



Fiber Optic Video/Audio/Data/Contact Mapping Transmission System

Installation Instructions

(FT/FR-1Uxxx/xxx-SFP series)

Part Number:

FT-1U2A2C1G/2A2C1G-SFP

**(Video transmitter w/2ch. bi-directional audio
& contact closure, 1ch. bi-directional data)**

FR-1U2A2C1G/2A2C1G-SFP

**(Video receiver, w/2ch. bi-directional audio
& contact closure, 1ch. bi-directional data)**

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FT/FR-1U2A2C1G/2A2C1G-SFP **Fiber Optic Video/Audio/Data Transmission System** **Installation Instructions**

1.0 Product Description

Meridian's product series ST/SR-1U2A2C1G/2A2C1G-SFP are fiber optic modems that transmit & receive one uni-directional 10-bit video channel two channels of bi-directional audio, two channels of bi-directional contact closure one channel of bi-directional user-selectable RS-232, RS-422 and RS-485 (2 & 4 wire) data signals over SFP 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-1002/S, SR-1600/S, and SR-2001 & SR-2000 series 19" equipment chassis.

SFP optical modules are supported. Optional conformal coating provides an additional level of protection from environments with high humidity.

Refer to Appendix 1 at the back of this manual for the module part numbers applicable in this manual.

2.0 Installation

Series FT/FR-1U2A2C1G/2A2C1G-SFP 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-1U2A2C1G/2A2C1G-x series products transmit and receive the following signals:

Signal Type	Channels	Transmit	Receive
NTSC/PAL video	1	FT-1U2A2C1G/2A2C1G-X	FR-1U2A2C1G/2A2C1G-X
Audio	2	Yes	Yes
Contact Mapping	2	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

Again, refer to Appendix 1 for the product part number and associated functional description. The above number and type of signals will vary based on the product part number.

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%
Data	
Formats	RS-232, RS-422, RS-485, Manchester, Bi-Phase
Date Rate (RS-232)	DC to 125Kb/s
Data Rate (RS-422 & RS-485)	DC to 250Kb/s
Bit Error Rate (BER)	10 ⁻⁹
Audio	
In/Out Impedance	600 Ohm balanced / 47K Ohm 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
Connectors	
Video	75 Ohm BNC w/gold center pin
Audio/Data/Contact	DB25F (25 pin Female 'D' style connector)
Optical	LC, SC – SFP dependent

3.0 Optical Specifications

The SFP series products are available for both singlemode and multimode fiber applications and either one or two fiber versions. Recommended optical speed for this product 155Mbps. Refer to optical SFP table for complete part and ordering information.

For more specifications on a SFP optic devices refer to SFP data sheet on Meridian website:

http://www.meridian-tech.com/downloads/datasheets/datasheet_SFP_optical_devices-x.pdf

4.0 Data Connector Pin Assignment

The 25-pin connector on the front of the module is used for all Audio & Data interfaces. Refer to the table below for the signal pinouts associated with the appropriate module part number found in Appendix 1.

User-settable switches on the module's motherboard are used to select the appropriate data format as required.

**RS-232 FACTORY SETTINGS

NOTE: These settings can be preconfigured to any data selection only by customer request.

Pin #	RS-232	RS-422	RS-485 (2-wire)	RS-485 (4-wire)	Audio	Contact Closures
1	GND	GND	GND	GND	GND	GND
2	Ch 2 IN (RD)	Ch 2 IN (-)	Ch 2 IN/OUT (-)	Ch 2 IN (-)	-----	-----
3	Ch 2 OUT (TD)	Ch 2 OUT (-)	-----	Ch 2 OUT (-)	-----	-----
4	Ch 1 IN (RD)	Ch 1 IN (-)	Ch 1 IN/OUT (-)	Ch 1 IN (-)	-----	-----
5	Ch 1 OUT (TD)	Ch 1 OUT (-)	-----	Ch 1 OUT (-)	-----	-----
6	-----	-----	-----	-----	-----	Ch 1 IN
7	GND	GND	GND	GND	GND	GND
8	-----	-----	-----	-----	-----	Ch 1 OUT
9	-----	-----	-----	-----	-----	Ch 2 OUT
10	-----	-----	-----	-----	Ch 1 IN (+)	-----
11	-----	-----	-----	-----	Ch 2 IN (+)	-----
12	-----	-----	-----	-----	Ch 1 OUT (-)	-----
13	-----	-----	-----	-----	Ch 2 OUT (-)	-----
14	Ch 2 IN (DTR)	Ch 2 IN (+)	Ch 2 IN/OUT (+)	Ch 2 IN (+)	-----	-----
15	Ch 2 OUT (DSR)	Ch 2 OUT (+)	-----	Ch 2 OUT (+)	-----	-----
16	Ch 1 IN (DTR)	Ch 1 IN (+)	Ch 1 IN/OUT (+)	Ch 1 IN (+)	-----	-----
17	Ch 1 OUT (DSR)	Ch 1 OUT (+)	-----	Ch 1 OUT (+)	-----	-----
18	-----	-----	-----	-----	-----	Ch 2 IN
19	-----	-----	-----	-----	-----	+5VDC
20	-----	-----	-----	-----	-----	Ch 1 OUT
21	-----	-----	-----	-----	-----	Ch 2 OUT
22	-----	-----	-----	-----	Ch 1 IN (-)	-----
23	-----	-----	-----	-----	Ch 2 IN (-)	-----
24	-----	-----	-----	-----	Ch 1 OUT (+)	-----
25	-----	-----	-----	-----	Ch 2 OUT (+)	-----

