User Guide

Clear-Com

FIM-S222 User Guide

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Clear-Com
AN HME COMPANY

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1 Document Reference

Clear-Com FIM-S222 User Guide

Part Number: 399G132sRevision: A

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1.1 Important Safety Instructions

- Read these instructions.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Do **not** use this apparatus near water.
- Clean only with dry cloth.
- Do **not** block any ventilation openings. Install in accordance with the manufacturer's instructions.
- Do **not** install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Do **not** defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer.
- Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-cord supply or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
- **Warning:** To reduce the risk of fire or electric shock, do not expose this product to rain or moisture.

1.2 Safety symbols

Familiarize yourself with the safety symbols in **Figure 1: Safety symbols**. These symbols are displayed on the apparatus and warn you of the potential danger of electric shock if the system is used improperly.

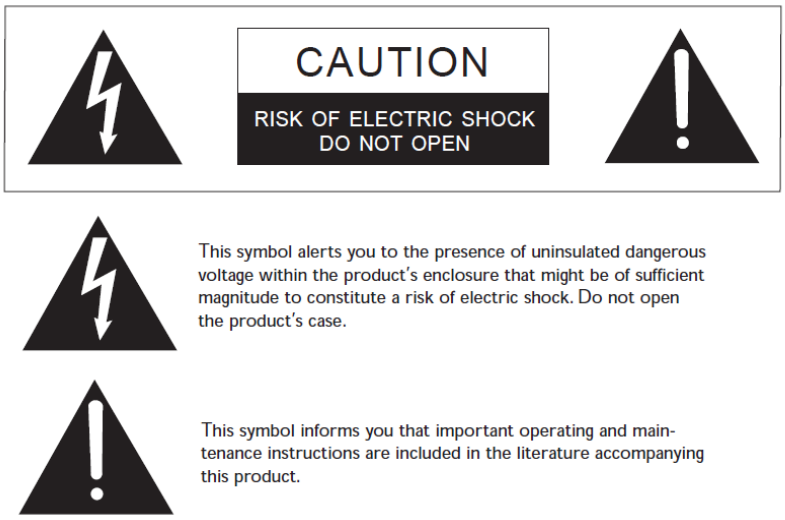
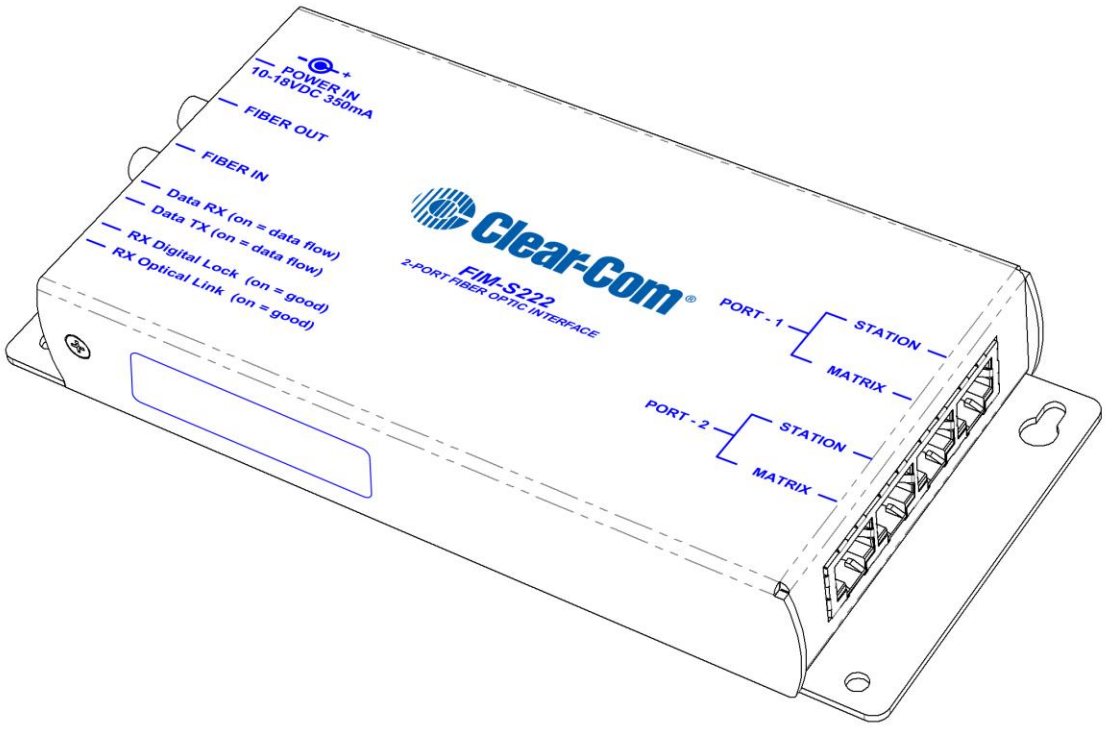


Figure 1-1: Safety symbols

Note: Important. For compliance notices, see 8 Compliance.

2 Introduction

The Clear-Com FIM-S222 is a free-standing, bi-directional interface, converting analog audio and digital data associated with an intercom channel to-and-from an optical format for transmission over fiber. A pair of FIM-S222s is required for each fiber link, one at the matrix-frame end of the link, and the other at the matrix-panel end.



With a Clear-Com FIM-S222 System, you can connect intercom panels or interfaces to a central matrix using fiber-optic cables at distances of up to 12 miles (20 km).

Connecting the pair of interfaces with fiber rather than with the standard 4-wire twisted copper gives you advantages such as increased security from electromagnetic and RF interference, flexibility in equipment placement, ease of maintenance, and often, reduced cost.

The FIM-S222 is a two-fiber system, with uni-directional send and receive fibers connecting the two units in a system.

The FIM-S222 is also available in the form of a card that plugs into a Grass Valley Densité-series frame. This version is designated FIM-1222, and is described in Chapter 7 of this manual, beginning on page

3 Installing the FIM-S222

3.1 Unpacking

When you receive your Clear-Com FIM-S222 System, check to make sure you have received all components of the system. The following items make up a Clear-Com FIM-S222:

- FIM-S222 multiplexer/demultiplexer unit
- External power supply
- You will require two FIM-S222 sets to complete a circuit.

