FOI-4451 and FOI-4541

FIBER OPTIC ISOLATOR

fiberplex
A Brand of Patton Electronics Company

Description

The FOI-4451 and FOI-4541 both provide complete electrical isolation for RS-422 communications. The units are transparent to all handshaking protocols and can accept data and clock signals up to a maximum rate of 6.144 Mbps. A regeneration switch on the FOI-4451 allows users to toggle between synchronous applications that require Send Timing (ST) and asynchronous or synchronous applications that require Terminal Timing (TT).

The units can be used in areas of high electrical noise or in and out of RF shielded enclosures. The fiber optic cable is not susceptible to interference caused by impulse noise, crosstalk, or EMI. Privacy of communications is also enhanced because the fiber optic cable does not radiate any emissions. FiberPlex recommends "T" units for high security applications because they have been TEMPEST tested and approved.

In addition, fiber optic cable offers much longer transmission distances than traditional RS-422 cabling. Multimode optics on the units can extend the distance to 2km, while singlemode optics can further extend the distance to 20km. A typical link consists of an FOI-4451 at the Data Communication Equipment (DCE) and an FOI-4541 at the Data Terminal Equipment (DTE) with a duplex fiber optic cable between them as shown under "TYPICAL APPLICATION".

TIA/EIA-422 (RS-422)

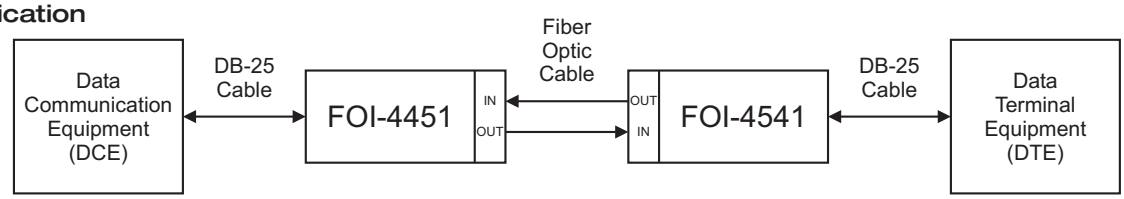
DC to 6.144 Mbps

FOI-4451: To DCE
FOI-4541: To DTE

Features:

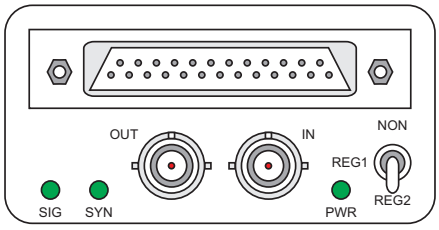
- Data Rate: DC to 6.144 Mbps
- Compatible with:
  - TIA/EIA-530 (RS-530)
  - MIL-STD-188-114A balanced type 1 and type 2
  - FED STD 1030A
- Supports tail circuit and null modem functions for DCE to DCE or DTE to DTE communications. Requires two of the same FOI units.
- An alternate interface (V.35 or RS-232) may be installed at the opposite end, allowing the user to create a link between two electrically incompatible interfaces without requiring a separate interface converter. For more information, please see the "OPTICAL COMPATIBILITY" table.

Typical Application

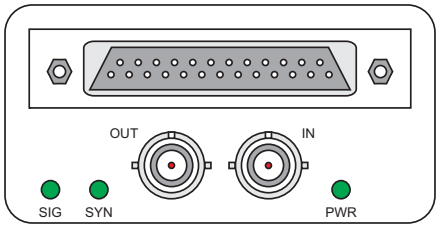


LED Indicators

Label	Color	Description
PWR	Green	Power supply in FOI unit is operating properly.
	Off	No power from the PSQ power supply or open fuse inside the FOI unit. Check that the PSQ power supply is operating properly. If the PSQ power supply is good, separate the FOI unit from the PSQ power supply for 30 seconds and then reattach so that the fuse inside the FOI unit has time to reset. If the PWR led is still off or not constant, replace the FOI unit.
SIG	Green	**Standard units:** No function. The SIG led will turn on upon power up and remain on. **TEMPEST units:** Optical signal in detected.
	Off	**Standard units:** No function. The SIG led will turn on upon power up and remain on. **TEMPEST units:** No optical signal in or optical level too low. Check that the opposite unit has power and that the fiber optic cables are properly connected. The transmit OUT optic from one end of the network connects to the receive IN optic at the opposite end as shown under "TYPICAL APPLICATION".
SYN	Green	Unit is in sync.
	Off	No sync characters detected. Unit is unable to frame to the data stream.



