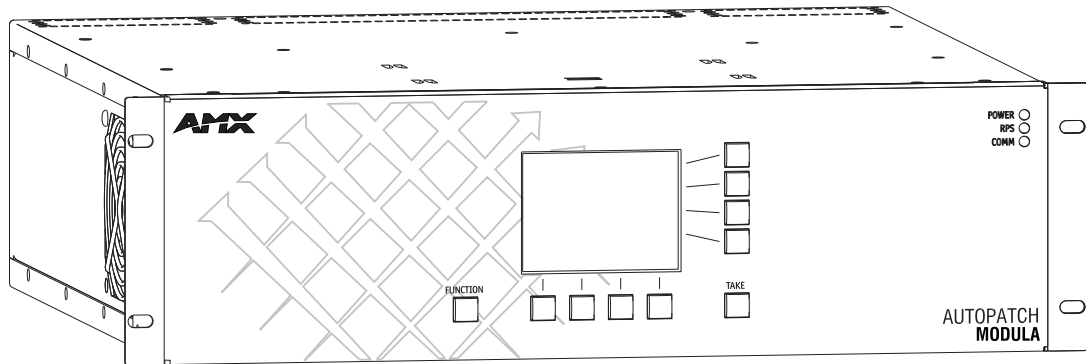




Instruction Manual

# Modula

Distribution Matrix



# AMX Limited Warranty and Disclaimer

This Limited Warranty and Disclaimer extends only to products purchased directly from AMX or an AMX Authorized Partner which include AMX Dealers, Distributors, VIP's or other AMX authorized entity.

AMX warrants its products to be free of defects in material and workmanship under normal use for three (3) years from the date of purchase, with the following exceptions:

- LCD Panels are warranted for three (3) years, except for the display and touch overlay components are warranted for a period of one (1) year.
- Disk drive mechanisms, pan/tilt heads, power supplies are warranted for a period of one (1) year.
- AMX lighting products are guaranteed to switch on and off any load that is properly connected to our lighting products, as long as the AMX lighting products are under warranty. AMX also guarantees the control of dimmable loads that are properly connected to our lighting products. The dimming performance or quality there of is not guaranteed, due to the random combinations of dimmers, lamps and ballasts or transformers.
- AMX software is warranted for a period of ninety (90) days.
- Batteries and incandescent lamps are not covered under the warranty.
- AMX AutoPatch Epica, Modula, Modula Series 4, Modula Cat Pro Series and 8Y-3000 product models will be free of defects in materials and manufacture at the time of sale and will remain in good working order for a period of three (3) years following the date of the original sales invoice from AMX. The three-year warranty period will automatically be extended to the life of the product (Limited Lifetime Warranty). The life of the product extends until five (5) years after AMX ceases manufacturing the product model. The Limited Lifetime Warranty applies to products in their original installation only. If a product is moved to a different installation, the Limited Lifetime Warranty will no longer apply, and the product warranty will instead be the three (3) year Limited Warranty.

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**Note:** *The complete Warranty is at [www.amx.com](http://www.amx.com).*

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# ESD Warning



To avoid ESD (Electrostatic Discharge) damage to sensitive components, make sure you are properly grounded before touching any internal materials.

When working with any equipment manufactured with electronic devices, proper ESD grounding procedures must be followed to ensure people, products, and tools are as free of static charges as possible. Grounding straps, conductive smocks, and conductive work mats are specifically designed for this purpose.

Anyone performing field maintenance on AMX equipment should use an appropriate ESD field service kit complete with at least a dissipative work mat with a ground cord and a UL listed adjustable wrist strap with another ground cord. These items should not be manufactured locally, since they are generally composed of highly resistive conductive materials to safely drain static charges, without increasing an electrocution risk in the event of an accident. ESD protective equipment can be obtained from 3M™, Desco®, Richmond Technology®, Plastic Systems®, and other such vendors.

# Important Safety Information and Instructions

When using and installing your AMX AutoPatch product, adhere to the following basic safety precautions. For more information about operating, installing, or servicing your AMX AutoPatch product, see your product documentation.

- Read and understand all instructions before using and installing AMX AutoPatch products.
- Use the correct voltage range for your AMX AutoPatch product.
- There are no user serviceable parts inside an AMX AutoPatch product; service should only be done by qualified personnel.
- If you see smoke or smell a strange odor coming from your AMX AutoPatch product, turn it off immediately and call technical support.
- For products with multiple power supplies in each unit, make sure all power supplies are turned on simultaneously.
- Use surge protectors and/or AC line conditioners when powering AMX AutoPatch products.
- Only use a fuse(s) with the correct fuse rating in your enclosure.
- Make sure the power outlet is close to the product and easily accessible.
- Make sure the product is on or attached to a stable surface.
- Turn off equipment before linking pieces together, unless otherwise specified in that product's documentation.
- For safety and signal integrity, use a grounded external power source and a grounded power connector.
- Turn off and unplug an enclosure before adding or removing boards, unless otherwise specified in that product's documentation.
- To avoid shock or potential ESD (Electrostatic Discharge) damage to equipment, make sure you are properly grounded before touching components inside an AMX AutoPatch product.



# Information et directives de sécurité importantes

Veillez vous conformer aux directives de sécurité ci-dessous lorsque vous installez et utilisez votre appareil AMX AutoPatch. Pour de plus amples renseignements au sujet de l'installation, du fonctionnement ou de la réparation de votre appareil AMX AutoPatch, veuillez consulter la documentation accompagnant l'appareil.

- Lisez attentivement toutes les directives avant d'installer et d'utiliser les appareils AMX AutoPatch.
- Le voltage doit être approprié à l'appareil AMX AutoPatch.
- Les appareils AMX AutoPatch ne contiennent aucune pièce réparable par l'utilisateur; la réparation ne doit être effectuée que par du personnel qualifié.
- Si de la fumée ou une odeur étrange se dégagent d'un appareil AMX AutoPatch, fermez-le immédiatement et appelez le Service de soutien technique.
- Veillez à ce que tous les blocs d'alimentation des appareils dotés de blocs d'alimentation multiples dans chaque unité soient allumés simultanément.
- Servez-vous de protecteurs de surtension ou de conditionneurs de lignes à courant alternatif lorsque vous mettez les appareils AMX AutoPatch sous tension.
- Placez uniquement des fusibles de calibre exact dans les boîtiers.
- Veillez à ce que la prise de courant soit proche de l'appareil et facile d'accès.
- Veillez à ce que votre appareil AMX AutoPatch soit installé sur une surface stable ou qu'il y soit fermement maintenu.
- Fermez toutes les composantes de l'équipement avant de relier des pièces, à moins d'indication contraire fournie dans la documentation de l'appareil.
- Par mesure de sécurité et pour la qualité des signaux, servez-vous d'une source d'alimentation externe mise à la terre et d'un connect d'alimentation mis à la terre.
- Fermez et débranchez le boîtier avant d'ajouter ou d'enlever des plaquettes, à moins d'indication contraire fournie dans la documentation du appareil.
- Pour éviter les chocs ou les dommages éventuels causés à l'équipement par une décharge électrostatique, veillez à ce le dispositif soit bien relié à la terre avant de toucher les composantes se trouvant à l'intérieur d'un appareil AMX AutoPatch.

# Notices

## Copyright Notice

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No patent liability is assumed with respect to the use of information contained herein.

## Liability Notice

While every precaution has been taken in the preparation of this publication, AMX assumes no responsibility for error or omissions. No liability is assumed for damages resulting from the use of the information contained herein.

Further, this publication and features described herein are subject to change without notice.

## USFCC Notice

The United States Federal Communications Commission (in 47CFR 15.838) has specified that the following notice be brought to the attention of the users of this product.

Federal Communication Commission Radio Frequency Interference Statement:

*“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 communications. Operation of this equipment in a residential area is likely to use harmful interference in which case the user will be require to correct the interference at his own expense.*

*If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the booklet, How to Identify and Resolve Radio-TV Interference Problems, prepared by the Federal Communications Commission to be helpful.”*

This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock N. 004-000-00345-4.

Use shielded cables. To comply with FCC Class A requirement, all external data interface cables and adapters must be shielded.

### Lithium Batteries Notice

Switzerland requires the following notice for products equipped with lithium batteries. This notice is not applicable for all AMX equipment.

Upon shipment of the products to Switzerland, the requirements of the most up-to-date Swiss Ordinance Annex 2.15 of SR 814.81 will be met including provision of the necessary markings, documents, and annual reports relative to the disposal of the batteries to the Swiss Authorities.

### Trademark Notices

AMX<sup>®</sup>, AutoPatch<sup>®</sup>, and NetLinx<sup>®</sup> are trademarks of AMX.

Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

HyperTerminal<sup>®</sup> is a copyright product of Hilgraeve Inc.

3M<sup>®</sup>, Desco<sup>®</sup>, Richmond Technology<sup>®</sup>, and Plastic Systems<sup>®</sup> are registered trademarks.

Neuron<sup>®</sup> and LonTalk<sup>®</sup> are registered trademarks of Echelon.

TosLink<sup>®</sup> is a registered trademark of the Toshiba Corporation.

Ethernet<sup>®</sup> is a registered trademark of the Xerox Corporation.

ENERGY STAR<sup>®</sup> is a registered trademark of the U.S. Environmental Agency and the U.S. Department of Energy.

Other products mentioned herein may be the trademarks of their respective owners.

### Warnings and Cautions

This manual uses the following conventions and icons to draw attention to actions or conditions that could potentially cause problems with equipment or lead to personal risk.



**ESD Warning:** *The icon to the left indicates text regarding potential danger associated with the discharge of static electricity from an outside source (such as human hands) into an integrated circuit, often resulting in damage to the circuit.*



**Warning:** *The icon to the left indicates text that warns readers against actions or conditions that could cause potential injury to themselves.*



**Caution:** *The icon to the left indicates text that cautions readers against actions that could cause potential injury to the product or the possibility of serious inconvenience.*



# Overview and General Specifications

## Product Notes

The Modula Distribution Matrix is AMX's most flexible matrix switchers, available as a standalone system or capable of being linked as part of a larger system including any other AMX AutoPatch products that are XNNet compatible.

Each Modula enclosure can hold up to sixteen boards with four connectors each. Modula systems fit in a broad range of audio/video/data environments and are controllable from a variety of sources (see page 15).

**Note:** *Because the Modula Distribution Matrix is available in several models and various configurations, the illustrations in this manual may differ from the model(s) you purchased.*

## Modula Features

- Ultra-Flat Response (bandwidth curve measured at a tight  $\pm 3$  dB)
- High bandwidth-linearity and low crosstalk
- Virtual matrices / levels
- Breakaway to route audio, video, or audio-follow-video
- Groupings and presets (local and global)
- Supports paralleled multi-channel signal routing
- Ability to mix a variety of audio, video, and data boards in a single enclosure
- Link to other AMX AutoPatch matrix switchers
- RS-232 port
- Enc Link (BNC) port for linking enclosures
- Board upgrade potential
- Optional Vertical Interval Sync (VIS) expansion boards
- Optional digital volume control (output)
- Input gain via potentiometers
- Audio connections support balanced or unbalanced audio
- Rack mounting ears included
- Backed by AMX Warranty (see warranty at [www.amx.com](http://www.amx.com) or on the *AMX AutoPatch CD*)
- 24-hour technical support

## Modula Control Features

Modula systems support three different protocols: BCS\* (Basic Control Structure), XNNet, and TCP/IP. Several different control options are available for Modula systems. Multiple control methods can be used on the same system.

- Choice of front mounted CP-10 or CP-20A control panel – or blank front panel
- Remote control panel options
- AMX control devices (for control programming information, see the instruction manual for the specific interface)
- APControl 3.0 software (free with all systems)
- APWeb (TCP/IP control via an external module)
- Supports AMX AutoPatch's simple BCS serial control protocol
- Supports third-party controllers

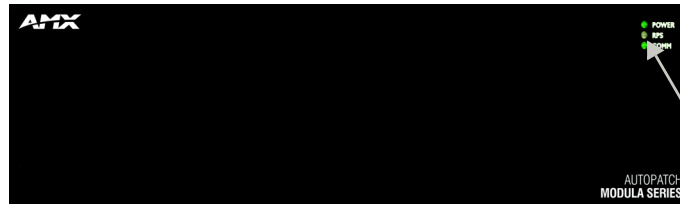
\* BCS is sent as ASCII characters through the serial port. For information on BCS commands, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at **[www.amx.com](http://www.amx.com)**.

**Note:** *Features and specifications described in this document are subject to change without notice.*

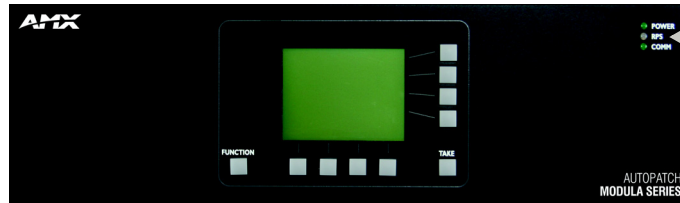
## Front View

The enclosure, which is the structural basis of the Modula Distribution Matrix, is available in many convenient pre-engineered sizes or can be custom built for your installation. An enclosure may have either a blank front panel or one of various control panels (front or remote panels produced by AMX AutoPatch for controlling the system's switches and system attributes). Although control panels are optional, we recommend one per system for system verification, redundant control, and troubleshooting. Control panel illustrations and directions for use are provided in the specific control panel instruction manual (available on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com)). For more control options, see page 15.

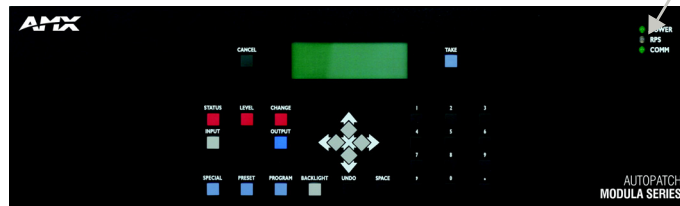
Blank front panel



CP-20A



CP-10



RPS indicators

FIG. 1 Modula front views

### RPS Indicator

Most Modula enclosures require a single power supply; for these enclosures, the RPS indicator will not be illuminated during normal operation. (If a single power supply fails, all LEDs will be off.)

Some Modula enclosures (e.g., CatPro RGBHV/HD-15) are equipped with standard dual power supplies. The RPS Indicator on the front of the enclosure (FIG. 1) indicates power supply functionality. For these models, if the RPS LED is:

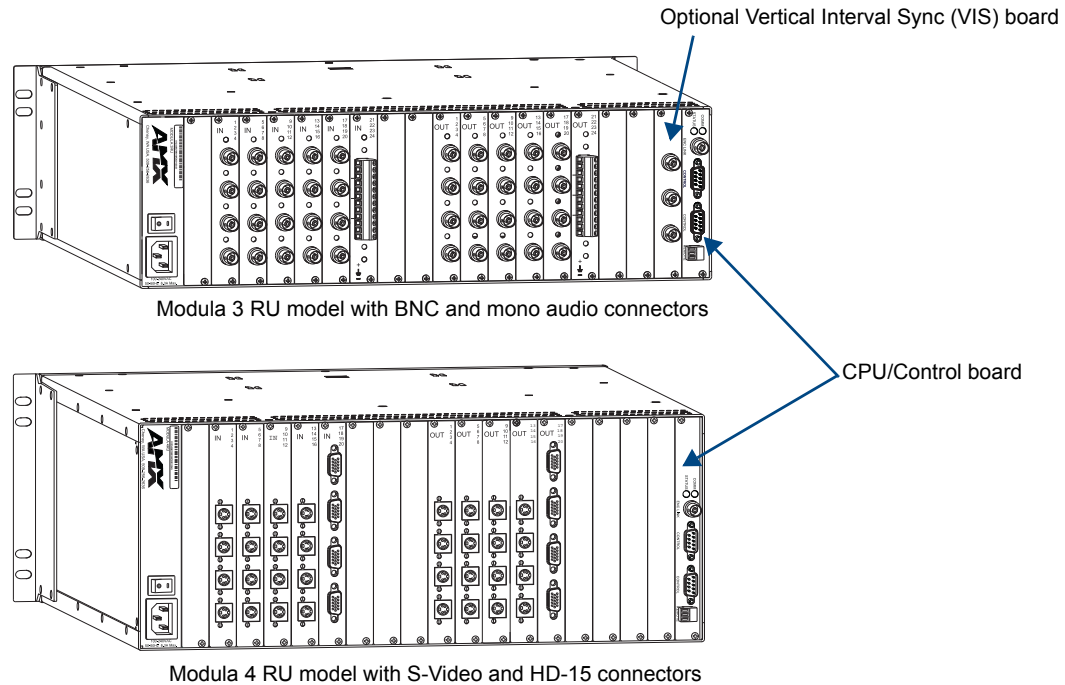
- Illuminated Green – Both power supplies are working
- Illuminated Red – One of the power supplies has failed



**Caution:** *If the system has dual power supplies and one of them fails, it should be replaced as soon as possible even if the system continues to operate. In the event this occurs, contact technical support (see page 43).*

## Rear View

The enclosure's appearance, as viewed from the rear (FIG. 2), will vary depending on the model, configuration, and signal types.



**FIG. 2** Rear views of Modula 3 RU and 4 RU enclosures

The following sections briefly introduce the hardware on the rear of the enclosure.

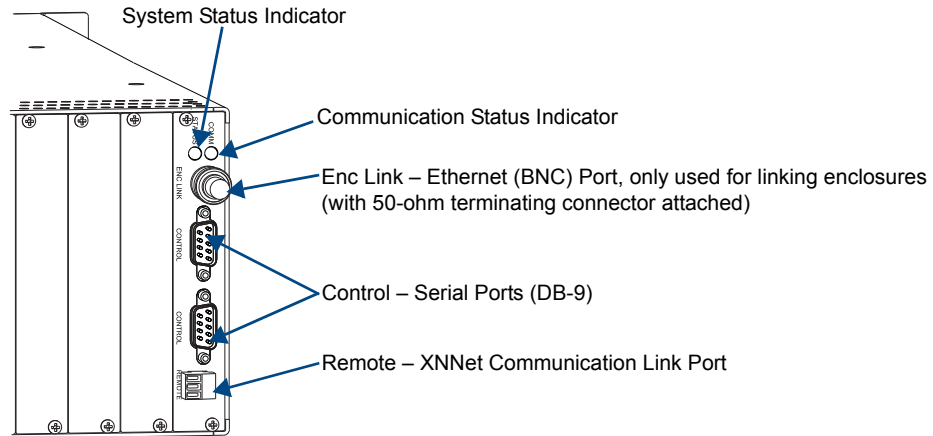
### Rear View Components

- CPU/Control board
- Power receptacle and specifications
- System Serial number
- Input and output boards (number will vary depending on enclosure size, and slots may be empty depending on the configuration)



## CPU/Control Board

The CPU is in the farthest right expansion/control slot on the rear of the enclosure (FIG. 3).



**FIG. 3** Modula CPU/Control board

At the top of the CPU you will find two indicators:

- System Status Indicator – for system status
- Communication Status Indicator – for communication activity

Each CPU has the following port options:

- Enc Link – Ethernet (BNC) link port used specifically for linking enclosures
- Control – Two RS-232 (DB-9) ports for attaching an external control device
- Remote – XNNet link port for linking to AMX AutoPatch remote control devices, such as remote control panels and Single Bus Controllers (SBCs)

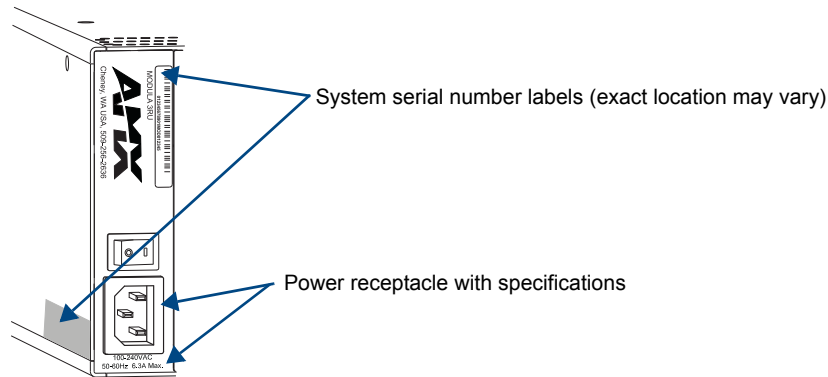
### Power Receptacle with Specifications

The universal power receptacle is in the lower left hand corner on the rear of the enclosure (FIG. 4).

Maximum power specifications are on the power receptacle. The power receptacle will accept all major international standard power sources. (Standard US power cords are provided for installations within the US.) This unit contains a fuse, a power switch, and the power receptacle. The fuse is internal and is not field serviceable. If you believe the fuse needs to be replaced, contact technical support (see page 43). Press the “0” side of the power switch to turn it off; press the “1” side to turn it on.



**Caution:** *Double Pole/Neutral Fusing fuses are used both in the “live” phase and the “neutral” phase of the device.*



**FIG. 4** Left end of enclosure rear

### System Serial Number

The system’s serial number is normally located in two places on the enclosure. When viewed from the rear, one serial number label is on the left expansion plate (FIG. 4). The second serial number label is on the left side of the enclosure at the bottom edge (near the power receptacle). The label on the side will also have the enclosure number (referred to as the chassis number). A single enclosure will be labeled “Chassis 1 of 1”; in a multiple-enclosure system the enclosures will be labeled “Chassis 1 of 3”, etc.

Before installation, we recommend recording the serial number for each enclosure in the system in an easily accessible location.

## Expansion Slots

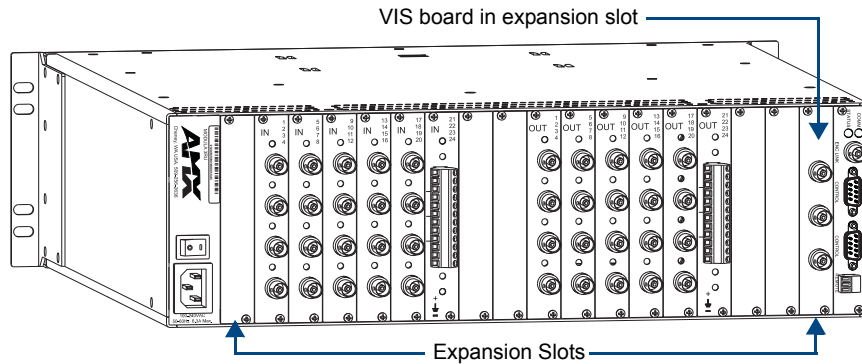


FIG. 5 Expansion slots

Each enclosure provides two expansion slots (FIG. 5). One is to the right of the power receptacle, and the other one is to the left of the CPU board. These slots can be used for boards which increase functionality and add new features to your system, such as the vertical interval sync (VIS) board illustrated in FIG. 5.

**Note:** Expansion slots are not designed for input or output boards. For flex-slot information, see page 17.

## Input and Output Connectors

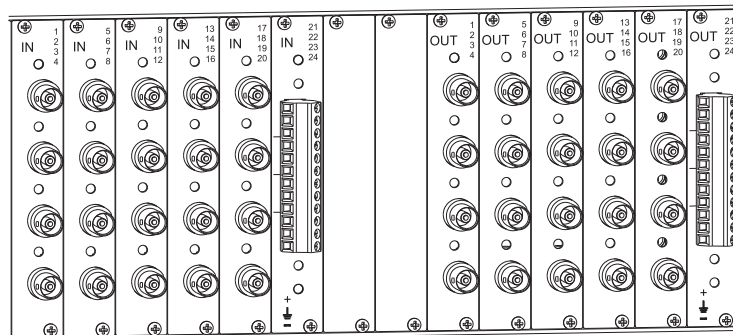


FIG. 6 Numbering starts with top channel of left-most board

Input and output connectors are the attachment points for source and destination devices that connect to the system. Viewed from the rear of the enclosure, the inputs (sources) are on the left side of each board, and the outputs (destinations) are on the right side of the board. BNC connectors are color coded; the white connectors are inputs and the black connectors are outputs.

Input and output connectors are numbered separately. The four connector numbers for each board are above and to the right of its top connector. This numbering pattern continues on each board (FIG. 6). Depending on the configuration, different types of boards may also be numbered separately.

A single enclosure can handle a combination of signals (such as analog audio, analog video, sync, digital video, etc.) depending on the number and type of input and output boards. For information on the types of boards each enclosure can hold see the “Enclosure Configurations” chapter on page 17.

For information on the boards included in your system, including connector types, cabling/wiring directions, and specifications, see the specific board chapter in this manual (chapter title specifies the board’s signal type).

## Modula Specifications

General Specifications	
Parameter	Value
Approvals	CE, UL, cUL, RoHS
Humidity	0 to 90% non-condensing
Operational Temperature	32° F to 110 F° (0° C to 43° C)
AC Power	100 VAC to 240 VAC (50 Hz to 60 Hz) 3.3 A @ 115 VAC max. 1.6 A @ 230 VAC max.
MTBF	88,000 hours
Power Consumption (max.) Modula 32x32 and Flex-Slot Modula RGBHV/HD-15 Modula CatPro	260 W per enclosure 260 W per enclosure 520 W per enclosure
Power Consumption (typical) Modula 32x32 and Flex-Slot Modula RGBHV/HD-15 Modula CatPro	100 W per fully loaded enclosure 105 W per enclosure 255 W per fully loaded enclosure
Thermal Dissipation (max.) Modula 32x32 and Flex-Slot Modula RGBHV/HD-15 Modula CatPro	887 BTU/hr. 887 BTU/hr. 1774 BTU/hr.
Thermal Dissipation (typical) Modula 32x32 and Flex-Slot Modula RGBHV/HD-15 Modula CatPro	341 BTU/hr. per fully loaded enclosure 358 BTU/hr. per fully loaded enclosure 870 BTU/hr. per fully loaded enclosure
Dimensions Depth Width without rack ears Width with rack ears Height Modula 32x32 and Flex-Slot Modula RGBHV/HD-15 Modula CatPro	17.0 in. (43.18 cm) 17.4 in. (44.2 cm) 18.8 in. (47.7 cm) 5.3 in. (13.4 cm) 3 RU 7.0 in. (17.8 cm) 4 RU 7.0 in. (17.8 cm) 4 RU
Weight Modula 32x32 and Flex-Slot Modula RGBHV/HD-15 Modula CatPro	Approximately 22 lbs. (9.98 kg) per loaded enclosure Approximately 22 to 24 lbs. (9.98 to 10.88 kg) per loaded enclosure Approximately 22 to 24 lbs. (9.98 to 10.88 kg) per loaded enclosure

AMX reserves the right to modify its products and their specifications without notice.

For individual board information and specifications, see the specific board chapter in this manual.

## Configuration and Control

The configuration file is stored in the CPU and contains routing and control information for an AMX AutoPatch Routing System. Each system is programmed (configured) at the factory according to customer specifications.

### Configuration Information

A copy of the custom configuration file is provided on the *AMX AutoPatch CD* that ships with each system. The configuration software, XNConnect, is provided on the CD and can be used to further customize the configuration file (see “Appendix A – Managing Configuration Files” on page 147).

Unless you need to modify your system, you will not need to use any of the configuration software that is included on the CD. Always make a copy of the configuration file before modifying it.

Configuration file modifications include basic tasks, such as creating local presets, customizing input and output channel names for control display (e.g., in APWeb’s control interface), as well as advanced tasks, such as adding or managing hardware. Configuration file modifications are made with XNConnect, which graphically displays the AMX AutoPatch system and its control configuration. Other configuration software for specific hardware or for adjusting signal quality is also available on the *AMX AutoPatch CD*. For details, see the individual program’s Help file.

### Control Options

Modula systems support three different protocols: BCS (as ASCII characters sent through an RS-232 port), XNNet, and TCP/IP. Several different control options are available for Modula systems. Multiple control methods can be used on the same system.

#### *Front Control Panel or Remote Control Panel*

AMX AutoPatch control panels, either front or remote, control a Modula’s switches and attributes. Although control panels are optional, we recommend one per system for routing verification, redundant control, and troubleshooting. If the system has a control panel, see the applicable control panel instruction manual on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com).

#### *AMX Control Devices*

The Modula is compatible with a number of AMX control devices. For control programming information, see the instruction manual for the specific interface.

#### *Control Software*

Modula enclosures can be controlled using AMX AutoPatch software:

- APControl 3.0 – for control and scheduling
  - Uses serial port located on the CPU
  - Runs on a PC connected to the serial port
  - Download\* from the *AMX AutoPatch CD*
- APWeb Server (TCP/IP) – for control, diagnostics, and third-party access
  - Uses serial port located on the CPU for connecting to an APWeb Server Module
  - Accessed through a TCP/IP interface, such as, a web browser (e.g., Internet Explorer)
  - Contact AMX regarding limitations and conditions for operating an Modula on a company LAN (Local Area Network)

\* If your AMX account has the required permissions, this program can be downloaded from [www.amx.com](http://www.amx.com).

### *BCS Serial Control Protocol*

The Modula can be controlled with an external serial controller that sends and receives ASCII characters via an RS-232 serial port. AMX AutoPatch has developed a command language, BCS (Basic Control Structure) protocol, for programming control operations and for diagnostic purposes. BCS commands can be entered into a terminal emulation program (such as, HyperTerminal) running on a PC. For information on BCS commands, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com).

### *Third-Party Controllers*

A third-party controller can also be attached to an Modula enclosure. If using a third-party controller, see the controller documentation for operating instructions.

**Note:** *Advanced programmers who want to design their own control programs can use AMX's AutoPatch XNNet protocol. The "AMX AutoPatch CD" includes the XNNet Communication Library, an interface that supports C, Java, and Visual Basic and has examples of the XNNet protocol in use.*

# Enclosure Configurations

## Enclosure Configurations

Each Modula enclosure holds up to 16 boards with 4 connectors each. The ratio of input and output boards depends on the model. Some models are available in configurations up to 32x32 in increments of four. Flex-slot models allow configurations that are either input or output heavy. All Modula enclosures can be added to in the field if not completely full when initially ordered.

### 32x32 Enclosures

- Configured for 32x32 with 8 input boards and 8 output boards
- Subset configurations in increments of four, e.g., 4x32, 12x8, 16x16, 20x4, or 28x12

### Flex-Slot Enclosures

The flex-slot models have three designated slots that can be used for either input or output boards. For example, an enclosure configured as 4x60 can be reconfigured to 16x48 by replacing the first three output boards with input boards.\*

- 16x48 Flex-Slot Enclosure
  - Configured for 16x48 with 4 input boards and 12 output boards
  - 1 input board minimum and 15 output boards maximum
  - Flex-slots 2, 3 and 4 can be used for output boards instead of input boards
  - Configurations of 4x60, 8x56, or 12x52 are also possible
- 48x16 Flex-Slot Enclosure
  - Configured for 48x16 with 12 input boards and 4 output boards
  - 15 input boards maximum and 1 output board minimum
  - Flex-slots 13, 14, and 15 can be used for input boards instead of output boards
  - Configurations of 60x4, 56x8, or 52x12 are also possible

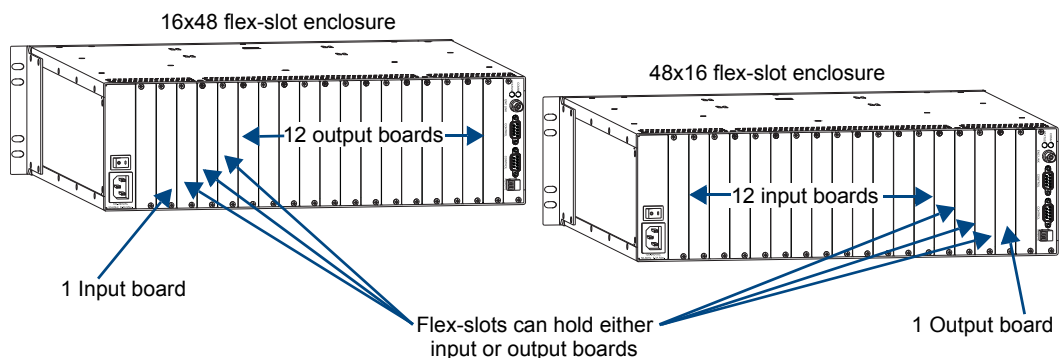


FIG. 7 Flex-slot enclosures

\* Changing or adding boards to an enclosure often requires a new configuration file.

## Applicability

The information in this manual applies to the following Modula pre-engineered systems, custom systems, input and output boards (individual board numbers are in board chapters), and expansion board:

### Modula Pre-Engineered Systems

All Modula pre-engineered systems are numbered FGP34-xxxx-xxx (e.g., FGP34-3232-117).

### Modula Custom Systems

All custom Modula systems contain one or more of the enclosure models in the following two tables. The description denotes the main type of board the enclosure holds. Additional board types may also be included according to the table on page 19.

32x32 Enclosure Models	
Model	Description
FG1034-31	Standard Video
FG1034-34	S-Video and Stereo
FG1034-25	Wideband Video
FG1034-28	Wideband and Stereo
FG1034-61	RGBHV/HD-15 (4 RU)
FG1034-42	CatPro RGBHV/HD-15 (4 RU)
FG1034-40	SDI Digital Video
FG1034-27	SDI Digital Video and Wideband Video
FG1034-30	SDI Digital Video and Standard Video
FG1034-33	SDI Digital Video and S-Video
FG1034-64	RS-422 (4 RU)
FG1034-37	Cat5 Video and Audio

Flex-Slot Enclosure Models		
Model	Configuration	Description
FG1034-16	16x48 Flex-slot	Standard Video
FG1034-46	48x16 Flex-slot	Standard Video
FG1034-19	16x48 Flex-slot	S-Video and Stereo
FG1034-49	48x16 Flex-slot	S-Video and Stereo
FG1034-10	16x48 Flex-slot	Wideband Video
FG1034-43	48x16 Flex-slot	Wideband Video
FG1034-22	16x48 Flex-slot	Cat5 Video and Audio
FG1034-52	48x16 Flex-slot	Cat5 Video and Audio



## Input and Output Boards

A single enclosure can handle a combination of signals (such as analog audio, analog video, sync, digital video, etc.) depending on the number and type of input and output boards.

### Board Signal Types

The table below indicates which enclosure types can hold which boards (signal types).

For information on the specific input and output boards in your system, including applicability numbers, connector types, cabling or wiring directions, and specifications, see the applicable board chapter in this manual (chapter title specifies the board's signal type).

**Tip:** If you are viewing this manual as a PDF, click on the page number for the Board (Signal Type) Chapter in the table to go to that chapter.

Enclosure Types and Board Types		Board (Signal Types) Chapter											
Enclosure Type	Standard Video (page 45)	S-Video (page 59)	Wideband Video (page 51)	HV Sync (page 55)	RGBHV (page 65)	CatPro RGBHV/HD-15 (page 69)	SD-SDI & HD-SDI Digital Video (page page 119)	RS-422 (page page 137)	Cat5/Video & Audio (page page 123)*	Mono Audio (page 103)	Stereo Audio (page 93)	Stereo, CatPro-Compatible (page 93)	Microphone & Phantom Power (page 113)
Standard Video	●			●						●			●
S-Video and Stereo	●	●		●						●	●		●
Wideband Video	●		●	●						●			
Wideband and Stereo	●		●	●						●	●		
RGBHV/HD-15	●	●	●	●	●					●	●		
CatPro RGBHV/HD-15	●	●	●	●	●	●				●	●	●	
SDI Digital Video							●						
SDI Digital Video and Wideband Video	●		●	●			●						
SDI Digital Video and Standard Video	●			●			●			●			
SDI Digital Video and S-Video	●	●		●			●			●	●		
RS-422								●					
Cat5/Video and Audio	●	●		●					●	●	●		●

\* For Standard Video, S-Video, Mono Audio, and Stereo Audio boards that are compatible with Cat5 Video and Audio boards, see the applicable board chapter.

## Expansion Board

Modula systems can be ordered with a Vertical Interval Sync board, FG1034-310, to synchronize video signal switches with the output device's refresh rate (see page 177).



# Installation and Setup

## Site Recommendations

When placing the enclosure, follow the recommendations and precautions in this section to reduce potential installation and operation hazards.

### Environment

- Choose a clean, dust free, (preferably) air-conditioned location.
- Avoid areas with direct sunlight, heat sources, or high levels of EMI (Electromagnetic Interference).
- If applicable, to make control panel operations easier, mount the enclosure with the control panel in the rack at eye level.

### Chassis Accessibility

Make sure the front and rear panels of the enclosure are accessible, so that you can monitor the LED indicators. Leaving adequate clearance at the rear will also allow for easier cabling and service.

### Power

The source's electrical outlet should be installed near the router, easily accessible, and properly grounded. Power should come from a building branch circuit. We recommend using a dedicated line for the system's power. Use a minimum breaker current rating of 15 A for 110 V or 30 A for 230 V. To avoid an overload, note the power consumption rating of all the equipment connected to the circuit breaker before applying power.

## General Hazard Precautions

These recommendations address potential hazards that are common to all installations:

### Elevated Operating Temperature

The maximum rated ambient temperature for Modula enclosures is 110° F (43° C).

All equipment should be installed in an environment compatible with the manufacturer's maximum rated ambient temperature. In a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than the ambient room temperature.



**Caution:** *To protect the equipment from overheating, do not operate in an area that exceeds 110° F (43° C) and follow the clearance recommendation below for adequate airflow.*

### Airflow Restriction

Modula enclosures are designed to adequately dissipate the heat they produce under normal operating conditions; however, this design is defeated when high heat producing equipment is placed directly above or below an enclosure.



**Caution:** *To prevent overheating, avoid placing high heat producing equipment directly above or below the enclosure. The system requires a minimum of one empty rack unit above and below (three empty rack units are recommended). Verify that the openings on the sides of the enclosure are not blocked and do not have restricted air flow.*

### Mechanical (Rack) Loading

When installing equipment in a rack, distribute the weight to avoid uneven mechanical loading.

## Circuit Overloading

When connecting the equipment to the supply circuits, be aware of the effect that overloading the circuits might have on over-current protection and supply wiring.

## Reliable Earthing (Grounding)

Reliable earthing of rack-mounted equipment should be maintained. If not using a direct connection to the branch circuit (e.g., plugging into a power strip), pay particular attention to supply connections.



**Caution:** For proper start up, turn on all power switches for the AMX AutoPatch equipment at the same time before applying power to the source and destination devices. We recommend attaching all power cords to a surge protector and/or an AC line conditioner.

## Unpacking

The Modula is shipped with one enclosure per shipping box. The invoice is sent separately; a packing slip is attached to the outside of each box. Each box contains the following items:

- Enclosure
- Standard US power cord (if shipped within the US)
- Rack ears (with 8 screws per set)
- Link cables and T-connectors (provided with multiple-enclosure systems)
- 50-ohm termination connector(s)
- Other enclosure products as needed

The documentation in the first box includes:

- AMX AutoPatch Modula Quick Start Guide
- AMX AutoPatch Linking Enclosures Quick Start Guide (for multiple-enclosure systems)
- AMX AutoPatch CD*
- AutoPatch Modula Connector Guide

For orders comprising multiple enclosures, the shipping boxes are marked as “Chassis \_\_ of \_\_,” where the first blank is the box number and the second blank is the total number of boxes in the shipment.

**Important:** If applicable, the shipping boxes each have a yellow/green sticker that states that the unit (enclosure) is part of a multiple-enclosure system and must be installed with the same serial numbers.

## Unpacking Tips

- Before fully unpacking the enclosure(s), *inspect the shipping box(es) for any signs of damage.* If a box is partially crushed or any sides have been broken open, notify the shipping agency immediately and contact your AMX representative (see the warranty on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com)).
- Once unpacking is complete, closely check the physical condition of the enclosure.
- Collect all documentation.

**Note:** Please save the original shipping container and packing materials. AMX is not responsible for damage caused by insufficient packing during return shipment to the factory. Shipping boxes are available; contact your AMX representative for details.

## Rack Installation and System Setup

Modula Distribution Matrix enclosures fit in a standard EIA 19 in. (48.26 cm) rack (rack ears are provided).

**Important:** *The system requires at least one empty rack unit above and below the enclosure to allow adequate airflow; three empty rack units are recommended.*

### Required items for rack installation:

- Enclosure(s)
- Standard EIA 19 in. (48.26 cm) rack
- Rack ears (with 8 screws per set)
- Screwdriver
- Screws that fit your rack for mounting the enclosure(s)
- Power cord(s)
- Link cables and equipment (included with multiple-enclosure systems)
- 50-ohm termination connector(s)
- Surge-protector(s) – highly recommended

### Optional items for rack installation:

- PC or laptop computer with a null modem cable (for communication with the Modula via the RS-232 serial port)

### Installation Recommendations

- Write the serial number for each enclosure (located on the rear and left side near the power receptacle) in an easily accessible location before installing the Modula in a rack.
- Use an earth-grounded power cord / system with the Modula.
- Attach all power cords to surge protectors and/or AC line conditioner(s).
- Apply power to the Modula enclosure(s) before applying power to its source and destination devices.

### Installation Procedure

A flow chart showing the installation sequence is in FIG. 8. The procedure following provides general steps with references to detailed information found in later sections of the manual.

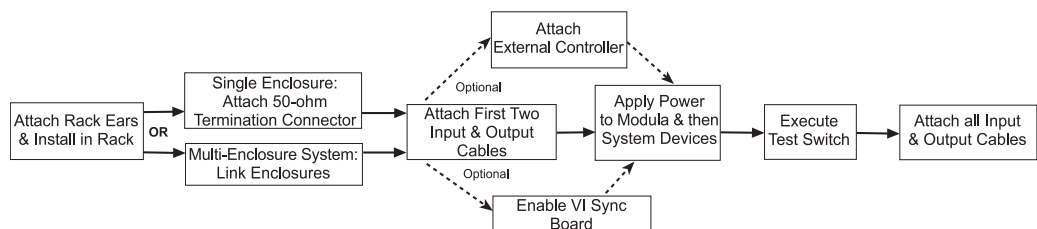


FIG. 8 Installation procedure



**Caution:** *To prevent overheating and airflow restriction, avoid placing high heat producing equipment directly above or below the enclosure. The system requires a minimum of one empty rack unit above and below (three empty rack units are recommended). Verify that the openings on the sides of the enclosure are not blocked and do not have restricted air flow.*

## To install and set up a Modula system in a rack:

1. Attach the rack ears per FIG. 9.

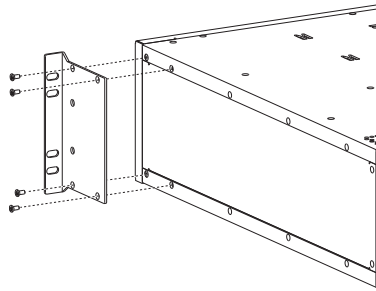


FIG. 9 Attach rack ears

2. Place the enclosure in the rack and attach front-mounting screws to hold it firmly in place (FIG. 10); repeat for any additional enclosures.

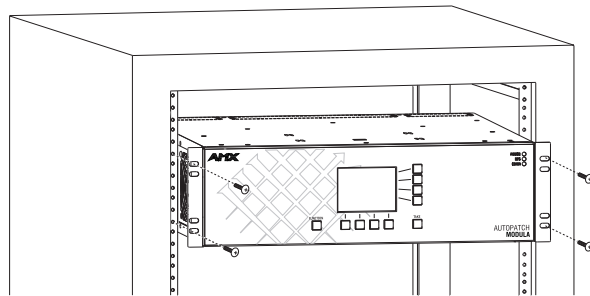


FIG. 10 Place enclosure in rack and secure with screws

**Tip:** When placing enclosures, keep in mind that the optimal viewing angle for a control panel is eye level.

3. Multiple-enclosure systems – Link the enclosures together; see “Linking Enclosures” on page 25.  
**Or**  
 Single enclosure – Attach a 50-ohm termination connector to Enc Link (BNC) port on the CPU.
4. Attach only the first source device and the first destination device; see “Attaching Inputs and Outputs” on page 37, and the “AutoPatch Modula Connector Guide” (shipped with each system).\*  
*Do not apply power to the devices until after the Modula has power (Step 7).*
5. Optional – Establish communication with an external control device (see page 31).
6. If applicable – For important information on installing and enabling a VIS board, see “Appendix F – Enabling Vertical Interval Sync” on page 177.
7. Attach the power cord(s) to the enclosure(s), then turn on the entire system (see “Applying Power and Startup” on page 38).  
*We recommend using a surge protector and/or an AC line conditioner.*
8. Execute a test switch to ensure the system is working properly (see “Executing a Test Switch” on page 41).
9. When the test switch works correctly, attach the remaining source and destination devices (refer to the “AutoPatch Modula Connector Guide”. If the system requires conversion modules, refer to their quick start guides for installation information.

\* If the installation includes paralleling inputs, see “Appendix C – Paralleling Inputs” on page 167.

### Installation Options

Additional installation tasks may include the following:

- Customizing Channel Names – See page 153 in “Appendix A – Managing Configuration Files.”
- Creating Local Presets – See page 154 in “Appendix A – Managing Configuration Files.”
- Creating global presets – See the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com).

### Special Installation Cases

Parallel Inputs – If the system is configured to route parallel inputs, see “Appendix C – Paralleling Inputs” on page 167.

## Linking Enclosures

Linking enclosures allows control information to pass between them. The enclosures are linked using the Ethernet linking ports\* on the CPUs; the Ethernet traffic between these ports maintains consistent control speed. In a multiple-enclosure system, the enclosure with the control panel or an external controller attached receives control information and passes on relevant information to the other enclosures via the links.

\* The Modula Ethernet (BNC) linking port is labeled “Enc Link.” On other AMX AutoPatch enclosures, the Link port (BNC or RJ-45) may be labeled “Link A,” “10/100,” or “Link 1.”



**Caution:** *AMX AutoPatch systems should only be linked in their own isolated networks.*

If any of the linked enclosures were not part of the original system, contact technical support (see page 43) for important information not included here.

A Modula can be linked directly to another Modula, an Epica-128, or an Epica-256 with the appropriate cable and T-connectors because they all use Ethernet (BNC) connectors for linking (see page 27).

A Modula can be linked to enclosures with RJ-45 link ports (e.g., Optima, Optima SD, Precis SD, Epica DG, Epica DGX 16/32, Epica DGX 144) using a 10Base-T to 10Base-2 Media (Ethernet) Converter and cables (see page 28).

A switch (or hub) is required to link systems that include one Modula enclosure and two or more enclosures with 10Base-T connectors (see page 30).

### Network Segments

The network segments (the physical network sections as determined by hardware) of a linked system determine the total distance between all the enclosures in a linked system. A switch/hub or a media converter indicates the start of a new network segment. For more information regarding network segments, see the directions for the individual type of system. 10Base-2 (BNC) network segments cannot exceed 10 ft. (3.05 m). 10Base-T (RJ-45) network segments cannot exceed 100 ft. (30.5 m).

**Important:** *Enclosures must be cabled correctly after linking. To ensure that you are attaching the correct signal cables to the correct enclosure, check the “AutoPatch Connector Guide” that ships with the system, as well as the system / enclosure numbers on the rear of each enclosure.*

### Enclosures and Linking Connectors

The method used for linking depends on the type of linking connector on each enclosure’s CPU. The table below indicates the type of linking connectors available on AMX AutoPatch enclosures.

Enclosure	Ethernet 10Base-T* (RJ-45)	Ethernet 10Base-2* (BNC)
Modula		●
Epica DG, Epica DGX 16/32, and Epica DGX 144	●	
Epica-128 and Epica-256		●
Optima and Optima SD	●	
Precis SD	●	

\* The Ethernet linking port (BNC or RJ-45) may be labeled “Link 1,” “Link A,” “10/100,” or “Enc Link.”

### Link Cables and Equipment

AMX provides link cables and equipment for enclosures that are ordered as part of a linked system. The link cables and equipment are also available for customers who want to link enclosures that were not originally ordered to do so. Contact your AMX representative for details.

