Matrix Plus II System

Volume II

Installation Manual

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Matrix Plus II System Installation Manual
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Clear-Com Systems
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U.S.A.

Congratulations on your purchase of a Matrix Plus II Intercom System. The Matrix Plus II System includes sophisticated hardware and software components that can be configured in many different ways. The three-volume set of the Matrix Plus II System Manual will guide you through installation, operation, and troubleshooting/maintenance of your system.

THREE-VOLUME SET DESCRIPTION

This is Volume II — Installation Manual. This manual describes how to install a Matrix Plus II System and includes the specifications of each Matrix Plus II System component. Technical Personnel will use this Installation Manual when installing the Matrix Plus II System.

Volume I — Operation Manual — describes the use of the Matrix Plus II System. In the Operation Manual, intercom station operators and other Matrix Plus II System users will find detailed instructions on the use of the Matrix Plus II System components, including the PGM-12 Configuration Program.

Volume III — Maintenance Manual includes troubleshooting and maintenance information on the Matrix Plus II System. The Maintenance Manual also provides schematics and bills of materials for each Matrix Plus II System hardware component. Technical Personnel will use the Maintenance Manual for locating solutions to common problems encountered in using the Matrix Plus II System.

All of these manuals are written for beginning users of Matrix Plus II Systems, however some experience with basic intercom systems is assumed. To use the PGM-12 Configuration Program, you must have some familiarity with your IBM-PC or compatible computer and the MS-DOS Operating System. External devices which are not supplied with your Matrix Plus II System are not covered in this manual. External devices include external party-line intercom systems, audio devices, and other hardware connected to the matrix through 4-wire connections or Matrix Plus II System Interface Modules.

HOW EACH MANUAL IS DIVIDED

Each of the three manual volumes is divided into chapters and sections. Chapters are marked by divider tabs labeled with the name of the chapter. The Chapter titles are Contents, Overview, Stations, Configuration, Matrix Cards, Interfaces, Frames, and Index. With the exception of the Contents, Overview, Frames and Index Chapters (these do not contain Sections), the page following the Chapter divider lists the Sections that are contained in each Chapter. These Sections are marked by numbered dividers. The titles for each Section within a Chapter are printed on the page immediately following the Section's numbered divider.

Page numbering begins at page "1" for each Chapter. With the exception of the Contents and Index Chapter (which use Roman numerals), each page is referred to by its Chapter letter, Section number, and page number. For example, the first page of the Section on the ICS-2002 Intercom Station is found on page "S1-1". "S1-1" stands for Station Chapter, Section 1, page 1".

To locate this page, turn to the Chapter divider tab labeled "Stations", and then turn to the next divider tab labeled "1".

CUSTOMER SERVICE DEPARTMENT

The Matrix Plus Customer Service Department is available to answer questions not covered in this manual.

Clear-Com Customer Service Department
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945 Camelia Street
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WARRANTY AND REPAIRS

CLEAR-COM LIMITED WARRANTY

Clear-Com products are warranted to be free from defects in materials and workmanship for a period of one year from the date of sale.

Clear-Com's sole obligation during the warranty period is to provide, without charge, the parts and labor necessary to remedy covered defects appearing in products returned prepaid to Clear-Com, 945 Camelia St., Berkeley, Ca. 94710-1484, U.S.A.

This warranty does not cover any defect, malfunction or failure caused beyond the control of Clear-Com, including unreasonable or negligent operation, abuse, accident, failure to follow instructions in the Manual, defective or improper associated equipment, attempts at modification and repair not authorized by Clear-Com, and shipping damage. Products with their serial numbers removed or defaced are not covered by this warranty.

To obtain warranty service, follow the procedures described below in the sections "Repairs" and "Shipping Instructions".

This warranty is the sole and exclusive express warranty given with respect to Clear-Com products. It is the responsibility of the user to determine before purchase that this product is suitable for the user's intended purpose.

Any and all implied warranties, including the implied warranty of merchantability are limited to the duration of this express limited warranty.

Neither Clear-Com nor the dealer who sells Clear-Com products is liable for incidental or consequential damages of any kind.

REPAIRS

Through your Dealer — If repair of Matrix Plus System hardware products is necessary, contact the dealer where the unit was purchased.

Through the Factory — If repair through the dealer is not possible, contact the Clear-Com Customer Service Department at the address listed (refer to CUSTOMER SERVICE DEPARTMENT on the previous page).

Be prepared to provide your company's name, address, phone number, name of person to contact regarding the repair, type and quantity of the equipment, description of the defect, and the equipment serial number(s).

If return of the product to the factory is authorized, the Clear-Com Customer Service Department will issue you a Return Authorization ("RA") Number. Do not return any equipment to the factory without first obtaining a Return Authorization Number.

WARRANTY REPAIR EXCHANGE PROGRAM

All warranty repair of Matrix Plus II System is covered by the following exchange program. This exchange program is limited to major parts of the system. Major parts are defined as one of the following:

- Crosspoint Cards
- CPU Controller Cards
- Intercom Station
- Interface Module
- Power Supply Module
- Matrix Card Frame
- Power Supply

After issuing an RA number, Clear-Com will immediately ship a replacement part(s). The customer will be billed for the exchange item and credited when the defective part is returned, in repairable condition, to Clear-Com with the proper RA number. Clear-Com will pay freight charges on equipment we send out. The customer will pay freight on all return items.

All warranty work is to be performed at the Clear-Com factory. All service at the customer's facility will be charged at the current quoted rate plus expenses and transportation.

SHIPPING INSTRUCTIONS

All shipments of Clear-Com equipment must be prepaid via United Parcel Service or the best available shipper. The equipment should be shipped in the original packing container. If the original container is not available, use a suitable container that is rigid and of adequate size. If a substitute container is used, the equipment should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material. All shipments should be directed to the attention of the Customer Service Department and must include the Return Authorization Number.

Upon completion of repairs, equipment will be returned collect via United Parcel Service or other specified shipper.

SOFTWARE LICENSE AGREEMENT

Clear-Com Systems ("Clear-Com") provides this software program and firmware for the Matrix Plus System and licenses its use. You assume responsibility for the selection of the program and firmware to achieve your intended results, and for the installation and use of, and results obtained from, the program.

"Program" in this agreement refers to the PGM-12 Configuration Program computer software ("MXPLUS"). "Firmware" in this agreement refers to the operating software stored in ROMs throughout the Matrix Plus System.

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You may use the program only on a single machine. You may copy the program into any machine-readable form for backup purposes in support of your use of the program on the single machine.

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Limited Warranty Clear-Com warrants that the Matrix Plus II software, firmware and the accompanying media will perform substantially in accordance with the specifications set forth in the accompanying documentation. Clear-Com does not warrant that the functions contained in the program will meet your requirements or that the operation of the program will be uninterrupted or error-free.

Limited Remedies If the Clear-Com software, firmware, or media fails to perform as warranted, Clear-Com will replace it within the warranty period. Clear-Com will at it's sole descression also endeavor to fix any software/firmware problems as stated in the **Limited Warranty**. In no event will Clear-Com be liable to you for any lost profits, lost savings or other incidental or consequential damages arising from use of, or inability to use, any program, even if Clear-Com or an authorized Clear-Com representative has been advised of the possibility of such damages, or for any claim by any other party.

Some States and Provinces do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Clear-Com's liability to you for actual damages for any cause whatsoever, and regardless of the form of the action, will be limited to the money paid for the program and firmware that caused the damages or that is the subject matter of, or is directly related to, the cause of the action.

General Any attempt to rent, lease, or sublicense the program, or (except as expressly provided in this agreement) to transfer any of the rights, duties or obligations under this agreement is void.

The agreement will be construed under the laws of the State of California, except for that body of laws dealing with the conflict of laws. If any provision of this agreement shall be held by a court of competent jurisdiction to be contrary to law, that provision will be enforced to the maximum extent permissible, and the remaining provisions of the agreement shall remain in full force and effect.

NOTICE REGARDING SPECIFICATIONS

Performance specifications included in this Installation Manual are "design-center specifications" and are included for customer guidance and to facilitate system installation. Actual operating performance may vary.

Introduction

This chapter describes the steps required to plan and install a Matrix Plus II System. It first provides a step-by-step guide to installing your system components as you receive them from the factory. The subsequent sections provide additional information that will be of use to you depending on the nature of your specific installation. Each of these sections are described below.

Step By Step Installation: The first section provides a step-by-step guide to installing your Matrix Plus II System components as you receive them from the factory.

Sample System Installation Diagram: The second section presents a system diagram of a "typical" Matrix Plus II System installation, illustrating common uses of the principal components of the system.

System Configurations: The third section reviews the five available "System Configurations", which are the combination of card frames and power supply units required for a system supporting a given number of ports.

Component Location Requirements: The fourth section describes all component location requirements that are imposed by the Matrix Plus II System. It also includes a summary of the size of the various components of the system, which is helpful in planning your installation.

Wiring Systems Summary: The fifth section provides an overview of the various wiring systems that can be used to connect stations and interfaces to the card frame. It also summarizes the mains AC power connections required for each component in the system, and the "Linking" of Matrix Plus II Systems together.

Power Supply Requirements: The sixth section describes how to plan the number of power supply units that are required to power a Matrix Plus II System. This number can vary depending on the number and type of matrix cards and interfaces in the system.

Step By Step Installation:

This section provides a step-by-step guide to installing your Matrix Plus II System components as you receive them from the factory. The steps are listed below, followed by a discussion that covers each step.

- Verify Your Shipment
- Locate Components
- Determine Wiring Required
- Install Wiring
- Install Components in Rack
- Wire Connectors
- Plug in Cables
- Check Mains AC Power Voltage Settings
- Apply Mains AC Power to the System

Verify Your Shipment

Upon receiving the equipment, inspect the shipping boxes for shipping damage. Report any shipping damage to the carrier. Your Matrix Plus II System distributor is not responsible for damage caused in shipping.

Count and verify that you received all items listed on the packing list. Note that some options are installed in intercom stations, for example the OPT-100 option. Each station is labeled on the rear panel with the option installed in it.

Save the packing materials (boxes, Styrofoam filler, etc.) at least until all items in the shipment are verified to be fully operational, and the system is completely installed and working. The packing materials are also useful in the event that some item must be returned for warranty service.

Locate Components

Decide on locations for the matrix frame, intercom stations, interface modules, computer, and any other system components. For additional information on limitations imposed on location by the Matrix Plus System see the Component Location Requirements section of this chapter.

Determine Wiring Required

Determine which stations are to be wired using 3-pair, 4-pair, or 1-Pair digital. For further information on each of these wiring systems, see the Wiring Systems Summary section of this chapter.

Install Wiring

Install the necessary wiring between the matrix frame and the system components. Usually the connectors are wired to the cables after the cables are routed. For further information Refer to **Wiring** in the **Frames** chapter as well as **Wiring** and **Connectors** in the applicable component sections.

Install Components in Rack

Install the card frame(s) in the rack as detailed in the **Frames** chapter.

Install the interface module frame in the rack, and plug the interface module(s) into the interface module frame. Install the power supply (or supplies) in the rack. Install each intercom station in its final location. For details of each of these installations see the applicable section in this volume.

Connect the DC power cables that connect the power supply (or supplies) to the card frame(s). Connect the AC power cables for these components. For the specific installation procedure for each of these, see the **Wiring** section of the **Frames** chapter of this volume.

Wire Connectors

Wire the connectors on the frame side of the cables that connect the intercom stations to the frame. Wire the connectors on the frame side of the cables that connect the interface modules to the frame.

If an external computer is to be used, wire the cable that will connect the computer to the matrix frame. A commercially available RS-232 cable can be used, but be sure that it provides the connections described in the **Wiring** section in the **Frames** chapter.

Wire the trigger circuit for the external alarm system to the power supply alarm relay contacts, if they will be used.

For each of these procedures see the **Wiring** section of the **Frames** chapter of this volume.

Wire the connectors on the station side of the cables that connect the intercom stations to the frame.

Wire the connections between each intercom station and any local devices.

Wire the connectors on the interface module side of the connectors that connect the interfaces to the card frame(s).

Wire the external devices, such as telephone lines, 4-wire audio lines, etc., that are to be connected to the interface modules.

Plug In Cables

Plug in cables to the frame(s).

Plug in cables to the intercom stations.

Plug in cables to the interface modules.

Check Mains AC Power Voltage Settings

Check the mains AC power voltage settings.

Apply Mains AC Power to the System

Apply the mains AC power to the Matrix Plus II System.

Sample System Installation Diagram

The following block diagram show an example of how the components of the Matrix Plus II System can be interconnected.

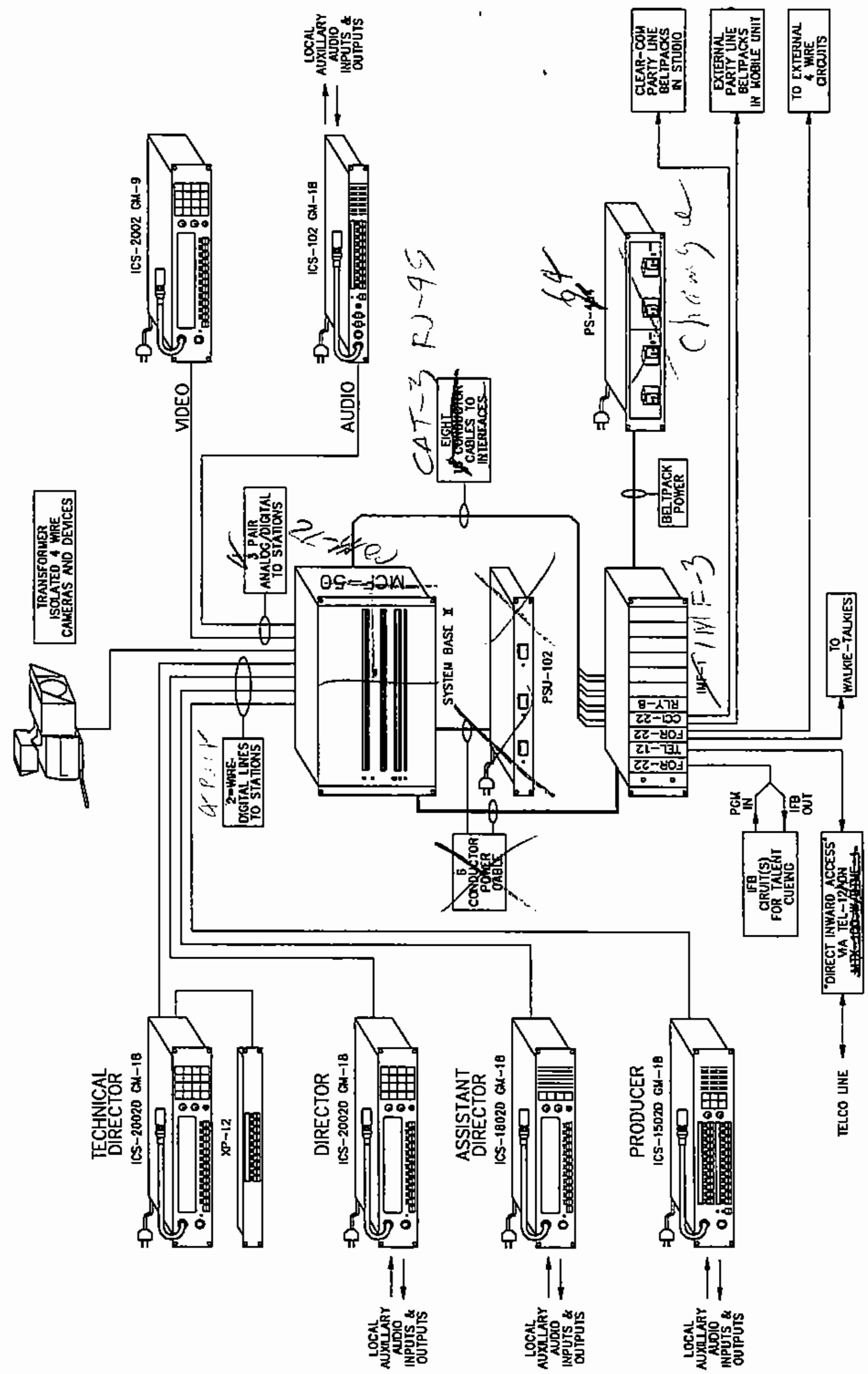


FIGURE O-1. Example Installation: Small Television Station

System Configurations

This section reviews the five available "System Configurations". A "system configuration" is a combination of card frames and power supply units supplied for a system that can support (or is expandable to support) a given number of ports. The five available system configurations are summarized below, and described in detail in subsequent sections.

- System Mini — 1 to 26 audio ports, maximum 5 interfaces.
- System I — 1 to 26 audio ports.
- System II — 1 to 50 audio ports.
- System III — 1 to 50 audio ports with expansion for System IV.
- System IV — 51 to 100 audio ports.

System Mini - 1 to 26 Ports

This system consists of a self-contained rack designed for applications requiring less than 26 ports and 5 interfaces in a compact space. It includes the following components:

- One MCF-10 25 x 25 Master Card Frame (13 Slots) with built-in power supplies and five built-in interface module slots.
- One CPU-100 Master Frame Controller Card

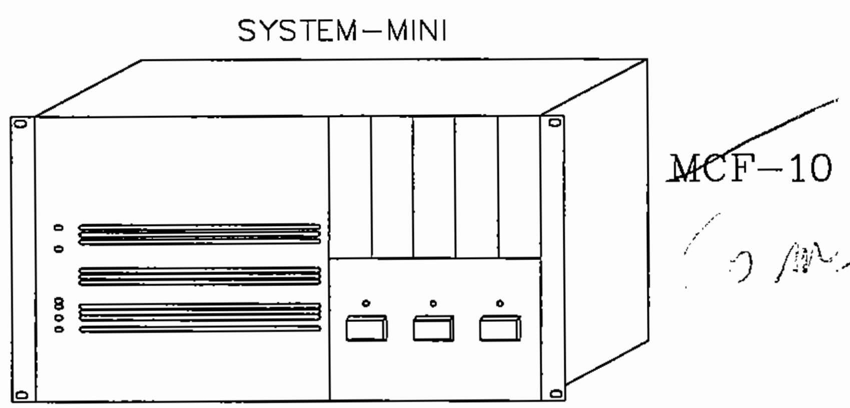


FIGURE O-2. Matrix Plus II Configuration of System - Mini

System I - 1 to 26 Ports

System I is designed for applications that are limited to 26 ports, but that may require more than the five interfaces supported by the System Mini. It uses a full sized card frame, interface frame and power supply. It includes the following components

- One MCF-25 25 x 25 Master Card Frame (13 slots)
- One PSU-102 Matrix Power Supply
- One CPU-100 Master Frame Controller Card

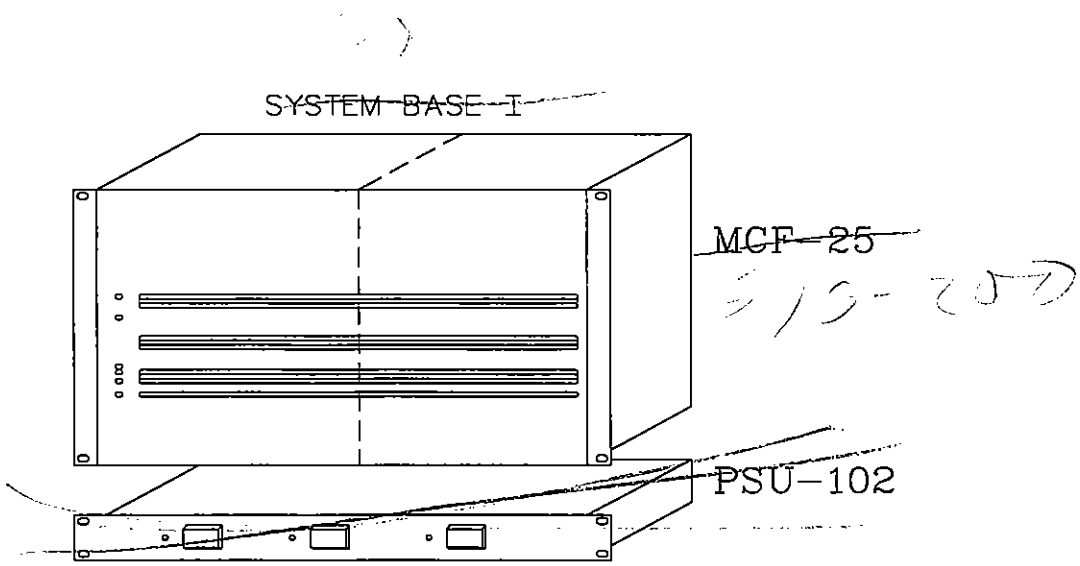


FIGURE O-3. Matrix Plus II Configuration of System I

System II - 1 to 50 Ports

This system is designed for systems requiring up to 50 audio ports. It consists of the following components:

- One MCF-50 50 x 50 Master Card Frame (25 slots).
- One PSU-102 Matrix Power Supply.
- One CPU-100 Master Frame Controller Card.

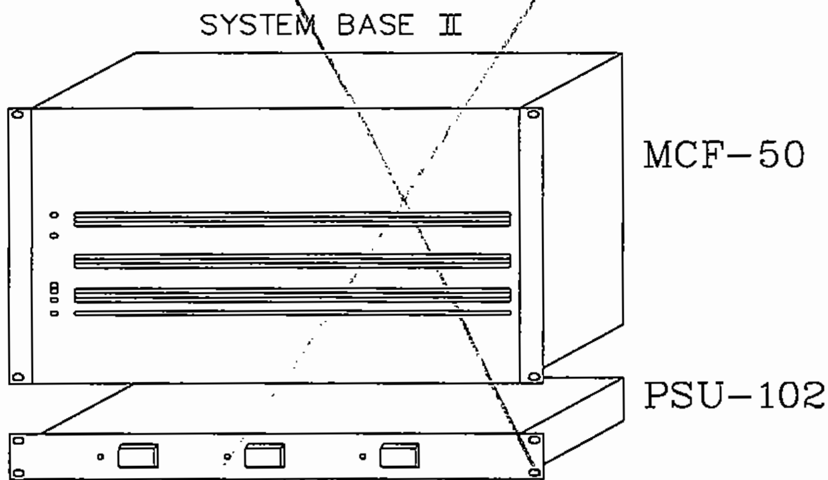


FIGURE O-4. Matrix Plus II Configuration of System II

System III - 1 to 50 Ports (Expandable to System IV)

This system is designed for systems that currently require up to 50 ports but require future expandability to up to 100 ports. It consists of the following components:

- One MCF-100 50 x 100 Master Card Frame.
- One PSU-102 Matrix Power Supply.
- One CPU-100 Master Frame Controller Card.

To expand the system to support up to 100 ports, add an expansion card frame, crosspoint cards, second power supply, and additional cables as described in the description of System IV on the next page.

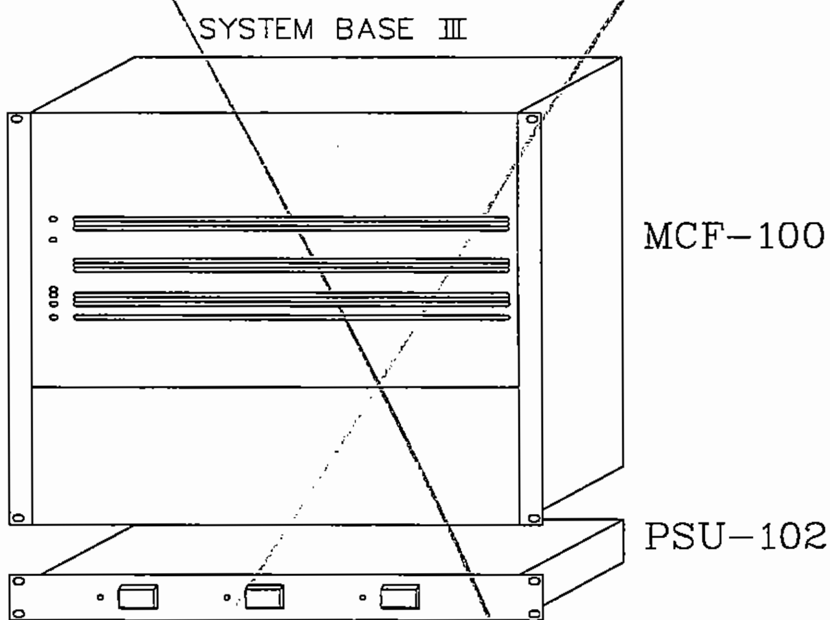


FIGURE O-5. Matrix Plus II Configuration of System III

System IV - 51 to 100 Ports

This system is designed for systems that require between 51 and 100 ports. It consists of the following components:

- One MCF-100 50 x 100 Master Card Frame.
- One SCF-101 50 x 100 Expansion Card Frame.
- Two PSU-102 Matrix Power Supplies
- One CPU-100 Master Frame Controller Card.
- One CPU-150 Expanded Frame Controller Card.
- All cables required for interconnecting frames.

Systems that support over 50 ports require a MTX-100/200 and a STX-101 in each location.

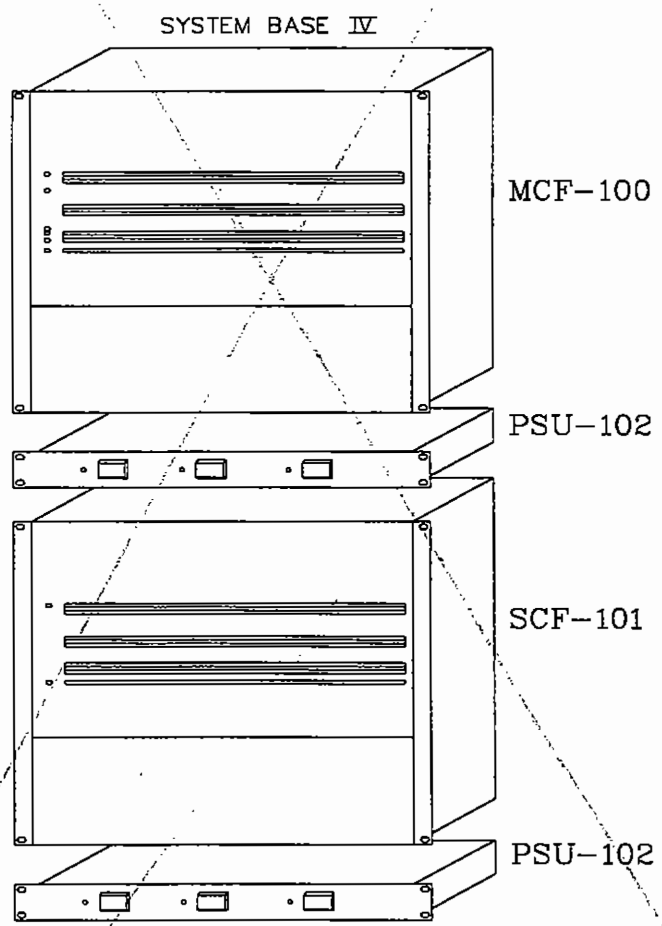


FIGURE O-6. Matrix Plus II Configuration System IV

Component Location Requirements

This section describes all component location requirements that are imposed by the Matrix Plus II System. It also includes a summary of the size of the various components of the system, which is helpful in planning your installation.