Inspect the units for mechanical damage. Inspect all electrical connectors for bent or damaged pins and latches. Report any damage to the carrier and to Clear-Com. Leave the protective plastic caps on the optical connectors until it is time to attach the fiber cables to the units.

3.2 FIM-S222 System Configuration

In a two-fiber system, identical and interchangeable FIM-S222 units are used at each end of the fibers.

This unit transmits and receives at 1310 nm through the installed SFP transceiver. It connects to the optical fibers through two ST connectors.

The units are connected by the two fibers so that the optical output of each box is connected to the optical input of the other.

3.3 Selecting and Installing the Fiber-Optic Cable

The person installing the FIM-S222 units is responsible for providing the fiber optic cable runs. The FIM-S222 will operate with either Single-Mode or Multi-Mode Fiber Optic Cable. You will experience the best distance performance when using Single-Mode cable as shown in the following table:

FIBER CORE DIAMETER	MAXIMUM FIBER LENGTH
50 microns (multimode)	3 miles (5 km)
62.5 microns (multimode)	2 miles (3 km)
8 microns (single mode)	12 miles (20 km)

Always follow the connector manufacturer's directions when fastening a connector to the cable.

Mark or tag the optical fibers when they are pulled, carefully avoiding the fiber tip, so that their identity is known at both ends. If there is confusion about the identity of the two fibers, shine a flashlight at one end of the fiber and look for light at the other end.

Do not use the FIM-S222 optical output to identify cables. Never look directly into the end of the optical fiber while either end of the system is operating. Even if you do not see visible light, eye damage is possible.

Inspect the fiber ends and clean them with clean, dry compressed air or with Kim-Wipes that have been saturated with isopropyl alcohol. Fingerprints or other dirt on the optical connector end surfaces will reduce the received optical signal level.

3.4 Connecting Fiber-Optic Cable to the FIM-S222

Refer to Figure 3-1 before connecting the optical fiber to the ST optical connectors on the FIM-S222 unit's left side panel.

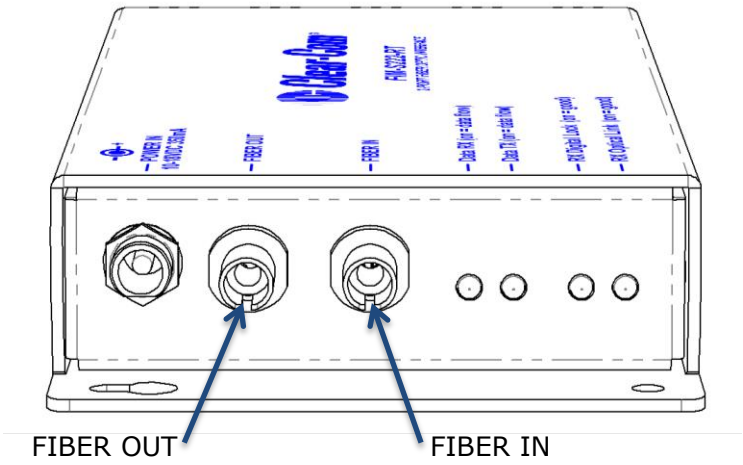


Figure 3-1 ST Optical Connections on the FIM-S222 Left Side Panel

The FIM-S222 is compatible with industry standard ST-type connectors. You may use installed backbone cables or dedicated cables with it.

Connect the two fiber cables so that:

- transmitter ST **"Fiber Out**" at the near end connects to receiver ST **"Fiber In**" at the far end,
- transmitter ST **"Fiber Out**" at the far end connects to receiver ST **"Fiber In**" at the near end.

Figure 3-3 illustrates the entire wiring scheme for the FIM-S222 system.

3.5 Connecting Audio/Data Cables to the FIM-S222

RJ-45 connectors on the FIM-S222 unit's right side panel connect the unit to audio and data inputs and outputs, as shown in Figure 3-2.

Two ports are provided, labeled PORT-1 and PORT-2.

The data passing through these two ports is bi-directional. Incoming data from the two ports is multiplexed onto a single fiber for transmission through the FIBER OUT optical connector. Data arriving on the FIBER IN optical connector is demultiplexed and passed to the appropriate port for output.

Each port has two RJ-45 connectors associated with it:

- MATRIX – connect to the main matrix frame
- STATION – connect to the remote panel or station.

The basic system overview is: the signals passing through MATRIX at one end of the system are the same as those passing through STATION at the other end of the system.

