Fiber Optic Video/Data Transmission System

Installation Instructions

FT/FR-1HD2W2G/2G-x, FT/FR-1HD2W3G/3G-x

1-Ch. HD-SDI Video, 2-Ch. 10-Bit Video & 2 or 3 Multi-protocol Bi-directional Data Transceiver

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1.0 Product Description

Meridian's FT/FR-1HD2W3G/3G-x products are fiber optic modems that transmit one channel of SDI/HDSDI video, two channels of 10-bit unidirectional digitized video and three 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-1001/S, SR-1002/S, SR-1200/S, SR-1500/S, SR1600/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 single-mode fiber applications, while the FC connector is available only for single-mode products. Optional conformal coating provides an additional level of protection from environments with high humidity.

2.0 Installation

Series FT/FR-1HD2W3G/3G-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" sub-rack 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-1HD2W3G/3G-x series products transmit and receive the following signals:

Signal Type	Channels	Transmit	Receive
SDI/HDSDI video	1	FT-1HD2W3G/3G-x	FR-1HD2W3G/3G-x
NTSC/PAL/SECAM video	2	FT-1HD2W3G/3G-x	FR-1HD2W3G/3G-x
RS-232 (Tx & Rx data)	3	Yes	Yes
RS-422 (Tx & Rx data)	3	Yes	Yes
RS-485 (2 & 4-wire)	3	Yes	Yes

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

Video SDI/HDSDI	
Format	SMPTE,310M, SMPTE,259M/344M, SMPTE 229M HDTV, DVB-ASI, SMPTE 305M STDI
Nominal Level	0.8Vp-p, 1.0Vp-p (max)
Data Rate	1Vp-p, 75 Ohm, 1.5Vp-p (max)/s – 1.5 Gb/s
Bandwidth	5 Hz to 7 MHz @ -3 dB
Impedance	75 Ohm
Gain	Unity
Input Coupling	AC
Return Loss	>30dB
Jitter	<0.2 UI
Cable Equalization	Automatic 0-70 m @ 1.5 Gb/s
Bit Error Rate (0 to –20dBm)	10^{-9}
Video 10-BIT	
Format	NTSC, PAL, SECAM
Voltage/Impedance	1Vp-p, 75 Ohm, 1.5Vp-p (max)
Bandwidth	5 Hz to 7 MHz @ -3 dB
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
Date 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
Data	High Density DB-15
Optical	Single-mode – ST or FC Multimode - ST

3.1 Optical Specifications

The table below lists the optical specifications for single-mode fiber applications.

Optical Specifications						
Fiber Type/Size (um)	Optical Output (dBm)	Rx Sensitivity (dBm)	Optical Budget (dB)	Wavelength (nm)	Optical connector	Optical Dynamic Range (dB)
Single-mode (FP Laser) 9 / 125	-5	-25	20	1310/1490/1550	ST, FC	23

4.0 Data Connector Pin Assignment

The RJ45 connector on the front of the module is used for all data interfaces. This module supports the following data formats:

RS-232 three channels full speed (Tx/Rx) with Handshake
RS-422 three channels Manchester, Bi-phase
RS-485 three channels (either 2* or 4 wire) 4 wire-default

The RS-232 channel is used for transmitting/receiving three channels of 2-wire 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.

* Note: For RS-485 2-wire requires external connection of pins 1 & 3 and pins 2 & 4.

DB-15 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	GROUND			
6	Ch 2 IN (RD)	Ch 2 IN (-)	Ch 2 IN/OUT (-)	Ch 2 IN (-)
7	Ch 2 IN (DTR)	Ch 2 IN (+)	Ch 2 IN/OUT (+)	Ch 2 IN (+)
8	Ch 2 OUT (TD)	Ch 2 OUT (-)		Ch 2 OUT (-)
9	Ch 2 OUT (DSR)	Ch 2 OUT (+)		Ch 2 OUT (+)
10	GROUND			
11	Ch 3 IN (RD)	Ch 3 IN (-)	Ch 3 IN/OUT (-)	Ch 3 IN (-)
12	Ch 3 IN (DTR)	Ch 3 IN (+)	Ch 3 IN/OUT (+)	Ch 3 IN (+)
13	Ch 3 OUT (TD)	Ch 3 OUT (-)		Ch 3 OUT (-)
14	Ch 3 OUT (DSR)	Ch 3 OUT (+)		Ch 3 OUT (+)
15	GROUND			