Your application will determine the ideal location of each component, subject to the constraints presented in this section. For example, each component must be allocated sufficient rack space, and each station, interface or other external device must be connected to the Matrix Frame.

Component Dimensions

The specific dimensions of each component in the Matrix Plus II System are presented under the **Specifications** headings in the sections for each specific component in this manual. All rack usage dimensions are based upon "Rack Units" ("RU"). Each RU is equivalent to 1.75 inches of vertical space in a 19-inch wide rack. Figure O-7 gives a brief listing of Matrix Plus II components and their RU requirements.

COMPONENT	SIZE (RU)
MCF-10	6 (10.5")
MCF-25	6 (10.5")
MCF-50	6 (10.5")
MCF-100	9 (15.75")
SCF-101	9 (15.75 ")
IMF-1	3 (5.25")
ICS-2002	2 (3.5")
ICS-1802	2 (3.5")
ICS-1502	2 (3.5")
ICS-62/102	1 (1.75")
ICS-52/92	1 (1.75")
ICS-2102	2 (3.5")
PSU-102	1 (1.75")
IP-50	4 (7.0")
XP-12/22, XPL-12/22	1 (1.75")
AP-22	1 (1.75")

FIGURE O-7 Matrix Plus II System Component Sizes

Card Frame(s)

The **Matrix Frame** is the central connecting point of the system. All stations, interfaces, and external devices must be connected directly to the Matrix Frame, so it should be located centrally. Your system's Matrix Frame may consist of a single MCF-100 (or MCF-50) Master Card Frame, or may also include an SCF-101 Expansion Card Frame, depending on the configuration

It is recommended that you leave an extra 1 RU both above and below each MCF-100 or SCF-101 to allow more effective cooling of the frame, but this is not required..

Interface Module Frame(s)

The IMF-1 Interface Module Frame(s) house(s) the interface modules required for your application. Each IMF-1 can hold up to 11 interface modules. Each interface has indicators and/or controls that must be accessible to operators, so you should plan to put the interface module frame in a convenient location. Usually the interface module frames are located near the card frames, but they can be located further away.

Power Supply

For System Configurations I, II, and III, the PSU-102 Power Supply is normally located below the MCF-100 Master Card Frame. For System Configuration IV, one PSU-102 is located below the MCF-100 and a second PSU-102 is located directly below the SCF-101. If redundant power supply pairs are used, mount them together.

It is required that you locate the unit at the bottom of the equipment rack, and leave an extra 1 RU above and below each power suppply unit. This allows for needed cooling for larger system loads.

Intercom Stations

Positioning

The ICS-2002 and ICS-1802 Intercom Stations have a back-lit LCD display panel. For most effective viewing of the LCD panel, locate the station away from bright, direct lighting. Locate all intercom stations at comfortable heights for operation. Leave at least 2 inches of clearance behind the rear of the station's chassis to allow for cable connectors.

Maximum Distance from Matrix Frame

3-Pair or 4-Pair: For stations connected to the Matrix Frame using the 3-Pair or 4-Pair system, the maximum distance between a station and the frame is about 10,000 feet (3.05 kilometers).

1-Pair Digital: For stations connected to the Matrix Frame using the 1-Pair Digital system, the maximum distance between a station and the frame cannot exceed 10,000 feet (3.05 kilometers).

External IBM-PC Computer

The external IBM-PC (or compatible) computer that is used to run the Matrix Plus II System Configuration Program is connected to the MCF-100 Master Card Frame via a standard PC serial port to DB-9 RS-232 cable. The maximum recommended length of this cable is approximately 50 feet.

Wiring Systems Summary

This section provides an overview of the various wiring systems that can be used to connect stations and interfaces to the card frame. It also summarizes the connection to the external IBM-PC compatible computer, the mains AC power connections for each component in the system, and the "Linking" of multiple Matrix Plus II Systems together.

For complete wiring diagrams of each of the cable types referred to below, see the associated heading in the Wiring section of the Frames chapter of this volume. For pinouts of the connectors on each component, see the **Connectors** headings in the sections devoted to each component in this volume.

The connectors required to build cables to interconnect your Matrix Plus II System are supplied with your system. The only exception is the cable required to connect the (optional) external IBM-PC computer used to run the Matrix Plus II System Configuration Program as noted below.

Intercom Stations

Each intercom station in the Matrix Plus II System must be connected to the Matrix Frame, and may have options wired directly to the station. The various wiring systems available for station to matrix frame wiring are described below, and local station options are briefly mentioned.

Local wiring

Each intercom station may have local options that require wiring, such as footswitches, external program sources, and IFB connections. Pinouts for the connectors on the intercom stations are included in each intercom station section under the heading **Connectors**. The description of each station option includes a cable wiring diagram for that option.

Wiring System Compatibility

Stations whose name is suffixed with a "D" (e.g. ICS-2002D) can only be connected to the Matrix Frame using the "1-Pair Digital" wiring system. All other Matrix Plus II System stations can communicate with the Matrix Frame using either the "3-Pair" or "4-Pair" wiring systems.

Older Matrix Plus System stations (ICS-60/100/1000/1500/2000) with appropraite software upgrades can only be connected to the frame using the "1-Pair Digital" wiring system.

The MTX-100 Analog Station / Interface Crosspoint Card provides ports compatible with the 3- and 4-Pair wiring system. The MTX-200 Digital 1-Pair Station Crosspoint Card provides ports compatible with the 1-Pair Digital wiring system.

4-Pair Duplex RS-422 Wiring System

In the 4-Pair system, the first pair sends digital data from the matrix card port to the station. The second pair sends digital data from the station to the matrix card port. The third pair carries audio from the station to the matrix card port. The fourth pair carries audio from the matrix card port to the station.

This system allows the audio and digital data to be sent through commonly available line repeaters.

3-Pair Simplex RS-422 Wiring System

The 3-Pair wiring system is similar to the 4-Pair system, except that the two digital data pairs are connected together, allowing all digital data to and from the station to be sent over one pair of wires instead of two.

This wiring system is simpler and more cost effective, but does not allow convenient use of line repeaters.

1- Pair Digital Wiring System

In this system, all audio and digital data are transmitted in a proprietary digital format over a single twisted pair of standard commercial telephone grade wire.

This system has the advantages of simplicity of wiring, excellent noise and crosstalk immunity, and high security. However, the audio bandwidth is limited to 3.5 KHz and line repeaters are not available. In addition, there are other specific requirements for the wiring that are described in the Wiring section of this volume.

Parallel Station Wiring

Parallel stations refers to several standard Matrix Plus II System intercom stations that are wired to each other, but of which only one is connected to a port in the matrix frame. This is an economical wiring configuration if the parallel stations do not need to talk to each other. For example, two or more stations can be set up in a large room so that the operator can answer calls at either end of the room. The requirements for setting up parallel stations are as follows:

- The maximum number of parallel stations is 4.
- Any station model can be used (e.g. ICS-2002, ICS-62, etc.). However, station models cannot be mixed on a port. For example three ICS-2002s in parallel is OK, but an ICS-2002 in parallel with an ICS-60 is not recommended.
- Each station must be assigned an identification number. ID numbers are assigned using jumpers on the station's rear panel connector.
- No intercom station with the "D" suffix can be connected in parallel (for example ICS-2002D).

Interface Module

The simplest method of wiring the interface modules to the frame is to use DB-15s wired with ribbon cables connecting all 15 pins. Each interface has an identification jumper to ID itself to the MTX cards, therefore the ports and interface modules can be moved without changing wiring.

However, this number of connections can be reduced by wiring fixed IDs in the port connectors for longer distant connections. Refer to the **Minimum Wiring** section in the **Frames** chapter of this volume.

Pinouts of the connectors that will be used to connect external devices to the interface are located in the section on each interface under the heading **Connectors**.

External IBM-PC Computer

A standard DB-9 PC serial port cable can be used to connect the PC to the Matrix Frame. This cable is not supplied with the Matrix Plus II System. For wiring diagrams, see the Wiring section of this volume.

Mains AC Power

Frame

Each PSU-102 power supply in the system can be powered by either 110 or 220 Volt Mains AC power, at 200 Volt-Amps maximum. The PSU-102 power supply automatically selects which line voltage (110 or 220 volts) and frequency (50 - 60 Hz) to use.

If two redundant PSU-102 Power Supplies are installed, the system can be powered by two independent mains AC power sources. Then, if one mains AC power source or PSU-102 power supply fails, the matrix can run on the other without interruption.

ICS-2002/1802/1502/2102 Intercom Stations

ICS-2002/18022/1502/2102 stations are powered by either 110 or 220 Volt Mains AC power. The station has an internal line voltage selection switch.

ICS-62/102/52/92 Intercom Stations and XPL/AP Key Panels

Mains AC power for these components is supplied by a wall-mount transformer. The 117 Volt transformer has a footprint of 2 inches by 2.5 inches, and requires a two conductor wall outlet. The 220 volt transformer requires a three conductor wall outlet, and is housed in a 2 inch by 3 inch by 5 inch box located in the middle of the length of the cable. Each compact station is connected to the transformer using the 2.1 millimeter coaxial power connector on the rear of the station. XP-12/22 Expansion Key Panels do not require external mains AC power.

Power Supply Requirements

This section describes how to plan the number of power supply units that are required to power a given Matrix Plus II System installation. This number can vary depending on the number and type of matrix cards and interfaces in the system, and on the degree of redundancy required. Although your system was initially designed with an adequate number of power supply units, this section is useful in the event that you plan to add additional matrix cards or interfaces.

The following sections specify the current capability of the PSU-102 System Power Supply, and outline the current requirements of each power-consuming component in the system. We conclude with two examples of system current requirement calculations.

PSU-102 System Power Supply

The PSU-102 System Power Supply produces sufficient power for one complete Matrix Frame plus some number of interfaces, depending on the current consumption of the specific interfaces.

Each PSU-102 has three separate 9 VDC power supplies: +9V Digital, +9V Analog, and -9V Analog. The output of each of the three is used in different amounts by the various components. For this reason the current consumption calculations address each of the outputs separately. Primarily the matrix cards use the +9V Digital output and the interfaces use the Analog outputs.

An audible alarm is included in the PSU-102, and an additional set of alarm relay contacts are provided on the supply. Clear-Com recommends that these contacts be connected to an appropriate alarm in the case of power failure or internal power supply malfunction.

If more than one IMF-1 Interface Module Frame is needed to house the required interface modules, each of the extra IMF frames must have its own PSU-102 power supply.

Interface modules' current consumption can vary depending on operating conditions. If the interfaces are used for periods of more than 10 seconds at a time even at medium current levels, use the maximum current figures in your calculations.

The current capacities of the three power supplies are as follows:

- +9V Digital 2.5 Amps
- +9V Analog 1.5 Amps
- -9V Analog 1.5 Amps

System Component Current Consumption

The following chart provides the current drain of the +/- analog power supplies for all components in the system. Some devices such as interfaces have a varing current depending on the operation of features. If applications where it is possible to activate all operating features of all components used, use the maximum current column for planning.

Component	Minimum	Maximum	Average Current
Frames			
MCF-10	------------	------------	0.000 Amps
MCF-25	------------	------------	0.000 Amps
MCF-50	------------	------------	0.000 Amps
MCF-100	0.400 Amps	0.400 Amps	0.400 Amps
SCF-101	0.400 Amps	0.400 Amps	0.400 Amps
Matrix Cards			
MTX-100	0.050 Amps	0.050 Amps	0.050 Amps
MTX-200	0.050 Amps	0.050 Amps	0.050 Amps
STX-101	0.007 Amps	0.007 Amps	0.007 Amps
Interfaces			
CCI-22	------------	------------	0.000 Amps
FOR-22	0.050 Amps	0.150 Amps	0.075 Amps
TEL-12	0.100 Amps	0.200 Amps	0.150 Amps
RLY-8	0.000 Amps	0.200 Amps	0.100 Amps

FIGURE O-8. Current Consumption of Interfaces

PSU-102 Power Supply Redundancy

Installing two PSU-102 power supplies per application provides redundancy because either of the two PSU-102 power supplies can power a complete system. If one fails, it can be removed without interruption of the entire system. Connectors on the rear panel of the Matrix Frames provide easy parallel connection. A third connector is provided to feed an IMF-1 Interface Module Frame .

Example # 1: Medium Sized System

Quantity		Component
1	-	MCF-50 Frame
22	-	MTX-100 Cards
6	-	TEL-12 Telephone Interfaces
5	-	FOR-22 4-Wire Interface Modules
6	-	CCI-22 Party Line Interface Modules
1	-	RLY-8 Relay Module

Solution: 6 + 5 + 6 + 1 = 18 Interface Modules require two IMF-1 Frames. Place the 5 FOR-22s and the 6 CCI-22s in one IMF-1 Frame and power it from the PSU-102 used for the Matrix Frame. Place the rest of the Interfaces in a second IMF-1 Frame and power them from a second PSU-102. The following calculations confirm that this will be adequate.

+/-9V Analog Current Requirement for the Matrix Frame and First IMF-1 Frame:

MCF-50	-	0.000 A X 1	=	0.000 A
MTX-100	-	0.050 A X 22	=	1.100 A
CCI-22	-	0.000 A X 6	=	0.000 A
FOR-22	-	0.075 A X 5	=	<u>0.375 A</u>
		Total for MCF-50 and IMF #1		**1.475 A**

+/-9V Analog Current requirement for the second IMF-1 Frame:

TEL-12-	0.150 A times 6	=	0.900 A
RLY-8	0.100 A times 1	=	<u>0.100 A</u>
	Total for IMF #2		**1.000 A**

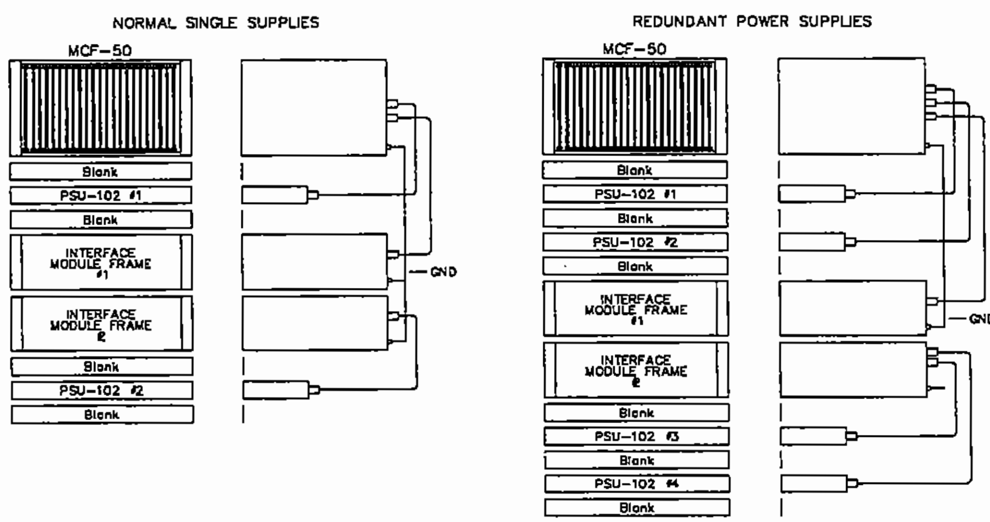


FIGURE O-9. Example # 1 Power Supply Configuration

Example # 2: Large System

The following page shows the system diagram for this example.

Quantity		Component
1	-	MCF-100 Frame
30	-	MTX-100 Cards
30	-	STX-101 Cards
11	-	TEL-12 Telephone Interfaces
8	-	CCI-22 Party Line Interface Modules
2	-	RLY-8 Relay Modules

Solution: Place 15 MTX-100s and 15 STX-101s in the MCF-100 Frame and the balance of the cards in the SCF-101. Adding 11 + 8 + 2 = 21 interfaces require 3 IMF-1 frames. The first IMF-1 frame would contain the eight CCI-22 modules and the two RLY-8 modules, and be powered by the same supply used by the MCF-1 frame. The second IMF-1 Frame would contain one TEL-12 module and would be powered with the supply used by the SCF-101 frame. The third IMF-1 Frame contains the remaining ten TEL-12 modules, powered by a separate PSU-102 . The following calculations confirm that this will be adequate.

MCF-100	-	0.400 A X 1	=	0.400 A
MTX-100	-	0.050 A X 15	=	0.750 A
STX-101	-	0.007 A X 15	=	0.105 A
CCI-22	-	0.000 A X 8	=	0.000 A
RLY-8	-	0.100 A X 2	=	0.200 A
	Total for MCF-100			**1.455 A**

SCF-101	-	0.400 A X 1	=	0.400 A
MTX-100	-	0.050 A X 15	=	0.750 A
STX-101	-	0.007 A X 15	=	0.105 A
TEL-12-		0.150 A X 1	=	0.150 A
	Total for SCF-101 and IMF #2			**1.405 A**

TEL-12		0.150 A x 10	=	1.500 A
	Total for IMF #3			**1.500A**

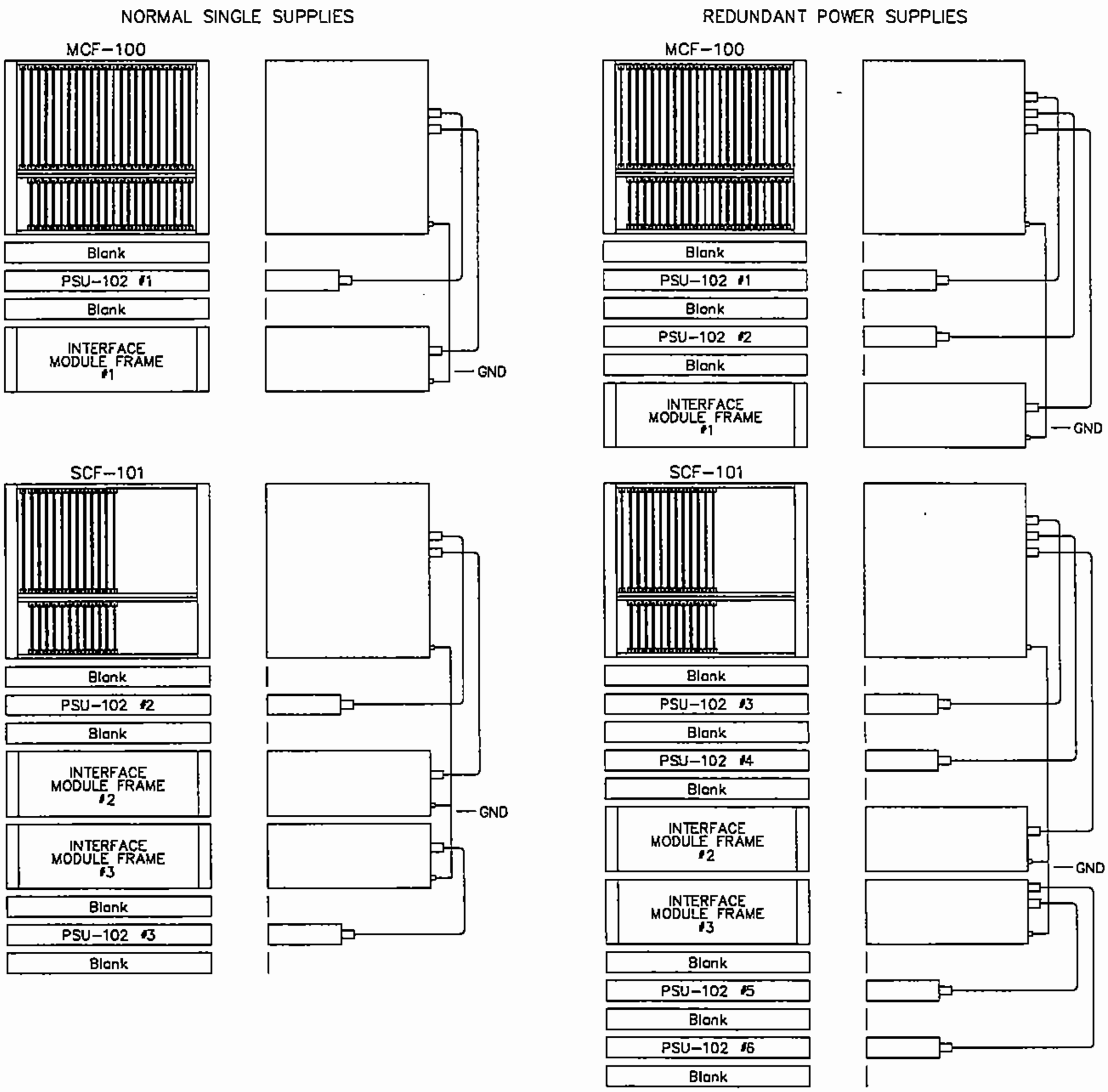
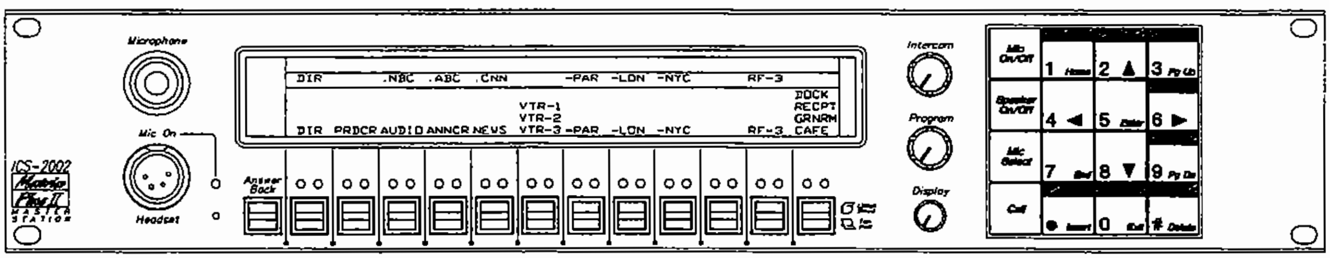
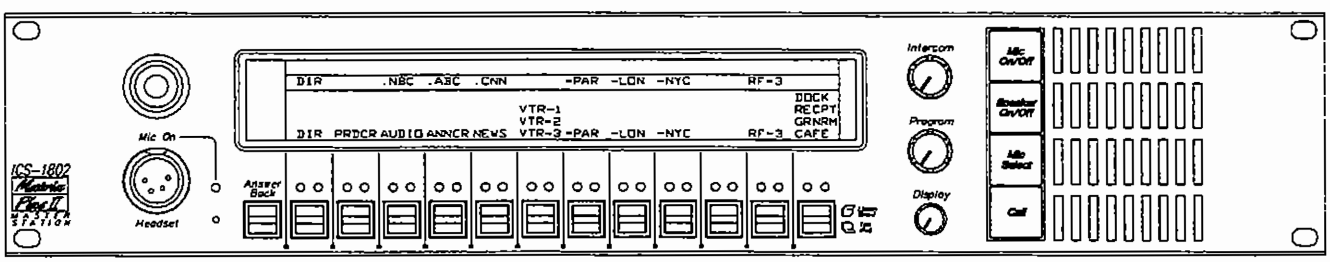


Figure O-10. Example # 2 Power Supply Configuration

NOTE: It is required that you locate the PSU-102 Power Supply Units at the bottom of the equipment rack, and leave an extra 1 RU above and below each power suppply unit. This allows for needed cooling for larger system loads.





Matrix Plus II System ICS-2002/ICS-1802
MASTER STATION INTERCOM STATION

Introduction

This section describes the installation of the ICS-2002 and ICS-1802 Twelve Key Display Stations. Much of the text is applicable to the ICS-2102, ICS-1502, ICS-102, ICS-92, ICS-62, and ICS-52 stations.

The wiring connections of the ICS-2002 and ICS-1802 Stations to the matrix frame and other equipment along with technical specifications are fully discussed in the following paragraphs.

Each station is shipped from the factory with a rear-panel label that indicates the Station's wiring configuration and installed options. The Intercom Station is equipped with a "label" indicating the station's assigned name. (Examples of labels are TAPE1, CAM, and RACK.) Install the station at the location associated with the station label.

Front and Rear Panels — ICS-2002

The front and rear panels of the ICS-2002 station are shown in Figure S1-1. The ICS-1802 is identical to the ICS-2002 except that it does not include twelve of the keys in the keypad on the right side of the unit.

All connectors used to install the station are on the rear panel. The connector types are discussed in the paragraphs under the heading **Connectors** and the pin-outs of the connectors are shown in the figures as they are discussed. An access hole on the rear panel is provided for moving the front panel headset to the rear panel or for the user to mount a second headset connector which is wired in parallel with the front headset connections.

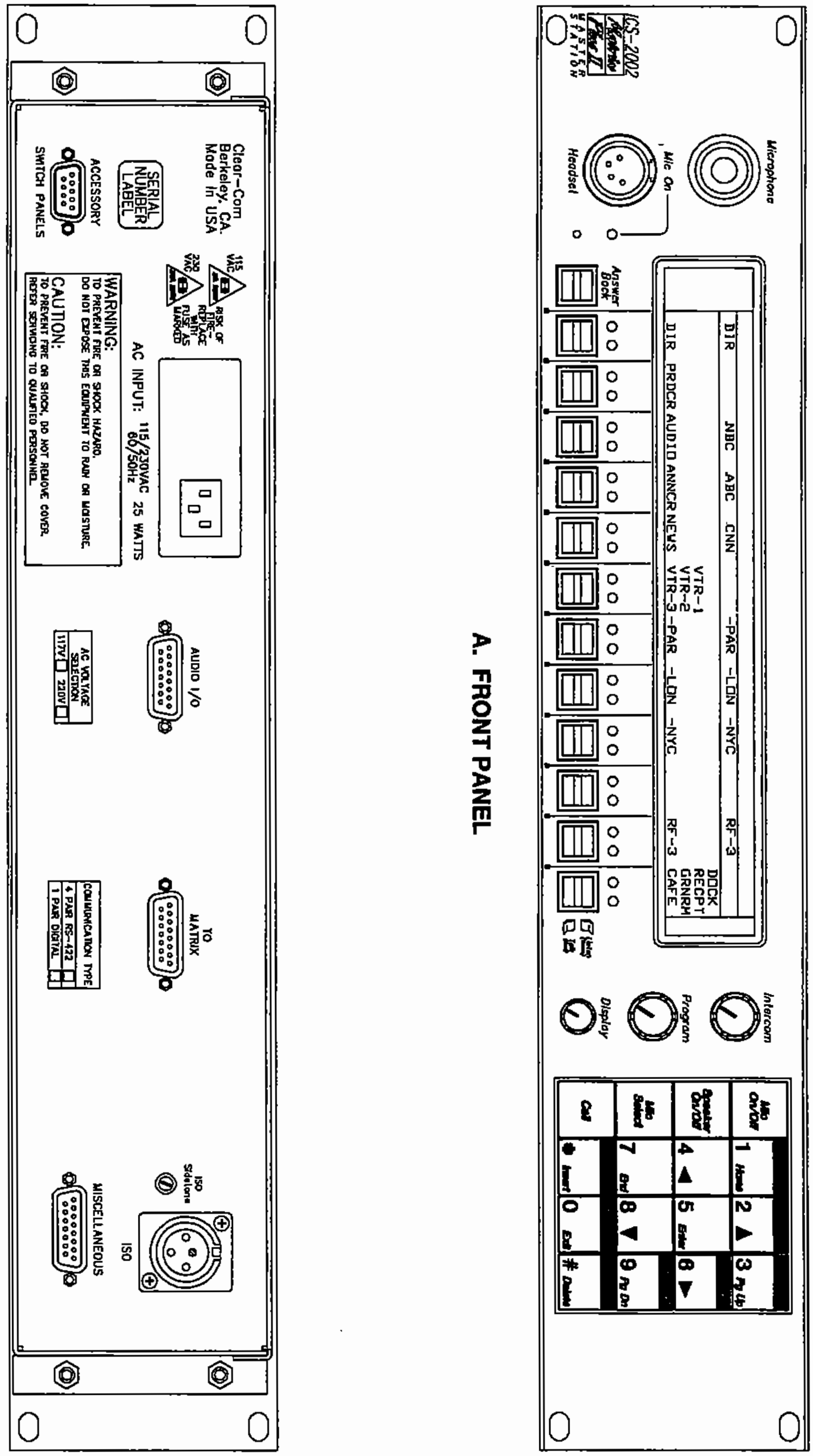


FIGURE S1-1. ICS-2002 Front and Rear Panels

Wiring

Each station in the Matrix Plus II System must be connected to the matrix card frame. All Matrix Plus II System master stations can communicate with the matrix frame using 3-Pair or 4-Pair. "D" series stations can only be wired 1-pair digital.

