



## INSTALLATION AND OPERATION MANUAL

# FVT/FVR1010(M)(S)1SHR

10-BIT DIGITALLY ENCODED VIDEO  
+ BI-DIRECTIONAL DATA  
+ SELF-HEALING RING TOPOLOGIES

The FVT/FVR1010SHR are part of ComNet's SHR product family. The FVT1010SHR transmits one channel of video and one channel of bi-directional data over its two fiber optic interfaces. The FVR1010SHR receives one channel of video and one channel of bi-directional data over its two fiber optic interfaces. The FVT/FVR1010SHR are fully compatible with the other products in ComNet's SHR product family (e.g. FVT/FVR4014SHR and FVT/FVR8018SHR).

The NTSC or PAL video signals are digitized with 10-bits of resolution providing superior image quality. The link also transmits one channel of bi-directional data over the same fiber. Each data channel can be configured for an electrical interface of RS232, RS422 or RS485 (2 Wire or 4 Wire).

Utilizing wave division multiplexing (WDM) technology, only one optical fiber is required between units. It's possible to implement a fully self-healing ring, linear add-drop, and even point-to-point topologies. A maximum of eight (8) video signals can be placed onto the ring through any combination of transmitter units, and an unlimited number of receiver units can be used to view any or all of these eight video signals.

Bi-Color (Red/Green) LED indicators are provided for rapidly ascertaining equipment operating status including the location of fiber breaks. See **Figure 9** on **Page 6** for an explanation of LED indicators. An alarm relay output on the FVR1010SHR indicates when a fault has occurred anywhere in the system.

These units are interchangeable between stand-alone or card-cage mount configurations. See **Figure A** on **Page 10** for mounting instructions.

See **Figures 1 – 11** for complete installation information.