5.0 Signal Conditioning Switch/Jumper Settings

The sections below illustrate how to change the various data format, audio impedance and contact mapping conditions.

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 three (3) switches control the data format that is transmitted/received. These switches on both the ST & SR modules 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 for both data channels** (Switches #1-4 set in the OFF ("UP") position).

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

There are sixteen (16) 3-pin jumpers located directly behind the DB25 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.

Audio Impedance - The input/Output impedance of each of the audio channels can be changed between 600 Ohm balanced and 47K Ohm unbalanced see figure 5.1. The default impedance is 600 Ohm.

Contact Mapping - The output state of each of the contacts can be changed from Normally-Open (NO) pos.1 to Normally-Closed (NC) pos.2 by properly selecting the jumpers 9-10. 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).

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

JUMPER SETTINGS

AUDIO

DATA/CC

	Pos.1/Pos.2	AUDIO 600 Ohm (Default)
Jumper 1		Audio Ch 1 (-) (OUT) - 600 Ohm
Jumper 2		Audio Ch 1 (+) (OUT) - 600 Ohm
Jumper 3		Audio Ch 2 (-) (OUT) - 600 Ohm
Jumper 4		Audio Ch 2 (+) (OUT) - 600 Ohm
Jumper 5		Audio Ch 2 (+) (IN) - 600 Ohm
Jumper 6		Audio Ch 2 (-) (IN) - 600 Ohm
Jumper 7		Audio Ch 1 (+) (IN) - 600 Ohm
Jumper 8		Audio Ch 1 (-) (IN) - 600 Ohm

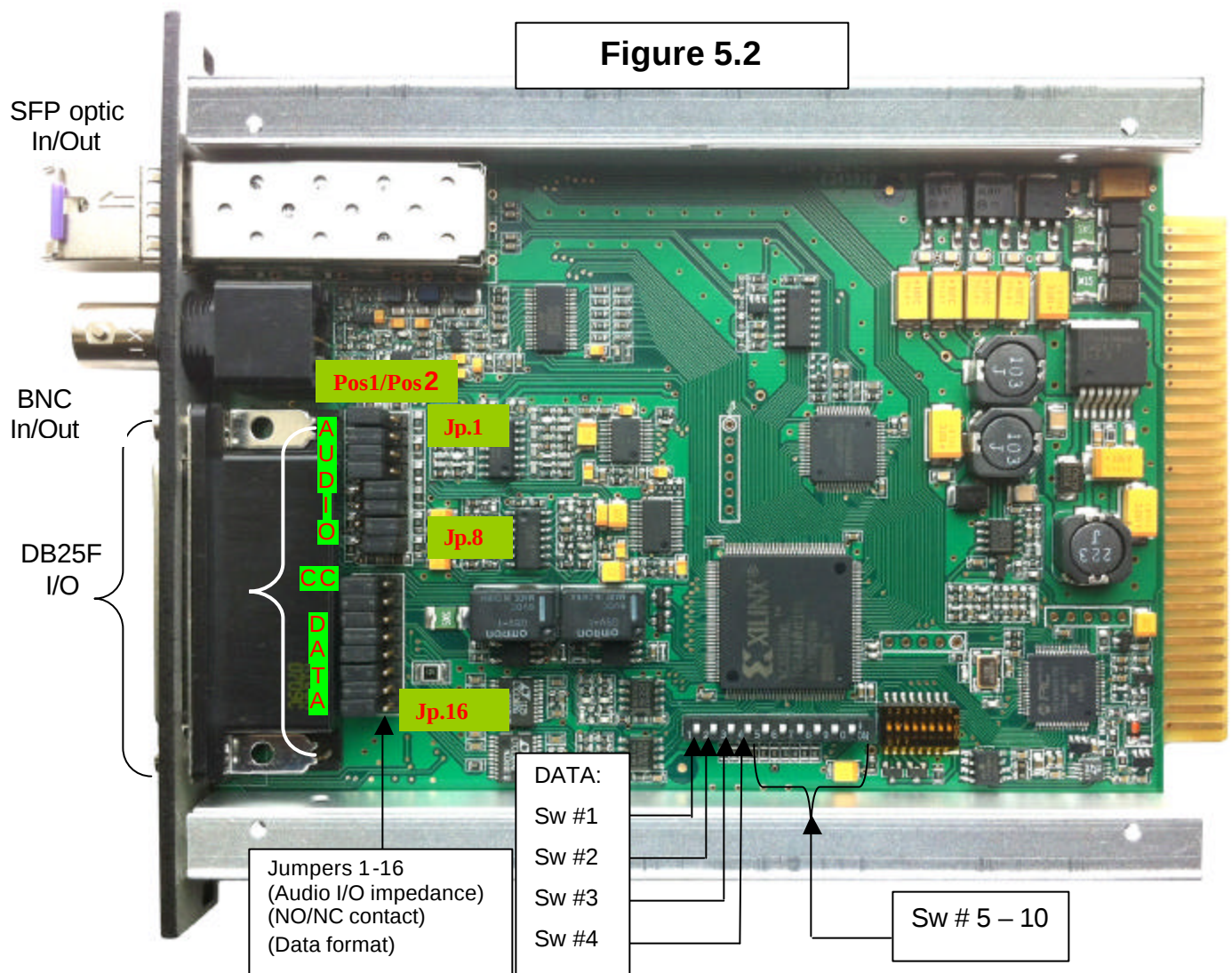
	Pos.1/Pos.2	AUDIO 47k Ohm Unbalanced
Jumper 1		Audio Ch 1 (-) (OUT) - Low Z
Jumper 2		Audio Ch 1 (+) (OUT) - Low Z
Jumper 3		Audio Ch 2 (-) (OUT) - Low Z
Jumper 4		Audio Ch 2 (+) (OUT) - Low Z
Jumper 5		Audio Ch 2 (+) (IN) - 47K Ohm
Jumper 6		Audio Ch 2 (-) (IN) - 47K Ohm
Jumper 7		Audio Ch 1 (+) (IN)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