The wiring requirements for 3-Pair and 4-Pair are exactly the same. Wire gauges between 20 and 26 can be used, either solid or stranded. The most common are the #24 or #26 gauge pairs commonly used in the telephone industry.

All wiring pairs in the system that carry analog audio, RS-422 digital data, or 1-pair digital data must be twisted pairs. This is because twisted pairs provide the noise rejection required by the Matrix Plus II System.

3-Pair

Refer to Figure S1-2 view A. 3-Pair Configuration. The 3-Pair system allows communication between any intercom station and the matrix frame to be transmitted over three pairs of wires. In the 3-Pair system, one pair is used for two-way data transmission, one pair for audio to the matrix frame from the intercom station, and one pair for audio from the matrix frame to the intercom station.

This provides full range audio bandwidth (up to 15KHz) and standard analog audio signals that can be patched and switched with standard audio equipment.

4-Pair

Refer to Figure S1-2 view B. 4-Pair Configuration. For applications requiring line repeaters, the ICS-2002 can be wired using 4-Pair. This allows communication between any master station and the matrix frame to be transmitted over four pairs of wires. In the 4-Pair system, two pairs are used for two-way data transmission, one pair for audio to the matrix frame from the master station, and one pair for audio from the matrix frame to the intercom station.

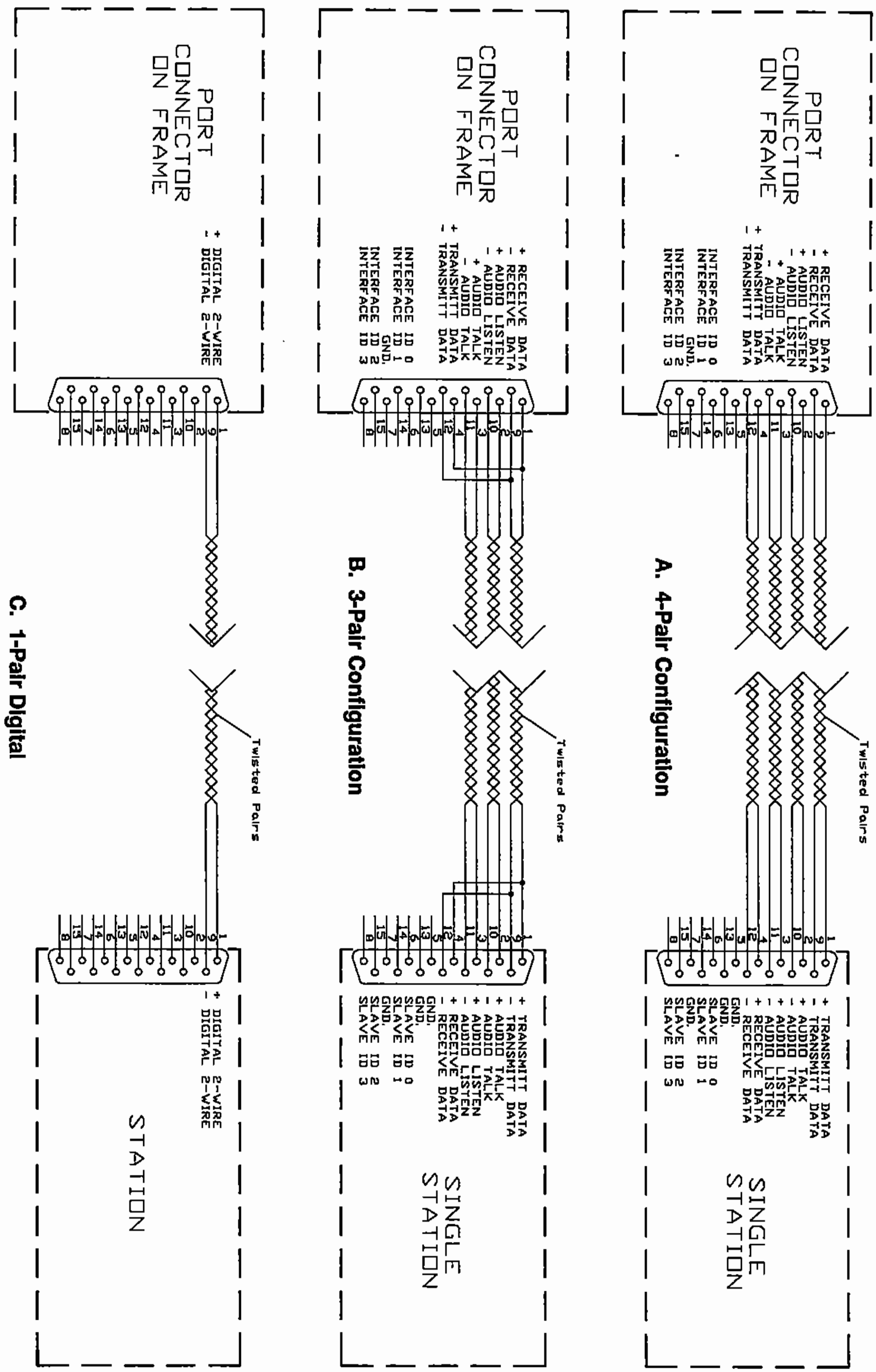


FIGURE S1-2. Wiring Configurations of Cable Connecting Intercom Station to Matrix Frame (Viewed from Connector Sides)

1-Pair Digital

Refer to Figure S1-2 view C. 1-Pair Digital. Any intercom station model number that ends in the letter "D" (ICS-2002D, ICS-1502D, etc.) is equipped for 1-Pair digital only. Figure S1-2 illustrates the three wiring configurations and the cable connecting the station to the matrix frame as viewed from the connector sides.

The 1-Pair digital wiring configuration is immune to crosstalk, so the pairs can be routed in large multiple-pair cables.

When using shielded cable, connect the shield to ground only at the matrix frame, and leave it disconnected at the other end.

The maximum signal attenuation permitted on the pair between the station and the frame is 30 dB. Since the attenuation is approximately proportional to the DC resistance of the wire, thicker wire gauges allow the station to be further from the frame.

The pair is a wide-band (120 kHz), full duplex channel and has the following requirements:

- The pair must be a twisted pair.
- The pair must be a DC path.
- The pair must be completely isolated from other circuits (a "dry" pair).
- Loading coils must not be connected to the pair.
- Only one gauge of wire must be used throughout a pair; no changes in wire gauge are permitted between a station and the matrix frame. (A pair that connects one station to the frame does not need to be the same gauge as a separate pair used to connect a different station to the frame).
- Terminal blocks and other standard splicing techniques can be used.
- Line bridging (whether loaded or unloaded) is not permitted
- Maximum length is 4.2 kilometers (approximately 2.5 miles) on #24 gauge pairs or 3.0 kilometers (approximately 1.9 miles) on #26 gauge pairs.
- Repeaters cannot be used because they are not available for this form of transmission.

Connectors

In this manual "DB-15F" and "DB-9F" refer to female D-shell connectors. "DB-15M" and "DB-9M" refer to male D-shell connector types. As viewed from left to right, the connectors on the rear panel of the ICS-2002 station include:

- Accessory Panel (DB-9F)
- Auxiliary Audio I/O (DB-15F)
- To Matrix (DB-15M)
- Miscellaneous (DB-15F)

Pinouts are covered under the heading for each connector below. Wiring diagrams for the cables that plug into these connectors are shown under headings in subsequent sections (organized according to their function).

Connector Kit

Each intercom station is supplied with a connector kit that contains one DB-15F connector used to build the cable that connects the station to the matrix frame, and one DB-15M connector used to build a cable(s) to connect external devices to the station via the Miscellaneous connector. The paragraphs below detail connection of the station to the wires leading to the matrix frame, and all connections between the station and local devices.

Accessory Panel Connector (DB-9F)

Connections to expansion key panels are via the **Accessory Panel** connector and pinouts are shown in Figure S1-3.

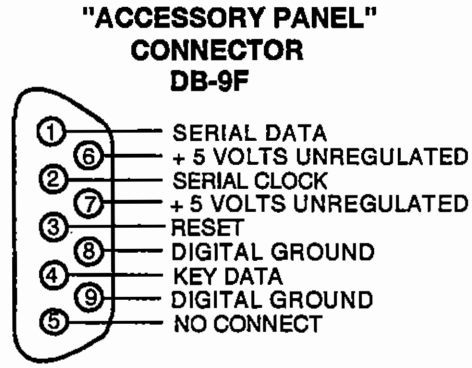


FIGURE S1-3. Accessory Panel Connector Pinout

(Viewed from Rear of Station)

Auxiliary Audio I/O Connector (DB-15F)

Connections to the auxiliary audio are provided by the OPT- 100 Auxiliary Audio Option are made via the **Auxiliary Audio I/O** connector. This connector is only installed if the OPT-100 option is installed in the station. Pinouts of the Auxiliary Audio I/O connector are shown in Figure S1-4.

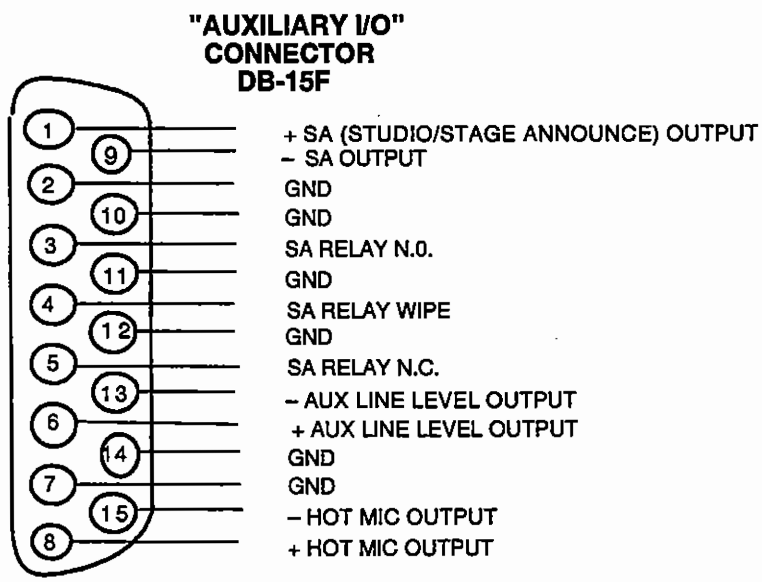


FIGURE S1-4. Auxiliary Audio I/O Connector Pinout

(Viewed from Rear of Station)

To Matrix Connector (DB-15M)

The **To Matrix** connector is used to connect the station to the matrix frame and the pinouts are shown in Figure S1-5.

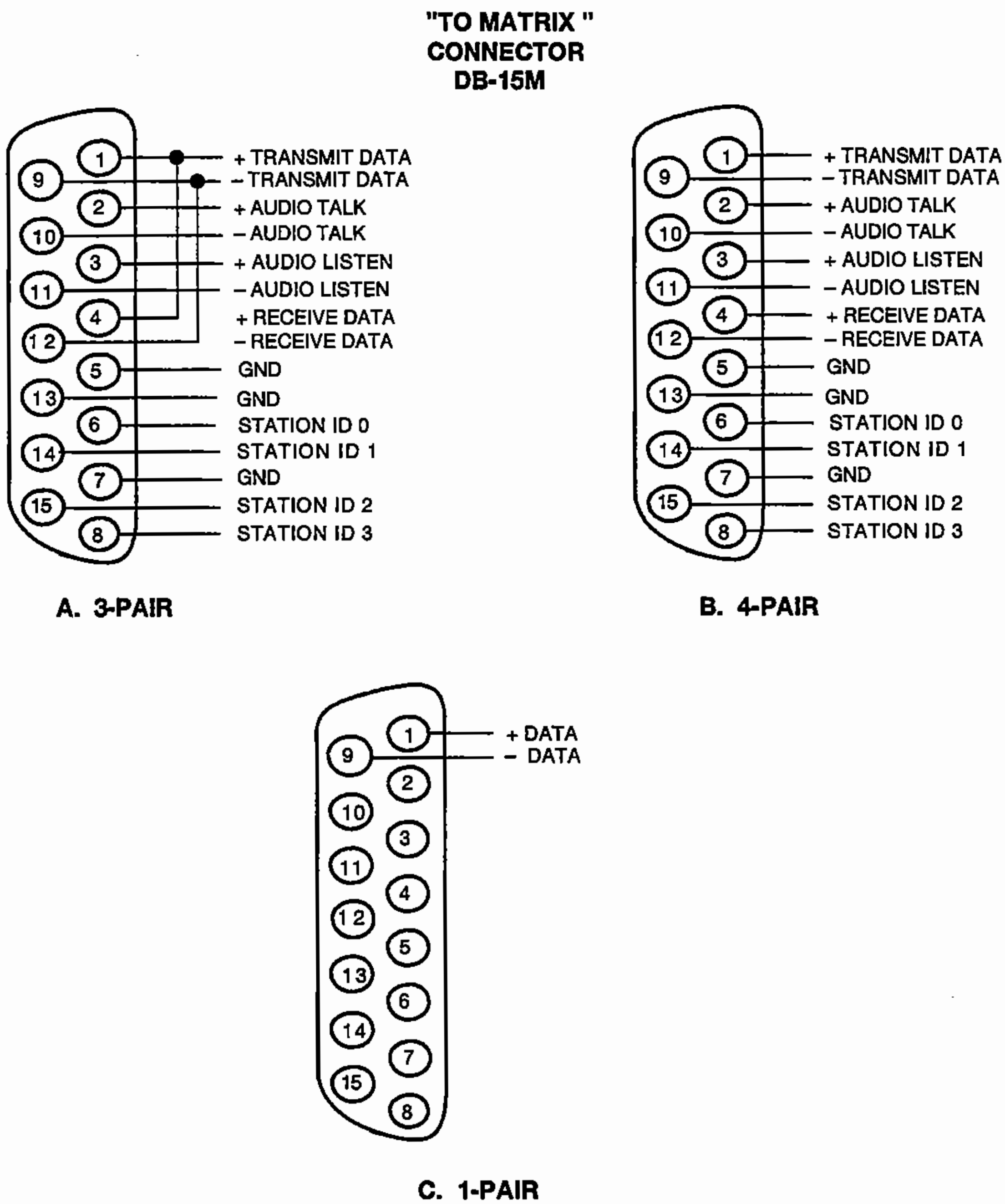


FIGURE S1-5. To Matrix Connector Pinout

(Viewed from Rear of ICS-2002 Station)

3-Pair

Figure S1-6 shows the wiring of a cable connecting an intercom station to the matrix frame using 3-Pair. The connector connecting the cable to the matrix frame port should be a DB-15M and the connector connecting the cable to the intercom station at the To Matrix connector should be a DB-15F. All of the connections required between the station and frame are shown. The wiring pairs must be a twisted pairs.

NOTE: An MTX-100 matrix card must be used for this configuration.

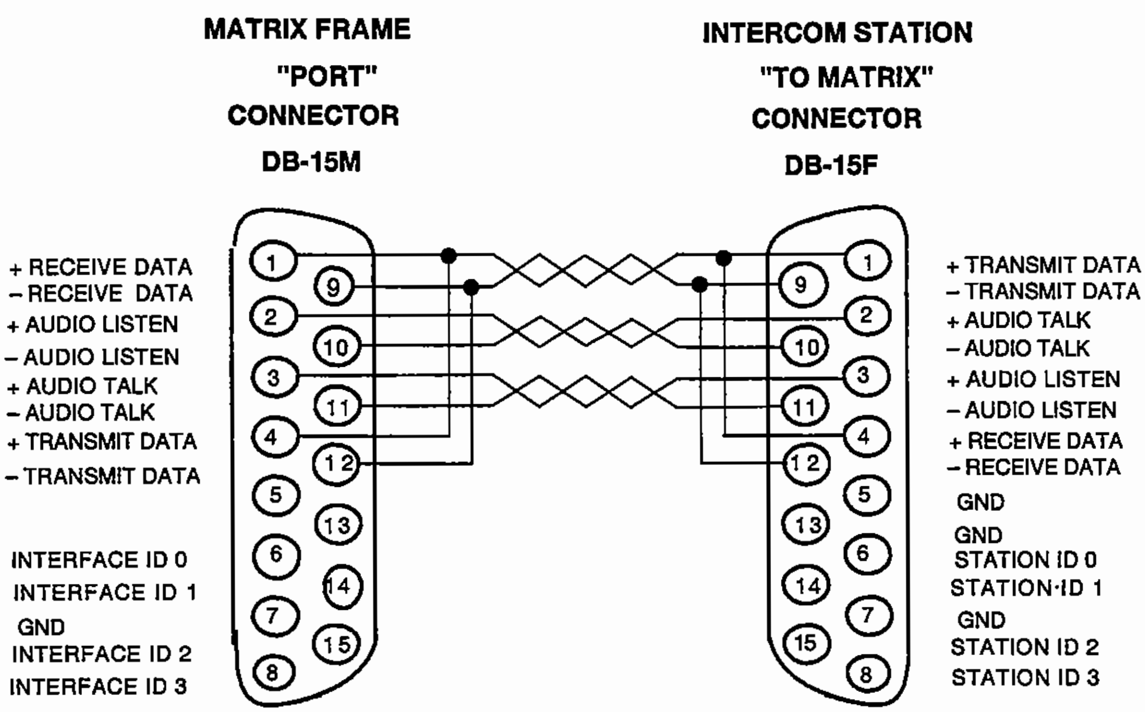


FIGURE S1-6. Wiring of Cable Connecting Intercom Station and Matrix Frame Using 3-Pair Operation (Viewed from Cable Side of Connectors)

4-Pair

Figure S1-7 shows the wiring of a cable connecting an intercom station to the matrix frame using 4-Pair. The cable connector for the matrix frame port should be a DB-15M and the cable connector connecting for the intercom station at the To Matrix connector should be a DB-15F. All of the connections required between the station and frame are shown. The wiring pairs must be a twisted pairs.

NOTE: A MTX-100 matrix card must be used for this configuration.

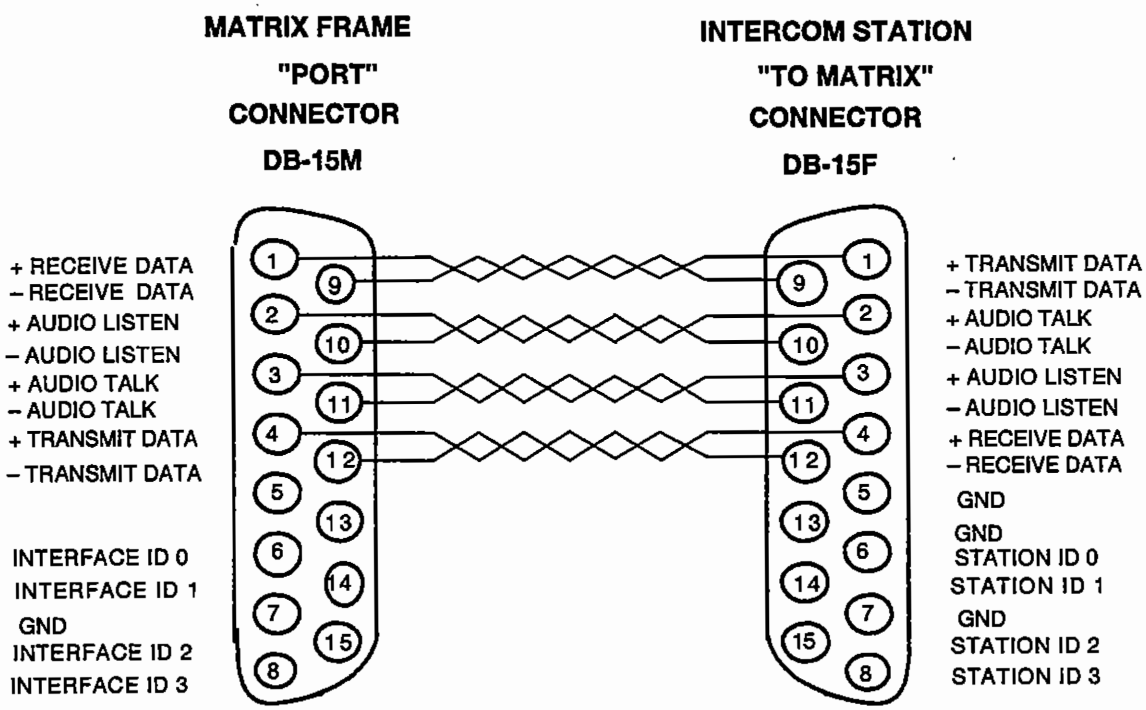


FIGURE S1-7. Wiring of Cable Connecting Intercom Station and Matrix Frame Using 4-Pair Operation (Viewed from Cable Side of Connectors)

1-Pair Digital

Figure S1-8 shows the wiring of a cable connecting an intercom station to the matrix frame using 1-Pair Digital. The cable connector for the matrix frame port should be a DB-15M and the cable connector for the intercom station at the To Matrix connector should be a DB-15F. All of the connections required between the station and frame are shown. The remaining connections in the cable connector on the frame side should be grounded or left floating as shown in the diagram. In the diagram, the connector is viewed from the rear (cable side).

NOTE: A MTX-200 matrix card must be used for this configuration and a "D" suffix station.

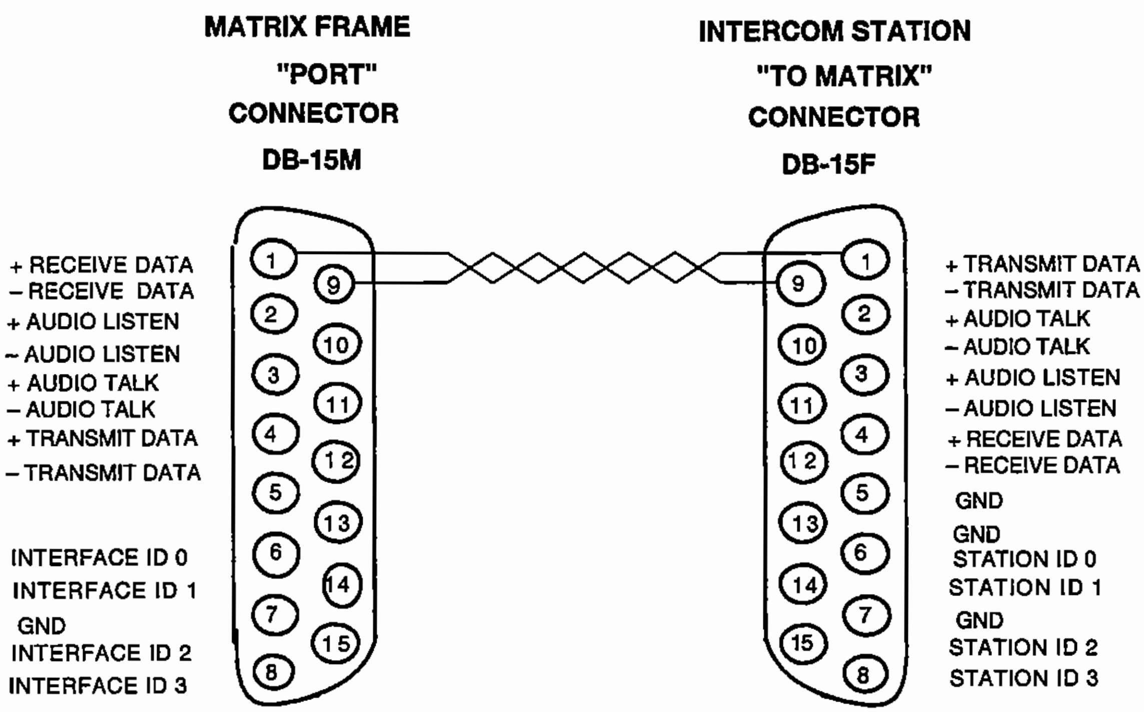


FIGURE S1-8. To Matrix DB-15M Connector Pinout Using 1-Pair Digital

(Viewed from Cable Side of Connectors)

Parallel Stations

Parallel Stations are used in a large area where more than one intercom station is needed, but they do not need to talk to each other. Up to four intercom stations can be connected together in parallel. Any intercom station type can be used except for "D" suffix types. The stations to be connected in parallel must be of the same type. For example, two ICS-2002s in parallel are OK, but an ICS-2002 and an ICS-62 in parallel are not. If one station goes down or is disconnected, the system will continue to run without interruption.

Each station must have a unique ID which is set via the parallel station ID jumpers in the To Matrix connector. If two stations have the same ID they will both attempt to answer the MTX-100 card at the same time causing unpredictable results. The jumper settings required are illustrated in Figures S1-9 and S1-10 below.

Figure S1-9 shows a wiring diagram of four parallel stations connected to a single MTX-100 port using the 3-Pair configuration. Figure S1-10 shows a wiring diagram of four parallel stations connected to a single MTX-100 port using the 4-Pair configuration.