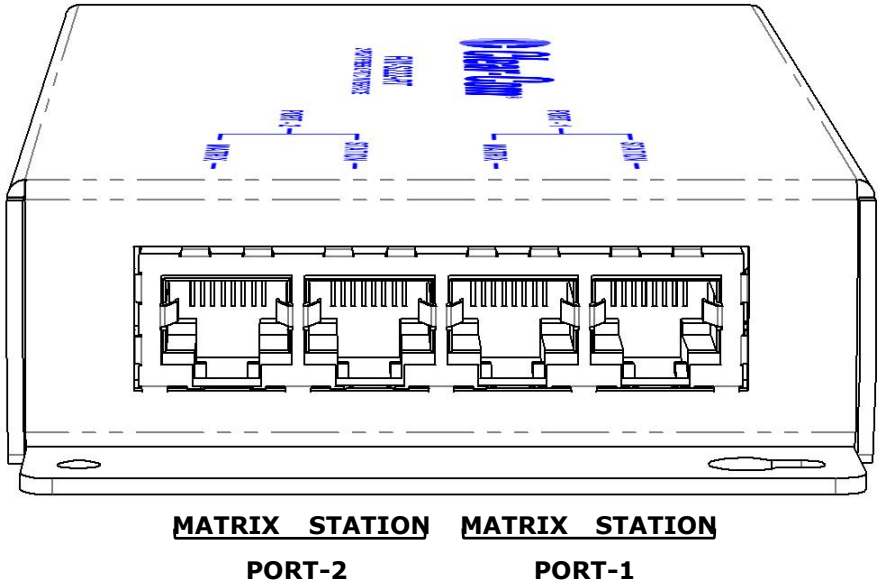


Figure 3-2 RJ-45 Connections on the FIM-S222 Right Side Panel

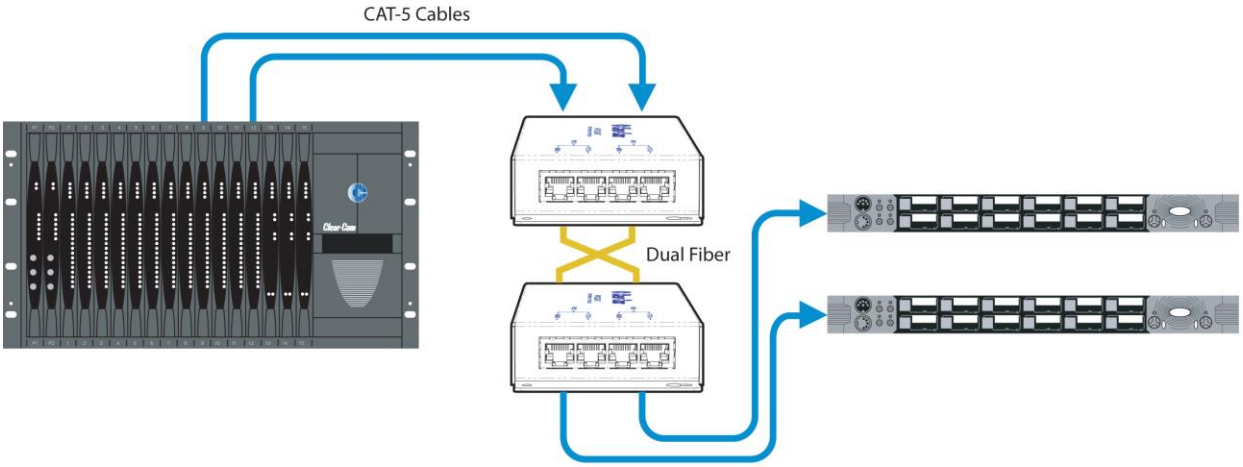
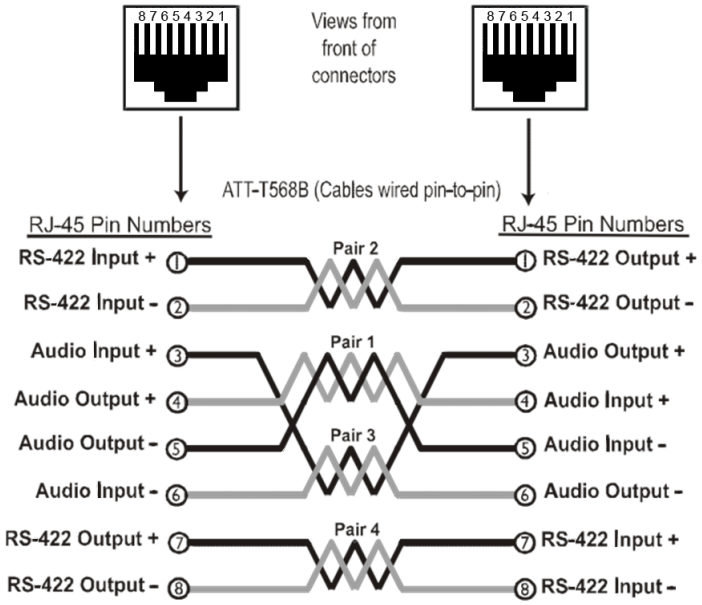


Figure 3-3 Wiring an FIM-S222 to Intercom Panels or Interfaces

Figure 3-4 illustrates the CAT-5 and above cable pinout configuration. The maximum length for CAT-5 cables is 10,000 feet (3 km).

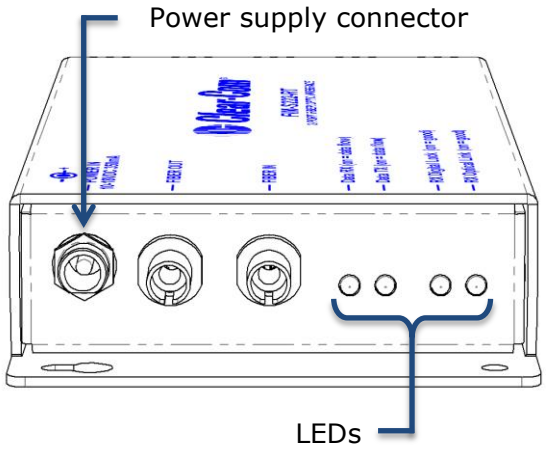


Pair 1 Audio output
Pair 2 RS-422 data input
Pair 3 Audio input
Pair 4 RS-422 data output

Figure 3-4 CAT-5 Cable Pinout Diagram

3.6 Powering the FIM-S222

Power the FIM-S222 by plugging the supplied external power adapter into the mains power source, and then plugging the adapter output into the power supply connector on the left side panel.



When power is first applied, you will notice that the LEDs on the left side panel flash for a few moments at random. When the power within the unit has stabilized, the left-most LED will illuminate at full intensity for a moment. The unit is then ready for operation.

3.7 Compatibility with FIM-102D interfaces

The FIM-102D and FIM-S222 interfaces are not fully compatible. Using FIM-S222 and FIM-102D units together to create a link will result in an audio level offset of 5dB.

