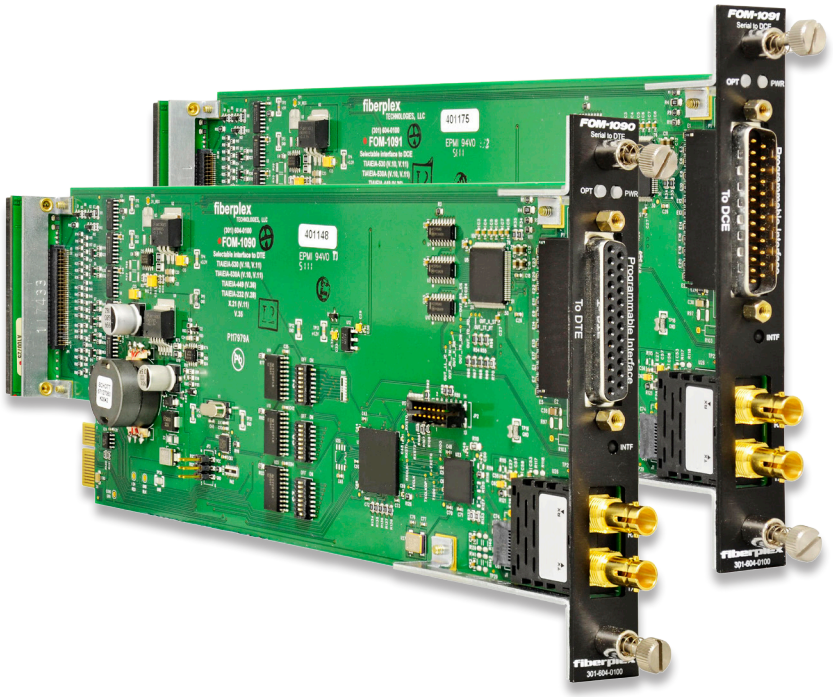
FOM-1090/91
MULTI-STANDARD INTERFACE



Description

The FOM-1090 and FOM-1091 fiber optic isolator\modem cards provides for full synchronous, asynchronous, or isochronous interfacing to serial data communications equipment. The unit is transparent to all data formats and protocol, and supports timing from the DCE and DTE as well as uncommon clocking styles such as gapped clock or gated clocks that stop in different states to indicate status. The status and direction of all supported signals is shown on front panel indicators in addition to power supply and optical link status for each card.

Applications

The user can achieve complete electrical isolation for NRZ data communications in areas of high electrical noise or in/out of RF shielded enclosures (SCIF). The fiber optic cable is not susceptible to induced impulse noise and since signal ground is not carried over the link, the signal is not affected by elevated ground potential from lightning or other sources. The fiber optic cable enhances privacy of communications. While a typical link consists of a FOM-1090 (DCE) at one end and a FOM-1091 (DTE) at the opposite end, a pair of the same units may be used together as when using two FOM-1090 DCE units to create a null modem link. In addition, a different interface may be selected at each end allowing the user to create a fiber link between two electrically incompatible interfaces without requiring a separate interface converter.

Serial Data Communications

Synchronous, Asynchronous or Isochronous Signal rates: DC to 20 MHz

FOM-1090 w/ DB-25 Female
FOM-1091 w/ DB-25 Male

Supported Interface Standards

TIA-530, TIA-530A

TIA-232

TIA-574 (w/ adapter cable)

TIA-449 (w/ adapter cable, using common subset of control signals)

V.35 (w/ adapter cable)

X.21 (w/ adapter cable)

Supported Electrical Standards

TIA-422 / V.11 / FED-STD-1030A

TIA-423 / V.10 / FED-STD-1020A

TIA-232 / V.28

V.35

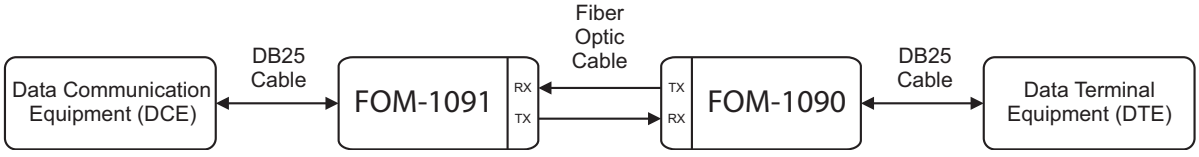
MIL-STD-100

MIL-STD-188-114A, Balanced types 1 and 2 (in V.11 mode)