Install fiber and power up receiving modem **prior to** power up of FVT1010SHR

FIGURE 1 – FVT/FVR1010SHR TRANSMITTER AND RECEIVER

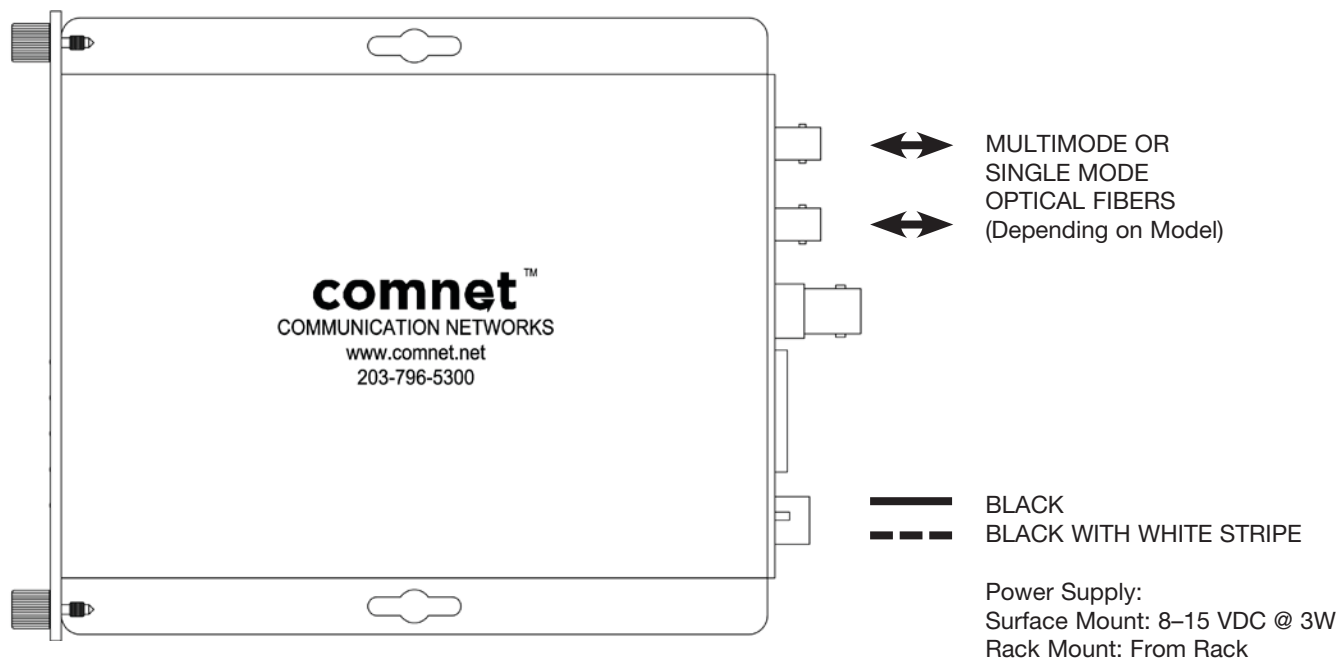


FIGURE 2 – FVT1010SHR TRANSMITTER

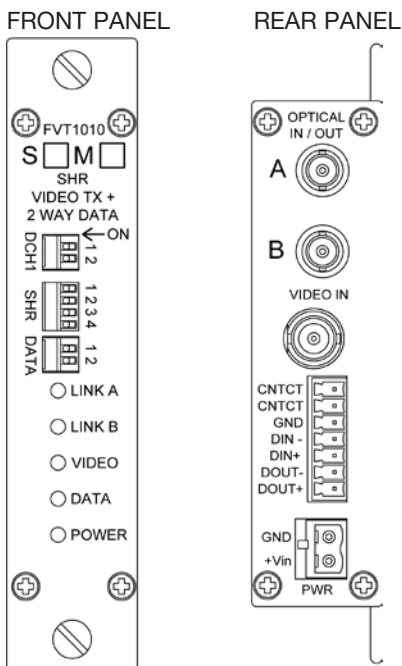
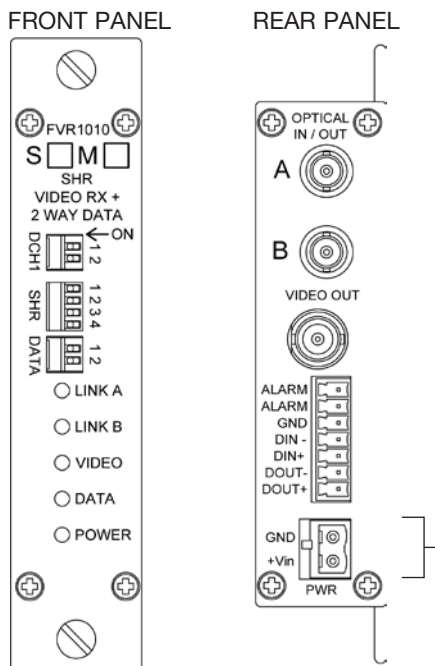