FT-1HD2W3G/3G-5

PINOUT DIAGRAM

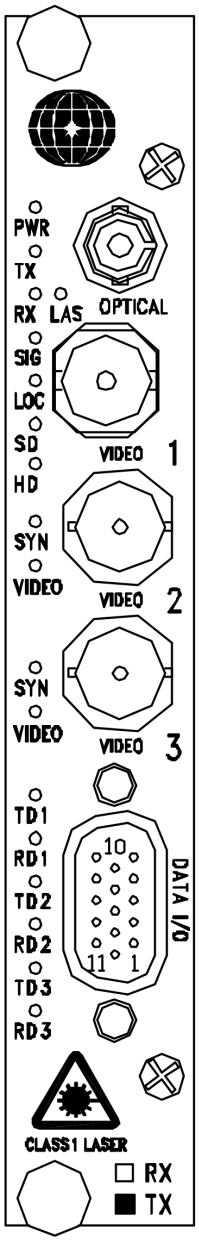
STATUS INDICATORS

PWR - POWER (GREEN)
TX - TX CARRIER (GREEN)/ ERROR (RED)
RX - RX CARRIER (GREEN)/ ERROR (RED)
LAS - SDI LASER (GREEN)/ FAIL (RED)
SIG - SDI SIGNAL PRESENT (GREEN)
LOC - SDI SIGNAL LOCK (GREEN)
SD - SDI PRESENT (GREEN)
HD - HDSDI PRESENT (GREEN)

SYN - (CH.2) SYNC PRESENT (GREEN)
/ LOAD ABSENT (RED)
VIDEO - (CH.2) VIDEO PRESENT (GREEN)
/ OVERLOAD (RED)

SYN - (CH.3) SYNC PRESENT (GREEN)
/ LOAD ABSENT (RED)
VIDEO - (CH.3) VIDEO PRESENT (GREEN)
/ OVERLOAD (RED)

TD1 - (CH.1) DATA INPUT (GREEN)
RD1 - (CH.1) DATA OUTPUT (GREEN)
TD2 - (CH.2) DATA INPUT (GREEN)
RD2 - (CH.2) DATA OUTPUT (GREEN)
TD3 - (CH.3) DATA INPUT (GREEN)
RD3 - (CH.3) DATA OUTPUT (GREEN)



OPTICAL PORT (ST, FC)

SDI VIDEO INPUT CH.1

VIDEO INPUT CH.2

VIDEO INPUT CH.3

DATA INPUT/OUTPUT
(DB-15 FEMALE)

1. (CH.1) DATA INPUT-
2. (CH.1) DATA INPUT+
3. (CH.1) DATA OUTPUT-
4. (CH.1) DATA OUTPUT+
5. GROUND
6. (CH.2) DATA INPUT-
7. (CH.2) DATA INPUT+
8. (CH.2) DATA OUTPUT-
9. (CH.2) DATA OUTPUT+
10. GROUND
11. (CH.3) DATA INPUT-
12. (CH.3) DATA INPUT+
13. (CH.3) DATA OUTPUT-
14. (CH.3) DATA OUTPUT+
15. GROUND

Figure 4.1

FT-1HD2W3G/3G-x Front Panel Layout Diagram

FR-1HD2W3G/3G-5

PINOUT DIAGRAM

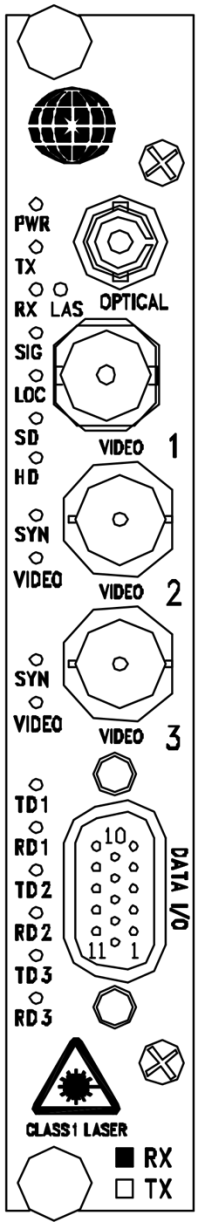
STATUS INDICATORS

PWR - POWER (GREEN)
TX - TX CARRIER (GREEN)/ ERROR (RED)
RX - RX CARRIER (GREEN)/ ERROR (RED)
LAS - SDI LOCK (GREEN)/ LOSS (RED)
SIG - SDI LEVEL 0/-5dBm (GREEN)
LOC - SDI LEVEL -5/-10dBm (GREEN)
SD - SDI LEVEL -10/-15dBm (GREEN)
HD - SDI LEVEL -15/-20dBm (GREEN)