4 Using the FIM-S222

4.1 FIM-S222 Left Side Panel Connectors and Indicators

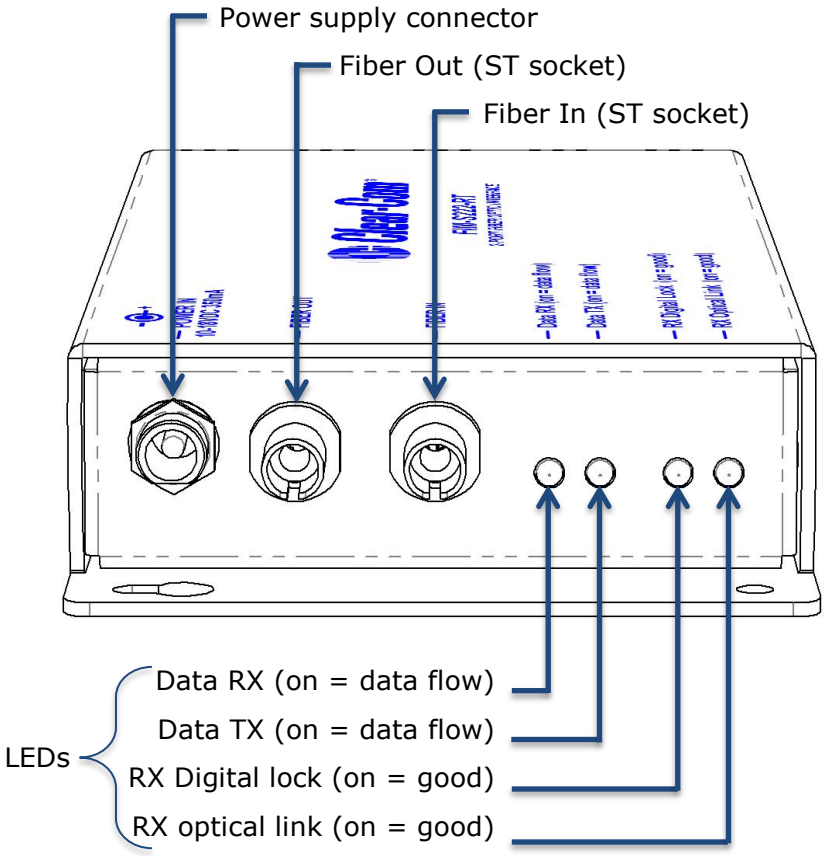


Figure 4-1 Left Side Panel of the FIM-S222

Fiber Out	Fiber Optic ST-type socket for connection of transmit Fiber Optic Cable to other FIM-S222 unit.
Fiber In	Fiber Optic ST-type socket for connection of receive Fiber Optic Cable from other FIM-S222 unit.
RX Optical Link	ON (green) indicates presence of sufficient optical signal from the other FIM-S222 unit for communication.
RX Digital Lock	ON (green) indicates presence of digital clock signal from the other FIM-S222 unit.
DATA TX	Flashing green indicates transmit data is flowing.
DATA RX	Flashing green indicates receive data is flowing

4.2 FIM-S222 Right Side Panel Connectors

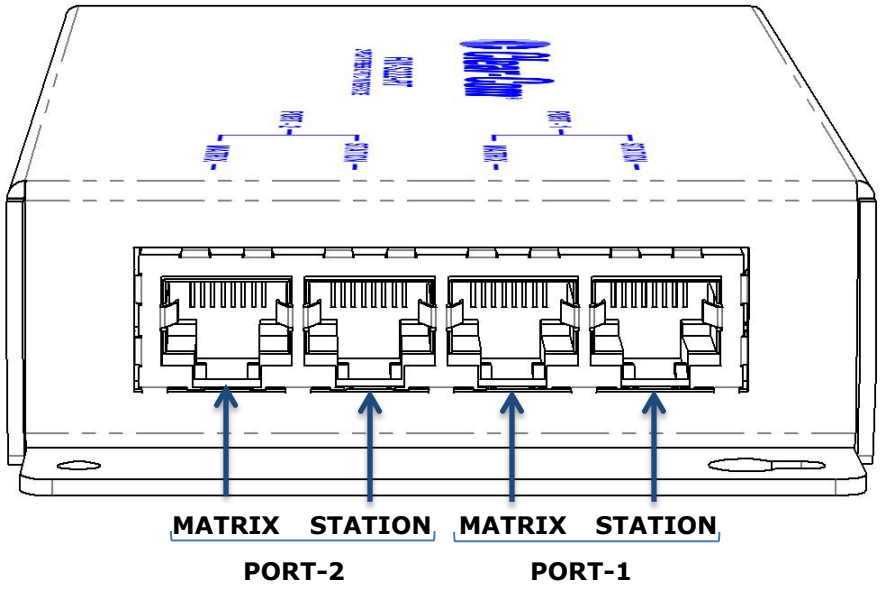


Figure 4-2 Right Side Panel of the FIM-S222

Port #2 Matrix Connect RJ-45 cable from here to Matrix port.

Port #2 Station Connect RJ-45 cable from here to Panel or Interface.

Port #1 Matrix Connect RJ-45 cable from here to Matrix port.

Port #1 Station Connect RJ-45 cable from here to Panel or Interface.

4.3 Applications

4.3.1 Connecting Intercom Panels to the Central Matrix

The Clear-Com FIM-S222 system transmits audio and data signals from 1 or 2 intercom panels or interfaces to the matrix frame through the process illustrated in Figure 4-3. The text below gives a step-by-step description of the signal processing that occurs as an intercom signal passes through the system. Signals flow in both directions simultaneously, as the system always transmits in full-duplex mode.

1. Matrix Plus 3 and Eclipse intercom panels transmit analog audio signals and digital data signals to the first FIM-S222 unit via copper cable terminated with RJ-45 connectors.
2. The first FIM-S222 unit converts the analog audio signals to digital audio signals through an analog-to-digital converter (ADC) located on the FIM-S222 unit's main circuit board.