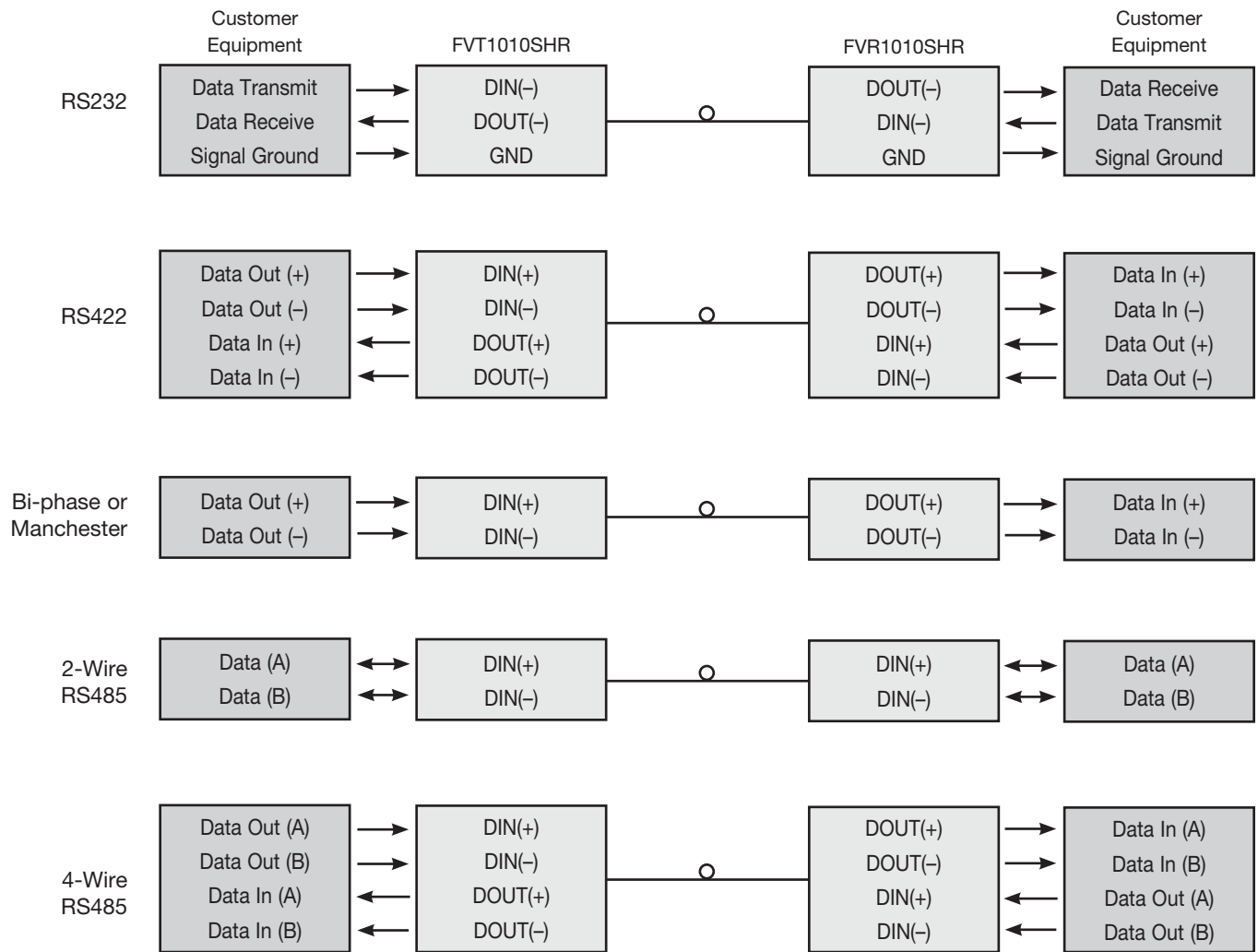
FIGURE 3 – FVR1010SHR RECEIVER



NOTE: Remove Electrical Connector for Rack Mount Units

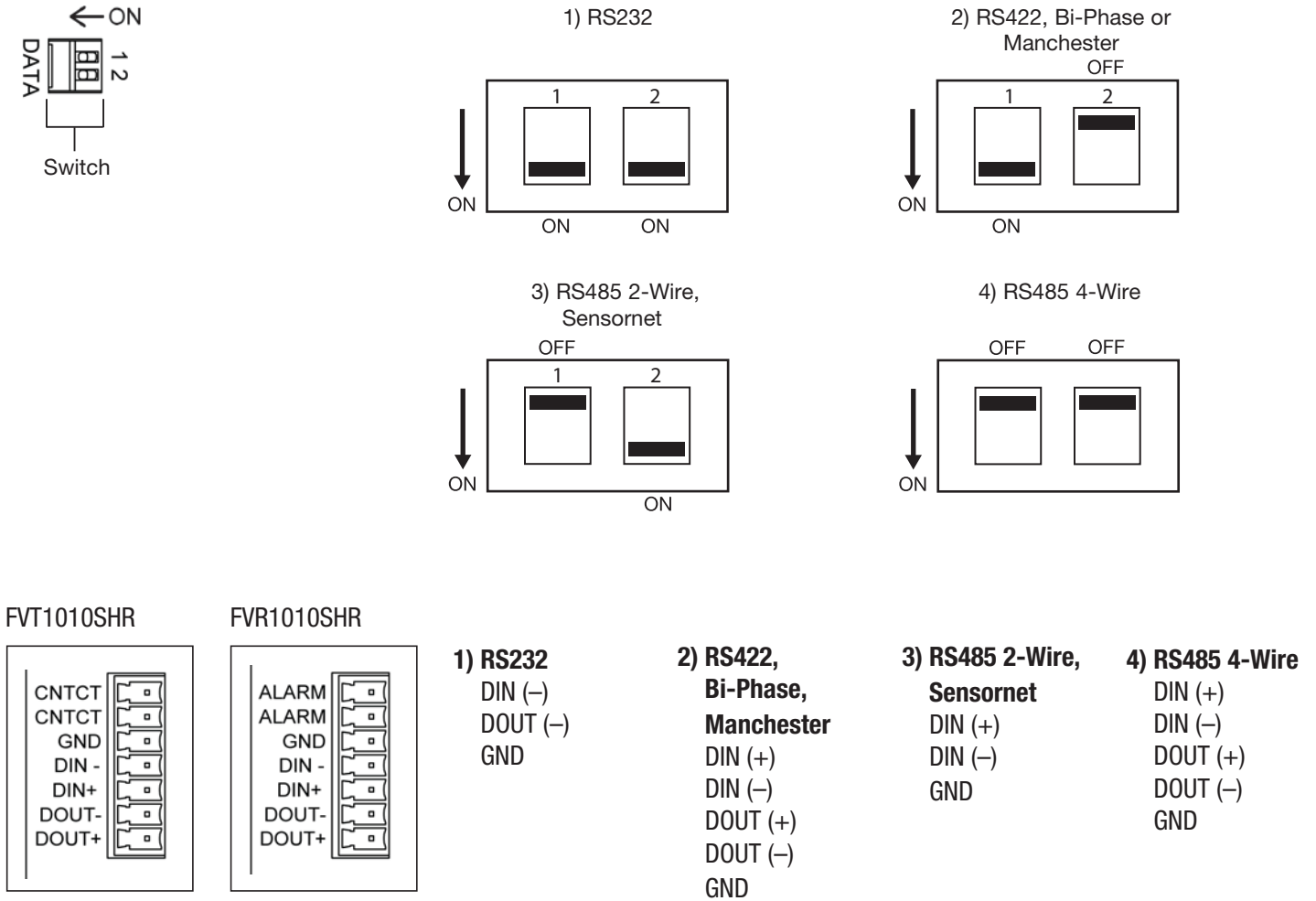
**FIGURE 4 – DATA CONNECTIONS**

See Figure 5 for Switch Positions



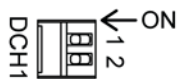
**FIGURE 5 – DATA SWITCH POSITIONS**

The mode for each data channel is configured using a pair of switches on the front panel of the unit.