MIL-STD-188-114A, Unbalanced (in V.10 mode)

MIL-STD-188C (Limited compatibility – see section on Compatibility with MIL-STD Circuits)

Typical Application



Interface Information – TIA-530, TIA-530A, TIA-449, X.21

TIA-530, TIA-530A Connections

Pin	FOM-1090	FOM-1091	TIA-530	TIA-530A
1	-	-	Shield	Shield
2	In	Out	SD A (V.11)	SD A (V.11)
3	Out	In	RD A (V.11)	RD A (V.11)
4	In	Out	RS A (V.11)	RS A (V.11)
5	Out	In	CS A (V.11)	CS A (V.11)
6	Out	In	DM A (V.11)	DM (V.10)
7	-	-	Signal GND	Signal GND
8	Out	In	RR A (V.11)	RR A (V.11)
9	Out	In	RT B (V.11)	RT B (V.11)
10	Out	In	RR B (V.11)	RR B (V.11)
11	In	Out	TT B (V.11)	TT B (V.11)
12	Out	In	ST B (V.11)	ST B (V.11)
13	Out	In	CS B (V.11)	CS B (V.11)
14	In	Out	SD B (V.11)	SD B (V.11)
15	Out	In	ST A (V.11)	ST A (V.11)
16	Out	In	RD B (V.11)	RD B (V.11)
17	Out	In	RT A (V.11)	RT A (V.11)
18	In	Out	LL (V.10)	LL (V.10)
19	In	Out	RS B (V.11)	RS B (V.11)
20	In	Out	TR A (V.11)	TR (V.10)
21	In	Out	RL (V.10)	RL (V.10)
22	Out	In	DM B (V.11)	IC (V.10)
23	In	Out	TR B (V.11)	--
24	In	Out	TT A (V.11)	TT A (V.11)
25	Out	In	TM (V.10)	TM (V.10)

Note: On the TIA-530A interface the DM and TR signals become single-ended and the single-ended signal IC is added.

TIA-449 Connections with adapter cable information

Pin	FOM-1090	FOM-1091	TIA-449	DB-37 Pin Connection
1	-	-	Shield	1
2	In	Out	SD A (V.11)	4
3	Out	In	RD A (V.11)	6
4	In	Out	RS A (V.11)	7
5	Out	In	CS A (V.11)	9
6	Out	In	DM A (V.11)	11
7	-	-	Signal GND	19, 20, 37
8	Out	In	RR A (V.11)	13
9	Out	In	RT B (V.11)	26
10	Out	In	RR B (V.11)	31
11	In	Out	TT B (V.11)	35
12	Out	In	ST B (V.11)	23
13	Out	In	CS B (V.11)	27
14	In	Out	SD B (V.11)	22
15	Out	In	ST A (V.11)	5
16	Out	In	RD B (V.11)	24
17	Out	In	RT A (V.11)	8
18	In	Out	LL (V.10)	10
19	In	Out	RS B (V.11)	25
20	In	Out	TR A (V.11)	12
21	In	Out	RL (V.10)	14
22	Out	In	DM B (V.11)	29
23	In	Out	TR B (V.11)	30
24	In	Out	TT A (V.11)	17
25	Out	In	TM (V.10)	18

Note: For best signal performance do not tie pin 20 (Receive Common), pin 37 (Send Common), or pin 19 (Signal Ground) together at the DB-37 connector. Bring all three pins back on individual conductors to pin 7 of the DB-25 and tie them together there.