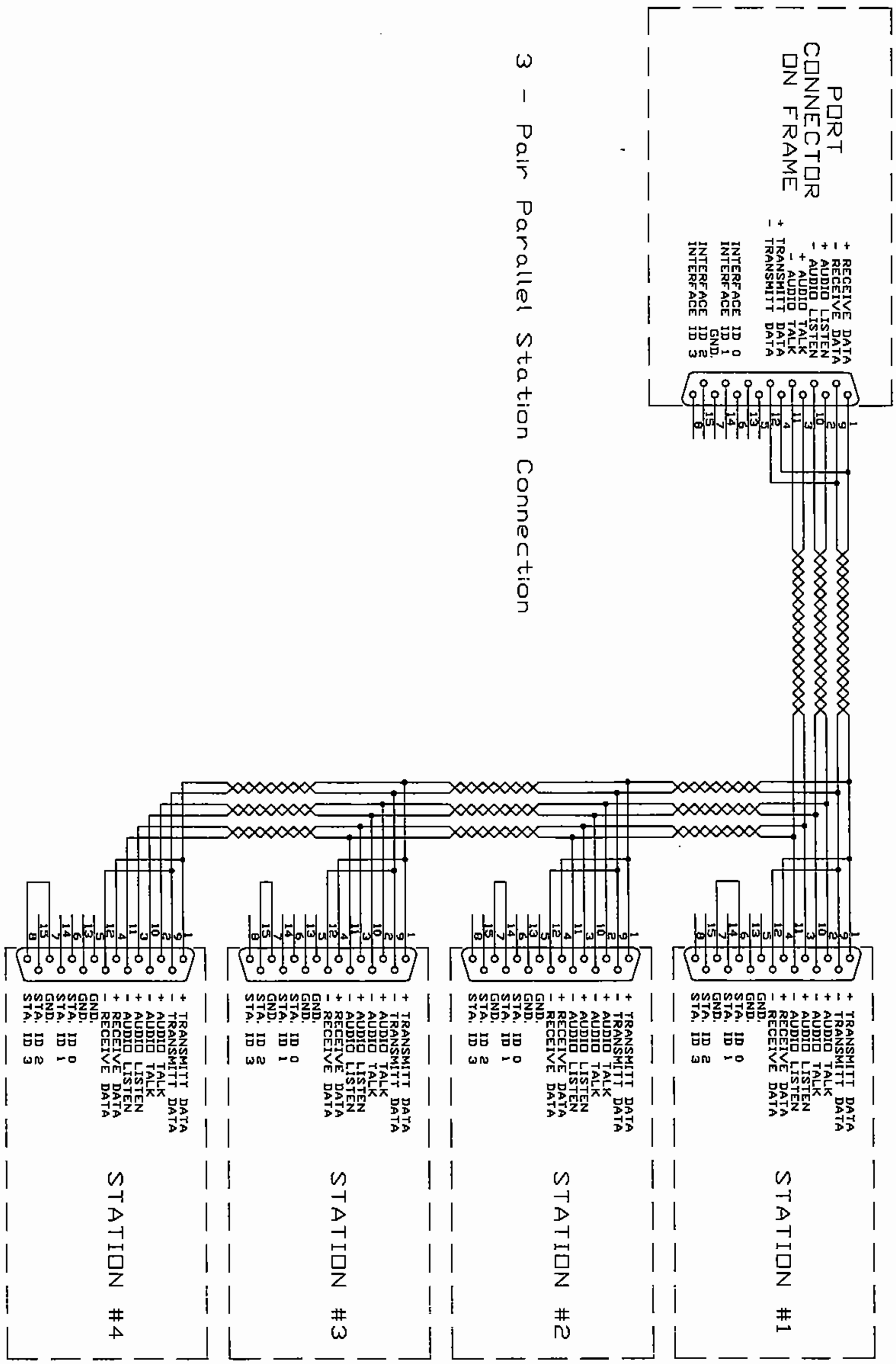


FIGURE S1-9. Wiring of Parallel Stations to Matrix Frame Using 3-Pair Operation
(Viewed from Cable Side of Connectors)

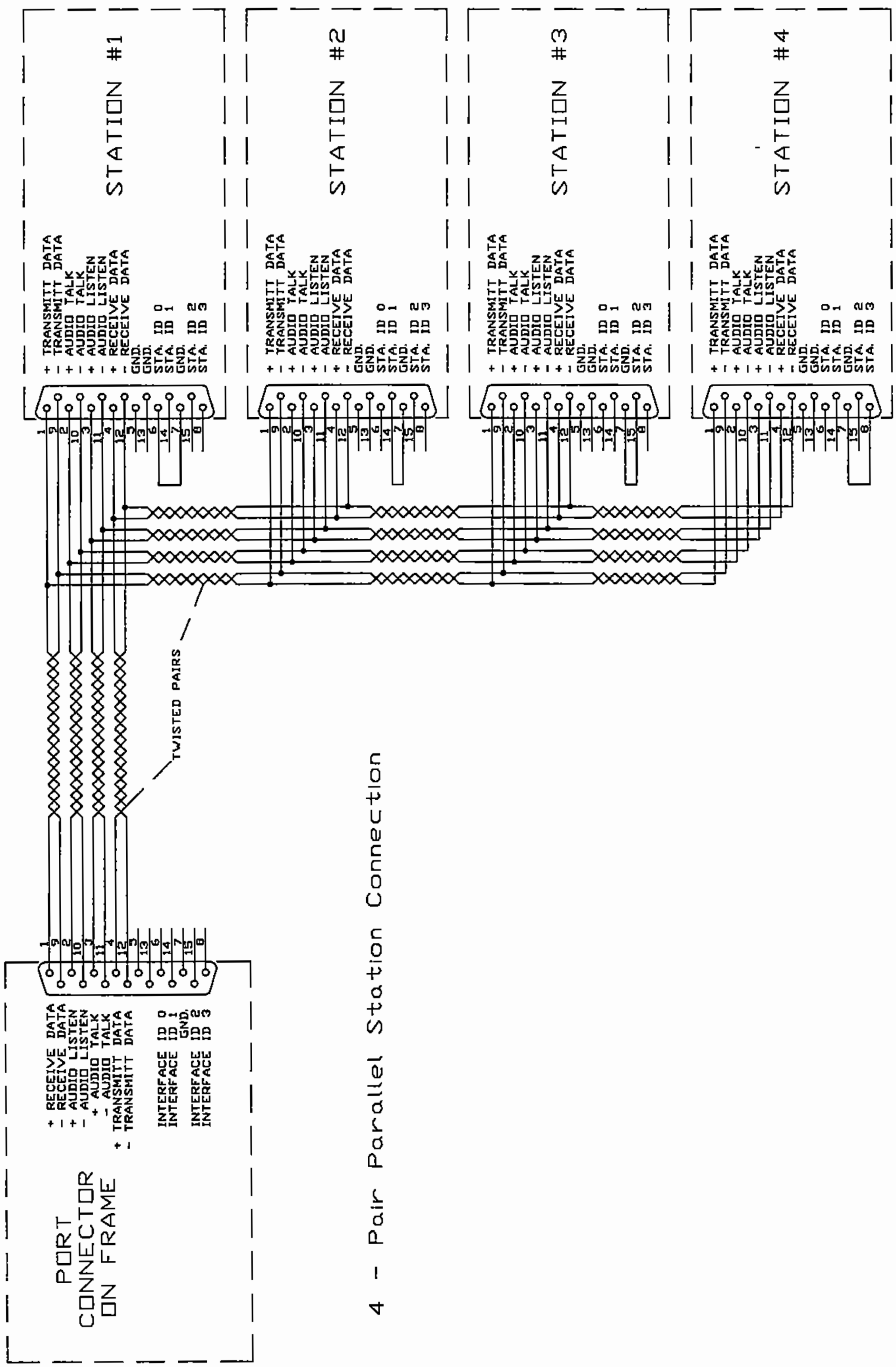


FIGURE S1-10. Wiring of Parallel Stations to Matrix Frame Using 4-Pair Operation (Viewed from Cable Sides of Connectors)

Miscellaneous Connector (DB-15F)

Connections between the station and most local devices are made via the **Miscellaneous** connector. These devices include program feed input, logic inputs, mute circuit, and circuits connected to the station relay contacts.

The pinout of the Miscellaneous connector is shown in Figure S1-11.

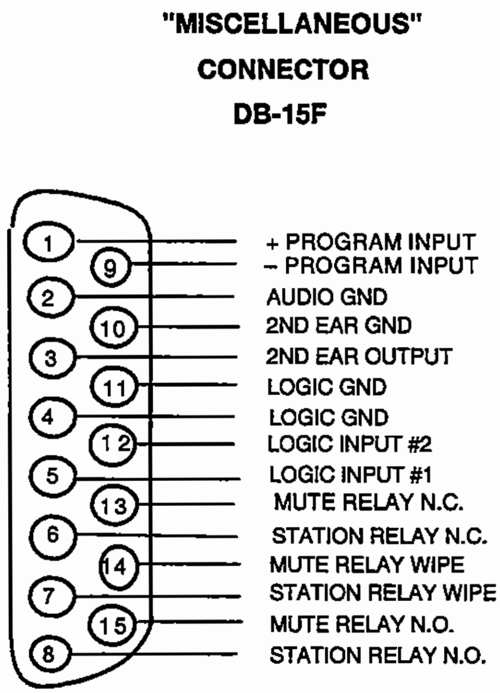


FIGURE S1-11. Miscellaneous DB-15F Connector Pinout (Viewed from Rear of Station)

External Program Feed Input

The external program feed input allows the station operator to monitor audio from an external source while simultaneously monitoring the intercom audio activity.

The input is designed to accept a balanced, line level audio feed at a maximum level of 0 dB. The program feed input passes through the Station's Program volume control before being mixed in with the audio at the station. The Program feed can be heard on the station's speaker and headset. It cannot be heard by other stations in the matrix. Figure S1-12 shows the wiring of the cable connecting the external program feed to a DB-15M for connecting it to the intercom station's **Miscellaneous** connector. The Figure is viewed from the cable sides of the connectors.

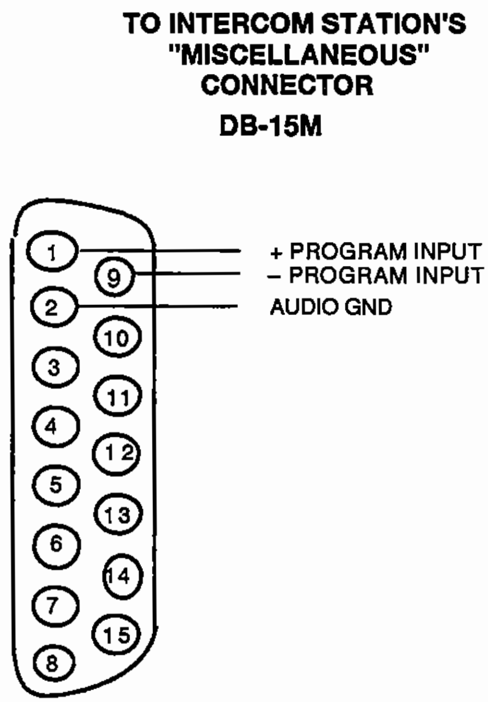


FIGURE S1-12. Wiring of Cable Connecting External Program Feed for Intercom Station's Miscellaneous Connector (Viewed from Cable Side of Connector)

Binaural Headset

A binaural external headset may be connected to the intercom station. One side of the binaural headset will contain the audio feed to the station from the Matrix Frame ("intercom audio"), and the other side will contain the audio present at the station's External Program Feed input ("program audio"). The volume levels of each are controlled individually by the Intercom and Program volume controls on the front panel.

To implement this connection, you must first connect one side of the headset to the standard headset connector audio output. You must then use the Configuration Program to remove the program audio from that output by going to Station - Local Setup, selecting this station, and setting the check mark in the Mute Local Program In Headset option.

Then, connect the other side of the headset to the Second Ear Output on the Miscellaneous Connector. The Second Ear Output provides the program audio only. Program volume is controlled by the Program volume control on the station's front panel.

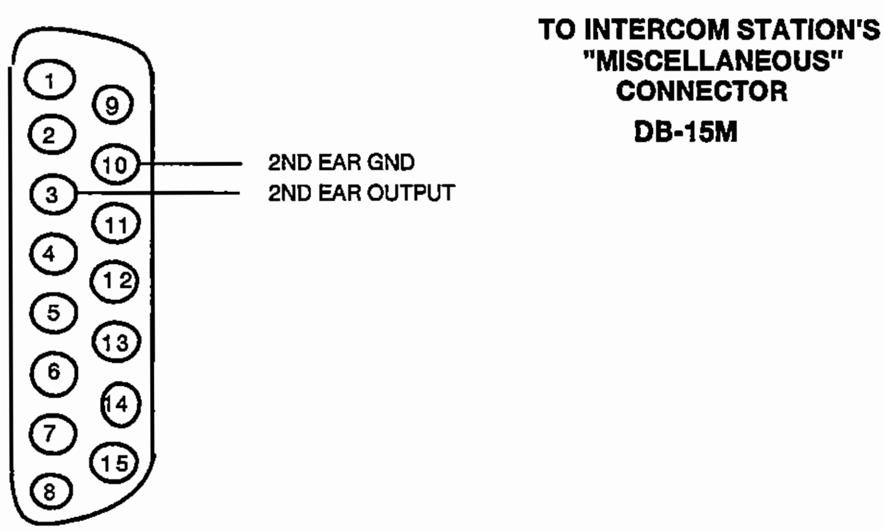


FIGURE S1-13. Wiring of Cable Connecting Binaural Headset for Intercom Station's Miscellaneous Connector (Viewed from Cable Side of Connector)

Logic Input #1 and Logic Input #2

This section describes the functions of logic inputs, differences between the two inputs, and wiring diagrams for use of these inputs.

Functions Of Logic Inputs Each of these two inputs can control one of several functions. You determine which function each will control by using the Configuration Program. To do this, go to Station - Local Setup, select the station, then select one of these functions from the popup box for the options Logic Input #1 and Logic Input #2. The following functions are available:

- **Mic On/Off (Toggle)** Activating this function toggles the station's microphone on and off.
- **Mute Mic Output To Frame** Activating this function turns off the audio from the station to the frame. It does not turn off the "Hot Mic" output (described in the section below on the OPT-100 Auxiliary Audio I/O Option). For an example of the use of this option, see the example below showing connection of a **External IFB Feed** to the station.
- **Mic Off (Momentary)** Activating this function momentarily turns OFF the station's microphone.
- **Answerback Talk/Clear** This function performs the same functions as the station's Answer Back key. It functions as follows. Holding down the switch activates a talk to that label. If there is a label in the station's Answer Back Stack, pressing and releasing the switch quickly clears the label.
- **Speaker Off** Activating this function turns off the station's speaker, disabling all audible output from the station.
- **Activate Talks (Push To Talk)** When this function is in the active state, the station behaves normally. When this function is deactivated, it disables activation of all talk labels, implementing a "Push To Talk" function for the station. Any controls (relays, etc.) assigned to the labels are activated or deactivated along with the label they are assigned to. The LED indicators associated with the active labels behave normally regardless of the state of this input. Both momentary and latched talks are controlled by this input.
- **Activate Talk Switch #1** Activating this function is equivalent to pressing the first (leftmost) talk selector key on the station. This is a momentary activation only.
- **Activate Talk Switch #2** Activating this function is equivalent to pressing the second talk selector key on the station. This is a momentary activation only.
- **Activate Listen Labels Button** Activating this function is equivalent to pressing the Listen Labels button on an ICS-52/92 station. All of the

modes of the Listen Labels button are supported. See the ICS-52/92 section of the Operations manual for details.

- **Studio Announce** Activating this option sends the output of the station's selected microphone (panel or headset) to the station's Studio Announce ("SA") audio output, and activates the SA relay. The microphone output is not sent to the frame. The SA output and relay are only present if the station has the OPT-100 Auxiliary Audio I/O Option installed. (The SA options are described in the OPT-100 section below).

Differences Between The Two Inputs There is only one difference between Logic Input #1 and Logic Input #2: Logic input #2 supports either an active hi input or an active low input, whereas Logic Input #1 only supports active low inputs. Active low is the default for Logic Input #2. To set Logic Input #2 to accept a logic hi input, you must set a jumper inside the ICS-2002 station as shown in figure S1-14.

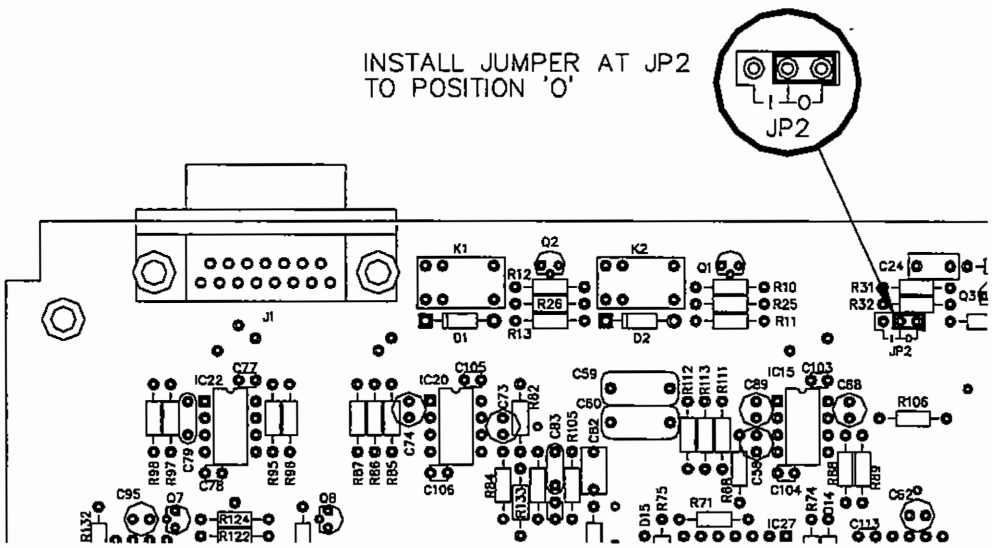


FIGURE S1-14. Jumper Setting for Logic Input Level Selection for Logic Input #2

The switch used to activate a logic input should be a "normally open" type, connected to ground as shown in figure S1-15. No external voltage should be applied to these inputs. The only exception to this is if Logic Input #2 is configured for an active hi input as described above. An active "hi" input is an input voltage from +4 to +30 VDC and a "lo" is between 0 and +2 VDC with reference to gnd.

Logic input #2 requires that the voltage at the logic input at power-up of the station be in the inactive state. Whether the input is active "hi" or active "lo" is determined then.

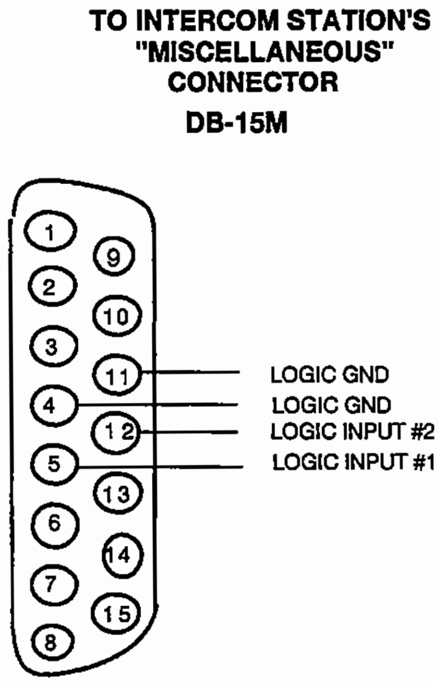


FIGURE S1-15. Wiring of Logic Input # 1 and #2 for Intercom Station's Miscellaneous Connector (Viewed from the rear of the connector)

Mute Relay Contacts

This set of relay contacts is activated whenever any talk path is activated at the station. You can use the contacts to activate an external device when a talk path is active, for example muting a control room monitor speaker.

Both "normally open" and "normally closed" contacts are provided. They are rated at 1 Amp at 24 Volts DC (resistive load). This relay is not designed for switching mains AC line voltage. To switch an external device that runs on mains AC line voltage, use an external relay (or other switching mechanism) that is activated by this relay. Figure S1-16 shows the wiring of the mute relay contacts to a DB-15M for connecting it to the intercom station's **Miscellaneous** connector.

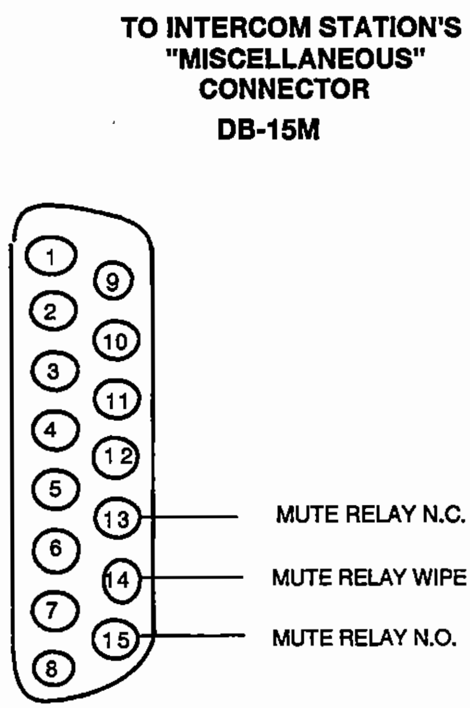


Figure S1-16. Wiring of Mute Relay Contacts for Intercom Station's Miscellaneous Connector (Viewed from Cable Side of Connector)

Station Relay Contacts

Each Matrix Plus II System station includes a relay that can be assigned to any label(s) in the system, and it will then activate whenever a talk or listen is set to that label(s). If no action other than activating the relay is desired, the relay should be assigned to a Control label. For further details see the following entries in the Configuration Program section of the Operation Manual: Setup - Relays and Global - Controls.

You can use the relay to activate an external device, for example an applause light in a studio, a cue light, or a security door lock. Figure S1-17 shows the wiring of the relay contacts to the **Miscellaneous Connector** as viewed from the cable side of the connector.

Both "normally open" and "normally closed" contacts are provided. They are rated at 1 Amp at 24 Volts DC (resistive load). This relay is not designed for switching mains AC line voltage. To switch an external device that runs on mains AC line voltage, use an external relay (or other switching mechanism) that is activated by this relay.

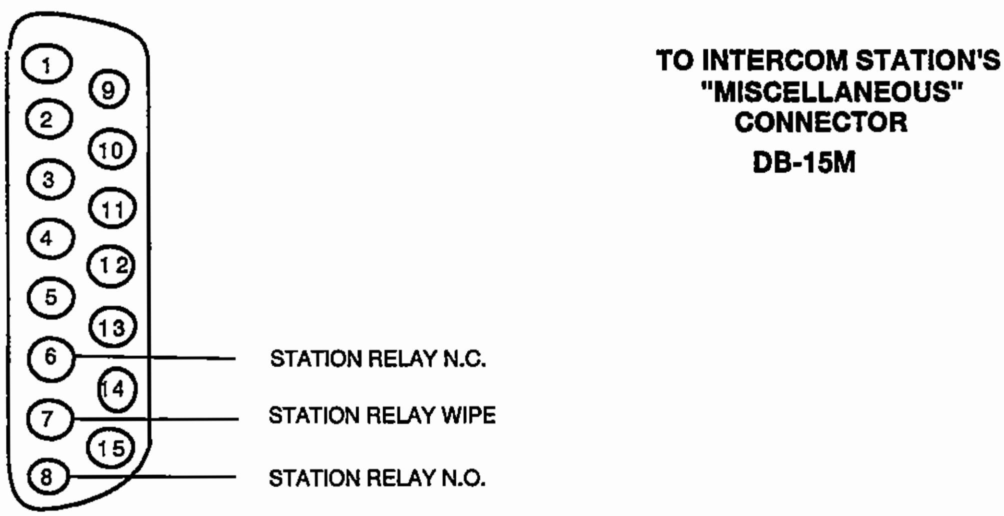


FIGURE S1-17. Wiring of Station Relay Contacts on Intercom Station's Miscellaneous Connector (Viewed from Cable Side of Connector)

OPT-100 Auxiliary Audio I/O Option

The OPT-100 Auxiliary Audio I/O Option provides three additional audio output signals, plus a set of relay contacts. The three audio outputs are Auxiliary Audio Line Level output, "Hot Mic" output, and SA (Stage/ Studio) Announce output. The SA Relay is activated whenever the SA output is active. The diagram shown in Figure S1-18 is the pinout of the DB-15F **Auxiliary Audio I/O Connector** on the back of the intercom station. The following paragraphs describe each audio output and include wiring diagrams showing the connections of the output devices to the intercom station's **Auxiliary Audio I/O Connector**.

"AUXILIARY I/O"
CONNECTOR
BD-15F

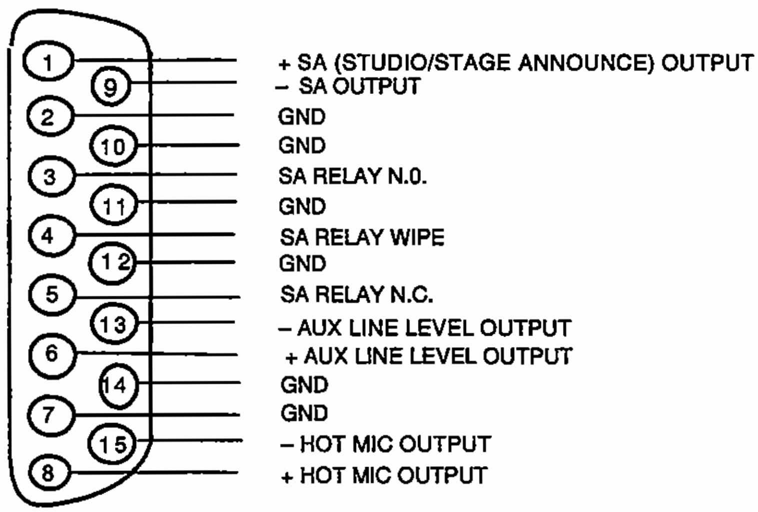


FIGURE S1-18. Auxiliary Line Output, Hot Mic Output, SA Output and SA Relay Contacts on Auxiliary I/O Connector (Viewed from the rear of Station)

Auxiliary Audio Line Level Output

The Auxiliary Audio Line Level output is a balanced line-level transformer-isolated feed of the same audio signal that is sent to the station's internal speaker. For example, this output could be used to feed an external amplifier connected to a set of ceiling loudspeakers. Figure S1-19 shows the wiring for the cable connecting the auxiliary audio line level output to the external device as viewed from the rear of the connector. This connector is a DB-15M so it will connect to the intercom station's DB-15F **Auxiliary Audio I/O** connector.

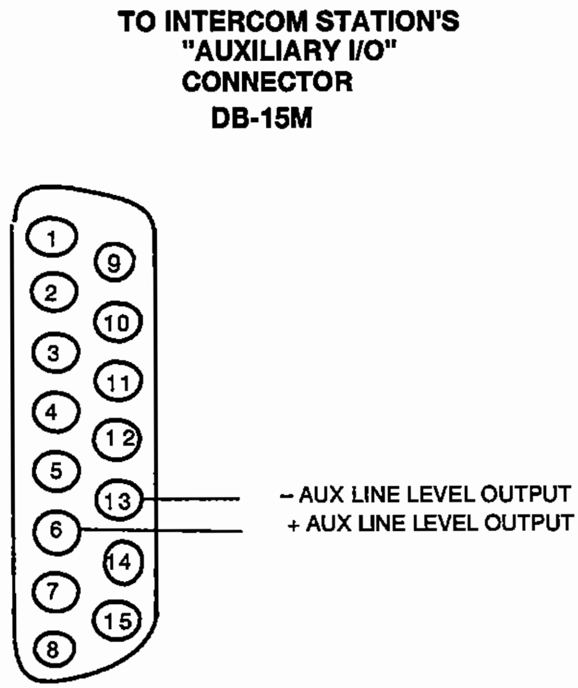


FIGURE S1-19. Wiring for Cable Connecting Auxiliary Line Level Output to External Device (Viewed from the cable side of the Connector)

Hot Mic Output

The "Hot Mic" output is a balanced line-level transformer-isolated feed of the signal from the currently selected microphone. The currently selected microphone is either the panel microphone or the headset microphone. For the ICS-2002, the selected microphone is controlled by the **Mic Select** keypad button.

