



Fiber Optic Video/Audio/Data Transmission

Installation Instructions

Part Number:

FT-1U1A1C1G/1A1C1G-x (ST/FC)
(Video transmitter w/1ch. bi-directional
audio, data & contact closure)

FR-1U1A1C1G/1A1C1G-x (ST/FC)
(Video receiver, w/1ch. bi-directional
audio, data & contact closure)

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FT/FR-1U1A1C1G/1A1C1G-x

Fiber Optic Video/Audio/Data Transmission System

Installation Instructions

1.0 Product Description

Meridian's FT/FR-1U1A1C1G/1A1C1G-x products are fiber optic modems that transmit one channel of uni-directional 10-bit video, one channel of bi-directional audio, one channel of bi-directional contact closure and one channel of bi-directional user-selectable RS-232, RS-422 and RS-485 (2 & 4 wire) data signals over one optical fiber using digital transmission technologies. This product series uses Meridian's standard 1-slot wide chassis mount card assembly and plugs into the following Meridian chassis: SR-500/S, SR-1000/S, SR-1001/S, SR-1200/S, SR-1500/S, and SR-2001 & SR-2000 series equipment chassis.

Both ST and FC optical connectors are supported, depending on the part number. An ST optical interface is available for both multimode and singlemode fiber applications. The FC optical interface is available only for singlemode products. Conformal coating provides an additional level of protection from environments with high humidity.

2.0 Installation

Series FT/FR-1U1A1C1G/1A1C1G-x products are one-slot wide cards and, as such, occupy one slot in Meridian's standard chassis. To install in these chassis, orient the card with the Meridian logo at the top of the module and slide onto the top and bottom card guides in the chassis. Press securely on the top and bottom of the module to ensure that it is fully seated in the chassis so that the electrical connector mates with the chassis-mounted motherboard. Once installed, manually tighten the two thumbscrews located at the top and bottom of the card. Do not use tools to secure these and do not over tighten.

Note: A fully loaded 19" subrack should have forced-air cooling to avoid excessive heat generation inside the chassis. A fan assembly tray (P/N FA-2000) with three (3) fans is available and should be installed under the 19" SR-2000/1 whenever possible.

3.0 Product Signal Format & Specifications

The FT/FR-1U1A1C1G/1A1C1G-x series products transmit and receive the following signals:

Signal Type	Channels	Transmit	Receive
NTSC/PAL video	1	FT-1U1A1C1G/1A1C1G-X	FR-1U1A1C1G/1A1C1G-X
Audio	1	Yes	Yes
Contact Mapping	1	Yes	Yes
RS-232 (Tx & Rx data)	1	Yes	Yes
RS-422 (Tx & Rx data)	1	Yes	Yes
RS-485 (2 & 4-wire)	1	Yes	Yes

The tables below identify the specifications for the various signals that these modems transmit/receive.

Video	
Format	NTSC, PAL, SECAM
Voltage/Impedance	1Vp-p, 75 Ohm, 1.5Vp-p (max)
Differential Gain	<0.6%
Differential Phase	<0.3°
SNR	>67dB (weighted)
Return Loss	>30dB
Field Tilt	<0.5%

Audio	
In/Out Impedance	600 Ohm, unbalanced/unbalanced
Frequency Response	10Hz to 20KHz
SNR	>90dB (weighted) @ 1KHz
In/Out Level	-8 to +8 dBm (4Vp-p, max)
THD	<0.01% @ 1KHz
Digitized Resolution	24 bit

Contact Mapping	
Contact type	Relay, normally-open, normally-closed, jumper selectable, Isolated contacts
Contact rating	0.3amps, 30 VAC/VDC
Contact bounce	5 msec
Max switching rate	10Hz

Data	
Formats	RS-232
Data Rate (RS-232)	DC to 125 Kb/s
Data Rate (RS-422 & RS-485)	DC to 250 Kb/s
Bit Error Rate (BER)	Better than 10 ⁻⁹

Connectors	
Video	75 Ohm BNC w/gold center pin
Audio	14 pin terminal strip (one 5 pin connector)
Contact	14 pin terminal strip (one 4 pin connector)
Data	14 pin terminal strip (one 5 pin connector)
Optical	Singlemode – ST or FC Multimode - ST

3.1 Optical Specifications

The table below lists the optical specifications for both singlemode and multimode fiber applications.

Optical Specifications						
Fiber Type/Size (um)	Optical Output (dBm)	Rx Sensitivity (dBm)	Optical Budget (dB)	Wavelength (nm)	Optical connector	Estimated Maximum Distance (km)
Multimode (FP Laser) 62.5 / 125	-5	-25	20	1300/850	ST	3
Singlemode (FP Laser) 9 / 125	-5	-25	20	1310/1550	ST, FC	50
Singlemode (DFB Laser) 9 / 125	+5	-25	26	1310/1550	ST, FC	70

4.0 Audio, Contact & Data Connector Pin Assignment

The 14-pin terminal block connector on the front of the module is used for all Audio, Contact & Data interfaces.