3. The first FIM-S222 unit then multiplexes (combines) the digital audio signals with the already-digital data signals

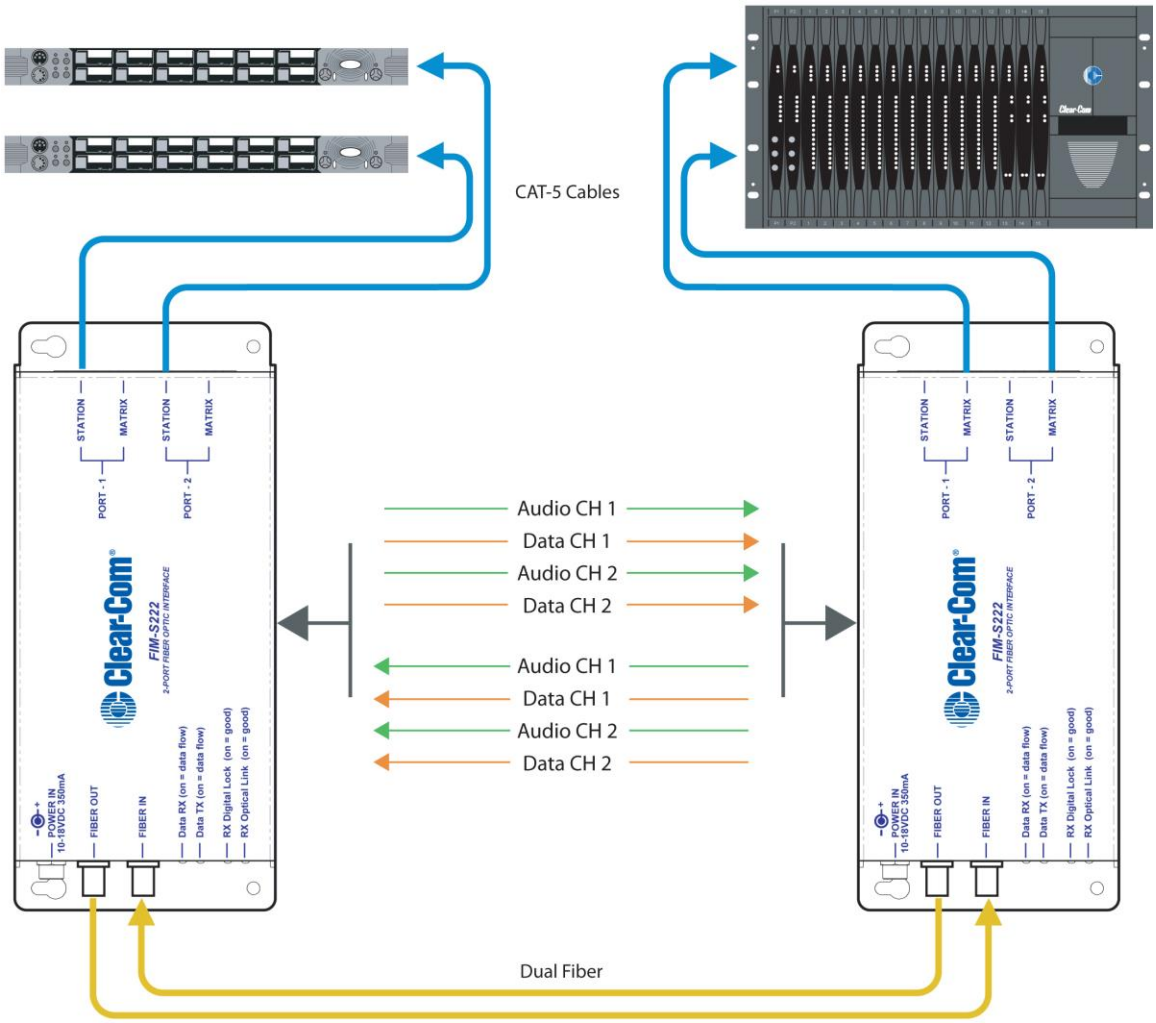


Figure 4-3 Connecting Intercom Panels to the Central Matrix

4. The first FIM-S222 then converts the multiplexed digital signal into an optical signal.
5. The first FIM-S222 then transmits the optical signal over up to 3 miles (5 km) of fiber-optical cable to the second FIM-S222 unit, where a similar but reverse process occurs to convert the signal back to its original format.
6. The second FIM-S222 unit converts the received optical signal to a digital signal.
7. The second FIM-S222 then de-multiplexes (separates) the digital signal back into its separate audio and data signals for each intercom unit.
8. The second FIM-S222 then converts the digital audio signals for each intercom panel to analog audio signals by sending the signals through a digital-to-analog converter (DAC) located on the FIM-S222 unit's main circuit board.

9. The second FIM-S222 unit then transmits the analog audio and digital data signals for each intercom panel to the central matrix over copper cable terminated with RJ-45 connectors.
10. The central matrix receives the intercom panels' audio and data signals in the same format in which they were originally sent by the Matrix Plus 3 or Eclipse intercom panels

CIRCUIT	DESCRIPTION
Analog-to-Digital (A/D) Converters	High speed analog-to-digital converters for each audio channel.
Multiplexer	Sequentially presents two RS-422 digital inputs and two digitized audio signals from the A/D converters to the optical output driver.
Demultiplexer	Takes sequential digital signals from the *pin* diode and separates them into 4 separate lines: two to the D/A converters and two to the RS-422 transmitters.
Digital-to-Analog (D/A) Converters	High speed digital-to-analog converters for each audio channel convert the digitized audio signal back to analog audio.

4.3.2 Connecting Interface Modules to the Central Matrix

With a pair of FIM-S222 units you can also remotely connect Clear-Com rack-mounted Matrix interface modules to the central matrix. For example, using a Clear-Com CCI-22 dual party-line interface at one end, you can connect two independent, external 2-wire party line systems to the central matrix from a distance of up to 3 miles (5 km). Or, with a Clear-Com TEL-14 Telephone Interface Module, you can send telephone audio to the central matrix over a secured, interference-free fiber-optic line. By using a Clear-Com FOR-22 4-wire interface module, you can send 4-wire audio plus transmit keying over a fiber-optic line. You can also use a Clear-Com EF-701M to interface 2-wire Clear-Com or RTS party lines to the central matrix over a fiber-optic link.

Figure 4-4 shows a system with connected interface modules.

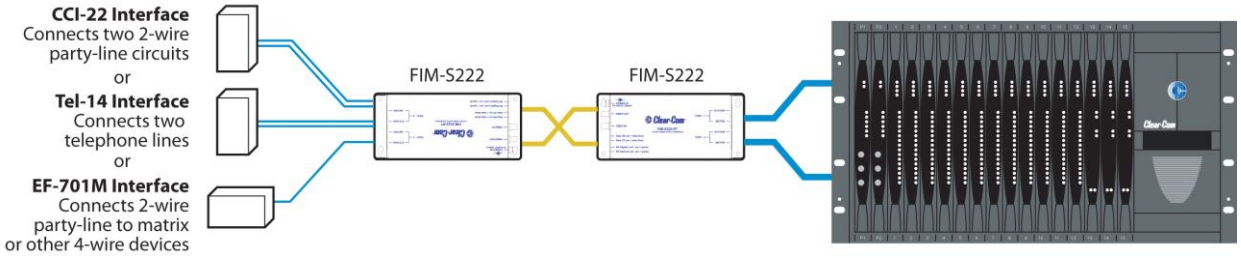


Figure 4-4 Connecting Interface Modules to the Central Matrix

4.3.3 Using the FIM-S222 with the EF-701M as a Stand-Alone Party Line Extender

Using a Clear-Com EF-701M at each end of an FIM-S222 set, you can extend Clear-Com or RTS 2-wire party line intercoms over a fiber-optic link independent of a matrix intercom system.