The Hot Mic output is active regardless of whether the station has talk paths set, and regardless of the settings of the front panel controls on the station. Figure S1-20 shows the wiring for the cable connecting the hot mic output to the external device as viewed from the rear of the connector. This connector is a DB-15M so it will connect to the intercom station's DB-15F **Auxiliary Audio I/O** connector.

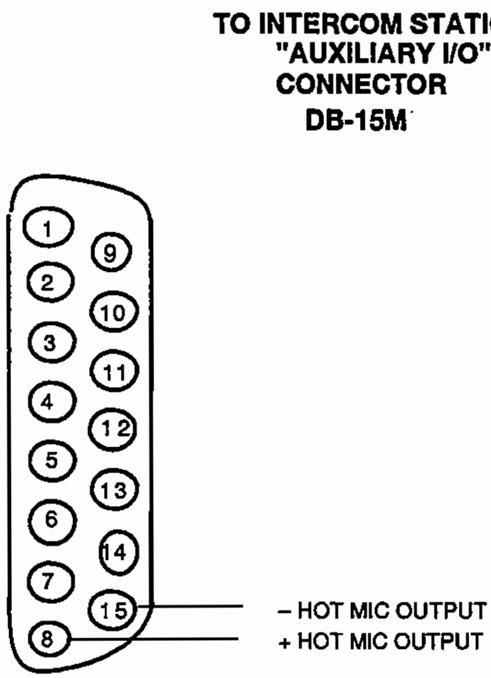


FIGURE S1-20. Wiring for Cable Connecting Hot Mic Output to External Device (Viewed from cable side of the Connector)

ICS-2002

SA (Studio/Stage Announce) Output

The SA Announce output is a balanced line-level transformer-isolated feed of the same signal sent to the Hot Mic output, except that it is only active when the SA button on the station's front panel is pressed or when activated by Logic Input #1 or #2 configured for the Local Studio Announce Function. Figure S1-21 shows the wiring for the cable connecting the SA audio output to the external device as viewed from the rear of the connector. This connector is a DB-15M so it will connect to the intercom station's DB-15F **Auxiliary Audio I/O** connector.

The next page describes the wiring of the SA Relay contacts.

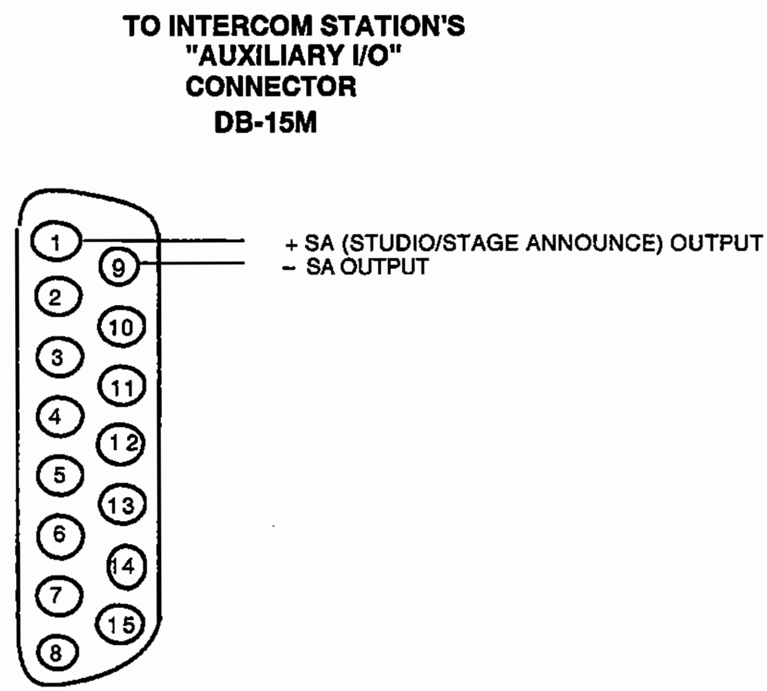


FIGURE S1-21. Wiring for Cable Connecting SA Audio Output to External Device

(Viewed from the cable side of the connector)

The SA Relay is activated whenever the SA button on the front panel of the station is pressed or when activated by Logic Input #1 or #2 configured for the Local Studio Announce Function. Both "normally open" and "normally closed" contacts are provided. They are rated at 1 Amp at 24 Volts DC (resistive load). This relay is not designed for switching mains AC line voltage. To switch an external device that runs on mains AC line voltage, use an external relay (or other switching mechanism) that is activated by this relay. Figure S1-22 shows the wiring of the cable connecting the SA relay contacts to the external device as viewed from the rear of the connector. This connector is a DB-15M so it will connect to the intercom station's DB-15F **Auxiliary Audio I/O** connector.

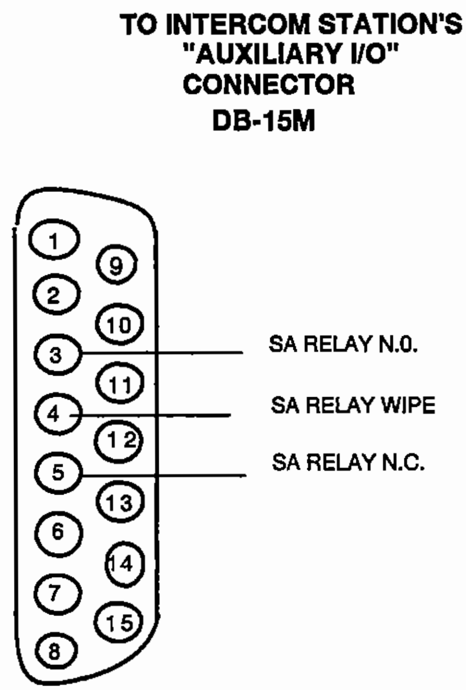


FIGURE S1-22. Wiring for Cable Connecting SA Relay Contacts to External Device

(Viewed from the cable side of the connector)

External IFB Feed Application

This section describes how to connect a Clear-Com MA-4 Talent Control Unit to the station. The primary purpose for doing this is to allow the station operator to use the station's microphone to talk to the MA-4 instead of the MA-4's microphone. When any key is pressed on the MA-4 panel, the MA-4 sends a control signal to the station. The station then sends its microphone signal to the MA-4's audio input.

To connect the MA-4, you must have the OPT-100 Auxilliary I/O Option installed, because it provides the additional audio output channel required (the Hot Mic output). The MA-4 must be activated using Logic Input #2, because only Logic Input #2 can be configured for the active hi logic level signal which the MA-4 produces.

The following steps are required to connect the MA-4 to the station:

- Configure Logic Input #2 for active hi input by setting the internal jumper as shown in Fig S1-14.
- Configure Logic Input #2 for **Mute Mic Output To Frame** by using the Configuration Program. To do this, go to Station - Local Setup and select this station. Then set the Logic Input #2 function to **Mute Mic Output To Frame** by selecting it from the popup selection box.
- Connect the control signal output of the MA-4 to the Logic Input #2 pin of the station, and the Hot Mic output of the station to the audio input of the MA-4.

Accessory Key Panels

The following paragraphs describe how to install the optional XP-12 and XP-22 Expansion Key Panels, XPL-12 and XPL-22 Expansion Key Panels with Electronic Labels, and AP-22 IFB Assignment Panel. This procedure is identical for all Matrix Plus II System intercom stations.

Description

The XP-12 provides 10 additional selector keys, and the XP-22 provides 20 additional selector keys. To label the keys on the XP series, you use paper label strips above the keys. You can add up to 60 additional selector keys to a station with XP panels. You can use any combination of XP-12 and XP-22 panels on a station.

The XPL series are similar except that they include electronic label displays that are automatically updated.

AP panels can be used either as selector pushbuttons with electronic labels, or as a way of conveniently assigning forced crosspoints. You can add up to 80 AP buttons to a station. For further details see the Assignment Panels section of the ICS-2002 chapter of the Operations manual.

XPL	AP
10	20
10	40
10	60
20	20
20	40
30	20
40	20
50	20
60	20
0	80

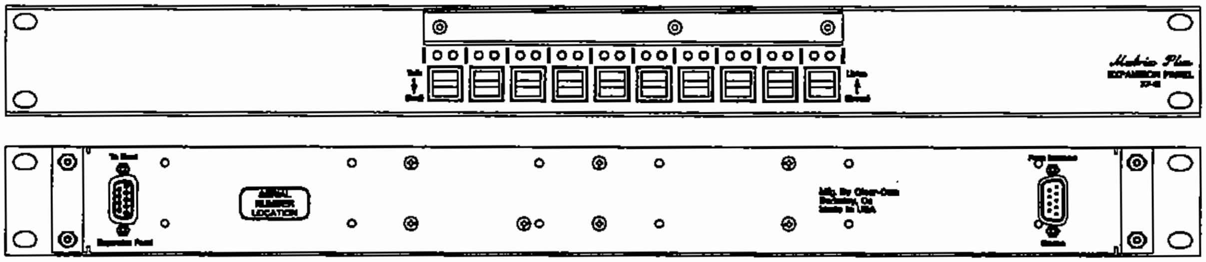
You can install a combination of XPL and AP panels on a station. However, you cannot mix XP series panels with XPL or AP panels. The possible combinations of keys are shown in the table at left.

XP panels can be added to any station, however XPL and AP panels can only be added to the following intercom stations: ICS-2002, ICS-1802, ICS-52, and ICS-92.

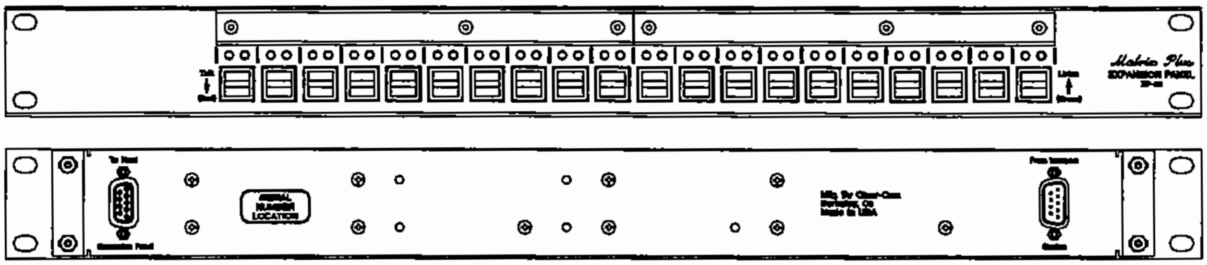
Power to the XP series accessory panels is provided by the station they are connected to, and do not require connection to the mains AC power line. Power to the XPL and AP panels is via an external DC power supply (included).

A cable is supplied with each panel to connect it to the station or to additional panels. The cable is 6 feet long and has a DB-9F connector on one end and a DB-9M connector on the other end.

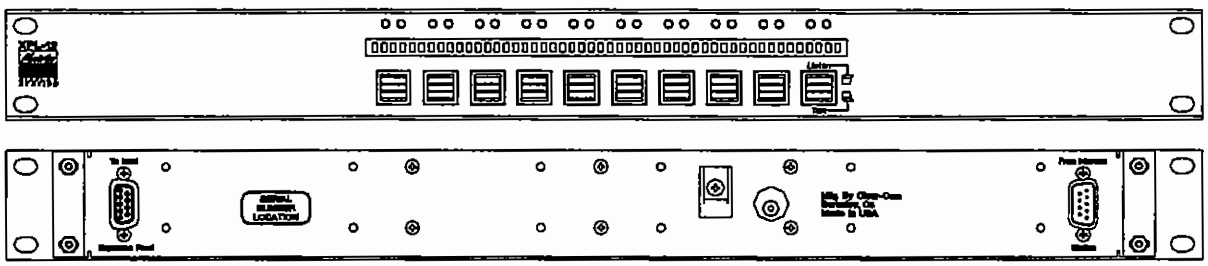
The same installation steps apply to all accessory panels. These steps are described below, including locating the panels, connecting one or more panels to the station, and assigning labels to the selector keys using the Matrix Plus System Configuration Program. Figure S1-23 shows the front and rear views of each accessory panel.



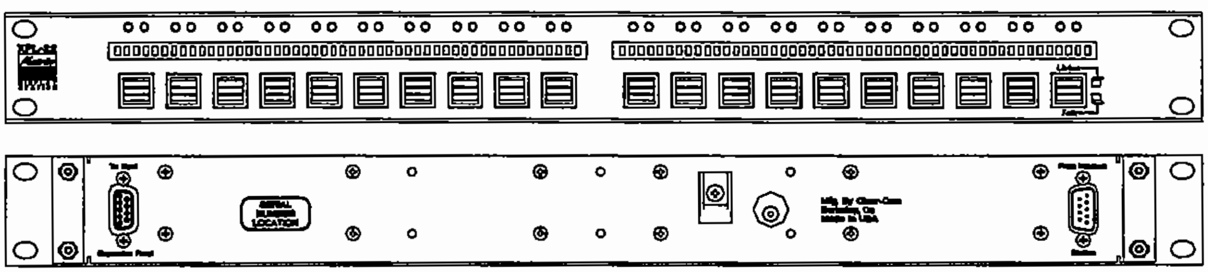
XP-12 EXPANSION PANEL



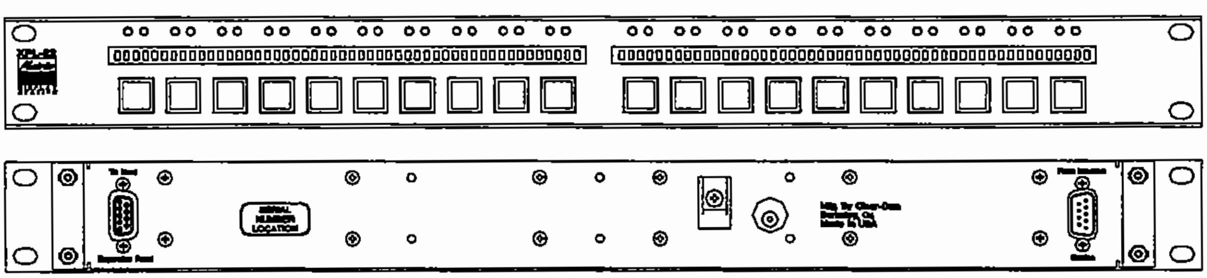
XP-22 EXPANSION PANEL



XPL-12 EXPANSION PANEL WITH ELECTRONIC LABELS



XPL-22 EXPANSION PANEL WITH ELECTRONIC LABELS



AP-22 ASSIGNMENT PANEL

FIGURE S1-23. Accessory Panels (Front and Rear Views)

Mounting

All accessory panels mount in a standard 19-inch rack, requiring one unit of rack space each. The precise physical dimensions are shown under the heading **Package Dimensions**, below. Leave at least 2 inches of clearance behind the rear of the chassis to allow for cable connectors.

XP panels can be added to any station, however XPL and AP panels can only be added to the following intercom stations: ICS-2002, ICS-1802, ICS-52, and ICS-92.

You can install a combination of XPL and AP panels on a station. However, you cannot mix XP series panels with XPL or AP panels.

To connect an accessory panel to an intercom station, plug the DB-9M end of the cable supplied into the **Accessory Panel** connector on the back of the station. Plug the DB-9F end into the **From Intercom Station** connector on the rear panel of the accessory panel.

To connect an additional accessory panel, plug the DB-9M end of the additional key panel's cable into the **To Next Expansion Panel** connector on the rear panel of the first expansion key panel. Plug the DB-9F end of that cable into the **From Intercom Station** connector on the rear panel of the additional key panel. Additional key panels are added in the same way, using "daisy-chain" wiring.

To make the physical locations of the keys match the way they are shown in the Station Key Assignments screen of the configuration program, mount the XPL keys all together and the AP keys all together. Daisy-chain them with the topmost XPL panel connected to the station, and the topmost AP panel connected to the last XPL panel.

To connect the AC power transformer to the XPL or AP panel, route the cord from the transformer's secondary to the panel's **AC Power Input** connector on the rear panel. This is a 2.1 mm Coax connector. When routing the cord make sure you use the stress relief on the rear panel. Any AC source which supplies between 12 and 16 volts RMS AC at 750 milliamps can power the panel.

Configuring

Once the key panels are physically mounted and connected to a station, you must also inform the Configuration Program of the number of accessory keys you have installed in the station. To do this use the Setup - Frames screen. On the right side there is an entry for each station, with a popup selection box allowing you to select the combination of keys installed. The number of keys is specified in increments of ten. It does not matter whether they are physically supplied by panels that supply 10 keys (like the XP-12) or twenty keys (like the XP-22). For example, you would select the number "30" keys whether you had three XP-12s installed or one XP-12 and one XP-22.

WARNING: If the number of expansion keys named in the Frame - Setup screen does not match the number of XP panel keys physically connected to the station, pressing expansion panel selector keys can produce unpredictable results.

To assign labels to the selector keys of the expansion key panels, use the Station - Key assignment screen in the Configuration Program or the assign keys mode on the ICS-2002.

Mains AC Power

The ICS-2002/ICS-1802 requires a 3-conductor, grounded mains AC power outlet. The station can operate on either 110 or 220 Volts AC, controlled by a line voltage selector switch located inside the mains AC power input module on the back of the station. The mains AC line voltage set for the station as shipped from the factory is indicated on the rear panel.

To set the mains AC power line voltage for 110 or 220 Volts, first unplug the mains AC power cord. Remove the top cover of the station and change the switch settings on the rear of the mains AC power input module.

You also must change the fuse to correspond with the mains AC power voltage, as follows:

- For 110 Volt operation use a 20 millimeter 0.5 Amp slow-blow fuse
- For 220 Volt operation use a 20 millimeter 0.25 Amp slow-blow fuse

Also replace the spare fuse supplied by the factory, which is located in the fuse holder of the mains AC power input module.

To replace the fuse and/or spare fuse, turn power OFF then use a small screwdriver to pry out the fuse from the fuse block. The fuse block press-fits tightly into the mains AC power input module adjacent to where the line cord plugs into the module. The fuse block has a small slot in it that is used to gain a purchase to pry it out. The slot is located on the side of the fuse block just inside the area that the line cord would occupy if it were plugged in. The fuse block holds both the fuse and the spare fuse. The fuse is held in the exposed clips at the back of the fuse block, and the spare fuse is held inside a press-fit insert inside the fuse block. To access the spare fuse, pop the insert out by using a small screwdriver to push on one end of the press-fit insert.

Adjustments

The following adjustable station parameters are set to a default setting at the factory. The stations should operate when received, however, some applications might require adjustment. These adjustments include setting the following functions: Headset Sidetone, Panel Mic Gain, Speaker Mute, Page Volume Level, Matrix Card Input Gain, and Station-to-Matrix Card Baud Rate.

ICS-2002

Headset Sidetone and Panel Mic Gain are internal adjustments to the station. Speaker Mute and Page Volume Level can only be set with the Configuration Computer. The Matrix Card Input Gain can be set with either the Configuration Program or from the System Programming Menus. The Station-to-Matrix Card Baud Rate is set from the Configuration Program.

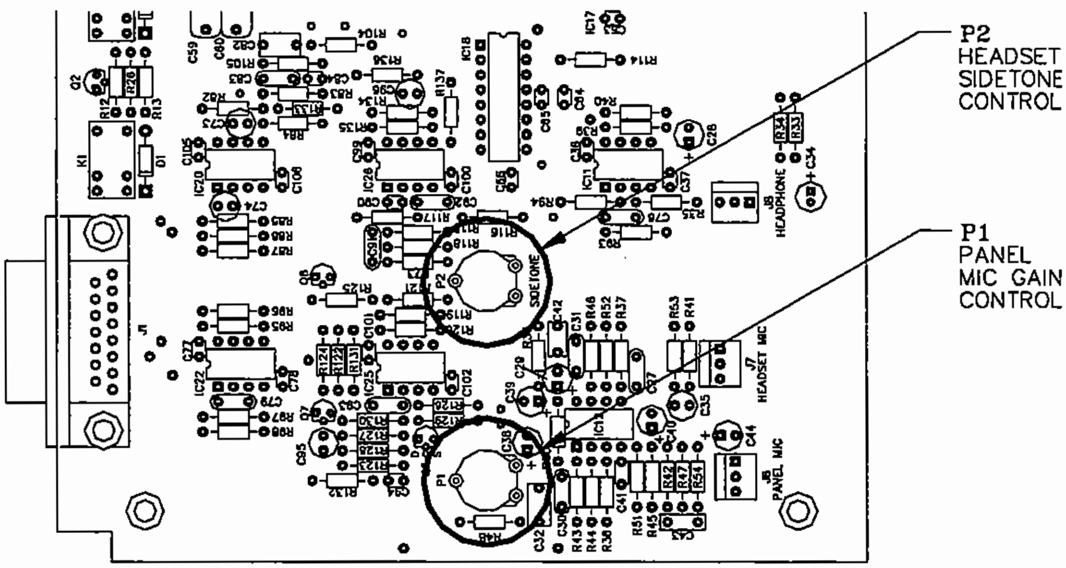


FIGURE S1-24. Sidetone and Panel Mic Gain Adjustment Controls.

Headset Sidetone

"Sidetone" is the portion of the signal the operator hears in their headset that is their own voice. The station is shipped with the sidetone set to maximum level.

To adjust the headset sidetone, remove the cover of the station and locate the sidetone control marked "**P2 SIDETONE**" on the Main PC Board. The location is shown in Figure S1-24. Connect a headset to the station and speak into the headset microphone. Rotate the sidetone control until the desired amount of microphone signal is present in the earphone on the headset. Install the cover on the station.

Panel Mic Gain

The gain of the panel microphone pre-amplifier is adjustable over a 10 dB range. The station is shipped with the panel mic gain set to maximum. In some noisy environments it is necessary to turn the gain down and have the operators talk closer into the microphone.

To adjust the panel mic gain, remove the cover of the station and adjust the control marked "**P1**" on the Main PC Board for the desired gain. The location is shown in Figure S1-24. Install the cover on the station.

NOTE: If the gain is set to maximum on two stations that talk to each other at the same time, there is a possibility of feedback even with the speaker mute set to maximun.

Speaker Mute

When a panel microphone and a speaker are used together there is a possibility of feedback. To reduce the possibility of feedback, the station software will "MUTE" or turn the speaker level down some predetermined level when both the microphone and speaker are enabled together.

To set the Speaker Mute level, use the Configuration Program. Refer to the Operation Manual section of the Station - Local Setup screen of the Configuration Program. The Speaker Mute level is adjustable in the range of 0 to 15dB. The default value is set to 6 dB.

Page Volume Level

Matrix Plus II stations have a software controlled function called Page Override. Page Override allows a system label to be tagged to evoke a predetermined listen level at any station the label is activated to. This Page function sets a speaker level regardless of the front panel listen level pot setting and turns the speaker on if it was off. If the front panel listen level control is set higher than the Page level the volume will not go down.

To set the Page Volume Level, use the Configuration Program. Refer to the Operation Manual section of the Station - Local Setup screen of the Configuration Program. The Page Volume Level is adjustable in a range of 0 to 10. These positions are equivalent front panel control settings. 0 is equal to off. 10 is equal to full pot. 5 is equal to half pot. The default value is set to 5 or half pot.

ICS-2002

Matrix Card Input Gain

Matrix Plus II Matrix Cards have input gain controls that are controlled by software. The basic purpose of these controls is to allow the adjustment of signal levels from interfaces such as program material. These gain controls also affect the signal coming from the station. This gain should normally be left at its default position of 0dB of gain. The range is -30dB to +12dB. In some uses of stations it might be desirable to increase the talk level from a station.

NOTE: This function is intended to only be used to trim the gain of a particular port to accommodate excessively high or low levels on that port only. This function should not be used to elevate the output operating level of a MTX card above the nominal 0 dB operating level. Excessive output level at the output of a MTX card reduces the headroom of the system, increases distortion, and increases system crosstalk

To set the Matrix Card Input Gain, use the Configuration Program or the Programming Menu in the ICS-2002. Refer to the Operation Manual section of the Station - Local Setup screen of the Configuration Program and the Program Menu operating instructions in the ICS-2002 section.

Station-to-Matrix Card Baud Rate

The RS-422 serial data communications between an intercom station (wired either 3-Pair or 4-Pair) can operate at one of two speeds (baud rates): Standard (19.2K baud, the default) or Long Line (9600 baud). Long Line is only required in the rare case when you have problems using Standard.

The baud rate is set from the configuration program, and the station automatically adapts accordingly.

Configuration

The Matrix Plus II System Configuration Program must be used to assign each station a name and other parameters. Refer to the Configuration Chapter in Volume I, Operation Manual for details. Also refer to the ICS-2002 Chapter of the Operation Manual for details of the configuration options available from the ICS-2002's menus.