FOI-4451-ST Front View



FOI-4541-ST Front View

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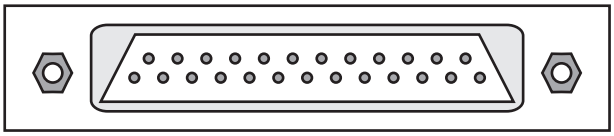
TO DCE

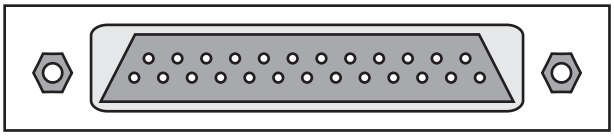
25 24 23 22 21 20 19 18 17 16 15 14



13 12 11 10 9 8 7 6 5 4 3 2 1

TO DTE

14 15 16 17 18 19 20 21 22 23 24 25



1 2 3 4 5 6 7 8 9 10 11 12 13

FOI-4451 DB-25 Male pinout

Pin	Direction	Label	Description
1			Chassis Ground
2	Out	SD	Send Data A
14		SD\	Send Data B
3	In	RD	Receive Data A
16		RD\	Receive Data B
4	Out	RTS	Request To Send A
19		RTS\	Request To Send B
5	In	CTS	Clear To Send A
13		CTS\	Clear To Send B
6	In	DSR	Data Set Ready A
22		DSR\	Data Set Ready B
7			Signal Ground
8	In	RR	Receiver Ready A
10		RR\	Receiver Ready B
15	In	ST	Send Timing A
12		ST\	Send Timing B
17	In	RT	Receive Timing A
9		RT\	Receive Timing B
18	Out	LL	Local Loopback
20	Out	TR	Terminal Ready A
23		TR\	Terminal Ready B
21	Out	RL	Remote Loopback
24	Out	TT	Terminal Timing A
11		TT\	Terminal Timing B
25	In	TM	Test Mode

FOI-4541 DB-25 Female pinout

Pin	Direction	Label	Description
1			Chassis Ground
2	In	SD	Send Data A
14		SD\	Send Data B
3	Out	RD	Receive Data A
16		RD\	Receive Data B
4	In	RTS	Request To Send A
19		RTS\	Request To Send B
5	Out	CTS	Clear To Send A
13		CTS\	Clear To Send B
6	Out	DSR	Data Set Ready A
22		DSR\	Data Set Ready B
7			Signal Ground
8	Out	RR	Receiver Ready A
10		RR\	Receiver Ready B
15	Out	ST	Send Timing A
12		ST\	Send Timing B
17	Out	RT	Receive Timing A
9		RT\	Receive Timing B
18	In	LL	Local Loopback
20	In	TR	Terminal Ready A
23		TR\	Terminal Ready B
21	In	RL	Remote Loopback
24	In	TT	Terminal Timing A
11		TT\	Terminal Timing B
25	Out	TM	Test Mode

Unbalanced single-ended signals are highlighted in yellow with a maximum data rate of 120 kbps. All other signals not highlighted are balanced differential signals with a maximum data rate of 6.144 Mbps.

FOI-4451 Switch

Label	Position	Description
NON	Up	Non-Regeneration Typically set for asynchronous or synchronous applications requiring Terminal Timing (TT). Transmit Data (TD) and Terminal Timing (TT) from the DTE are both passed transparently to the DCE with the addition of normal propagation delay and sampling jitter.
REG1	Middle	Regeneration 1 and 2 Typically set for synchronous applications requiring Send Timing (ST). This may be used to correct for timing delays over long runs of wiring between the DCE and the DTE. Terminal Timing from the DTE is ignored and will not be passed to the DCE. Instead, Send Timing (ST) from the DCE is looped back to the Terminal Timing (TT) output on the FOI-4451. Transmit Data (TD) from the DTE is sampled in on the rising edge of Send Timing (ST) from the DCE.
REG2	Down	Transmit Data (TD) from the DTE is sampled in on the falling edge of Send Timing (ST) from the DCE.