Figure 4-5 EF-701M and FIM-S222 as Party-Line Extender

5 Maintaining the FIM-S222

5.1 Troubleshooting Tips

Listed below are some of the more common problems that you may experience, their possible causes and suggested solutions.

SYMPTOM	POSSIBLE CAUSE	ACTION
No operation, indicators all off.	No power.	Make sure the external power supplies are plugged into a suitable power outlet and to the power receptacle on the FIM-S222
No operation, RX Optical Link and RX Digital Lock LEDs are lit.	Optical communications failure.	Check for broken or disconnected fibers. Check to see if the FIM-S222 at the other end is operating correctly.
FIM-S222 units are operating correctly, but connected panels or interfaces are not.		Check RJ-45 cables or Matrix configuration.

If you are unable to resolve a problem with your FIM-S222 unit, contact the Clear-Com Technical Support center nearest you.

5.2 Preventive Maintenance

Every two years, verify the adequacy of optical power at the far end of each optical fiber with an optical power meter.

6 FIM-1222 for Grass Valley Densité Frames

The functionality of the FIM-S222 is now available in the form of a card that plugs into a Grass Valley Densité-series frame.

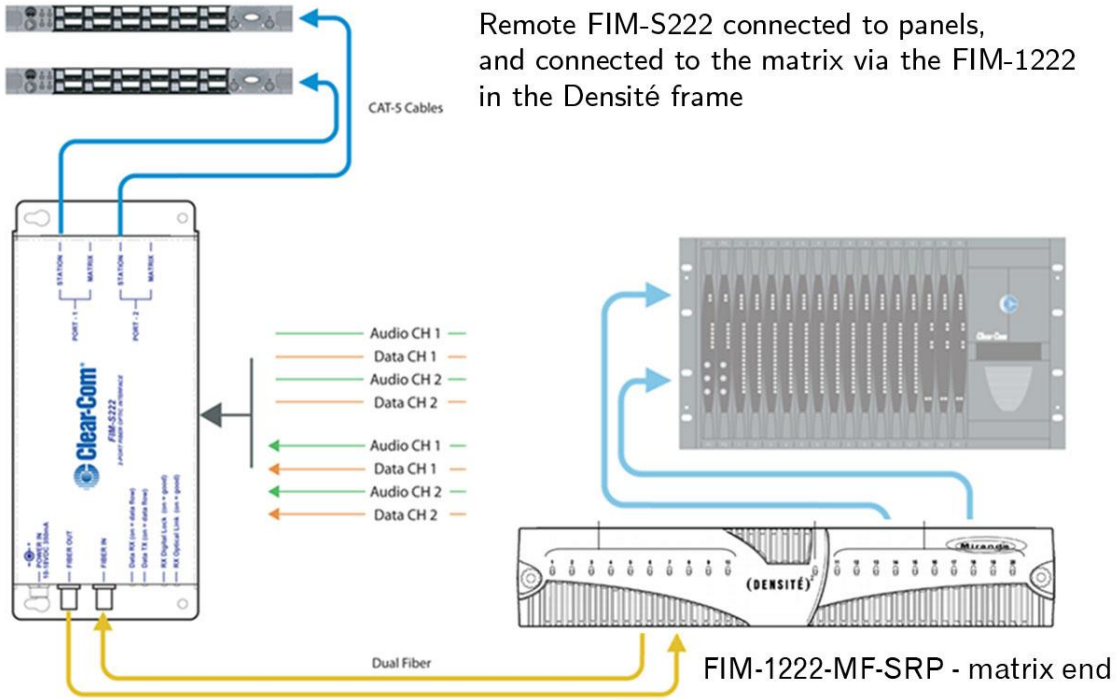
The FIM-1222 card occupies a single slot in the frame. It is sized for the 2RU Densité-2 frame, but optional extenders allow it to fit into 3RU Densité frames as well.

All input and output connectors are mounted on a rear panel that installs in the frame. The card is monitored by the frame's on-board controller, and information about the status of the card is available through the frame's local control panel, or remotely through the Grass Valley iControl system.

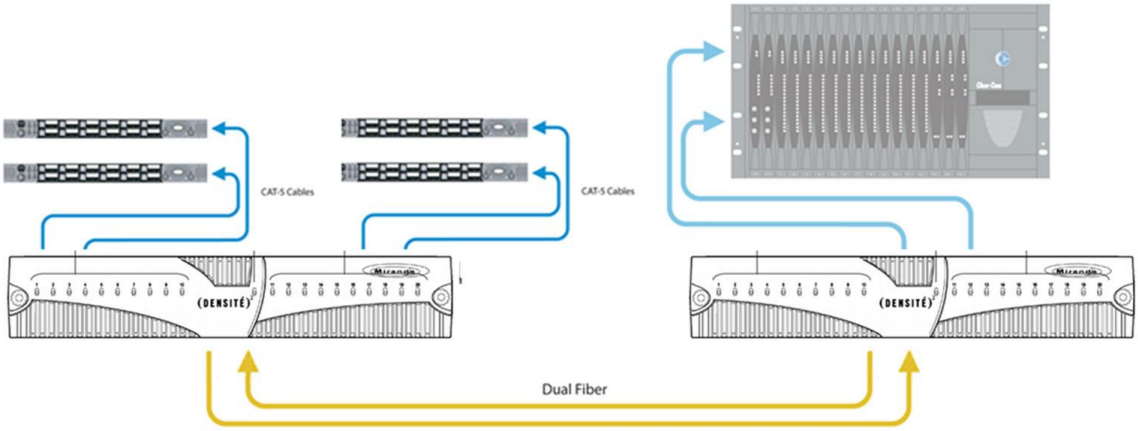
6.1 Application Examples

The FIM-1222 is completely cross-compatible with the FIM-S222, and can be deployed where the frame-mount configuration is the most efficient solution.

