5 to connect either Clear to Send (CTS, pin 5), Data Set Ready (DSR, pin 6), or Carrier Detect (CD, Pin 8). In the Isolated setting, the selected signal passes through the Opto-Isolator isolated up to 2500 VRMS.

| Connect CTS Signal (Pin 5) | | |
|---|---|---|
| **Switch** | **Isolated Signal** | **Setting** |
| S1-3 | CTS | Off |
| S1-4 | CTS | Off |
| S1-5 | CTS | On |
| S2-3 | CTS | Off |
| S2-4 | CTS | Off |
| S2-5 | CTS | On |

Note: Default Settings

| Connect DSR Signal (Pin 6) | | |
|---|---|---|
| **Switch** | **Isolated Signal** | **Setting** |
| S1-3 | DSR | Off |
| S1-4 | DSR | On |
| S1-5 | DSR | Off |
| S2-3 | DSR | Off |
| S2-4 | DSR | On |
| S2-5 | DSR | Off |

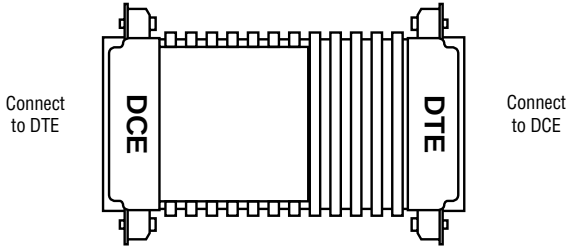
| Connect CD Signal (Pin 8) | | |
|---|---|---|
| **Switch** | **Isolated Signal** | **Setting** |
| S1-3 | CD | On |
| S1-4 | CD | Off |
| S1-5 | CD | Off |
| S2-3 | CD | On |
| S2-4 | CD | Off |
| S2-5 | CD | Off |

**NOTE**

Switches S1-6, S1-7, S1-8, S2-6, S2-7, and S2-8 are reserved for future use.

# 4. Installation

The Opto-Isolator provides 2500-VRMS optical isolation between a DTE and a DCE device. It plugs directly into the DTE and connects to the DCE by a short cable. No additional power is required in most cases. Refer to the diagram below and follow the instructions to install the Opto-Isolator.




1) Plug the Opto-Isolator's DB25 female connector, labeled DCE, directly into the DB25 male RS-232 port on your DTE device (PC, terminal, host, etc.). If your DTE device has a connector other than a male DB25, or if you need greater distance from the RS-232 interface, use a straight-through cable.

2) Connect the DB25 female connector labeled DTE on the Opto-Isolator to your DCE device.

3) When installed according to these instructions, the Opto-Isolator will operate transparently. There is no ON/OFF switch; it's operational as soon as power is supplied.

### Additional Power

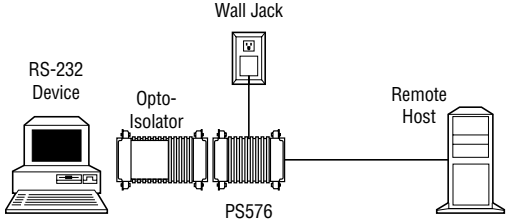
In most cases, the Opto-Isolator requires no additional power to work. However, if the connected interfaces supply insufficient power, you may supply additional power at +9 VDC ±5% @ 100 mA. We recommend using the PS576; it's equipped with DB25 connectors on each end.

To attach the power supply:

1) Disconnect the Opto-Isolator from the low-power RS-232 device.

2) Connect the PS576 to the Opto-Isolator's DB25 connector.

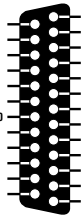
3) Connect the other end of the Opto-Isolator into the low-power RS-232 device. The application should look like the one shown below.




4) Plug the wall adapter into the AC wall jack.

# Appendix A. Pin Assignments

| DIRECTION | STANDARD "DCE" SETTING | DIRECTION |
|---|---|---|
| | 1- (FG) Frame Ground | |
| | 2- (TD) Transmit Data | To Isolator |
| | 3- (RD) Receive Data | From Isolator |
| | 4- (RTS) Request to Send | To Isolator |
| | 5- (CTS) Clear to Send | From Isolator |
| | 6- (DSR) Data Set Ready | From Isolator |
| To Isolator | Data Term Ready (DTR) -20 | |
| | 7- (SG) Signal Ground | |
| | 8- (DCD) Data Carrier Detect | From Isolator |



| DIRECTION | STANDARD "DTE" SETTING | DIRECTION |
|---|---|---|
| | 1- (FG) Frame Ground | |
| | 2- (TD) Transmit Data | From Isolator |
| | 3- (RD) Receive Data | To Isolator |
| | 4- (RTS) Request to Send | From Isolator |
| | 5- (CTS) Clear to Send | To Isolator |
| | 6- (DSR) Data Set Ready | To Isolator |
| From Isolator | Data Term Ready (DTR) -20 | |
| | 7- (SG) Signal Ground | |
| | 8- (DCD) Data Carrier Detect | To Isolator |