**FIGURE 6 – DCH1 SWITCH POSITIONS**

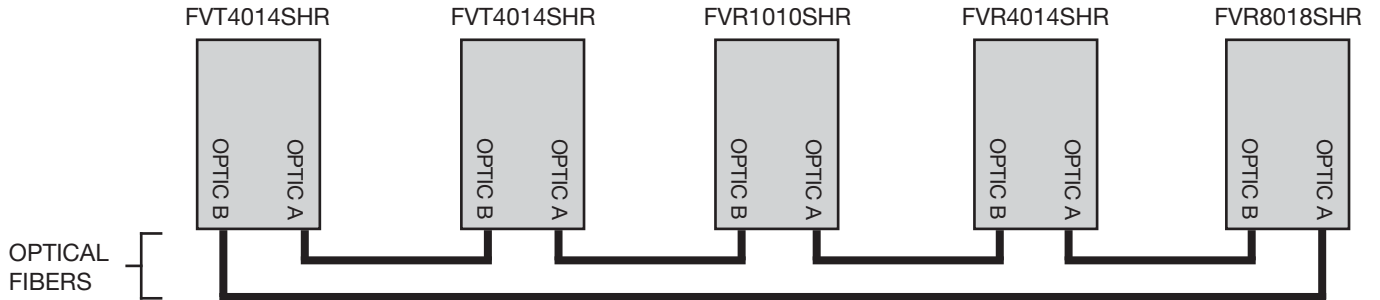
These switches are not used and are reserved for a future release.



**FIGURE 7 – FIBER CONNECTIONS**

Many ring configurations are possible, including the addition of other Video/Data units in the ComNet SHR Product Line.  
 Note that Optic A is always connected to Optic B on the next unit.