Interface Information – TIA-530, TIA-530A, TIA-449, X.21 (continued)

X.21 Connections with adapter cable information

Pin	FOM-1090	FOM-1091	X.21	DB-15 Pin Connection
1	-	-	Shield	1
2	In	Out	TD A (V.11)	2
3	Out	In	RD A (V.11)	4
4	In	Out	RS A (V.11)	
5	Out	In	CS A (V.11)	
6	Out	In	DM A (V.11)	
7	-	-	Signal GND	8
8	Out	In	CON A (V.11)	5
9	Out	In	ST B (V.11)	13
10	Out	In	CON B (V.11)	12
11	In	Out	TT B (V.11)	
12	Out	In	BT B (V.11)	14
13	Out	In	CS B (V.11)	
14	In	Out	TD B (V.11)	9
15	Out	In	BT A (V.11)	7
16	Out	In	RD B (V.11)	11
17	Out	In	ST A (V.11)	6
18				
19	In	Out	RS B (V.11)	
20	In	Out	IND A (V.11)	3
21				
22	Out	In	DM B (V.11)	
23	In	Out	IND B (V.11)	10
24	In	Out	TT A (V.11)	
25				

Notes:

The X.21 ST signal will be routed through the FOM labeled as RT (pins 17 & 9) as this would be the equivalent clock for conversion to other interfaces. The BT signal is routed through on the ST signal (pins 15 & 12). The BT signal may not be present on some X.21 interfaces.

The FOM signal TT is available on the DB25 connector, but there is no equivalent signal assigned to the X.21 interface. Some X.21 interfaces support a companion clock sourced from the same end as the TD signal, using the BT pins for that clock. The TT signal may be used for that clock in those cases.

The FOM signals RS, CS, and DM are available on the DB25 connector, but there are no equivalent signals assigned to the X.21 interface. These signals may alternately be used for the CONTROL and INDICATION signals to allow for adapting flow control to a non-X.21 interface at the opposite end.

Interface Information – TIA-232, TIA-574

TIA-232 Connections; TIA-574 with adapter cable information

Pin	FOM-1090	FOM-1091	TIA-232	TIA-574 DB-9 Connection
1	-	-	Shield	
2	In	Out	TD (V.28)	3
3	Out	In	RD (V.28)	2
4	In	Out	RTS / RS (V.28)	7
5	Out	In	CTS / CS (V.28)	8
6	Out	In	DSR / DM (V.28)	6
7	-	-	Signal GND	5
8	Out	In	DCD / RR (V.28)	1
9				
10				
11				
12				
13				
14				
15	Out	In	ST (V.28)	
16				
17	Out	In	RT (V.28)	
18	In	Out	LL (V.28)	
19				
20	Out	In	DTR / TR (V.28)	4
21	In	Out	RL (V.28)	
22	Out	In	RI / IC (V.28)	9
23				
24	In	Out	TT (V.28)	
25	Out	In	TM (V.28)	

Interface Information – V.35

V.35 Connections with adapter cable information

Pin	FOM-1090	FOM-1091	V.35	M-34 Pin Connection
1	-	-	Shield	A
2	In	Out	TD A (V.35)	P
3	Out	In	RD A (V.35)	R
4	In	Out	RTS / RS (V.28)	C
5	Out	In	CTS / CS (V.28)	D
6	Out	In	DSR / DM (V.28)	E
7	-	-	Signal GND	B
8	Out	In	DCD / RR (V.28)	F
9	Out	In	RT B (V.28)	X
10				
11	In	Out	TT B (V.35)	W
12	Out	In	ST B (V.35)	AA
13				
14	In	Out	TD B (V.35)	S
15	Out	In	ST A (V.35)	Y
16	Out	In	RD B (V.35)	T
17	Out	In	RT A (V.28)	V
18	In	Out	LL (V.28)	L
19				
20	In	Out	DTR / TR (V.28)	H
21	In	Out	RL (V.28)	N
22	Out	In	RI / IC (V.28)	J
23				
24	In	Out	TT A (V.35)	U
25	Out	In	TM (V.28)	NN

Compatibility with MIL-STD circuits

The drivers and receivers for V.11 signals are compatible with the MIL-STD balanced specifications and the V.10 interface is similar to MIL-STD unbalanced. MIL-STD-100 signals use the same negative MARK condition as TIA circuits, so there is no need to invert the TD and RD signals. MIL-STD-188-114A is set-up for user control of the MARK level, so the need for data inversion at the FOM will need to be made on a case-by-case basis.