Specifications

0 dBv is referenced to 0.775 volts RMS

ICS-2002, ICS-1802, ICS-2002D, and ICS-1802D Intercom Stations

Front Panel Controls and Connectors

Talk/Listen Switches:	12
Function Keys	16 (ICS-2002) 4 (ICS-1802)
Answer Back Switch	1
Volume Controls	2
Headset Connector	1 D4M XLR
Panel Mic Connector	1 1/4 inch Phone Jack

Rear Panel Connectors

Miscellaneous	DB-15F
To Matrix	DB-15M
Audio IO (OPT-100)	DB-15F
Accessory	DB-9F
AC Power	IEC-320

Panel Microphone Input

Type:	Electret
Input Level	40dBv
Impedance	200 ohms

Headset Microphone Input

Type	Dynamic
Input Level	-55dBv
Gain Adjustment Range	+/- 5dB
Impedance	200 Ohms

Local Program Input

Type	Electronically Balanced
Impedance	8k Ohms Bridging
Level	0 dBv will produce full output of speaker when volume control is fully clockwise

Headphone Outputs

Impedance	50 to 600 Ohms
Power	1/2 Watt into 50 Ohms

Speaker Amplifier Output

Impedance	8 Ohms
Power	2 Watt

Line Input (4-wire Listen from Matrix) (ICS-2002 and ICS-1802)

Type	Transformer Balanced
Impedance	8k Ohms Bridging
Level	0 dBv nominal
Freq. Resp.	100Hz to 15KHz +/- 2dB

Line Output (4-wire Talk to Matrix) (ICS-2002 and ICS-1802)

Type	Transformer Balanced
Impedance	150 Ohms (when talk active)
Level	0 dBv nominal
Freq. Resp.	100Hz to 15KHz +/- 2dB

2-Wire Digital Operation (ICS-2002D and ICS-1802D)

Type	ISDN U-type loop (not standard ISDN)
Data Rate	160 Kilobits/sec full duplex
Line Impedance	100 to 120 Ohms at 120 kHz
Signal Level	1.2 Volts peak-to-peak, +/- 0.2 Volts
Signal Type	Complex biphase modulation with soft edges. The spectral density centers about 120kHz. The level is 34dB down beyond 240kHz.
Audio Coding	8 bit "u Law" companded at 8K samples/sec.
Audio Frequency Response	200 to 3500 Hz, +/- 1/2 dB
Audio Distortion	Less than 0.5% THD
Signal to Noise Ratio	Greater than 60 dB, 200 to 3500 Hz

Logic Input #1

Type	5 Volt logic with pull-up resistor
Logic	True = Short to Ground

Logic Input #2

Type (Option 1)	5 Volt logic with pull-up resistor
Logic (Option 1)	True = Short to Ground
Type (Option 2)	External Voltage Sense
Logic (Option 2)	Lo = 0 - +2VDC Hi = +4 - +30 VDC

Mute Relay

Contact Type	1 pair SPDT (single form C)
Contact Voltage Rating	24 Volts DC
Contact Current Rating	1 Amp continuous, 2 Amps peak at 24 Volts DC (resistive load)

Station Relay

Contact Type	1 pair SPDT (single form C)
Contact Voltage Rating	24 Volts DC
Contact Current Rating	1 Amp continuous, 2 Amps peak at 24 Volts DC (resistive load)

Mains AC Power

Voltage	117 VAC nominal (105 to 130 VAC)
Or	220 VAC nominal (200 to 240 VAC)
AC Current	0.2 Amp at 117 VAC
	0.1 Amp at 220 VAC
Frequency	50 to 60 Hz

Temperature

Operating	between 0 and 50° C (32-125° F)
Storage	between 0 and 70° C (32-150° F)

Humidity

Operation and Storage	Between 20% and 90%, Non-Condensing

Package Dimensions

Height	3.5 inches (8.89 cm), (2RU, EIA rack)
Width	19.0 in. (48.26 cm)
Depth	6.75 in. (17.15 cm)
Weight	7.5 lbs (4.0 Kg)

OPT-100 Auxilliary Audio I/O Option

Audio

Output Signal Levels	0.0 dBv nominal
Impedance	600 Ohms, transformer balanced
Frequency Response	100 to 10k Hz, +/- 2 dB of mic preamp or external program input
Distortion	Less than 0.5% THD

SA Relay

Contact Type	1 pair SPDT (single form C)
Contact Voltage Rating	24 Volts DC
Contact Current Rating	1 Amp continuous, 2 Amps peak at 24 Volts DC (resistive load)

Accessory Key Panels

XP-12

Height	1.75 inches (44mm), (1RU)
Width	19.0 inches (483mm)
Depth	1.88 inches (46mm)
Weight	1.2 lbs (0.5Kg)
Power	Powered by intercom station

XP-22

Height	1.75 inches (44mm), (1RU)
Width	19.0 inches (483mm)
Depth	1.88 inches (46mm)
Weight	1.5 lbs (0.7Kg)
Power	Powered by intercom station

XPL-12

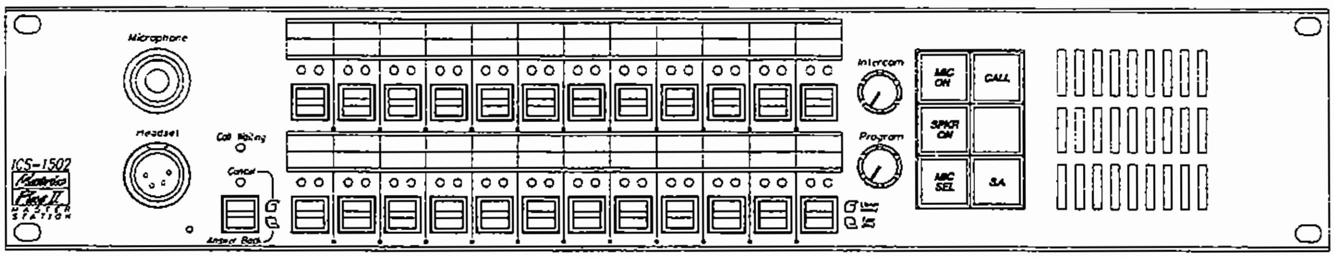
Height	1.75 inches (44mm), (1RU)
Width	19.0 inches (483mm)
Depth	2.50 inches (64mm)
Weight	1.5 lbs (0.7Kg)
Power	14 VAC 0.5 Amps (120 VAC 770mA wallmount transformer supplied with unit. 220 VAC version available on special order).

XPL-22

Height	1.75 inches (44mm), (1RU)
Width	19.0 inches (483mm)
Depth	2.50 inches (64mm)
Weight	1.8 lbs (0.8Kg)
Power	14 VAC 0.5 Amps (120 VAC 770mA wallmount transformer supplied with unit. 220 VAC version available on special order).

AP-22

Height	1.75 inches (44mm), (1RU)
Width	19.0 inches (483mm)
Depth	2.50 inches (64mm)
Weight	1.8 lbs (0.8Kg)
Power	14 VAC 0.5 Amps (120 VAC 770mA wallmount transformer supplied with unit. 220 VAC version available on special order).



Matrix Plus II System ICS-1502

MASTER STATION INTERCOM STATION

Introduction

This Section covers installation, adjustment, and specifications of ICS-1502 Intercom Station. Figure S2-1 shows the front and rear of the ICS-1502.

Installation

The installation procedures for the ICS-1502 are identical to those described for the ICS-2002 Intercom Station in the ICS-2002 Section of this Installation Manual and are not duplicated in this Section.

As with the ICS-2002, some connections depend on the OPT-100 Option installed in each ICS-1502 station. The OPT-100 Option and XP-12/ XP-22 Expansion Key Panels are installed in the ICS-1502 in exactly the same way as described in the ICS-2002 Section.

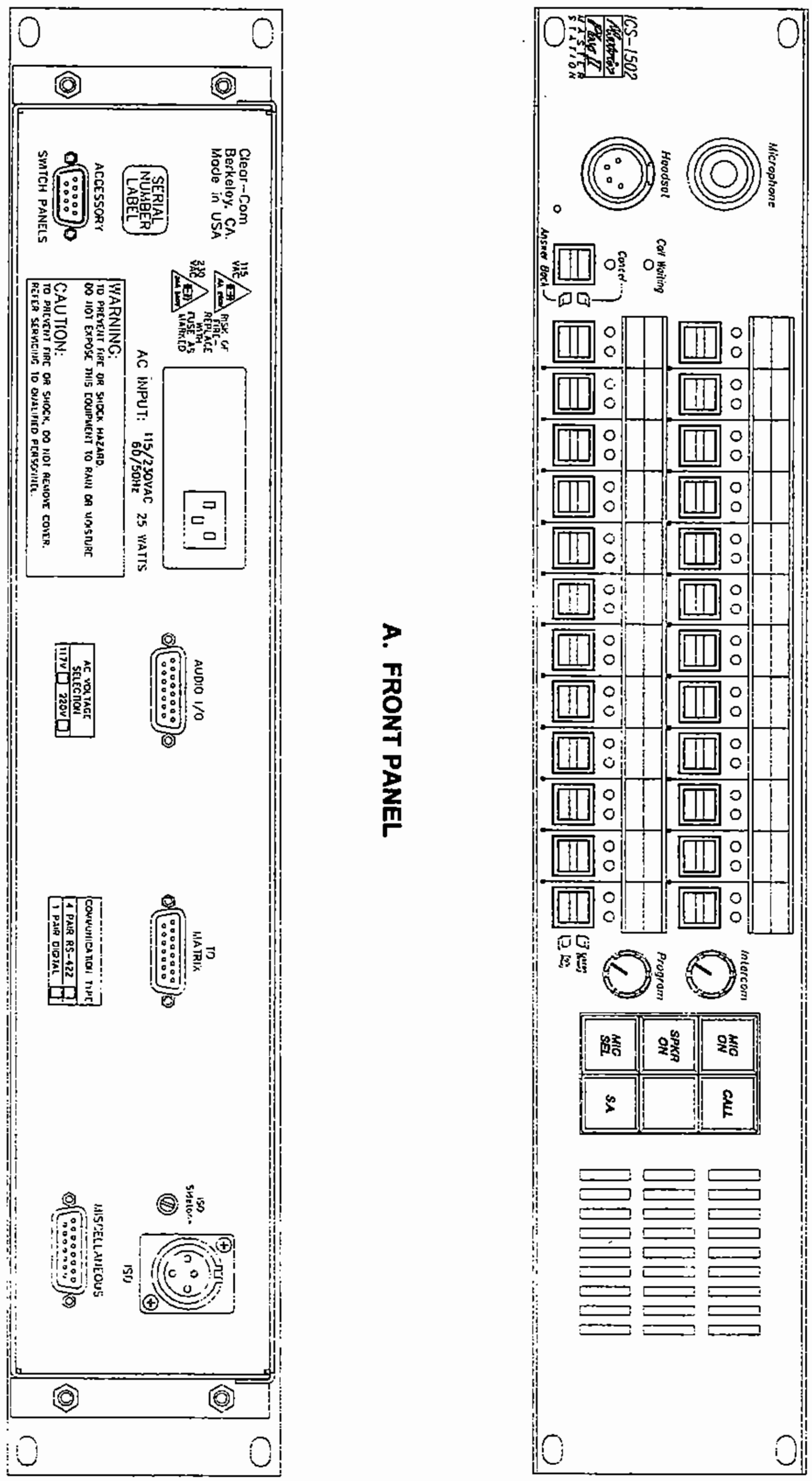
Adjustments

The adjustments, required to prepare the ICS-1502, are identical to those described for the ICS-2002 Intercom Station in the ICS-2002 Section of this Installation Manual and are not duplicated in this Section.

Specifications

The electrical and mechanical specifications of the ICS-1502 are identical to those of the ICS-2002 except where specifically noted in the ICS-2002 Section.

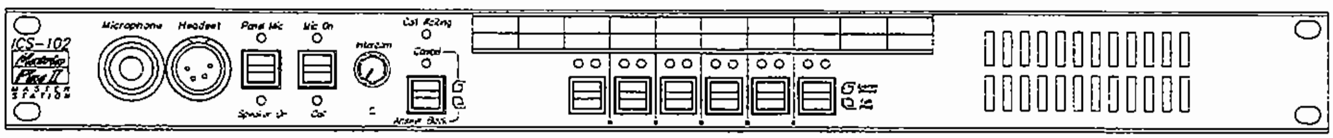
ICS-1502

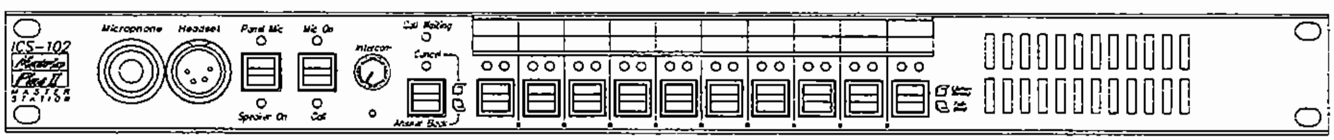


A. FRONT PANEL

B. REAR PANEL

FIGURE S2-1. ICS-1502 Front and Rear Panels





Matrix Plus II System ICS-62/ICS-102
MASTER STATION INTERCOM STATION

Introduction

This Section covers installation, adjustment, and specifications of the ICS-62 and ICS-102 Intercom Stations. The ICS-62 and ICS-102 are identical, except that the ICS-62 has six selector keys and the ICS-102 has ten selector keys. Figure S3-1 shows the front and rear of these two stations.

Installation

Installation of the ICS-62 and ICS-102 is identical to that of the ICS-2002 with the following exceptions:

- Mains AC Power
- Physical Size
- Second Ear Output is not available.

All other options such as the OPT-100 and XP expansion key panels install the same as for the ICS-2002.

As with other stations the letter "D" on the end of the model number indicates the digital 2-wire version.

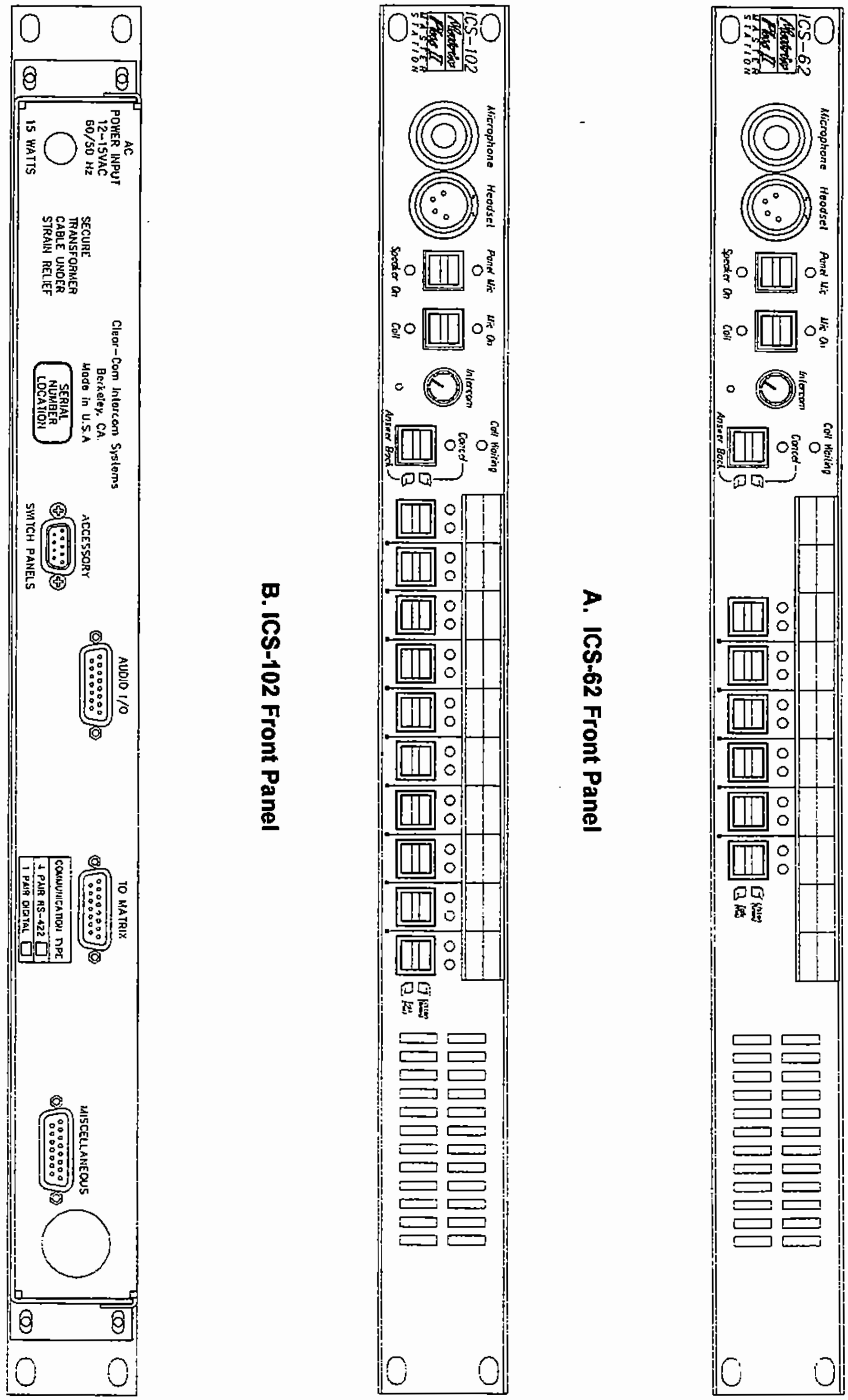
Mains AC Power

The ICS-62/ICS-102 stations are shipped with a wall-mount transformer that provides 14 volts RMS AC to the station. The transformer provided operates on a mains AC power voltage of either 117 volts (part no. 730166) or 220 volts (part no. 820049). The choice of transformer is made when ordering the station.

The power input to the station is internally protected with a 0.9 ampere "poly fuse". A poly fuse is a self-healing fuse that will recover when the fault is removed.

To connect the transformer supplied, route the cord from the transformer's secondary to the station's AC Power Input connector on the rear panel. This is a 2.1 mm Coax connector. When routing the cord make sure you use the stress relief on the rear panel as shown in view C. ICS-62/ICS-102 Rear Panel in Figure S3-1.

Any AC source which supplies between 12 and 16 volts RMS AC at 750 milliamps can power the station.



A. ICS-62 Front Panel

B. ICS-102 Front Panel

C. ICS-62 and ICS-102 Rear Panel

FIGURE S3-1. ICS-62/ICS-102 Front and Rear Panel

ICS-62/ICS-102

Adjustments

The adjustments required to prepare the ICS-62/ICS-102 include the headset sidetone and panel mic gain adjust. These adjustment procedures are the same as those described in the ICS-2002 Section and are not duplicated in this Section.

Specifications

All specifications of the ICS-62 and ICS-102 are identical to the ICS-2002 with exception of the following.

Speaker Amplifier Output

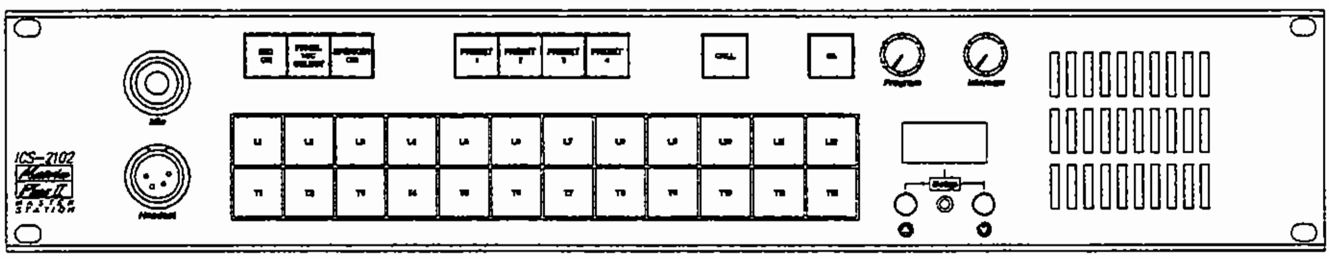
Impedance	8 Ohms
Power	4 Watts

Power

AC Input to Station	Between 12 and 16 VAC at 750 milliamps Mains AC Power Input to Wall-Mount Transformer 16 Watts (150 mA at 115 VAC)

Package Dimensions

Height:	1.75 inches (44mm), (1RU)
Width:	19.0 in. (483mm)
Depth:	6.75 in. (171mm)
Weight:	4.27 lbs (2.0Kg)



Matrix Plus II System ICS-2102

MASTER STATION INTERCOM STATION

Introduction

This Section covers installation, adjustment, and specifications of ICS-2102 Intercom Station. Figure S4-1 shows the front and rear of the ICS-2102.

Installation

The installation procedures for the ICS-2102 are identical to those described for the ICS-2002 Intercom Station in the ICS-2002 Section of this Installation Manual and are not duplicated in this Section.

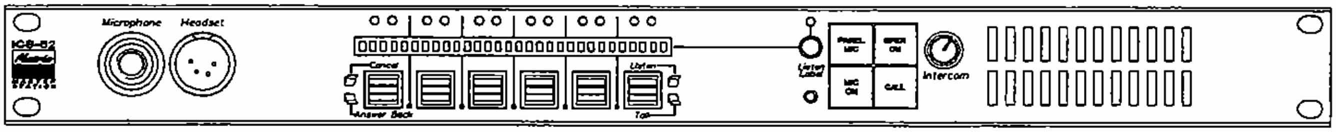
As with the ICS-2002, some connections depend on the OPT-100 Option installed in each ICS-2102 station. The OPT-100 Option and XP-12/ XP-22 Expansion Key Panels are installed in the ICS-2102 in exactly the same way as described in the ICS-2002 Section.

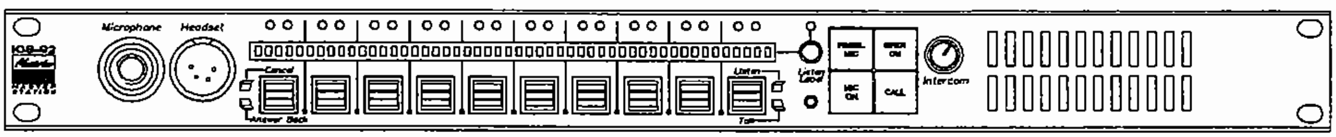
Adjustments

The adjustments, required to prepare the ICS-2102, are identical to those described for the ICS-2002 Intercom Station in the ICS-2002 Section of this Installation Manual and are not duplicated in this Section.

Specifications

The electrical and mechanical specifications of the ICS-2102 are identical to those of the ICS-2002 except where specifically noted in the ICS-2002 Section.





Matrix Plus II System ICS-92/ICS-52
MASTER STATION INTERCOM STATION

Introduction

This Section covers installation, adjustment, and specifications of the ICS-52 and ICS-92 Intercom Stations. The ICS-52 and ICS-92 are identical, except that the ICS-52 has six selector keys and the ICS-92 has ten selector keys.

Installation

Installation of the ICS-52 and ICS-92 is identical to that of the ICS-2002 with the following exceptions:

- Mains AC Power
- Physical Size
- Second Ear Output is not available.

All other options such as the OPT-100, XP, and XPL expansion key panels install the same as for the ICS-2002.

As with other stations the letter "D" on the end of the model number indicates the digital 2-wire version.

Mains AC Power

The ICS-52/ICS-92 stations are shipped with a wall-mount transformer that provides 14 volts RMS AC to the station. The transformer provided operates on a mains AC power voltage of either 117 volts (part no. 730166) or 220 volts (part no. 820049). The choice of transformer is made when ordering the station.

The power input to the station is internally protected with a 0.9 ampere "poly fuse". A poly fuse is a self-healing fuse that will recover when the fault is removed.

To connect the transformer supplied, route the cord from the transformer's secondary to the station's **AC Power Input** connector on the rear panel. This is a 2.1 mm Coax connector. When routing the cord make sure you use the stress relief on the rear panel.

Any AC source which supplies between 12 and 16 volts RMS AC at 750 milliamps can power the station.

Adjustments

The adjustments required to prepare the ICS-52/ICS-92 include the headset sidetone and panel mic gain adjust. These adjustment procedures are the same as those described in the **ICS-2002 Section** and are not duplicated in this Section.

Specifications

All specifications of the ICS-52 and ICS-92 are identical to the ICS-2002 with exception of the following.

Speaker Amplifier Output

Impedance	8 Ohms
Power	4 Watts

Power

AC Input to Station	Between 12 and 16 VAC at 750 milliamps Mains AC Power Input to Wall-Mount Transformer 16 Watts (150 mA at 115 VAC)

Package Dimensions

Height:	1.75 inches (44mm), (1RU)
Width:	19.0 in. (483mm)
Depth:	6.75 in. (171mm)
Weight:	4.27 lbs (2.0Kg)

Introduction

This Chapter specifies the computer hardware required to run the **Matrix Plus II System Configuration Program** ("**MXPLUS2**"), and how to install the **Configuration Program** software.

Installation

To run MXPLUS2, you will need a personal computer (PC) running DOS Version 3.3 or higher with at least 560K bytes of "free DOS memory", a 5¼- or 3½-inch low or high density floppy drive, a hard disk drive with at least 1.5 Megabyte of free storage, and one serial port. Standard VGA, EGA, and monochrome displays are supported. A mouse (which may require an additional serial port) is highly recommended, but not required. MXPLUS2 can also use "extended", "expanded", and/or "XMS" memory if it is available on the PC.

Required Hardware

The MXPLUS2 Configuration Program runs on an IBM-PC XT/AT 286, 386, or 486 (or compatible) computer having the qualifications described in the following paragraphs.

The PC must have at least 560K of "free DOS memory". This implies that the PC has 640K of physical RAM memory, but that up to 80K of it (640-80K=560K) may already be used for other purposes, such as the DOS operating system, network driver, mouse driver, and so on. To determine the amount of free DOS memory in your PC, run one of the DOS utilities "chkdsk" or "mem" (DOS Versions 3.3 and 5.0 respectively) from the DOS command line. For details on these utilities, consult your DOS manual. To get an accurate measurement of the amount of free memory available in a DOS window under Microsoft Windows, you need to run the "mem" utility from within that window.

The PC must have a hard disk drive. A hard disk is required, because MXPLUS2 uses "memory overlays" (described under the heading **Memory** below) which must be loaded at runtime from the disk drive, making operation from floppy drives extremely slow. Also the MXPLUS2 files are supplied in "compressed" form so that they will fit on a low density floppy disk for shipping. However, MXPLUS2.EXE cannot be executed from a low density (less than 1 Megabyte capacity) floppy drive, because its uncompressed file size is greater than 1Mbytes.

The amount of space used by the MXPLUS2 files in their uncompressed form on the disk drive is approximately 1.2 Mbytes for MXPLUS2.EXE, and an additional 100Kbytes for each configuration (.CFG) file. There are two configuration files supplied with the release bringing the minimum disk storage requirements to approximately 1.5 Megabyte.

Memory

The MXPLUS2 program uses an advanced "overlay" system to allow it to run within the 560K of DOS memory, even though it requires more memory than this. The "overlays" are portions of MXPLUS2 that are associated only with specific features of MXPLUS2, and thus do not always need to be present in DOS Memory. The overlays are not loaded from disk until the user selects an option that requires them. The result of this is that while a function may be noticeably slow the first time the user selects it, once its overlays have been loaded into DOS memory, subsequent uses of that function will be substantially faster. Physically, the overlays are part of the MXPLUS2.EXE file; they are not separate files as in older overlay systems.

MXPLUS2 can automatically detect and use any available "extended", "expanded", or "XMS" memory available on the PC. It uses this "extra" memory (i.e.; memory above and beyond the 560K of DOS memory it requires) for storing its overlays when they are not in use. This allows very fast access to the overlays, resulting in the fastest possible operation. If no usable extra memory is available on the system, MXPLUS2 accesses its overlays from the disk drive.

Mouse

A mouse is highly recommended for running MXPLUS2. However, MXPLUS2 can be run without a mouse as there are equivalent keystrokes available for every necessary action. If you are short of serial ports, there are several mouse vendors that provide "bus mouse" versions that do not require a serial port.

Serial Port Connection

MXPLUS2 requires a serial port to communicate with the Matrix Frame. MXPLUS2 can be configured to use any one of the standard PC serial ports COM1, COM2, COM3, or COM4.

Wiring

In this manual "DB-9F and "DB-25F" refer to female D-shell connector types, while "DB-9M" and "DB-25M" refer to male D-shell connector types.

The serial communication cable must use a DB-9M connector to attach to the matrix frame's DB-9F connector. The connector on the matrix frame is labeled "**IBM-PC RS-232**".

Figure C-1 shows the pinout of the **IBM-PC RS-232** connector on the back of the matrix frame.

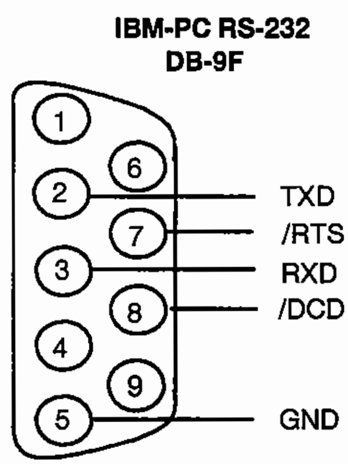


FIGURE C-1. Pinout of the IBM-PC RS-232 Connector on the Matrix Frame (Viewed From Rear of Frame)

Subsequent figures show the connections for a cable that connects the matrix frame to the computer. Two versions are shown, the first (Figure C-2) for a computer serial port with a DB-9M connector on the back (cable connector is female), the second (Figure C-3) for a computer serial port with a DB-25M connector on the back (cable connector is female).