Link Cables and Equipment in Modula Linked Systems				
Enclosure →	Cable →	Converter →	Cable →	Enclosure
Modula	RG-58 coax	–	–	Modula
Modula	RG-58 coax	Media Converter	RJ-45 straight-through patch	Epica DG, Epica DGX 16/32, and Epica DGX 144
Modula	RG-58 coax	–	–	Epica-128 and Epica-256
Modula	RG-58 coax	Media Converter	RJ-45 straight-through patch	Optima and Optima SD
Modula	RG-58 coax	Media Converter	RJ-45 straight-through patch	Precis SD

### Link Cables and Equipment List

- **RG-58 Coax Cable:** use to daisy chain 10Base-2 enclosures (also used to connect a 10Base-2 / BNC enclosure to a Media Converter).
- **RJ-45 Straight-Through Patch Cable:** use to connect a 10Base-T (RJ-45) enclosure to a Media Converter or to a Multi-Port Switch. Both ends of the cable are wired to TIA/EIA-568-A.
- **Media Converter:** use when linking 10Base-2 (BNC) enclosures to 10Base-T (RJ-45) enclosures.
- **Multi-Port Switch:** use when linking some types of multiple-enclosure systems.

**Note:** The Comm (Communication Status) indicator at the top of the CPU board indicates communication status when the enclosure is linked as part of an active system

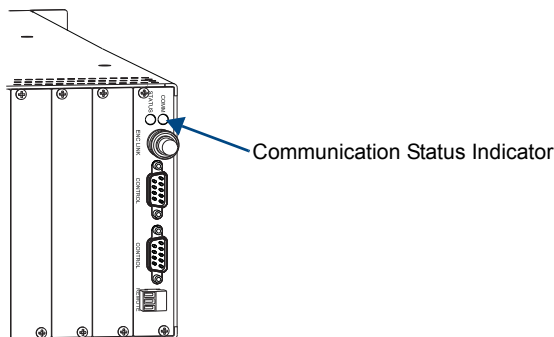


FIG. 11 Comm indicator on CPU



**Important:** If an enclosure in a linked system is down (due to power failure, etc.), it may need to be disconnected from the remaining enclosures in order for the rest of the system to continue working.

### Linking a Modula to a Modula, Epica-128, or Epica-256

A Modula can be directly linked to another Modula, an Epica-128, or an Epica-256 via the Ethernet linking ports.

The total distance between the two linked enclosures cannot exceed 10 ft. (3.05 m).

#### Cable Length Requirements

Network Segment	Cable Type	Maximum Distance
Modula to Modula or Epica-128 or Epica-256	RG-58 coax	10 ft. (3.05 m)

**Important:** 50-ohm termination connectors are required on the open ends of all T-connectors when linking enclosures.

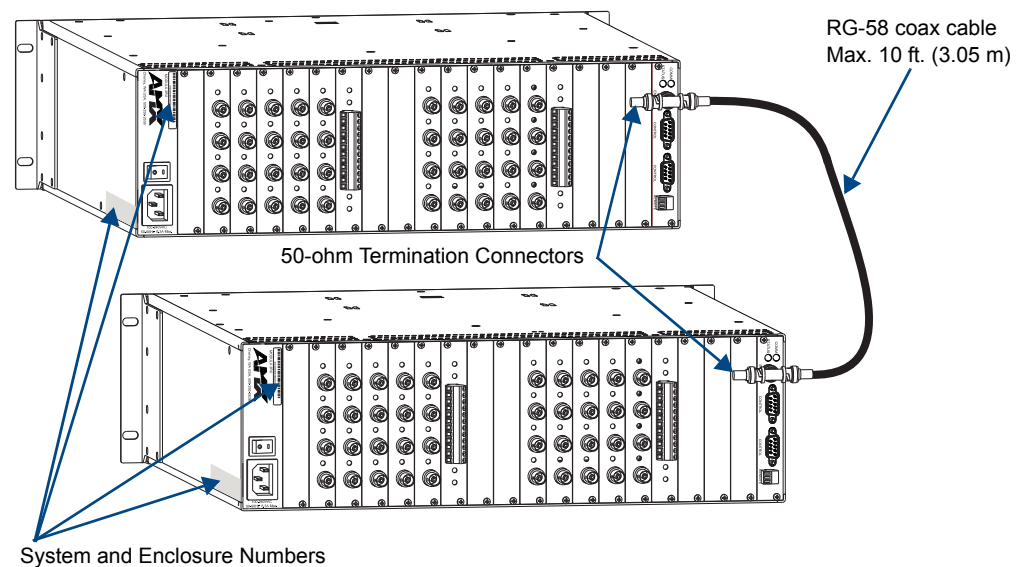


FIG. 12 Modula linked to Modula

#### To link a Modula to a Modula, Epica-128, or Epica-256:

1. Fasten T-connectors to the Ethernet (BNC) linking ports on both enclosures.
2. Fasten 50-ohm termination connectors to the T-connectors on both enclosures.
3. Attach an RG-58 coax cable from the open end of the T-connector on the first enclosure to the open end of the T-connector on the second enclosure.
4. If applicable, additional 10Base-2 enclosures can be daisy-chained off either enclosure (see page 29).

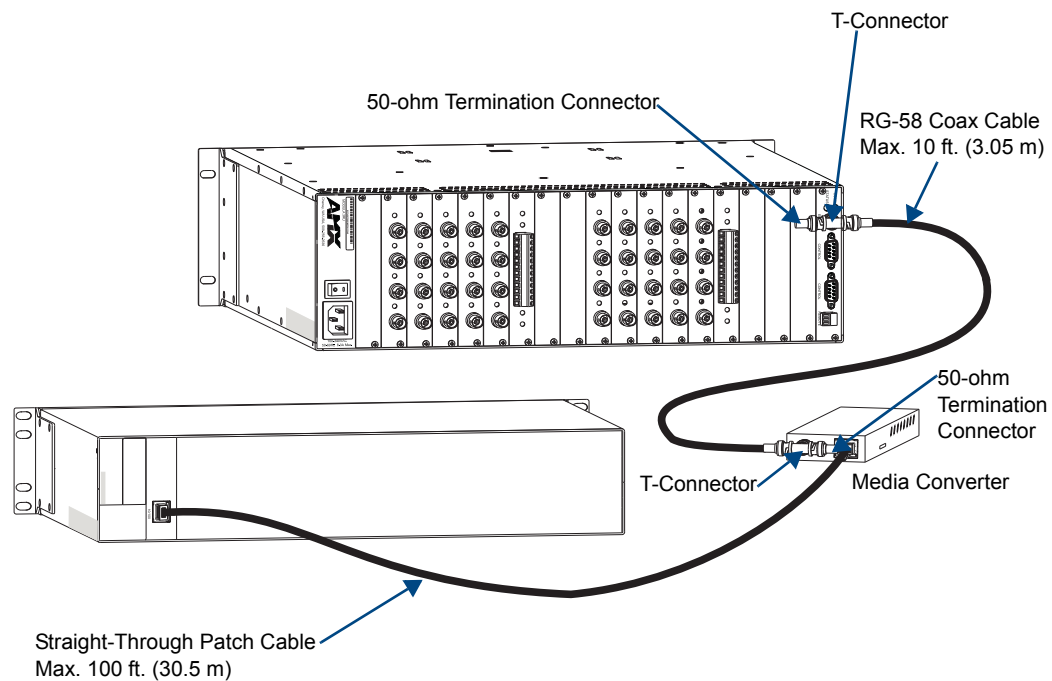
When power is applied, the Comm (Communication Status) indicator at the top of the CPU board illuminates indicating traffic between enclosures.

### Linking a Modula to an Epica DG, Epica DGX 16/32, Epica DGX 144, Optima, Optima SD, or Precis SD

A Modula enclosure can be linked to an enclosure with an Ethernet 10Base-T (RJ-45) port (Epica DG, Epica DGX 16/32, Epica DGX 144, Optima, Optima SD, or Precis SD) by using a Media Converter.

#### Cable Length Requirements

Network Segment	Cable Type	Maximum Distance
Modula to Media Converter	RG-58 coax	10 ft. (3.05 m)
Media Converter to enclosure with 10Base-T port	RJ-45 straight-through patch	100 ft. (30.5 m)



**FIG. 13** A Modula linked to enclosure with an RJ-45 Ethernet linking port

#### To link a Modula to an enclosure with an Ethernet 10 Base-T port:

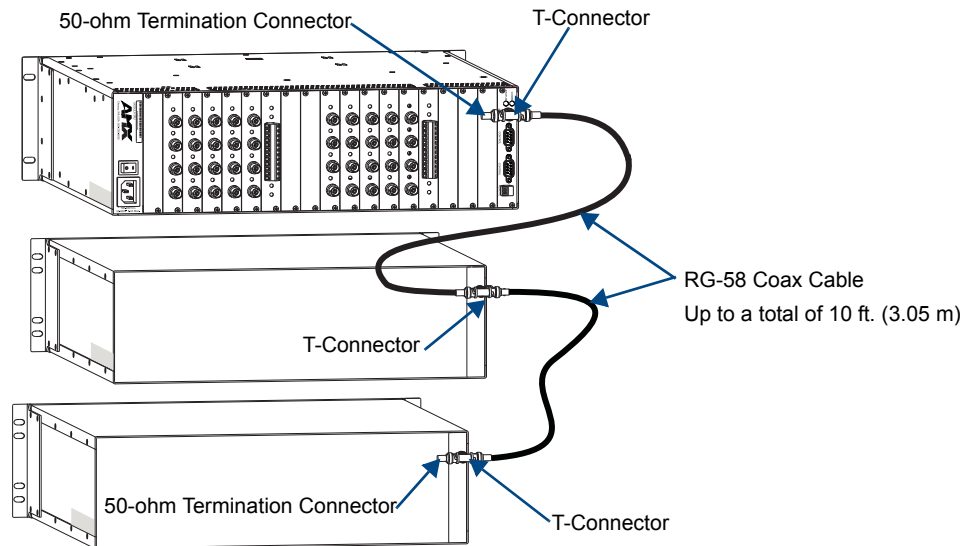
1. Fasten T-connectors to the Ethernet (BNC) linking connector on the Modula’s CPU and to the BNC connector on the Media Converter.
2. Fasten 50-ohm termination connectors to the T-connectors on the Modula enclosure and the Media Converter.
3. Attach an RG-58 coax cable from the open end of the T-connector on the Modula to the open end of the T-connector on the Media Converter.
4. Insert the RJ-45 straight-through patch cable into the Media Converter’s 10/100 (RJ-45) port.
5. Insert the other end of the RJ-45 straight-through patch cable into the second enclosure’s Ethernet (RJ-45) linking port.

When power is applied, the Comm (Communication Status) indicator at the top of the CPU board illuminates indicating traffic between enclosures.

## Linking a Modula to Multiple 10Base-2 (BNC) Enclosures

**Important:** Always attach 50-ohm termination connectors to the open ends of the T-connectors on the Media Converter and on the last enclosure on the coax cable run in multiple-enclosure systems.

A Modula can link to multiple BNC enclosures in a daisy chain with RG-58 coax cable (FIG. 14). The total distance between the two end termination connectors in a multiple-enclosure system with BNC ports cannot exceed 10 ft. (3.05 m).



**FIG. 14** Modula linked to two enclosures via 10Base-2 (BNC) ports

### To link a Modula to multiple enclosures with BNC ports:

1. Fasten a T-connector to the Ethernet (BNC) linking connector on the Modula's CPU.
2. Attach a 50-ohm termination connector to one end of the T-connector.
3. Fasten T-connectors to the Ethernet (BNC) linking ports on the remaining enclosures.
4. Attach an RG-58 coax cable from the open end of the T-connector on the Modula to the T-connector on the next enclosure.
5. Link remaining enclosures in a daisy chain using RG-58 coax cable attached to the T-connectors.
6. Attach a 50-ohm termination connector to the open end of the T-connector on the last enclosure in the daisy chain.

When power is applied, the Comm (Communication Status) indicator at the top of the CPU board illuminates indicating traffic between enclosures.

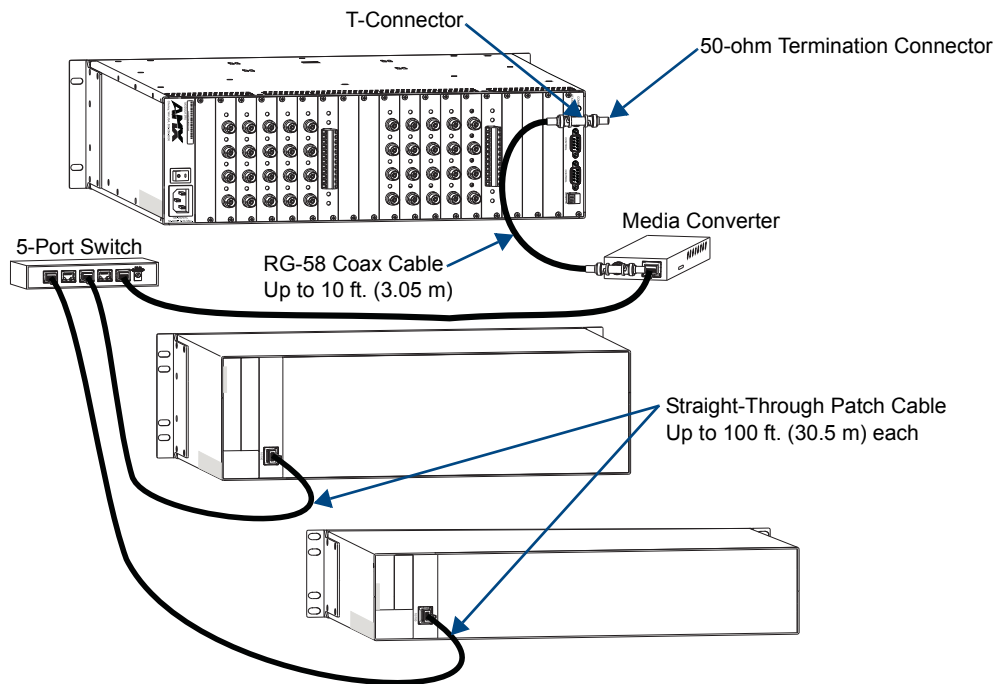
## Linking a Modula to Multiple 10Base-T (RJ-45) Enclosures

Linking a Modula enclosure to multiple RJ-45 enclosures requires a Media Converter, a Multi-Port switch, and RJ-45 straight-through patch cables (FIG. 15).

**Note:** *If you have questions regarding cabling or network related issues in conjunction with using a Multi-Port Switch (or hub) for linking enclosures, contact your network administrator.*

### Cable Length Requirements

Network Segment	Cable Type	Maximum Distance
Modula to Media Converter	RG-58 coax	10 ft. (3.05 m)
Media Converter to Multi-Port Switch	RJ-45 straight-through patch	100 ft. (30.5 m)
Multi-Port Switch directly to enclosure with RJ-45 port	RJ-45 straight-through patch	100 ft. (30.5 m)



**FIG. 15** Modula linked to two enclosures via 10Base-T (RJ-45) ports

### To link a Modula to multiple enclosures with RJ-45 ports:

1. Fasten T-connectors to the Ethernet (BNC) linking connector on the Modula's CPU and the BNC connector on the Media Converter.
2. Fasten 50-ohm termination connectors to one end of the T-connectors on the Modula and on the Media Converter.
3. Attach the RG-58 coax cable from the open end of the T-connector on the Modula to the open end of the T-connector on the Media converter.
4. Insert one end of a RJ-45 straight-through patch cable into the Media Converter's 10/100 (RJ-45) port and the other end into one of the 10/100 (RJ-45) ports on the Multi-Port Switch.
5. Insert one end of a RJ-45 straight-through patch cable into the Ethernet (RJ-45) linking port on the first enclosure and the other end into one of the 10/100 (RJ-45) ports on the Multi-Port Switch.
6. Repeat Step 5 for the remaining enclosures.

When power is applied, the Comm (Communication Status) indicator at the top of the CPU board illuminates indicating traffic between enclosures.

## Attaching External Controllers

The Modula can be controlled by attaching an external control device that uses one of the communication protocols listed below:

- **BCS (Serial)** – ASCII sent over a null modem serial cable or RS-422 cable via the serial port
- **XNNet** – AMX AutoPatch protocol via all ports (including serial); AMX AutoPatch control and accessory devices usually connect via the Remote (XNNet) port
- **TCP/IP** – Requires an external module; see the APWeb Server Module documentation

### Control Options

The communication protocols listed above are used for these control options:

#### *AMX Control Devices*

The Modula is compatible with a number of AMX control devices. For control programming information, see the instruction manual for the specific interface.

#### *AMX AutoPatch Remote Control Panels and SBCs*

AMX AutoPatch remote control panels (CP-20A, CP-10) and control devices (SBC, Preset SBC), usually connect to the Remote port on the CPU board. For instructions for attaching an external controller to the Remote port, see page 36. For specific information, see the product documentation.

#### *APControl 3.0 (Serial)*

APControl 3.0 software (for control and scheduling) runs on a PC connected to a Modula via a serial port (DB-9) and is available on the *AMX AutoPatch CD*.

#### *APWeb (TCP/IP)*

The APWeb Server Module (used for control, diagnostics, and third-party access) is accessed through a TCP/IP interface, such as, a web browser (e.g., Internet Explorer). For setup and operation information, see the APWeb Server Module's documentation on the *AMX AutoPatch CD* and at [www.amx.com](http://www.amx.com).

**Important:** Contact AMX regarding limitations and conditions for operating a Modula on a company LAN.

#### *XNNet Protocol (Serial)*

Advanced programmers who want to design their own control programs can use AMX AutoPatch XNNet protocol. The *AMX AutoPatch CD* includes the XNNet Communication Library, an interface library that supports C, Java, and Visual Basic and has examples of the XNNet protocol in use.

#### *BCS (Serial) Control*

AMX AutoPatch has developed a command language, BCS (Basic Control Structure), for executing control operations and for diagnostic purposes. BCS commands are issued via a terminal emulation program, such as Windows® HyperTerminal. For information on BCS commands, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com).

#### *Third-Party Controllers (Serial)*

Third-party controllers connect to a serial port (DB-9) on the CPU. If using a third-party controller, see the controller documentation for setup and operating instructions.

## Attaching Serial Controllers

An external serial controller is any device that can send and receive ASCII code over an RS-232 (null modem) or an RS-422 serial cable attached to a serial port (DB-9) on the rear of the enclosure. PCs are common serial controllers. Once a PC is attached to the Modula, the system can be controlled by running AControl software on the attached PC (see the *AMX AutoPatch CD*). The system can also be controlled by entering BCS commands into a terminal emulation program (e.g., HyperTerminal). For information on BCS commands, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* and at [www.amx.com](http://www.amx.com).

### PC Requirements for AControl 3.0

- Windows XP Professional® or Windows 2000®
- Java Runtime Environment (JRE): v1.4.2 or the latest version
- Minimum Hardware: 166 MHz, 128 MB RAM, 20 MB free disk space, 800x600 display
- Recommended Hardware: 2.0 GHz, 512 MB RAM, 20 MB free disk space, 1280x1024 display
- Serial port

### PC Requirements for BCS

- Windows XP Professional® or Windows 2000®
- Terminal emulation program
- Serial port

**Important:** For non-linked enclosures, attach a 50-ohm termination connector to the unused network BNC connector on the CPU (connector supplied); see FIG. 18 on page 34.

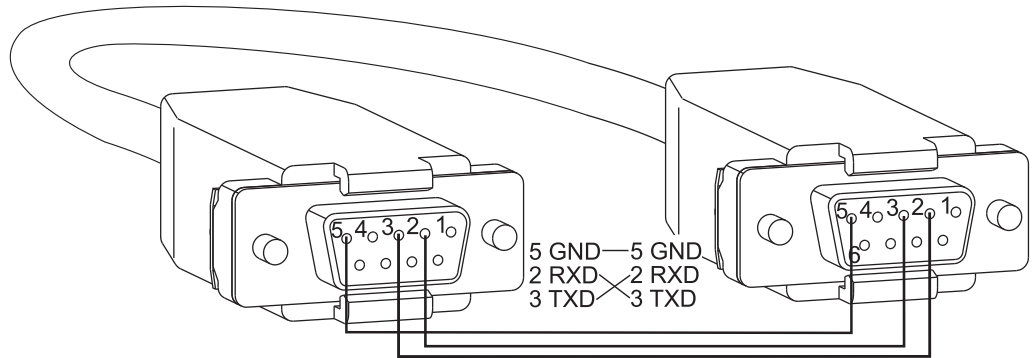
**To establish external serial control:**

*Cable Pinouts*

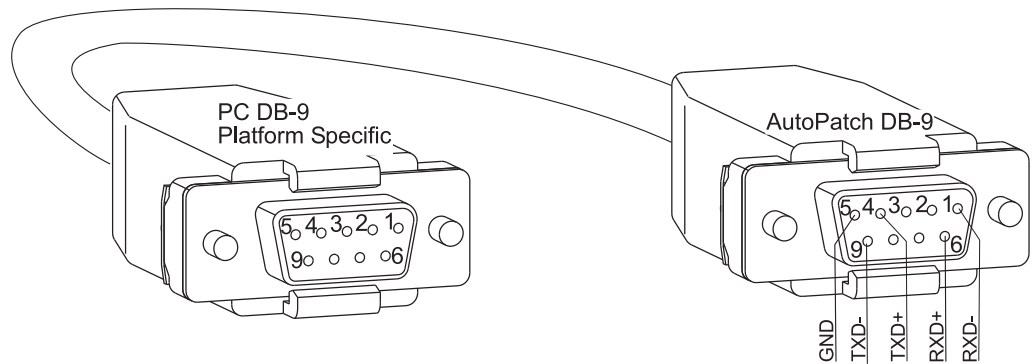
1. Use a null modem cable that matches the pin diagram in FIG. 16 for RS-232 without hardware flow control. AMX AutoPatch equipment requires pins 2, 3, and 5 only.

**Or**

Use a cable that matches the pin diagram in FIG. 17 for RS-422.



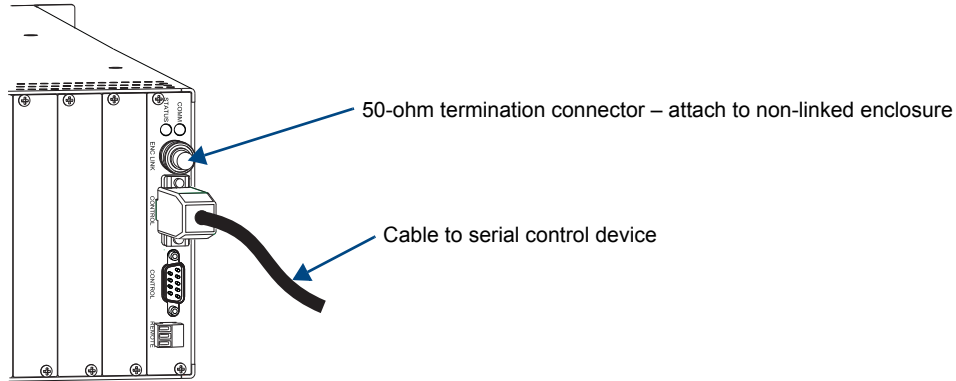
**FIG. 16** RS-232 null modem pin diagram, no hardware flow control



**FIG. 17** RS-422 pin diagram

Instructions continue on the following page.

2. Establish an RS-232 serial connection with the enclosure.
  - If using an RS-232 cable for control, follow only the first checklist below FIG. 18.
  - If using an RS-422 cable for control, follow the first checklist below FIG. 18 to establish an RS-232 connection with the upper serial port. Then follow the second checklist to configure the lower serial port for RS-422 control.



**FIG. 18** Attach null modem cable to serial port

**RS-232 null modem serial cable:**

- Plug one end of the null modem serial cable into either serial port on the Modula (FIG. 18). If you will be using an RS-422 for control, be sure to attach the RS-232 cable to the upper serial port.
- Plug the other end of the serial cable into the serial port on the PC (or serial controller/device).
- Open the serial communication software and set the PC port settings to match the Modula port settings (see table to the right). In addition to the default baud rate of 9600, Modula enclosures support baud rates of 19200, 38400, and 57600. The settings on the PC serial communication software and the Modula enclosure *must* correspond to each other. If a change is required to make them match, changing the PC’s settings is preferable. If you decide to change the enclosure’s settings instead, use XNConnect (see the Help file).

Modula Serial Port Settings	
Baud Rate	9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

**Or**

**RS-422 cable:**

- Use the checklist above to establish serial communication with the enclosure. The RS-232 cable *must* be plugged into the upper serial port on the Modula enclosure.
- Download XNConnect (see page 148) and open the configuration file (page 149) or discover the system (see page 150).
- In the Hardware view, right-click on the icon for the lower serial port and select Change Settings. On the Modify Serial Port drop-down menu under Mode, select RS-422 Character (unless directed by technical support to use RS-422 Block). After changing the Mode setting, click Download. Click OK.
- Plug one end of the RS-422 serial cable into the lower serial port (DB-9) on the enclosure (FIG. 18) and the other end into the RS-422 port on the control device.

**Important:** After a serial port is configured for RS-422 cable, do not attach an RS-232 cable without first reconfiguring the port in XNConnect.





**Caution:** To avoid system damage, follow the power-up sequence on page 38. We recommend attaching all power cords to a surge protector and/or AC line conditioner.

*To complete establishing external serial control*

3. If not already on, apply power first to the Modula enclosure and then to the source and destination devices (see “Applying Power and Startup” on page 38).
4. Set up and run the desired method of control:
  - **AMX Control Devices** – see the documentation for the specific control device.
  - **APControl 3.0** – Install and open the program from the *AMX AutoPatch CD* (if your account has the required permissions, this program can be downloaded from [www.amx.com](http://www.amx.com)). Follow the setup wizard and open the APControl Launchbar.
  - **Terminal emulation (HyperTerminal)** – Open the program, select the COM port, and check that the settings match those in the Modula Serial Port Settings table (see previous page). If the COM port settings do not match, enter the applicable values from the table. Click OK.  
A short splash screen appears.
5. Execute a test switch to ensure the Modula is working properly (see “Executing a Test Switch” on page 41).

## Attaching External XNNet Controllers

An remote XNNet device is any device that sends and receives XNNet protocol over the Remote (XNNet) port.

AMX AutoPatch XNNet control devices include remote control panels (e.g., the CP-10 and CP-20A). AMX AutoPatch XNNet accessory devices include Single Bus Controllers (SBCs) and Preset SBCs.

The instructions below are for attaching a device to the Remote (XNNet) port, found at the bottom of the CPU board. For specific product information, see the individual device's documentation.

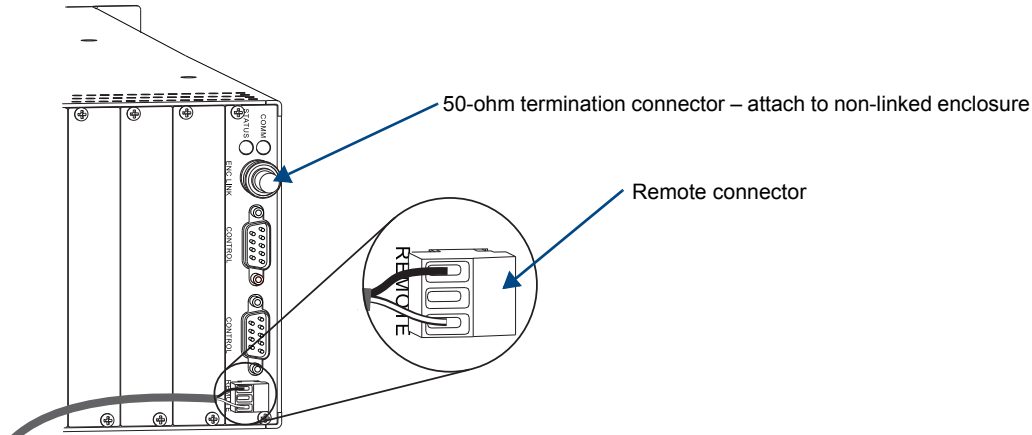
### Communication Cable Requirements

- ❑ A two-conductor, 20 AWG, 7/28 strand cable with a drain wire or shield, such as Alpha 2412C (customer supplied)
- ❑ Maximum length of cable: 1,000 ft. (305 m) total, including linked panels

### To establish a Remote port connection with an XNNet device:

1. Attach one end of the XNNet link cable to the corresponding port on the device (see the individual product documentation).
2. On the Modula's CPU, unplug the Remote connector.
3. Loosen the screws on the Remote connector.
4. Insert the two wires of the XNNet link cable from the device into the Remote connector leaving the center slot empty (FIG. 19).

Note that either wire can be inserted into either of the outer slots.



**FIG. 19** Insert the wires into the Remote connector on the CPU

5. Tighten both screws and plug the connector back into the CPU.
6. If not already on, apply power first to the Modula enclosure before applying power to the XNNet device (see “Applying Power and Startup,” page 38).
7. Execute a test switch to ensure the Modula is working properly (see “Executing a Test Switch”, on page 41).

## Attaching Inputs and Outputs

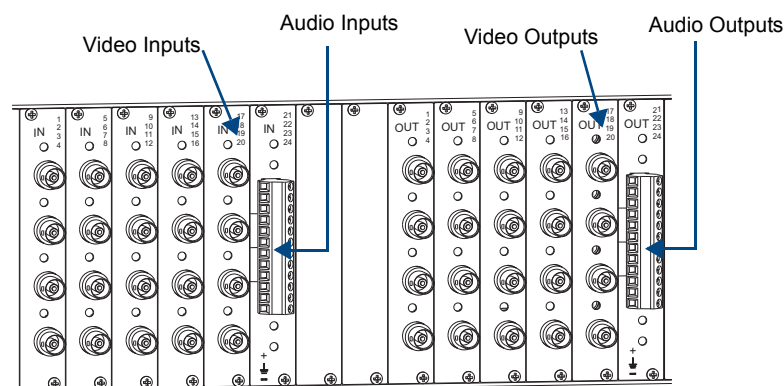
Input and output connectors are the attachment points for source and destination devices that connect to the system. Looking at the rear of a Modula enclosure, the inputs (for sources) are on the left side of the enclosure, and the outputs (for destinations) are on the right side of the enclosure.

The number and type of connectors depend on the number and type of input and output boards. Input and output connectors are numbered separately. The four connector numbers for each board are above and to the right of its top connector. This numbering pattern continues on each board (FIG. 20).

**Note:** Depending on the types of boards in the configuration, the numbering may start over with each board type.

When attaching input and output signal cables, refer to the sheet labeled “AutoPatch Modula Connector Guide” that shipped with the system. The guide shows where to attach each signal cable on the rear of each enclosure. The system’s serial number is in two places on the Modula enclosure; left rear and left side (near the power receptacle). The label on the side also has the enclosure number, referred to as the chassis number. Follow the guide exactly; the system was programmed at the factory to operate only as indicated on the “Connector Guide.”

Before connecting all input and output cables, attach only the first two inputs and outputs and execute a test switch (see page 41). When the test switch is successful, attach the rest of the input and output cables.



**FIG. 20** Numbering starts with top channel of left-most board

### Signal Types and Connectors

Signal types and connectors for a Modula enclosure could include those listed in the table below.

Signal Type	Connector Type
Analog video (composite)	BNC
S-Video	Locking S-Video, S-Video
Y/c	BNC
HV Sync	BNC
RGBHV	HD-15 or BNC
RGBHV + Stereo (CatPro)	RJ-45
Composite or S-Video; stereo or mono (Cat5)	RJ-45
Wideband Video (300 MHz)	BNC
HDTV / Component	BNC
Digital video (HD-SDI and SD-SDI)	BNC
Analog audio – mono (balanced or unbalanced)	Pluggable 3-position terminal block
Analog audio – stereo (balanced or unbalanced)	Pluggable 5-position terminal block
Digital audio	BNC

For board connector information and specifications, see the specific board chapter in this manual.

## Applying Power and Startup

The enclosure's universal power receptacle will accept all major international standard power sources. Standard US power cords are provided for installations within the US. Maximum power specifications are on the power receptacle (also listed on page 14). Always use an earth-grounded power cord / system with a Modula.

The source electrical outlet should be installed near the Modula, easily accessible, and properly grounded. Power should come from a building branch circuit. We strongly recommend using a dedicated line for the system's power. Use a minimum breaker current rating of 15 A for 110 V or 30 A for 230 V. To avoid an overload, note the power consumption rating of all the equipment connected to the circuit breaker before applying power.



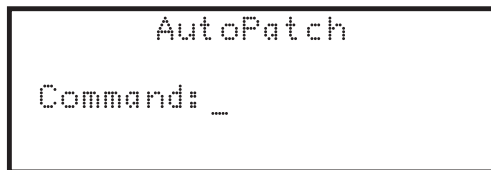
**Caution:** *To avoid system damage, turn on all power switches for the AMX AutoPatch equipment at the same time before applying power to the system's source and destination devices. We recommend attaching all power cords to a surge protector and/or an AC line conditioner.*

### Power-Up Sequence

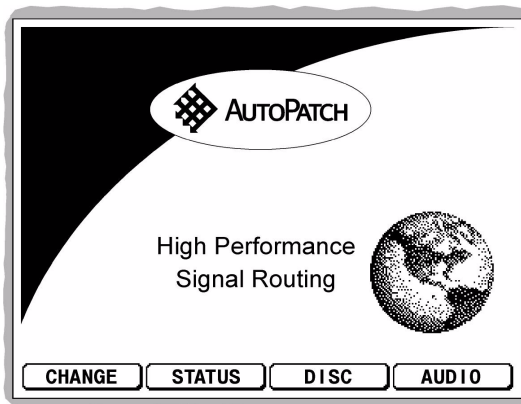
#### To apply power:

1. Attach the first two source and destination devices.  
*Do not apply power to the source and destination devices until Step 8.*
2. Optional – Attach an external controller (see page 31).
3. Plug the power cord into the power receptacle on the enclosure (repeat for multiple-enclosure systems).
4. Plug the other end of the power cord(s) into a power strip (we recommend a 30 A power strip) *that is turned off.*
5. Turn on the power strip (to all enclosures if applicable).
6. Press the “I” side of the power switch on the rear of the enclosure(s).  
The Power Indicator illuminates.
7. Apply power to any external control device/system.
8. Apply power to the source and destination devices.  
For startup information on specific types of control *before* executing a test switch, see page 31.  
The system is ready for a test switch. See “Executing A Test Switch” on page 41.

After applying power and turning on the enclosure(s), the LED on the control panel illuminates and displays the menu screen. FIG. 21 and FIG. 22 show examples of control panel startup screens. The system is ready for a test switch.



**FIG. 21** Command screen on the CP-10



**FIG. 22** Main Menu screen on the CP-20A

**Note:** For instructions on checking the software version, see the applicable Control Panel Instruction Manual.

## Serial Control Device Startup

If you have not already done so, attach the serial control device to the serial port on the enclosure (see page 31) and open the control program.

### AMX Control Devices

Modula Distribution Matrices are compatible with a number of AMX control devices. For control programming information, see the instruction manual for the specific interface.

### APControl 3.0

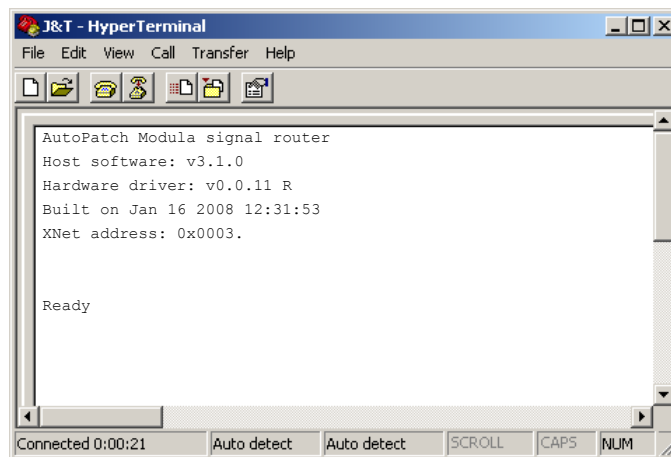
If you are using APControl 3.0, install and open the program. Follow the directions in the setup wizard to discover the system's configuration. From the Launchbar menu, select Views / CrossBar and click on the crosspoints to execute switches.

### APWeb

For startup information, see the APWeb Server Module documentation.

### HyperTerminal

When power is applied to the enclosure, HyperTerminal displays a short splash screen followed by "Ready" (FIG. 23). The system is ready for a test switch (see page 41).



**FIG. 23** Power-up splash screen in HyperTerminal

FIG. 23 shows an example of a short splash screen (your system's splash screen may differ). The short splash screen provides the following information:

- Host software – version of the initial operating system (IOS)
- Hardware driver – the firmware version
- Built – date the software was built
- XNet address – enclosure's XNNet identification number

To see advanced system information, enter `~scr!` to view a long splash screen.

**Note:** AMX reserves the right to add to the contents of the splash screen at any time, without notice.

## Executing a Test Switch

Execute a test switch to verify the system is working properly before attaching all inputs and outputs. Aside from having signal cables (and a controller if applicable) attached, the system is ready to execute switches when it ships from the factory.

The first two source and destination devices must be attached to the input and output connectors as indicated in the “AutoPatch Modula Connector Guide” that is shipped with each system (for specific board connector information and specifications, see the specific board chapter in this manual). After the devices are connected, power must be applied to the enclosure and then to the devices before executing a test switch.

**Note:** *If the signal from the source or destination device is a component signal that requires being attached to multiple input or output connectors (e.g., an RGB signal that requires three connectors), all of the signal cables for that signal must be attached before executing the test switch.*

A test switch can be executed from the following:

- A front or remote control panel
- AMX control device
- AMX control software, such as, APControl 3.0 or APWeb
- BCS (Basic Control Structure) commands over an external controller
- An external third-party controller

## Executing a Test Switch

**Before executing the test switch**, make sure the first two source devices and the first two destination devices are connected to the input and output connectors exactly as shown on the “AutoPatch Modula Connector Guide” that is shipped with each system. Depending on the signal type (e.g., component signals), you may need to attach multiple input and output cables.

**When executing a test switch**, we suggest routing Input (source) 1 to Output (destination) 2 on the virtual matrix or level indicated on the “AutoPatch Modula Connector Guide.”

### *Control Panel*

Directions for executing switches using the control panel specific to your system can be found in the applicable control panel instruction manual on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com). Depending on the control panel, the term *virtual matrix* or *level* may appear on the LCD screen. When controlling a Modula, these terms are interchangeable.

### *AMX Control Device*

For executing and disconnecting switches using an AMX control device, see the specific control device documentation.

### *APControl 3.0 or APWeb*

Directions for executing and disconnecting switches using APControl 3.0 are found in its Help file. For directions for executing switches using APWeb, see the *APWeb* documentation.

### BCS Commands

To enter BCS commands, the system must be attached to a serial control device (see “Attaching External Control” on page 31) running a terminal emulation program such as Windows® HyperTerminal. The settings on the PC serial communication software and the enclosure *must* correspond to each other. For setting information, see page 34.

When using HyperTerminal, command characters are entered and sent to the enclosure’s CPU (the command characters appear in HyperTerminal when the enclosure responds). When all of the entered characters appear in HyperTerminal, the command has been successfully executed.

The following test switch routes Input 1 to Output 2 on Level 0 (or use the level indicated on your system’s “AutoPatch Modula Connector Guide”).

#### To execute a test switch using BCS commands:

1. Enter the following BCS command line:

```
CL0I1O2T
```

When the “T” appears, the system has successfully executed the command. If any other characters appear, the command was not successful. Verify that the source signal is present (visible and/or audible) at the destination.

For a complete list of BCS commands and responses, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com).

### Troubleshooting

If the test switch did not execute correctly:

- Check the power indicator on the front of the enclosure.  
If it is not illuminated, check the power cords.
- Verify the status of the test switch.  
If using BCS commands, enter “SL0O2T”.  
If “SL0O2T (1)” appears, the test switch is routed.  
If the status returns as routed correctly, the system established a connection between the specified input and output connectors within the enclosure.
- Check all link and signal connections on the rear of the enclosure(s) to make sure everything is physically set up correctly.
- Check all power switches on the source and destination devices to make sure they are all turned on.
- Isolate source and destination equipment and cable problems by patching around the router using barrel connectors to check the overall signal path.
- Attempt the switch again.  
If the switch still does not work, contact technical support (see page 43).



## Technical Support

Before contacting technical support with a question, please consult this manual. If you still have questions, contact your AMX representative or technical support. Have your system's serial number ready. The system's serial number is normally located in two places on the enclosure; on the left rear and on the left side (near the power receptacle).

We recommend recording your system's serial number in an easily accessible location.

### *AMX Contact Information*

- 3000 Research Drive, Richardson, TX 75082
- 800.222.0193
- 469.624.8000
- Fax 469.624.7153
- Technical Support 800.932.6993
- [www.amx.com](http://www.amx.com)



# Standard Video Boards

## Applicability Notice

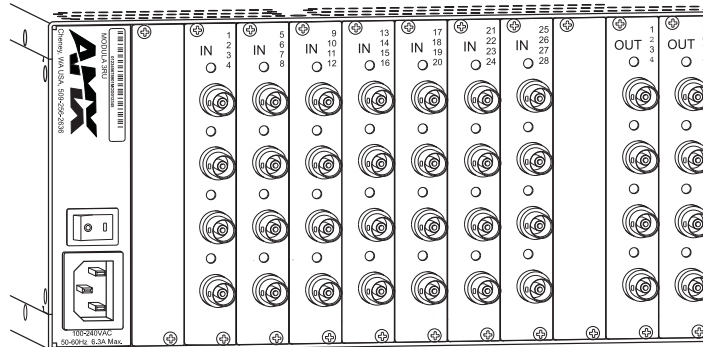


FIG. 24 Standard video boards

This chapter pertains to Modula standard video boards contained in pre-engineered systems and custom systems. The following five tables provide information on the types of standard video boards and their numbers and indicate which enclosure models can hold which boards.

Applicability Table 1A									
Standard Video Boards in Standard Video, S-Video, and Cat5 / Video & Audio Enclosures									
<b>Note:</b> For Cat5 Video and Audio enclosures – the standard video boards listed in this table do not work with Cat5 boards or Cat5 compatible standard video boards. For Cat5 compatible standard video boards, see Applicability Table 2 (page 47).									
Standard Video Boards & Numbers <i>Note: Specifications for these boards are listed in Specifications Table 1 (page 48).</i>	Enclosure Types & Numbers								
	Standard Video (32x32) <b>FG1034-31</b>	Standard Video (16x48 Flex-slot) <b>FG1034-16</b>	Standard Video (48x16 Flex-slot) <b>FG1034-46</b>	S-Video & Stereo (32x32) <b>FG1034-34</b>	S-Video & Stereo (16x48) <b>FG1034-19</b>	S-Video & Stereo (48x16) <b>FG1034-49</b>	Cat5 / Video & Audio (32x32) <b>FG1034-37</b>	Cat5 / Video & Audio (16x48 Flex-slot) <b>FG1034-22</b>	Cat5 / Video & Audio (48x16 Flex-slot) <b>FG1034-52</b>
Input - Standard Video <b>FG1034-455</b>	•		•	•	•	•	•		•
Input - Standard Video, High Impedance <b>FG1034-461</b>	•		•	•		•	•		•
Input - Standard Video <b>FG1034-569</b>		•			•			•	
Output - Standard Video <b>FG1034-476</b>	•	•	•	•	•	•	•	•	•

Applicability Table 1B Standard Video Boards in Wideband Video and Wideband Video & Stereo Enclosures				
	Enclosure Types & Numbers			
	Wideband Video (32x32) <b>FG1034-25</b>	Wideband Video (16x48 Flex-slot) <b>FG1034-10</b>	Wideband Video (48x16 Flex-slot) <b>FG1034-43</b>	Wideband & Stereo (32x32) <b>FG1034-28</b>
<b>Standard Video Boards &amp; Numbers</b> <i>Note: Specifications for these boards are listed in Specifications Table 1 (page 48).</i>				
Input - Standard Video <b>FG1034-452</b>	●	●	●	●
Input - Standard Video, High Impedance <b>FG1034-458</b>	●	●	●	●
Output - Standard Video <b>FG1034-470</b>			●	
Output - Standard Video <b>FG1034-473</b>	●			●
Output - Standard Video <b>FG1034-572</b>		●		

Applicability Table 1C Standard Video Boards in SDI Digital Video & Wideband Video, SDI Digital Video & Standard Video, and SDI Digital Video & S-Video Enclosures			
	Enclosure Types & Numbers		
	SDI Digital Video & Wideband Video (32x32) <b>FG1034-27</b>	SDI Digital Video & Standard Video (32x32) <b>FG1034-30</b>	SDI Digital Video & S-Video (32x32) <b>FG1034-33</b>
<b>Standard Video Boards &amp; Numbers</b> <i>Note: Specifications for these boards are listed in Specifications Table 1 (page 48).</i>			
Input - Standard Video <b>FG1034-454</b>		•	•
Input - Standard Video <b>FG1034-448</b>	•		
Output - Standard Video <b>FG1034-457</b>		•	•
Output - Standard Video <b>FG1034-451</b>	•		

Applicability Table 2 Cat5 Compatible Standard Video Boards in Cat5 Video & Audio Enclosures	
<i>Note: Cat5 compatible standard video boards work in conjunction with Cat5 TX and RX modules or AF-10 boards and are not compatible with the standard video boards listed in Table 1A that work in the Cat5 / Video and Audio enclosures.</i>	
Standard Video Boards & Numbers	Enclosure Types & Numbers
<i>Note: Specifications for these boards are listed in Specifications Table 2 (page 49).</i>	Cat5 / Video & Audio (32x32) <b>FG1034-37</b>
Input – Standard Video to Cat5 output <b>FG1034-509</b>	Cat5 / Video & Audio (16x48 Flex-slot) <b>FG1034-22</b>
Output – Standard Video from Cat5 input <b>FG1034-521</b>	Cat5 / Video & Audio (48x16 Flex-slot) <b>FG1034-52</b>

Applicability Table 3 Standard Video Boards in CatPro RGBHV/HD-15 and RGBHV/HD-15 Enclosures	
<b>Note:</b> These standard video boards cannot work in conjunction with CatPro boards.	
Standard Video Boards & Numbers	Enclosure Types & Numbers
<b>Note:</b> Specifications for these boards are listed in Specifications Table 3 (page 49).	CatPro RGBHV/HD-15 (32x32) <b>FG1034-42</b>
Input - Standard Video <b>FG1034-647</b>	RGBHV/HD-15 (32x32) <b>FG1034-61</b>
Input - Standard Video, High Impedance <b>FG1034-650</b>	
Output - Standard Video <b>FG1034-659</b>	

## Standard Video Boards Specifications

### Specifications Table 1

Applies to Modula standard video boards listed in Applicability Tables 1A, 1B, and 1C (page 45 to page 47).

Also applies to these standard video boards when contained in pre-engineered systems.

Specifications Table 1		
Parameter	Conditions	Value
Frequency Response	1 to All	±3 dB to 50 MHz or better ±1 dB to 20 MHz or better
Crosstalk	f = 5 MHz	<-50 dB
Differential Gain	f = 3.58 MHz	<0.2% or better
Differential Phase	f = 3.58 MHz	<0.2° or better
Signal to Noise Ratio (SNR)	V <sub>in</sub> = 0.7 V, 100 IRE	>65 dB
Input Level (max.)		±2.5 V
Input Impedance		75 ohms
Output Level (max.)		±2.5 V
Output Impedance		75 ohms
Connector Type		BNC

## Specifications Table 2

Applies to Modula Cat5 compatible standard video boards contained in Cat5 systems listed in Applicability Table 2 (page 47).

Also applies to these Cat5 compatible standard video boards when contained in pre-engineered systems.

Specifications Table 2		
Parameter	Conditions	Value
Frequency Response	Using Cat5, Cat5e, or Cat6 cable: Up to 3 ft. (0.9 m) Up to 300 ft. (91 m) Up to 1000 ft. (305 m)	$\pm 3$ dB to 35 MHz or better $\pm 3$ dB to 15 MHz or better $\pm 3$ dB to 10 MHz or better
Crosstalk	f = 5 MHz	<50 dB
Differential Gain	f = 3.58 MHz, 10 to 90% APL	<0.2% or better
Differential Phase	f = 3.58 MHz, 10 to 90% APL	<1° or better
Signal to Noise Ratio (SNR)	Vin = 0.7 V, 100 IRE	>65 dB
Input Level (max.)		$\pm 1$ V
Input Impedance		75 ohms
Output Level (max.)		$\pm 1$ V
Output Impedance		75 ohms
Connector Type		BNC

## Specifications Table 3

Applies to Modula standard video input and output boards contained in CatPro systems listed in Applicability Table 3 (page 48).