**Self Healing Ring:**



**Linear:**

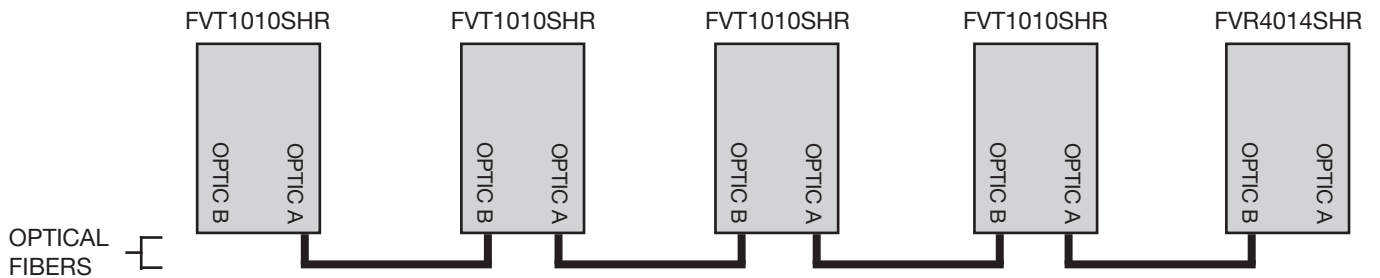


FIGURE 8 – SHR SWITCH POSITIONS

SHR Switch			Resulting Configuration
1	2	3	
ON	ON	ON	Video on Channel 1
OFF	ON	ON	Video on Channel 2
ON	OFF	ON	Video on Channel 3
OFF	OFF	ON	Video on Channel 4
ON	ON	OFF	Video on Channel 5
OFF	ON	OFF	Video on Channel 6
ON	OFF	OFF	Video on Channel 7
OFF	OFF	OFF	Video on Channel 8

**SHR Switch 4** can disable the Remote Fault Locator (RFL) feature of the OPTIC A and OPTIC B LEDs as described in Figure 10. For self-healing ring topologies, this switch would normally be turned OFF at every unit in the system so that the RFL is enabled. However, for linear topologies this switch would be turned ON at the two end points and turned OFF at the rest of the units. Disabling the RFL at these two locations prevents them reporting their disconnected optic ports as a fault to the rest of the units in the system. Fiber breaks throughout the rest of the system will still be reported normally, even at the two end-points. It is also possible to completely disable the RFL by setting this switch to the ON position at every unit in the system. In this case, the OPTIC A and OPTIC B LEDs will only report the status of the optical link between this unit and the next; the LEDs would either be solid green or solid red.

FIGURE 9 – LED INDICATORS

	OPTIC A/B	VIDEO	DATA	POWER
<b>GREEN</b>	Communication link has been established over optical fiber	An active video signal is present on the BNC connector.	An active data signal is present on the pins of the data connector.	Unit powered up
<b>RED</b>	Communication link has not been established.	No video signal is present.	—	—
<b>GREEN/RED BLINK</b>	Communication has been established over optical fiber. However a fiber break has been detected in the system.	—	—	—
<b>OFF</b>	Unit powered down	Unit powered down	No data signal is present.	Unit powered down

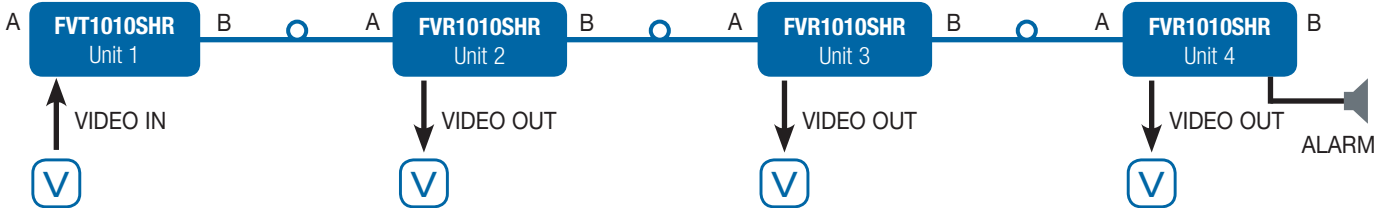
**Remote Fault Locator (RFL) using the OPTIC LEDs**

The Bi-color OPTIC A and OPTIC B LEDs on the front panel convey the status of the optical link between one unit and the next unit around the ring, as well as the status of the ring as a whole. They can be used to identify the location of a remote fiber fault based on their color and pattern:

- **Solid Green**     **Optical link has been established between this optical port and the adjacent unit over fiber.**  
Furthermore, every other unit in the system is also reporting that link has been established. There are no faults in the system.
- **Solid Red**     **Optical link over this port has been lost.**  
This could be due to a broken fiber, a bad connection, or loss of power at the adjacent unit.
- **Blinking Green/Red**     **Optical link has been established between this optical port and the adjacent SHR unit.**  
However, a fault condition has been detected somewhere in the system. The OPTIC LED will be green for a period of time, and then flash red some number of times. The number of red flashes indicates the location of the fault by “hops” around the ring. If the LED flashes red three times, then the location of the fault is three hops away (i.e. three SHR units away). For larger systems with faults greater than 9 hops away, the LED will use a combination of long and short red flashes. Each long flash indicates 10 hops. Each short flash indicates 1 hop. For example, a fault 47 hops away would be encoded as 4 long red flashes, followed immediately by 7 short red flashes. The pattern repeats indefinitely until the fault is resolved.