If the MIL-STD interface uses any unbalanced signals, such as MIL-STD-188C (note that this standard uses a positive MARK), then provisions will need to be made to externally bias one side of the receivers on the FOM to use them single-ended. Note that the MIL standards are only an electrical specification and do not specify a pin out or connector type, so a custom cable will be required in many cases.

Asynchronous, Isochronous, or Synchronous operation

The FOM is transparent to data and clocking formats, so there are no switch settings for distinguishing the different modes of operation. When a pair of FOM-1090 units is used as modem link between two DTEs, all of the input signals are transferred to the crossed-over corresponding outputs (i.e. - TT from the DTE is provided as RT out of the FOM-1090) at the opposite end. When the FOM is used in Send Timing applications, certain switch options may be used to eliminate clocking issues that may arise. Those options are explained below.

Send Data Regeneration when using Send Timing from the DCE

The typical Send Timing set-up has the DCE supplying all clocks. The ST signal is generated at the DCE and then carried to the remote DTE. In return, the remote DTE then clocks the Send Data out of itself on the rising edge of the supplied ST signal. The Send Data is carried back to the DCE where it is clocked in, sampling the data bit on the falling edge of the generated ST clock. Alignment problems arise due to propagation delay when certain combinations of data rate and cable distance (both copper and fiber) result in the Send Data transitions occurring near the falling edge of the ST signal at the DCE.

As an example, using a rough number of 4 ns delay per meter of cable, 25 meters of cable with a 2.5 mHz clock will cause a 180 degree shift in the ST-SD relationship at the DCE interface. (There is actually 50 meters of propagation delay since the clock travels 25 meters in one direction and the data travels 25 meters in the other). This is without taking into account the delays of the line drivers and receivers in the DTE.

The FOM-1091 regeneration options make up for this in two ways. The first is to correct for any SD-ST misalignment due to propagation delay from the FOM-1091 to the DCE by delaying the SD signal out of the FOM by one half of a ST clock cycle. The second is the FOM has the ability to retime the incoming SD data internally with the incoming ST signal, which removes any sampling jitter from the SD signal as well as correcting for propagation delays.

While the falling edge of the ST signal from the DCE is ideally located mid-bit of the SD signal coming into the DCE, it is not necessary for it to be mid-bit. In fact, it's usually not mid-bit due to delays. This is often misunderstood. The actual requirement is that the set-up time for the register that the SD signal is being loaded into be met and this is usually a fraction of the available bit time. The only time there is a problem is when the falling edge of the ST is too close to the SD transitions at the DCE interface and this prevents the set-up time from being met. If the ST falling edge is far enough away from the SD transition edges (when the new SD data bit has met the set-up time), the DCE will still clock the data reliably even though it isn't mid-bit. This is why many ST timing set-ups will work with no regeneration required at all. When the edges are too close at the DCE the FOM will need to retime the data on the opposite edge of the ST signal by setting switch 1.8 to ON. This will allow that when the propagation delays are taken into account the edges have skewed enough to meet the set-up time at the DCE.

Note that in installations where the data rate may be changed or the cable lengths may change due to patch panel routing of equipment, it's entirely possible that a combination of switch settings that works in one scenario will not work in another. The only solution to these situations is to insert more delay in one or more of the configurations by adding to cable length until all of the scenarios will work with the same switch settings.

Setting the switches for using ST from the DCE

Taking into account the variables of cable length from the DCE to the FOM-1091, fiber cable length, cable length from the FOM-1090 to the DTE, plus data rates, there is no single 'correct' setting for the ST invert and SD data regeneration switches. To correctly configure a synchronous link using Send Timing from the DCE, try one of the following:

Correct for propagation delay between FOM-1091 and DCE

Determine if the removal of sampling jitter (it's actually duty cycle distortion, not speed fluctuation) from the SD signal is desired. If it is, then proceed to next section below. If it is not a requirement, start with switches 1.6, 1.7, and 1.8 OFF. If the link functions properly, no regeneration configuration is needed. If the link does not operate properly, try accounting for propagation delay between the FOM-1091 and the DCE by setting switch 1.8 to ON. The link should now operate correctly. If it does not, check cabling for the selected interface. If the link is running near its maximum speed it may be necessary to remove the sampling jitter from the SD signal as described in the next section.