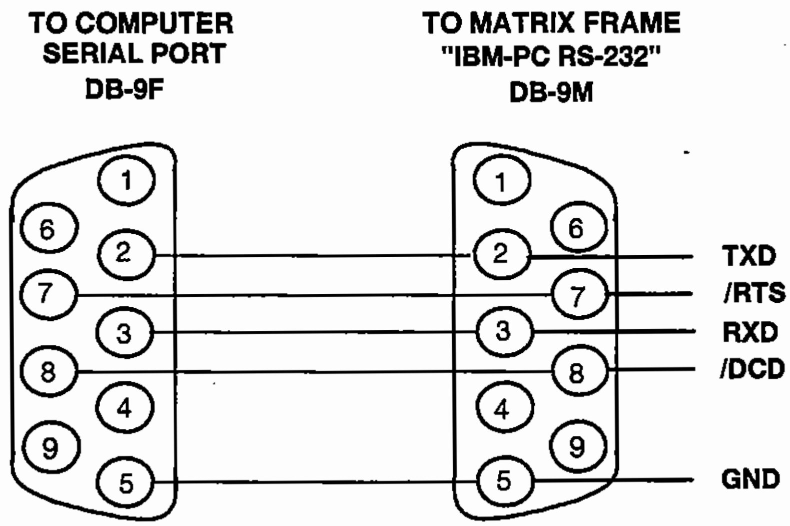


FIGURE C-2. Pinout of Cable Connecting Matrix Frame to Computer Port

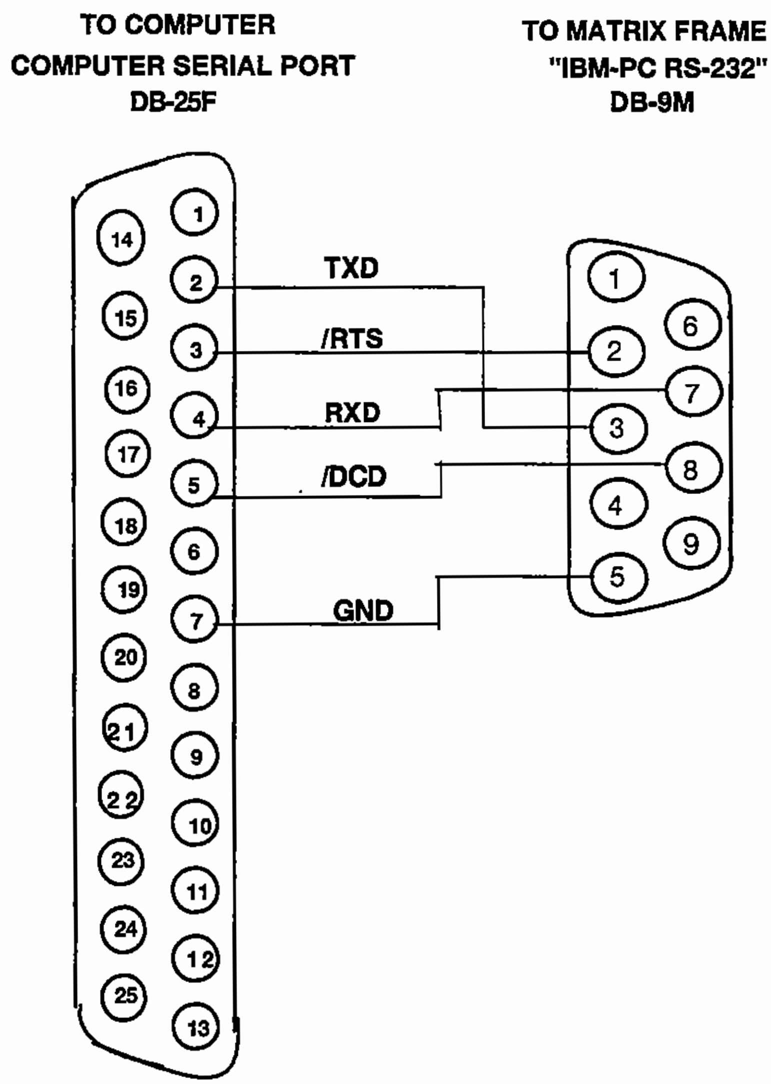


FIGURE C-3. Pinout of Cable Connecting Matrix Frame to Computer Serial Port (viewed from Cable Side of Connectors)

Software Installation

The **PGM-12 Configuration** Software is delivered on floppy disk in both of the following formats.

- 5¼ high density (1.2M) – 1 diskette
- 3½ high density (1.44M) – 1 diskette

After opening the shipping package, **make a backup copy of the disk**. For details on how to make a copy of the disk, please refer to your DOS Manual. Store the original disk(s) in a safe place.

To install the MXPLUS2 files onto your disk drive, run the install program supplied with the release. To do this, first make the drive where the MXPLUS2 distribution is located the current drive (for example by typing "A:" at the DOS prompt), then type "INSTALL". The installation utility will create the directory "MXPLUS2on the "C" drive and then will copy decompressed copies of the MXPLUS2 files into that directory. If another drive is desired besides "C", run the install program by typing "INSTALL d" ('d' is the desired drive name).

To cause the program to start every time the computer is turned on, place the statement "**MXPLUS2**" in the AUTOEXEC.BAT file. This must be preceded by changing to the directory that the MXPLUS2.EXE file is located in, or that directory must be in the DOS search path.

To run the program, make your MXPLUS2 directory the current path (or make sure the directory is in the search path) and type "**MXPLUS2**" at the DOS command prompt.

Program Files

The following files are supplied on the disk(s) and the following paragraphs explain the purpose of each of these files.

INSTALL.BAT

MX2FILES.EXE

INSTALL.BAT

INSTALL.BAT is an executable file that decompresses the MX2FILES.EXE file, creates the directory \MXPLUS2 and copies the **Configuration Program** files from the distribution diskette to your computer's hard disk drive. The default drive is C.

MX2FILES.EXE

The MX2FILES.EXE file contains the files that were compressed so they could be shipped on floppy disks. The files that were compressed are as follows:

MXPLUS2.EXE

SAMPLE.CFG

MXPLUS2.HLP

MXPLUS2.PDT

MXPLUS2.FNT

MXPLUS2.EXE

MXPLUS2.EXE is the executable program file for the **Configuration Program**. To run the **Configuration Program**, make the MXPLUS2 directory the current directory and type **MXPLUS2** at the DOS prompt.

MXPLUS2.EXE is also used to store the password, the screen colors, and other setup information for MXPLUS2.

SAMPLE.CFG

The file SAMPLE.CFG contains the Matrix Plus II System Configuration used at the factory to produce the example **Configuration Program** screens shown in the **Configuration** Chapter in **Volume I, Matrix Plus II System Operation Manual**. We encourage you to examine and experiment with these screens as you read through the **Operation Manual**.

MXPLUS2.HLP

This file contains all of the HELP screens for the program.

MXPLUS2.PDT

This file contains the printer definitions used by MXPLUS2 to print selector key designation strips.

MXPLUS2.FNT

This file contains the font used by MXPLUS2 to print selector key designation strips.

Directories Used with the Configuration Program

A typical **Configuration Program** installation requires only a single directory. For example, you may use multiple directories if it is convenient for you, but each directory must contain a separate version of MXPLUS2.EXE if the password(s), serial port setup or other items set from the PC Setup Screen are to be different for each directory's configuration files. For details, refer to **PC Setup Screen** in this Chapter.

The **Configuration Program** stores your settings within the file MXPLUS2.EXE and uses them whenever you run the **Configuration Program**.

MXPLUS2 Settings For Your PC

To set the opening password, PC serial mode, serial port, serial baud rate and screen colors for your computer, select **PC Setup** in the MXPLUS2 Menu Screen. The default settings will work on most PCs. Setting these parameters is described in the following paragraphs.

Password Protection

When the **Configuration Program** starts up, it displays the title screen and requests a password (the "Opening Password") if one has been set. When shipped from Clear-Com, the **Configuration Program** has no opening password set.

To set the opening password, select "PC Setup" from the MXPLUS Menu. Type the desired password in the Password field, the press <Enter> (while the cursor is in the field) to confirm it. The password is not case sensitive. That is, "MYPASSWORD" is the same as "mypassword". To allow users to enter MXPLUS2 without entering a password, delete any password in the field.

Your opening password will be stored within the DOS file MXPLUS2.EXE. To keep your system secure, put the original **Configuration Program** diskette in a secure place, because it can be used to wipe out any existing passwords and gain access to your system.

If your password is lost or forgotten, you can wipe out any existing passwords and install new ones. To do this, repeat the installation procedure. NOTE: Save any important configurations under names other than those on the distribution disk. Then use the "Password" function in the PC Setup Screen to assign a new password. After replacing MXPLUS2.EXE, you will also need to reconfigure the rest of the PC Setup parameters.

Display Type:

MXPLUS2 attempts to correctly determine the type of display adapter on your PC. In some cases it is necessary to force MXPLUS2 to use either the monochrome map or the color map. The monochrome map is predetermined, and is designed for use with "Hercules" (or compatible) monochrome adapters. The color map is determined by the color selection fields in the lower part of the PC Setup screen. To select a mode, choose Auto-Detect, Color, or Monochrome from the popup selection box selected by this field.

Display Colors:

MXPLUS2 lets you set the colors for various categories of screens and data. To set these colors, click on the field in the color display map, and select the desired foreground/background color pair for that category from the color selection popup. Once you select a color pair from the popup, the display map reflects your choices. To cause MXPLUS2 to actually save and use the color set displayed in the display map, click on the Save New Colors button below the map. To restore the default color map, click on the Restore Default Colors button.

If you are using a grey-scale monitor such as the monochrome VGA often found in laptop computers, you should set the Display Type field to Color, then use the color selection fields to set appropriate grey tones for your monitor.

Report Printer:

This field allows you to set the destination printer port for reports sent directly to a printer from the MXPlus - Reports screen. Printer choices are PostScript or HP LaserJet Series II, and port choices are LPT1, LPT2, or LPT3.

Label Printer:

These fields allow you to set the printer type and destination port MXPLUS2 will use when printing selector key designation strips from the Stations - Key Assignments screen. Printer choices are PostScript or HP LaserJet Series II, and port choices are LPT1, LPT2, or LPT3.

NOTE: The PostScript and HP LaserJet printer drivers are designed to be as compatible as possible with the wide variety of printers available. However, Clear-Com cannot guarantee that these drivers will work correctly with every printer. If you experience difficulty printing designation strips on your printer, please contact Clear-Com Technical Support.

PC Serial Port

To set the serial port used to communicate between your computer and the matrix frame, select COM1, COM2, COM3, or COM4 from the PC Serial Port field of the MXPLUS-PC SETUP screen. When shipped from the factory, the serial port is set to COM2, because COM1 is often used for the mouse.

PC Serial Baud Rate

The default baud rate, Standard Operation (19.2K baud) is used in almost all cases. Under certain circumstances you may need to run at the slower rate provided by the Long Line Operation setting (9600 baud). For example, if your PC to Frame cable is very long. The CPU-100 card automatically detects the baud rate set by the PC and adapts to it.

Verifying the Installation

After installing the RS-232 cable and setting the program parameters, you can verify the operation of the **Configuration Program** and its communications with the matrix frame by attempting to load the current configuration of the matrix from the matrix frame to the computer.

To do this, select "On-Line to Matrix" from the MXPlus Menu of the **Configuration Program**. The computer will request the frame to send the current configuration. While the computer is communicating with the frame, the screen will display the message "Uploading Configuration from Matrix" and the amber PC Serial LED on the CPU-100 card will flicker.

If the computer correctly receives this configuration information from the matrix frame, the installation is successful. If the Template Filename stored in the CPU-100 card memory cannot be found or the CPU-100 card has been reset to its generic configuration, a warning box will appear, this is normal and confirms correct data communication with the frame.

Otherwise, the screen will display the error message "The frame is not responding. Check serial port connections". If this message appears, check the cable connecting the computer to the frame to make sure that it is plugged in and that it makes the correct connections as described in the Serial Port Connection section above. This message is also displayed if the matrix frame does not have mains AC power or if the CPU-100 card is unplugged from the frame or installed in the wrong slot or not installed at all.

If the "Loading Current Frame Configuration Into PC Memory" message stays on the screen more than 4 minutes, communications have somehow failed. In this case, press the computer's <ESCAPE> key and wait a few seconds (no more than 10 seconds). This should bring you back to the MXPLUS2 Main menu. If it does not, you will need to reboot the computer by pressing the <Alt><Ctrl><Del> keys simultaneously.

Troubleshooting

If communications between the frame and the computer fail, the most common causes are as follows:

1 Wrong serial port is selected in MXPLUS - PC Setup. A mouse or other active device may fool the hardware handshake lines into thinking a frame is connected.

2 Cable is plugged into wrong serial port connector on PC

3 Cable is miswired.

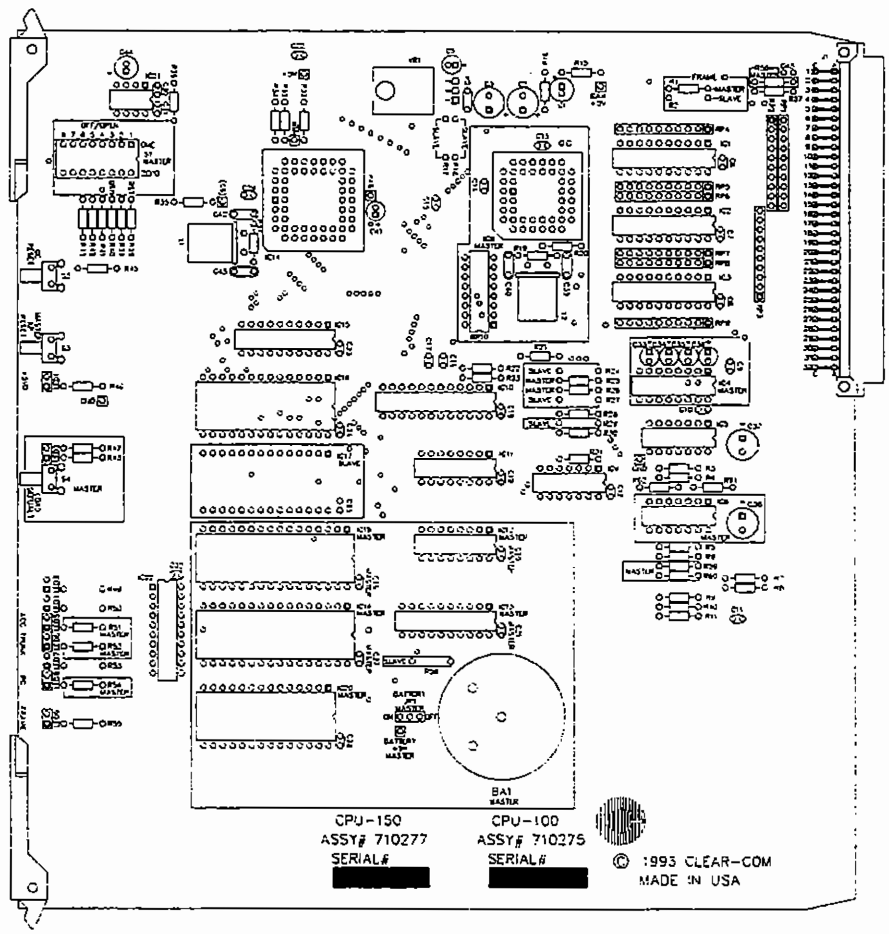
4 Wrong baud rate is selected.

5 PC is not fast enough to support selected baud rate

6 Cable is too long for baud rate selected

If the problem persists, reset the CPU-100 card and the computer, and try again. If the problem still persists, check the computer's serial port by running some other device (such as mouse) through the port, then try replacing the CPU-100 card..

If MXPLUS2 "crashes" or exits with an "abnormal termination" or other error message, the problem is almost certainly that your computer has less than the required 560K of free DOS memory. See the discussion under Required Hardware in this section for details. If you experience a crash like this, you will need to reboot your computer before proceeding (or attempting to run other programs on your computer). The solution to this problem involves editing your AUTOEXEC.BAT and/or CONFIG.SYS files to free up more DOS memory.



Matrix Plus II System CPU-100

MASTER FRAME CONTROLLER CARD

Introduction

This Section describes the CPU-100 Master Controller Card and the factors to consider when installing it into the matrix frame. It describes the battery jumper pins and installation and operation. This Section also provides the specifications of the card.

Description

One CPU-100 Master CPU Controller Card is required for each Master card frame, providing control functions for the system.

The CPU-100 provides the following functions:

- Control of all matrix cards in the frames
- Serial data connection to the external IBM-PC computer running the **Matrix Plus II System Configuration Program.**
- Serial port dedicated for Linking multiple systems together.
- Serial port for accessory modules to be directly connected to the Matrix Frame.
- Memory used to store the operational configuration of the system. A second bank of memory is available for a default configuration.
- Battery backup of system memory.

CPU-100

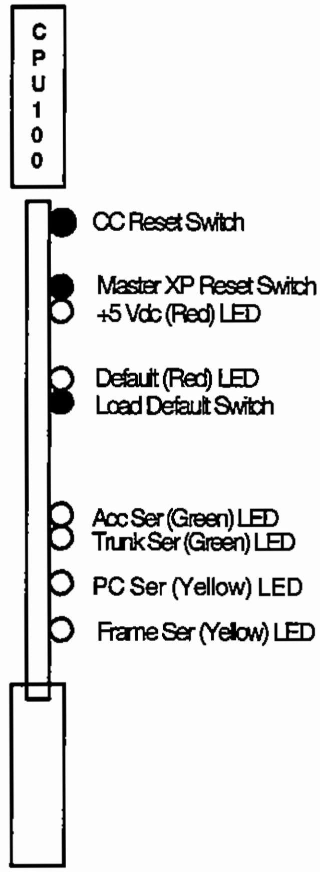


FIGURE M1-1. CPU-100 Front Installation View with Switches and LED Labels

Installation

The paragraphs below describe how to set the baud rate for serial communication to the external PC Configuration computer, the considerations when handling the CPU-100, and the use of the battery disconnect jumper.

Handling

When installing the CPU-100 Card, be careful not to bend any of the connector pins or component leads on the board. The board contains CMOS integrated circuits that can be destroyed by static electricity. Before handling the board, touch a grounded metal object to dissipate any residual static on your hands that could result in a static spark being produced and dissipated within the circuit board.

The CPU-100 contains one lithium battery to provide back-up power for its processor's internal RAM memory. A set of jumper pins on the board allow you to disconnect the battery from the circuit for replacement, and when servicing the CPU-100 circuit board. Always disconnect the battery as described under the heading **CPU-100 Battery Backup,** in this Section, before servicing any part of the RAM circuits on the board. Disconnecting the battery causes the battery-backed RAM memory to lose any configuration information stored in it.

Storage

Caution: Lithium batteries may overheat and possibly explode if they are shorted. When you handle the loose battery or the entire CPU-100 circuit board, never let the battery (or the circuits that it is connected to) touch external electrically conducted materials.

Spare CPU-100 circuit boards should be stored in electrically insulating packaging, for example, heavy duty plastic bags. They can also be stored in empty slots in a matrix frame without disturbing the system.

CPU-100 Battery Backup

The CPU-100 Controller Card contains one lithium battery to provide back-up power for all RAM memory. The Battery jumper on the PC board allows you to disconnect the battery from the circuit for replacement, and when servicing the CPU-100 circuit board. Always disconnect the battery before servicing any part of the RAM circuits on the board. Disconnecting the battery causes the battery-backed RAM memory to lose any configuration information stored in it.

The lithium battery should be replaced every 5 years as a preventive maintenance measure.

To disconnect the battery from the circuit, first find the jumper labeled "Battery" on the CPU-100 circuit board. In normal operation, the battery is connected to the circuit, and the Battery jumpers installed across the set of pins on the header that are towards the front of the card. To disconnect the battery, remove the jumper and replace it on the pair of pins on the other side of the header. This grounds the backup power circuits while the battery power is disconnected.

Warning: The Battery jumper must be replaced onto its adjacent grounding jumper pins whenever they are removed from their original location! If they are not replaced, the run-time behavior of the CPU-100 will be unpredictable, for example, the microprocessor may reset itself intermittently.

Verification of Installation

CPU-100

The LED indicators on the CPU-100 Controller Card provides a quick check that it has been installed correctly and is able to power up and communicate with the system. Figure M1-1 shows the layout of the LED indicators on the CPU-100. The following discussion describes the appearance of each LED during various operating conditions.

- **+5 VDC** (red). When lit indicates that +5 Volt DC power is supplied to the CPU-100 Card.
- **LOAD DEFAULT** (red). This led has two functions. When the LOAD DEFAULT push-button is pressed the led will flash for 5 seconds warning of an impending down-loading of the DEFAULT configuration is memory to the CURRENT configuration. After the 5 second time-out the led will stay on solid and will remain on until there is some change to the CURRENT configuration that makes it different from the DEFAULT.
- **ACC SERIAL DATA COMMUNICATION** (green). When lit indicates that the CPU-100 is in progress of an actual data transmission to the Accessory Port (RLY-8). In actual use this communications only happens when there is a status change in one or more relays .
- **TRUNK SERIAL DATA COMMUNICATION** (green). When lit indicates that the CPU-100 is in progress of actual communication to another Matrix frame for LINKING purposes. In actual use this led will flicker occasionally.
- **PC SERIAL DATA COMMUNICATION** (amber). When lit indicates the **Configuration Program** is actively sending/receiving configuration information to/from the matrix frame.
- **FRAME SERIAL DATA COMMUNICATION** (amber). When lit indicates that communication between the CPU-100 Card and one of the crosspoint Cards is actively in progress. In normal use this LED Indicator flashes at a regular interval..

Specifications

Microprocessor Type

Motorola 68HC11

Program Memory

16 K Bytes EPROM

Ram Memory

Type:	Static CMOS
Quantity:	256K Bytes
Redundancy:	Lithium Battery Backed with 5 years life min.

Serial Communication Ports

1. RS-232 for Configuration computer connection

Signal Levels :	Conforms to RS-232 voltage and timing specifications.
Type:	Asynchronous (8 bits, odd parity and one stop bit)
Baud Rates:	1200 Baud to 19.2K Baud.

2. RS-422 for System linking

Signal Levels:	Conforms to RS-422 voltage and timing specifications
Type:	Asynchronous (8 bits with parity)
Baud Rates:	300 to 9600 Baud selectable from the Configuration Program.

3. ACCESSORY Port

Purpose:	System accessories (e.g.; RLY-8)
Signal Levels:	5-volt TTL Logic
Baud Rates:	Custom synchronous serial bus

4. FRAME SERIAL COMMUNICATION Port

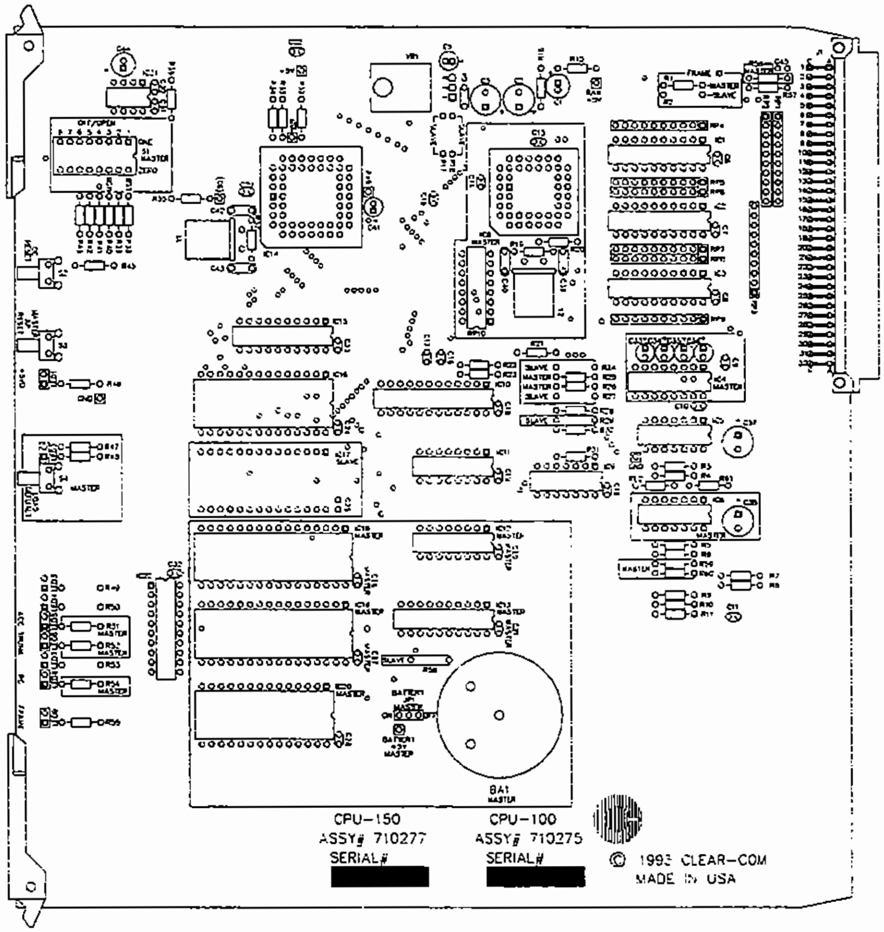
Purpose:	Internal frame communication to Matrix Cards
Type:	Asynchronous (8 bits with parity)
Signal Levels:	5-volt TTL Logic
Baud Rates:	38K BAUD

DC Power Requirements

Regulation:	Contains regulators for its DC supply	Input
Voltage:	8 - 10 Volts DC	Current:
	200 mA DC	

Dimensions

Form Factor:	6U "Euro Style PC Board	Con-
nectors:	1 64-pin "Euro" Style	Dimen-
sions:	10 by 8.5 inches (25.4 cm by 21.6 cm)	
Weight:	0.6 lb (0.27 Kg)	



Matrix Plus II System CPU-150

SLAVE FRAME CONTROLLER CARD

Introduction

This Section describes the CPU-150 Expanded CPU Controller Card and the factors to consider when installing it into the matrix frame. It describes verifying the installation and operation of the CPU-150 based upon the pattern of the LED indicators on the card. This Section also provides the specifications of the card.

Description

For applications using 51 or more audio ports, one CPU-150 Expanded CPU Controller Card is required for the matrix and is installed in the SCF-101 Expansion Card Frame. The CPU-150 is not required if your application is using either an MCF-25 or MCF-50 Master Card Frame.

The CPU-150 assists the CPU-100 Master Controller Card to gather communication requests from the matrix cards in the second frame. The communication between the CPU-150 and CPU-100 is automatic and transparent to the user.

Figure M2-1 shows the CPU-150 matrix card as viewed from the front of the matrix card frame.

Installation

The paragraphs below describe the considerations when handling the CPU-150 and the verification of the installation.