SYN - (CH.2) SYNC PRESENT (GREEN)
/ LOAD ABSENT (RED)
VIDEO - (CH.2) VIDEO PRESENT (GREEN)
/ OVERLOAD (RED)

SYN - (CH.3) SYNC PRESENT (GREEN)
/ LOAD ABSENT (RED)
VIDEO - (CH.3) VIDEO PRESENT (GREEN)
/ OVERLOAD (RED)

TD1 - (CH.1) DATA INPUT (GREEN)
RD1 - (CH.1) DATA OUTPUT (GREEN)
TD2 - (CH.2) DATA INPUT (GREEN)
RD2 - (CH.2) DATA OUTPUT (GREEN)
TD3 - (CH.3) DATA INPUT (GREEN)
RD3 - (CH.3) DATA OUTPUT (GREEN)



OPTICAL PORT (ST, FC

SDI VIDEO OUTPUT CH

VIDEO OUTPUT CH.2

VIDEO OUTPUT CH.3

DATA INPUT/OUTPUT
(DB-15 FEMALE)

1. (CH.1) DATA INPUT-
2. (CH.1) DATA INPUT+
3. (CH.1) DATA OUTPUT-
4. (CH.1) DATA OUTPUT+
5. GROUND
6. (CH.2) DATA INPUT-
7. (CH.2) DATA INPUT+
8. (CH.2) DATA OUTPUT-
9. (CH.2) DATA OUTPUT+
10. GROUND
11. (CH.3) DATA INPUT-
12. (CH.3) DATA INPUT+
13. (CH.3) DATA OUTPUT-
14. (CH.3) DATA OUTPUT+
15. GROUND

Figure 4.2

FR-1HD2W3G/3G-x Front Panel Layout Diagram

5.0 Signal Conditioning Switch Settings & Data Format Selection

A group of 10 switches is located on the bottom center of the module's circuit card (see Figure 5.2). The first six of these switches control the data format for ch.1, ch.2 & ch.3 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. FT and FR modules can be configured differently allowing each to have a unique data format (Figure 5.1)

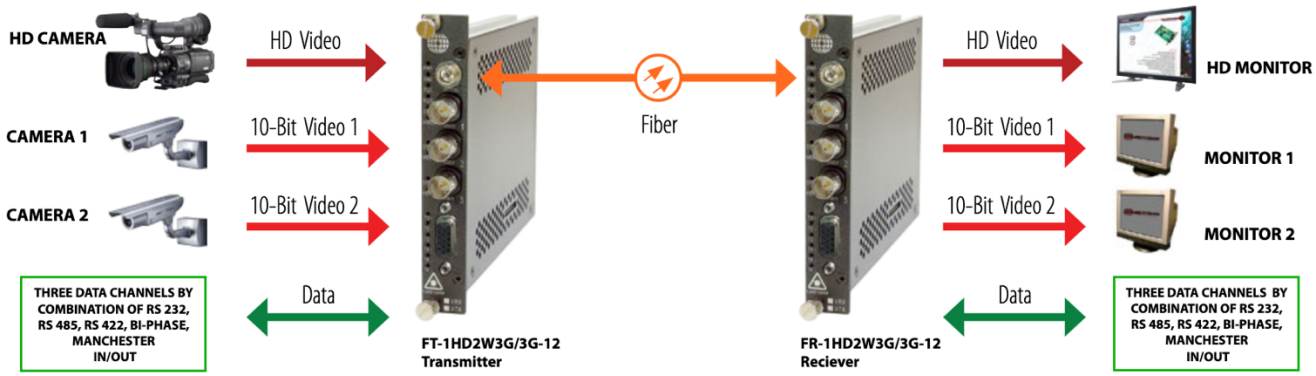


Figure 5.1

Three data channels using a combination of RS-232, RS-485, RS-422, Bi-phase, Manchester IN and OUT.