In this example, a remote FIM-S222 interconnects via fiber to an FIM-1222 card in a Densité frame at the matrix end. The FIM-1222 connects to the matrix via CAT-5 cables.



An alternative application uses FIM-1222 cards in Densité frames at both station and matrix ends of the system.



FIM-1222-RP-SRP – station end

FIM-1222-MF-SRP – matrix end

6.2 Rear panels and connectors

Two rear panels are available for the FIM-1222:

- FIM-1222-RP-SRP – station end
- FIM-1222-MF-SRP – matrix end

Each has two fiber connectors (Rx and Tx) and two cable connectors, as appropriate (STATION1 and STATION 2) or (MATRIX 1 and MATRIX 2).

The functionality of these connectors matches exactly the functionality of the connectors on the FIM-S222, as described elsewhere in this manual.

Note that, while the FIM-S222 has both MATRIX and STATION ports on board, and can therefore be used at either end of the system, the FIM-1222 rear panel is specific to one end of the system, and a different rear panel is required at each end. Identical FIM-1222 cards are used at both ends of the system.

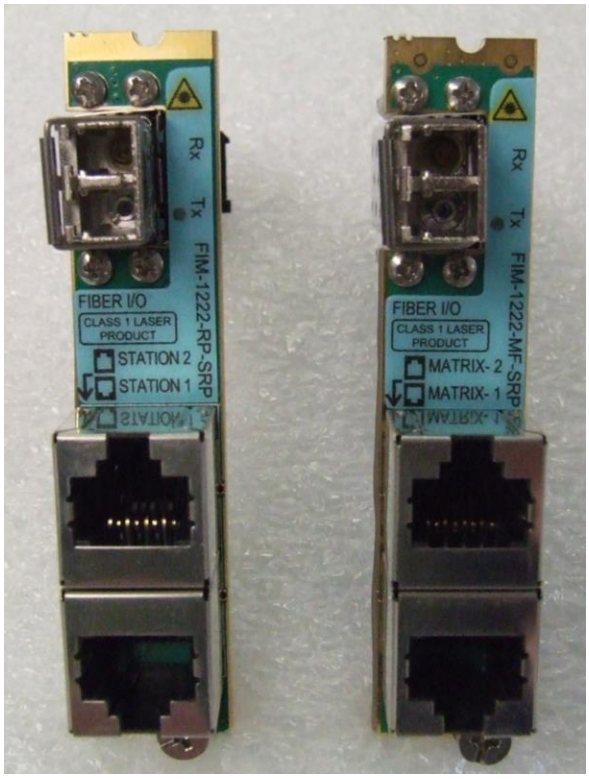


Figure 6-1 – FIM-1222 Rear Panels

6.2.1 Connector Pinouts

The rear panel connectors have the following pinouts:

FIM-1222-RP-SRP STATION 1 & STATION 2	Pin #	FIM-1222-MF-SRP MATRIX 1 & MATRIX 2
RS-422 input +	1	RS-422 output +
RS-422 input –	2	RS-422 output –
Audio input +	3	Audio output +
Audio output +	4	Audio input +
Audio output –	5	Audio input –
Audio input –	6	Audio output –
RS-422 output +	7	RS-422 input +
RS-422 output –	8	RS-422 input –
GND	9	GND
GND_1	10	GND_1

6.3 Local User Interface

6.3.1 Front Card-edge Interface

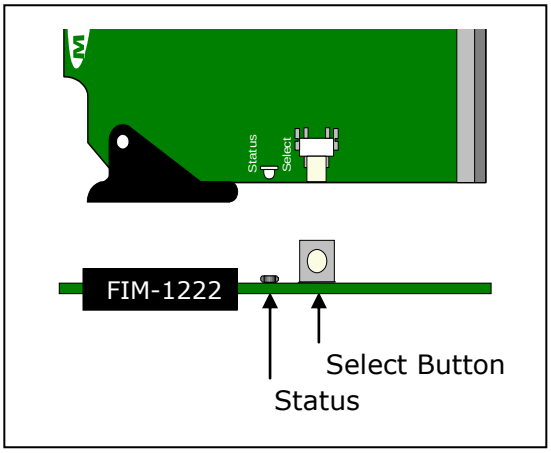
The front card-edge of the FIM-1222 incorporates two elements:

- Status LED

  Reports the operating status of the card

- Select Button

  Push this button to access the on-board menu for detailed status monitoring, using the on-board menu that can be accessed through the control panel mounted on the frame's controller card.



6.3.2 Local Control Panel Operation

Push the SELECT button on the FIM-1222 card edge (see section 6.3.1) to assign the local control panel to operate the FIM-1222. Use the control panel buttons to navigate through the menu, as described below.

The local control panel is fastened to the front of the frame's controller card, and is located in the front center of the frame, positioned in front of the power supplies. The panel consists of a display unit capable of displaying two lines of text, each 16 characters in length, and five pushbuttons.

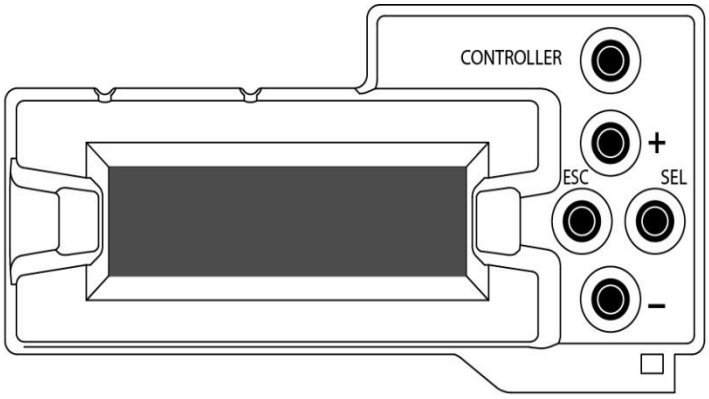


Figure 6.2 Densité Frame local control panel

The panel is assigned to operate any card in the frame by pushing the SELECT button on the front edge of that card.