This module supports the following data formats:

RS-232	One channel w/HS (Tx/Rx)
RS-422	One channel
RS-485	One channel (either 2 or 4 wire)

The RS-232 channel is used for transmitting/receiving two channel of RS-232 w/Handshake (Tx/Rx). In addition to the RS-232, this module supports both RS-422 and 2 or 4-wire RS-485 signals. User-settable switches on the module's motherboard are used to select the appropriate data format as required.

The one 14-pin screw connectors on the front of the module are used for the Audio interfaces, Contact Closure and Data. The diagrams in figure 4.1 & 4.2 indicate the video with audio, data & contact closure input/output connection terminals.

Port 1 Audio Connector Pinout Assignment				
Pin #	Audio Channel 1			
1	INPUT (-)			
2	INPUT (+)			
3	OUTPUT (-)			
4	OUTPUT (+)			
5	GND			
Port 2 C.C. Connector Pinout Assignment				
Pin #	C.C. Channel 1			
1	OUTPUT (-)			
2	OUTPUT (+)			
3	INPUT			
4	GND			
Port 3 Data Connector Pinout Assignment				
Pin #	RS-232	RS-422	RS-485 (2-wire)	RS-485 (4-wire)
1	Ch 1 IN (RD)	Ch 1 IN (+)	Ch 1 IN/OUT (+-)	Ch 1 IN (+)
2	Ch 1 IN (DTR)	Ch 1 IN (-)	Ch 1 IN/OUT (-)	Ch 1 IN (-)
3	Ch 1 OUT (TD)	Ch 1 OUT (+)		Ch 1 OUT (+)
4	Ch 1 OUT (DSR)	Ch 1 OUT (-)		Ch 1 OUT (-)
5	GND	GND	GND	GND

4.1 Front Panel Indicator Lights

There are 18 LED indicator lights mounted on the left side of the module's front panel (see Figure 4.1 below). These indicators show the operation status of the module's power, optical carriers, video signal and the various data/audio channels. These indicators can be used for troubleshooting the module, electrical and optical connections.

Not all of the LEDs apply to all versions of these modules. Please refer to the module's part number for the appropriate signals, description.