Also applies to these standard video boards when contained in pre-engineered systems.

Specifications Table 3		
Parameter	Conditions	Value
Frequency Response	1 to All	$\pm 3$ dB to 50 MHz or better $\pm 1$ dB to 20 MHz or better
Crosstalk	f = 5 MHz	<-50 dB
Differential Gain	f = 3.58 MHz	<0.2% or better
Differential Phase	f = 3.58 MHz	<0.2° or better
Signal to Noise Ratio (SNR)	Vin = 0.7 V, 100 IRE	>65 dB
Return Loss (Input)	f = 5 MHz	<-45 dB
Input Level (max.)		$\pm 1.2$ V
Input Impedance		75 ohms
Output Level (max.)		$\pm 1.2$ V
Output Impedance		75 ohms
Connector Type		BNC

AMX reserves the right to modify its products and their specifications without notice.

## Attaching Cables

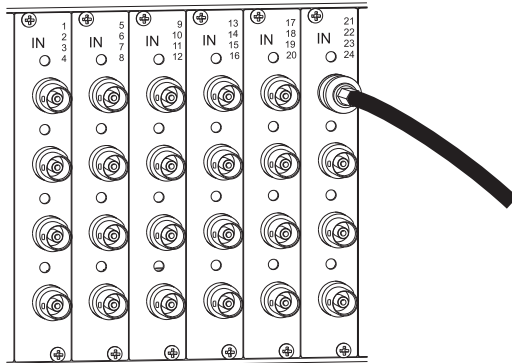
**Important:** If using Cat5 compatible standard video boards – for information on installation and system setup, first see “Cat5 Video and Audio Boards with TXs & RXs” starting on page 123.

When attaching standard video input and output cables, refer to the sheet labeled “AutoPatch Modula Connector Guide” that ships with the system. The sheet shows you where to attach each cable and each wire on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet.

### Attaching Video Cables

#### To connect video inputs and outputs:

1. Fasten the cables onto the input and output BNC connectors (FIG. 25).



**FIG. 25** Fasten cable onto input or output BNC connector

Make sure the video cable is connected to the correct BNC connector on the correct enclosure. Standard video boards look similar to wideband, HV sync, HD-SDI digital, SD-SDI digital, and vertical interval sync boards, but the “Connector Guide” identifies them.



# Wideband Boards

## Applicability Notice

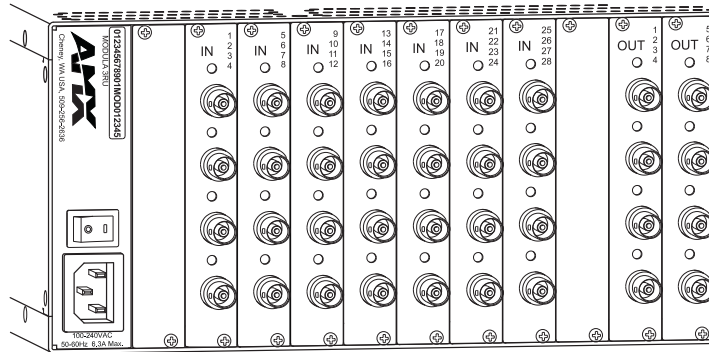


FIG. 26 Wideband video boards

This chapter pertains to the Modula wideband video boards contained in pre-engineered systems and custom systems. The following two tables provide information on the types of wideband video boards and their numbers and indicates which enclosure models can hold which boards.

Applicability Table 1 Wideband Video Boards in Wideband Video, Wideband & Stereo, and SDI Digital Video & Wideband Video Enclosures					
	Enclosure Types & Numbers				
	Wideband Video (32x32) <b>FG1034-25</b>	Wideband Video (16x48 Flex-slot) <b>FG1034-10</b>	Wideband Video (48x16 Flex-slot) <b>FG1034-43</b>	Wideband & Stereo (32x32) <b>FG1034-28</b>	SDI Digital Video & Wideband Video (32x32) <b>FG1034-27</b>
<b>Wideband Video Boards &amp; Numbers</b> <i>Note: Specifications for these boards are listed in Specifications Table 1 (page 52).</i>					
Input – Wideband Video <b>FG1034-497</b>	●	●	●	●	
Output – Wideband Video <b>FG1034-506</b>	●			●	
Output – Wideband Video <b>FG1034-500</b>			●		
Output – Wideband Video <b>FG1034-503</b>		●			
Input – Wideband Video <b>FG1034-442</b>					●
Output – Wideband Video <b>FG1034-445</b>					●

<b>Applicability Table 2</b> <b>Wideband Video Boards in RGBHV/HD-15 and CatPro RGBHV/HD-15 Enclosures</b>	
<b>Wideband Video Boards &amp; Numbers</b>	<b>Enclosure Types &amp; Numbers</b>
<b>Note:</b> Specifications for these boards are listed in Specifications Table 2 (page 53).	RGBHV/HD-15 (32x32, 4 RU) <b>FG1034-61</b>
Input – Wideband Video <b>FG1034-638</b>	CatPro RGBHV/HD-15 (32x32, 4 RU) <b>FG1034-42</b>
Input – Wideband Video, High Impedance <b>FG1034-641</b>	
Output – Wideband Video <b>FG1034-644</b>	

## Wideband Video Board Specifications

### Specifications Table 1

Applies to wideband video input and output boards listed in Applicability Table 1 (page 51). Also applies to these wideband video boards when contained in pre-engineered systems.

<b>Specifications Table 1</b>		
<b>Parameter</b>	<b>Conditions</b>	<b>Value</b>
Frequency Response	1 to All	±3 dB to 300 MHz or better ±1.5 dB to 200 MHz or better ±1 dB to 60 MHz or better
Crosstalk	f = 5 MHz f = 150 MHz	<-60 dB <-30 dB
Signal to Noise Ratio	V <sub>in</sub> = 0.7 V, 100 IRE	>60 dB
Input Level (max.)		±1.75 V
Input Impedance		75 ohms
Sync Input / Output Level		TTL
Output Level (max.)		±1.75 V
Output Impedance		75 ohms
Connector Type		BNC

## Specifications Table 2

Applies to wideband video input and output boards listed in Applicability Table 2 (page 52).

Also applies to these wideband video boards when contained in pre-engineered systems.

Specifications Table 2		
Parameter	Conditions	Value
Frequency Response	1 to All	±3 dB to 300 MHz or better ±1.5 dB to 200 MHz or better ±1 dB to 60 MHz or better
Crosstalk	f = 5 MHz f = 150 MHz	<-60 dB <-30 dB
Signal to Noise Ratio	V <sub>in</sub> = 0.7 V, 100 IRE	>60 dB
Input Level		±1.75 V
Input Impedance		75 ohms
Return Loss – CatPro RGBHV/HD-15 enclosures only		<-45 dB
Output Level		±1.75 V
Output Impedance		75 ohms
Connector Type		BNC

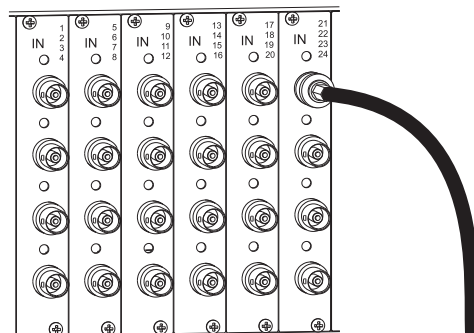
AMX reserves the right to modify its products and their specifications without notice.

## Attaching Cables

When attaching wideband input and output cables, refer to the sheet labeled “AutoPatch Modula Connector Guide” that ships with the system. The sheet shows you where to attach each cable on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side (near the power receptacle).

### To connect wideband video inputs and outputs:

1. Fasten the cables onto the input and output BNC connectors (FIG. 27).



**FIG. 27** Fasten cable onto input or output BNC connector

Make sure the video cable is connected to the correct BNC connector on the correct enclosure. Wideband video boards look similar to standard, HV sync, HD-SDI digital, SD-SDI digital, and vertical interval sync boards, but the “Connector Guide” identifies them.



# HV Sync Video Boards

## Applicability Notice

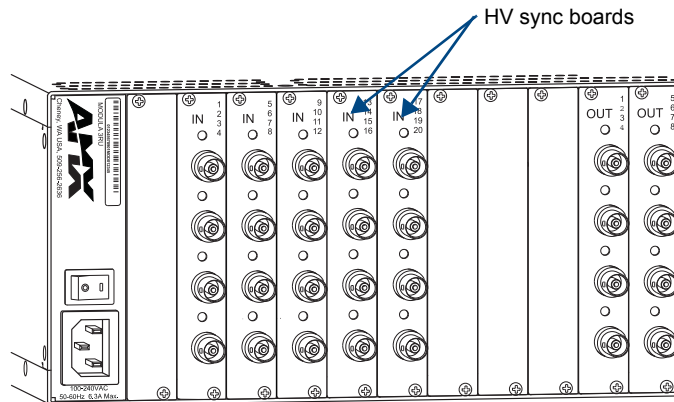


FIG. 28 2 HV sync boards (shown with 3 Wideband Video input boards)

This chapter pertains to Modula HV sync boards contained in pre-engineered systems and custom systems. The following three tables provide information on the types of HV sync boards and their numbers and indicate which enclosure models can hold which boards.

Applicability Table 1 HV Sync Boards in Standard Video and S-Video & Stereo Enclosures	
HV Sync Boards & Numbers	Enclosure Types & Numbers
<b>Note:</b> Specifications for these boards are listed on page 57.	Standard Video (32x32) <b>FG1034-31</b>
Input - HV Sync Video <b>FG1034-464</b>	Standard Video (16x48 Flex-slot) <b>FG1034-16</b>
Output - HV Sync Video <b>FG1034-479</b>	Standard Video (48x16 Flex-slot) <b>FG1034-46</b>
	S-Video & Stereo (32x32) <b>FG1034-34</b>
	S-Video & Stereo (16x48) <b>FG1034-19</b>
	S-Video & Stereo (48x16) <b>FG1034-49</b>

<b>Applicability Table 1 (continued)</b> <b>HV Sync Boards in Cat5 / Video &amp; Audio, Wideband Video, and Wideband Video &amp; Stereo Enclosures</b>	
<b>HV Sync Boards &amp; Numbers</b>	<b>Enclosure Types &amp; Numbers</b>
<b>Note:</b> Specifications for these boards are listed on page 57.	Cat5 / Video & Audio (32x32) <b>FG1034-37</b>
Input - HV Sync Video <b>FG1034-464</b>	Cat5 / Video & Audio (16x48 Flex-slot) <b>FG1034-22</b>
Output - HV Sync Video <b>FG1034-479</b>	Cat5 / Video & Audio (48x16 Flex-slot) <b>FG1034-52</b>
	Wideband Video (32x32) <b>FG1034-25</b>
	Wideband Video (16x48 Flex-slot) <b>FG1034-10</b>
	Wideband Video (48x16 Flex-slot) <b>FG1034-43</b>
	Wideband & Stereo (32x32) <b>FG1034-28</b>

<b>Applicability Table 2</b> <b>HV Sync Boards in SDI Digital Video &amp; Wideband Video, SDI Digital Video &amp; Standard Video, and SDI Digital Video &amp; S-Video Enclosures</b>	
<b>HV Sync Boards &amp; Numbers</b>	<b>Enclosure Types &amp; Numbers</b>
<b>Note:</b> Specifications for these boards are listed on page 57.	SDI Digital Video & Wideband Video (32x32) <b>FG1034-27</b>
Input - HV Sync Video <b>FG1034-499</b>	SDI Digital Video & Standard Video (32x32) <b>FG1034-30</b>
Output - HV Sync Video <b>FG1034-502</b>	SDI Digital Video & S-Video (32x32) <b>FG1034-33</b>

<b>Applicability Table 3</b> <b>HV Sync Boards in CatPro RGBHV/HD-15 and RGBHV/HD-15 Enclosures</b>	
<b>Note:</b> These HV sync boards cannot work in conjunction with CatPro boards.	
<b>HV Sync Boards &amp; Numbers</b>	<b>Enclosure Types &amp; Numbers</b>
<b>Note:</b> Specifications for these boards are listed on page 57.	CatPro RGBHV/HD-15 (32x32) <b>FG1034-42</b>
Input - HV Sync Video <b>FG1034-653</b>	RGBHV/HD-15 (32x32) <b>FG1034-61</b>
Output - HV Sync Video <b>FG1034-662</b>	

## HV Sync Boards Specifications

Applies to Modula HV sync boards FG1034-464, FG1034-479, FG1034-499, FG1034-502, FG1034-653, and FG1034-662.

Also applies to these HV sync boards when contained in pre-engineered systems.

Specifications		
Parameter	Conditions	Value
HV Sync Input Level		0 V to +5 V
HV Sync Output Level		0 V to +5 V
Sync Polarity		Output follows Input
Connector Type		BNC

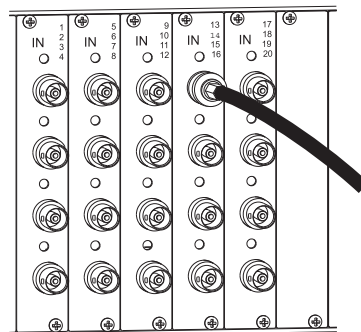
AMX reserves the right to modify its products and their specifications without notice.

## Attaching Cables

When attaching HV sync input and output cables, refer to the sheet labeled “AutoPatch Modula Connector Guide” that ships with the system. The sheet shows you where to attach each cable and each wire on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet.

### To connect HV sync inputs and outputs:

1. Fasten the cable connector onto the input or output BNC connectors (FIG. 29).



**FIG. 29** Fasten cable onto input or output BNC connector

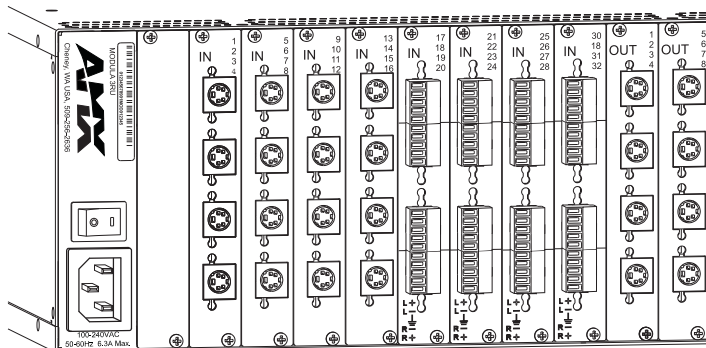
Make sure the video cable is connected to the correct BNC connector on the correct enclosure. HV sync boards look similar to standard video, wideband, HD-SDI digital, SD-SDI digital, and vertical interval sync boards, but the “Connector Guide” identifies them.





# S-Video Boards

## Applicability Notice



**FIG. 30** S-Video boards (shown with stereo audio boards)

This chapter pertains to the Modula S-Video boards contained in pre-engineered systems and custom systems. The following four tables provide information on the types of S-Video boards and their numbers and indicate which enclosure models can hold which boards.

**Applicability Table 1A**

### S-Video Boards in S-Video & Stereo and Cat5 / Video & Audio Enclosures

**Note:** For Cat5 Video & Audio enclosures – the S-Video boards listed in this table cannot work in conjunction with Cat5 boards or Cat5 compatible S-Video boards. For Cat5 compatible S-Video boards, see Applicability Table 2 (page 60).

S-Video Boards & Numbers	Enclosure Types & Numbers
<b>Note:</b> Specifications for these boards are listed in Specifications Table 1 (page 61).	S-Video & Stereo (32x32) <b>FG1034-34</b>
Input – S-Video <b>FG1034-467</b>	S-Video & Stereo (16x48 Flex-slot) <b>FG1034-19</b>
Output – S-Video <b>FG1034-482</b>	S-Video & Stereo (48x16 Flex-slot) <b>FG1034-49</b>
	Cat5 / Video & Audio (32x32) <b>FG1034-37</b>
	Cat5 / Video & Audio (16x48 Flex-slot) <b>FG1034-22</b>
	Cat5 / Video & Audio (48x16 Flex-slot) <b>FG1034-52</b>

**Applicability Table 1B**

### S-Video Boards in SDI Digital Video & S-Video Enclosures

S-Video Boards & Numbers	Enclosure Type & Number
<b>Note:</b> Specifications for these boards are listed in Specifications Table 1 (page 61)	SDI Digital Video & S-Video (32x32) <b>FG1034-33</b>
Input – S-Video <b>FG1034-505</b>	
Output – S-Video <b>FG1034-508</b>	

Applicability Table 2 Cat5 Compatible S-Video Boards in Cat5 / Video & Audio Enclosures	
<b>Note:</b> Cat5 compatible S-Video boards work in conjunction with Cat5 TX and RX modules or AF-10 boards and are not compatible with the S-Video boards listed in Table 1A.	
S-Video Boards & Numbers	Enclosure Type & Number
<b>Note:</b> Specifications for these boards are listed in Specifications Table 2 (page 61).	Cat5 / Video & Audio (32x32) <b>FG1034-37</b>
Input – S-Video to Cat5 Output <b>FG1034-512</b>	Cat5 / Video & Audio (16x48 Flex-slot) <b>FG1034-22</b>
Output – S-Video from Cat5 Input <b>FG1034-524</b>	Cat5 / Video & Audio (48x16 Flex-slot) <b>FG1034-52</b>

Applicability Table 3 S-Video Boards in CatPro RGBHV/HD-15 and RGBHV/HD-15 Enclosures	
<b>Note:</b> These S-Video boards cannot work in conjunction with CatPro boards.	
S-Video Boards & Numbers	Enclosure Types & Numbers
<b>Note:</b> Specifications for these boards are listed in Specifications Table 3 (page 62).	CatPro RGBHV/HD-15 (32x32) <b>FG1034-42</b>
Input – S-Video <b>FG1034-430</b>	RGBHV/HD-15 (32x32) <b>FG1034-61</b>
Output – S-Video <b>FG1034-433</b>	

## S-Video Boards Specifications

### Specifications Table 1

Applies to S-Video boards listed in Applicability Tables 1A and 1B (see page 59).

Also applies to these S-Video boards when contained in pre-engineered systems.

Specifications Table 1		
Parameter	Conditions	Value
Frequency Response	1 to All	±3 dB to 50 MHz or better ±1 dB to 20 MHz or better
Crosstalk	f = 5 MHz	<-50 dB
Differential Gain	f = 3.58 MHz	<0.2% or better
Differential Phase	f = 3.58 MHz	<0.2° or better
Signal to Noise Ratio (SNR)	V <sub>in</sub> = 0.7 V, 100 IRE	>65 dB
Input Level (max.)		±2 V
Input Impedance		75 ohms
Output Level		±2 V
Output Impedance		75 ohms
Connector Type		S-Video (4 Pin Mini-Din), Locking S-Video

### Specifications Table 2

Applies to Cat5 compatible S-Video boards contained in Cat5 Video / Audio enclosures listed in Applicability Table 2 (see page 60).

Also applies to these S-Video boards when contained in pre-engineered systems.

Specifications Table 2		
Parameter	Conditions	Value
Frequency Response	Using Cat5, Cat5e, or Cat6 cable: Up to 3 ft. (0.9 m) Up to 300 ft. (91.4 m) Up to 1000 ft. (304.8 m)	±3 dB to 35 MHz or better ±3 dB to 15 MHz or better ±3 dB to 10 MHz or better
Crosstalk	f = 5 MHz	<-50 dB
Differential Gain	f = 3.58 MHz, 10 to 90% APL	<0.2% or better
Differential Phase	f = 3.58 MHz, 10 to 90% APL	<1° or better
Signal to Noise Ratio (SNR)	V <sub>in</sub> = 0.7 V, 100 IRE	>65 dB
Input Level (max.)		±1 V
Input Impedance		75 ohms
Output Level (max.)		±1 V
Output Impedance		75 ohms
Connector Type		S-Video (4 Pin Mini-Din), Locking S-Video

### Specifications Table 3

Applies to S-Video boards contained in RGBHV/HD-15 and CatPro RGBHV/HD-15 enclosures listed in Specifications Table 3 (see page 60).

Also applies to these S-Video boards when contained in pre-engineered systems.

Specifications Table 3		
Parameter	Conditions	Value
Frequency Response	1 to All	±3 dB to 50 MHz or better ±1 dB to 20 MHz or better
Crosstalk	f = 5 MHz	<-60 dB
Signal to Noise Ratio (SNR)	V <sub>in</sub> = 0.7 V, 100 IRE	>65 dB
Channel Separation – CatPro RGBHV/HD-15 enclosures	f = 5 MHz	>65 dB
Channel Separation – RGBHV/HD-15 enclosures	f = 5 MHz	<-65 dB
Differential Gain	f = 3.58 MHz	<0.2% or better
Differential Phase	f = 3.58 MHz	<0.2° or better
Return Loss (Input)	f = 5 MHz	<-45 dB
Input Level (max.)		±1 V
Input Impedance		75 ohms
Output Level (max.)		±1 V
Output Impedance		75 ohms
Connector Type		S-Video (4 Pin Mini-Din), Locking S-Video

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## Attaching Cables

**Important:** If using Cat5 compatible S-Video boards – for information on installation and system setup, first see “Cat5 Video and Audio Boards with TXs and RXs” starting on page 123.

When attaching S-Video input and output cables, refer to the sheet labeled “AutoPatch Modula Connector Guide” that ships with the system. The sheet shows you where to attach each cable on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side (near the power receptacle).

### Attaching S-Video Cables

Modula S-Video boards are equipped with locking S-Video connectors. When used in conjunction with an AMX AutoPatch manufactured S-Video cable, the connector and the cable lock into place. Standard S-Video connectors may be used, but will not lock.

#### To connect S-Video inputs and outputs:

1. Fasten the cables onto the input and output S-Video connectors (FIG. 31).

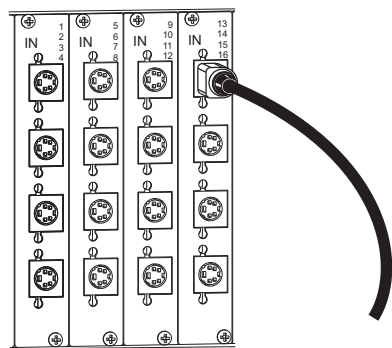


FIG. 31 Fasten S-Video cable onto connector



**Caution:** To avoid damaging a locking S-Video connector or board, be sure to pull on the connector housing instead of the cable.

#### To fasten a locking S-Video connector:

1. Hold the connector at a slight angle to the right while pushing in.  
**Or**  
 Pull back on the housing of the connector (FIG. 32) while pushing the connector in.

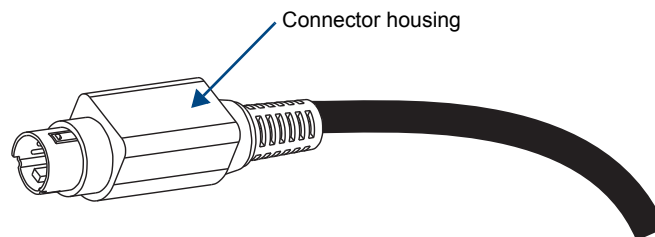


FIG. 32 Pull back housing to fasten connector

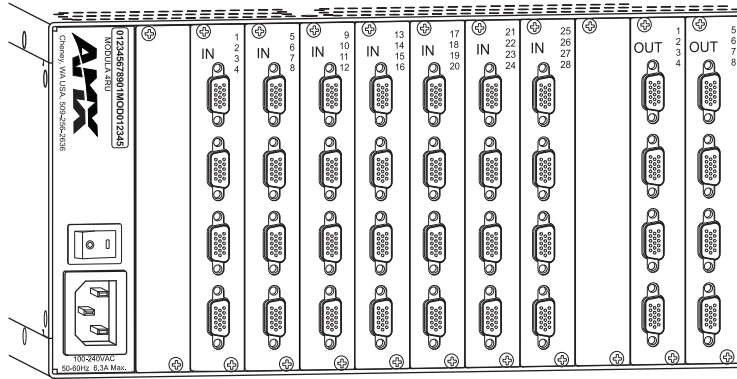
#### To remove a locking S-Video connector:

1. Pull back on the housing of the connector.



# RGBHV/HD-15 Boards

## Applicability Notice



**FIG. 33** RGBHV/HD-15 boards

This chapter pertains to Modula RGBHV/HD-15 video boards contained in pre-engineered systems and custom systems. The table below provides information on RGBHV/HD-15 boards and their numbers and which enclosure models can hold which boards.

RGBHV/HD-15 boards can be used in conjunction with CatPro boards; i.e., an RGBHV/HD-15 input board can switch to CatPro output boards and an RGBHV/HD-15 output board can receive RGBHV/HD-15 signals from CatPro input boards.

Modula RGBHV/HD-15 Boards in RGBHV/HD-15 and CatPro RGBHV/HD-15 Enclosures	
RGBHV/HD-15 Boards & Numbers	Enclosure Types & Numbers
<b>Note:</b> Specifications for these boards are listed on page 66.	
Input <b>FG1034-590</b>	RGBHV/HD-15 (32x32, 4 RU) <b>FG1034-61</b>
Output <b>FG1034-593</b>	CatPro RGBHV/HD-15 (32x32, 4 RU) <b>FG1034-42</b>

## RGBHV/HD-15 Specifications

### RGBHV/HD-15 and CatPro Enclosures – RGBHV/HD-15 to RGBHV/HD-15

Applies to Modula RGBHV/HD-15 boards FG1034-590 and FG1034-593 when contained in RGBHV/HD-15 enclosures. Applies to these boards when contained in CatPro enclosures and switching to RGBHV/HD-15 boards.

Also applies to these RGBHV/HD-15 boards when contained in preconfigured systems and switching to RGBHV/HD-15 boards.

Specifications Table 1		
Parameter	Conditions	Value
Frequency Response		±3 dB to 300 MHz or better
Crosstalk	f = 150 MHz f = 30 MHz f = 5 MHz	<-30 dB <-35 dB <-50 dB
Signal to Noise Ratio (SNR)	Vin = 0.7 V, 100 IRE	>60 dB
Input Level (max.)		±1.5 V
Input Impedance		75 ohms
Return Loss (Input)	f = 5 MHz	<-45 dB
Sync Input Level		TTL
Output Level (max.)		±1.5 V
Output Impedance		75 ohms
Sync Output Level		TTL
Connector Type		HD-15

### CatPro Enclosures – RGBHV/HD-15 to CatPro

Applies to Modula RGBHV/HD-15 boards FG1034-590 and FG1034-593 when contained in CatPro enclosures and switching to CatPro boards.

Also applies to these RGBHV/HD-15 boards when contained in preconfigured systems and switching to CatPro boards.

Specifications Table 2		
Parameter	Conditions	Value
Input Level (max.)		+0.75 V to -0.3 V
Input Impedance		75 ohms
Maximum Resolution		1600x1200(4:3) and 1920x1080p(16:9) @ 60Hz up to 1000 ft. (305 m) (Cat5)
Crosstalk	f = 150 MHz f = 30 MHz f = 5 MHz	<-30 dB <-35 dB <-50 dB
Signal to Noise Ratio (SNR)	Vin = 0.7 V, 100 IRE	>60 dB
Return Loss (Input)	f = 5 MHz	<-45 dB
Sync Input Level		TTL
Output Level (max.)		+0.75 V to -0.3 V
Output Impedance		75 ohms
Sync Output Level		TTL
Connector Type		HD-15
Compatibility		These boards can be used to break into and out of the CatPro RGBHV+Stereo boards

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## Attaching Cables

**Important:** If using RGBHV/HD-15 boards in a CatPro system – first see “RGBHV+Stereo to CatPro Boards with TXs and RXs” starting on page 69 for special system information.

When attaching RGBHV/HD-15 input and output cables, refer to the sheet labeled “AutoPatch Modula Connector Guide” that ships with the system. The sheet shows you where to attach each cable on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side (near the power receptacle).

### To connect RGBHV/HD-15 inputs and outputs:

1. Fasten the cables onto the input and output HD-15 connectors (FIG. 34).

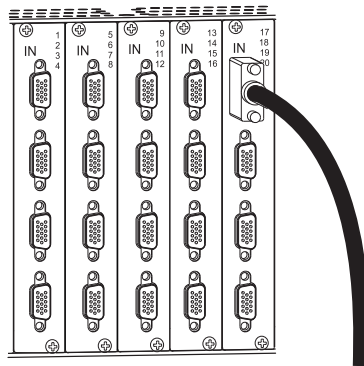


FIG. 34 Fasten cable onto input or output HD-15 connector

### HD-15 Board Connector Pinout

For High Density DB-15 board connector pinout information, see FIG. 35.

RGBHV/HD-15 Board Connector Pinouts		
<b>Input (VESA DDC Compliant)</b>		
1. Red	6. Red GND	11. ID Bit
2. Green	7. Green GND	12. DDC SDA
3. Blue	8. Blue GND	13. Horizontal sync
4. ID Bit	9. +5 V in DDC	14. Vertical sync
5. GND	10. GND	15. DDC SCL
<b>Output</b>		
1. Red	6. Red GND	11. ID Bit
2. Green	7. Green GND	12. ID Bit
3. Blue	8. Blue GND	13. Horizontal sync
4. ID Bit	9. +5 V out DDC	14. Vertical sync
5. GND	10. GND	15. ID Bit

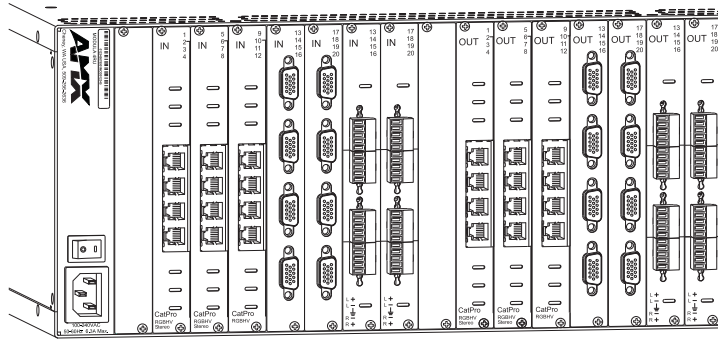
**Note:** 55 mA supplied on output pin 9; power draw not to exceed 50 mA per port.

FIG. 35 RGBHV/HD-15 input and output board connector pinout



# RGBHV+Stereo to CatPro Boards with TXs & RXs

## Applicability Notice



**FIG. 36** RGBHV+Stereo to CatPro boards (shown with RGBHV/HD-15 and stereo audio boards)

This chapter pertains to Modula RGBHV+Stereo to CatPro boards contained in pre-engineered systems and custom systems. The table on the following page shows the types of RGBHV+Stereo to CatPro boards and their numbers and indicates the pre-engineered systems containing the boards that are available.

Modula CatPro boards *must* be used in conjunction with CatPro RGBHV+Stereo Transmitter (TX) and/or Receiver (RX) Modules to make up a complete system. The third table on the following pages shows the types of CatPro RGBHV+Stereo TX and RX modules and their numbers. For information on system setup, see page 78.

CatPro boards work in conjunction with RGBHV/HD-15 and CatPro-compatible stereo audio boards. Although other types of boards may be included in the CatPro RGBHV/HD-15 enclosure, they cannot receive signals from CatPro input boards or route signals to CatPro output boards.

RGBHV+Stereo to CatPro Boards in CatPro Pre-Engineered Systems	
RGBHV+Stereo to CatPro Boards and Numbers	System Types and Numbers
<p><b>Note:</b> Specifications for these boards are listed on page 71.</p>	<p>Input: 32 CatPro inputs                      Output: 32 CatPro outputs                      Configuration: 32x32                      Model Number: <b>FGP34-BLBL-PRO</b></p>
<p>Input / Receiver (RX)  <b>FG1034-487</b></p>	
<p>Output / Transmitter (TX)  <b>FG1034-490</b></p>	<p>Input: 32 CatPro RX inputs                      Output: 16 local outputs (16 RGBHV &amp; 16 stereo)                      Configuration: 32x16                      Model Number: <b>FGP34-BLGB-PRO</b></p>
<p>For CatPro-compatible RGBHV/HD-15 boards, see the board chapter starting on page 65.</p>	<p>Input: 16 local inputs (16 RGBHV &amp; 16 stereo)                      Output: 32 CatPro TX outputs                      Configuration: 16x32                      Model Number: <b>FGP34-GBBL-PRO</b></p>
<p>For CatPro-compatible stereo audio boards, see the board chapter starting on page 93.</p>	<p>Input: 8 local inputs (8 RGBHV &amp; 8 stereo)                      16 CatPro RX inputs                      Output: 8 local outputs (8 RGBHV &amp; 8 stereo)                      16 CatPro TX outputs                      Configuration: 8+16x8+16                      Model Number: <b>FGP34-DGDG-PRO</b></p>
	<p>Input: 8 local inputs (8 RGBHV &amp; 8 stereo)                      8 CatPro RX inputs                      Output: 8 local outputs (8 RGBHV &amp; 8 stereo)                      8 CatPro TX outputs                      Configuration: 8+8x8+8                      Model Number: <b>FGP34-DDDD-PRO</b></p>

RGBHV+Stereo to CatPro Boards in CatPro Customs Systems	
RGBHV+Stereo to CatPro Boards and Numbers	Enclosure Type and Number
<p><b>Note:</b> Specifications for these boards are listed on page 71.</p>	<p>CatPro RGBHV/HD-15 (32x32, 4 RU)                      Model Number: <b>FG1034-42</b></p>
<p>Input / Receiver (RX)  <b>FG1034-487</b></p>	
<p>Output / Transmitter (TX)  <b>FG1034-490</b></p>	
<p>For other types of boards that may be contained in this enclosure but are not CatPro compatible, see the applicability table in the specific board type's chapter.</p>	

RGBHV+Stereo to CatPro Boards used with CatPro RGBHV+Stereo Modules	
RGBHV+Stereo to CatPro Boards and Numbers	CatPro RGBHV+Stereo Modules Types and Numbers
<p><b>Note:</b> Specifications for these boards are listed on page 71.</p>	<p><b>Note:</b> Specifications for these modules are listed on page 72.</p>
<p>Input / Receiver (RX)  <b>FG1034-487</b></p>	<p>Transmitter (TX) Module  <b>FG1010-45-01</b></p>
<p>Output / Transmitter (TX)  <b>FG1034-490</b></p>	<p>Receiver (RX) Module  <b>FG1010-48-01</b></p>

For adjustment procedures when CatPro RGBHV+Stereo TX and RX Modules are used in conjunction with Modula CatPro input and output boards, see page 81.

## RGBHV+Stereo to CatPro Boards Specifications

Applies to RGBHV+Stereo to CatPro input board FG1034-487 and output board FG1034-490 when used in conjunction with CatPro RGBHV+Stereo TX and RX Modules using Cat5e cable (for module specifications, see page 72).

Also applies to these boards when contained in pre-engineered systems using CatPro TX and RX Modules.

Video Specifications		
Parameter	Conditions	Value
Signal Types		RGBHV and stereo audio
Maximum Resolution		1600x1200* (4:3) and 1920x1080p (16:9) @ 60 Hz up to 1000 ft.** (305 m)
RGB In Signal Level Range (max.)	Terminated, user adjustable gain and peak using CatPro Wizard	+0.75 V to -0.3 V typical
RGB Out Signal Level Range (max.)	Terminated, user adjustable gain and peak using CatPro RX Module	+0.75 V to -0.3 V typical
RGB In Skew Adjustment	User adjustable using CatPro Wizard	0 to 62 ns in 2 ns increments on R, G, and B channels
RGB Out Skew Adjustment	User adjustable using CatPro RX Module	0 to 62 ns in 2 ns increments on R, G, and B channels
RGB In/Out Impedance		75 ohms
RGB Signal to Noise Ratio		>50 dB
RGB Crosstalk	f = 30 MHz f = 5 MHz	<-35 dB <-50 dB
RGB Return Loss	f = 5 MHz	<-35 dB
Sync In Impedance		510 ohms
Sync In/Out Polarity	Output follows input polarity	Active high or low
Sync Out Signal Levels	Unterminated	Low = 0 V High = +5 V
Supported Twisted-Pair Cable Types***		Cat5, Cat5e, Cat6, Cat6e, STP (skew-free cable is not recommended)
RGBHV+Stereo Connector Options		Female RJ-45

\* Signals displayed using a resolution of 1600x1200 at 60 Hz may exhibit slightly visible background noise in certain circumstances (particularly with LCD monitors).

\*\* Overall transmission distance including input and output cannot exceed 1,000 ft. (305 m) from source to destination.

\*\*\* All measurements were taken using Cat5e cable.

### RGBHV+Stereo to CatPro Boards Specifications (continued)

Audio Specifications		
Parameter	Conditions	Value
Audio In/Out Signal Type		Stereo, unbalanced
Audio In/Out Signal Level (max.)		+8 dBu
Audio Frequency Response	f = 20 Hz to 20 kHz,	<±0.2 dB
Audio THD+Noise	f = 1 kHz, Vin = -10 dBu to +4 dBu	<0.04%
Audio Crosstalk	f = 1 kHz, Vin = +4 dBu	<-98 dB
Audio Signal to Noise Ratio	f = 20 Hz to 20 KHz, Vin = +4 dBu	>83 dB
Audio In Impedance		2 kohms
Audio Output Impedance		<5 ohms
Audio Out Volume Adjustment Range	User adjustable at CatPro RX Module	+6 dB to mute
Supported Twisted-Pair Cable Types		Cat5, Cat5e, Cat6, Cat6e, STP (skew-free cable is not recommended)
RGBHV+Stereo Connector Options		Female RJ-45

**Note:** Skew-free cable is not recommended for use with AMX AutoPatch equipment.

### CatPro RGBHV+Stereo RX and TX Modules Specifications

Applies to TX Module FG1010-45-01 and RX Module FG1010-48-01 when used in conjunction with RGBHV+Stereo to CatPro boards.

General Specifications	
Approvals	CE, UL, cUL
Signal Types	RGBHV+stereo audio, unbalanced
Maximum Resolution	1600x1200 (4:3) and 1920x1080p (16:9) @ 60 Hz up to 1000 ft. (305 m)*
Supported Twisted-Pair Cable Types	Cat5, Cat5e, Cat6, Cat6e, STP
Power Consumption (max.)	+12 V to +24 V @ 1.3 A
Power Connector	2.1 mm DC power jack. Modules use power supplies that are provided with each unit.
Thermal Dissipation (max.)	20 BTU/hr.
Humidity	0 to 90% non-condensing
Operational Temperature	32° to 110° F (0° to 43° C)
Dimensions – TX Module	5.15 in. (13.08 cm) depth 5.80 in. (14.73 cm) width 1.66 in. (4.22 cm) height
Weight – TX Module	Approximately 1.5 lb. (0.68 kg)
Dimensions – RX Module	5.15 in. (13.08 cm) depth 4.33 in. (11.0 cm) width 1.66 in. (4.22 cm) height
Weight – RX Module	Approximately 1.3 lb. (0.6 kg)

\* When used with an AMX AutoPatch Distribution Matrix, overall cable length cannot exceed 1,000 ft. (305 m).

**Note:** Skew-free cable is not recommended for use with AMX AutoPatch equipment.

## CatPro RGBHV+Stereo RX and TX Modules Specifications (continued)

Specifications – TX Module (FG1010-45-01)		
Parameter	Conditions	Value
<b>RGB In</b> Signal Level Range: Impedance: Return Loss:	Terminated  f = 5 MHz	+0.75 V to -0.3 V 75 ohms <-35 dB
<b>RGB Local Out</b> Signal Level Range: Impedance: Signal to Noise Ratio:	Terminated	+0.75 V to -0.3 V 75 ohms >65 dB
<b>Sync In</b> Impedance: Polarity:		510 ohms Active high or low
<b>Sync Local Out</b> Signal Level: Polarity:	Unterminated Follows input polarity	Low = 0 V, High = +5 V Active high or low
<b>Audio In</b> Signal Level (max.): Impedance:		+8 dBu 2 kohms
<b>Audio Local Out</b> Signal Level (max.): Frequency Response: THD+Noise: Signal to Noise Ratio: Impedance:	f = 20 Hz to 20 kHz f = 1 kHz, Vin = -10 dBu to +4 dBu f = 20 Hz to 20 kHz, Vin = +4 dBu	+8 dBu (unity gain) <±0.35 dB <0.04% >105 dB <5 ohm
<b>Connector Options</b> RGBHV In: RGBHV Local Out: Stereo Audio In: Stereo Audio Local Out: RGBHV+Stereo Out:		1 Female HD-15 1 Female HD-15 1 Female 3.5 mm mini-stereo jack 1 Female 3.5 mm mini-stereo jack 1 Female RJ-45

### CatPro RGBHV+Stereo RX and TX Modules Specifications (continued)

Specifications – RX Module (FG1010-48-01)		
Parameter	Conditions	Value
<b>RGB Out (at 1000 ft.)</b> Signal Level Range: Impedance: Signal to Noise Ratio: Skew Adjustment:	Terminated, user adjustable with gain and peak  User adjustable	+0.75 V to -0.3 V typical 75 ohms >50 dB 0 to 62 ns, in 2 ns increments on R, G, and B channels
<b>Sync Output</b> Signal Levels: Polarity:	Underterminated Follows input polarity	Low = 0 V, High = +5 V Active high or low
<b>Audio Out (at 1000 ft.)</b> Signal Level (max.): Volume Control Range: Frequency Response: THD+Noise: Signal to Noise Ratio: Impedance:	User adjustable f = 20 Hz to 20 kHz f = 1 kHz, Vin = 10 dBu to +4 dBu f = 20 Hz to 20 kHz, Vin = +4 dBu	+8 dBu (unity gain) Mute to +6 dB <±0.2 dB <0.04% >105 dB <5 ohm
<b>Connector Options</b> RGBHV+Stereo Input: RGBHV Out: Stereo Audio Out:		1 Female RJ-45 1 Female HD-15 1 Pluggable 3.5 mm terminal block

AMX reserves the right to modify its products and their specifications without notice.

## Attaching Cables and Wires

**Important:** *Before attaching cables and wires – For important information, see CatPro system equipment requirements on page 77 and see setting up a CatPro system on page 78.*

When attaching input and output cables and wires, refer to the sheet labeled “AutoPatch Modula Connector Guide” that ships with the system. The sheet shows you where to attach the cables and wires on each enclosure. Follow the sheet exactly; the system was programmed to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side (near the power receptacle).

**Important:** *To guarantee 1,000 ft. (305 m) skew compensation, the inter-pair skew must be rated at ≤20 ns/100 m. The cables should be tested for skew which will determine whether the run has less than 62 ns skew and is within 1,000 feet (305 m).*

### CatPro Supported Twisted-Pair Cable Types

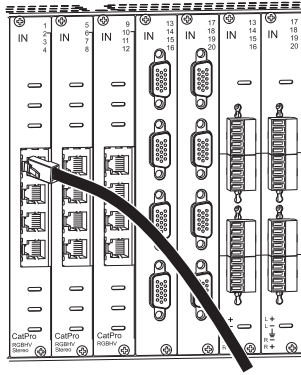
- Cat5
- Cat5e
- Cat6
- Cat6e
- STP (Shielded Twisted Pair)

**Note:** *Skew-free cable is not recommended for use with AMX AutoPatch equipment.*



### To attach CatPro (RJ-45) inputs and outputs:

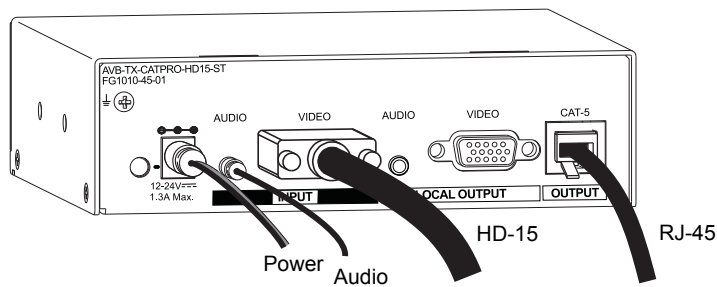
1. Insert the RJ-45 cable connectors into the input and output RJ-45 receptacles (FIG. 37).



**FIG. 37** Insert RJ-45 connector into RJ-45 receptacle

### To attach input, outputs, and power to the TX Module:

1. Insert the audio mini-jack (3.5 mm) into the Audio Input connector (FIG. 38).

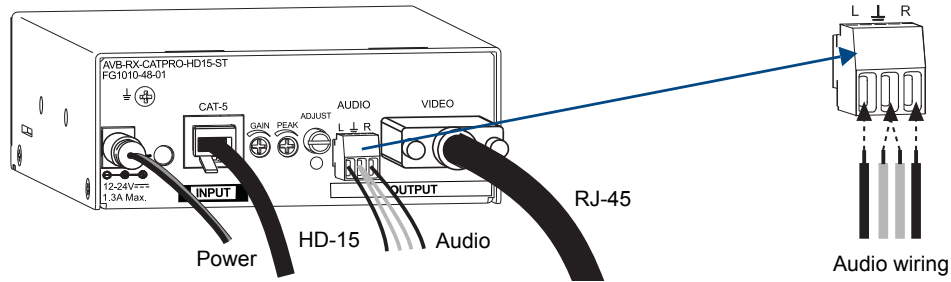


**FIG. 38** Attach source device connectors, RJ-45 connector and power to TX

2. Fasten the HD-15 cable to the Video Input connector.
3. Insert the RJ-45 connector into the Cat5 receptacle.
4. If using the AMX AutoPatch power supply provided – Plug the desktop power supply into the power jack on the module and into an AC external power source.  
**Or**  
If you are providing the power supply – Plug the power cord from a UL (or equivalent) listed power supply into the power jack on the module. The electrical ratings must meet those indicated in the specifications table (see page 72).
5. Optional – To use the Local Out option, insert the audio mini-jack and the HD-15 connector into the Local Output connectors.

**To attach destination device connectors and power to the RX Module:**

1. Fasten the HD-15 cable to the Video Out connector (FIG. 39).



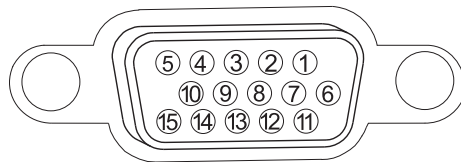
**FIG. 39** Attach destination device connectors and power to RX

2. Wire the audio connector (FIG. 39 right shows unbalanced output).
3. Insert the RJ-45 connector into the Cat5 receptacle.
4. If using the AMX AutoPatch power supply provided – Plug the desktop power supply into the power jack on the module and into an AC external power source.

**Or**

If you are providing the power supply – Plug the power cord from a UL (or equivalent) listed power supply into the power jack on the module. The electrical ratings must meet those indicated in the specifications table (see page 72).

**TX and RX HD-15 Pinouts**



**Input (VESA DDC Compliant)**

1. Red	6. Red GND	11. ID Bit
2. Green	7. Green GND	12. DDC SDA
3. Blue	8. Blue GND	13. Horizontal Sync
4. ID Bit	9. +5 VDC in DDC	14. Vertical Sync
5. GND	10. GND	15. DDC SCL

**Output**

1. Red	6. Red GND	11. ID Bit
2. Green	7. Green GND	12. ID Bit
3. Blue	8. Blue GND	13. Horizontal Sync
4. ID Bit	9. +5 VDC in DDC	14. Vertical Sync
5. GND	10. GND	15. ID Bit

**FIG. 40** Pinout for HD-15 connector

**Note:** 55 mA supplied on output pin 9; power draw not to exceed 50 mA per port.

## CatPro System Equipment

A typical Modula CatPro system includes source and destination devices, TX and/or RX Modules, and a PC for setup. See the following for explanations of the equipment and their requirements.