The REG1 and REG2 switch position is determined by the data rate of the RS-422 link and the distance between the DCE and the DTE. In some cases if the timing delays are just right, a link will function in 2 switch positions, NON and REG1 or NON and REG2. It is also possible to have a link operate in all 3 switch positions, NON, REG1, and REG2. However, in synchronous applications where the DCE requires Send Timing (ST), it would be more beneficial to use either REG1 or REG2 rather than NON because regeneration eliminates the sampling jitter from the Transmit Data (TD) to the DCE.

FOI-4451 Optical Compatibility

Model	Description	Typical Application
FOI-4451	RS-422 to DCE	RS-422 ↔ fiber ↔ RS-422 (tail circuit - DCE to DCE)
FOI-4541	RS-422 to DTE	RS-422 ↔ fiber ↔ RS-422
FOI-4431	V.35 to DTE	RS-422 ↔ fiber ↔ V.35
FOI-4411	RS-232 to DTE	RS-422 ↔ fiber ↔ RS-232

FOI-4541 Optical Compatibility

Model	Description	Typical Application
FOI-4541	RS-422 to DTE	RS-422 ↔ fiber ↔ RS-422 (null modem - DTE to DTE)
FOI-4451	RS-422 to DCE	RS-422 ↔ fiber ↔ RS-422
FOI-4341	V.35 to DCE	RS-422 ↔ fiber ↔ V.35
FOI-4141	RS-232 to DCE	RS-422 ↔ fiber ↔ RS-232

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Specifications

		minimum	typical	maximum	unit
Power Requirement	Voltage Range	7	9	12	V
	Supply Current	-	625	-	mA
Balanced Differential Signals	Data Rate	DC	-	6.144	Mbps
	Sampling Jitter	0	-	23	%
	Input Resistance	5	6.8	10	kΩ
	Common-Mode Input Voltage	-	-	±7	V
	Common-Mode Output Voltage	-	1.8	3	V
Unbalanced Single-Ended Signals	Data Rate	DC	-	120	kbps
	Sampling Jitter	0	-	0.4	%
	Input Resistance	3	5	7	kΩ
	Input Voltage Range	-25	-	25	V
	Output Voltage Swing	-	±5	-	V
Environmental	Storage Temperature	-40	-	85	°C
	OperatingTemperature	0	-	50	°C
Interface Connector	FOI-4451	DB-25 Male			
	FOI-4541	DB-25 Female			
Case Dimensions	Size 4	**length**	**width**	**height**	**weight**
		4.5 in (114 mm)	1.453 in (37 mm)	2.562 in (65 mm)	2 lb (0.9 kg)

Optical Characteristics

Fiber	Size	Max Distance	Wavelength	Output Power	Receiver Sensitivity	Loss Budget
Multimode	62.5 / 125 µm	2 km	1300 nm	-18 dBm	-30 dBm	12 dB
Singlemode	9 /125 µm	20 km	1300 nm	-11 dBm	-32 dBm	21 dB

Accessories

Model	Description
CMA-2001	Chassis Mounting Adapter for RMC-2101
CMA-3002	Chassis Mounting Adapter for RMC-3101, RMC-3102
PSQ-4909	Power Supply for FOI-4xxx series
RMC-2101	Rack Mount Chassis 3-1/2" H x 19"W, rear access
RMC-3101	Rack Mount Chassis 5-1/4" H x 19"W, front access
RMC-3102	Rack Mount Chassis 5-1/4" H x 19"W, front access with optical patch panel
WMA-2001	Wall Mount Adapter with optical patch
WMA-3002	Wall Mount Adapter

Ordering Information

FOI - ____ ____ ____ – ____

Optical Interface:
ST, SC*, FC*

Fiber:
Blank = multimode
S = singlemode

TEMPEST Approved:
Blank = standard unit
T = TEMPEST (Only w/ ST)

Model:
4451 = TO DCE
4541 = TO DTE

* Indicates Custom Catalog Item

Standard Options:

FOI-4451-ST	FOI-4541-ST
FOI-4451S-ST	FOI-4541S-ST
FOI-4451T-ST	FOI-4541T-ST
FOI-4451TS-ST	FOI-4541TS-ST

For special applications that require custom units, please call FiberPlex for more information.