FT-1U1A1C1G/1A1C1G-XS

PINOUT DIAGRAM

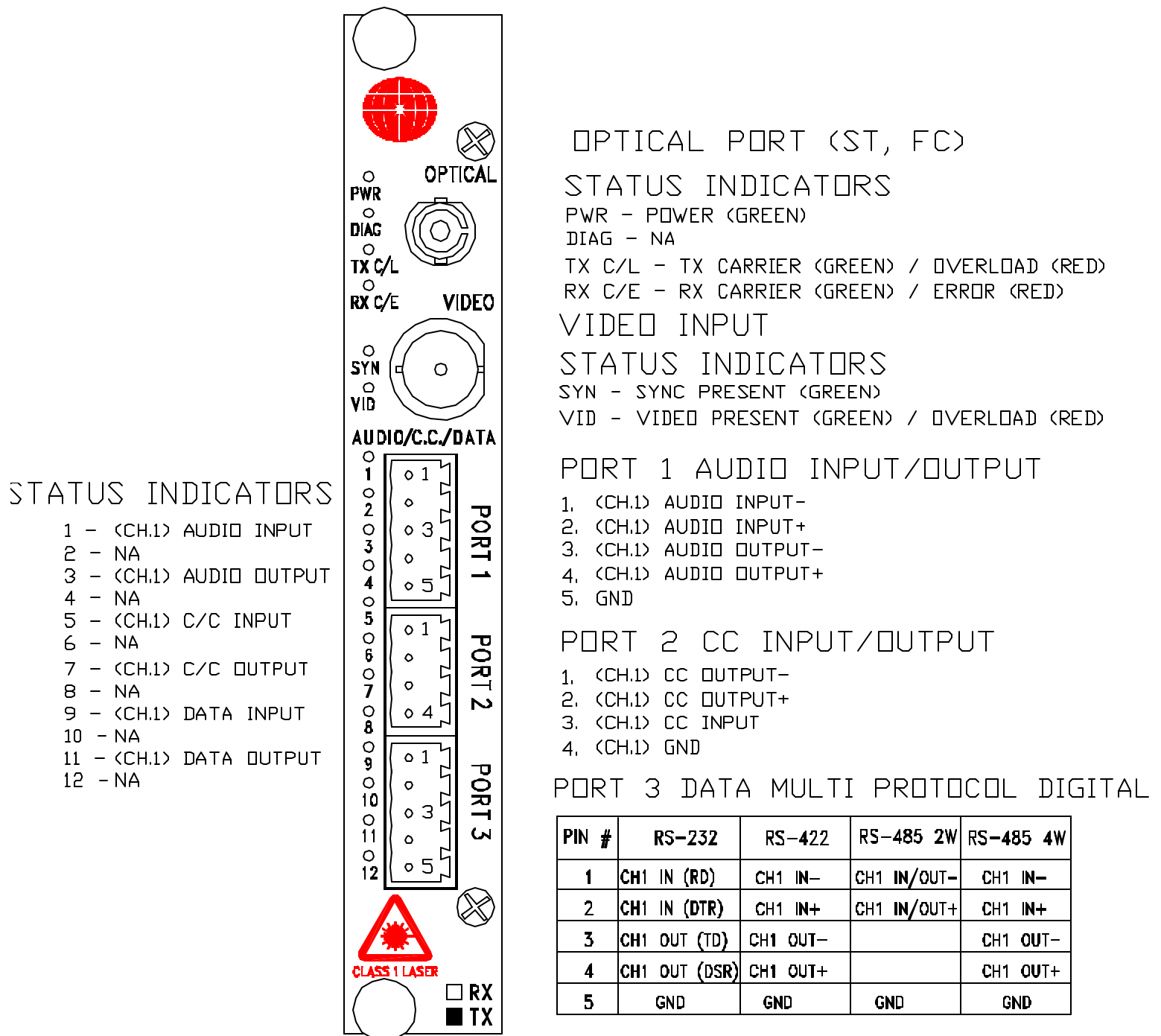


Figure 4.1
FT-1U1A1C1G-1A1C1G-x Front Pane Layout Diagram

FR-1U1A1C1G/1A1C1G-XS

PINOUT DIAGRAM

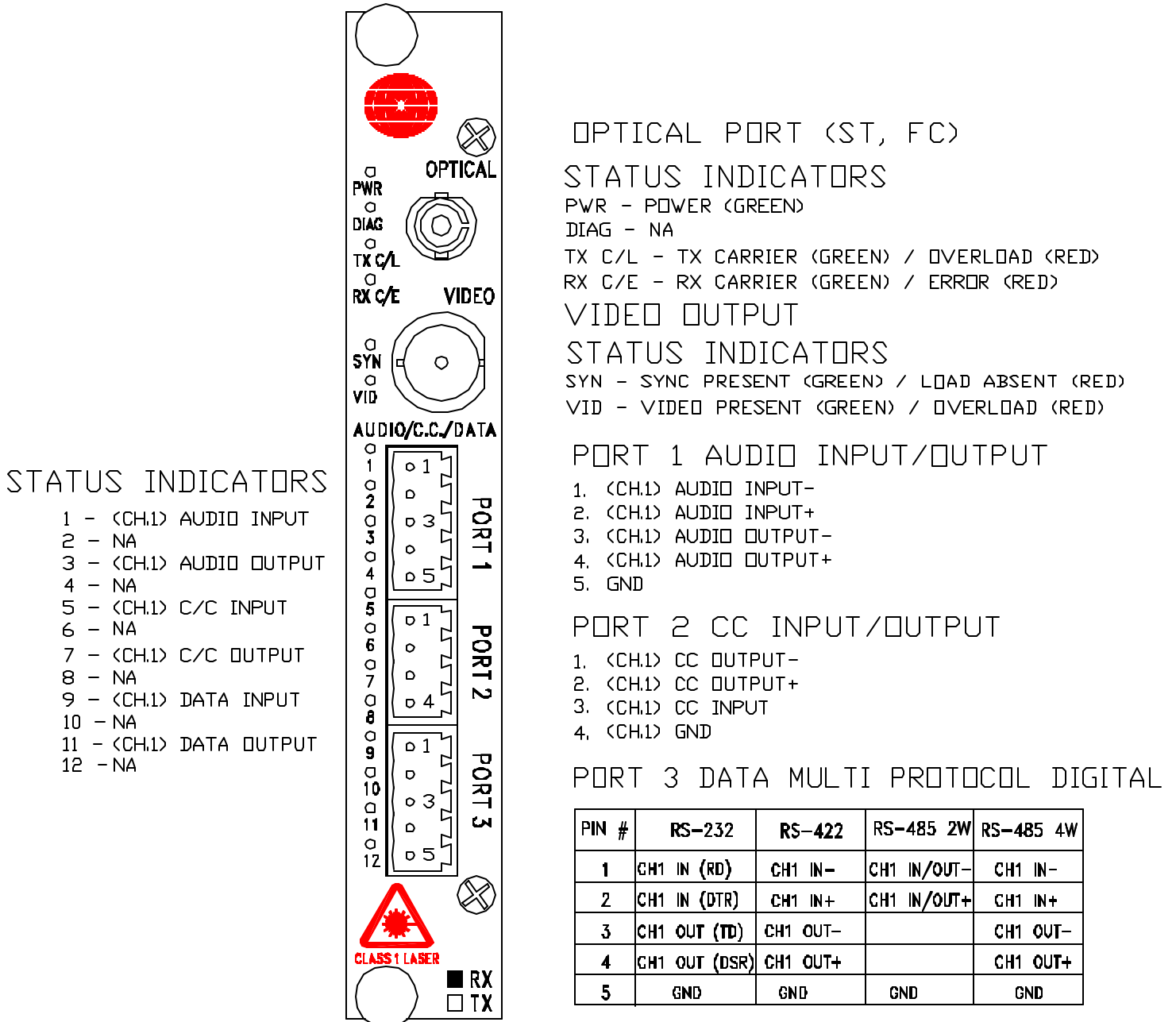


Figure 4.2
FR-1U1A1C1G-1A1C1G-x Front Pane Layout Diagram

5.0 Signal Conditioning Switch/Jumper Settings

The sections below illustrate how to change the various data format, audio impedance and contact mapping conditions. User-settable switches on the module's motherboard are used to select the appropriate data format as required.

5.1 Data Format Selection

A group of 10 switches is located on the bottom center of the module's circuit card (see figure below). The left four (4) of these switches control the data format that is transmitted/received. These switches on both the transmitter and receiver must be set the same in order to have proper data communications format between them. The figure and table below illustrates these switch locations on the board and how they are configured for the proper data format options. The factory-supplied default setting is for RS-232 data (Switch #1-4 OFF (up)).

Data Format Selection Switch Settings				
Ch.1			Ch.2	
	Switch #1	Switch #2	Switch #3	Switch #4
RS-232	OFF (up)	OFF (up)	OFF (up)	OFF (up)
RS-422	ON (down)	ON (down)	ON (down)	ON (down)
RS-485 (2-wire)	ON (down)	OFF (up)	ON (down)	OFF (up)
RS-485 (4-wire)	OFF (up)	ON (down)	OFF (up)	ON (down)

The remaining Switches 5 through 10 should be in the OFF (up) position.

5.2 Audio Impedance, Contact Mapping and Data Selection jumpers

Audio Impedance - The input/Output impedance of each of the audio channels can be changed between 600 Ohm balanced and 47K Ohm unbalanced. The default impedance is 600 Ohm.