### Source Device (PC or other RGB video source)

In a CatPro system, the source device is normally a PC. The Source PC sends a signal to the destination device (normally a monitor). The Source PC can be connected to a CatPro TX Module (which is connected to a CatPro input board) or to an RGBHV/HD-15 input board. If the Source PC also has audio, the audio signal can be routed along with the RGBHV signal.

### Destination Device (Monitor)

The Destination Monitor receives signals from the Source PC. It can be connected to the CatPro RX Module (which is connected to a CatPro output board) or to an RGBHV/HD-15 output board (depending on the routing path). Adjustments made on the CatPro RX Module and/or the CatPro Wizard (which is run on a Control PC) are reflected on the Destination Monitor. When making display adjustments, open the provided test image\* on the Source PC so that it can be routed to the Destination Monitor for display.

### CatPro RGBHV+Stereo TX and RX Modules

CatPro RGBHV+Stereo TX and RX Modules connect the source and destination devices that use HD-15 and stereo audio connectors to the Modula CatPro boards. How the modules are used in a CatPro system depends on the desired routing path (see page 78).

#### *TX Module FG1010-45-01*

The TX module receives RGBHV and stereo audio signals from a source device and passes the signals over the CatPro supported cable to the Modula CatPro input board (which is a receiver and requires the CatPro Wizard for video adjustments).

#### *RX Module FG1010-48-01*

The RX Module receives RGBHV and stereo audio signals from the Modula CatPro output board and passes them onto the destination device. Display adjustments are made using the potentiometers and the Adjust knob on the RX Module to clear the image and compensate for skew. The Adjust knob can also be used to adjust the volume.

### Control PC and CatPro Wizard

#### *Control PC Requirements*

- Windows 2000<sup>©</sup> or Windows XP Professional<sup>©</sup>
- 2 MB free disk space
- 15 MB RAM
- Serial port

The Control PC, which runs the CatPro Wizard software\*\*, connects via a null modem cable to the serial port on the Modula. The Control PC settings and the CatPro Wizard settings (which default to serial port Com 1 and baud rate 9600) *must* match. The Control PC is required for two of the routing paths (see page 78). Once the system is set up and no further changes to the display settings are necessary, the Control PC can be disconnected.

\* Adobe Acrobat Reader is required to view the provided test image .pdf file. It is a free software program available online at [www.adobe.com](http://www.adobe.com).

\*\* The CatPro Wizard adjusts the video signal (as seen on the Destination Monitor) to clear the image and compensate for skew.

## System Setup

A CatPro system uses at least one of three different paths as the signal(s) passes through the modules and boards from the source to the destination. The three routing paths are herein referred to as Routing Paths A, B, and C (see the chart below). A system can include multiple routing paths. Illustrations, explanations, and cable length information for each of the three paths are found from page 79 to page 80.

FIG. 41 illustrates a system that is equipped to handle all three routing paths involving CatPro input and output boards, as well as for routing signals directly from RGBHV/HD-15 input boards and CatPro-compatible stereo input boards to RGBHV/HD-15 output boards and CatPro-compatible stereo output boards. Note that FIG. 41 also includes a Control PC (only needed during installation) connected to the serial port of the Modula.

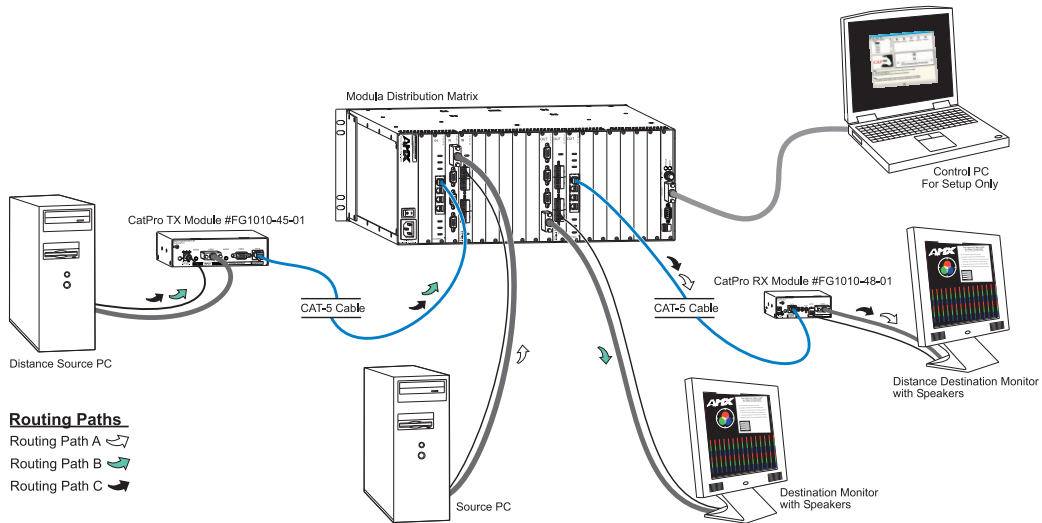


FIG. 41 A typical system with CatPro RGBHV input and output boards

## Routing Paths

**Important:** The routing path determines the method used to adjust the video display (see page 81).

The equipment used for the individual routing paths is presented in the table below with explanations and illustrations following. (All routing paths include routing audio along with video.)

Routing Path	Equipment
A	Source→ RGBHV/HD-15 Input Board→ CatPro Output Board→ CatPro RX Module→ Destination
B	Source→ CatPro TX Module→ CatPro Input Board→ RGBHV/HD-15 Output Board→ Destination
C	Source→ CatPro TX Module→ CatPro Input Board→ CatPro Output Board→ CatPro RX Module→ Destination
D	Source→ RGBHV/HD-15 Input Board→ RGBHV/HD-15 Output Board→ Destination (This standard routing path is available but is not described, as it does not require adjustment.)

### Routing Path A

In Routing Path A (FIG. 42), the RGBHV and stereo signals from a source device are sent to an RGBHV/HD-15 input board and a CatPro-compatible stereo audio input board, which route the signals to a CatPro output board. The signal is then passed to the CatPro RX Module, which sends the signals to the destination device. The cable between the Modula and the RX Module cannot exceed 1,000 ft. (305 m). The video display is adjusted using the RX Hardware Method (see page 82).

Source → RGBHV/HD-15 Input Board → CatPro Output Board → CatPro RX Module → Destination

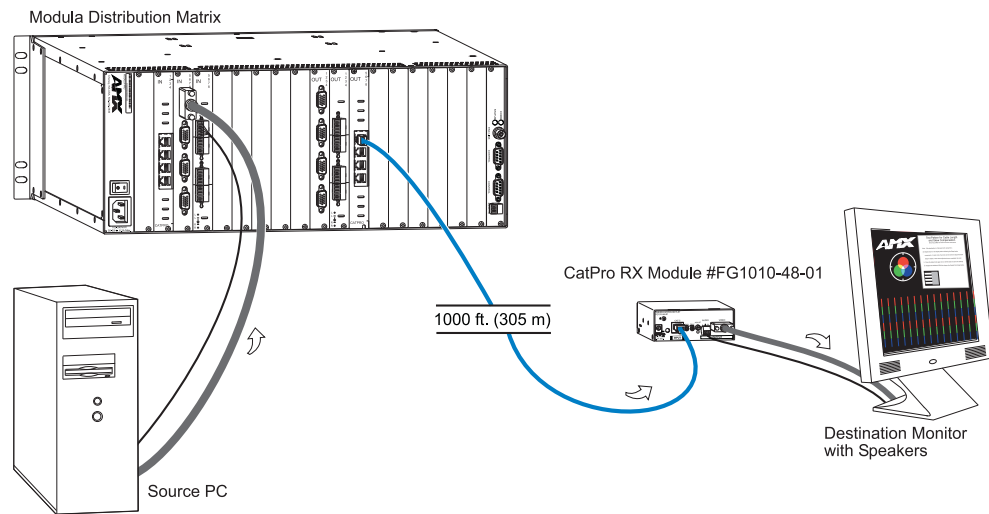


FIG. 42 Routing Path A

### Routing Path B

In Routing Path B (FIG. 43), the RGBHV and stereo signals from a source device are sent to a CatPro TX Module, which passes the signals to the CatPro input board. The signal is then routed through the RGBHV/HD-15 and CatPro-compatible stereo output boards to the destination device. The cable between the CatPro TX Module and the Modula cannot exceed 1,000 ft. (305 m). The video display is adjusted using the CatPro Wizard on the Control PC (see page 86).

Source → CatPro TX Module → CatPro Input Board → RGBHV/HD-15 Output Board → Destination

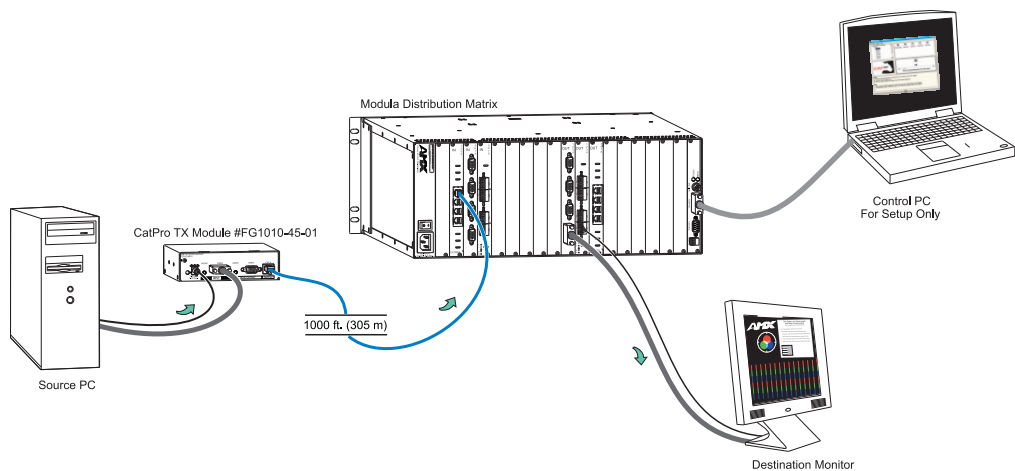


FIG. 43 Routing Path B

### Routing Path C

In Routing Path C (FIG. 44), the signal from a source device is sent to a CatPro TX Module, which passes the RGBHV and stereo audio signals to the CatPro input board. The signals are then routed to the CatPro output board and on to the CatPro RX Module, which sends the signals to the destination device. The total length of the cables between the two modules cannot exceed 1,000 ft. (305 m). The video display is adjusted using the Wizard / RX Hardware Method (see page 89).

Source → CatPro TX Module → CatPro Input Board → CatPro Output Board → CatPro RX Module → Destination

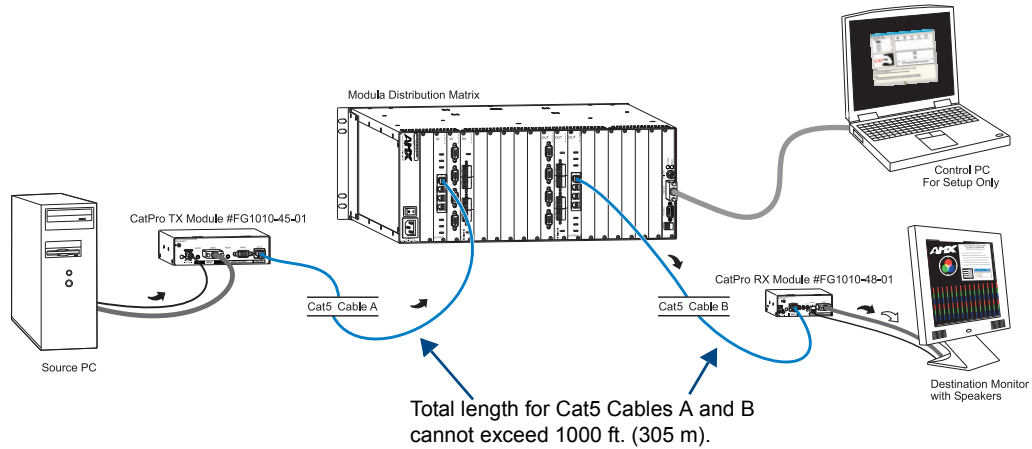


FIG. 44 Routing Path C

## Cabling and Video Display Adjustment

### Adjustment Methods

The image on the Destination Monitor may be unclear or distorted due to the cable length. Depending on the routing path, adjustments are made using the RX Module and/or the CatPro Wizard to clear the image and compensate for the skew. Be sure that the source device sending the signal to the display device has a sharp picture before you start.

An easy way to remember the adjustment requirements of the system is that every place CatPro supported cable is attached to a receiver (either a board or module), you need to compensate for the cable length. The CatPro input board requires adjustment with the Wizard, and the CatPro RX Module requires adjustment with its potentiometers and Adjust knob.

The method used to adjust the signal depends on the equipment used for any given routing path in the system setup. Use the table below to determine the routing path option(s) you are using, and then see the corresponding “Routing Path – Method” section for directions for adjusting the video display.

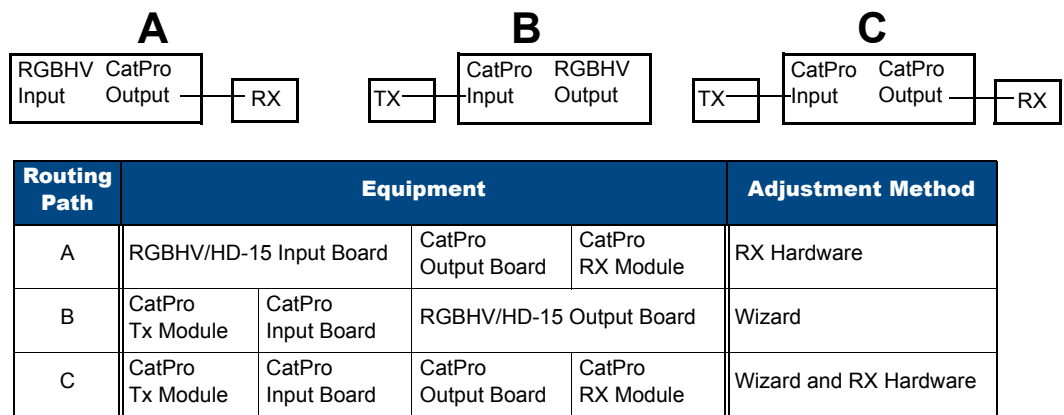


FIG. 45 Routing paths and adjustment methods

**Tip:** For systems that use more than one type of routing path, it may be easier to make adjustments for all of one routing path type before making adjustments for another routing path type. For example, make adjustments for all equipment using Routing Path A before making adjustments for Routing Path B.

### Routing Path A – Cabling and the RX Hardware Method

Source → RGBHV/HD-15 Input Board → CatPro Output Board → CatPro RX Module → Destination

For Routing Path A, the hardware on the RX Module (which works in conjunction with the CatPro output board) is adjusted to obtain a sharp picture on the Destination Monitor. The hardware includes Gain and Peak potentiometers and an Adjust knob for skew (FIG. 47). The Adjust knob also adjusts volume.

#### To cable the system for Routing Path A:

1. Place all source and destination devices in their final installation locations.
2. Cable the complete routing paths from the source devices to the destination devices (FIG. 46). All cable should be the actual cable that will be used.

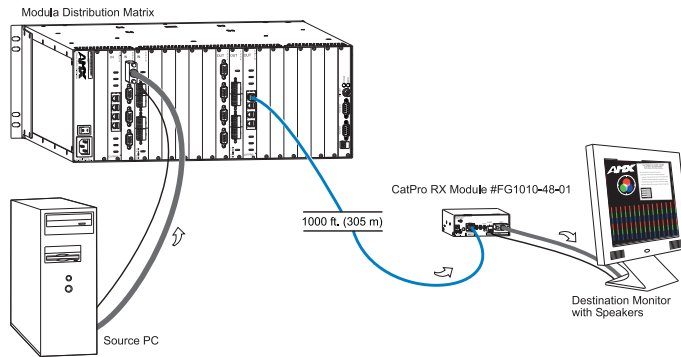


FIG. 46 Routing Path A

#### Gain and Peak

The Gain and Peak potentiometers (pots) on a CatPro RX Module are used to compensate for the overall cable length. For Routing Path A, the CatPro supported cable between a CatPro output board and its RX Module can be up to 1,000 ft. (305 m).

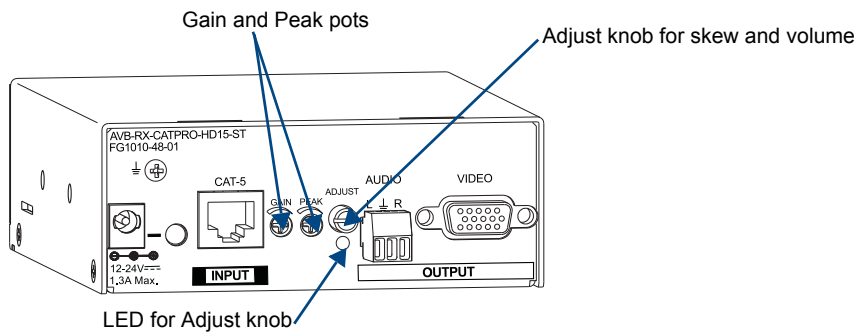


FIG. 47 CatPro RX Module



### Skew and Volume

The Adjust knob on the CatPro RX Module can be used to compensate for the skew inherent in the supported cable types by adjusting the video signal to eliminate the skew. It also adjusts the volume. A small screwdriver works well for turning and pressing the knob. The knob does not have a mechanical start or stop point. If the LED blinks when the knob is turned, the setting has reached its minimum or maximum adjustment point.

The CatPro RX Modules ship with factory-defined default settings of “no skew delay” for the skew on R, G, and B and for “unity gain” on the volume. Once the adjustment process is successfully completed and saved, the new settings replace the factory settings. The system restores the new settings when power is cycled. If necessary, restore the video factory default by adjusting the R, G, and B fully counterclockwise and restore unity gain by adjusting the audio six clicks left from “full on” (which is blinking), then save.

### Test Image Files

Test image .pdf files for adjusting the display are provided on the *AMX AutoPatch CD*. The test image file is opened\* on the Source PC and subsequently displays on the Destination Monitor. The file names for the test image .pdf begin with the resolution and end with “SkewPattern” (e.g., 1280x1024SkewPattern.pdf). Select the file with the resolution that corresponds to the resolution of the source signal (ideally this should be the native resolution of the Destination Monitor).

\* Adobe Acrobat Reader is required to view the test image .pdf file. It is a free software program available online at: [www.adobe.com](http://www.adobe.com).

*The following procedures explain how to:*

- Use the potentiometers to adjust the gain and peak
- Use the Adjust knob to eliminate skew and adjust volume
- Abort the skew adjustment procedure, if necessary

**Tip:** *Be sure that the source device sending the signal to the display monitor (or device) has a sharp picture before you start.*

### To adjust the gain and peak using the RX Module potentiometers:

1. On the Source PC, open the test image .pdf file that corresponds to the resolution of the Source device.
2. Route the source to the destination.  
The test image appears on the Destination Monitor (the image will be distorted).



**FIG. 48** Test image on Destination Monitor with distorted display

3. If the Destination Monitor’s brightness needs to be increased or decreased, turn the Gain potentiometer on the RX Module until the desired brightness is reached.

- If the picture is not sharp enough, turn the Peak potentiometer. (Increasing the peak removes the graininess.) The image will still be skewed.



FIG. 49 Test image adjusted for gain and peak (image is still skewed)

If the gain and peak have not already been adjusted, complete Steps 1 through 4 previous, then complete the following steps.

If the skew was adjusted previously, restore the default settings before proceeding to Step 5. Adjust skew potentiometers fully counterclockwise on R, G, and B in the following steps and save.

**Tip:** To adjust the volume without changing the skew settings, press the Adjust knob until the LED turns white and then complete Step 12 in the following procedure.

### To adjust the skew and volume using the RX Module Adjust Knob:

- Press the Adjust knob.  
The LED turns red; the module is placed in Red Skew Adjust mode.
- Turn the Adjust knob clockwise or counterclockwise until the red color bars align as closely as possible with the green color bars.
- Press the Adjust knob.  
The LED turns green; the module is placed in Green Skew Adjust mode.
- Turn the Adjust knob clockwise or counterclockwise, if necessary, to align the green color bars with the red color bars.
- Press the Adjust knob.  
The LED turns blue; the module is placed in Blue Skew Adjust mode.
- Turn the Adjust knob clockwise or counterclockwise until the blue color bars align with the red and green color bars.

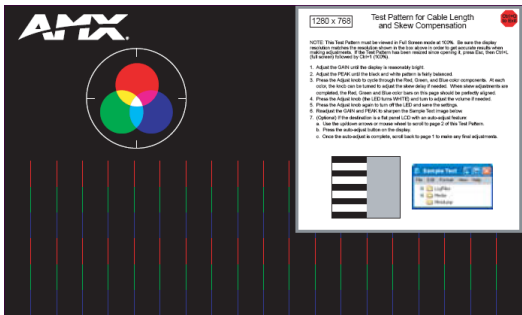


FIG. 50 Test image adjusted for skew

- Press the Adjust knob.  
The LED turns white; the module is placed in Volume Adjust mode.

12. Turn the Adjust knob clockwise to increase volume or counterclockwise to decrease volume.

13. Press the Adjust knob.

The LED turns off, and the module saves all of the settings.

Additional fine-tuning with the potentiometers may be necessary. If undesirable display conditions persist, see Troubleshooting on page 92.

**Tip:** For optimal results on flat panel LCDs, use page 2 of the .pdf test image and press the auto-adjust button on the panel after using the potentiometers and the Adjust knob.

#### To abort the adjustment procedure at any time:

1. Hold the Adjust knob down until the LED turns amber, then release the knob.

The LED blinks 3 times and the RX Module reverts to its previous settings.

Cycling power on the CatPro RX Module during the adjustment procedure will have the same effect. Individual settings are not stored in memory until all adjustments (Steps 1 through 13) have been made.

#### LED Blinks Red and Green

If the LED alternately blinks red and green, a configuration failure has occurred.

- If the blinking happens when the Adjust knob is pressed to save (Step 13), the system failed to save the settings. Any adjustments just made are still in effect, but will be lost the next time power is cycled. Press the Adjust knob; repeat (cycle the colors) until the LED turns off.
- If the blinking happens when power is cycled, the system could not find valid settings and reverted to the factory defined default settings. Complete Steps 5 through 13 again.

## Routing Path B – Cabling and the Wizard Method

Source → CatPro TX Module → CatPro Input Board → RGBHV/HD-15 Output Board → Destination

For Routing Path B, video adjustments are made with the CatPro Wizard, which adjusts gain, peak, and skew for a sharp picture on the Destination Monitor.

### To cable the system for Routing Path B:

1. Place all source and destination devices in their final installation locations, reserving one of the monitors for Step 3 (reserve a monitor with the highest resolution available).
2. Cable the complete routing paths from the source devices to the destination devices (FIG. 51). All cable should be the actual cable that will be used. The minimum cable length for a Modula CatPro Input board should not be less than 12 feet (3.66 m).

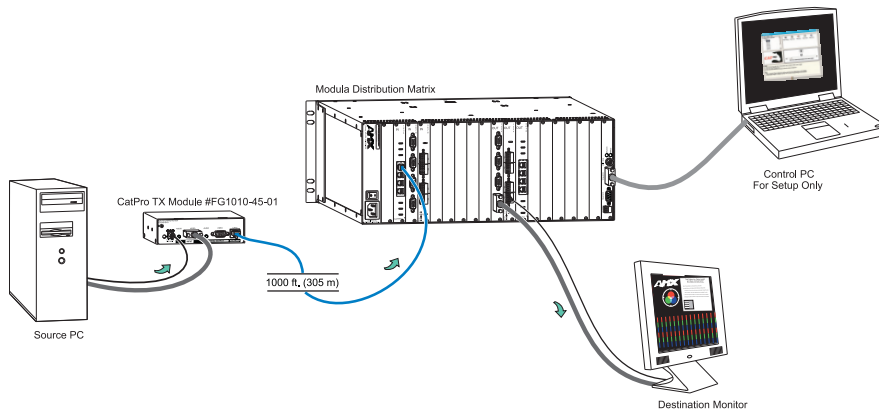


FIG. 51 Routing Path B

3. Place the reserved monitor from Step 1 (which will be used for calibration purposes) close to the Control PC. The reserved monitor can be used as part of the last routing path that is calibrated.
4. Connect the Control PC (with the CatPro Wizard installed) to the Modula using a null modem cable; the Control PC settings and the CatPro Wizard settings (which default to serial port Com 1 and baud rate 9600) *must* match. (Leave the Control PC connected until the system is completely adjusted.)

## Saving and Restoring Files

When a file is opened with the CatPro Wizard, the settings are loaded to the CatPro input board on the Modula. Changes made in the Wizard are immediately reflected on the output device(s) the source signal is routed to. After all adjustments have been made, the settings *must* be saved to the Modula, or they will be lost when power is cycled. We recommend saving the settings to a PC file as a backup, so they can be reloaded if necessary.

### Test Image File

Test image .pdf files for adjusting the display are provided on the *AMX AutoPatch CD*. The test image file is opened\* on the Source PC and subsequently displays on the Destination Monitor. The file names for the test image .pdf begin with the resolution and end with "SkewPattern" (e.g., 1280x1024SkewPattern.pdf). Select the file with the resolution that corresponds to the resolution of the source signal (ideally this should be the native resolution of the Destination Monitor).

\* Adobe Acrobat Reader is required to view the test image .pdf file. It is a free software program available online at: [www.adobe.com](http://www.adobe.com).

**To adjust the video display using the CatPro Wizard:**

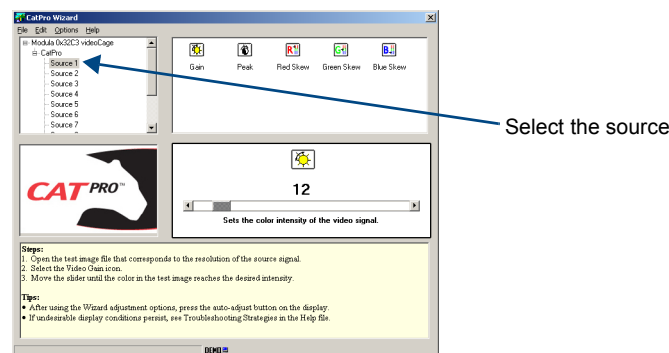
1. Connect the monitor that was reserved for calibration to any one of the HD-15 outputs.
2. Route the source being calibrated to the HD-15 output (destination).
3. On the Source PC, open the test image file from the *AMX AutoPatch CD* whose resolution corresponds to the highest source resolution used in the system.

The test image appears on the Destination Monitor (the image will be distorted).



**FIG. 52** Test image on Destination Monitor with distorted display

4. On the Control PC, open the CatPro Wizard.
5. In the Wizard, select the source in the navigation tree in the upper left corner that corresponds to the input connector number for the source signal to be adjusted.



**FIG. 53** Select the source to be adjusted

6. If the Destination Monitor's brightness needs to be increased or decreased, select the Gain icon and move the slider until the desired brightness is reached.
7. If the picture is not sharp enough, select Peak and move the slider until the desired sharpness is reached. (Increasing the peak removes the graininess; over peaking can result in the picture going blank.) The image will still be skewed.



**FIG. 54** Test image adjusted for gain and peak (image is still skewed)

8. Select Red Skew and move the slider until the red color bars align as closely as possible with the green color bars
9. Select Blue Skew and move the slider until the blue color bars align with the red and green ones. (If necessary, reselect the icons and adjust further.)

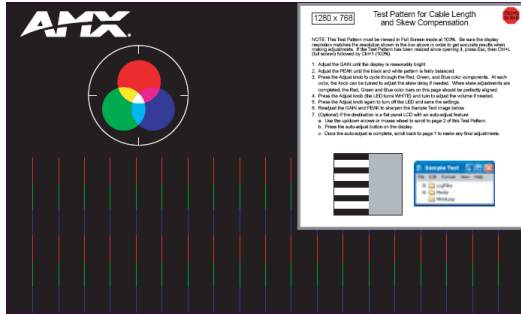


FIG. 55 Test image adjusted for skew

10. If necessary, make final adjustments for the gain and peak.
11. Repeat Steps 2 through 10 for all CatPro inputs using the appropriate sources and their TX Modules (for applying the settings to multiple sources, see below).
12. From the Options menu, select Save to System (to restore the settings upon power up). The Save to System dialog box opens.
13. Click OK.
14. From the File menu, select Save As to save a backup file to the PC.
15. Enter a file name, and click OK.

**Tip:** For optimal results on flat panel LCDs, use page 2 of the .pdf test image file and press the auto-adjust button on the panel after using the Wizard.

If additional source devices of the same type are connected to the same type of destination devices with similar cable runs, the settings for the file saved in Step 14 can be applied to those sources.

**To apply settings to multiple sources:**

1. From the Options menu, select Enable Multiple Selections.
2. Highlight the source whose settings need to be duplicated.

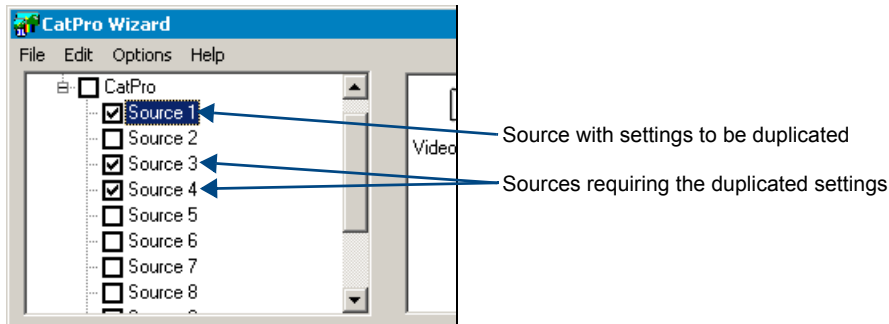


FIG. 56 Select the sources

3. Click the check boxes for all sources that require the same settings.
4. From the Options menu, open the Copy to Selected submenu and select Current Profile. The settings are applied to all sources that were selected in Step 3.

If undesirable display conditions persist after using the adjustment procedure, see Troubleshooting on page 92.

## Routing Path C – Cabling and the Wizard / RX Hardware Method

Source → CatPro TX Module → CatPro Input Board → CatPro Output Board → CatPro RX Module → Destination

For Routing Path C, video adjustments are made using both the Wizard Method (which requires a PC) and the RX Hardware Method.

To adjust the video for Routing Path C, you will need to complete the following four sets of instructions:

- Assemble a “Temporary RX Module Unit” and calibrate its RX Module
- Cable the system
- Calibrate the TX Modules to the CatPro inputs (using the Wizard Method and the Temporary RX Module Unit)
- Calibrate the CatPro outputs to the RX Modules (using the RX Hardware Method)

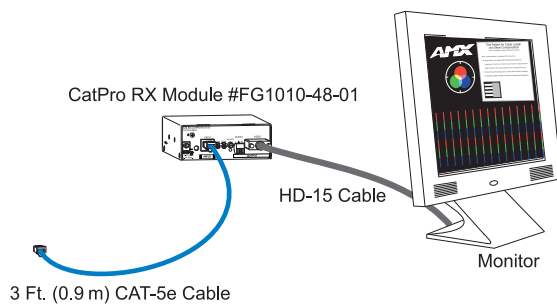
### Temporary RX Module Unit

The Temporary RX Module Unit consists of an RX Module\*, a monitor\*, a 3-foot Cat5e cable (provided with the system), and an HD-15 cable. After the unit is calibrated, it is used to calibrate the TX Modules to CatPro input boards. Then to complete the system setup, the CatPro output boards need to be calibrated to the RX Modules.

\* We suggest using the module and monitor (with the highest resolution available) that will be used in the last routing path to be calibrated, if spare ones are not available.

### To assemble the Temporary RX Module Unit and calibrate its RX Module:

1. Assemble the Temporary RX Module Unit (FIG. 57):
  - a. Connect the 3-foot (0.9 m) Cat5e cable to the RX Module.
  - b. Connect the RX Module to a temporary monitor using HD-15 cable.  
(The module and monitor can be used in the last routing path to be calibrated.)



**FIG. 57** The Temporary RX Module Unit

2. Connect a TX Module to a Source PC (FIG. 58 on page 90).

3. Connect the Temporary RX Module Unit to the TX Module using the open connector on the 3-foot Cat5e cable (FIG. 58).

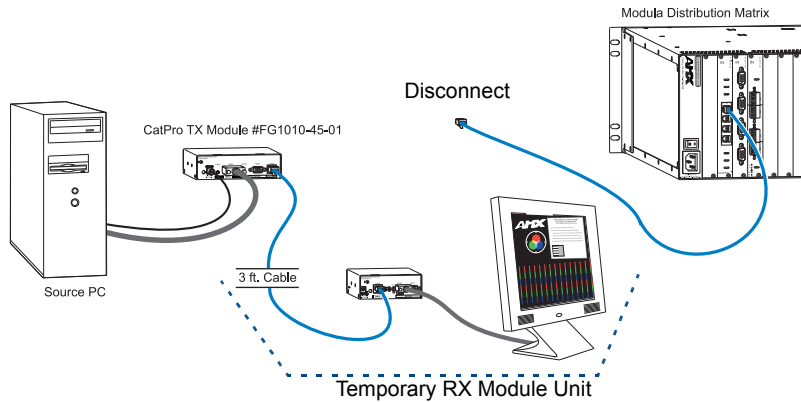


FIG. 58 Connect the Temporary RX Module Unit to the TX Module

4. Turn on the Source PC and open the AMX AutoPatch supplied test image file for the highest input device resolution that is planned for use in the system. The test pattern displays on the temporary monitor.
5. Adjust the gain and peak using the potentiometers on the RX Module until the image is clear and sharp; see the RX Hardware Method on page 82. (Skew is not a concern with the short cable but *must* be adjusted fully counterclockwise to the factory default for R, G, and B.)
6. Disconnect the Temporary RX Module Unit.

**To cable the system for Routing Path C:**

1. Connect the Control PC (with the CatPro Wizard installed) to the serial port on the Modula using a null modem cable. The Control PC settings and the CatPro Wizard settings (which default to serial port Com 1 and baud rate 9600) *must* match. (Leave the Control PC connected until the system is completely adjusted.)
2. Place all source and destination devices in their final installation locations.
3. Cable the complete routing paths from the source devices to the destination devices. FIG. 59 shows the placement of TX and RX Modules. All cable should be the actual cable that will be used. The minimum cable length for a Modula CatPro Input board should not be less than 12 feet (3.66 m).

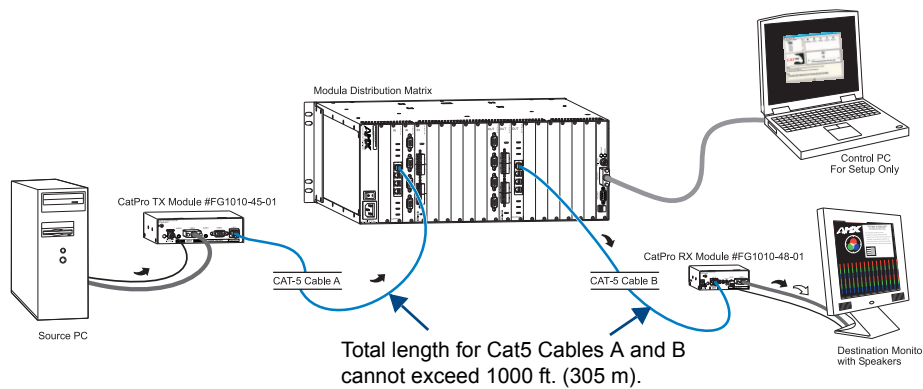


FIG. 59 Routing Path C

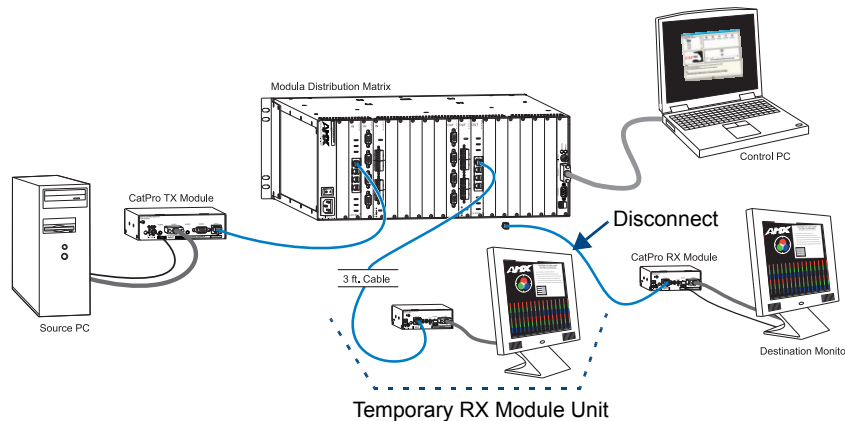
**Important:** Do not make adjustments to the Temporary RX Module Unit during the following procedure; make adjustments only on the CatPro Wizard.



The following procedure needs to be completed for all the sources used in Routing Path C.

**To calibrate a TX Module to its CatPro input (using the Wizard):**

1. Disconnect an RX Module from one of the CatPro output boards.
2. Using the 3-foot Cat5e cable, connect the Temporary RX Module Unit to the now empty connector on the CatPro output board (FIG. 60).



**FIG. 60** Routing Path C ready for calibration with the Wizard

3. Route the signal for the first source device (the test image file should be open on the source) to the output on the CatPro output board that is connected to the Temporary RX Module Unit.
4. Open the CatPro Wizard on the Control PC.
5. Adjust the display using the CatPro Wizard according to Steps 5 through 10 on page 84.
6. Disconnect the Temporary RX Module Unit and reconnect the permanent RX Module to the CatPro output board.
7. Repeat Steps 1 through 6 for all the sources used in Routing Path C (if source devices and their cable runs are similar, see the note below).
8. From the Options menu, select Save to System to restore the settings upon power up. The Save to System dialog box opens.
9. Click OK.
10. From the File menu, select Save As to save a backup file to the PC.
11. Enter a file name, and Click OK.

**Note:** If the same types of source devices are connected to the same types of destination devices with similar cable runs, the settings for the file saved in Step 9 can be applied to those sources (see page 88).

The following procedure needs to be completed for all the destinations that will be used in Routing Path C.

**To calibrate a CatPro output to its RX Module (using the RX Hardware Method):**

1. Route a source to the output to be adjusted on the CatPro output board.
2. On the RX Module connected to the output, adjust the video display using the Gain and Peak potentiometers and the Adjust knob (see page 83).
3. Repeat for all the outputs (destinations) on the board that will be used in Routing Path C.

If undesirable display conditions persist after using the adjustment procedure, see the Troubleshooting section on the following page.

## Troubleshooting

**Note:** *If undesirable display conditions persist after trying the Troubleshooting procedures below, contact Technical Support (see page 43).*

Troubleshooting solutions will depend on the equipment / routing path used.

- Problem: Image periodically goes blank.  
This problem may occur because the CatPro input boards are over-peaked.
- Solution: Try reducing the peak slightly using the Wizard.
  
- Problem: The image does not display or is dark and severely distorted.
- Solution: Try adjusting the gain and peak on the RX Module and/or the Wizard.
  
- Problem: The image on the destination monitor displays missing, extra, or flickering pixels.  
This problem may occur because of abnormally high signal amplitudes from the source video equipment exceeding the CatPro's typical RGB range of 0 mv to 700 mv.
- Solution: Try decreasing the brightness setting on the source device to allow the signal to propagate throughout the system without any clipping or other signal degradation. Typically, brightness can be adjusted by opening the video card drivers on the source device/PC (e.g., from the Control Panel settings, select Intel GMA Driver) and in the Color Correction tab, adjust the brightness setting down. After adjusting the brightness of the source device, slightly readjust the gain on the RX Module and/or on the Wizard until the image is clear and sharp.
  
- Problem: The Wizard stops functioning. Wizard Adjustments already made are still in effect but will be lost when power is cycled.
- Solution: If adjustments are complete, save the settings to the system and to a PC file for backup.  
If adjustments are not complete, restart the Wizard and finish adjustments.

# Stereo Audio Boards

## Applicability Notice

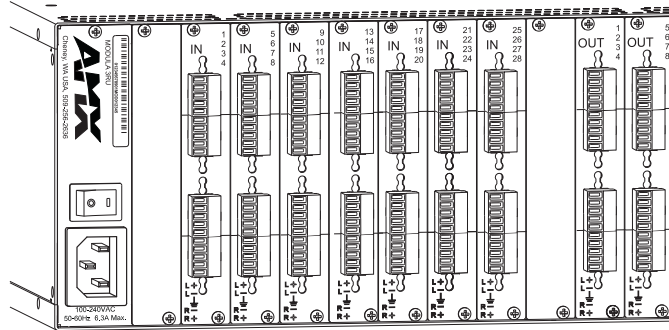


FIG. 61 Stereo audio boards (shown with potentiometer gain option)

This chapter pertains to Modula stereo audio boards contained in pre-engineered systems and custom systems. The following six tables provide information on the types of stereo audio boards and their numbers and indicate which enclosure models can hold which boards.

Applicability Table 1A Stereo Audio Boards for S-Video & Stereo and Cat5 / Video & Audio Enclosures	
<p><b>Note:</b> For Cat5 Video &amp; Audio enclosures – the stereo audio boards listed in this table do not work with Cat5 boards or with Cat5 compatible stereo audio boards. For Cat5 compatible stereo audio boards, see Applicability Table 2 (page 94).</p>	
<p><b>Stereo Audio Boards &amp; Numbers</b></p> <p><b>Note:</b> Specifications for these boards are listed in Specifications Table 1 (page 95).</p>	<p><b>Enclosure Types &amp; Numbers</b></p>
<p>Input – Stereo Audio, gain control, HH* (potentiometer gain)</p> <p><b>FG1034-431</b></p>	<p>S-Video &amp; Stereo (32x32) <b>FG1034-34</b></p> <p>S-Video &amp; Stereo (16x48 Flex-slot) <b>FG1034-19</b></p>
<p>Output – Stereo Audio, gain control, HH* (potentiometer gain)</p> <p><b>FG1034-449</b></p>	<p>S-Video &amp; Stereo (48x16 Flex-slot) <b>FG1034-49</b></p>
<p>Output – Stereo Audio, digital volume control</p> <p><b>FG1034-566</b></p>	<p>Cat5 / Video &amp; Audio (32x32) <b>FG1034-37</b></p> <p>Cat5 / Video &amp; Audio (16x48 Flex-slot) <b>FG1034-22</b></p> <p>Cat5 / Video &amp; Audio (48x16 Flex-slot) <b>FG1034-52</b></p>
<p>* High Headroom – up to a +22 dBu signal</p>	

Applicability Table 1B Stereo Audio Boards for Wideband & Stereo Enclosures	
<p><b>Stereo Audio Boards &amp; Numbers</b></p> <p><b>Note:</b> Specifications for these boards are listed in Specifications Table 1 (page 95).</p>	<p><b>Enclosure Type &amp; Number</b></p>
<p>Input – Stereo Audio, gain control (potentiometer gain)</p> <p><b>FG1034-428</b></p>	<p>Wideband &amp; Stereo (32x32) <b>FG1034-28</b></p>
<p>Output – Stereo Audio, gain control (potentiometer gain)</p> <p><b>FG1034-446</b></p>	

Applicability Table 1C Stereo Audio Boards for SDI Digital Video & S-Video Enclosures	
Stereo Audio Boards & Numbers	Enclosure Type & Number
<b>Note:</b> Specifications for these boards are listed in Specifications Table 1 (page 95).	SDI Digital Video & S-Video (32x32) <b>FG1034-33</b>
Input – Stereo Audio, gain control (potentiometer gain) <b>FG1034-511</b>	
Output – Stereo Audio, gain control (potentiometer gain) <b>FG1034-514</b>	

Applicability Table 2 Cat5 Compatible Stereo Audio Boards for Cat5 / Video & Audio Enclosures	
<b>Note:</b> Cat5-compatible stereo audio boards work in conjunction with Cat5 TXs and RXs (modules or AF-10 boards) and are not compatible with standard stereo audio boards listed in Applicability Table 1A. For Cat5 system setup, see page 128.	
Cat5 Compatible Stereo Audio Boards & Numbers	Enclosure Types & Numbers
<b>Note:</b> Specifications for these boards are listed in Specifications Table 2 (page 96).	Cat5 / Video & Audio (32x32) <b>FG1034-37</b>  Cat5 / Video & Audio (16x48 Flex-slot) <b>FG1034-22</b>  Cat5 / Video & Audio (48x16 Flex-slot) <b>FG1034-52</b>
Input – Stereo Audio to Cat5 output, unbalanced (potentiometer gain) <b>FG1034-518</b>	
Output – Stereo Audio from Cat5 input, unbalanced (potentiometer gain) <b>FG1034-530</b>	
Output – Stereo Audio from Cat5 input, digital volume control, unbalanced <b>FG1034-542</b>	

Applicability Table 3 Stereo Audio Boards for CatPro RGBHV/HD-15 and RGBHV/HD-15 Enclosures	
<b>Note:</b> These standard stereo audio boards cannot work in conjunction with CatPro boards. For CatPro compatible stereo audio boards, see Applicability Table 4 (below).	
Stereo Audio Boards & Numbers	Enclosure Types & Numbers
<b>Note:</b> Specifications for these boards are listed in Specifications Table 3 (page 97).	RGBHV/HD-15 (32x32, 4 RU) <b>FG1034-61</b>  CatPro RGBHV/HD-15 (32x32, 4 RU) <b>FG1034-42</b>
Input – Stereo Audio, gain control (potentiometer gain) <b>FG1034-632</b>	
Output – Stereo Audio, gain control (potentiometer gain) <b>FG1034-635</b>	

Applicability Table 4 CatPro-Compatible Stereo Audio Boards for CatPro RGBHV/HD-15 Enclosures	
<b>Note:</b> CatPro-compatible stereo input boards can switch to CatPro output boards, and CatPro-compatible stereo output boards can receive stereo signals from CatPro input boards. However, CatPro-compatible stereo audio boards do not work with the standard stereo audio boards listed in Applicability Table 3.	
<b>CatPro-Compatible Stereo Audio Boards &amp; Numbers</b> <b>Note:</b> Specifications for these boards are listed in Specifications Table 4 (page 98).	<b>Enclosure Type &amp; Number</b>
Input – Stereo Audio to CatPro output (potentiometer gain) <b>FG1034-493</b>	CatPro RGBHV/HD-15 (32x32, 4 RU) <b>FG1034-42</b>
Output – Stereo Audio from CatPro input, digital volume control <b>FG1034-496</b>	

## Stereo Audio Boards Specifications

### Specifications Table 1

Applies to Modula stereo audio input and output boards listed in Applicability Tables 1A and 1B (see page 93) and 1C (see page 94).

Also applies to these stereo audio boards when contained in pre-engineered systems.

Specifications Table 1		
Parameter	Conditions	Value
Frequency Response	f = 20 Hz to 20 kHz	<±0.1 dB
THD+Noise, volume control	f = 20 Hz to 20 kHz, V <sub>in</sub> = -10 to +20 dBu	<0.03%
THD+Noise, no volume control	f = 20 Hz to 20 kHz, V <sub>in</sub> = -10 to +22 dBu	<0.02%
THD+Noise, volume control in a Wideband & Stereo enclosure	f = 1 kHz, V <sub>in</sub> = -10 to +20 dBu	<0.05%
Crosstalk	f = 1 kHz, V <sub>in</sub> = +20 dBu	<-95 dB
Signal to Noise Ratio	f = 20 Hz to 20 kHz, V <sub>in</sub> = +20 dBu	>100 dB
Input Level (max.), balanced		+22 dBu
Input Impedance		18 kohms
Input Gain Adjustment Range	Potentiometer adjustment	+6 dB to -6 dB
Output Level (max.), balanced		+22 dBu
Output Impedance		50 ohms
Output Gain Adjustment Range	Potentiometer adjustment	+6 dB to -10 dB
Output Volume Adjustment Range	Via serial / control panel	+10 dBu to -70 dBu (muted)
Signal Type		Balanced or unbalanced
Connector Type		Pluggable 5-position terminal block

## Specifications Table 2

Applies to Modula Cat5 compatible stereo audio input and output boards contained in Cat5 systems listed in Applicability Table 2 (page 94).