Regenerate Send Data signal and correct for propagation delay between FOM-1091 and DCE

If removal of sampling jitter is desired, set switch 1.6 ON and switches 1.7 and 1.8 OFF. This will allow the FOM to try to configure the regeneration settings on its' own. If the link functions properly, no further regeneration configuration is needed. If the link does not operate properly, try accounting for propagation delay between the FOM-1091 and the DCE by setting switch 1.8 to ON.

If the above setting does not work, you will need to set the regeneration manually. Set switches 1.6 and 1.8 to OFF and set switch 1.7 to ON. If the link functions properly, no further regeneration configuration is needed. If the link still does not operate properly, again try accounting for propagation delay between the FOM-1091 and the DCE by setting switch 1.8 to ON.

If there are still errors, set switch 1.8 OFF and switch 1.6 to ON. If there are still errors, once again try accounting for propagation delay between the FOM-1091 and the DCE by setting switch 1.8 to ON.

One of the above groups of switch settings should allow a properly configured ST link to pass regenerated data to the DCE.

The above is summarized in the following table. If calculating delays, keep in mind that the FOM card may mintroduce up to 40ns of I/O chipset and multiplexing delay itself.

SW6	SW7	SW8	
0	0	0	No regeneration
1	0	0	Auto Regeneration; data from FOM-1091 transitions on rising edge of ST from DCE
1	0	1	Auto Regeneration; data from FOM-1091 transitions on falling edge of ST from DCE
0	1	0	Manual Regeneration using rising edge of ST; data to DCE transitions on rising edge of ST from DCE
0	1	1	Manual Regeneration using rising edge of ST; data to DCE transitions on falling edge of ST from DCE
1	1	0	Manual Regeneration using failing edge of ST; data to DCE transitions on rising edge of ST from DCE
1	1	1	Manual Regeneration using falling edge of ST; data to DCE transitions on falling edge of ST from DCE
0	0	1	This setting has no effect on FOM-1091

FOM-1090/1091 Switch Settings

(all default settings are OFF with exception of interface selection)

Switches 1.1, 1.2, and 1.3: Interface Configuration

These three switches select the following interface standards as shown on the table below.

The rear panel INTF led will indicate the current interface setting.

Interface	Switch 1.1	Switch 1.2	Switch 1.3	INTF LED
X.21	Off	On	On	1 Flash
TIA-232	On	On	Off	2 Flashes
V.35	On	Off	Off	3 Flashes
TIA-449	On	Off	On	4 Flashes
TIA-530	Off	On	Off	5 Flashes
TIA-530A	Off	Off	On	6 Flashes
Disabled	On	On	On	Solid Red
(TIA-530)	Off	Off	Off	5 Flashes
(All OFF defaults to TIA-530 setting)				

Switch 1.4: No Function

Switch 1.5: Data Invert

Changes the MARK condition for use with MIL-STD type interfaces. The idle state for some MIL-STD interfaces is the opposite of TIA and this setting allows the conversion from those MIL signals to TIA or between opposite state MIL interfaces when this switch is ON. See section **Compatibility with MIL-STD Circuits** for more information.

OFF	Negative MARK
ON	Positive MARK

Switch 1.6: Data Regeneration A (FOM-1091 only; no function on FOM-1090)

Enables FOM-1091 auto or manual adjustment for regeneration of TD signal to DCE

OFF	Normal operation
ON	Enables various modes of TD out signal regeneration using ST signal from DCE in conjunction with switch 1.7.

Switch 1.7: Data Regeneration B (FOM-1091 only; no function on FOM-1090)

Enables FOM-1091 auto or manual adjustment for regeneration of TD signal to DCE.

OFF	Normal operation
ON	Enables various modes of TD out signal regeneration using ST signal from DCE in conjunction with switch 1.6.