**FIGURE 10 – EXAMPLE SYSTEM IN LINEAR TOPOLOGY**

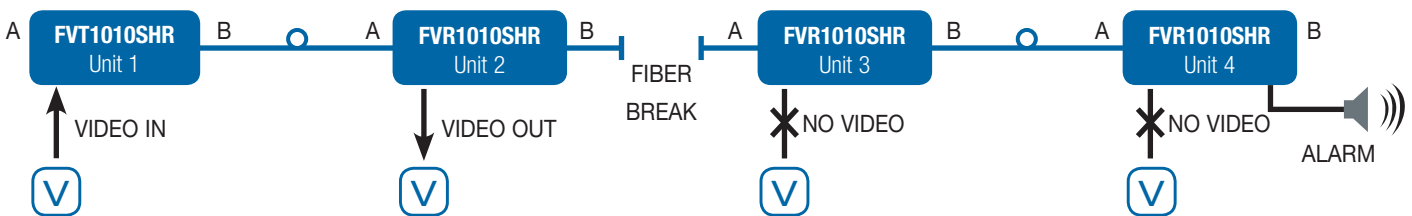
**A** The figure below shows a system with FVT/FVR1010SHR units connected in a linear topology. The system demonstrates a video distribution application. A single video input is transmitted by a FVT1010SHR over fiber optic cable to three daisy-chained FVR1010SHR units. The last unit in the chain is connected to an audible alarm to indicate faults. Three receivers are used in this example, but there is no limit to the number of receivers used in a system. This example could also be expanded to distribute four or eight channels of video using FVT/FVR4014SHR or FVT8018SHR/FVR8018 units, respectively.



**B** The table below shows the SHR configuration switches for each unit in the system. Once the system is configured, all of the POWER, OPTIC and VIDEO LEDs will be solid green except for the OPTIC A LED on Unit 1 and the OPTIC B LED on Unit 4, which would both be solid red. No faults will be reported because RFL has been disabled at Units 1 and Unit 4. The alarm relay will be closed.

Unit	SHR Switch				Notes
	1	2	3	4	
1	ON	ON	ON	ON	Transmit video on Channel 1. Do not report fiber faults to other units.
2	ON	ON	ON	OFF	Receive video from Channel 1.
3	ON	ON	ON	OFF	Receive video from Channel 1
4	ON	ON	ON	ON	Receive video from Channel 1. Do not report fiber faults to other units.