Also applies to these Cat5 compatible stereo audio boards when contained in pre-engineered systems.

Specifications Table 2		
Parameter	Conditions	Value
Frequency Response	f = 20 Hz to 20 kHz	<±0.2 dB
THD+Noise, balanced	f = 20 Hz to 20 kHz, Vin = -10 to +22 dBu	<0.04%
THD+Noise, unbalanced	f = 20 Hz to 20 kHz, Vin = -10 to +8 dBu	<0.03%
Crosstalk, balanced	f = 1 kHz, Vin = +20 dBu	<-90 dB
Crosstalk, unbalanced	f = 1 kHz, Vin = +2 dBu	<-85 dB
Signal to Noise Ratio, balanced	f = 20 Hz to 20 kHz, Vin = +20 dBu	>110 dB
Signal to Noise Ratio, unbalanced	f = 20 Hz to 20 kHz, Vin = +4 dBu	>90 dB
Input Level (max.), balanced		+22 dBu
Input Level (max.), unbalanced		+8 dBu
Input Impedance		18 kohms
Output Level (max.), balanced		+22 dBu
Output Level (max.), unbalanced		+8 dBu
Output Impedance		50 ohms
Signal Type		Will route stereo or mono audio
Connector Type		Pluggable 5-position terminal block
Compatibility		These boards can be used to break into and out of the Cat5 boards.

### Specifications Table 3

Applies to Modula stereo audio boards contained in CatPro RGBHV/HD-15 and RGBHV/HD-15 systems listed in Applicability Table 3 (page 94).

Also applies to these stereo audio boards when contained in pre-engineered systems.

Specifications Table 3		
Parameter	Conditions	Value
Frequency Response	f = 20 Hz to 20 kHz	<±0.1 dB
THD+Noise – RGBHV/HD-15 enclosures	f = 20 Hz to 20 kHz, Vin = -10 to +22 dBu f = 1 kHz, Vin = -10 to +20 dBu	<0.03% <0.05%
No volume control		
Volume control		
THD+Noise – CatPro enclosures	f = 20 Hz to 20 kHz, Vin = -10 dBu to +22 dBu	<0.03%
No volume control		
Crosstalk	f = 1 kHz, Vin = +20 dBu	<-92 dB
Signal to Noise Ratio	f = 20 Hz to 20 kHz, Vin = +20 dBu	>100 dB
Input Level (max.), balanced		+22 dBu
Input Impedance		18 kohms
Input Gain Adjustment Range	Potentiometer adjustment	+6 dB to -6 dB
Output Level (max.), balanced		+22 dBu
Output Impedance		50 ohms
Output Volume Adjustment Range	Potentiometer adjustment	+6 dB to -10 dB
Output Volume Adjustment Range	Via serial / control panel	+10 dB to -70 dB (mute)
Signal Type		Balanced or unbalanced
Connector Type		Pluggable 5-position terminal block

### Specifications Table 4

Applies to CatPro-compatible stereo audio contained in the CatPro RGBHV/HD-15 system listed in Applicability Table 4 (page 95).

Also applies to these CatPro-compatible stereo audio boards when contained in pre-engineered systems.

Specifications Table 4		
Parameter	Conditions	Value
Frequency Response	f = 20 Hz to 20 kHz	<±0.25 dB
THD+Noise	f = 1 kHz, Vin = -10 to +4 dBu	<0.06%
Crosstalk	f = 1 kHz, Vin = +4 dBu	<-95 dB
Signal to Noise Ratio	f = 20 Hz to 20 kHz, Vin = +4 dBu	>80 dB
Input Level (max.), balanced		+8 dBu
Input Impedance		18 kohms
Input Gain Adjustment Range	Potentiometer adjustment	+6 dB to -6 dB
Output Level (max.), balanced		+8 dBu
Output Impedance		50 ohms
Output Volume Adjustment Range	Via serial / control panel	+10 dBu to -70 dBu (muted)
Type		Balanced or unbalanced
Connector Type		Pluggable 5-position terminal block
Compatibility		These boards can be used to break into and out of the CatPro RGBHV boards.

AMX reserves the right to modify its products and their specifications without notice.



## Attaching Wires

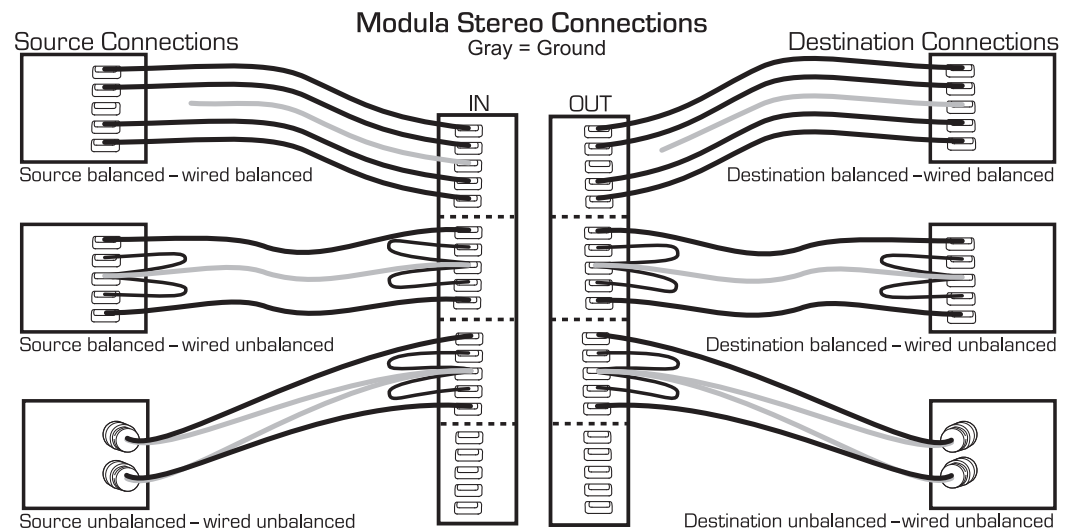
### Important:

- If using Cat5 compatible stereo audio boards – for information on installation and system setup, first see “Cat5 Video and Audio Boards with TXs & RXs” starting on page 123.
- If using CatPro-compatible stereo audio boards – for information on installation and system setup, first see “RGBHV+Stereo to CatPro Boards with TX & RX Modules” starting on page 69.

When attaching stereo audio input and output wires, refer to the sheet labeled “AutoPatch Modula Connector Guide” that ships with the system. The sheet shows you where to attach the wires on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side (near the power receptacle).

### Wiring Sources and Destinations

Source and destination devices will require either balanced (differential) or unbalanced (single-ended) connections. The diagram in FIG. 62 illustrates the options for wiring connections between the sources and the input connectors and between the output connectors and the destinations. More than one of these options can be used in the same system. FIG. 63 shows details for balanced and unbalanced wiring.



**FIG. 62** Options for source-to-Modula-to destination 5-term wiring

### To attach stereo audio input and output wires:

1. Unscrew the clamps on the audio connector.
2. Insert the wires (for wire placement for balanced and unbalanced audio, see FIG. 63) and firmly re-tighten the clamps to make proper connections.

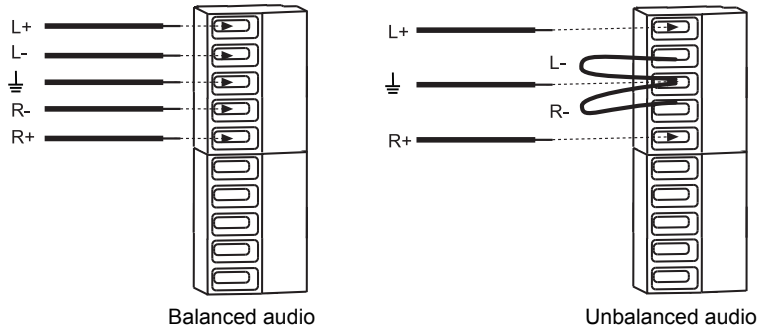


FIG. 63 Stereo audio balanced and unbalanced wiring

**Note:** For stereo audio signals using twisted pair wire, connect the shield (ground) only at one end (recommend receiving end) to minimize low frequency noise.

## Adjusting Output Volume

Most stereo output boards in a Modula can be ordered with either potentiometer volume control or digital volume control. Either adjustment can be made at any time during normal operation. When audio is adjusted for a device on one level, the adjustment remains in effect for that device on all levels switching audio signals.

### Potentiometer Output Boards

Stereo output boards are set to unity gain at the factory.

#### To adjust output volume using potentiometers:

1. Route a source (input) to the first destination (output).

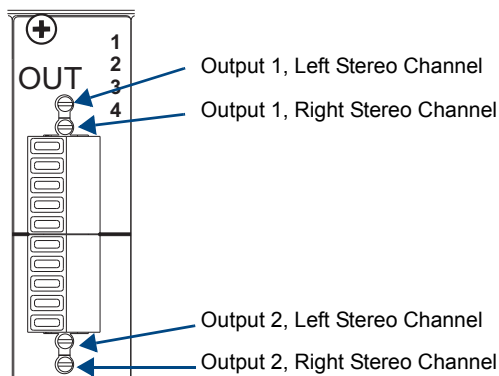


FIG. 64 Output gain adjustment pots

2. Adjust the output volume for the destination to the desired dB level by turning the corresponding potentiometer (FIG. 64) clockwise (to the right) to decrease volume or counterclockwise (to the left) to increase volume.
3. Repeat for all destinations that require adjustment.

## Digital Gain (Volume) Output Boards

Output volume can be adjusted using either a control panel that supports this feature (see the control panel's instruction manual or quick start guide) or BCS (Basic Control Structure) commands from an external controller.

### BCS Volume Adjustment

Volume can be adjusted using one of three BCS command methods: Absolute, Relative, or Increment/Decrement. Directions for adjusting volume using the Absolute Method (adjusting volume to a specific decibel level) are given below. Information and instructions for the other two methods can be found in the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com).

### To adjust volume using the BCS Absolute Method:

1. Enter the Volume Absolute command using the format below. Replace the “#”s with the level number and the output number, and replace “^^^” with the decibel level. Enter the decibel level as a decimal number to the tenth place without the decimal point (e.g., -31.5 dB is entered as -315).

```
CL#O#VA^^^T
```

### Example

Adjust the volume to +10 dB for Output 3 on Level 0 (VM 0) by entering the following BCS command line:

```
CL003VA100T
```

## Adjusting Input Gain

For stereo audio boards that support input gain, adjustments (within the gain range for the specific audio inputs) are normally made during system setup; however, they can be made at any time during normal operation. When audio is adjusted for a device, the adjustment applies to all levels switching audio signals. Stereo input boards are set to unity gain at the factory.



**Caution:** We strongly recommend that input gain adjustment be made only by a qualified installer or dealer.

### Purpose and Uses of Input Gain

Adjusting input gain (the nominal level of the signal from the source device) allows source signals of varying amplitudes to be equalized before they are routed and the volume is adjusted. Equalizing source levels provides a consistent reference for volume adjustments and eliminates jumps when routing a new input to an output. Input gain adjustment is also used for equalizing amplitudes between balanced and unbalanced inputs.

### To equalize input levels by adjusting input gain:

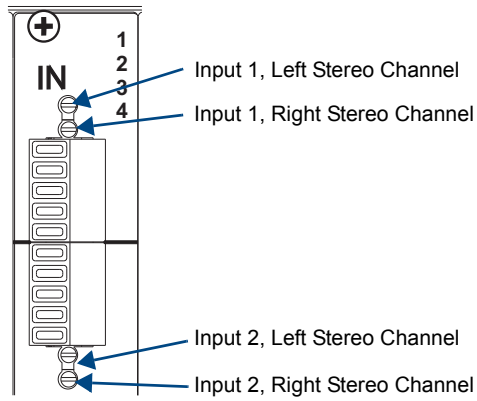
1. Route the first input (source) to an output (destination).
2. Adjust the input gain for the source to the desired dB level (see page 102).
3. Repeat for all inputs that will be routed to the same output.

**Note:** The total through-system gain (the amount of input gain plus the amount of output gain) specified for any input to output routing path cannot exceed 10 dBr. If a volume command is entered that exceeds 10 dBr when it is combined with the gain of an input, the command will be accepted (and will be indicated in status results) but will not result in an audible difference of more than 10 dBr.

### Potentiometer Input Boards

#### To adjust potentiometer input gain:

1. Route a source (input) to the first destination (output).



**FIG. 65** Input gain adjustment pots

2. Adjust the input gain for the source to the desired dB level by turning the corresponding potentiometer (FIG. 65) clockwise (to the right) to decrease gain or counterclockwise (to the left) to increase gain.

# Mono Audio Boards

## Applicability Notice

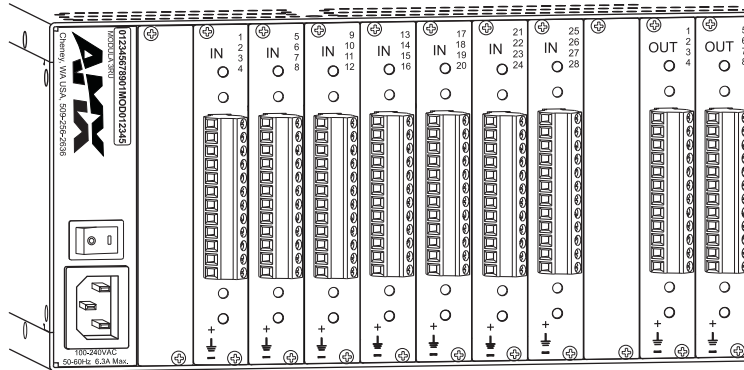


FIG. 66 Mono audio boards (shown with potentiometer gain option)

This chapter pertains to Modula mono audio boards contained in pre-engineered systems and custom systems. The following five tables provide information on the types of mono audio boards and their numbers and indicate which enclosure models can hold which boards.

Applicability Table 1A Mono Audio Boards for Standard Video, S-Video & Stereo and Cat5 / Video & Audio Enclosures	
<b>Note:</b> For Cat5 Video & Audio enclosures – the mono audio boards listed in this table cannot work in conjunction with Cat5 boards or Cat5 compatible mono audio boards. For Cat5 compatible mono audio boards, see Applicability Table 2 (page 105).	
Mono Audio Boards & Numbers	Enclosure Types & Numbers
<b>Note:</b> Specifications for these boards are listed in Specifications Table 1 (page 106).	Standard Video (32x32) <b>FG1034-31</b>
Input – Mono Audio, gain control, HH* (potentiometer gain) <b>FG1034-422</b>	Standard Video (16x48 Flex-slot) <b>FG1034-16</b>
Output – Mono Audio, gain control, HH* (potentiometer gain) <b>FG1034-437</b>	Standard Video (48x16 Flex-slot) <b>FG1034-46</b>
Output – Mono Audio, digital volume control <b>FG1034-443</b>	S-Video & Stereo (32x32) <b>FG1034-34</b>
	S-Video & Stereo (16x48 Flex-slot) <b>FG1034-19</b>
	S-Video & Stereo (48x16 Flex-slot) <b>FG1034-49</b>
	Cat5 / Video & Audio (32x32) <b>FG1034-37</b>
	Cat5 / Video & Audio (16x48 Flex-slot) <b>FG1034-22</b>
	Cat5 / Video & Audio (48x16 Flex-slot) <b>FG1034-52</b>
* High Headroom – up to a +22 dBu signal.	

<b>Applicability Table 1B</b> <b>Mono Audio Boards for Wideband Video and Wideband Video &amp; Stereo Enclosures</b>	
<b>Mono Audio Boards &amp; Numbers</b>	<b>Enclosure Types &amp; Numbers</b>
<b>Note:</b> Specifications for these boards are listed in Specifications Table 1 (page 106).	Wideband Video (32x32) <b>FG1034-25</b>
Input – Mono Audio, gain control (potentiometer gain) <b>FG1034-419</b>	Wideband Video & Stereo (32x32) <b>FG1034-28</b>
Output – Mono Audio, gain control (potentiometer gain) <b>FG1034-434</b>	
Output – Mono Audio, digital volume control <b>FG1034-440</b>	
Input – Mono Audio, gain control (potentiometer gain) <b>FG1034-677</b>	Wideband Video (16x48 Flex-slot) <b>FG1034-10</b>
Output – Mono Audio, gain control (potentiometer gain) <b>FG1034-680</b>	
Output – Mono Audio, digital volume control <b>FG1034-683</b>	
Input – Mono Audio, gain control (potentiometer gain) <b>FG1034-686</b>	Wideband Video (48x16 Flex-slot) <b>FG1034-43</b>
Output – Mono Audio, gain control (potentiometer gain) <b>FG1034-689</b>	
Output – Mono Audio, digital volume control <b>FG1034-692</b>	

<b>Applicability Table 1C</b> <b>Mono Audio Boards for SDI &amp; Standard Video and SDI &amp; S-Video Enclosures</b>	
<b>Mono Audio Boards &amp; Numbers</b>	<b>Enclosure Types &amp; Numbers</b>
<b>Note:</b> Specifications for these boards are listed in Specifications Table 1 (page 106).	SDI & Standard Video (32x32) <b>FG1034-30</b>
Input – Mono Audio, HH* (potentiometer gain) <b>FG1034-475</b>	SDI & S-Video (132x32) <b>FG1034-33</b>
Output – Mono Audio, HH* (potentiometer gain) <b>FG1034-472</b>	
* High Headroom – up to a +22 dBu signal	

Applicability Table 2 Cat5 Compatible Mono Audio Boards for Cat5 / Video & Audio Enclosures	
<b>Note:</b> Cat5 mono audio boards work in conjunction with Cat5 S-Video+Stereo TXs and RXs (modules or AF-10 boards) and are not compatible with the mono audio boards listed in Applicability Table 1A.	
Mono Audio Boards & Numbers	Enclosure Types & Numbers
<b>Note:</b> Specifications for these boards are listed in Specifications Table 2 (page 107).	Cat5 / Video & Audio (32x32) <b>FG1034-37</b>
Input – Mono Audio to Cat5 output, unbalanced (potentiometer gain) <b>FG1034-515</b>	Cat5 / Video & Audio (16x48 Flex-slot) <b>FG1034-22</b>
Output – Mono Audio from Cat5 input, unbalanced (potentiometer gain) <b>FG1034-527</b>	Cat5 / Video & Audio (48x16 Flex-slot) <b>FG1034-52</b>
Output – Mono Audio from Cat5 input, digital volume control, unbalanced <b>FG1034-539</b>	

Applicability Table 3 Mono Audio Boards for RGBHV/HD-15 and CatPro RGBHV/HD-15 Enclosures	
<b>Note:</b> These mono audio boards cannot work in conjunction with CatPro boards or CatPro TXs and RXs.	
Mono Audio Boards & Numbers	Enclosure Types & Numbers
<b>Note:</b> Specifications for these boards are listed in Specifications Table 3 (page 108).	RGBHV/HD-15 (32x32, 4 RU) <b>FG1034-61</b>
Input – Mono Audio, gain control (potentiometer gain) <b>FG1034-656</b>	CatPro RGBHV/HD-15 (32x32, 4 RU) <b>FG1034-42</b>
Output – Mono Audio, gain control (potentiometer gain) <b>FG1034-665</b>	
Output – Mono Audio, digital volume control <b>FG1034-668</b>	

## Mono Audio Boards Specifications

### Specifications Table 1

Applies to mono audio input and output boards listed in Tables 1A (see page 103) and 1B and 1C (see page 104).

Also applies to these mono audio boards when contained in pre-engineered systems.

Specifications Table 1		
Parameter	Conditions	Value
Frequency Response	f = 20 Hz to 20 kHz	<±0.1 dB
THD+Noise, volume control	f = 20 Hz to 20 kHz, Vin = -10 to +20 dBu	<0.03%
THD+Noise, no volume control	f = 20 Hz to 20 kHz, Vin = -10 to +22 dBu	<0.02%
THD+Noise, volume control, Wideband and Wideband & Stereo enclosures	f = 1 kHz, Vin = -10 to +20 dBu	<0.05%
Crosstalk	f = 1 kHz, Vin = +20 dBu	<-95 dB
Signal to Noise Ratio	f = 20 Hz to 20 kHz, Vin = +20 dBu	>100 dB
Input Level (max.), balanced		+22 dBu
Input Impedance		18 kohms
Input Gain Adjustment Range	Potentiometer adjustment	+6 dB to -6 dB
Output Level (max.), balanced		+22 dBu
Output Impedance		50 ohms
Output Gain Adjustment Range	Potentiometer adjustment	+6 dB to -10 dB
Output Volume Adjustment Range	Via serial / control panel	+10 dBu to -70 dBu (mute)
Signal Type		Balanced or unbalanced
Connector Type		Pluggable 3-position terminal block



## Specifications Table 2

Applies to Cat5 compatible mono audio boards contained in Cat5 systems listed in Applicability Table 2 (see page 105).

Also applies to these Cat5 compatible mono audio boards when contained in preconfigured systems.

Specifications Table 2		
Parameter	Conditions	Value
Frequency Response	f = 20 Hz to 20 kHz	<± 0.2 dB
THD+Noise, balanced	f = 20 Hz to 20 kHz, Vin = -10 dBu to +22 dBu	<0.04%
THD+Noise, unbalanced	f = 20 Hz to 20 kHz, Vin = -10 dBu to +8 dBu	<0.03%
Crosstalk, balanced	f = 1 kHz, Vin = +20 dBu	<-90 dB
Crosstalk, unbalanced	f = 1 kHz, Vin = +2 dBu	<-85 dB
Signal to Noise Ratio, balanced	f = 20 Hz to 20 kHz, Vin = +20 dBu	>110 dB
Signal to Noise Ratio, unbalanced	f = 20 Hz to 20 kHz, Vin = +4 dBu	>90 dB
Input Level (max.), balanced		+22 dBu
Input Level (max.), unbalanced		+8 dBu
Input Impedance		18 kohms
Output Level (max.), balanced		+22 dBu
Output Level (max.), unbalanced		+8 dBu
Output Impedance		50 ohms
Signal Type		Will route stereo or mono audio
Connector Type		Pluggable 3-position terminal block
Compatibility		These boards can be used to break into and out of the Cat5 boards.

### Specifications Table 3

Applies to mono audio boards contained in CatPro RGBHV/HD-15 and RGBHV/HD-15 systems listed in Applicability Table 3 (see page 105).

Also applies to these mono audio boards when contained in pre-engineered systems.

Specifications Table 3		
Parameter	Conditions	Value
Frequency Response	f = 20 Hz to 20 kHz	<±0.1 dB
THD+Noise, no volume control	f = 20 Hz to 20 kHz, Vin = -10 to +22 dBu	<0.03%
THD+Noise, with volume control RGBHV/HD-15 enclosures only	f = 20 Hz to 20 kHz, Vin = -10 to +20 dBu	<0.05%
Crosstalk	f = 1 kHz, Vin = +20 dBu	<-92 dB
Signal to Noise Ratio	f = 20 Hz to 20 kHz, Vin = +20 dBu	>100 dB
Input Level (max.), balanced		+22 dBu
Input Impedance		18 kohms
Input Gain Adjustment Range	Potentiometer adjustment	+6 dB to -6 dB
Output Level (max.), balanced		+22 dBu
Output Impedance		50 ohms
Output Gain Adjustment Range	Potentiometer adjustment	+6 dB to -10 dB
Output Volume Adjustment Range	Via serial / control panel	+10 dB to -70 dB (mute)
Signal Type		Balanced or unbalanced
Connector Type		Pluggable 3-position terminal block

AMX reserves the right to modify its products and their specifications without notice.

## Attaching Wires

**Important:** If using Cat5 compatible mono audio boards – first see “Cat5 Video and Audio Boards with TXs & RXs” starting on page 123 for special system setup information.

When attaching mono audio input and output wires, refer to the sheet labeled “AutoPatch Modula Connector Guide” that ships with the system. The sheet shows you where to attach the wires on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side (near the power receptacle).

### Wiring Sources and Destinations

Source and destination devices will require either balanced (differential) or unbalanced (single-ended) connections. FIG. 67 illustrates the options for wiring between the sources and the input connectors and between the output connectors and the destinations. More than one of these options can be used in the same system. FIG. 68 shows details for balanced and unbalanced wiring.

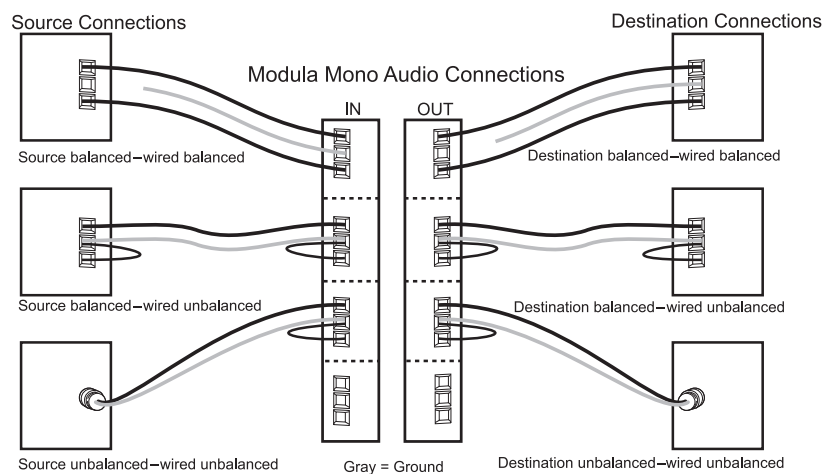


FIG. 67 Options for source-to-Modula-to-destination 3-Term wiring

### To attach mono audio input and output wires:

1. Unscrew the clamps on the audio connector.
2. Insert the wires and firmly re-tighten the clamps to make secure connections.  
For balanced audio wire placement, see the left wiring diagram in FIG. 68.  
For unbalanced audio wire placement, see the right wiring diagram in FIG. 68.

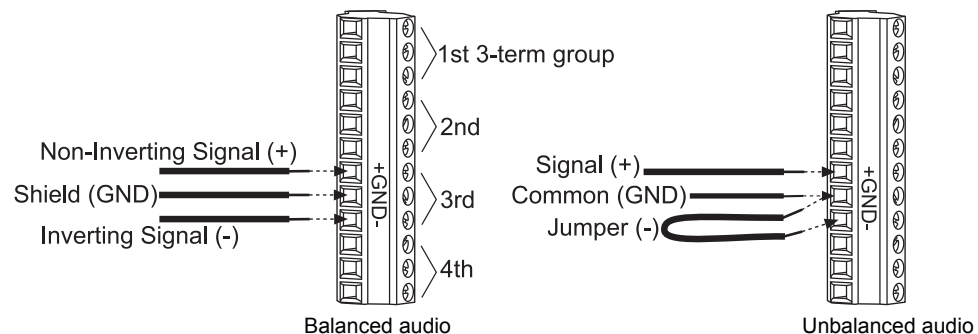


FIG. 68 Balanced and unbalanced mono audio wiring

**Note:** For mono audio signals using twisted pair wire, connect the shield (ground) only at one end (recommend receiving end) to minimize low frequency noise.

## Adjusting Output Volume

Most mono audio output boards in a Modula can be ordered with either potentiometer volume control or digital volume control (see below for both). Either adjustment can be made at any time during normal operation.

### Potentiometer Output Boards

Mono audio output boards are set to unity gain at the factory.

#### To adjust output volume using potentiometers:

1. Route a source (input) to the first destination (output).

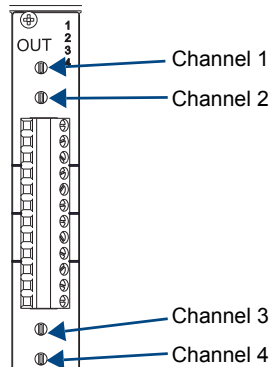


FIG. 69 Output gain adjustment pots

2. Adjust the output volume for the destination to the desired dB level by turning the corresponding potentiometer (FIG. 69) clockwise to decrease volume, counterclockwise to increase volume.
3. Repeat for all destinations that require adjustment.

### Digital Gain (Volume) Output Boards

Output volume can be adjusted using either a control panel that supports this feature (see the control panel's instruction manual) or BCS (Basic Control Structure) commands from an external controller.

#### BCS Volume Adjustment

Volume can be adjusted using one of three BCS command methods: Absolute, Relative, or Increment/Decrement. Directions for adjusting volume using the Absolute Method (adjusting volume to a specific decibel level) are given below. Information and instructions for the other two methods can be found in the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com).

#### To adjust volume using the BCS Absolute Method:

1. Enter the Volume Absolute command using the format below. Replace the “#”s with the level number and the output number, and replace “^^^” with the decibel level. Enter the decibel level as a decimal number to the tenth place without the decimal point (e.g., -31.5 dB is entered as -315).  
CL#O#VA^^^T

#### Example

Adjust the volume to +10 dB for Output 3 on Level 0 (VM 0) by entering the following BCS command line:

```
CL003VA100T
```

**Note:** The total through-system gain (the amount of input gain plus the amount of output gain) specified for any input to output routing path cannot exceed 10 dBr. If a volume command is entered that exceeds 10 dBr when it is combined with the gain of an input, the command will be accepted (and will be indicated in status results) but will not result in an audible difference of more than 10 dBr.

## Adjusting Input Gain

For mono audio boards that support input gain, adjustments (within the gain range for the specific audio inputs) are normally made during system setup; however, they can be made at any time during normal operation. When audio is adjusted for a device, the adjustment applies to all levels switching audio signals. Mono input boards are set to unity gain at the factory.



**Caution:** We strongly recommend that input gain adjustment be made only by a qualified installer or dealer.

### Purpose and Uses of Input Gain

The purpose of controlling input gain (the nominal level of the signal from the source device) is to allow source signals of various amplitudes to be equalized before they are routed and the volume is adjusted. Equalizing source levels provides a consistent reference for volume adjustments and eliminates jumps when routing a new source to a destination. Typical uses for input gain include switching consumer and professional grade audio equipment (whose levels can vary noticeably) in the same matrix switcher. Input gain adjustment is also used for equalizing amplitudes between balanced and unbalanced sources.

### To equalize input levels by adjusting input gain:

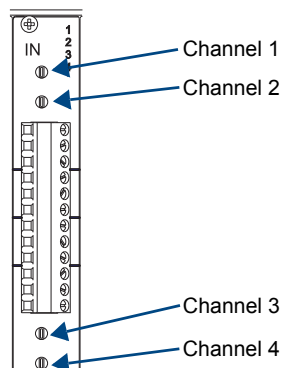
1. Route a source (input) to the first destination (output).
2. Adjust the input gain for the source to the desired dB level (see below).
3. Repeat for all sources that will be routed to the same destination.

### Potentiometer Input Boards

Mono audio input boards are set to unity gain at the factory.

### To use potentiometer input gain to equalize input levels:

1. Route a source (input) to the first destination (output).
2. Adjust the input gain for the source to the desired dB level by turning the corresponding potentiometer (FIG. 70) clockwise (to the right) to decrease gain, counterclockwise (to the left) to increase gain.



**FIG. 70** Input gain adjustment pots

3. Repeat for all sources that will be routed to the same destination.



# Microphone Input and Phantom Power Boards

## Applicability Notice

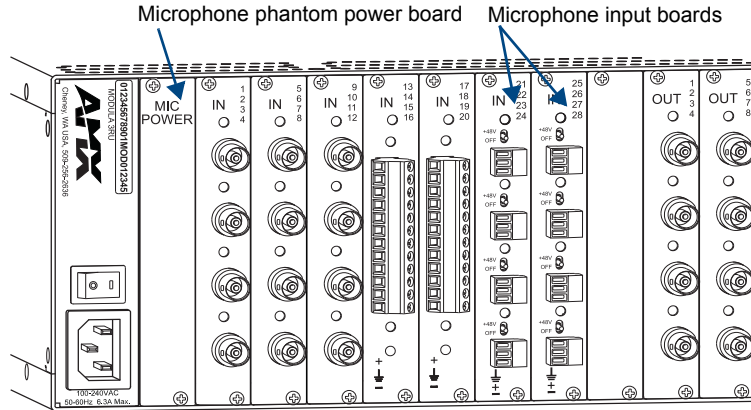


FIG. 71 Microphone phantom power board and microphone input boards

This chapter pertains to Modula microphone input and phantom power boards that can be ordered for custom systems. Microphone input boards are used in conjunction with mono audio output boards. Enclosures with microphone input boards can be ordered to include a microphone power board to provide phantom power for microphone boards connected to condenser type microphones.

Modula Microphone Input and Phantom Power Boards for Standard Video, S-Video & Stereo, and Cat5 / Video & Audio Enclosures	
Microphone Input and Microphone Phantom Power Boards & Numbers	Enclosure Types & Numbers
<i>Note: Specifications for these boards are listed on page 114.</i>	Standard Video (32x32) <b>FG1034-31</b>
Microphone Board <b>FG1034-563</b>	Standard Video (16x48 Flex-slot) <b>FG1034-16</b>
Microphone Phantom Power Board +48 VDC <b>FG1034-316</b>	Standard Video (48x16 Flex-slot) <b>FG1034-46</b>
	S-Video & Stereo (32x32) <b>FG1034-34</b>
	S-Video & Stereo (16x48 Flex-slot) <b>FG1034-19</b>
	S-Video & Stereo (48x16 Flex-slot) <b>FG1034-49</b>
	Cat5 / Video & Audio (32x32) <b>FG1034-37</b>
	Cat5 / Video & Audio (16x48 Flex-slot) <b>FG1034-22</b>
	Cat5 / Video & Audio (48x16 Flex-slot) <b>FG1034-52</b>

## Microphone Input and Phantom Power Board Specifications

### Microphone Input Board Specifications

Applies to Modula microphone input board FG1034-563.

Specifications		
Parameter	Conditions	Value
Frequency Response		20 Hz to 20 kHz
Input Compression Ratio		1:1, 2:1, 3:1, 5:1
Input Level	Differential (balanced)	-78 dBu to -25 dBu
Input Impedance		25 kohms
Input Digital Gain Control Range	Serial control adjustment	-78 dBu to +3 dBu
Connector Type		3-position terminal block

### Microphone Phantom Power Board Specifications

Applies to Modula microphone phantom power board FG1034-316.

Specifications		
Parameter	Conditions	Value
Internal Phantom power	Supplied to microphone with switch	+48 V @ 500 mA

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## Compression Ratio

Individual connectors on the microphone board can be set at one of four different compression ratios: 1:1 (factory default), 2:1, 3:1, and 5:1. FIG. 72 shows all four compression ratios as well as the limiting point. If you need to set the compression ratio at a setting other than the 1:1 factory default, follow the procedure on page 115. If not, go to “Attaching Wires” on page 116.

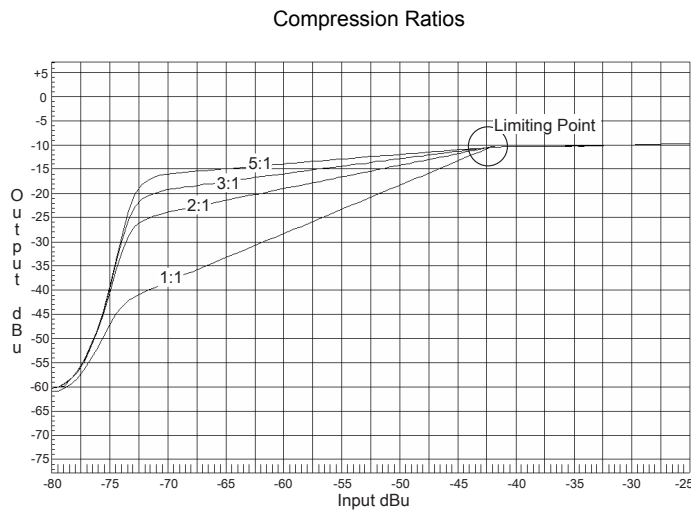


FIG. 72 Compression Ratios with Limiting Point



## Setting the Compression Ratio (changing from default)



**Caution:** If the enclosure contains the optional microphone power board, make sure the phantom power selection switches (FIG. 74 on page 116) are set to “OFF” before setting the compression ratio.

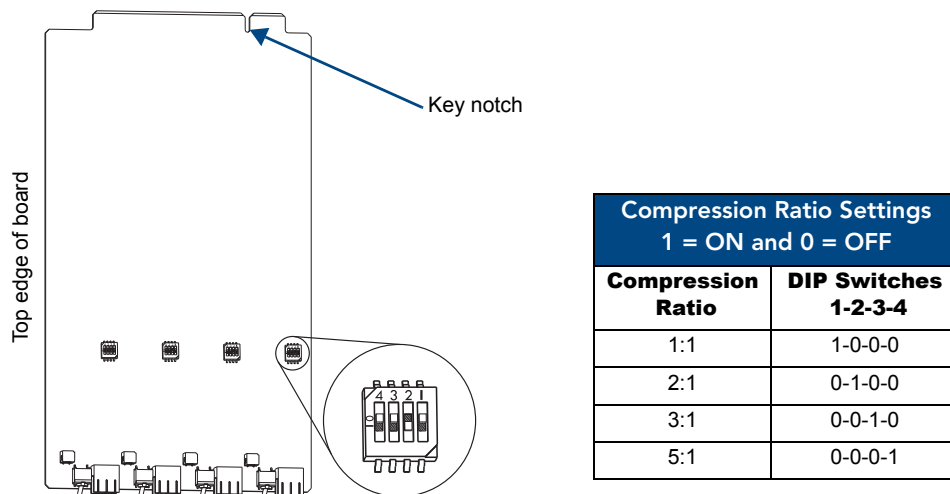
The microphone input board must be removed from the enclosure to set the compression ratio switches.



**ESD Warning:** To avoid ESD (Electrostatic Discharge) damage to sensitive components, make sure you are properly grounded before touching any internal Modula materials. Use an ESD wristband and cord with an alligator clip attached to a good ground source.

### To set the compression ratio switches:

1. Check that the phantom power selection switches (FIG. 74 on page 116) are set to “OFF”.
1. Turn off the power switch on the rear of the enclosure and unplug the power cord.
2. Multiple-enclosure systems – label and disconnect link cables.
3. If necessary – label and disconnect all wires attached to the board. If wires or cables from adjoining boards obstruct access, label and disconnect them as necessary.
4. Remove the two screws from the top and bottom of the plate covering the microphone input board. Set screws aside for reuse.
5. Carefully pull the board straight out of the board slot.
6. Change the toggles on the DIP switch for each connector to the desired setting according the table in FIG. 73.  
(Note that the numbering starts on the right.)  
The “ON” position (1) is toward the connectors.  
The “OFF” position (0) is toward the board’s key notch.



**FIG. 73** This example shows a setting of 0-1-0-0 for a compression ratio of 2:1 for the fourth connector

7. Line up the board with the board guides that are on the top and bottom of the board slot. Carefully push the board into the enclosure until it is fully seated and snaps into place.
8. Replace and tighten the two screws.
9. Attach all wires and cables that were disconnected in Step 3.
10. Apply power to the enclosure.

## Attaching Wires

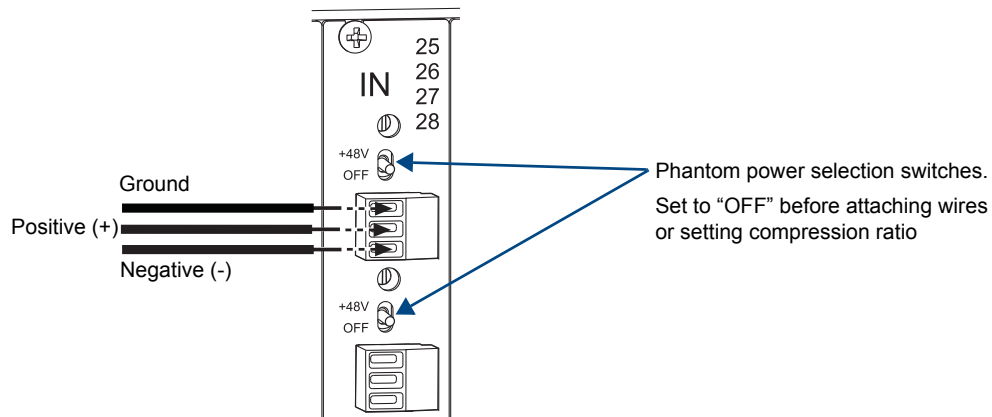
When attaching wires, refer to the sheet labeled “AutoPatch Modula Connector Guide” that ships with the system. The sheet shows you where to attach each wire on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet.



**Caution:** If the enclosure contains the optional microphone power board, make sure the phantom power selection switches (FIG. 74) are set to “OFF” before connecting wires.

### To attach wires to the microphone input board:

1. Set phantom power switches to “OFF” (FIG. 74).



**FIG. 74** Loosen wire clamps, insert wires, and re-tighten clamp screws

2. Loosen the wire clamps on the three-position connector. Be sure the clamps are open all the way, but do not remove the screws from the connector.
3. Insert the proper wires (FIG. 74) and firmly re-tighten the clamp screws to make proper connections

## Turning the Microphone Input Board On

When power is applied to the Modula, microphone input boards come up in a muted state. The appropriate BCS command must be sent to the microphone board to turn it on (see below) and to obtain the equivalent to unity gain.

Currently the software is set to return the board to the previous dB level any time power has been off and then restored.

### To turn on the microphone board:

1. Enter the following BCS command into HyperTerminal:  
`CL#I#VA0T` (This is the BCS Absolute command for adjusting an input to unity gain.)  
 Replace the “#” with the appropriate level and input (source).

BCS commands are used to control the decibel level. For information on adjusting input gain using BCS commands, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com).

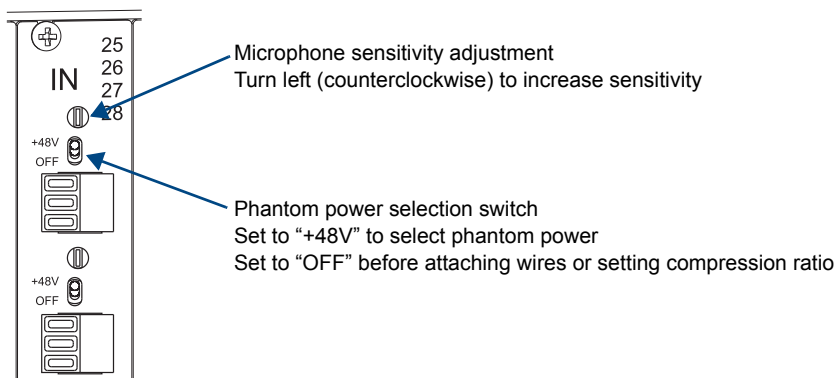
## Board Settings

The microphone input board has two setting options:

- Microphone sensitivity adjustment
- Selection of phantom power for microphones (works only if a microphone power board is installed).

### To increase microphone sensitivity:

1. Turn the microphone sensitivity adjustment to the left (counterclockwise).



**FIG. 75** Setting options

### To select phantom power for microphones (if microphone power board is installed):

1. Set the phantom power selection switch to "+48 V" (flip up).



# SD-SDI and HD-SDI Digital Video Boards

## Applicability Notice

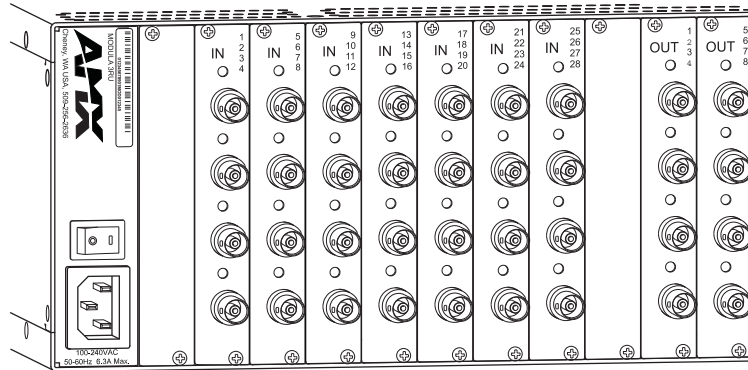


FIG. 76 SD-SDI digital video boards

This chapter pertains to Modula SD-SDI and HD-SDI digital video boards contained in pre-engineered systems and custom systems. The table below provides information on the types of digital video boards and their numbers and indicates which enclosure models can hold which boards.

SD-SDI and HD-SDI Digital Video Boards in SD-SDI and HD-SDI Enclosures	
<b>SD-SDI Digital Video Boards &amp; Numbers</b> <i>Note: Specifications for these boards are listed in Specifications Table 1 on page 120.</i>	<b>Enclosure Types &amp; Numbers</b> SDI Digital Video (32x32) <b>FG1034-40</b> SDI Digital Video & Wideband Video (32x32) <b>FG1034-27</b> SDI Digital Video & Standard Video (32x32) <b>FG1034-30</b> SDI Digital Video & S-Video Enclosure (32x32) <b>FG1034-33</b>
SD-SDI Input <b>FG1034-410</b>	
SD-SDI Output <b>FG1034-413</b>	
<b>HD-SDI Digital Video Boards &amp; Numbers</b> <i>Note: Specifications for these boards are listed in Specifications Table 2 on page 120.</i>	
HD-SDI Input <b>FG1034-533</b>	
HD-SDI Output <b>FG1034-536</b>	

**Note:** HD-SDI digital video boards can also be used to route SD-SDI digital video signals.

## SD-SDI and HD-SDI Digital Video Board Specifications

### Specifications Table 1

Applies to SD-SDI digital video boards FG1034-410 and FG1034-413 contained in the enclosures listed on page 119.

Also applies to these SD-SDI digital video boards when contained in pre-engineered systems.

Specifications Table 1	
Parameter	Value
Bit Rates	143 Mbps, 177 Mbps*, 270 Mbps, 360 Mbps, 540 Mbps*
Auto Data Rate Lock	Yes
Data Type	8 bit or 10 bit
Standards	SMPTE-259M, SMPTE-344M
Input Level (max.)	0.8 Vpp, $\pm 10\%$
Input Impedance	75 ohms
Output Level (max.)	0.8 Vpp, $\pm 10\%$
Output Impedance	75 ohms
Timing Jitter	<0.1 UI @ 360 Mbps
Alignment Jitter	<0.1 UI @ 360 Mbps
Rise and Fall Time	600 ps, $\pm 100$ ps
Auto Cable Equalization	Up to 350 m (1148.29 ft.) of Belden 8281 or equivalent @ 270 Mbps
CDR (Reclocking)	Yes
Connector Type	BNC

\* Data not available for bit rates of 177 Mbps and 540 Mbps.

### Specifications Table 2

Applies to HD-SDI digital video boards FG1034-533 and FG1034-536 contained in the enclosures listed on page 119.

Also applies to these HD-SDI digital video boards when contained in pre-engineered systems.

Specifications Table 2	
Parameter	Value
Bit Rates	143 Mbps, 177 Mbps*, 270 Mbps, 360 Mbps, 540 Mbps*, 1.485 Gbps
Auto Data Rate Lock	Yes
Data Type	8 bit or 10 bit
Standards	SMPTE-259M, SMPTE-292M, SMPTE-344M
Input Level (max.)	0.8 Vpp, $\pm 10\%$
Input Impedance	75 ohms
Output Level (max.)	0.8 Vpp, $\pm 10\%$
Output Impedance	75 ohms
Timing Jitter	<0.2 UI @ 1.485 Gbps
Alignment Jitter	<0.1 UI @ 1.485 Gbps
Auto Cable Equalization	Up to 140 m (459.32 ft.) of Belden 1694A or equivalent @ 1.485 Gbps
CDR (Reclocking)	Yes
Connector Type	BNC

\* Data not available for bit rates of 177 Mbps and 540 Mbps.

AMX reserves the right to modify its products and their specifications without notice.

## Attaching Cables

When attaching SD-SDI and HD-SDI input and output cables, refer to the sheet labeled “AutoPatch Modula Connector Guide” that ships with the system. The sheet shows you where to attach each cable on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side (near the power receptacle).

Make sure the SD-SDI or HD-SDI digital video cable is connected to the correct BNC connector on the correct enclosure. Digital video boards look identical to each other and to standard and wideband video, vertical interval sync, and HV sync boards, but the “AutoPatch Modula Connector Guide” identifies them.