- Pushing the CONTROLLER button on the control panel selects the Controller card itself.
- The STATUS LED on the selected card flashes yellow.

The local control panel displays a menu that can be navigated using the four pushbuttons located beside the display. The functionality of the pushbuttons is as follows:

[+] [–] Used for menu navigation and value modification

[SELECT] Gives access to the next menu level. When a parameter value is shown, pushing this button once enables modification of the value using the [+] and [–] buttons; a second push confirms the new value

[ESC] Cancels the effect of parameter value changes that have not been confirmed; pushing [ESC] causes the parameter to revert to its former value.

Pushing [ESC] moves the user back up to the previous menu level. At the main menu, [ESC] does *not* exit the menu system. To exit, re-push the [SELECT] button for the card being controlled.

If no controls are operated for 30 seconds, the controller reverts to its normal standby status, and the selected card's STATUS LED reverts to its normal operating mode.

6.3.3 Menu for local status monitoring

The FIM-1222 reports its operational status to the frame's on-board controller.

- Press the SELECT button on the FIM-1222 front card edge to assign the frame's local control panel to the FIM-1222
- Use the keys on the local control panel to step through the displayed menu to monitor the status of the FIM-1222.
- There are no adjustments or configuration options available through this menu

The complete menu structure is shown in this table.

Menu for FIM-1222 SLOT XX			
Level 1	**Level 2**	**Display**	**Notes**
STATUS	REAR TYPE	[name]	
	PORT TYPE	[MATRIX, STATION]	
	SFP TYPE	[name]	
	SIGNAL STATUS	[SIGNAL OK]	
	SFP VENDOR	[mfr name]	
	SFP PART #	[part no.]	
	SFP TEMPERATURE	[value]	
	SFP RX POWER	[value]	
	SFP TX POWER	[value]	
	SFP DATE CODE	[date]	
SFP	SIGNAL	[status]	
	TEMP	[value]	
	Rx PWR	[value]	
	Tx PWR	[value]	
DATA ACT	DATA Tx	[ON, OFF]	
	DATA Rx	[ON, OFF]	
VERSION	CPU	[Frame software version]	
	PCB	[FIM software version]	

Note that the information available through the menu may also be accessed remotely, if the frame is connected to a Grass Valley iControl system.

7 Specifications

Audio

Transmission Method	Digital, TDM, 24-bit, 48k samples/sec
Input Impedance	600 Ohms balanced
Output Impedance	30 Ohms balanced
Maximum Input Level (600 Ohms)	+18 dBm (peak)
Maximum Output Level (from 30 Ohms balanced)	+18 dBm into 600 Ohms
Frequency Response (@0 dBm from 50 Hz to 15 kHz)	±0.2 dB
Total Harmonic Distortion + Noise (from 20 Hz to 20 kHz @ +8 dBm)	<0.2%
(at 1 kHz @ +18 dBm)	<0.007%
CMRR (Common Mode Rejection Ratio)	~55 dB @ 1kHz
Signal to Noise Ratio (unweighted, 20 Hz - 20 kHz, ref. to +18 dBm clip level)	>80 dB
Aggregate Digital Data Rate	147.456 MB

Mechanical/Electrical/Environmental

Connectors	RJ-45; coaxial
Optical Connectors	ST-type
Power Connector	2.5mm Circular
Input Voltage Range	9-18 Vdc
Power Consumption (@13.8V per end, all channels at full level)	<5 watts
Temperature Range	-40 ° to 65 ° C
Humidity Range	0 to 95% non-condensing
A/C Adapters	Supplied

Electro-Optical System Margin Data

Operating Wavelength	1300 nm
TX output into cable	-8 to -15 dBm
RX sensitivity	≤31 dBm
OP Margin Single Mode	~19 dBm
OP Margin Multi Mode	~12 dBm

Matrix Data Communications (Frame-to-Panel Digital Data)

Transmission Rate (RS-422, Balanced TTL Levels)	0 to 150 kBits/sec
Jitter	1.12 msec*

*Higher rates possible dependent upon user system jitter tolerance.

Power Requirements

Voltage	9-18 VDC

WARNING: Absolute maximum voltage is 18 VDC. Equipment damage may occur at higher voltages.

NOTICE ABOUT SPECIFICATIONS
While Clear-Com makes every attempt to maintain the accuracy of the information contained in its product manuals, the information is subject to change without notice. Performance specifications included in this manual are design-center specifications and are included for customer guidance and to facilitate system installation. Actual operating performance may vary.

8 Compliance

FCC notice

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communication. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by Clear-Com, LLC, an HM Electronics, Inc. company could void the user's authority to operate this equipment.

Industry Canada Compliance Statement

This Class [A] digital device complies with Canadian ICES-003.
Avis de conformité à la réglementation d'Industrie Canada
Cet appareil numérique de la class[*] est conforme à la norme NMB-003 du Canada.

Warning:
This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. The FIM-222S complies with the following specifications:

UL 60065-7
CAN/CSA-C22.2 No.60065-3
IEC 60065-7

Waste Electrical And Electronic Equipment (WEEE)

The European Union (EU) WEEE Directive (2002/96/EC) places an obligation on producers (manufacturers, distributors and/or retailers) to take-back electronic products at the end of their useful life. The WEEE Directive covers most Clear-Com products being sold into the EU as of August 13, 2005. Manufacturers, distributors and retailers are obliged to finance the costs of recovery from municipal collection points, reuse, and recycling of specified percentages per the WEEE requirements.

Instructions for Disposal of WEEE by Users in the European Union

The symbol shown below is on the product or on its packaging which indicates that this product was put on the market after August 13, 2005 and must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of the user's waste equipment by handing it over to a designated collection point for the recycling of WEEE. The separate collection and recycling of waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local authority, your household waste disposal service or the seller from whom you purchased the product.

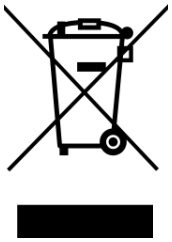


Figure 8-1: WEEE Symbol