Contact Mapping - The output state of each of the contacts can be changed from Normally-Open (NO) to Normally-Closed (NC) by properly selecting the jumpers. A NO contact (output side) closes when the contact input on the input module's side is closed to ground. The default contact setting is NO (normally-open).

There are sixteen (16) 3-pin jumpers located directly behind the 14-pin terminal front-panel mounted connector. The top 10 jumpers are used to select the Input/Output Audio Impedance and the power-on state of the contacts (NO or NC). The bottom 6 jumpers are used for 2 & 4-wire RS-485 selection and removing the default 120 Ohm load on the RS-422 input channels.

The illustration below describes the function of each of these 16 jumpers. The jumpers are shown in their default condition.

JUMPER SETTINGS

	Pos.1/Pos.2	
Jumper 1		Audio Ch 1 (-) (OUT) - 800 Ohm / Low Z
Jumper 2		Audio Ch 1 (+) (OUT) - 800 Ohm / Low Z
Jumper 3		NA
Jumper 4		NA
Jumper 5		NA
Jumper 6		NA
Jumper 7		Audio Ch 1 (+) (IN) - 47K Ohm / 600 Ohm
Jumper 8		Audio Ch 1 (-) (IN) - 47K Ohm / 600 Ohm

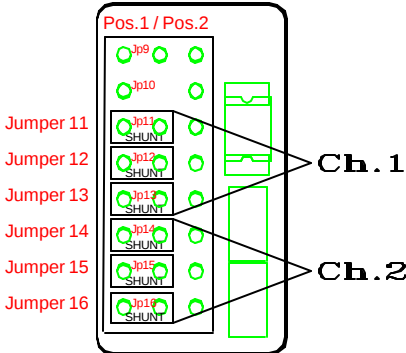
	Pos.1/Pos.2	
Jumper 9		NA
Jumper 10		Contact Ch 1 (OUT) - Normally Open (NO) - default
Jumper 11		RS-485 Ch 1 (4-wire/2-wire selection)
Jumper 12		RS-485 Ch 1 (4-wire/2-wire selection)
Jumper 13		RS-422 Ch 1 (IN) - 120 Ohm load - ON
Jumper 14		NA
Jumper 15		NA
Jumper 16		NA

Data Jumper Settings

RS-485 (2-wire & 4-wire) selection – In addition to selecting the proper switch position for conversion from 4-wire RS-485 to 2-wire Rs-485 (see Section 5.1), jumpers 11,12,13 for ch.1 & 14,15,16 for ch.2 (as shown below) must be moved to the position as indicated. The default position of these jumpers is for RS-232.