### To connect SD-SDI or HD-SDI digital video inputs and outputs:

1. Fasten the cables onto the input and output BNC connectors (FIG. 77).

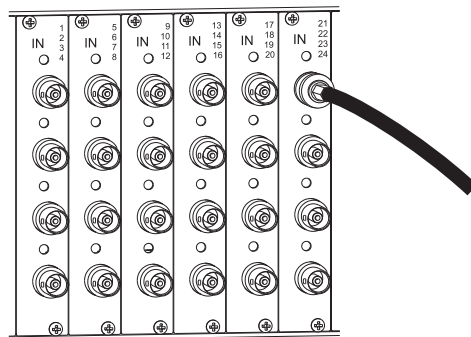


FIG. 77 Fasten cable onto input or output BNC connector

### Terminating Connectors

For optimal performance, attach 75-ohm terminating connectors to all unused outputs (FIG. 78).

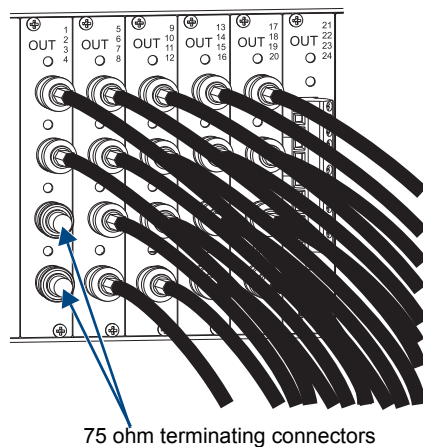


FIG. 78 Add 75-ohm terminating connectors to unused outputs





# Cat5 Video and Audio Boards with TXs & RXs

## Applicability Notice

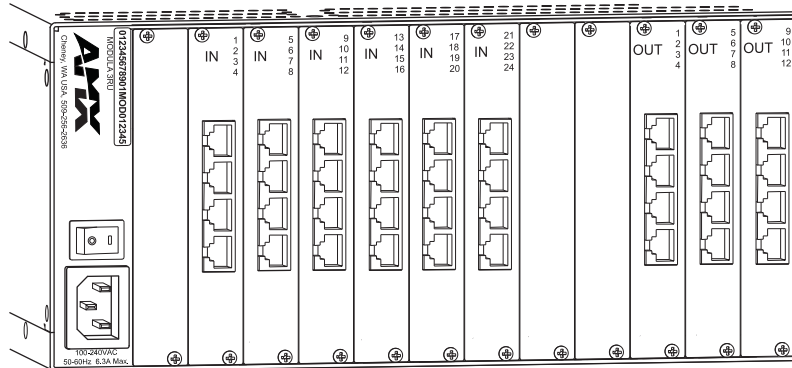


FIG. 79 Cat5 boards

This chapter pertains to Modula Cat5 (Category 5) input and output boards contained in pre-engineered systems and custom systems. The table below provides information on the types of Modula Cat5 boards and their numbers and indicates which enclosure models can hold which boards.

Modula Cat5 boards *must* be used in conjunction with Cat5 S-Video+Stereo Transmitters (TX) and/or Receivers (RX) to make up a complete system. Cat5 TXs and RXs are available either as modules or as AF-10 boards. For information on system setup, see page 128.

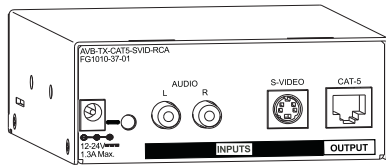
Modula Cat5 Video and Audio Boards in Cat5 Video and Audio Enclosures	
Cat5 Video and Audio Boards and Numbers	Enclosure Types and Numbers
<b>Note:</b> Specifications for these boards are listed on page 125.	Cat5 / Video and Audio (32x32) <b>FG1034-37</b>
Input <b>FG1034-488</b>	Cat5 / Video and Audio (16x48 Flex-slot) <b>FG1034-22</b>
Output <b>FG1034-494</b>	Cat5 / Video and Audio (48x16 Flex-slot) <b>FG1034-52</b>

### Cat5 TX and RX Modules and Numbers

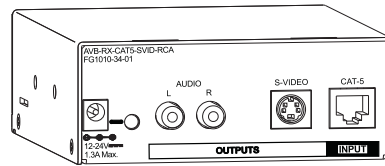
**Note:** Specifications for these modules are listed on page 126.

#### TX Modules

#### RX Modules

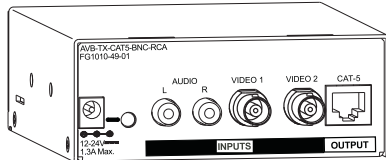


FG1010-37-01

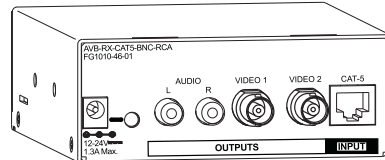


FG1010-34-01

S-Video / RCA unbalanced

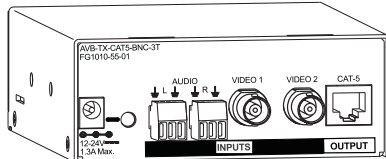


FG1010-49-01

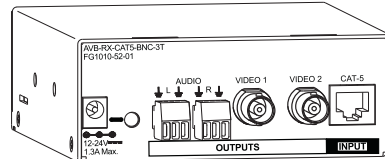


FG1010-46-01

BNC / RCA unbalanced

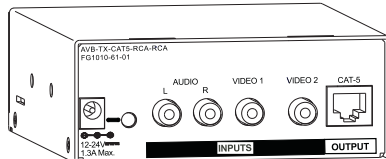


FG1010-55-01

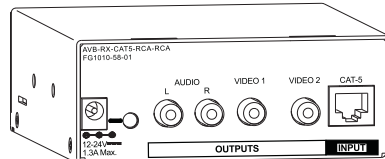


FG1010-52-01

BNC / 3-position unbalanced

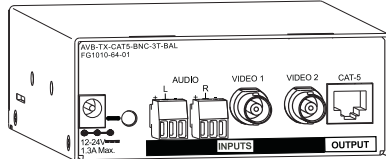


FG1010-61-01

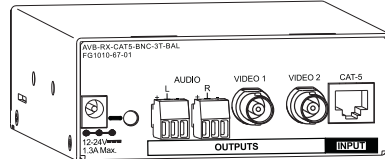


FG1010-58-01

RCA / RCA unbalanced

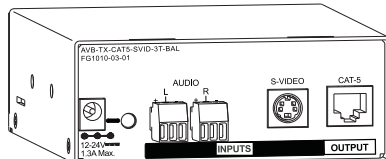


FG1010-64-01

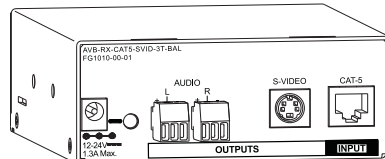


FG1010-67-01

BNC /3-position balanced (HH)\*



FG1010-03-01



FG1010-00-01

S-Video /3-position balanced (HH)\*

\* High headroom – up to a +22 dBu signal

**FIG. 80** Cat5 TX and RX Modules (rear view)

## Cat5 TX and RX AF-10 Boards and Numbers

**Note:** Specifications for these AF-10 boards are listed on page 126.

Cat5 S-Video+Stereo TX and RX AF-10 Boards		
TX	RX	Connector Types
FG1040-410	FG1040-425	RCA / RCA unbalanced
FG1040-413	FG1040-428	S-Video / RCA unbalanced
FG1040-416	FG1040-431	S-Video / 3-position unbalanced
FG1040-419	FG1040-434	BNC / 3-position unbalanced
FG1040-422	FG1040-437	BNC / RCA unbalanced
FG1040-440	FG1040-446	S-Video / 3-position balanced (HH)*
FG1040-443	FG1040-449	BNC / 3-position balanced (HH)*

\* High headroom – up to a +22 dBu signal

## Cat5 Video and Audio Boards Specifications

Applies to Modula Cat5 Video and Audio input and output boards FG1034-488 and FG1034-494 when used in conjunction with Cat5 TX and RX Modules or AF-10 boards.

Also applies to Cat5 Video and Audio boards contained in pre-engineered systems.

Video Specifications		
Parameter	Conditions	Value
Frequency Response	f = 35 MHz or better, 3 ft. (0.914 m)	±3 dB
	f = 15 MHz or better, 300 ft. (91.44 m)	±3 dB
	f = 10 MHz or better, 1000 ft. (305 m)	±3 dB
Crosstalk	f = 5 MHz	<50 dB
Differential Gain	f = 3.58 MHz, 10 to 90% APL	<0.2% or better
Differential Phase	f = 3.58 MHz, 10 to 90% APL	<1° or better
Signal to Noise Ratio	V <sub>in</sub> = 0.7 V, 100 IRE	>65 dB
Input Level (max.)		±1 V
Input Impedance		75 ohms
Output Level (max.)		±1 V
Output Impedance		75 ohms
Signal Type		Composite, S-Video
Supported Twisted-Pair Cable Types		Cat5, Cat5e, Cat6
Connector Options		RJ-45

### Cat5 Video and Audio Boards Specifications (continued)

Audio Specifications		
Parameter	Conditions	Value
Frequency Response	f = 20 Hz to 20 kHz	<± 0.2 dB
THD + Noise, balanced	f = 20 Hz to 20 kHz, Vin = -10 dBu to +22 dBu	<0.04%
THD + Noise, unbalanced	f = 20 Hz to 20 kHz, Vin = -10 dBu to +8 dBu	<0.03%
Crosstalk, balanced	f = 1 kHz, Vin = +20 dBu	<-90 dB
Crosstalk, unbalanced	f = 1 kHz, Vin = +2 dBu	<-85 dB
Signal to Noise Ratio, balanced	f = 20 Hz to 20 kHz, Vin = +20 dBu	>110 dB
Signal to Noise Ratio, unbalanced	f = 20 Hz to 20 kHz, Vin = +4 dBu	>90 dB
Input Level (max.), balanced		+22 dBu
Input Level (max.), unbalanced		+8 dBu
Input Impedance		18 kohms
Output Level (max.), balanced		+22 dBu
Output Level (max.) unbalanced		+8 dBu
Output Impedance		50 ohms
Signal Type		Will route stereo or mono audio
Connector Options		RJ-45

### Cat5 S-Video+Stereo TXs and RXs Modules Specifications

Applies to the TX and RX modules in FIG. 80 and the TX and RX AF-10 boards listed in the chart on page 125 when used in conjunction with Cat5 Video and Audio boards.

General Specifications	
Approvals	CE, UL, cUL
Signal Types	S-Video (or composite on one BNC or RCA) and stereo audio
Supported Twisted-Pair Cable Types	Cat5, Cat5e, Cat6
Power Consumption (max.) – Modules	+12 VDC to +24 VDC @ 1.3A
Power – AF-10	120 VAC / 240 VAC
Power Connector – Modules	2.1 mm DC power jack. AMX AutoPatch power supply provided with the unit
Humidity	0 to 90% non-condensing
Operational Temperature	32° to 110° F (0° to 43° C)
Dimensions	5.15 in. (13.08 cm) depth 4.33 in. (11.00 cm) width 1.66 in. (4.22 cm) height
Weight	Approximately 1.5 lb. (0.68 kg)
Connector Options	RJ-45, BNC, RCA, S-Video, 3-position terminal block

## Cat5 S-Video+Stereo TXs and RXs Modules Specifications (continued)

Video Specifications		
Parameter	Conditions	Value
Video Bandwidth	All distances up to 1000 ft. (305 m) ( $\pm 3$ dB)	10 MHz (min.)
Video Crosstalk	f = 5 MHz	<-70 dB
TX Level (max.)		$\pm 2$ V
TX Impedance		75 ohms
RX Level (max.)		$\pm 2$ V
RX Impedance		75 ohms

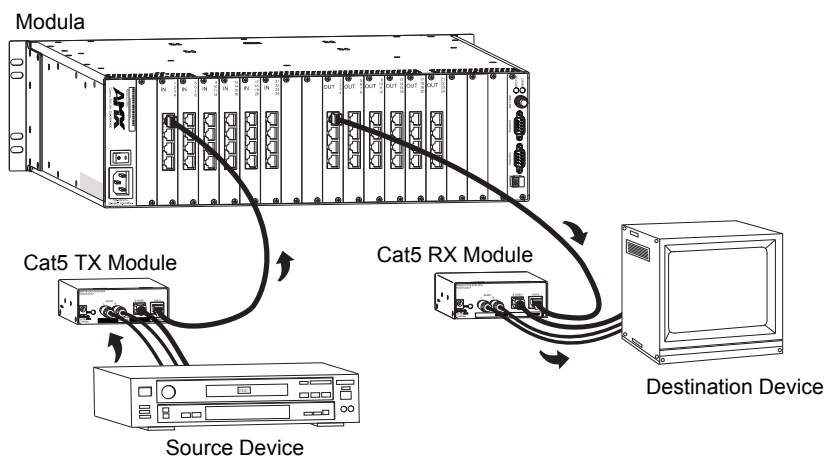
Audio Specifications		
Parameter	Conditions	Value
THD + Noise, balanced	f = 20 Hz to 20 kHz, Vin = +4 to +22 dBu	<0.01%
	f = 20 Hz to 20 kHz, Vin = -10 to +22 dBu	<0.04%
THD + Noise, unbalanced	f = 20 Hz to 20 kHz, Vin = -10 to +8 dBu	<0.01%
Crosstalk, balanced	f = 1 kHz, Vin = +20 dBu	<-90 dB
Crosstalk, unbalanced	f = 1 kHz, Vin = +2 dBu	<-90 dB
TX Level (max.), balanced (High Headroom)		+8 dBu
TX Level (max.), unbalanced (standard)		+22 dBu
TX Impedance		18 kohms
RX Level (max.), balanced (High Headroom)		+8 dBu
RX Level (max.), unbalanced (standard)		+22 dBu
RX Impedance		50 ohms

AMX reserves the right to modify its products and their specifications without notice.

## System Setup

In a Modula Cat5 Video and Audio system, the Modula's Cat5 boards work in conjunction with Cat5 S-Video+Stereo TX and RX Modules (or AF-10 boards). Set up the system with a TX module between each source device and the Modula and an RX module between the Modula and each destination device (FIG. 81). The Modula input board or the RX (module or AF-10 board) may need adjustments to compensate for differences in Cat5 cable length. These adjustments *must* be made before attaching cables.

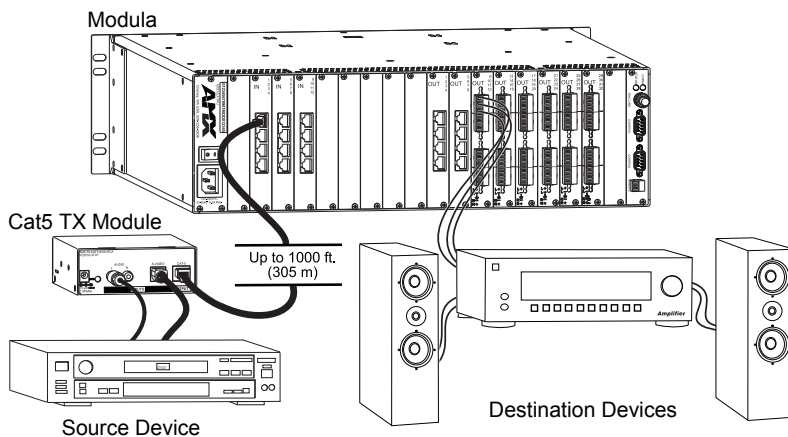
- To adjust the Modula Cat5 input board for differences in cable length, see the directions on page 130.
- To adjust the RX Module for differences in cable length, see the directions on page 131.
- To adjust the RX AF-10 board for differences in cable length, see the directions on page 132.



**FIG. 81** Cat5 system setup with TX and RX (modules shown)

**Note:** The “Y/c - Stereo” versions of the Cat5 Transmitter and Receiver may also be used to convert two composite and/or two mono audio signals instead of Y/c and stereo.

When installing a Modula system containing Cat5 input boards to route signals to standard output boards (standard video, S-Video, mono audio or stereo audio), you will need to place a Cat5 TX Module (or AF-10 board) between each source and the enclosure (FIG. 82).



**FIG. 82** Cat5 system setup with TX (module shown)

When installing a Modula system containing Cat5 output boards to accept signals from standard boards (standard video, S-Video, mono audio or stereo audio), you will need to place a Cat5 RX Module (or AF-10 board) between each destination and the enclosure (FIG. 83).

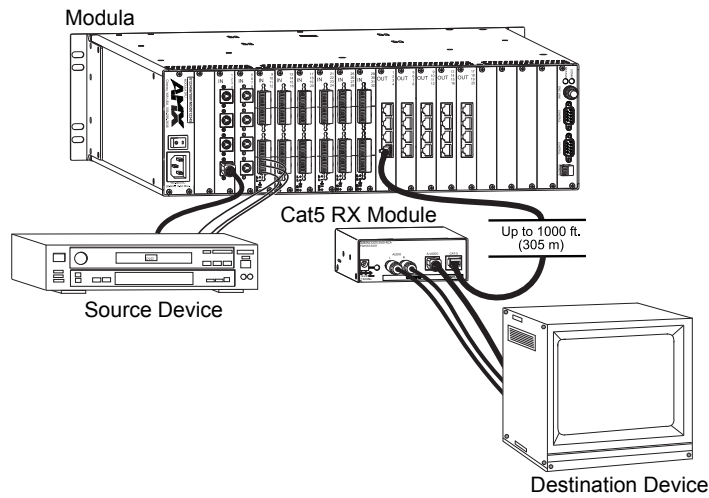


FIG. 83 Cat5 system setup with RX (module shown)

## Adjusting for Cable Length

If the length of the cable between the TX and the Modula input board or between the Modula output board and the RX does not match the length specified for the factory default setting of <175 ft. (53 m), an adjustment is required and must be done before the connectors are attached. Use the DIP switch settings from the table below when making the adjustment.

Line Length Adjustments	
Cat5e Cable Length	Dip Switch "On" (1) and "Off" (0) Setting (Positions for Toggles 1 - 2 - 3 - 4)
<175 ft. (53 m)	0 - 0 - 0 - 0
176 to 400 ft. (54 to 121 m)	1 - 0 - 0 - 0
401 to 450 ft. (122 to 137 m)	0 - 1 - 0 - 0
451 to 550 ft. (138 to 167 m)	1 - 1 - 0 - 0
551 to 650 ft. (168 to 198 m)	1 - 0 - 1 - 0
651 to 699 ft. (199 to 213 m)	0 - 1 - 1 - 0
700 to 800 ft. (214 to 243 m)	1 - 1 - 1 - 0
801 to 900 ft. (244 to 274 m)	0 - 0 - 0 - 1
901 to 950 ft. (275 to 289 m)	1 - 0 - 0 - 1
951 to 1000 ft. (290 to 305 m)	1 - 0 - 1 - 1

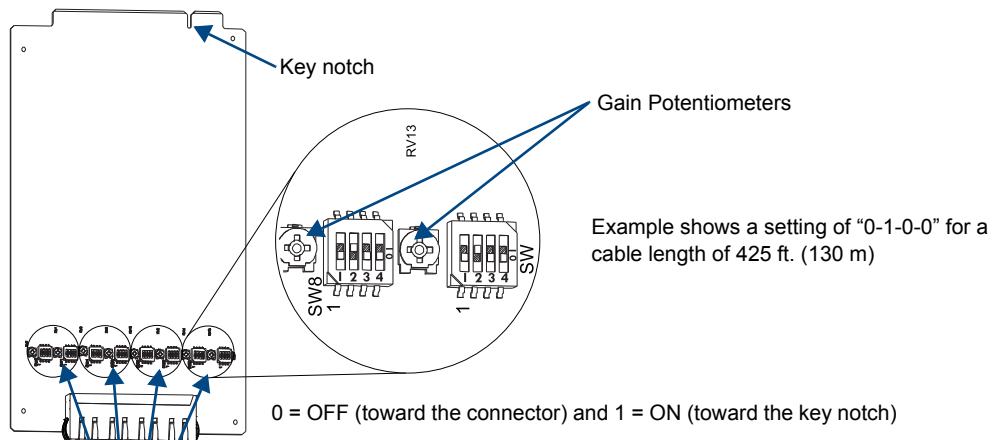
**Important:** Adjustments to compensate for cable length must be done before attaching cables to the board or module.



**ESD Warning:** To avoid ESD (Electrostatic Discharge) damage to sensitive components, make sure you are properly grounded before touching any internal Modula materials. Use an ESD wristband and cord with an alligator clip attached to a good ground source.

### To adjust a Modula Cat5 input board for cable length:

1. Remove the input board (for instructions on removing boards, see Appendix D, “Adding or Replacing Boards” on page 171).
2. Set toggles for *both* DIP switches for the input connector being adjusted (a small screwdriver or paper clip works well) to the correct position according to the “Line Length Adjustments” table on page 129.  
0 = OFF (toward the connector) and 1 = ON (toward the key notch).



**FIG. 84** Set toggles on both DIP switches to the same value

3. Repeat Step 2 for each additional pair of DIP switches that need adjusting.
4. Replace the input board.
5. Insert the screws and tighten until snug.

**Tip:** Gain adjustments can also be made on the potentiometers while the board is out of the enclosure.

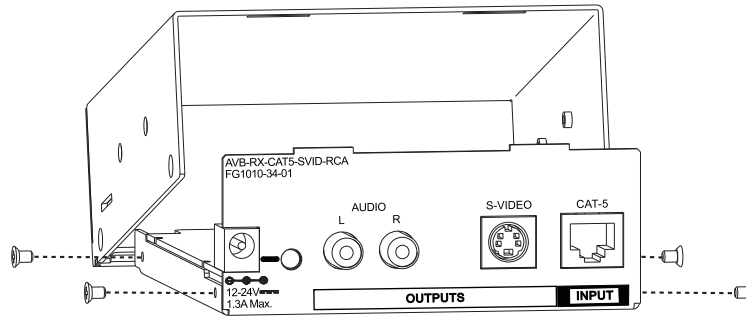




**ESD Warning:** To avoid ESD (Electrostatic Discharge) damage to sensitive components, make sure you are properly grounded before touching any internal module materials. Use an ESD wristband and cord with an alligator clip attached to a good ground source.

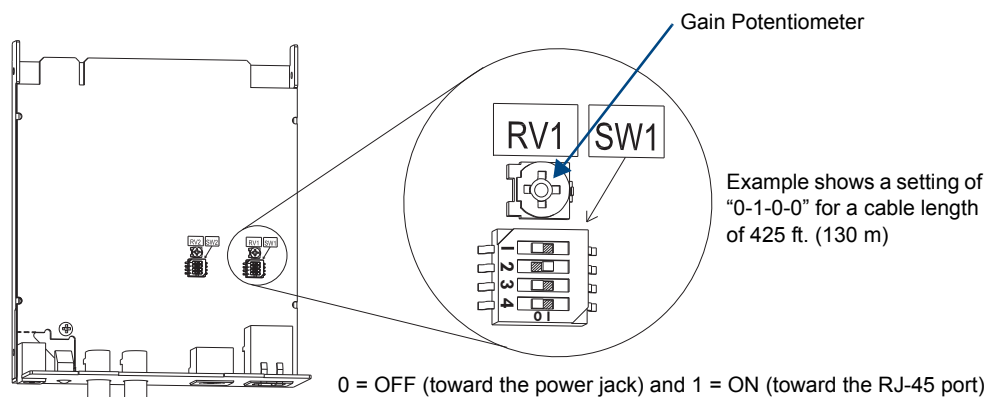
### To adjust an RX Module for cable length:

1. Remove the screws on each side of the receiver (four screws total).



**FIG. 85** Remove screws indicated and lift top plate up

2. From the rear of the module, free the edge of the module's top cover from the tabs on the rear plate and lift the edge up.
3. Open the lid on its hinge far enough to access the DIP switches.
4. Set toggles (1-2-3-4) on *both* DIP switches (a small screwdriver or paper clip works well) to the correct position according to the "Line Length Adjustments" table on page 129.  
0 = OFF (toward the power jack) and 1 = ON (toward the RJ-45 port).



**FIG. 86** Set toggles on both DIP switches to the same value

5. Close the lid, inserting the tabs on the module's back plate into the slots on the top cover. Insert screws and tighten until snug.

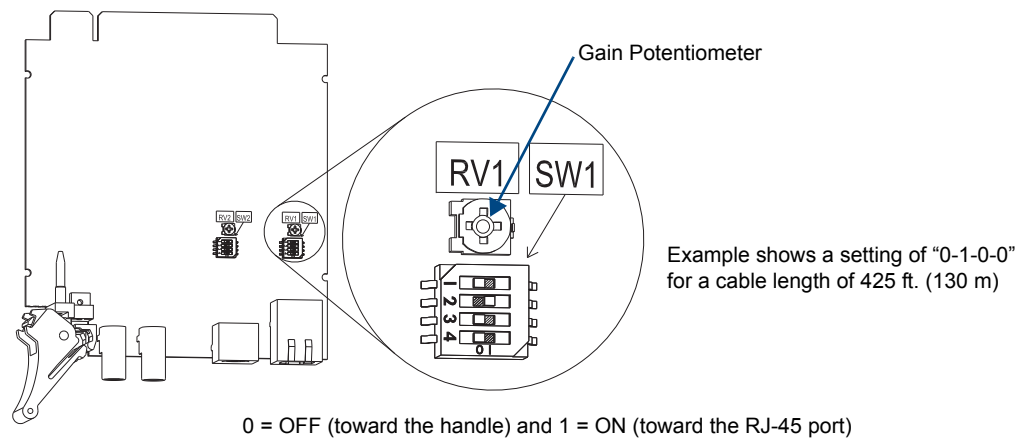
**Tip:** Gain adjustments can also be made on the potentiometers while the lid is lifted off the RX Module.



**ESD Warning:** To avoid ESD (Electrostatic Discharge) damage to sensitive components, make sure you are properly grounded before touching any internal AF-10 materials. Use an ESD wristband and cord with an alligator clip attached to a good ground source.

### To adjust an AF-10 RX Board for cable length:

1. Remove the screws at the top and bottom of the board's faceplate.
2. Push down on the board extractor handle and pull the board out.
3. Set toggles (1-2-3-4) on both DIP switches (a small screwdriver or paper clip works well) to the correct position according to the "Line Length Adjustments" table on page 129. Both DIP switches *must* be set to the same value.  
0 = OFF (toward the handle) and 1 = ON (toward the RJ-45 port).



**FIG. 87** Set toggles on both DIP switches to the same value

4. Push the board back into position (handle will snap into place); replace screws.

**Tip:** Gain adjustments can also be made on the potentiometers while the board is out of the AF-10.

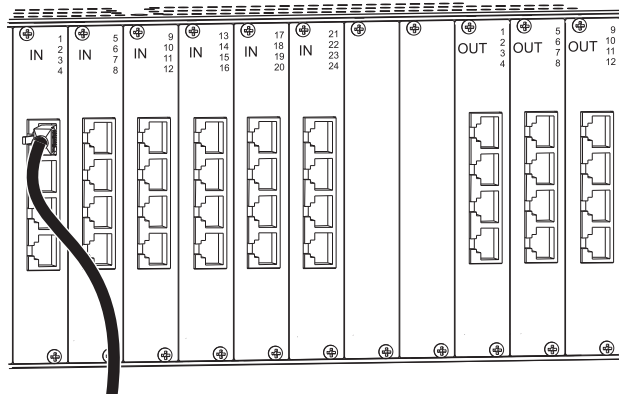
## Attaching Cables and Wires

When attaching input and output cables, refer to the sheet labeled “AutoPatch Modula Connector Guide” that ships with the system. The sheet shows you where to attach the wires and cables on the rear of the enclosure. Follow the sheet exactly; the system was programmed to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side (near the power receptacle).

Each Modula Cat5 board has four RJ-45 modular receptacles. Connector options for the TX and RX Modules and AF-10 boards include BNC, RCA, or S-Video for video and 3-position terminal block (balanced or unbalanced) or RCA (unbalanced) for audio.

### To attach Cat5 (RJ-45) inputs and outputs:

1. Adjust the Modula Cat5 board for line length if necessary (see page 130).
2. Insert the RJ-45 cable connectors into the input and output RJ-45 receptacles (FIG. 88).

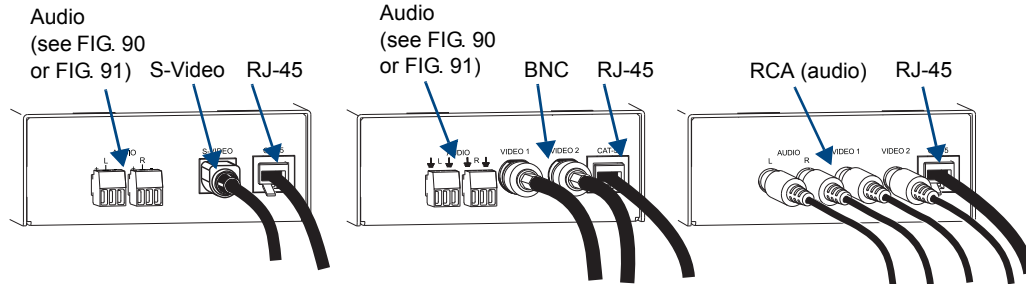


**FIG. 88** Insert RJ-45 connector into RJ-45 receptacle

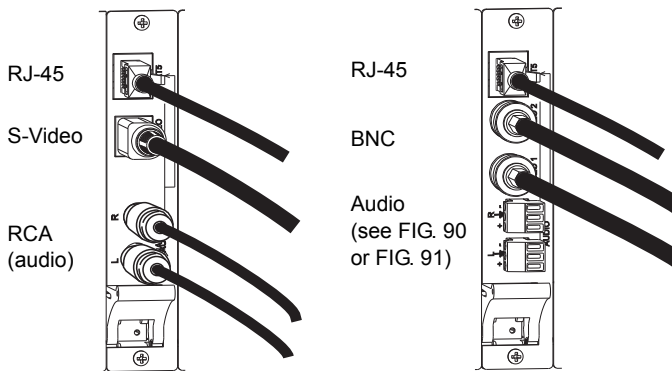
**To attach inputs, outputs, and power to the TXs and RXs:**

1. Adjust the RX for cable length if necessary (see page 129).
2. Attach input and output cables to the TX or RX connectors on the modules or AF-10 boards (FIG. 89).

*TX and RX Modules*



*TX and RX AF-10 Boards*

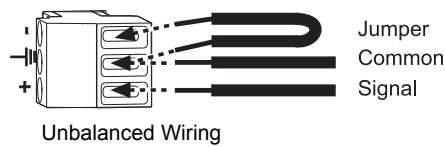


**FIG. 89** Fasten cable onto input or output connector

- BNC** – Fasten the cable connectors onto the input and output BNC connectors.
- RCA** – Insert the RCA cable plugs into the input and output RCA jacks.
- S-Video** – Hold the connector at a slight angle to the right while pushing in or pull back on the connector housing while pushing the connector in. (AMX AutoPatch S-Video cables lock onto S-Video connectors. Standard S-Video cables may be used, but will not lock.)

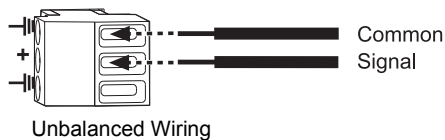
**Important:** To determine the correct wiring to use for the audio connectors, check the type of connectors specified under each module illustrated in the figure on page 124 and in the table for AF-10 boards on page 125. If the model is listed for balanced audio, it may also be wired for unbalanced audio (FIG. 90). If the model is listed for unbalanced, it can only be wired for unbalanced (FIG. 91).

3. Attach 3-position terminal block audio wires:
  - Unscrew the clamps on the audio connector.
  - Insert the wires (FIG. 90 or FIG. 91) and firmly re-tighten the clamps to make secure connections.



**FIG. 90** Wiring options for models with 3-position balanced audio connectors

**Note:** When using twisted pair wire, connect the shield (ground) at one end only (recommend receiving end) to minimize low frequency noise.



**FIG. 91** Wiring for models with 3-position unbalanced audio connectors

4. Apply power to the system. The electrical ratings must meet those indicated in the specifications table (see page 126).
  - AF-10** – Plug the AC power cord into the power receptacle and into the external power source.
  - Module** – If you are using the AMX AutoPatch power supply, plug the desktop power supply into the power jack on the module(s) and into an AC external power source.
  - Or**
  - If you are providing the power supply, plug the power cord from a UL (or equivalent) listed power supply into the power jack on the module(s).



# RS-422 Boards

## Applicability Notice

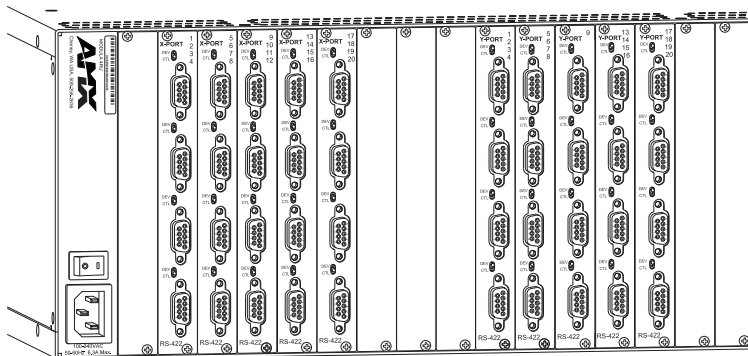


FIG. 92 RS-422 boards

This chapter pertains to Modula RS-422 X-Port and Y-Port boards contained in pre-engineered systems and custom systems. The table below provides information on the types of RS-422 boards and their numbers and the enclosure model that holds these boards.

RS-422 Boards in RS-422 Enclosure	
RS-422 Boards & Numbers	Enclosure Type & Number
X-Port board <b>FG1034-620</b>	RS-422 (32x32, 4RU) <b>FG1034-64</b>
Y-Port board <b>FG1034-623</b>	

## RS-422 Specifications

Applies to Modula RS-422 X-Port board FG1034-620 and Y-Port board FG1034-623 when contained in Modula RS-422 enclosure FG1034-64.

Specifications	
<b>Throughput</b>	
RS-422 Specification	EIA-422A
RS-422 Data Rates	Up to 5 Mbps
RS-422 Cable Length	Up to 1 mile (1.6 km); length depends on quality of cable & data rate being sent
RS-232 Cable Length	Length & data rates are limited by the connected RS-232 equipment
Cable Type (recommended)	100 ohm twisted-pair
Connector Type	Female DB-9
Input Termination	100 ohms optional (via jumper)
RS-232 Voltage Compatibility	TX Recommended (max.) Voltage = +12 V, -8 V
	TX Absolute (max.) Voltage = +15 V, -10 V
	RX Recommended (min.) Input Voltage, HIGH $\geq 2.5$ V, LOW $< 1.0$ V

AMX reserves the right to modify its products and their specifications without notice.

## Overview and System Setup

### Overview

A Modula with RS-422 boards functions as an X/Y distribution matrix that also provides Y/X distribution. Each RS-422 matrix is configured to route bi-directional signals (RS-422 or RS-232\*) between the X-Port connectors on the left and the Y-Port connectors on the right. The default configuration is for X to Y Point-to-Point routing (see page 143) in which a controller signal is routed through a single X-Port to a single Y-Port and a device status signal automatically returns from the Y-Port back to the X-Port. For information on an advanced configuration option, see page 144.

\* For information crucial to using this system for routing RS-232 signals, see the specifications (page 137) and the pinout information (page 139).

### System Setup

When installing an RS-422 system, the equipment attached to the Modula will be of two types, controllers and devices. Controller and device equipment may be attached to either X-Ports or Y-Ports. To simplify the explanations and examples, the information presented is for systems with all controller equipment attached to the X-Port connectors and all device equipment attached to Y-Port connectors (the default configuration). If your system is different, remember to adjust accordingly.

One possible setup for an RS-422 system with Sony® 9-pin compatible components might include a piece of equipment cabled to an RS-422 X-Port on the left side of the Modula, using a straight-through cable. Additional equipment would be cabled to the RS-422 Y-Ports on the right side of the Modula, using the same type of cable.

The example in FIG. 93 shows routing using the default configuration (X to Y Point-to-Point, see page 143). A controller signal from an editing station is being routed to a tape deck and a device status signal from the tape deck is being returned. The controller signal could be switched to route to the camera instead, in which case the camera would return its device status signal.

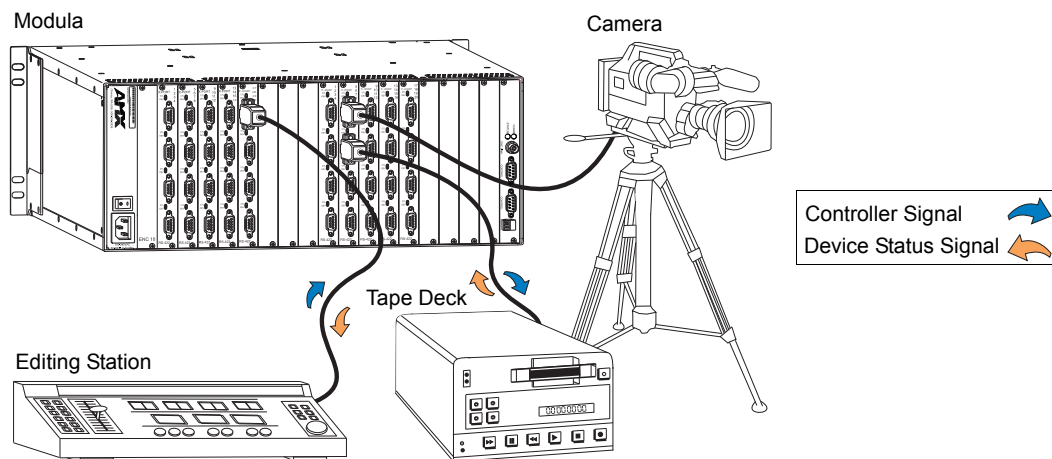


FIG. 93 Equipment set up using a Modula with RS-422 boards

**Note:** RS-422 systems can include any type of RS-422 equipment as long as the cable is wired correctly (see page 140). For important RS-232 requirements, see the specifications (page 137) and pinouts (page 139).

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## Attaching Cables

When attaching RS-422 (or RS-232) cables for controllers or for devices, refer to the sheet labeled “AutoPatch Modula Connector Guide” that ships with the system. The sheet shows where to attach each cable on the rear of each enclosure. Follow the sheet exactly; the system was programmed to operate *only* as indicated on the sheet.

The default configuration is for all controller equipment to be attached to X-Port connectors and all device equipment to be attached to Y-Port connectors.

**Important:** *If using high data rates or long cable lines, see the “Termination Jumper” section (page 142) before attaching cables.*

### To attach RS-422 (or RS-232) controllers or devices:

1. Fasten the cables onto the X-Port or Y-Port DB-9 connectors (FIG. 94).

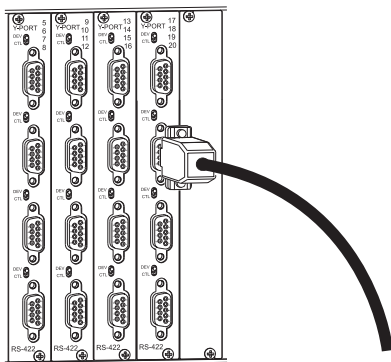
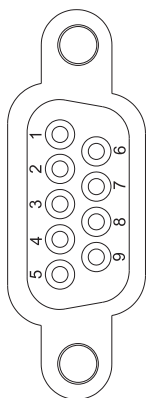


FIG. 94 Fasten cable onto X-Port or Y-Port connector

### RS-422 Pinout for DB-9 Connector

The Modula RS-422 is designed to meet or exceed EIA-422A specifications and supports the Sony® 9-pin RS-422 pinout.

The DB-9 connectors on the boards each have transmit and receive pins which *must match* the DB-9 cable connectors from the controller and device equipment. The table below lists the functions for the individual pin numbers for the board connectors for RS-422 and indicates the corresponding toggle switch setting. If you know the pinout for the controller or device equipment, set the board connector’s toggle switch (see page 141) to the setting that matches it (see table in FIG. 95 below), so that Transmit is connected to Receive and Receive is connected to Transmit.



RS-422 Board – RS-422 Pinout for DB-9 Connector		
Pin #	Board Switch Set to CTL	Board Switch Set to DEV
1	Common Ground	Common Ground
2	Transmit A (-)	Receive A (-)
3	Receive B (+)	Transmit B (+)
4	Common Ground	Common Ground
5	N/C	N/C
6	Common Ground	Common Ground
7	Transmit B (+)	Receive B (+)
8	Receive A (-)	Transmit A (-)
9	Common Ground	Common Ground

FIG. 95 Pinout for female DB-9 connector (on board)

## RS-232 Pinout for DB-9 Connector

If RS-232 cable is used it *must* be a null modem cable (no hardware flow control).

- When a controller is attached, use the cable pinout in FIG. 96 and set the toggle switch on the board to CTL.
- When a device is attached, use the cable pinout in FIG. 97 and set the toggle switch on the board to DEV.

### RS-232 Pinout, Toggle Set to CTL

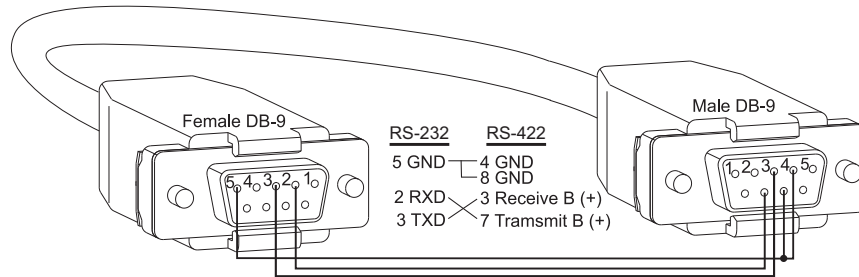


FIG. 96 RS-232 when toggle switch is set to CTL

### RS-232 Pinout, Toggle Set to DEV

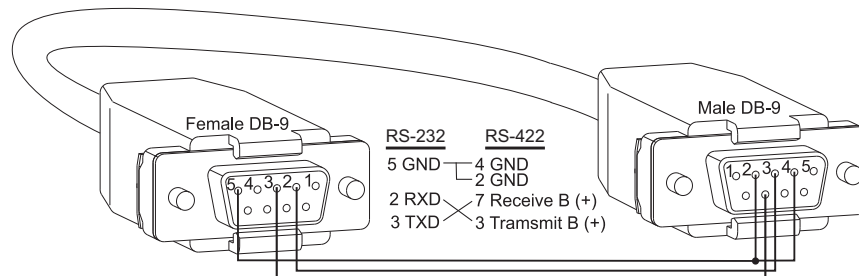


FIG. 97 RS-232 when toggle switch is set to DEV

RS-232 Voltage Compatibility	
TX Recommended (max.) Voltage	+12 V, -8 V
TX Absolute (max.) Voltage	+15 V, -10 V
RX Recommended (min.) Input Voltage	HIGH $\geq 2.5$ V LOW $< 1.0$ V

**Note:** RS-232 cable length and data rates are limited by the connected RS-232 equipment.

## Port Configuration

The configuration of the X-Port and Y-Port connectors *must match* the port configuration of the controller and device equipment attached to the Modula.

### Determine and Set Switch Settings

The toggle switches individually configure the X-Port and Y-Port connectors to function as controller or device ports. The switches are above and to the left of the DB-9 connectors (FIG. 98), which support the Sony<sup>®</sup> 9-pin RS-422 pinout. The default setting for X-Port connector switches is CTL for attaching controller equipment. The default setting for Y-Port connector switches is DEV for attaching device equipment.

If your system setup is different, the toggle switches on the boards must be adjusted accordingly.

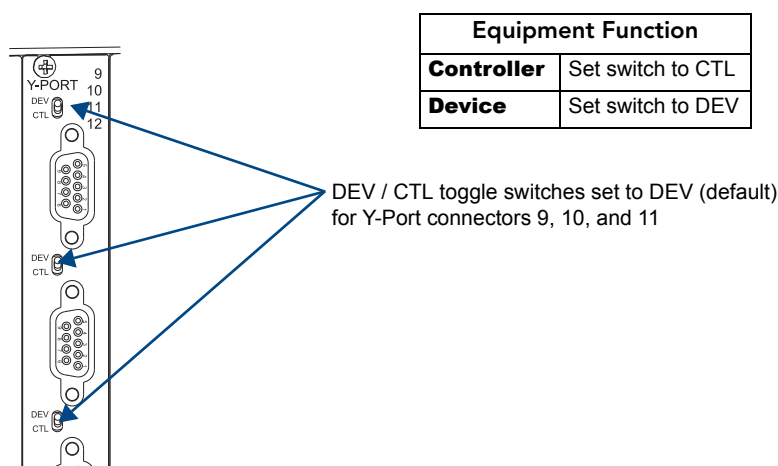
If the equipment attached to a board functions as a controller, set the switch to CTL.

If the equipment functions as a device, set the switch to DEV (see pinout table on page 139).

**Important:** *If the toggle switches are changed from their default settings, the control information provided on page 143 through page 145 must also be interpreted accordingly.*

### To set the port configuration:

1. Toggle the switch up for the device (DEV) setting or down for the controller (CTL) setting.



**FIG. 98** Set toggle switches to determine port configuration

### Termination Jumper

Typically jumper pins for a connector should be set for termination when high data rates or long cable lines are used. Each connector has two 100-ohm, 3-pin jumpers. The jumper needing termination depends on the toggle switch setting (see the table below). The board must be removed to access the jumpers (for instructions on removing and replacing a board, see “Appendix D – Adding or Replacing Boards” on page 171). The factory default setting is “not terminated,” as indicated in FIG. 99 on the left (J1 and J2 jumpers are each on Pins 2 and 3, the unnumbered pins).

#### To terminate a jumper pin (provide a termination load):

1. Move the jumper to cover Pin 1 (numbered) and Pin 2, as indicated in FIG. 99 on the right.

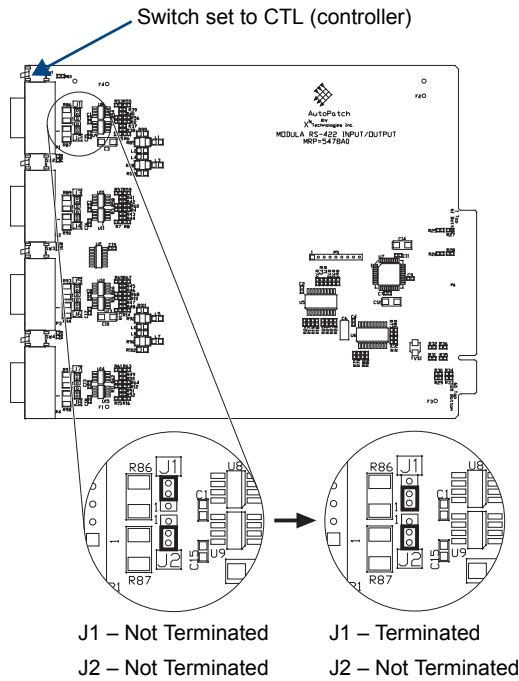


FIG. 99 Example: Terminate J1 jumper (cover Pins 1 & 2) when first connector is set to CTL

The table below shows which jumper to terminate depending on the toggle switch setting for the port configuration type (to determine switch settings, see page 141).

Termination Jumper Settings		
	Switch Set to CTL (Controller)	Switch Set to DEV (Device)
First Connector	Terminate J1	Terminate J2
Second Connector	Terminate J4	Terminate J3
Third Connector	Terminate J6	Terminate J5
Fourth Connector	Terminate J8	Terminate J7

## Configuration and Control

Due to the RS-422 board's bi-directional switching capability, a basic command that routes a controller's signal to a device will also return a status signal from that device to the controller. The board's toggle switch settings do not affect system control.

**Important:** *X-Ports are always controlled as inputs/sources; Y-Ports are always controlled as outputs/destinations.*

The toggle switch settings determine the nature of the signals routed and returned during switching. If any toggle switches are changed from their default settings, the signal types as explained here need to be interpreted accordingly.