Figure 5.1

Data Jumper Settings

Data 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 11-12/14-15 (as shown below) must be moved to the position 2 as indicated. The default position of these jumpers is for 4-wire RS-485 (Pos.1)

DATA JUMPER SETTINGS	DATA JUMPER SETTINGS	DATA JUMPER SETTINGS
RS-232 Factory default settings data RS-232 Table 1	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	RS-485 (2W) *To convert from RS-232 to RS-485 (2w) data move Jumpers11-16 to Pos.2 Table 3



****RS-232 and 600Ohm Audio balance are FACTORY SETTINGS**

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

5.3 Changing default jumpers settings

The jumpers to change the audio (from 600 Ohm balanced to 47K Ohm unbalanced format) or data format can be easily changed as follows:

1. Lay the module on its side with the front panel facing to the left.
2. Remove the screws in each of the 4 corners of the top cover and carefully remove the cover.
3. The Jumpers (1-16) are located on the top two connectors of the module.
4. Refer to the above drawing to locate the 16 jumpers that are located near the DB-25F connector.
5. Using a small tool, carefully remove the jumper and place it on the appropriate pins to properly select the audio format (see Figure 5.2)
6. Carefully replace the side cover and secure with the screws.
7. Repeat this process for the other module. The jumper selection needs to be the same for both the FXA/FT and FXB/FR units.

6.0 Front Panel Indicator Lights

There are 18 LED indicator lights mounted on the left side of the module's front panel (see Figure 6.1 below). These indicators show the operation status of the module's power, optical carriers, video signal and the various data/audio channels. 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.