DATA JUMPER SETTINGS

RS-232

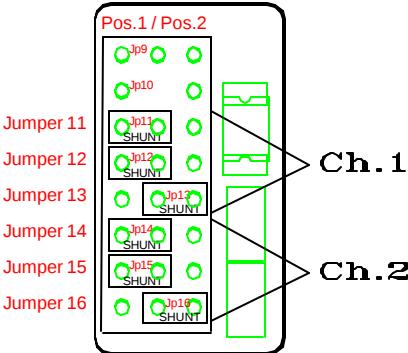


Factory default settings data RS-232

Table 1

DATA JUMPER SETTINGS

RS-422 RS-485 (4W)

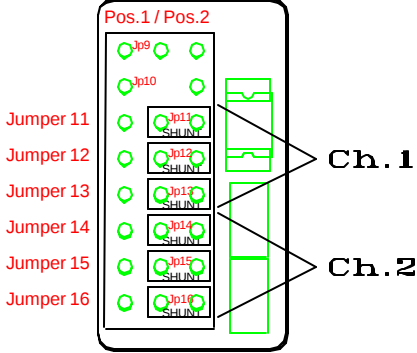


*To convert from RS-232 to RS-422 or RS-485 (4w) data move Jumpers13 & 16 to Pos.2

Table 2

DATA JUMPER SETTINGS

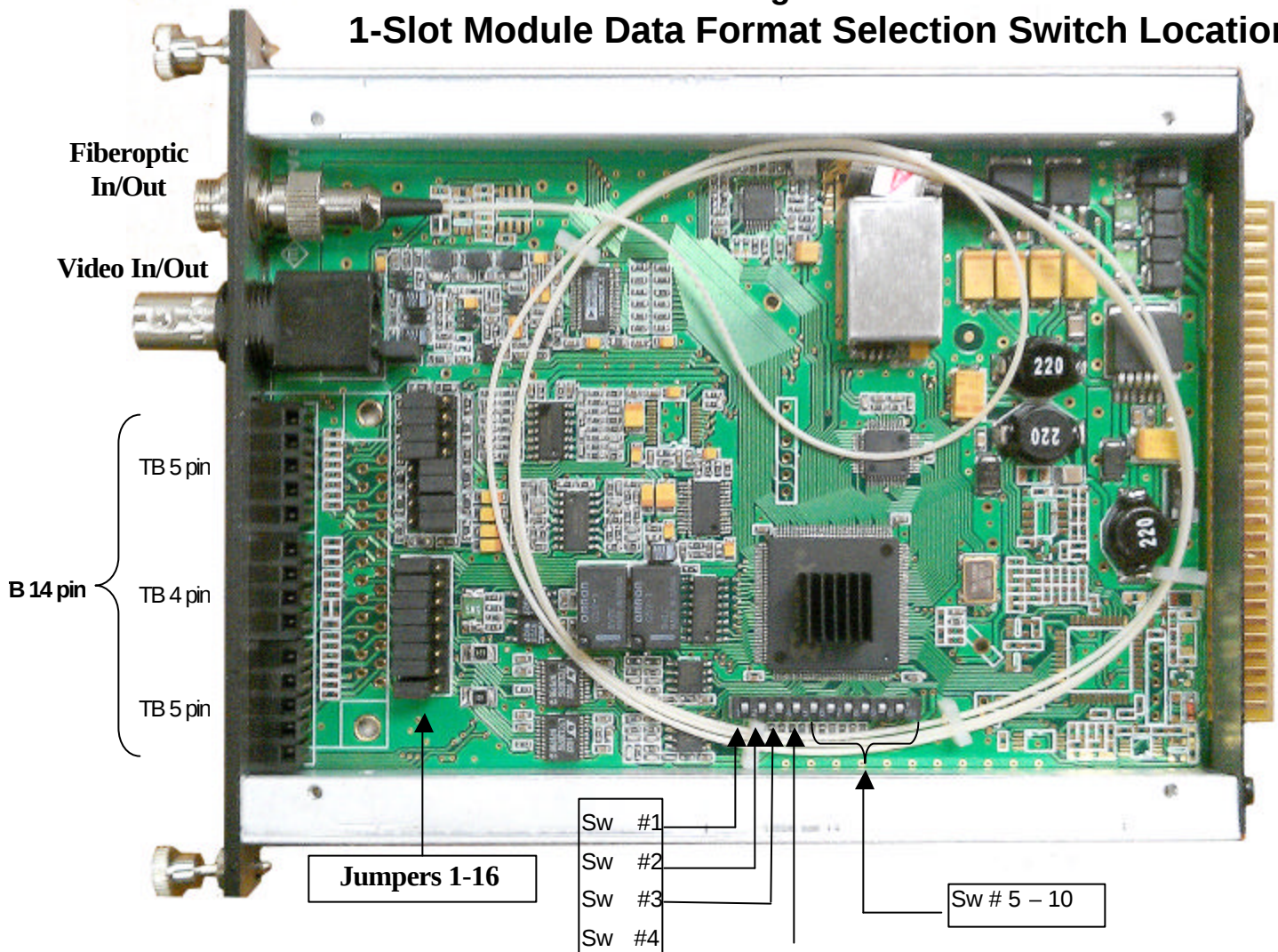
RS-485 (2W)