### Control Panels

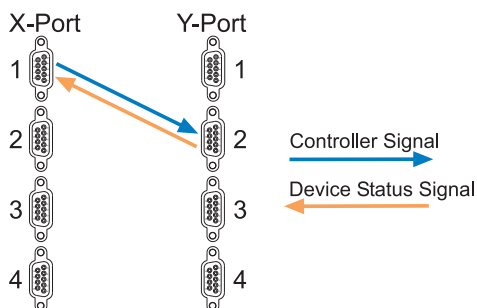
Use the Change command sequence for the control panel (see the control panel's documentation). When entering the command, for an X-Port select Input (or Source depending on the control panel) and for a Y-Port select Output (or Destination). Depending on the panel, you may need to specify the Input first in the Change command.

### BCS Commands

When entering any of the switch commands, for the X-Port use an  $\sqcap$  command character (normally thought of as "Input") and for the Y-Port use an  $\circ$  ("Output"). It does not matter whether the  $\sqcap$  or the  $\circ$  is specified first in an execute switch command. For information on BCS command characters and command line formats, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com).

### X to Y Point-to-Point (Default)

An X to Y Point-to-Point configuration is the factory default for routing RS-422 systems. Using a single command, this configuration allows for one controller signal from an X-Port to be routed to one Y-Port and for a device status signal from that Y-Port to be automatically returned to the X-Port (FIG. 100). *With this configuration, routing one-to-many signals is not possible.* If the RS-422 system has been configured for complex routing, see "Advanced Configuration and Control" on page 144.



**FIG. 100** X to Y Point-to-Point configuration

### Control Panel

For the example in FIG. 100, enter a Change command that routes Input (X-Port) 1 to Output (Y-Port) 2. A device status signal automatically returns from Y-Port 2 to X-Port 1.

### BCS Control

Enter the following command for the example in FIG. 100.

```
CL0I1O2T
```

In this command, a controller signal is routed on Level 0 from X-Port 1 to Y-Port 2, and a device status signal automatically returns from Y-Port 2 to X-Port 1.

## Advanced Configuration and Control

This section covers the advanced configuration routing of X to Y Fanout and the commands for executing it.

**Note:** *If you need to change the system's configuration, see page 146.*

The order in which the signals are routed is important because in one-to-many routing, only the last device status signal that is returned remains connected.

### Control Panels

Control Panels can be used to operate an RS-422 system configured for X to Y Fanout. Use the Change command sequence for the control panel (see the control panel's documentation). When entering the command, for an X-Port select Input (or Source depending on the control panel) and for a Y-Port select Output (or Destination). Depending on the control panel, you may need to specify the Input first in the Change command.

### BCS Commands

BCS commands can be used for operating an RS-422 system that has been configured for X to Y Fanout. When entering switch commands, for the X-Port use an I command character (normally thought of as "Input") and for the Y-Port use an O ("Output"). It does not matter whether the "I"s or the "O"s are specified first in the execute switch command. For information on BCS command characters and command line formats, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com).

### X to Y Fanout

Using a single command, this configuration routes a controller signal from an X-Port to multiple Y-Ports (the fanout part of the switch) and then automatically returns the last device status signal from the Y-Port back to the X-Port. During the process (see the example in FIG. 101), the first device status signals returned are immediately disconnected as each subsequent controller signal is routed (although the controller signals remain routed). Only the last device status signal connected is left (the point-to-point part of the switch). The process occurs so quickly that it seems as though only the one device status signal has been returned.

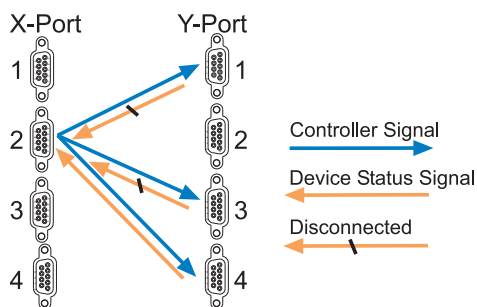


FIG. 101 X to Y Fanout configuration

### Control Panels

For the example in FIG. 101, enter a Change command that routes Input (X-Port) 2 to Outputs (Y-Ports) 1, 3, and 4. The last device status signal returned (from Y-Port 4) is the only status device signal that remains connected. Since some control panels do not preserve the order of the ports entered, the device status signal from the Y-Port that you want to remain may need to be sent separately for it to be other than the last one in the numerical order. For example, when routing X-Port 2 to Y-Ports 1, 3, and 4, you might want to have the device status signal return from Y-Port 1. To do so, you may need to enter the command to route to Y-Ports 3 and 4 first, and then enter the command for Y-Port 1.

### *BCS Control*

Enter the following BCS command for the example in FIG. 101.

```
CL0I2O1 3 4T
```

In this command, a controller signal is routed on Level 0 from X-Port 2 to Y-Ports 1, 3, and 4. The last device status signal returned (from Y-Port 4) is the only status device signal that remains connected. If the remaining device status signal must be returned from a different Y-Port, simply change the order the Y-Ports are entered in the command. The remaining device status signal will be the last one entered.

### **Switching Independent Controller and Device Status Signals**

To switch controller and device status signals independently, commands are executed using different levels (virtual matrices). This method can be used for either of the configuration methods, as long as each signal type is on a different level. The system *must* be configured in XNConnect to handle this type of independent routing. If the system was not ordered this way, contact technical support (see page 43).

#### *Control Panel*

When routing controller and device status signals independently with a control panel, be sure to change the level prior to each Change command.

#### *BCS Control*

The following example assumes an X to Y Point-to-Point configuration in which Level 1 has been configured to route only the X-Port's controller signals and Level 2 has been configured to route only the Y-Port's device status signals.

```
CL1I5O6T
```

```
CL2I5O7T
```

In the first command, a controller signal is routed on Level 1 from X-Port 5 to Y-Port 6 without a device status signal being returned from Y-Port 6 to X-Port 5.

In the second command, the device status signal for Y-Port 7 is routed on Level 2 to X-Port 5 without a controller signal first being routed from X-Port 5 to Y-Port 7.

## RS-422 Configuration Files

XNConnect (the configuration software program on the *AMX AutoPatch CD* shipped with the Modula) supports Modula systems with RS-422 boards.

Even if XNConnect is already on your PC, install the newest version that shipped on the same CD as the .xcl configuration file. We *strongly* recommend nonstaining the old version of XNConnect before installing a new version.



**Caution:** Use this software only if you need to change the configuration information to route the system using a different configuration method than originally specified. If you find it necessary to modify the file for any reason, we *strongly* recommend contacting technical support (see page 43) and saving a back-up copy of the original configuration.

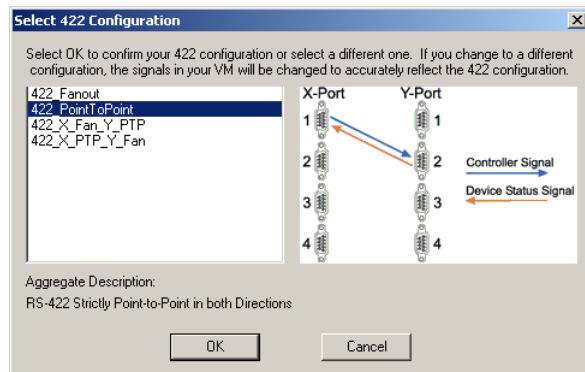
An RS-422 enclosure is generally configured with a virtual matrix (VM) for the RS-422 bi-directional signals, plus VMs for RS-422 breakaway signals. XNConnect can be used to change the main VM to the X to Y Fanout option. Breakaway VMs must be configured using the same option as the main VM.



**Caution:** Completing the steps below will invalidate any global presets stored on the system and will also result in the loss of any custom labels.

### To change the configuration of an RS-422 system:

1. Connect the PC to the enclosure's Comm port using a null modem cable.
2. Open the configuration (.xcl) file in XNConnect. Both the file and the software are located on the *AMX AutoPatch CD*.
3. In the Virtual Matrices view, right-click on the virtual matrix.
4. From the shortcut menu, choose Select 422 Configuration. The Select 422 Configuration dialog box opens.



5. Select the desired configuration.
6. Click OK.
7. From the Configure menu, select Configure All to download to the system.



# Appendix A – Managing Configuration Files

## Applicability Notice

This appendix applies to XNConnect version 2.10.0. (XNConnect’s version information is found under its Help menu.)

This appendix covers basic modifications that can be made to a configuration file using XNConnect software. Appendix B covers advanced configuration modifications. For complete coverage of XNConnect, see the Help file.

## Overview

A configuration file contains system\* configuration information which is loaded onto the system at the factory. Each enclosure’s CPU references the configuration file, which defines switching behavior. The file can be modified using XNConnect (found on the *AMX AutoPatch CD* shipped with each system) which graphically displays system information.

Configuration file modifications include basic tasks, such as creating local presets and customizing input and output channel names for control display (e.g., in the APWeb or APControl interface).



**Caution:** Use XNConnect *only* if you need to reload the configuration file or to modify your system’s configuration from the original specifications. Make a copy of the current file every time the file is modified.

A copy of the system’s configuration file (with an .xcl file extension) is found on the *AMX AutoPatch CD*. If your AMX account has the required permissions, you can also download the newest version of XNConnect from [www.amx.com](http://www.amx.com). (An INI file Updater for updating XNConnect is available on the AMX website under AutoPatch Tools; an account is not required.)

If you download XNConnect from the website, see “Discovering a System” on page 150. If you cannot download XNConnect from the website, contact technical support (see page 43) for a copy of XNConnect. Have your system’s serial number ready when requesting a replacement .xcl file.

This appendix covers the following topics:

- Installing XNConnect (see page 148)
- Opening a configuration file (see page 149)
- Discovering a system (see page 150)
- Navigating the interface (see page 151)
- Customizing channel names / labels (see page 153)
- Creating local presets (see page 154)
- Loading a configuration file (see page 156)

\* A system can be a standalone matrix switcher or multiple matrix switchers with or without additional controllers and accessories.

## Installing XNConnect

Use this software *only* if you need to customize or change the configuration information from the original specification.

Even if XNConnect is already on your PC, install the newest version that shipped on the same CD as the .xcl configuration file. We *strongly* recommend uninstalling the old version of XNConnect before installing a new version.

### System Requirements

- Windows XP Professional®
- 233 MHz processor
- Minimum of 128 MB of RAM
- 20 MB of available hard drive space
- 800x600 screen resolution (1024x768 is recommended)
- Serial port and RS-232 null modem cable

### To install XNConnect from the AMX AutoPatch CD:

1. Close all other applications currently running on your PC.
2. Insert the *AMX AutoPatch CD* into your CD drive to start automatically.  
If the CD does not autorun, explore the CD folder and double-click the Index.html file.
3. Select Software and find XNConnect.
4. Optional – Select Release Notes to read about the software before installation.
5. Select Install.
6. Follow the directions in the subsequent dialog boxes.

**Note:** If your AMX account has the required permissions, you can download *the newest version of XNConnect* from [www.amx.com](http://www.amx.com). An *INI file Updater* for updating XNConnect is available on the AMX website under *AutoPatch tools* (an account is not required).

## Opening a Configuration File

**Important:** Even if XNConnect is already on your PC, install the newest version that shipped on the same CD as the configuration file. We *strongly* recommend uninstalling the old version of XNConnect before installing a new version.

The process of modifying a configuration file starts by opening it with XNConnect. After the modifications are complete, the new configuration information must be loaded onto the system to implement the changes.

If you cannot locate the factory configuration file, see “Discovering a System” on page 150.

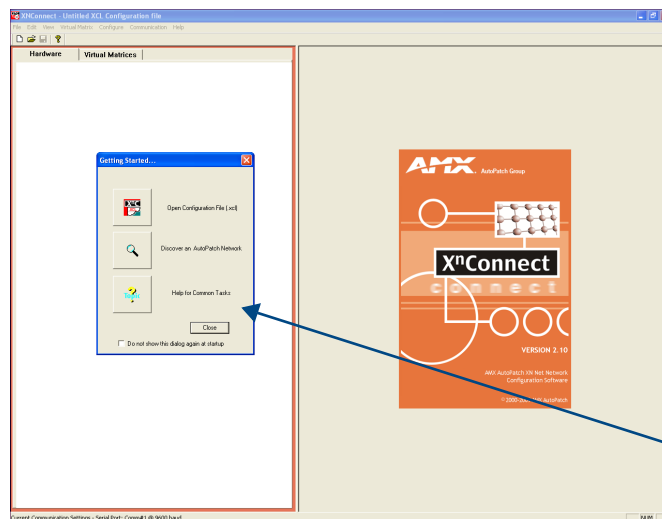


**Caution:** Use XNConnect *only* if you need to reload the configuration file or modify your system’s configuration from the original specification. Make a copy of the original file before making modifications every time the file is modified.

### To launch XNConnect:

1. From the Start menu, select Programs.
2. Select AutoPatch Applications (or other file group you specified during the installation).
3. Select the XNConnect folder.
4. Select XNConnect.

The XNConnect program opens.



Getting Started dialog box

5. From the Getting Started dialog box, click Open Configuration File. (If the dialog box does not appear, from the File menu select Open).
6. Use the standard Open dialog box to locate and open your configuration (.xcl) file. The default location is in the MyXCL folder on the *AMX AutoPatch CD*.
7. Using Save AS (under the File menu), make a duplicate copy of the file with a new name and save it to the PC. (We *strongly* recommend making a duplicate copy every time the file is modified.)

The file is ready to be modified. If changes are made, the file must be loaded onto the system to implement the changes (see page 156).

## Discovering a System

The discovery process queries the attached system for configuration information and properties, including information regarding assigned signals and virtual matrix definitions. This procedure can be used if the *AMX AutoPatch CD* with the .xcl file is not available. The discovery process may take several minutes to complete.

We recommend disconnecting any third-party control devices from the enclosure's serial ports *before* starting the discovery process.

### To discover a system:

1. Disconnect any third-party control devices from the Modula enclosure's serial port.
2. Connect the enclosure\* to your PC (see page 31).
3. (If not already open) launch XNConnect (see page 148).
4. Open the Communication menu; select Serial Port.
5. Open the Communication menu again; select Change Comm Settings. Check the settings for the selected port (the default is Com 1, baud rate 9600) and adjust if necessary.
6. Optional – Click the Test button to verify that communication has been established with the Modula.  
Click OK.
7. From the File menu, select Discover System (the discovery may take a few minutes).
8. From the File menu, select Save to save the discovered configuration information to the PC.
9. From the File menu, select Save As and make a duplicate copy of the file with a new name and save it to the PC. (We *recommend* making a duplicate copy every time the file is modified.)  
The new configuration file is ready to be modified. If changes are made, the new file must be loaded onto the system to implement the changes (see page 156).

\* For systems with multiple enclosures, you can connect any of the enclosures to the PC as long as all of the enclosures are linked together.

## Navigating the Interface

XNConnect displays configuration information in two panes. The graphics are located in the left pane, and the properties of the currently selected graphic are in the right pane. At the top of the left pane are two tabs, Hardware and Virtual Matrices, for accessing the Hardware and Virtual Matrix views (see below). To see the details and components of a device or a virtual matrix, click the plus “+” symbol to the left of the device or the virtual matrix.

Most configuration file modifications involve entering information in a series of dialog boxes that are accessed by right-clicking a hardware device or virtual matrix icon and selecting an option from the shortcut menu.

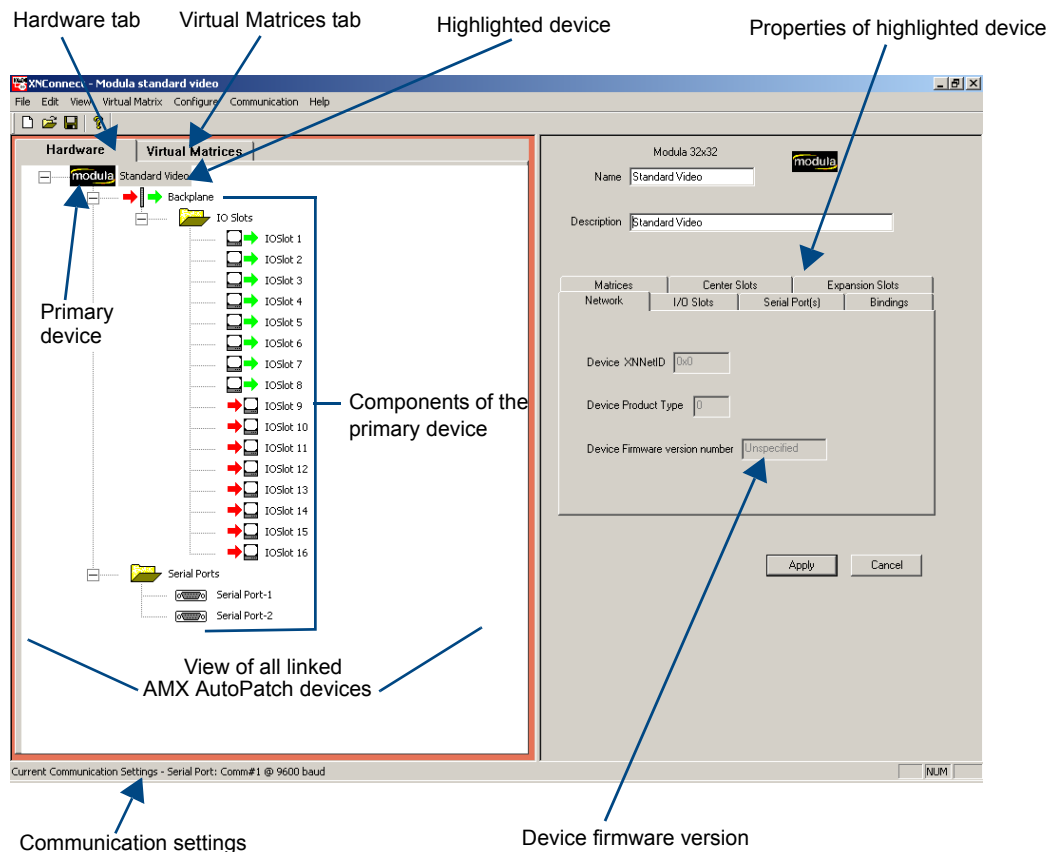
**Tip:** *If you have a question regarding an open dialog box, press the F1 key for Help.*

### Hardware View

The Hardware view displays the system’s hardware, such as enclosures and serial ports.

### Virtual Matrix View

The Virtual Matrix view displays properties of the existing virtual matrices. Most common tasks are conducted from this view, including customizing channel names and creating local presets.



**FIG. 102** The XNConnect interface showing the Hardware view

## Multiple Signal Paths

In Modula systems, each matrix is a signal path. When you select a connector in the virtual matrix view, the properties box in the right pane indicates the signal and the signal path for the connector. If the signal has multiple signal paths (e.g., component signals), each of the signals will be displayed and each signal path will display an appended number. In the example shown (FIG. 103), the connector for input six contains two signal paths for an S-Video signal:

- S-VidV\_IN\_006.1 for the “Y” signal path
- S-VidV\_IN\_006.2 for the “c” signal path

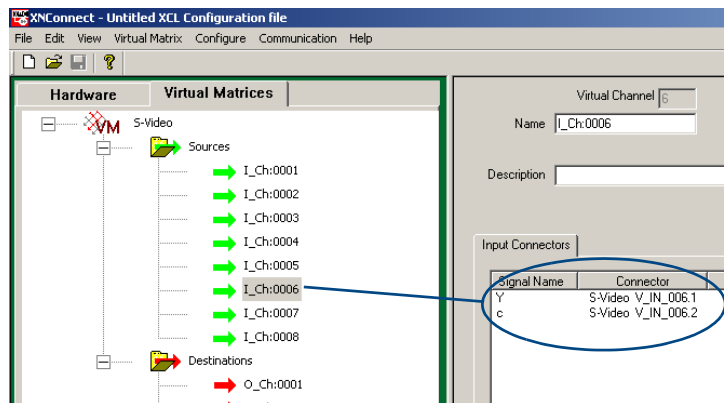


FIG. 103 Input connector properties showing two signal paths for one S-Video connector

## Modifying a Configuration File

Modifying a configuration file with XNConnect involves entering information in a field or in a series of dialog boxes. A brief look at the contents in the Help file provides a quick overview of the possible modifications.

This section provides instructions for two common tasks: modifying channel names and configuring local presets. For complete coverage of configuration related tasks, see the XNConnect Help file.

### Modifying Source and Destination Channel Names

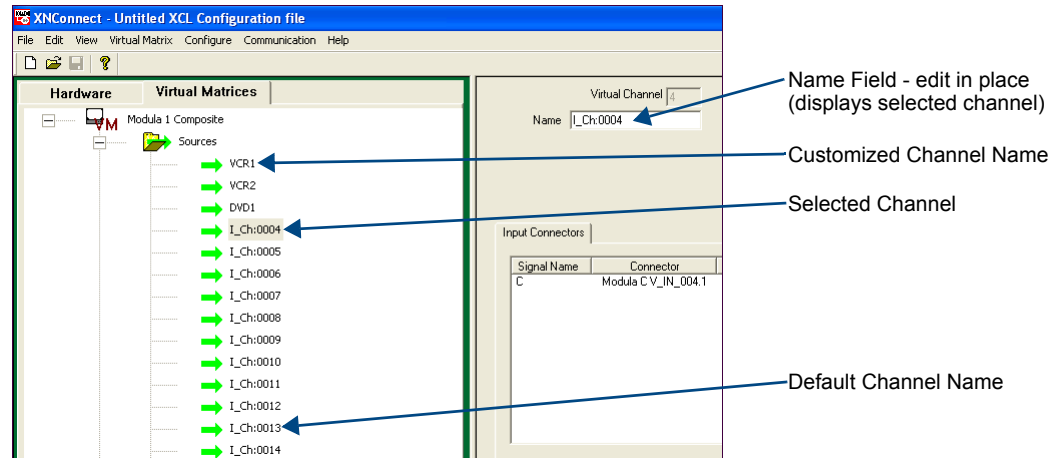
If the system is using APWeb for control, the names for the source and destination channels displayed in the XBar can be customized in XNConnect. The custom names (labels) can be up to 23 characters and cannot contain the following characters: ‘ “ \ = ? < >

If your system has a graphical front panel (such as a CP-20A), the names for the source and destination channels displayed on the LCD can be customized in XNConnect.

For more information on channel names and description parameters, see the XNConnect Help file.

### To customize the channel names:

1. In the Virtual Matrices view, click the “+” to the left of the Virtual Matrix.
2. Click the “+” to the left of the Sources or Destinations folder.
3. Select the channel you want to rename.
4. Enter the new name in the Name field in the right-hand pane and press Enter.  
The new channel name replaces the default channel name in the Sources or Destinations list.



**Note:** If a channel is in more than one VM (virtual matrix), you must repeat Step 4 for the channel in each of the VMs.

5. Customize additional channels by repeating Steps 3 and 4.
6. Load the configuration file onto the system (see page 156).  
If channel names are the only modifications that have been made to the file, use the “Configure System Namespace” option (found under Configure \ Configure Special – Virtual Matrix).
7. Using Save As (under the File menu), make a duplicate copy of the modified file with a new name and save it to the PC. (We *strongly* recommend making a duplicate copy every time the file is modified.)



**Caution:** The system must not be actively switching when loading this information onto the system.

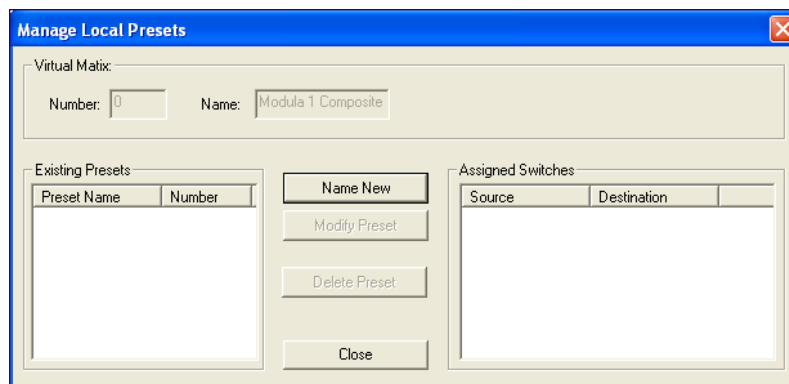
## Creating Local Presets

A local preset is a predetermined collection of switches on the same virtual matrix to be routed simultaneously. Executing a local preset affects only those inputs and outputs specified, not the whole system. Local presets are defined using XNConnect and can be executed using a control panel (local or remote) or using BCS commands as part of a macro in APControl 3.0 or APWeb or entered in a terminal emulation program. The process for creating local presets involves three dialog boxes that cover managing, naming, and modifying presets.

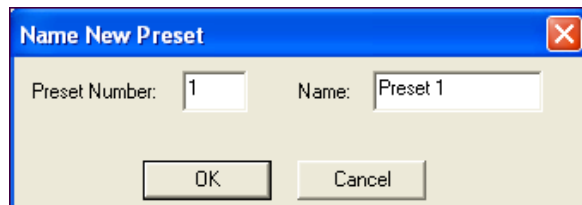
The instructions below are for creating a local preset. For detailed information on modifying and deleting local presets, see the XNConnect Help file.

### To create a new local preset:

1. In the Virtual Matrices view, right-click the virtual matrix the preset will be created for and select Manage Local Presets from the shortcut menu.  
The Manage Local Presets dialog box opens.



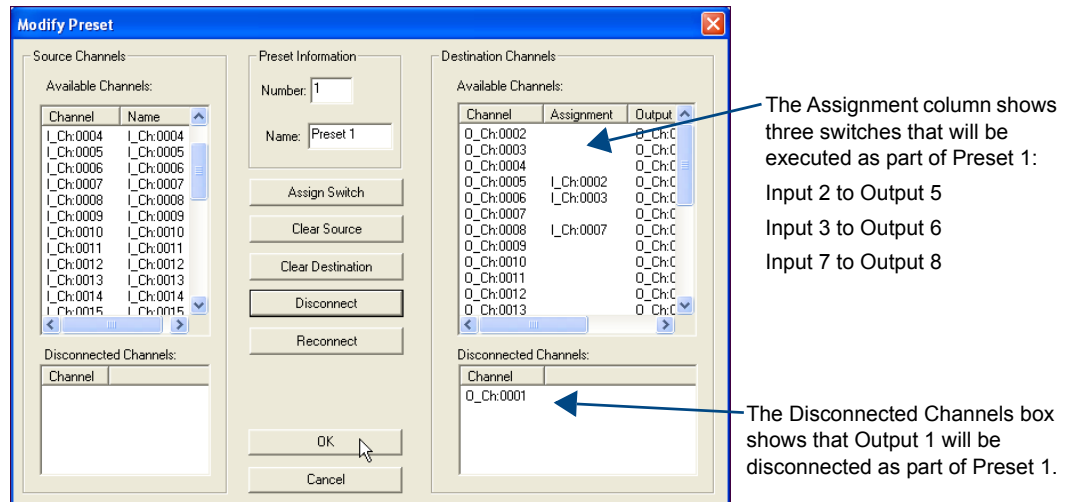
2. Click the Name New button.  
The Name New Preset dialog box opens.



3. Optional – Enter a different preset number (local presets do not need to be numbered sequentially).
4. Enter a name for the new preset.
5. Click OK.  
The Modify Preset dialog box opens.



- For the first switch, click the source channel (input) and one or more destination channels (outputs). Select multiple destination channels by holding down the Control key while selecting the channels.



- Click the Assign Switch button.  
The input appears in the Assignment column of the Destination Channels list; the switch will execute when the local preset is executed.
- Disconnect inputs\* or outputs as part of the local preset by selecting either the source or destination channel and clicking the Disconnect button.  
The input or output appears in its corresponding Disconnected Channels list; the input or output will be disconnected when the local preset is executed.
- Repeat Steps 7, 8, and 9 for all switches and/or disconnects to be included in the preset.

**Note:** For information on the other buttons and preset modifications, press F1 while the Manage Local Presets dialog box is open.

- After all switches for the preset have been assigned, click OK and then close the Manage Local Presets dialog box.
- Define additional local presets by repeating the steps.
- Load the configuration file onto the system (see page 156); see Caution below.  
If the configuration file has already been loaded to the system and local presets are the only modifications that have been made to the file, select “Configure All VM Local Presets” (found under Configure \ Configure Special – Virtual Matrix).
- Using Save As (under the File menu), make a duplicate copy of the modified file with a new name and save it to the PC. (We *strongly* recommend making a duplicate copy every time the file is modified.)



**Caution:** The system must not be actively switching when loading this information onto the system.

\* Disconnecting an input will disconnect *all* outputs it is connected to.

## Loading a Configuration File

Once modifications have been made to the configuration file, the new file must be loaded onto the system's CPU for the changes to be implemented.

The two basic options for loading a configuration file are:

- Load the entire file using the “Configure All” option (see Caution below)
- Load part of the file using one of the “Configure Special” options

To determine which configuration option to use, see “Configure Menu Commands” in the Help file.



**Caution:** Using the “Configure All” option or the “Configure All Virtual Matrices” option will erase any global presets (see the “Instruction Manual – BCS Basic Control Structure Protocol” on the “AMX AutoPatch CD” or at [www.amx.com](http://www.amx.com)) that have already been defined for the system.

### To load the modified configuration file from XNConnect to the Modula CPU:

1. Disconnect external controllers to ensure that no switches are executed during the loading of the file. *The matrix switcher must not be actively switching when loading a configuration file.*
2. Using Save As (under the File menu), make a duplicate copy of the modified file with a new name and save it to the PC. (We *strongly* recommend making a duplicate copy every time the file is modified.)
3. Connect the Modula enclosure\* to the PC (see page 31).
4. In XNConnect, open the Communication menu; select Serial Port.
5. Open the Communication menu again, select Change Comm Settings. Check the settings for the selected port (the default is Com 1, baud rate 9600) and adjust if necessary.
6. Optional – Click the Test button to verify that communication has been established with the Modula.  
Click OK.
7. From the Configure menu, select the appropriate configuration option (for an explanation of Configuration menu options, see the Help file).  
The system automatically reboots (applies to non-hardware configuration options only; for hardware, select the appropriate configuration option and then Configure > Reboot All Devices).

\* For Modula multiple-enclosure systems, you can connect any of the enclosures to the PC as long as all of the enclosures are linked together.

# Appendix B – Advanced Configuration: Modifying Virtual Matrices

**Applicability Notice:** This appendix applies to XNConnect version 2.10.0 (XNConnect’s version information is found under its Help menu).

## Overview

Your AMX AutoPatch Distribution Matrix is pre-configured at the factory. It is ready to switch once the source and destination devices are attached. The configuration file does *not* need any advanced modification unless you change the hardware or want to change or add virtual matrices. Any new equipment for upgrading an existing system will be shipped from the factory along with a new configuration file to be loaded onto the system. *We strongly recommend using the new file instead of attempting to modify the existing configuration file to accommodate the new equipment.*

**Important:** *If any modifications are made to the configuration file other than customizing channel names, creating local presets, or changing control panel passwords, provide technical support with a copy of the modified .xcl file for future support.*

If your configuration file needs any type of additional advanced modification, we *strongly recommend* contacting technical support (see page 43) to request a modified .xcl file or to ask for assistance.



**Caution:** *Virtual matrix modifications are an advanced feature of XNConnect that should not be attempted unless you are extremely familiar with XNConnect and the AMX AutoPatch Distribution Matrix being configured.*

This appendix covers three advanced virtual matrix related tasks:

- Joining (combining) virtual matrices
- Creating breakaway virtual matrices
- Creating a new virtual matrix

**Important:** *Save a back up copy of the existing configuration file if you find it necessary to modify the file for any reason.*

### Virtual Channels and Virtual Matrices

A system’s configuration allows groups of incoming signals from source devices to be routed through the system and out to destination devices. The signals are grouped into virtual input and output channels in which the channels’ component signals (such as R, G, B, H, and V) can be grouped into a single channel to permit the simultaneous switching of them as an aggregate signal (RGBHV). The resulting virtual channel uses a single input or output number for control purposes.

A virtual channel is assigned to a physical connector or group of physical connectors. The signals in the virtual channels will be switched in unison (e.g., a Y signal and a c signal on a Y/c board are each assigned to a different connector but are switched in unison). A virtual channel can also be a subset of a signal on a single connector (e.g., the left channel of a stereo audio connector).

The virtual input and output channels are then grouped into virtual matrices (VMs) that define where the virtual channels can be routed. A virtual channel on one VM cannot be routed to a virtual channel on another VM. However, a VM can be created that includes multiple VMs. Normally the virtual channels are assigned to a VM in a pattern (see page 165), but they can be assigned individually (see the XNConnect Help file).

## Joining Virtual Matrices

Existing virtual matrices can be joined, allowing the signals of the combined VMs to be switched simultaneously. The most common reason for joining VMs is to configure a system so that audio can follow video. VMs that contain the same signal cannot be joined, e.g., two matrices cannot be joined if they both contain S-Video signals.

If one of the VMs to be joined is smaller than the other, the combined VM will only include the number of channels in the smaller VM. For example, if VM 1 is 8x8 and VM 2 is 16x16, the combined VM will include all of the channels of VM 1 and the first 8 input and 8 output channels of VM 2.

Joining a specific subset of channels is not supported at this time. For the same result, join two VMs, delete the unwanted channels from the joined VM, and then collapse the channel gaps (see the XNConnect Help file).

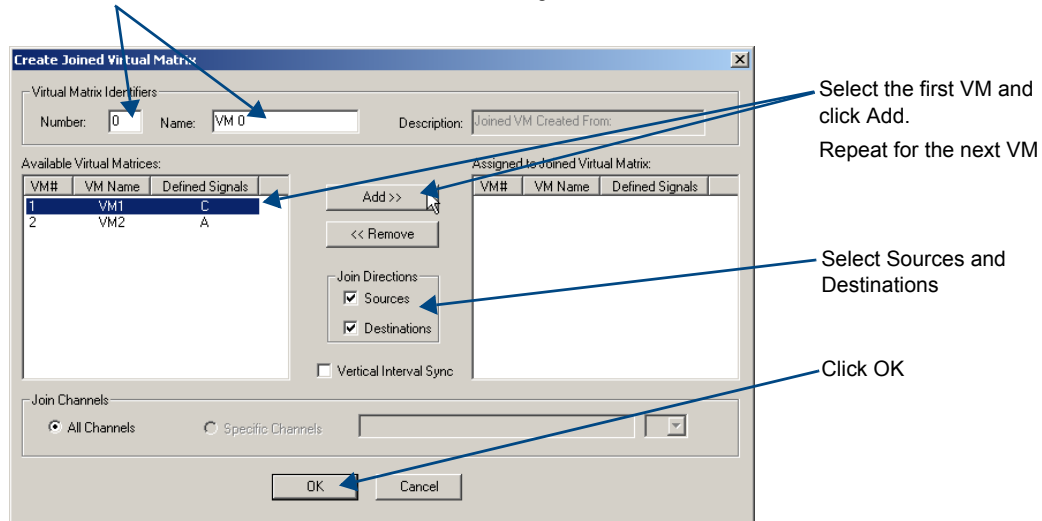
The information in the dialog box below is based on the following scenario. The original system switches 16x16 S-Video on VM 1 and 20x20 stereo audio on VM 3. The two VMs are joined to create VM 0 that switches input and output signals for sixteen pairs of video and audio signals.

**Note:** For additional information on joining virtual matrices, see the XNConnect Help file. To access the Help file topic for an open dialog box, press F1.

### To create a joined virtual matrix:

1. From the Virtual Matrix menu, select Join Virtual Matrices.
2. Select the first VM to be joined and click Add.

The VM's default number and default name can be changed



3. Select the second VM to be joined and click Add.  
Repeat for any additional VMs.
4. Optional – Under Virtual Matrix Identifiers, change the number and name.
5. Check the Source and Destination check boxes so that both are joined in the new VM.  
Click OK.
6. Load the configuration file onto the system; see page 156.
7. Using Save As (under the File menu), make a duplicate copy of the modified file with a new name and save it to the PC.  
We *strongly* recommend making a duplicate copy every time the file is modified.



**Caution:** The system must not be actively switching when loading this information onto the system.

## Creating Virtual Matrix Breakaways

Breakaway virtual matrices can be created from an existing virtual matrix, allowing signals to be switched independently. The most common reason for creating virtual matrix breakaways is to configure a system so that video and audio signals can be switched separately.

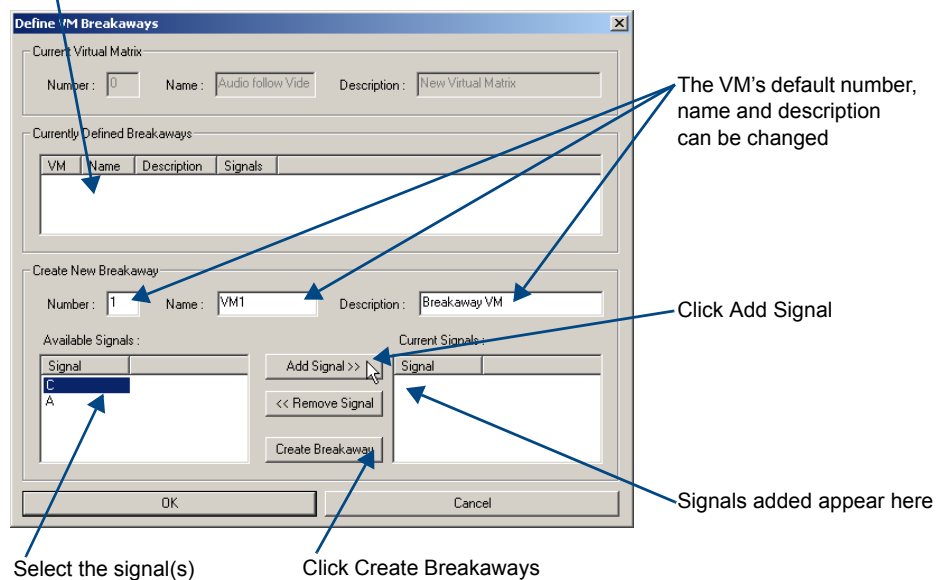
The information in the dialog boxes for this section is based on the following scenario. The original system was configured to switch RGBHV and stereo signals together on VM 0, and now they need to be switched independently. Two additional virtual matrices, VM 1 (for RGBHV) and VM 2 (for stereo audio), are created to allow the video and audio to switch independently (breakaway).

**Note:** For additional information on creating breakaways, see the *XNConnect Help file*. To access the Help file topic for an open dialog box, press the F1 key.

### To create the first breakaway:

1. Right click the VM that the breakaways will be created from.
2. From the shortcut menu, select Define VM Breakaways.  
The Define VM Breakaways dialog box appears.
3. Optional – Under the Create New Breakaway section, change the number, name, and description.
4. From the Available Signals list, select the signal(s) to be included (to select multiple signals, hold down the Control key), and click Add Signal.  
The signals appear in the Current Signals list.

Currently Defined Breakaways list



5. Click Create Breakaway. Do *not* close the dialog box.  
The VM appears in the Currently Defined Breakaways list.

**To create the second breakaway:**

6. Optional – Under the Create New Breakaway section, change the number, name, and description.
7. From the Available Signals list, select the signal(s) to be included and click Add Signal. The signal appears in the Current Signals list.
8. Click Create Breakaway. The VM appears in the Currently Defined Breakaways list.
9. Click OK to finalize the assignments.
10. Load the configuration file onto the system; see page 156.
11. Using Save As (under the File menu), make a duplicate copy of the modified file with a new name and save it to the PC. (We *strongly* recommend making a duplicate copy every time the file is modified.)



**Caution:** *The system must not be actively switching when loading this information onto the system.*

## Creating a New Virtual Matrix

**Important:** Save a backup copy of the existing configuration file if you find it necessary to modify the file for any reason.

A new virtual matrix can be created for new or existing hardware in a system. Rather than making changes to an existing virtual matrix, you can create a new one that uses the same board(s). When creating a VM to replace an existing one, delete the old VM or (if reuse is likely) change its number. *Always exercise caution and make a backup copy before deleting any part of the existing file.*

### Optional – To delete an existing VM:

1. Using Save As (under the File menu), make a backup copy of the current file with a new name and save it to the PC.
2. Right click the VM and select Delete.

### Process Overview

Creating a new virtual matrix involves creating virtual channels which must be assigned to the physical connectors and grouped into a virtual matrix. For more information on virtual matrices, see page 157. Four dialog boxes are used for creating a virtual matrix (FIG. 104). The first is for assigning the signals to the VM; the second for assigning the signals to the physical matrix; the third for selecting the connector assignment method; and the fourth for completing the connector assignments. To access the Help file regarding an open dialog box, press F1.

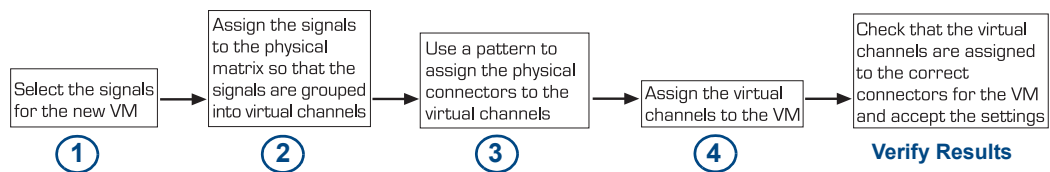


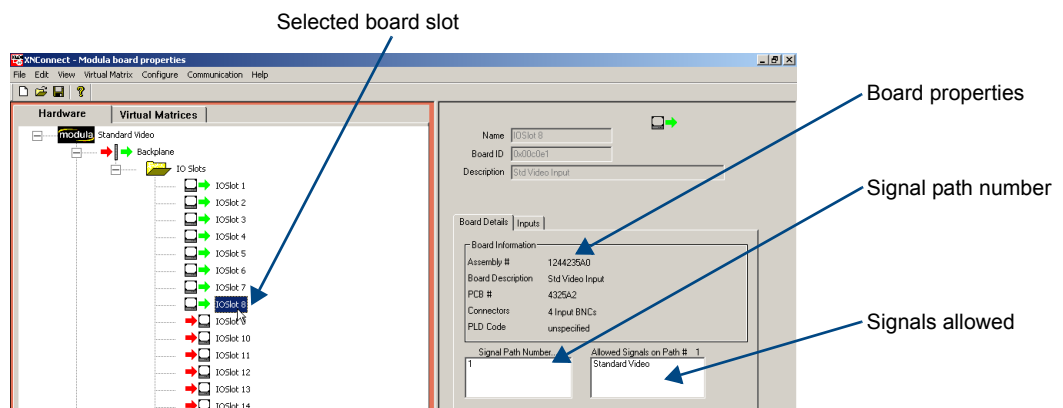
FIG. 104 Four step process for creating a new virtual matrix

### The Physical Matrix

The virtual channels need to be assigned to the physical matrix in the Assign Signals to Matrices box. The list in this box shows only physical matrices that are capable of routing the selected signal.

### To view the properties of a board:

1. Select the Hardware tab.
2. Expand the enclosure and backplane, and select the slot the board is in.



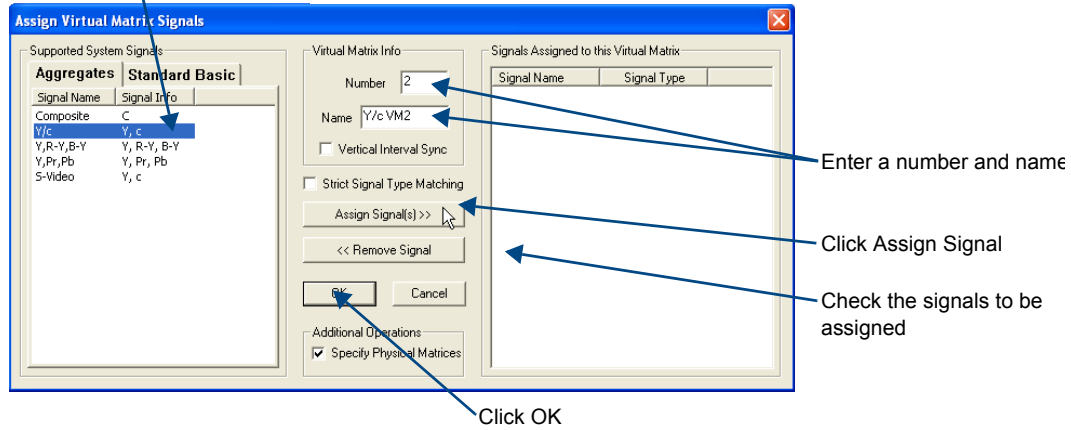
The information in the dialog boxes for the following section is based on the following scenario. An enclosure configured for 16x16 standard video is reconfigured to switch 8x8 Y/c by creating a new VM 2 that switches 8 channels of “Y” and 8 channels of “c” using the previous “composite” channels.

**Note:** For additional information on creating virtual matrices, see the XNConnect Help file. To access the Help file topic for an open dialog box, press F1.

**To create a new virtual matrix:**

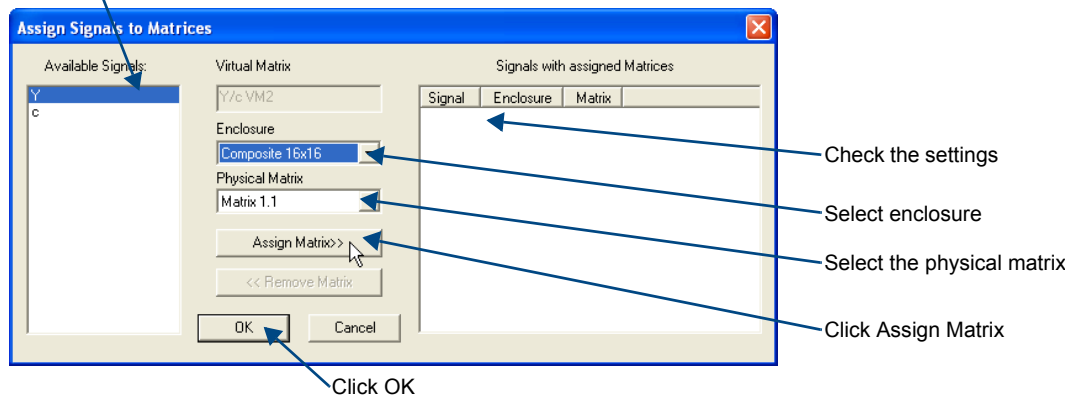
1. From the Virtual Matrix menu, select Add Virtual Matrix.  
The Assign Virtual Matrix Signals dialog box opens.

Select the signal



2. Under the Supported System Signals list (use either tab), select the signals for the new VM (to select multiple signals, hold the down the Control key) and click Assign Signal.
3. Under Virtual Matrix Info, enter a number and a unique name. Click OK.  
The Assign Signals to Matrices dialog box opens.

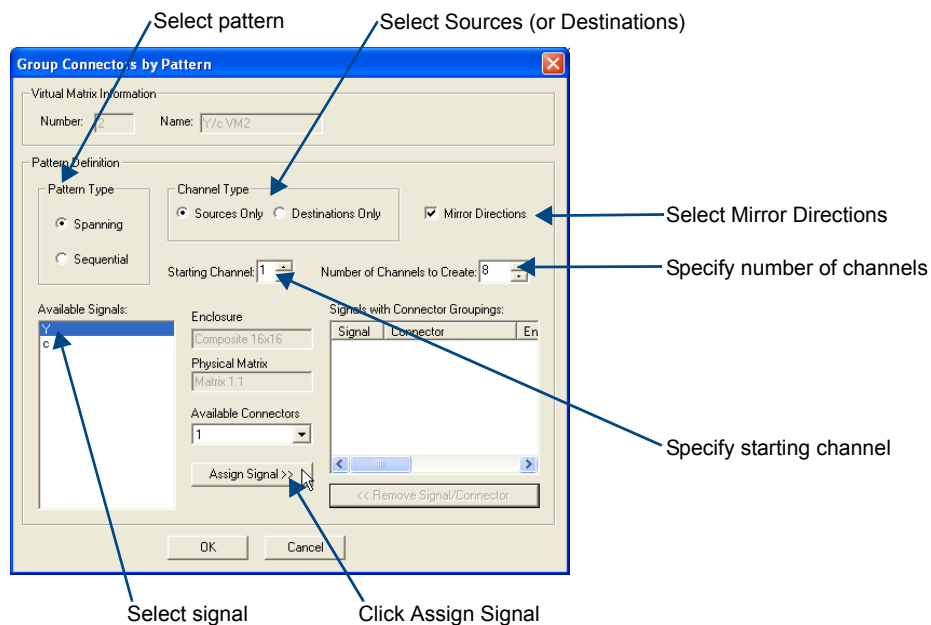
Select signal



4. From the Available Signals box, select the signal.
5. If applicable – For a multiple-enclosure system, from the Enclosure drop down list, select the correct enclosure.
6. From the Physical Matrix drop down list, select the matrix (see “The Physical Matrix” on page 161).
7. Click Assign Matrix.
8. Repeat Steps 4 through 7 for additional signals.