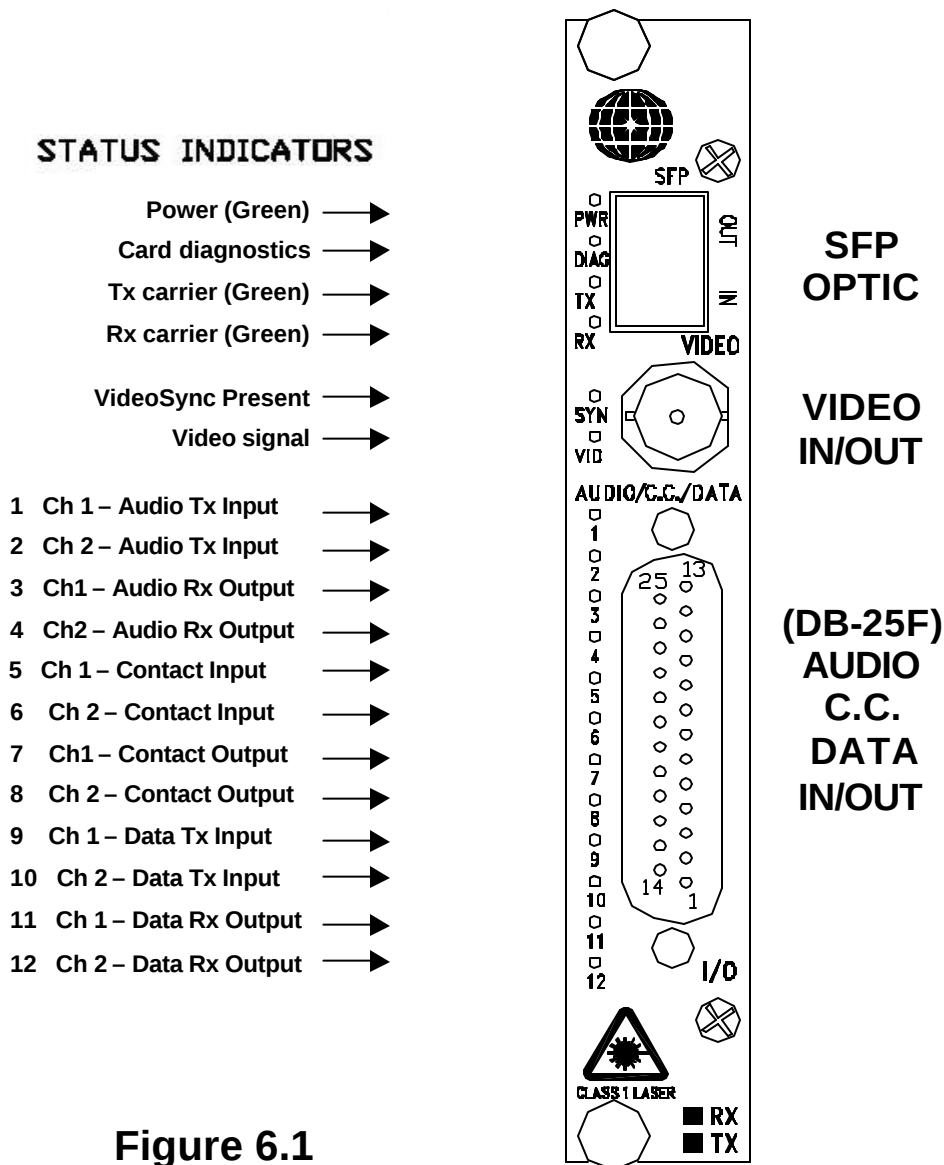


Figure 6.1
Module LED Status Indicators

Each of the indicator lights will light when activity is detected for that particular input or output channel. These indicators can be used for troubleshooting the module, electrical and optical connections. Please note that not all lights are active for a given product model number. Please refer to the functional description of the module for the indicators that pertain to that specific product.

7.0 Spectra View™ Network Monitoring System

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 (DataTx & CC Tx) on the module initiating the test will flash at a 1Hz rate. The audio transmit light (AudioTx) 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 (DataRx & CC Tx) 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 (AudioRx) 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 loopback 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.

8.0 Product Part Numbers

Appendix 1 – Applicable Part Number Variations

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
ST/SR-1U2G/2G-SFP	Video w/2-ch bi-directional Data
ST/SR-1U2A/2A-SFP	Video w/2-ch bi-directional Audio
ST/SR-1U2C/2C-SFP	Video w/2-ch bi-directional Contact Closure
ST/SR-1U1A1G/1A1G-SFP	Video w/1-ch bi-directional Data & Audio
ST/SR-1U2A2G/2A2G-SFP	Video w/2-ch bi-directional Data & Audio
ST/SR-1U1A1C1G/1A1C1G-SFP	Video w/1-ch bi-directional Data & Audio & Contact Closure
ST/SR-1U2A2C1G/2A2C1G-SFP	Video w/2-ch bi-directional Audio & Contact Closure & 1ch Data
ST/SR-1U1A1C/1A1C-SFP	Video w/1-ch bi-directional Audio & Contact Closure
ST/SR-1U2A2C/2A2C-SFP	Video w/2-ch bi-directional Audio & Contact Closure
ST/SR-1U1C1G/1C1G-SFP	Video w/1-ch bi-directional Contact Closure & Data
ST/SR-1U2C2G/2C2G-SFP	Video w/2-ch bi-directional Contact Closure & Data

9.0 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 Data*
- Action:** Check that both the transmit and receive modules are set to transmit/receive the same data format and that the data connections are correct. Check to ensure that the data source is operating properly.
- 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:** *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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