*To convert from RS-232 to RS-485 (2w) data move Jumpers11-16 to Pos.2

Table 3

Figure 5.1
1-Slot Module Data Format Selection Switch Location



****RS-232 FACTORY SETTINGS**

NOTE: This setting can be preconfigured to any data selection by customer request.

6.0 SpectraView™ Network Monitoring

The table below lists the function of each of these switches (numbered from left to right) and identifies how to set the various diagnostic test modes.

Test Switch	Contact Closure Enable	Coaxitron Enable	Transmit Test	Receive Test	Spectra View Enabled	Extended Range Enable
SW1 – SW4 – Data format selection switches						
SW5	ON	OFF	OFF	OFF	OFF	OFF
SW6	OFF	ON	OFF	OFF	OFF	OFF
SW7	OFF	OFF	ON	OFF	OFF	OFF
SW8	OFF	OFF	OFF	ON	OFF	OFF
SW9	OFF	OFF	OFF	OFF	ON	OFF
SW10	OFF	OFF	OFF	OFF	OFF	ON

Note: To turn a switch “ON”, move the switch in the down position. Likewise, to turn a switch “OFF”, move it in the up position.

In order to enter the test modes on the module, it is necessary to actuate one of the above switches as described below:

Data/Audio/Contact Transmit Test (SW7) – (applicable to both full-duplex transceiver modules (FXA-xxx & FXB-xxx) and one-way data transmission modules. The type and quantity of channels that can be tested are determined by the type of channels associated with the particular module under test.

In order to perform the transmit test, it is necessary to configure both the modules as follows:

- ✍✍ The FT or FR and FXA & FXB modules must be connected together via fiber and power applied in order to perform the Transmit tests.
- ✍✍ When testing the data channels, it is necessary that the data formats for both the modules be set the same (RS-232, RS-422, RS-485)
- ✍✍ The Transmit Test switch (SW7) on the module initiating the test must be in the ON (down) position
- ✍✍ Test switches (SW5-10) on the local unit must be in the OFF (up) position
- ✍✍ This test overrides any external data that may be at the input terminals of the unit under test.

This test will inject the Audio, Data and Contact Closure test signals into the transmitter and will be sent over fiber to the associated receiver module. This test will perform diagnostic tests on all of the channels integrated in the module using the module’s own internal test signals. In addition, the internal frequency/data rate of the various internal tests is as follows:

Data - 1Hz square wave
Contact closure - 1Hz square wave

Once the Transmit test switch on the remote FT, FR, FXA or FXB module is switched ON, the above signals will be transmitted over fiber to the receiving unit. The outputs can be monitored by standard Audio, Data and Contact mapping measurement/monitoring techniques.

LED indicator status – During the test, the Tx channel indicator lights for the data and contact mapping (DTx & CTx) on the module initiating the test will flash at a 1Hz rate. The audio transmit light (ATx) will be ON continuously. This applies to each type and number of channels in the module. Likewise, each of the channel’s front panel Rx channel indicator lights for the data and contact mapping (DRx & CRx) on the receiver module’s front panel will flash at a 1Hz rate to indicate proper reception of the test signals while the

audio receive light (ARx) will be ON continuously.

To disable the test, move SW7 on the FT, FXA or FXB switch to the OFF position.

Data/Audio/Contact Receive Test (SW8) - (applicable to both full-duplex transceiver modules (FXA-xxx & FXB-xxx) and one-way receiver modules. These tests will test all of the audio, data and contact closure transmission channels installed on the module associated with the remote loop back test. Obviously, the channels that can be tested are determined by the type of channels associated with the particular module under test.