**C** Let's consider how the system would respond to a broken fiber between Units 2 and 3:

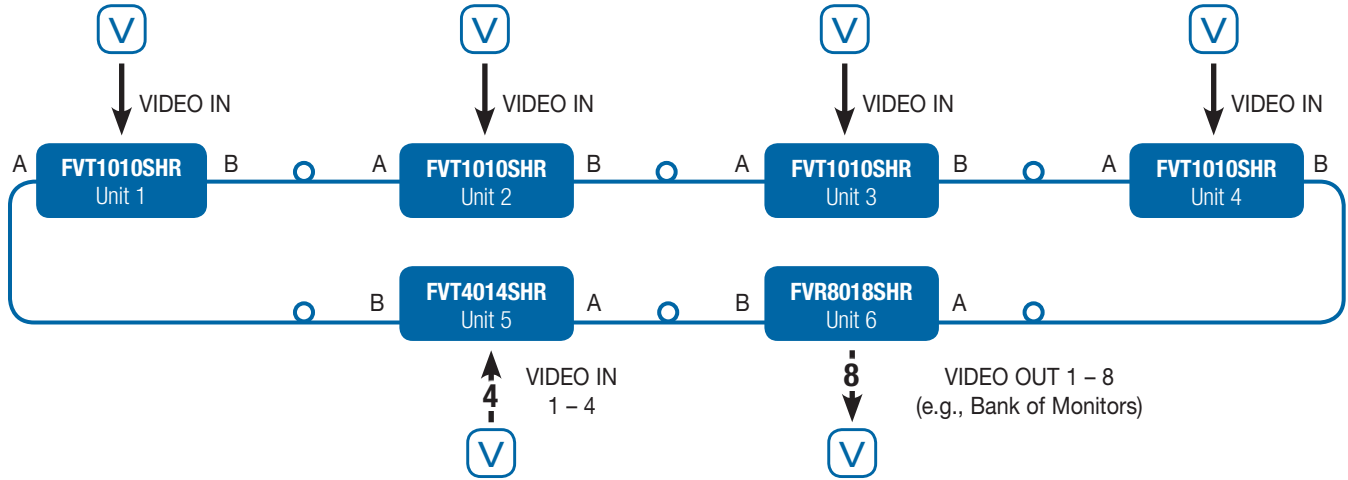


**D** The video would no longer be displayed at Units 3 and 4 because this system has a linear topology (i.e. there is no redundant fiber path). The alarm relay will open and cause the audible alarm at Unit 4 to sound. In addition, the other units in the system would indicate the location of the fault using their OPTIC LEDs as described in the table below.

Unit	OPTIC A LED	OPTIC B LED
1	Solid Red	Green, then Blink Red 1 time
2	Solid Green	Solid Red
3	Solid Red	Solid Green
4	Green, then Blink Red 1 time	Solid Red

FIGURE 11 – EXAMPLE SYSTEM IN SELF-HEALING RING

**A** The figure below shows a system of four FVT1010SHR units, a FVT4014SHR unit and a FVR8018SHR unit connected as a self-healing ring. Eight channels of video enter the system at the five transmitter units and are sent to the video receiver and are displayed on a bank of monitors.



**B** The table below shows the SHR configuration switches for each unit in the system. Once the system is configured, all of the POWER, OPTIC and VIDEO LEDs will be solid green. No faults will be reported.

Unit	SHR Switch				Notes
	1	2	3	4	
1	ON	ON	ON	OFF	Transmit video on Channel 1.
2	OFF	ON	ON	OFF	Transmit video on Channel 2.
3	ON	OFF	ON	OFF	Transmit video on Channel 3.
4	OFF	OFF	ON	OFF	Transmit video on Channel 4.

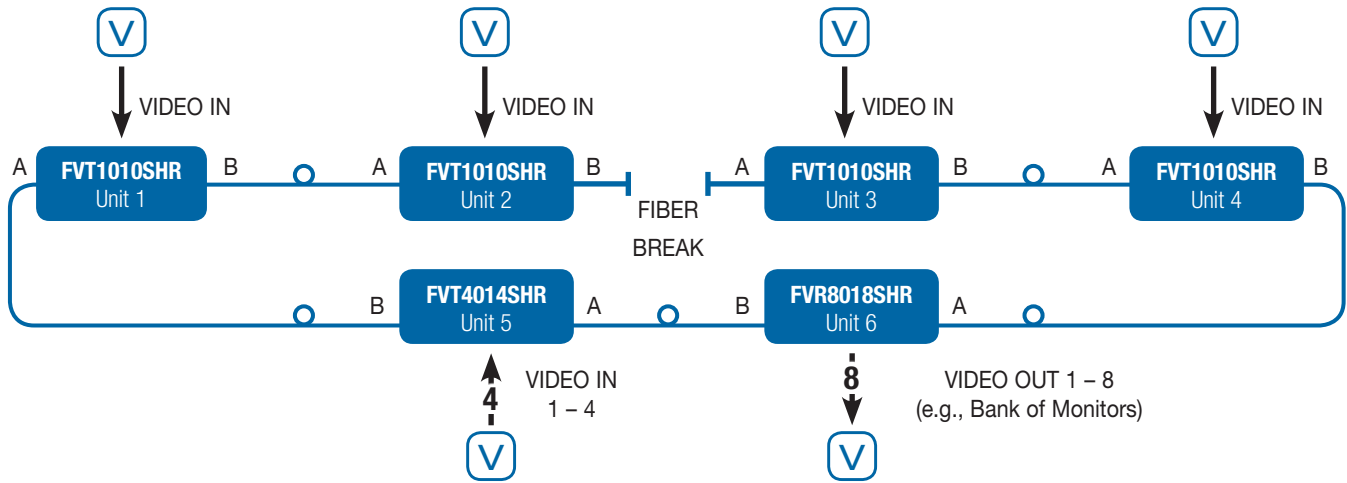
Unit	SHR Switch		Notes
	1	2	
5	OFF	OFF	Transmit video on Channels 5 – 8
6	NA*	OFF	Receive video from Channels 1 – 8

Switch 1 on the FVR8018SHR unit is not used currently and is reserved for a future release.