The figure and table below show switch locations on the board and configuration options. The factory-supplied default setting is RS-232 Data (Switch #1-6 OFF (up)).

Data Format Selection Switch Settings					
	RS-232	RS-422	RS-485 (2-wire)	RS-485 (4-wire)	DATA
Switch #1	***OFF (up)***	ON (down)	ON (down)	***OFF (up)***	CH.1
Switch #2	***OFF (up)***	ON (down)	***OFF (up)***	ON (down)	
Switch #3	***OFF (up)***	ON (down)	ON (down)	***OFF (up)***	CH.2
Switch #4	***OFF (up)***	ON (down)	***OFF (up)***	ON (down)	
Switch #5	***OFF (up)***	ON (down)	ON (down)	***OFF (up)***	CH.3
Switch #6	***OFF (up)***	ON (down)	***OFF (up)***	ON (down)	

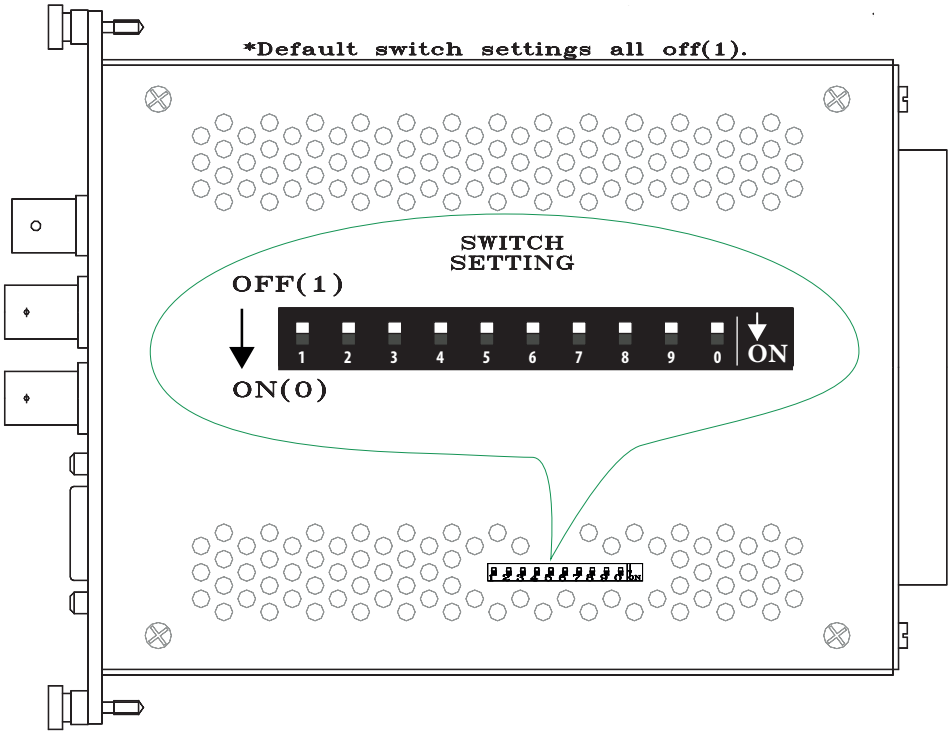
Switches 7-10 factory-supplied default settings are OFF (up). The switches 8 & 9 are used to configure proper video format for TX and RX cards. The illustration below describes the function of each of these switches.

Video Format Selection Switch Settings				
Switch #7	***OFF (up)*** SDI bypass / **ON (down)** Re-clock			
	Transmitter		**Receiver**	
Switch #8	**ON** - SDI Flash Enable	**OFF** - Disable	**ON** - SDI Clock Out	**OFF**- Data Out
Switch #9	**ON** – SDI EQ Disable	**ON** - Enable	**ON** - Auto Mute Enable	**ON** - Disable
Switch #10	***OFF (up)*** Spectra View Enable / **ON (down)** Spectra View Disable			