In order to perform the receive tests, it is necessary to configure both the modules as follows:

- ✍✍ The FT or FR and FXA & FXB modules do not need to be connected together via fiber.
- ✍✍ The type of data output will be as per the data format selection switches 1 through 4 (RS-232, RS-422, RS-485)
- ✍✍ The Receive Test switch (SW8) on the module initiating the test must be in the ON (down) position

The receive test will perform diagnostic tests on all of the channels integrated in the module using the module's own internal test signals. The internal frequency/data rate of the various internal tests is as follows:

Audio - 1Khz square wave
Data - 1Hz square wave
Contact closure - 1Hz square wave

Once the Receive test switch on the FT, FR, FXA or FXB module is switched ON, the above signals sent to the appropriate electrical outputs on the same module. These signal outputs can be monitored by standard Audio, Data and Contact mapping measurement/monitoring techniques.

LED indicator status – During the test, each of the channel's front panel Rx channel indicator lights for the data on the receiver module's front panel will flash at a 1Hz rate to indicate proper reception of the test signals. This applies to each type and number of channels in the module.

To disable the test, move SW7 on the FR, FXA or FXB switch to the OFF position. This will restore operation to its normal mode.

Video Test – (Applicable to one-way transmission modules (FT & FR units). This video test mode will allow the user to test the video transmission channel without the use of an external camera to generate a video signal.

There are two video tests available – Transmit video & Receive video. The following describes the test setup for each:

Transmit video test – This test injects a 4-bar video test pattern into the video transmitter and sends this signal over fiber to the associated receiver module.

In order to initiate the internal transmit video test it is necessary to configure the modules as follows:

- ✍✍ SW7 on the FT video Tx module must be set to the ON (down) position.
- ✍✍ SW8 on the FR video Rx module must be set to the OFF (up) position.
- ✍✍ The optical fiber between the FT & FR modules must be connected together
- ✍✍ Connect a standard video monitor to the output of the FR (Video Receiver) module
- ✍✍ 4 grey-scale vertical bars will be displayed on the monitor
- ✍✍ Receiver module LEDs – If a video monitor is not available, the activity of the transmit video test can be monitored on the receiver's front panel LEDs. When this test is activated, the receiver modules Video Sync & Video Present green LEDs (SYN & VID) will light.

Receive video test – This test injects an 8-bar video test pattern into the video receiver and sends it to the receiver output BNC for display on a video monitor.

In order to initiate the internal receive video test it is necessary to configure the modules as follows:

- ✍✍ SW7 on the FT video Tx module must be set to the OFF (up) position.
- ✍✍ SW8 on the FR video Rx module must be set to the ON (down) position.
- ✍✍ The optical fiber between the FT & FR modules must be connected together
- ✍✍ Connect a standard video monitor to the output of the FR (Video Receiver) module
- ✍✍ 8 grey-scale vertical bars will be displayed on the monitor
- ✍✍ **SpectraView Enabled (SW9)** - (Applicable to one-way transmission modules with video (FT & FR units). This video mode will enable the vertical video bars to be displayed in the event that either the incoming video signal has been removed or if the optical signal from the transmitter has been interrupted.
- ✍✍ To enable this video bars feature it is necessary to configure the modules as follow:
 - ✍✍ SW 9 on the FR (video Receiver) module must be set to the ON (down) position
 - ✍✍ SW 9 on the FT (video Transmitter) module must be set to the ON (down) position

Under normal operation, the video from the CCTV camera will be displayed on the respective monitor at the receive side. There are two 'alarm' modes - one for loss of video sync and one for loss of optical signal. When one or the other of these alarm modes is present, the monitor will display the following:

Loss of video sync - 4 vertical gray-scale bars across the monitor screen

Loss of optical signal - 8 vertical gray-scale bars across the monitor screen

Note: Modules equipment with Meridian's SpectraSmart Network Diagnostic System option will have a slightly different video display. Instead of the vertical bars, the monitor will actually display a text message (as described below):

Loss of video sync error: will display the message "No Video Sync"

Loss of Optional signal error: will display – "No Optical Fiber"

This procedure concludes the testing of the video/audio/data/contact channels within Meridian's DigiCool (1-slot) fiber optic digitally-encoded transmission modules.

7.0 Product Part Number Variations

The table below lists the various part numbers and description that are available for this series of product.