Switch 1.8 A: Invert Send Timing Out (FOM-1090 only)

Inverts ST signal out of FOM-1090

OFF	No inversion
ON	ST out is inverted

Data Regeneration C (FOM-1091 only)

Changes TD out relationship to ST in at FOM-1091 when using Data Regeneration Switch. No function if Switch 1.6 and Switch 1.7 are off

OFF	TD out transitions on rising edge of ST in
ON	TD out transitions on falling edge of ST in

FOM-1090/1091 Switch Settings
(all default settings are OFF with exception of interface selection) - continued

Switch 2.1: Loop RS and CS locally	
This setting creates a loop back for the RS \ CS signals at the local end. The corresponding signal input is still carried across the link to the remote interface. The signal from the remote end is ignored.	
OFF	Normal RS and CS signal operation
ON	On FOM-1090: Loops RS input to CS output. CS signal from remote end is ignored.
	On FOM-1091: Loops CS input to RS output. RS signal from remote end is ignored.

Switch 2.2: Force RS \ CS On	
Forces the corresponding output ON when unit is in optical sync. This overrides any signal from the far end of the link.	
OFF	Normal RS \ CS operation
ON	Forces RS out ON (FOM-1091) or CS out ON (FOM-1090) when unit is in optical sync.

Switch 2.3: Loop TR and DM locally	
This setting creates a loop back for the TR \ DM signals at the local end. The corresponding signal input is still carried across the link to the remote interface. The signal from the remote end is ignored.	
OFF	Normal TR and DM signal operation
ON	On FOM-1090: Loops TR input to DM output. DM signal from remote end is ignored.
	On FOM-1091: Loops DM input to TR output. TR signal from remote end is ignored.

Switch 2.4: Force TR \ DM On	
Forces the corresponding output ON when unit is in optical sync. This overrides any signal from the far end of the link.	
OFF	Normal TR / DM operation
ON	Forces TR out ON (FOM-1091) or DM out ON (FOM-1090) when unit is in optical sync.

Switch 2.5: Force RR On (FOM-1090 only; no function on FOM-1091)	
Forces RR out ON when unit is in optical sync. This overrides RR from the far end of the link.	
OFF	Normal RR operation
ON	Forces RR out ON (FOM-1090) when unit is in optical sync.

Switch 2.6: No Function

Switch 2.7: No Line Terminations	
This switch removes all line terminations from the interface allowing the FOM to be used as a monitor point on an electrical link. The unit cannot selectively remove terminations on active lines; either all terminations are present or all are removed.	
OFF	Standard terminations for selected interface type are present
ON	Terminations removed (Hi-Z impedance)

Switch 2.8: Loop Back Test	
Loops optic TX to optic RX and loops all copper signals to their corresponding signal (TD-RD, TT-RT, RS-CS, TR-DM, RL-TM, RR On, IC Off, LL Off)	
OFF	Normal operation
ON	Loop back test

Switch 3.1: No Function
Switch 3.2: No Function

Switch 3.3: Crypto to Crypto Null Modem (FOM-1090 only; no function on FOM-1091)	
This setting, when used with a FOM-1090 at each end, reconfigures the interface to allow the fiber link to act as a null modem between two crypto units. The FOM-1090 can be connected directly to the crypto using a standard straight-through 25 pin cable at each end, eliminating the need for a custom crossover cable. This configuration functions in TIA-530, TIA-530A, or TIA-232 mode with a straight-through cable or in TIA-449 mode with a DB-25 to DB-37 adapter cable. When this switch is on it overrides configuration switches 2.1-2.5.	
OFF	Normal operation
ON	Crypto crossover mode (no function on FOM-1091)

Switch 3.4: No Function
Switch 3.5: No Function
Switch 3.6: No Function
Switch 3.7: No Function