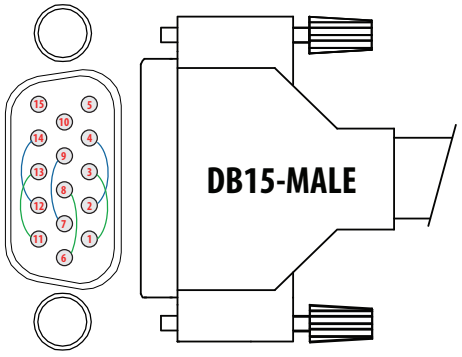
SWITCH SETTINGS FOR FT/FR-1HD2W3G/3G, FT/FR-1HD2W2G/2G, FT/FR-2W3G/3G, FT/FR-2W2G/2G CARDS

DATA FORMAT SELECTION SWITCH SETTINGS					
	RS-232	**RS-422**	**RS-485 (2-wire)**	**RS-485 (4-wire)**	**DATA**
Switch #1	OFF (up)	ON (down)	ON (down)	OFF (up)	CH.1
Switch #2	OFF (up)	ON (down)	OFF (up)	ON (down)	
Switch #3	OFF (up)	ON (down)	ON (down)	OFF (up)	CH.2
Switch #4	OFF (up)	ON (down)	OFF (up)	ON (down)	
Switch #5	OFF (up)	ON (down)	ON (down)	OFF (up)	CH.3
Switch #6	OFF (up)	ON (down)	OFF (up)	ON (down)	

VIDEO FORMAT SELECTION SWITCH SETTINGS (FOR CARDS WITH HD VIDEO ONLY)				
Switch #7	OFF (up) SDI bypass / ON (down) Re-clock			
	Transmitter		Receiver	
Switch #8	ON - SDI Flash Enable	OFF - Disable	ON - SDI Clock Out	OFF- Data Out
Switch #9	ON – SDI EQ Disable	ON - Enable	ON - Auto Mute Enable	ON - Disable
Switch #10	OFF (up) Spectra View Enable / ON (down) Spectra View Disable			



FOR RS-485 2-WIRE DATA ONLY



* Note:

The RS-485 2-wire setting requires jumpers on following DB15-M connector pins pares :

Ch. 1: pins 1 & 3, 2 & 4

Ch. 2: pin 6 & 8, 7 & 9

Ch. 3: pin 11 & 13, 12 & 14

Place jumpers on DB15-Male connector of RS-485 2-wire Data IN/OUT cable for Tx and Rx cards.

6.0 SpectraView™ Network Monitoring

This module series is equipped with Meridian's SpectraView network diagnostics that continuously monitors the fiber system and associated equipment to provide real-time information regarding the integrity of the system.

SpectraView supports the following diagnostic functions:

1. Fiber continuity
2. Presence/loss of video

Notification and identification of faults for the above conditions is automatically displayed on the monitor connected to the video output on the receiver module.

The table below lists the detected faults and associated alert messages that are displayed on the monitor:

Fault	Video Display Message
Broken optical fiber between Tx & Rx units	8 vertical gray-scale bars
Loss of video signal at CCTV (Tx) side	4 vertical gray-scale bars

In addition to the loss of video on the monitor, these messages alert the operator as to the cause of the associated video loss. Upon receiving one of these messages, the operator should inform their technical service center to remedy the situation.

The table in Figure 5.2 lists the function of switch 10 (numbered from left to right) and identifies how to set the diagnostic test modes.

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:

SpectraView Enabled (SW10) - (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 10 on the FR (video Receiver) module must be set to the ON (down) position
- SW 10 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"

7.0 Product Part Numbers

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-1HD2W3G/3G-2	FR-1HD2W3G/3G-2	Multimode	ST
FT-1HD2W3G/3G-5	FR-1HD2W3G/3G-5	Single-mode	FC
FT-1HD2W3G/3G-5ST	FR-1HD2W3G/3G-5ST	Single-mode	ST

Note: This FT & FR family cards are not compatible with ST & SR family cards.

8.0 Troubleshooting

Below is a listing of several problems that may arise during the installation & operation of the modules.

Problem: *Module does not fit in chassis slots*
Action: Check module orientation. Meridian "Globe" must be oriented on the top side of the card front panel. 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/sub-rack 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 transmit and receive modules is set to transmit/receive the same data format (see section 5.0 for data settings). Confirm that the data connections are correct (see section 4.0 for data pinout connections). Check to ensure that the data source is operating properly.

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

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