Product Part Number Guide			
Part Number	Matching Part #	Fiber Interface	Optical Connector
FT-1U1A1C1G/1A1C1G-2	FR-1U1A1C1G/1A1C1G-2	Multimode	ST
FT-1U1A1C1G/1A1C1G-5	FR-1U1A1C1G/1A1C1G-5	Singlemode	FC
FT-1U1A1C1G/1A1C1G-5ST	FR-1U1A1C1G/1A1C1G-5ST	Singlemode	ST

The table below indicates the part numbers and product description that are included in this manual. The pinout diagram in section 4.0 shows the connector pinouts (input/output connections) for the all-inclusive product. The appropriate modules consist of 1-channel of uni-directional video and various combinations of bi-directional (symmetric) Audio, Data and Contact Closures. Please use this table to determine the exact pinout of the particular model of interest. Note that where there is only one audio, data or contact closure channel, the pinouts for "Ch1" are used. The "Ch2" connector pinout assignments are only used when two channels of that particular signal are present.

Part Numbers	Description
FT/FR-1U2A/2A-x	Video w/2-ch bi-directional Audio
FT/FR-1U2C/2C-x	Video w/2-ch bi-directional Contact Closure
FT/FR-1U2G/2G-x	Video w/2-ch bi-directional Data
FT/FR-1U1A1C/1A1C-x	Video w/1-ch bi-directional Audio & Contact Closure
FT/FR-1U1A1G/1A1G-x	Video w/1-ch bi-directional Audio & Data
FT/FR-1U1A2C/1A2C-x	Video w/1-ch bi-directional Audio & 2-ch bi-directional Contact Closure
FT/FR-1U2A1C/2A1C-x	Video w/2-ch bi-directional Audio & 1-ch bi-directional Contact Closure
FT/FR-1U1C2G/1C2G-x	Video w/1-ch bi-directional Contact Closure & 2-ch bi-directional Data
FT/FR-1U2C1G/2C1G-x	Video w/2-ch bi-directional Contact Closure & 1-ch bi-directional Data
FT/FR-1U1A1C1G/1A1C1G-x	Video w/1-ch bi-directional Audio & Data & Contact Closure
FT/FR-1U1A1C1G/1M1A1C1G-x	Video/Pelco Coaxitron w/1-ch bi-directional Audio & Data & Contact Closure

FT/FR-1U1A1C1G/1P1A1C1G-x	Video/PTZ Control data w/1-ch bi-directional Audio & Data & Contact Closure
FT/FR-1U2A2C2G-x	Video w/1-ch uni-directional Audio & Data & Contact Closure

Note: *This FT & FR series cards are not compatible with the other 1-slot ST & SR cards.*

8.0 Troubleshooting

Below is a listing of several problems that may arise during the installation & operation of the modules. If you are having difficulty installing or operating the modules please refer to this list below.

Problem: *Module does not fit in chassis slots*

Action: Check module orientation. Meridian “Globe” must be oriented on the top left hand side of the module. Make sure the card guides in the chassis are aligned with the extrusion on the module.

Problem: *Card power LED does not light when power to the module/subrack is applied or power indicator turns on and off*

Action: Check power supply to ensure that it is plugged in and turned on. If flashing continues, move module to another chassis or location in the same chassis, if available.

Problem: *No video at output of module*

Action: Check the SpectraView display on the monitor for an indication of what the problem may be. Also, check to ensure that the video channel-specific LEDs are on (Green). Also, check to ensure that the optical LEDs are ON. If no video is still present, check to ensure that the monitor is ON and the video cable is connected to the correct video port on the Rx module.

Problem: *Video image is dark*

Action: Check the iris control on the camera to ensure that it is open to the proper amount for the conditions.

Problem: *Video image is too bright and appears overexposed*

Action: Check the Video overload indicator on the Rx module. If it is Red, the video signal level is too high and the CCTV iris should be checked to ensure that it is open properly for the conditions.

Problem: *No or distorted Audio*

Action: Check to ensure that the audio input/output connections are correct and that the Input/Output impedance jumpers are set correctly. The I/O impedance of each audio channel can be set independently so be sure to check that the appropriate channel is configured properly.

Problem: *No Data*

Action: Check that both the transmit and receive modules are set to transmit/receive the same data format (see section 5.0 for switch settings).
Verify that the PWR, Tx C/L and Rx C/L lights on both modems are on GREEN. Confirm that the data pinouts/connections are correct (see section 4.0 for data pinout connections).
Confirm the internal DIP switch and jumpers are set correctly for the data protocol. Verify that the DT1 light flashes when transmitting data and that the corresponding DR1 light on the other modem is flashing.
Confirm that the data connections are correct (Check to ensure that the data source is operating properly). The front panel lights located next to the 14 pin connector should be flashing as data is being sent to the transmit side.
Check to ensure that data is being transmitted to the unit.

Problem: *Contact closure not working*

Action: Input side – Ensure that the input contact is connected between the appropriate input connection and ground
Output side – Ensure that the terminal device is connected to the proper output contact pinouts and that the individual contact channel jumpers are set to the appropriate normally-open or normally-closed position

If the problem still persists after reviewing the above items, please contact Meridian technical support (516-285-1000).

Notes:



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