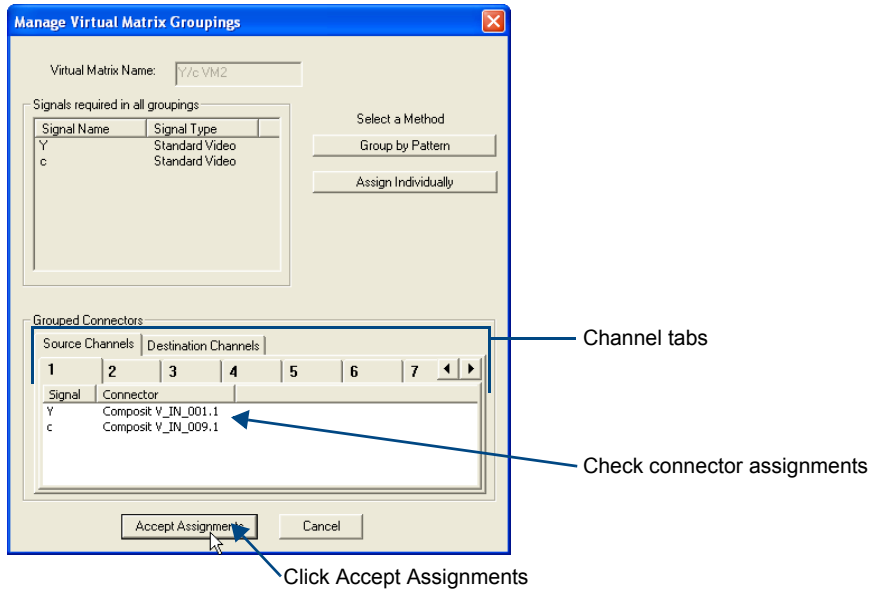


9. Click OK to finalize the settings and close the dialog box.
10. From the Virtual Matrix view, right click the new virtual matrix and select Manage Connector Groupings.  
The Manage Virtual Matrix Groupings dialog box opens.
11. Under Select a Method, click Group by Pattern.  
(To group connectors individually, see the Help file.)
12. Specify the following parameters:
  - Under Pattern Type, select the pattern. (Spanning is the most common; for an explanation of the Spanning and Sequential patterns see page 165.)
  - Under Channel Type:
    - If the number of inputs equals the number of outputs, select Mirror Directions to apply the settings to both inputs and outputs.
    - Or**
    - If the number is not equal, select Sources Only (Destinations Only will be selected in Step 18).
  - In the Starting Channel field, enter the first channel number to be included.
  - In the Number of Channels to Create field, enter the number of channels needed for the first signal.



13. Select the first signal from the Available Signals list.
14. If applicable – If not using the entire set of connectors that are available for the signal, change the Starting Channel, Number of Channels to Create, and Available Connectors as necessary.
15. Click Assign Signal.
16. Repeat Steps 13 through 15 until all of the signals in the Available Signals list have been assigned to connectors, changing the values for the Starting Channel, Number of Channels to Create, and Available Connectors as necessary.
17. Click OK.  
The Manage Virtual Matrix Groupings dialog box opens again.

18. If applicable – If Mirror Directions was not selected in Step 12, repeat Steps 11 through 17 for the outputs, selecting Destinations Only in Step 12.
19. Under Grouped Connectors, check the virtual channel assignment for each connector by selecting the Source and Destination Channel tabs.



20. Click Accept Assignments if satisfied.
21. Load the configuring file onto the system; see page 156.
22. Using Save As (under the File menu), make a duplicate copy of the modified file with a new name and save it to the PC. (We *strongly* recommend making a duplicate copy every time the file is modified.)



**Caution:** The system must not be actively switching when loading this information onto the system.

## Grouping Pattern Examples

For switching purposes, connectors can be grouped in two basic patterns of virtual channels, spanning and sequential. Explanations and examples of each follow.

### Spanning Grouping Pattern

A spanning pattern is the most common method of grouping connectors for an Modula Distribution Matrix. When this pattern is selected, each of the component (standard) signals in an aggregate signal is assigned to a connector on an adjacent board. The same pattern is then repeated for the outputs.

#### Example

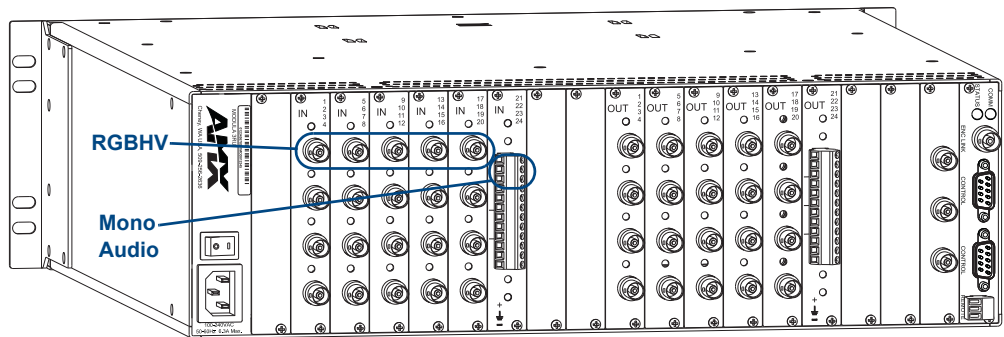
In the RGBHV systems in FIG. 105 the first channel of VM 0 (audio-follow-video) is composed of connectors 1, 5, 9, 13, 17, and 21. This configuration routes any of the four source channels of RGBHV with mono audio to any or all of the four destinations.

VM 1 or VM 2 breakaway switches can also be routed using the four channels of RGBHV or mono audio connections respectively. The first channel of RGBHV breakaway is composed of connectors 1, 5, 9, 13, and 17. The first channel of mono audio breakaway is composed of connector 21.

VM 0 = RGBHV + Mono Audio

VM 1 = RGBHV

VM 2 = Mono Audio



Virtual Inputs: RGBHV + Mono Audio = 1st input channel of VM 0

FIG. 105 Connectors grouped in a spanning pattern

### Sequential Grouping Pattern

Although using a spanning pattern is more common for Modula Distribution Matrix enclosures, a sequential pattern can be used to group connectors. When this pattern is selected, each of the standard (component) signals in an aggregate signal is assigned to an adjacent connector on the same board.

#### Example

In the Y/c system in FIG. 106, the first channel of VM 0 (audio-follow-video) is composed of connectors 1, 2, and 17. This configuration routes any of the eight source channels of Y/c with mono audio to any or all of the eight destinations.

VM 1 or VM 2 breakaway switches can also be routed using the eight channels of Y/c or eight channels of mono audio. The first channel of Y/c breakaway is composed of connectors 1 and 2. The first channel of mono audio breakaway is composed of connector 17.

- VM 0 = Y/c + Mono Audio
- VM 1 = Y/c
- VM 2 = Mono Audio

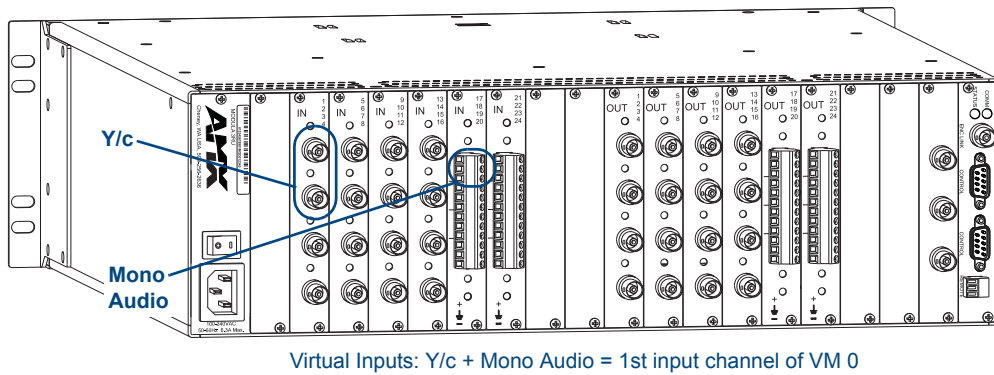


FIG. 106 Connectors grouped in a sequential pattern

# Appendix C – Paralleling Inputs

**Important:** The system must have been ordered to handle parallel inputs to use these directions.

This appendix contains directions for cabling and operating a paralleled system that switches composite (or Y/c) over BNC connectors. Parallel systems *must* contain standard video high impedance (Hi-Z) input boards (either FG1034-461 or FG1034-458) in all enclosures except for the last enclosure, which must contain standard video (not Hi-Z) input boards. For more information, contact an AMX representative.

A Modula's switching capability can be expanded by paralleling ("splitting") inputs. Normally the input connectors on one enclosure can only route a signal to the output connectors on that enclosure. However, connecting an input on one enclosure to the corresponding input on a second enclosure with a T-connector allows a source signal to be routed to all available output connectors for that signal on both enclosures. By paralleling inputs on two enclosures each with a 32x32 configuration, the set of configuration possibilities expands to 32x64.

The source signal must be routed on different levels for each enclosure; therefore, the system must be configured in XNConnect so the enclosures switch on different virtual matrices (levels); see page 168.

**Note:** Splitting a signal more than four times requires a distribution amplifier.

## Cabling Parallel Inputs



**Caution:** When video signal inputs are paralleled, all enclosures must contain standard video high impedance (Hi-Z) input boards except for the last enclosure, which must contain standard video (not Hi-Z) input boards.

### To parallel inputs between two enclosures:

**Important:** Signal cable B in FIG. 107 needs to be approximately 3.0 in. (7.6 cm) long. Signal cable C should be just long enough to reach from enclosure to enclosure.

1. Fasten a T-connector to signal cable A, which comes from the source device.

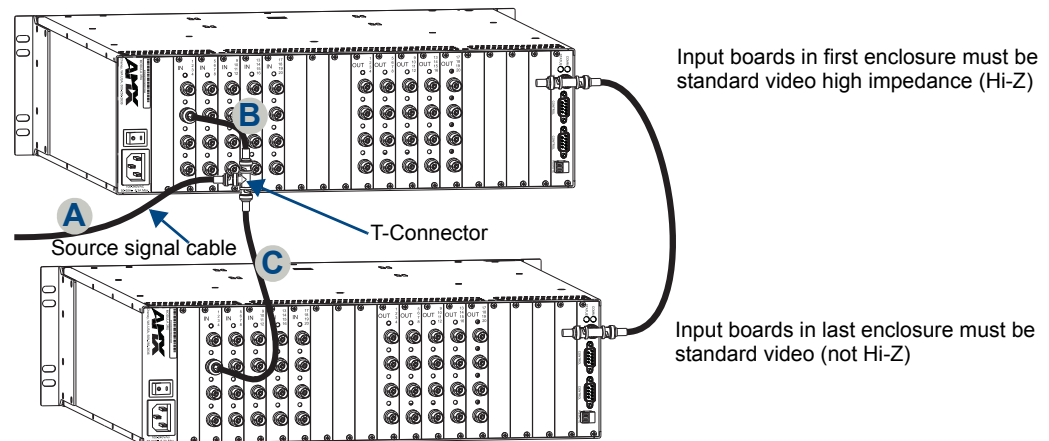


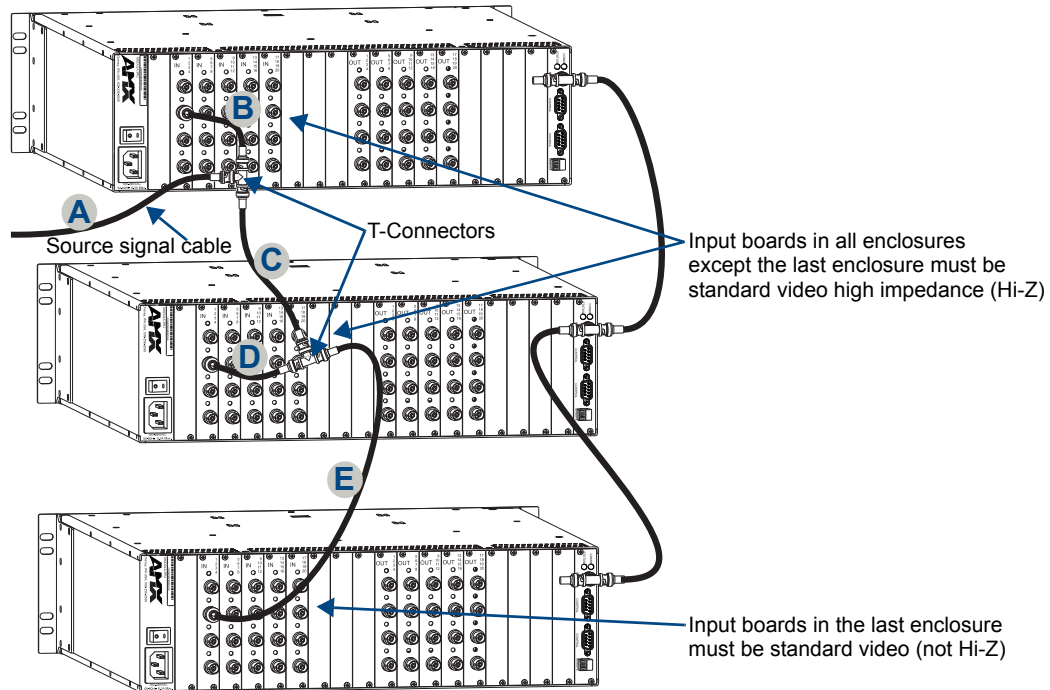
FIG. 107 Connecting two inputs for parallel control

2. Fasten one end of signal cable B to the T-Connector. Fasten the other end of signal cable B to the input on the first enclosure.
3. Fasten signal cable C to the open end of the T-Connector. Fasten the other end of signal cable C to the corresponding input on the second enclosure. The source is ready to switch to outputs on both enclosures (for information on controlling parallel inputs, see page 169).

### To parallel inputs between more than two enclosures:

**Important:** Signal cables B and D in FIG. 108 need to be approximately 3.0 in. (7.6 cm) long. Signal cables C and E should be just long enough to reach from enclosure to enclosure.

1. Fasten the first T-connector to signal cable A, which comes from the source device.



**FIG. 108** Connecting inputs for parallel control

2. Fasten one end of signal cable B to the first T-Connector.  
Fasten the other end of signal cable B to the input on the first enclosure.
3. Fasten one end of signal cable C to the first T-Connector.  
Fasten the other end of signal cable C to an open end on the second T-Connector, per FIG. 108.
4. Fasten signal cable D to the second T-Connector.  
Fasten the other end of signal cable D to the corresponding connector on the second enclosure.
5. Fasten signal cable E to the open end on the second T-Connector.  
Fasten the other end of signal cable E to the corresponding connector on the last enclosure.  
The source is ready to switch to outputs on all enclosures (for information on controlling parallel inputs, see page 169).

## Controlling Paralleled Inputs

For control purposes, each split of the source signal is treated as a separate input signal. To control paralleled inputs, the system *must* be configured in XNConnect so the enclosures are on different virtual matrices (levels). For more information on system configuration using XNConnect, see the Help file.

### Control Panel

#### To execute switches on paralleled inputs using a control panel:

1. Follow the instructions for executing a switch on the control panel, using the virtual matrix (level) for which the first board is configured and selecting the paralleled input (source) and the desired output(s) (destinations).
2. Repeat Step 1 for the second board, using the virtual matrix (level) for which it is configured and selecting the paralleled input and the desired output(s).

For more information on executing switches with a control panel, see the applicable control panel instruction manual on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com).

### APControl or APWeb

#### To execute switches on paralleled inputs using APControl or APWeb:

1. Using the CrossBar (APControl) or XBar (APWeb) for the VM (level) associated with the first board, select the crosspoint for the paralleled input and desired output(s).
2. Repeat Step 1 for the second board using the CrossBar or XBar for the second VM (level).

For more information on executing switches using APControl or APWeb, see the APControl Help file or the *Instruction Manual – APWeb Interface* on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com).

### BCS Commands

#### To execute switches on paralleled inputs using BCS commands:

1. Enter the command for the first enclosure using its level and selecting the paralleled input and the desired output(s).
2. Enter the command for the second enclosure using its level and selecting the paralleled input and the desired output(s).

#### Example:

For a system where the paralleled enclosures are configured as Level 1 and 2, entering the commands below switches paralleled Input 2 to Output 3 on the first enclosure (Level 1) and also switches paralleled Input 2 to Output 15 on the second enclosure (Level 2).

```
CL1I2O3T
```

```
CL2I2O15T
```

For more information on BCS commands, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at [www.amx.com](http://www.amx.com).





# Appendix D – Adding or Replacing Boards

This appendix covers the procedure to add or replace a Modula input or output board.

Input and output boards can be added to a partially filled enclosure to expand a system's capabilities or increase an enclosure's possible signal routings.

A VIS board can also be added to a Modula enclosure to synchronize video signal switches with the output device's refresh rate. A VIS board *must* be enabled after installation by updating the system's configuration file. (For information, see "Appendix E – Vertical Interval Sync" on page 177.)

Other types of boards may or may not require an update to the system configuration. See "Configuration Requirements" below to determine if the system's configuration information needs to be updated after adding or replacing an input or output board.

**Important:** *Adding or replacing boards should only be done by personnel trained to handle ESD sensitive parts and assemblies.*

## Items Required

- Modula board(s)
- Phillips #1 screwdriver
- ESD wristband and cord with alligator clip
- Updated configuration file (see "Configuration Requirements" below to determine if required)

## Configuration Requirements

- If a board is replaced with the same type of board or if the system was configured for expansion, the configuration file will not need to be updated.
- If a board is added to a previously empty slot as part of an unplanned upgrade or if a board is replacing a different type of board, a CD has been included with an updated configuration file, which *must* be uploaded to the system (see page 174) for the new board to work.

## Before starting:

- Turn off the power switch on the rear of the enclosure and unplug the power cord.
- Multiple-enclosure systems – label and disconnect link cables.
- If necessary – label and disconnect all cables on the board being replaced. If cables from adjoining boards obstruct access, label and disconnect them as necessary.

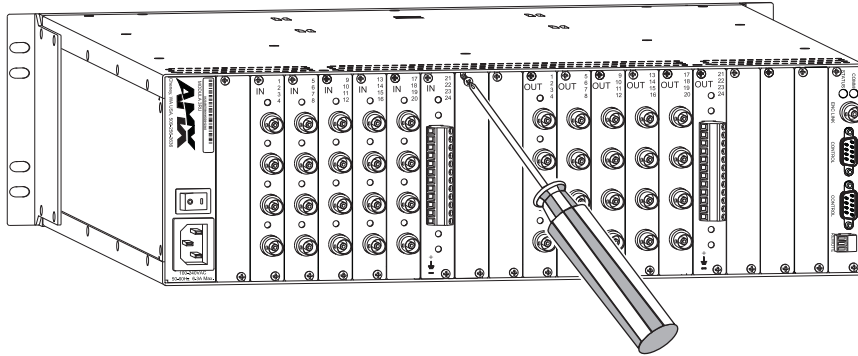


**ESD Warning:** *To avoid ESD (Electrostatic Discharge) damage to sensitive components, make sure you are properly grounded before touching any internal Modula materials. Use an ESD wristband and cord with alligator clip attached to a good ground source.*

## Removing Blank Board Plates or Boards

To remove a blank board plate or a current Modula board:

1. Remove the two screws indicated from the top and bottom of the board plate (FIG. 109).



**FIG. 109** Remove screws from empty board slot or current board

2. Blank board plate – Remove the plate covering the empty expansion slot.  
Current board – Remove the plate covering the board being replaced.  
If the current board is an audio board, first unplug the 3 or 5-terminal connector from the board, then remove the board plate.  
If the new board is the same type as the replacement board, set the plate and its screws aside for reuse.
3. Current board – Carefully pull the board straight out of the board slot and place in an ESD approved static shield bag.

## Adding Modula Boards

**Important:** Be sure to install an upgrade board in the correct slot (normally the next empty slot to the right of the existing input boards or output boards). The board's location must match the system's configuration information. If a board is installed in the wrong slot, signal routing is affected.

### To add a Modula board:

1. Line up the new board with the board guides that are on the top and bottom of the board slot (FIG. 110). Note that for 4 RU enclosures, some boards use the bottom board guide only (FIG. 111).

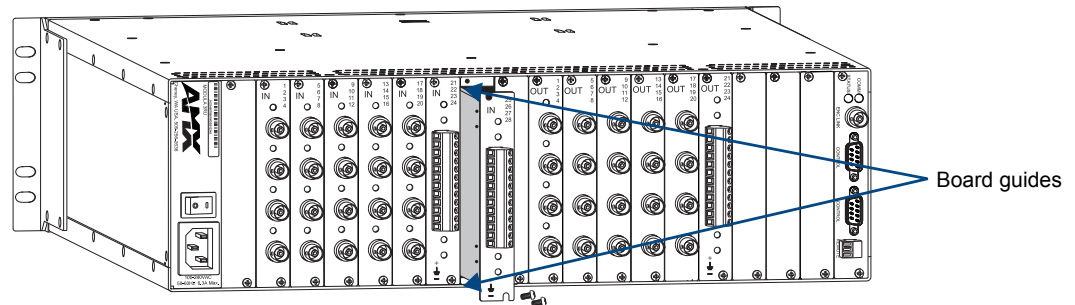


FIG. 110 Line up board with guides and push until flush with back

**Note:** Normally boards for any 4 RU Modula Distribution Matrix are installed the same as the ones for the 3 RU models. However, for Step 1, boards which do not extend to the top of the face plate use the bottom board guide only (FIG. 111)

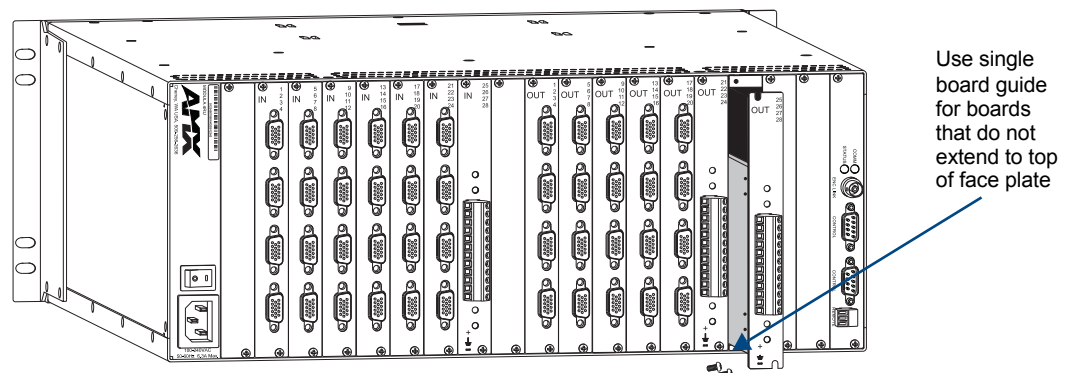
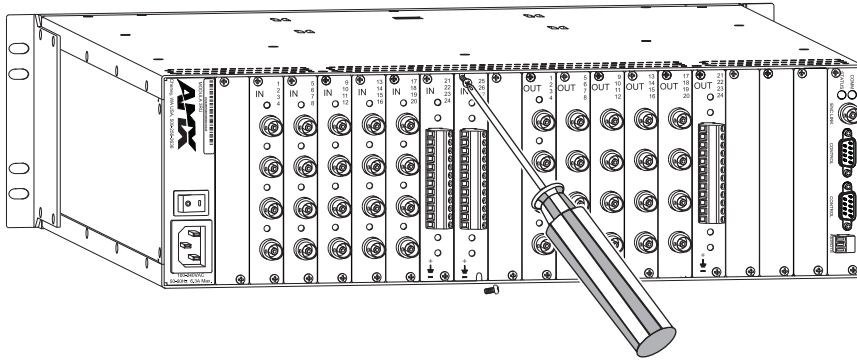


FIG. 111 Some Modula boards (4 RU enclosures) use the bottom guide only

2. Carefully push the board into the enclosure until it snaps into place.
3. If the new board is the same type as the old board, replace the original metal plate.  
**Or**  
 If the new board is a different type, install the new metal plate sent with the board.  
 If the metal plate is not flush with the back of the enclosure, carefully press on the board until it is fully seated and the plate is level.

4. Insert the screws into the holes in the plate (FIG. 112) and tighten the screws until they are snug.



**FIG. 112** Insert and tighten screws until they are snug

5. Attach the cables to the connectors and reconnect any other cables that were disconnected in the removal procedure.

**Important:** *If the slot was previously empty or if the board type has changed, the system's configuration file must be updated before signals can be routed on the new board; see "Updating the System Configuration" below.*

6. If the system's configuration file does not need updating, reapply power to the enclosure and proceed with normal operations.

**Or**

If the system's configuration file requires updating, reapply power to the enclosure and continue to the section below.

## Updating the System Configuration

The configuration file stored on the Modula system may or may not need to be updated, depending on the type of board being installed.

- If an input or output board is replaced with the same type of board or if the system was pre-configured for expansion, the configuration file will not need to be updated.
- If an input or output board is added to a previously empty slot (an upgrade) in a system *not* configured for expansion, or if the replacement is a different type of board, the system's configuration file *must* be updated before the board will work. If the system requires a new configuration file, the file is provided on a CD and needs to be loaded using XNConnect.

**Note:** *We recommend keeping a copy of the former configuration file for reference.*

**Important:** *When loading any part of a configuration file, the matrix switcher must not be actively switching. You may want to disconnect any external controllers to ensure that no switches are executed during the loading of the file.*

### To update the system configuration file:

1. Attach a PC to the Modula's serial port with an RS-232 null modem cable.
2. Open a terminal emulation program (such as HyperTerminal), and set the port settings to: baud rate = 9600, data bits = 8, stop bit = 1, parity = none, and flow control = none.
3. Plug in the enclosure.  
A short splash screen\* appears (FIG. 113).
4. Enter ~def!  
Wait until a "v" appears (FIG. 113) to verify that the command is successful (this may take a few minutes), then exit the program.

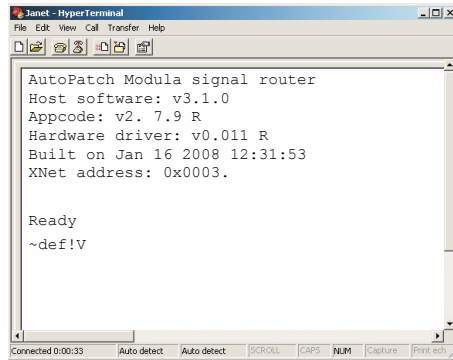


FIG. 113 Short splash screen in HyperTerminal

5. Install XNConnect from the *AMX AutoPatch CD* sent with the new board. (If XNConnect is already installed on the PC, we *strongly* recommend uninstalling the old version before installing a new version).
6. Open XNConnect.
7. From the Communication menu, select Change Comm Settings. Check the settings for the selected PC port (the default is Com 1, baud rate 9600) and adjust if necessary.
8. From the File menu select Open.
9. Using the standard File Open dialog box, locate and open the XCL (\*.xcl) configuration file that was sent with the new board. The default location is in the C:\AutoPatch\Configuration Software<Version>\MyXCL folder.
10. For XNConnect version 2.4.0 – from the Configure menu, select Configure All.  
The system automatically reboots all devices.  
**Or**  
For XNConnect versions prior to 2.4.0 – from the Configure menu, select Reboot All Devices.
11. Execute a test switch that includes a signal routed on the new board to ensure the system is working correctly. (Repeat for any additional new boards.)

If the test switch does not execute correctly, contact technical support (see page 43).

\* Your splash screen may differ. AMX reserves the right to change the contents and/or formatting of the splash screen without notice.



# Appendix E – Vertical Interval Sync (VIS)

## Applicability Notice

This appendix pertains to the Modula Vertical Interval Sync (VIS) expansion board, FG1034-325.

## Overview

A VIS board gives the Modula complete vertical interval synchronization switching capability. Each Modula enclosure is built to hold one VIS board; we recommend installing the VIS board in the expansion slot immediately to the left of the CPU/Control board.

The VIS board must be attached to an external sync source generating one of the following signal types:

- Blackburst generator
- NTSC composite video
- Composite sync type of synchronization

If all of the source devices are genlocked to the same source, the master sync signal synchronizes the video switching to occur during the vertical interval (pulse), eliminating vertical roll or jitter on the monitor. When a VIS board is installed in each enclosure that contains video boards, one master sync signal can be used to synchronize all video signals for the system.

Each Modula enclosure that was ordered with sync will have the VIS board already installed. In an enclosure without the board, vertical interval sync can be enabled by installing a VIS board in an expansion slot and updating the system's configuration file with XNConnect.

## Enabling Vertical Interval Sync

**Important:** *Adding or replacing boards should only be done by personnel trained to handle ESD sensitive parts and assemblies.*

### Overview

#### *If a VIS Board is added to an existing system*

- If necessary, set the termination load jumper J1 (see page 178)
- Install the board in an expansion slot
- Attach the cable(s)
- Optional – Verify that the system recognizes the VIS board
- Required – Enable the VIS board using XNConnect

#### *If the system is ordered with a VIS board*

- Verify the J1 jumper setting is correct (see page 178); if necessary, set the jumper (you will need to remove and reinstall the board).
- Attach the cable(s)
- Update the system's configuration file with XNConnect

### Configuration Requirements

- If the original configuration file has not been modified, a CD has been included with a new configuration file, which *must* be uploaded to the system with XNConnect for the VIS board to work. The new file will automatically enable the VIS board for the system.
- If the original configuration file has been modified and you do not want to replace it, use XNConnect to enable the VIS board (see page 183).

### Before starting:

- Turn off and unplug the enclosure. For multiple-enclosure systems, turn power off and unplug all enclosures that will have a VIS board added or enabled.
- If necessary – If cables from adjoining boards obstruct access, label and disconnect them as necessary.

### Termination Load Jumper

VIS boards are shipped with the termination load jumper (J1) set to the “off” position (covering jumper pin number 1) for high impedance. If the house sync generator does not have a termination load of 75 ohms, the J1 jumper *must* be set to the “on” position (covering both jumper pins) to internally set a 75 ohm load. FIG. 114 shows the jumper location on Modula VIS boards.

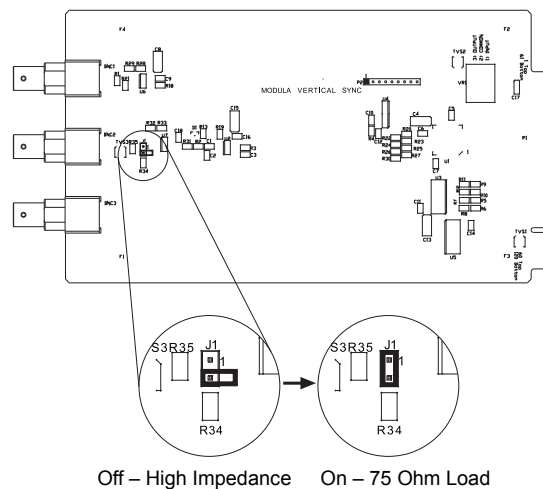


FIG. 114 Termination load jumper (J1) positions

### To set the termination load jumper:

1. If the VIS board is already installed, remove it from the enclosure (see Steps 1 and 2 of the installation procedure on page 179).
2. Set the J1 jumper according to FIG. 114.
3. Replace (install) the board (see Steps 3 through 6 on page 180).



## Removing and Installing a VIS board



**ESD Warning:** To avoid ESD (Electrostatic Discharge) damage to sensitive components, make sure you are properly grounded before touching any internal Modula materials. Use an ESD wristband and cord with alligator clip attached to a good ground source.

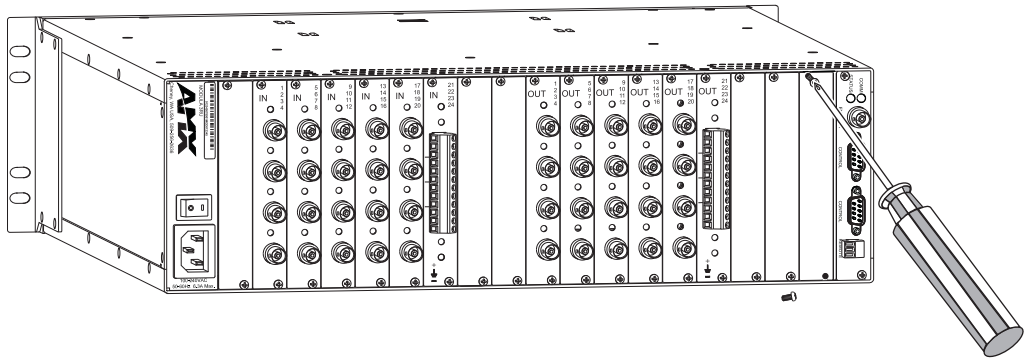
### Items Required

- Modula VIS board(s)
- Phillips #1 screwdriver
- ESD wristband and cord with alligator clip
- If applicable – Updated configuration file see the “Configuration Requirements” section (page 178) to determine if required

**Important:** Be sure to install a VIS board in the expansion board slot next to the CPU. If a VIS board is installed in an input or output board slot, signal routing is affected.

### To remove and install a VIS board:

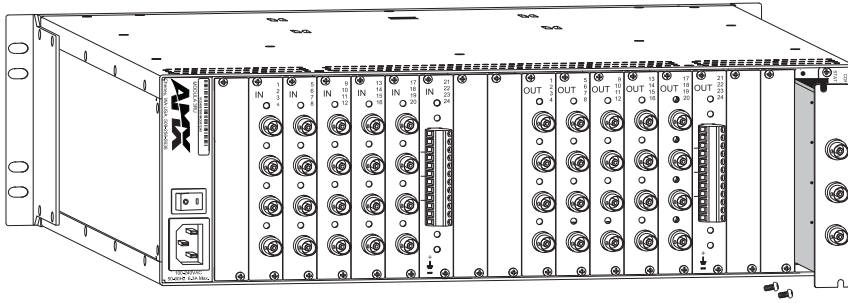
1. Blank board plate – Remove top and bottom screws on the plate covering the empty expansion slot and set plate aside (FIG. 115). Set screws aside for reuse.
- Or**
- VIS board – Remove top and bottom screws on VIS board and carefully pull the VIS board straight out of the board slot. Set screws aside for reuse.



**FIG. 115** Remove the plate from expansion slot

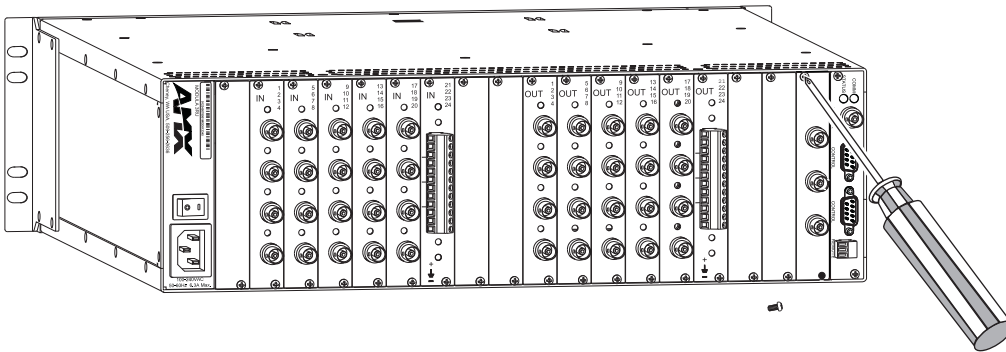
2. Determine the setting of the termination load jumper J1 (FIG. 114 on page 178) on the VIS board (new or previously installed).  
If necessary, follow the steps on page 178 to set the jumper to the “on” position.

3. Replace or install the VIS board by lining up the board with the board guides that are on the top and bottom of the expansion board slot. The VIS board has the correct end up when the back of the connectors are to the right of the board.



**FIG. 116** Line up the board with guides and push until flush with the back

4. Carefully push the board into the enclosure until it snaps into place. Make sure the plate is flush with the back.
5. Insert the screws into the holes on the connector assembly and tighten the screws until they are snug.



**FIG. 117** Insert the screws and tighten until snug

6. Cable the VIS board according the steps in the following section.

## Cabling the VIS board

### VIS Board Connectors

Each of the three BNC-type connectors on a VIS board serves a different function (FIG. 118).

- **P1 – Local Sync Input:** This connector is designed to be connected by cable to the local sync output (P3) of another VIS board to switch TTL-level signals. This connection allows enclosures to be switched on command from the master enclosure.
- **P2 – External Sync Input:** This connector accepts any of the following signal types:
  - NTSC composite video
  - Composite sync type of synchronization
  - RGBs group member that contains sync information
  - Blackburst generator
- **P3 – Local Sync Output:** This connector is designed to be connected by cable to the local sync input (P1) of another VIS board to switch TTL-level signals. This connection allows enclosures to be switched on command from the master enclosure.

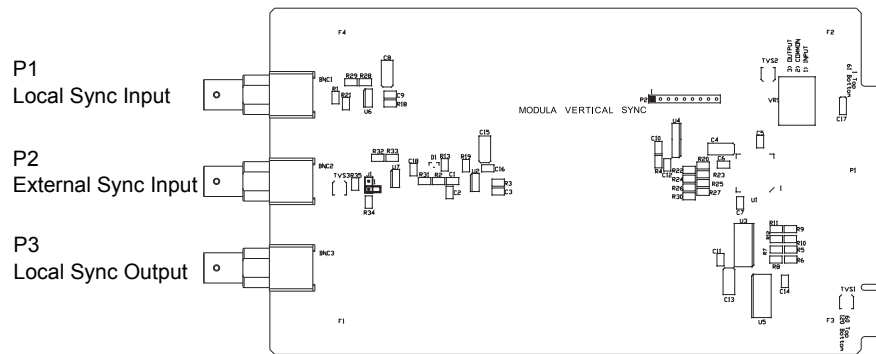


FIG. 118 VIS board connectors

### Single Enclosure

#### To send the sync to a single enclosure:

1. Attach the external sync cable to the External Sync Input (P2) connector on the VIS board (FIG. 119).

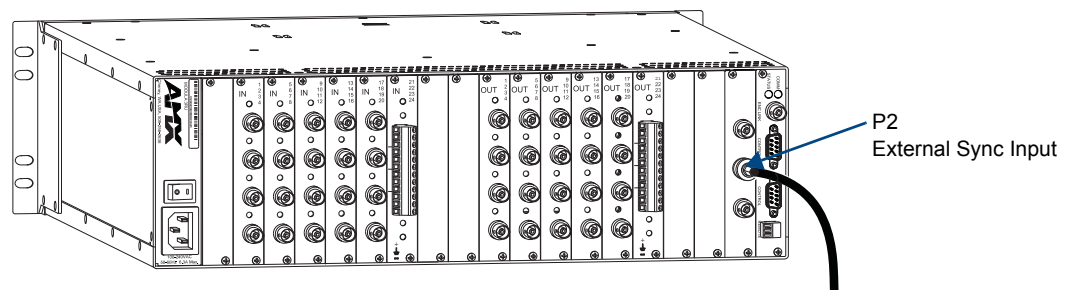


FIG. 119 Fasten external sync cable to P2 connector

### Multiple Enclosures

Systems with multiple enclosures will need a VIS board installed in all enclosures that require vertical interval sync switching. Attach an external sync source to the master enclosure’s External Sync Input (P2) connector (FIG. 120). Relay the sync signal to all additional enclosures using the Local Sync Output (P3) and Local Sync Input (P1) connectors in a daisy chain pattern.

#### To send the sync signal to multiple enclosures:

1. Attach an external sync source to the External Sync Input (P2) connector on the master enclosure.
2. Attach a cable to the Local Sync Output (P3) connector on the VIS board in the master enclosure (FIG. 120).

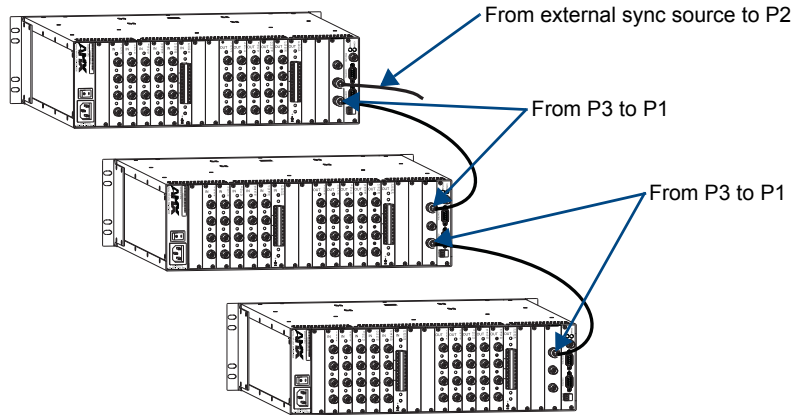


FIG. 120 Multiple enclosures cabled for external sync

3. Attach the other end of the cable to the Local Sync Input (P1) connector on the VIS board in the second enclosure.
4. For additional enclosures, cable the P3 connectors to the P1 connectors.
5. Optional – Verify system recognition of the VIS board by completing the steps below.
6. Required – Enable the VIS board by updating the configuration file using the steps on page 183.

### Verifying System Recognition of the VIS Board

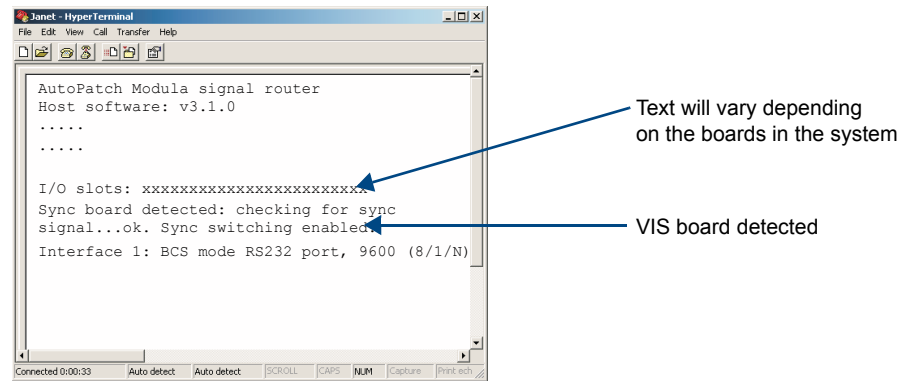
To verify system recognition of the VIS board, attach an external serial control device with a terminal emulation program to the serial port on the enclosure. The steps below are specifically for using HyperTerminal on a PC; however, similar devices and programs can be used instead.

#### To verify that the VIS board is enabled:

1. Attach a PC to the Modula’s serial port with an RS-232 null modem cable.
1. Open HyperTerminal and set the serial port settings to match the Modula’s default settings (see table to the right). If the Modula’s settings have been changed from the default since installation, use the current settings instead.
2. Reapply power to all enclosures that were turned off when the board was installed.
3. Enter `~scr!` in HyperTerminal.

Modula Serial Port Settings	
Baud Rate	9600
Data Bits	8
Stop Bit	1
Parity	None
Flow Control	None

4. Check the splash screen\* to be sure the VIS board has been detected and is enabled (FIG. 121).



**FIG. 121** VIS recognition display in splash screen

\* Your splash screen may differ. AMX reserves the right to change the contents and/or formatting of the splash screen without notice.

*If the sync board is not detected and enabled:*

(If the splash screen either reports a failure or does not report on the sync board:)

- Power the system down.
- Ensure the board is aligned with the board guides and is firmly in place.
- Check that the source of the master sync signal is providing a good signal.
- Re-enter `~scr!` into HyperTerminal. Check the splash screen to see if the sync board is detected. If it is still not detected, contact technical support (see page 43).

### Enabling the VIS Board

To complete the installation, the VIS board *must* be enabled using one of the following two methods.

- If the original configuration file has not been modified, use XNConnect to load the new file that shipped with the board (see “Loading a Configuration File” on page 156). The new file automatically enables the VIS board for the system.
- If the original configuration file has been modified (local presets, names, etc.) and you do not want to replace it follow the steps below.

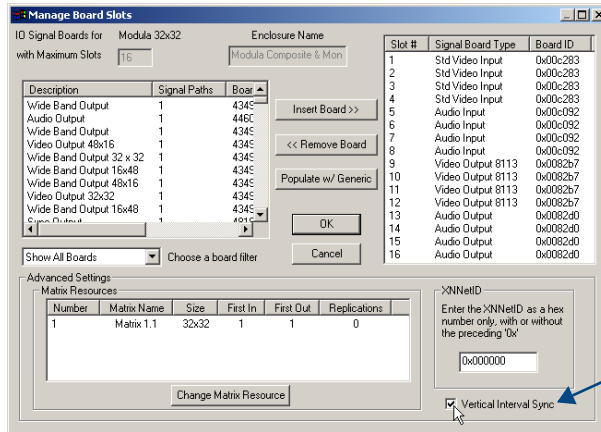
**Note:** We recommend keeping a copy of the former configuration file for reference.

When loading any part of a configuration file, the matrix switcher must not be actively switching. You may want to disconnect any external controllers to ensure that no switches are executed during the loading of the file.

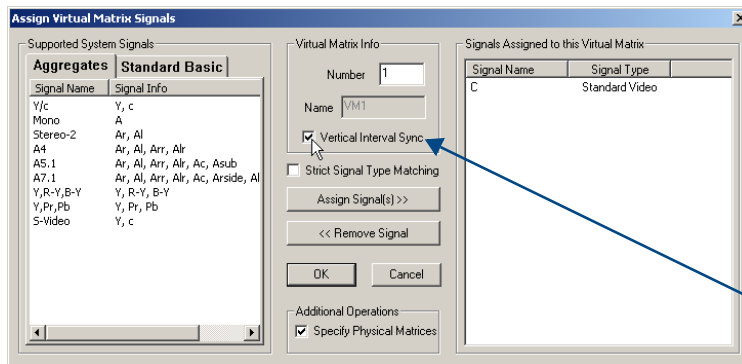
#### To enable a VIS board using XNConnect:

1. Install XNConnect from the *AMX AutoPatch CD* sent with the new board. (If XNConnect is already installed on the PC, we *strongly* recommend uninstalling the old version before installing a new version).
2. Open XNConnect.
3. Using the standard File Open dialog box, locate and open your XCL (\*.xcl) configuration file that was sent with the new board. The default location is in the C:\AutoPatch\Configuration Software<Version>\MyXCL folder.

4. In the Hardware view, right click the enclosure with the VIS board and select Manage Board Slots from the shortcut menu.
5. Check the Vertical Interval Sync box to assign the board to an enclosure. Click OK.



6. Repeat Steps 4 and 5 for all enclosures with a VIS board.
7. In the Virtual Matrix view, right click the first video virtual matrix that participates in the vertical sync and select Assign Signals from the shortcut menu. The Assign Virtual Matrix Signals dialog box opens.



8. Check the Vertical Interval Sync check box to assign the VIS board to the virtual matrix. Click OK. Click OK to close the next window.
9. Repeat Steps 7 and 8 for all remaining video virtual matrices that contain signals that need to be synchronized.
10. Connect a PC to the enclosure's serial port. For XNConnect version 2.4.0 – from the Configure menu, select Configure All. The system automatically reboots all devices.  
**Or**  
For XNConnect versions prior to 2.4.0 – from the Configure menu, select Reboot All Devices.
11. Execute a test switch that includes a signal routed on the new board to ensure the system is working correctly.

If the test switch does not execute correctly, contact technical support (see page 43).



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