FIGURE 11 – EXAMPLE SYSTEM IN SELF-HEALING RING (CONT'D)

C Let's consider how the system would respond to a broken fiber between Units 2 and 3:



D Because the system is connected as a self-healing ring, all eight channels of video will still be displayed even after the fiber break. All of the units in the system will indicate the location of the fault using their OPTIC LEDs as described in the table below.

Unit	Optic A LED	Optic B LED
1	Green, then blink Red 4 times	Green, then blink Red 1 time
2	Green, then blink Red 5 times	Solid Red
3	Solid Red	Green, then blink Red 5 times
4	Green, then Blink Red 1 time	Green, then blink Red 4 times
5	Green, then blink Red 3 times	Green, then blink Red 2 times
6	Green, then blink Red 2 times	Green, then blink Red 3 times

# MECHANICAL INSTALLATION INSTRUCTIONS

## INSTALLATION CONSIDERATIONS

This fiber-optic link is supplied as a Standalone/Rack module. Units should be installed in dry locations protected from extremes of temperature and humidity.

## C1-US, C1-EU, C1-AU OR C1-CH CARD CAGE RACKS

**CAUTION:** Although the units are hot-swappable and may be installed without turning power off to the rack, ComNet recommends that the power supply be turned off and that the rack power supply is disconnected from any power source. **Note:** Remove electrical connector before installing in card cage rack.

1. Make sure that the card is oriented right side up, and slide it into the card guides in the rack until the edge connector at the back of the card seats in the corresponding slot in the rack's connector panel. Seating may require thumb pressure on the top and bottom of the card's front panel.

**CAUTION:** Take care not to press on any of the LEDs.

2. Tighten the two thumb screws on the card until the front panel of the card is seated against the front of the rack.

**WARNING:** Unit is to be used with a Listed Class 2 or LPS power supply rated 9-12 VDC @ 1A.

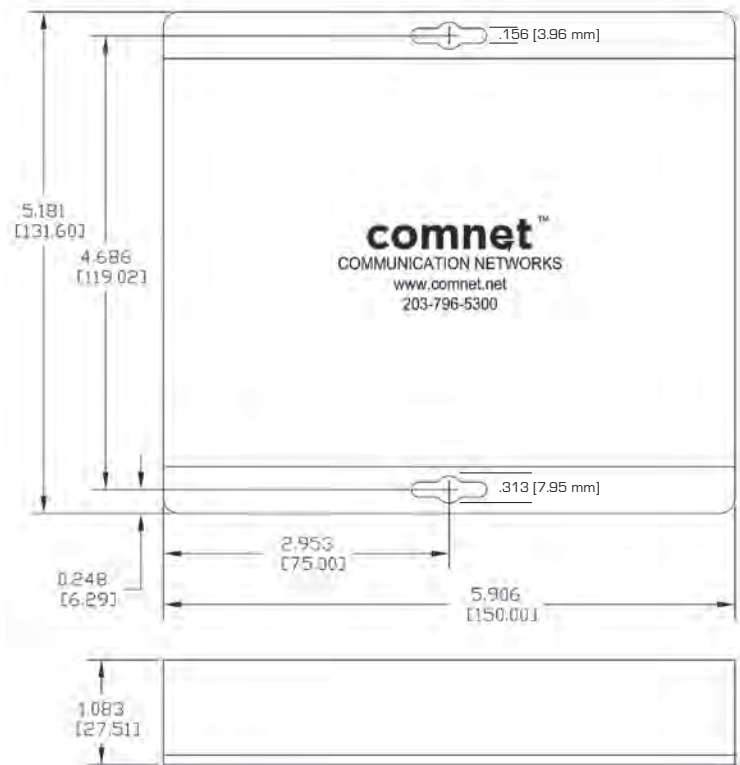
## IMPORTANT SAFEGUARDS:

**A) Elevated Operating Ambient** - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (T<sub>ma</sub>) specified by the manufacturer.

**B) Reduced Air Flow** - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.

**FIGURE A**

Dimensions are for a standard ComNet™ one slot module



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