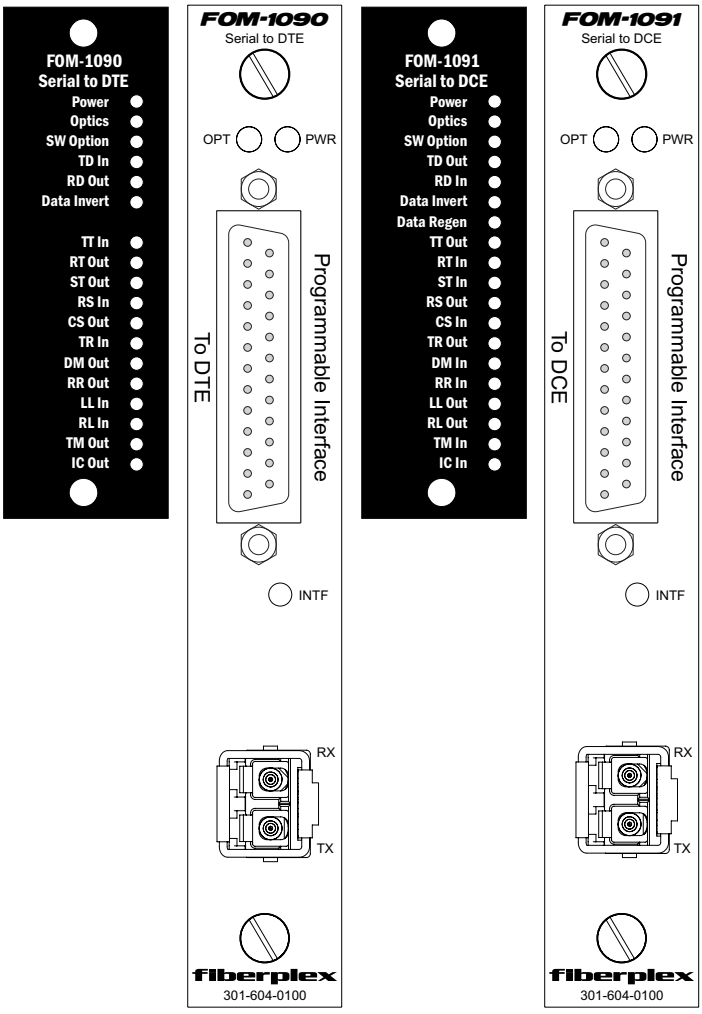
Switch 3.8: Display Test	
This setting will cause the front panel display to flash each of the indicators yellow or orange (with the exception of the power led, which remains green) for verification purposes. The rear OPT led will also flash. The unit continues to function normally - only the display is affected.	
OFF	Normal indicator operation
ON	All indictors except power will flash. The Optics led flashes out of phase with the others.

FOM-1090/1091 Displays

Power	Steady Green	Card power supply normal operation
	Steady Red	Card power supply failure or in over-current protection
	Off	Card failure or main power failure
Optics	Steady Green	Optics in sync at each end of link
	Flashing Green	Local optical RX is receiving errors
	Steady Yellow	Remote optical RX loss of signal or sync
	Flashing Yellow	Local optical RX signal present, but no sync
	Flashing Orange	Card type mismatch at remote end; the two cards are not compatible
	Steady Red	No optical RX signal
	Off	Card failure
SW Option	Steady Green	Optional switch setting is in use
	Flashing Red	Card is in Loop Back mode
	Off	No optional switch setting is in use; text is turned off
TD	Flashing	Data transitions detected
RD	Steady	Data in steady SPACE condition
	Off	Data in steady MARK condition
TT	Flashing	Clock transitions detected
RT	Steady	Clock in steady On state
ST	Off	Clock in steady Off state
Data Invert	Steady Green	Optional data invert in use – typically used for MIL interfaces
	Off	No optional data invert – normal operation; text is turned off
Data Regen	Steady Green	Optional TD signal regeneration in use – FOM-1091 only
	Flashing Red	Optional TD regeneration configuration error
	Off	No TD regeneration – normal operation; text is turned off
RS	Steady	Control signal in On state
CS	Off	Control signal in Off state
TR		
DM		
RR		
LL		
RL		
TM		
IC	Steady	Control signal in On state
	Off	Control signal in Off state
(Text and On indication is only displayed in TIA-232 and TIA-530A modes)		

Interface signals are marked as In or Out on each card in relation to the DB-25 interface (DCE or DTE). In addition, the signal line indicators are color coded as Orange for DTE source and Yellow for DCE source.

The rear panel PWR and OPT leds follow the corresponding front panel leds. The rear panel INTF led will flash a fixed number of times indicating the selected interface mode. It will be yellow for a DCE unit and orange for a DTE. It will be solid red for a disabled interface. See FOM-1090/1091 Switch Settings, Switches 1.1, 1.2, and 1.3: Interface Configuration, for the table of display codes.



FOM-1090/91
MULTI-STANDARD INTERFACE

fiberplex TECHNOLOGIES, LLC

Electrical Specifications

		Min	Typ	Max
Power Requirement	Voltage Range (V)	20	24	34
	Supply Current (mA)	-	400	-

TIA-422 / V.11 / FED-STD-1030A Signals	**Min**	**Typ**	**Max**
Output Levels into 100Ω Load (V)	±2	-	±6
Input Levels (V)	0	-	±7
Input Threshold (V)	±0.2	-	-
Maximum Speed, Data and Clock Lines (MHz)	0	-	25
Maximum Speed, Control Lines (KHz)	0	-	250
Input Termination (4KΩ min w/ no termination) (Ω)	-	100	-

TIA-423 / V.10 / FED-STD-1020A Signals	**Min**	**Typ**	**Max**
Output Levels Open Circuit (V)	±4	-	±6
Input Levels (V)	0	-	±7
Input Threshold (V)	±0.2	-	-
Maximum Speed (KHz)	0	-	250
Input Termination (KΩ)	4	15	-

TIA-232 / V.28 Signals	**Min**	**Typ**	**Max**
Output Levels, 3KΩ Termination (V)	±5	-	±15
Input Levels (V)	0	-	±15
Input Threshold (V)	±3	-	-
Maximum Speed, Data and Clock Lines (KHz)	0	-	125
Maximum Speed, Control Lines (KHz)	0	-	125
Input Termination (KΩ)	3	-	7

V.35 Signals	**Min**	**Typ**	**Max**
Output Levels, 100Ω Termination (V)	±0.44	-	±0.66
Input Levels (V)	0	-	±4
Input Threshold (V)	±0.2	-	-
Maximum Speed, Data and Clock Lines (MHz)	0	-	20
Input Termination (Ω)	90	-	110

V.28 Signals	**Min**	**Typ**	**Max**
Output Levels, 3KΩ Termination (V)	±5	-	±15
Input Levels (V)	0	-	±15
Input Threshold (V)	±3	-	-
Maximum Speed (KHz)	0	-	125
Input Termination (KΩ)	3	-	7
Receiver Off Impedance (Ω)	300	-	-

Electrical Specifications continued

Environmental	-40	-	85
	0	-	50
Interface Connector			
FOM-1090	DB-25 Female		
FOM-1091	DB-25 Male		

Physical Specifications

	Length	**Width**	**Height**	**Weight**
Card Dimensions	11.25 in } (286 mm)	0.825 in (21 mm)	5..25 in (133 mm)	10 oz (0.3 kg)

Optical Characteristics - All

Order Suffix	**Fiber**	**Fiber Type***	**Max Dist (km)**	**λ (nm)**	**Bandwidth Typ (dB)**	**Loss (dB)**	**Connector**
T10	Multimode	OM2	0.4	850	12.5	5.7	ST
L10	Multimode	OM2	0.4	850	14.5	5.7	LC
T5A	Singlemode	OS1, OS2	10	1310	14	8.5	ST
L5A	Singlemode	OS1, OS2	10	1310	12.75	8.5	LC
C	SFP Cage with no Optical Module Installed						

* Specs obtained assuming fiber is as described in 'Fiber Type' with a 1.25GB Data Rate

Accessories

RMC-5000	16 slot, 7.5" high (5U), 19" wide rack mount chassis Includes one PSM-5000 AC power supply
RMC-5000D	16 slot, 7.5" high (5U), 19" wide rack mount chassis Includes one PSM-5048 DC power supply
PSM-5000	RMC-5000 AC redundant power supply, 90-250 VAC input, 250W
PSM-5048	RMC-5000 DC redundant power supply, 35-56 VDC input, 250W
SAC-1AC	Single slot stand-alone chassis, 90-250 VAC or 120-370 VDC input, 15W
SAC-1DC	Single slot stand-alone chassis, DC input

Ordering Information

FOM - 1090

Optical Interface:
T10 = multimode, 850nm, >500m, ST
L10 = multimode, 850nm, >500m, LC
T5A = singlemode, 1300nm, 10km, ST
L5A = singlemode, 1300nm, 10km, LC
C = SFP cage, no optical module

Other Optical interfaces available on our custom Catalog

Model:
1090 = DCE Interface w/ DB-25 Female
1091 = DTE Interface w/ DB-25 Male