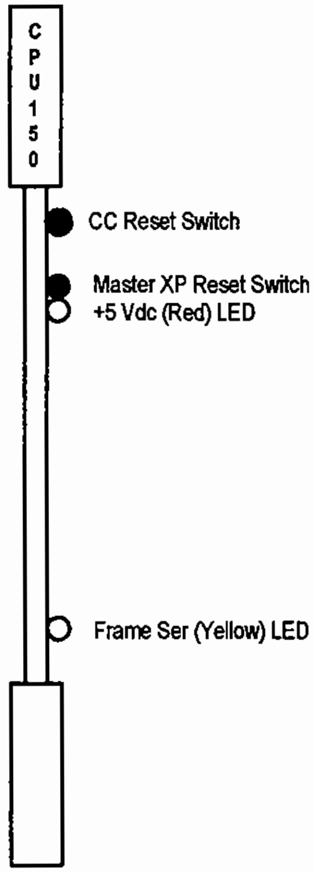


FIGURE M2-1. CPU-150 Front Installation View with Switches and LED Labels

Handling

When installing the CPU-150 Card, be careful not to bend any of the connector pins or component leads on the board. The board contains CMOS integrated circuits that can be destroyed by static electricity. Before handling the board, touch a grounded metal object to dissipate any residual static on your hands that could result in a static spark being produced and dissipated within the circuit board.

Spare CPU-150 circuit boards should be stored in electrically insulating packaging, for example, heavy duty plastic bags.

Verification of Installation

The LED indicators on the CPU-150 Expanded CPU Controller Card provides a quick check that it has been installed correctly and is able to power up and communicate with the system. Figure M2-1 shows the layout of the LED indicators on the CPU-150. The following discussion describes the appearance of each LED during operating conditions.

The +5 Volt Digital Power Supply LED should be lit continuously. The Frame Serial Data Communication LED is lit when communication between the CPU-150 card and the CPU-100 card is actively in progress.

Specifications

Microprocessor Type

Motorola 68HC11

Program Memory

16 K Bytes EPROM

Ram Memory

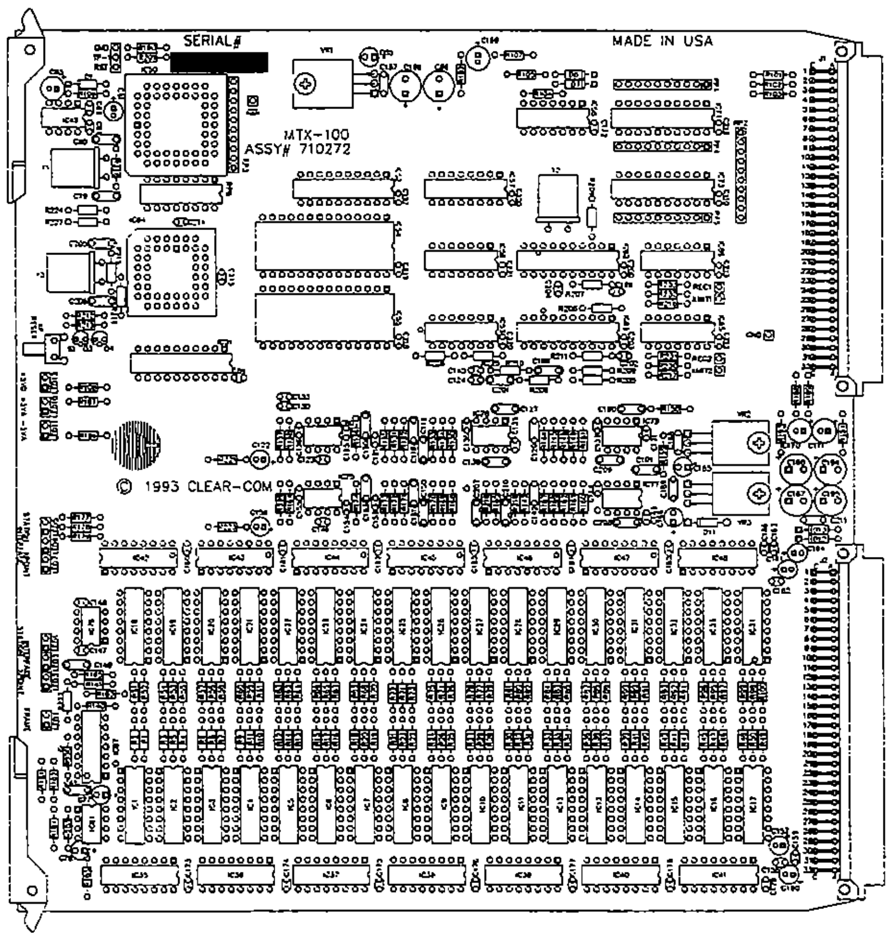
Type:	Static CMOS
Quantity:	8K Bytes

DC Power Requirements

Regulation:	Contains regulators for its DC supply
Input Voltage:	8 - 10 Volts DC
Current:	100 mA DC

Dimensions

Form Factor:	6U "Euro Style PC Board
Connectors:	1 64-pin "Euro" Style
Dimensions:	10 by 8.5 inches (25.4 cm by 21.6 cm)
Weight:	0.6 lb (0.27 Kg)



Matrix Plus II System MTX-100

STATION CROSSPOINT CARD

Introduction

This Section describes the MTX-100 Station/Interface Crosspoint Card including the DTMF Option for the MTX-100 and the factors to consider when installing cards into the matrix frame. It describes verifying the installation and operation of the MTX-100 based upon the pattern of the LED indicators on the card. This Section also provides the specifications of both the cards.

Description

The following paragraphs describe the MTX-100 and the DTMF Option for MTX-100.

MTX-100 Crosspoint Card

The MTX-100 Station/Interface Crosspoint Card contains the electronic crosspoint switches and communications hardware necessary to add two ports to the matrix. Each of these two ports includes all the circuitry required to connect either an intercom station (via 6-Wire/3-Pair or 8-Wire/4-Pair) or an interface (via audio 4-wire) to the matrix.

The Reset pushbutton on the front edge of the MTX-100 card causes the microprocessor on the MTX-100 card to stop whatever it is doing and restart. Resetting the MTX-100 disconnects all communication paths on both ports of the MTX-100 Card.

Figure M3-1 shows the MTX-100 matrix card as viewed from the front of the matrix card frame. The label on the bottom of the card informs you if the MTX-100 card contains the DTMF Option.

DTMF Option for MTX-100

The DTMF Option for the MTX-100 is a kit consisting of a pair of DTMF encoder/decoder chips providing direct inward access using pre-programmed DTMF tone codes. The direct inward access allows the caller to activate pre-programmed talk and listen paths within the system. This direct inward access is controlled through the use of direct dialing labels, passwords, and selector codes that are assigned from the Matrix Plus II System Configuration Program.

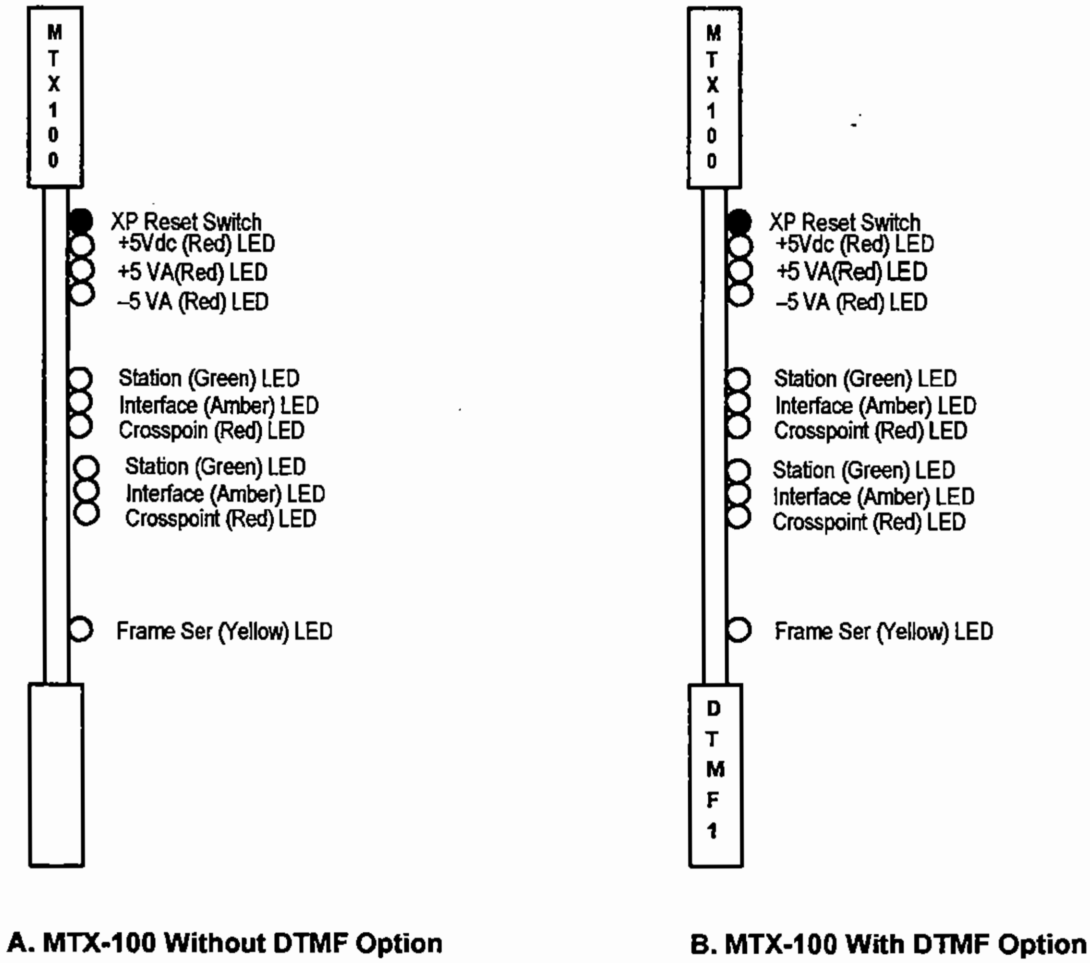


FIGURE M3-1. MTX-100 Front Installation View with Switches and LED Labels

Installation

The paragraphs below describe the considerations when handling the MTX-100 cards, the port numbering scheme, and the verification of the installation.

Handling

When installing the MTX-100 Card, be careful not to bend any of the connector pins or component leads on the board. The board contains CMOS integrated circuits that can be destroyed by static electricity. Before handling the board, touch a grounded metal object to dissipate any residual static on your hands that could result in a static spark being produced and dissipated within the circuit board.

Spare MTX-100 circuit boards should be stored in electrically insulating packaging, for example, heavy duty plastic bags or in unused slots in the matrix frame.

Port Numbering

The extreme leftmost card slot on the MCF-100, MCF-50 and MCF-25 Card Frame is always occupied by the CPU-100 Master CPU Controller Card and does not occupy any port number. Applications using 51 or more audio ports will also require an SCF-101 Expansion Card Frame with its leftmost card slot occupied by the CPU-150 Expanded CPU Controller Card. The slot in the matrix frame that each MTX-100 card is installed in determines the port number for that port.

The port number is used to identify the port from within the functions of the Matrix Plus II System Configuration Program. Beginning with the leftmost card slot on the MCF-100, MCF-50 ,MCF-25 and MCF-10 Mini-Frame Card Frames next to the CPU-100 Card the port numbers are 1 and 2, the second card slot port numbers are 3 and 4, and continue in this numbering sequence up to the maximum number of ports for the frame.

For applications with 51 or more ports, beginning with the leftmost card slot on the SCF-101 Card Frame next to the CPU-150 Card, the port numbers are 51 and 52, then the next slot is 53 and 54. This numbering sequence continues up to the maximum number of 100.

Verification of Installation

The LED indicators on the MTX-100 Card provide a quick check that the card has been installed correctly and is able to power up and communicate with the system. Figure M3-1 shows the layout of the LED indicators on the MTX-100 and DTMF Option for MTX-100 Cards. The following discussion describes the appearance of each LED during operating conditions.

Top Three Leds: The top three (red) LEDs indicate that DC power is applied to the card (+5 Volts Digital, +5 Volts Analog, and -5 Volts Analog, respectively).

Middle Group of Three Leds: The middle group of three LED indicators provide information about the first of the two ports on the card.

- Top Green Led (Station Connected Indicator) The top LED, when lit, indicates that the port is connected to a Matrix Plus II intercom station and that data communications to and from the station are established. This LED indicator should always be lit when the port is connected to an intercom station.
- Middle Amber Led (Interface Connected Indicator) The second LED, when lit, indicates that the port is connected to a Matrix Plus II interface.
- Bottom Red Led (Crosspoint Closed Indicator) The third LED, when lit, indicates that at least one crosspoint switch is closed on that port.

Bottom Group of Three Leds: The bottom group of three LED indicators provide information about the second of the two ports on the card. The color and function of these leds is identical to the middle group except that they relate to the second port.

Bottom Single Amber Led: When lit indicates that the port is currently communicating with the CPU-100 Master CPU Controller Card. The LED is on only during actual communication with the CPU-100 so normally it will only be on briefly. During up-loading and down-loading it will be on longer but only during actual communication to or from the CPU-100.

Specifications

Microprocessor Type
Motorola 68HC11

Program Memory
16K Bytes EPROM

Ram Memory

Type:	Static CMOS
Quantity:	16K Bytes

Serial Communication Ports

1. RS-422 for Station Communication (2 Ports)

Signal Levels:	Conforms to RS-422 voltage and timing specifications
Type:	Asynchronous (8 bits with parity)
Baud Rates:	300 to 9600 Baud selectable from the Configuration Program.

2. FRAME SERIAL COMMUNICATION Port

Purpose:	Internal frame communication to Matrix Cards
Type:	Asynchronous (8 bits with parity)
Signal Levels:	5-volt TTL Logic
Baud Rates:	38K BAUD

4-Wire Audio Ports

Port Quantity: 2

Outputs	
Level	0.0 dBv Nominal
Imped.	50 Ohms, Electronically Balanced
Freq. Resp.	100 to 18k Hz ± 1.0 dB
Distortion	Less than 0.1% THDOutputs
Inputs	
Level	0.0 dBv Nominal
Imped.	300 Ohms, Electronically Balanced
Freq. Resp.	100 to 18k Hz ± 1.0 dB
Distortion	Less than 0.1% THD

DTMF Tone Characteristics

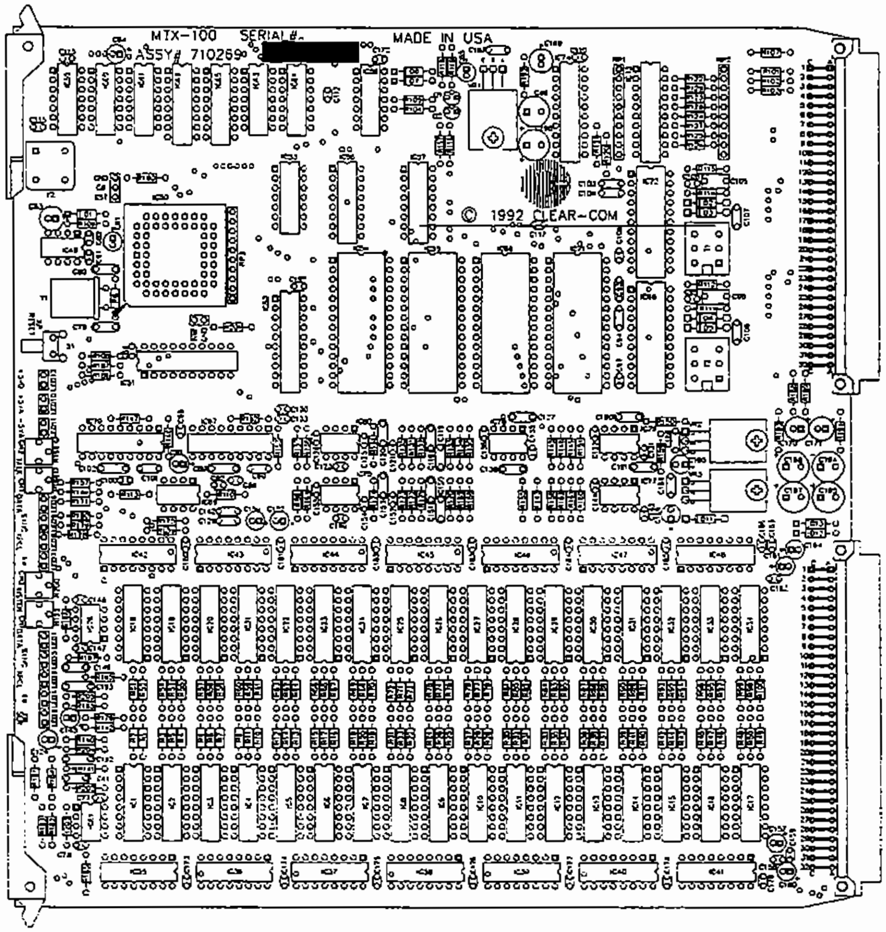
DTMF Tones:	Standard "Telephone Central Office" compatible Tone Burst Duration (Sending) 50 milliseconds (typical) 52 milliseconds (maximum) Minimum required DTMF tone duration (receiving) 20 milliseconds

DC Power Requirements

Regulation:	Contains regulators for its DC supply
Input Voltage:	8 - 10 Volts DC
Current:	100 mA DC

Dimensions

Form Factor:	6U "Euro Style PC Board
Connectors:	2 - 64-pin "Euro" Style
Dimensions:	10 by 8.5 inches (25.4 cm by 21.6 cm)
Weight:	0.6 lb (0.27 Kg)



Matrix Plus II System MTX-200

STATION CROSSPOINT CARD

Introduction

This Section describes the MTX-200 Digital Station Crosspoint Card and the factors to consider when installing the card into the matrix frame. It describes verifying the installation and operation of the MTX-200 based upon the pattern of the LED indicators on the card. This Section also provides the specifications of the card.

Description

The MTX-200 Digital Station Crosspoint Card contains the electronic crosspoint switches and communications hardware necessary to add two ports to the matrix. The MTX-200 only supports an intercom station configured for single pair operation.

The Reset pushbutton on the front edge of the MTX-200 card causes the microprocessor on the MTX-200 card to stop whatever it is doing and restart. Resetting the MTX-200 disconnects all communication paths on both ports of the MTX-200 Card.

Figure M4-1 shows the MTX-200 matrix card as viewed from the front of the matrix card frame.

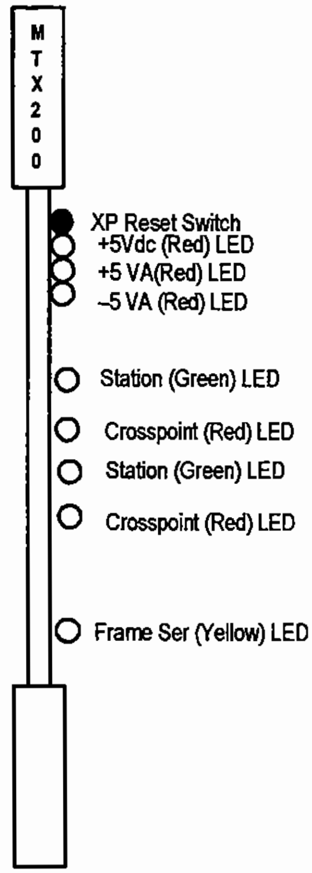


FIGURE M4-1. MTX-200 Front Installation View with Switches and LED Labels

Installation

The paragraphs below describe the considerations when handling the MTX-200 card, the port numbering scheme, and the verification of the installation.

Handling

When installing the MTX-200, be careful not to bend any of the connector pins or component leads on the board. The board contains CMOS integrated circuits that can be destroyed by static electricity.

Before handling the board, touch a grounded metal object to dissipate any residual static on your hands that could result in a static spark being produced and dissipated within the circuit board. Extra cards could be stored in unused slots in the frame.

Port Numbering

The extreme leftmost card slot on the MCF-100, MCF-50 and MCF-25 Card Frame is always occupied by the CPU-100 Master CPU Controller Card and does not occupy any port number. Applications using 51 or more audio ports will also require an SCF-101 Expansion Card Frame with its leftmost card slot occupied by the CPU-150 Expanded CPU Controller Card. The slot in the matrix frame that each MTX-100 card is installed in determines the port number for that port.

The port number is used to identify the port from within the functions of the Matrix Plus II System Configuration Program. Beginning with the leftmost card slot on the MCF-100, MCF-50 ,MCF-25 and MCF-10 Mini-Frame Card Frames next to the CPU-100 Card the port numbers are 1 and 2, the second card slot port numbers are 3 and 4, and continue in this numbering sequence up to the maximum number of ports for the frame.

For applications with 51 or more ports, beginning with the leftmost card slot on the SCF-101 Card Frame next to the CPU-150 Card, the port numbers are 51 and 52, then the next slot is 53 and 54. This numbering sequence continues up to the maximum number of 100

Verification of Installation

The LED indicators on the MTX-200 Card provide a quick check that the card has been installed correctly and is able to power up and communicate with the system. Figure M4-1 shows the layout of the LED indicators on the MTX-200 Card. The following discussion describes the appearance of each LED during operating conditions.

Top Three Leds: The top three (red) LEDs indicate that DC power is applied to the card (+5 Volts Digital, +5 Volts Analog, and -5 Volts Analog, respectively).

Middle Group of Two Leds: The middle group of two LED indicators provide information about the first of the two ports on the card.

- Top Green Led (Station Connected Indicator) The top LED, when lit, indicates that the port is connected to a Matrix Plus II intercom station and that data communications to and from the station are established. This LED indicator should always be lit when the port is connected to an intercom station.
- Bottom Red Led (Crosspoint Closed Indicator) The third LED, when lit, indicates that at least one crosspoint switch is closed on that port.

Bottom Group of Two Leds: The bottom group of two LED indicators provide information about the second of the two ports on the card. The color and function of these leds is identical to the middle group except that they relate to the second port.

Bottom Single Amber Led: When lit indicates that the port is currently communicating with the CPU-100 Master CPU Controller Card. The LED is on only during actual communication with the CPU-100 so normally it will only be on briefly. During uploading and downloading it will be on longer but only during actual communication to or from the CPU-100

Specifications

Microprocessor Type
Motorola 68HC11

Program Memory
16K Bytes EPROM

Ram Memory

Type:	Static CMOS
Quantity:	16K Bytes

Serial Communication Ports

Purpose:	Internal frame communication to Matrix Cards
Type:	Asynchronous (8 bits with parity)
Signal Levels:	5-volt TTL Logic
Baud Rates:	38K BAUD

2-Wire Digital Ports to Digital Stations

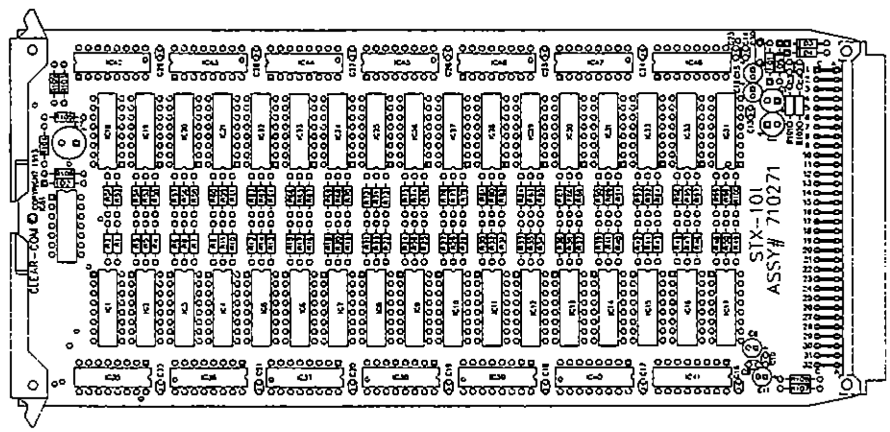
Port Quantity	2
Type	ISDN (non-standard) U-type loop
Data Rate	160 Kilobits/sec full duplex
Line Impedance	100 to 120 Ohms at 120 kHz
Signal Level	1.2 volts peak-to-peak, ± 0.2 volts
Signal Type	Complex biphase modulation with soft edges.
Audio Coding	8 bit "µ Law" companded at 8K samples/sec.
Audio Freq.	Resp.200 to 3500 Hz, ± ½ dB
SN Ratio	Greater than 60 dB, 200 to 3500 Hz

DC Power Requirements

Regulation:	Contains regulators for its DC supply
Input Voltage:	8 - 10 Volts DC
Current:	100 mA DC

Dimensions

Form Factor:	6U "Euro Style PC Board
Connectors:	2 - 64-pin "Euro" Style
Dimensions:	10 by 8.5 inches (25.4 cm by 21.6 cm)
Weight:	0.6 lb (0.27 Kg)



Matrix Plus II System STX-101
CROSSPOINT EXPANSION CARD

Introduction

This Section describes the STX-101 Expansion Crosspoint Card and the factors to consider when installing the card into the matrix frame. This Section also provides the specifications of the card.

Description

For those applications requiring 51 or more audio ports, the STX-101 Expansion Crosspoint Card contains the necessary circuitry to expand the 2 X 50 crosspoint switch matrix of the MTX-100 and MTX-200 to a 2 X 100 switch matrix for each slot in a card frame. The MCF-100 and SCF-101 frames are constructed such that each matrix card slot has a companion STX-101 slot for this expansion. The STX-101 does not contain any reset switches or LED indicators. Each STX-101 is controlled by the matrix card that is directly above it.

The MTX cards contain the TALK switches for all ports within the frame it is located in. The STX cards contain the TALK switches necessary to connect to the ports located in the other frame of a two frame system. In the first frame (MCF-100) the MTX cards have TALK switches for ports 1 to 50 and the STX cards have TALK switches for ports 51 to 100. In the second frame (SCF-101) the MTX cards have TALK switches for ports 51 to 100 and STX cards have TALK switches for ports 1 to 50.

Normally, one STX-101 card is installed with each MTX matrix card installed in the system. It is possible to selectively install STX-101 cards only in those slots that need TALK paths to ports that are located in the other frame.

Installation

When installing the STX-101, be careful not to bend any of the connector pins or component leads on the board. The board contains CMOS integrated circuits that can be destroyed by static electricity. Before handling the board, touch a grounded metal object to dissipate any residual static on your hands that could result in a static spark being produced and dissipated within the circuit board.

Spare STX-101 circuit boards should be stored in electrically insulating packaging, for example, heavy duty plastic bags.

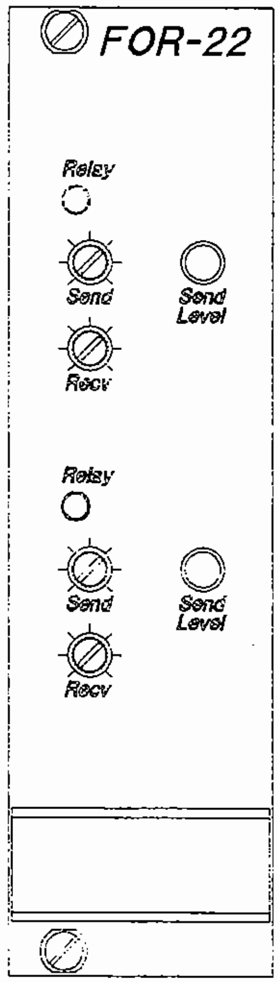
Specifications

DC Power Requirements

Regulation:	Contains regulators for its DC supply
Input Voltage:	8 - 10 Volts DC
Current:	7 mA DC

Dimensions

Form Factor:	3U "Euro Style PC Board
Connectors:	1 - 64-pin "Euro" Style
Dimensions:	10 by 4.4 inches (25.4 cm by 11.2 cm)
Weight:	0.3 lb (0.16 Kg)



Matrix Plus II System FOR-22

DUAL 4-WIRE INTERFACE MODULE

Introduction

This Section describes the FOR-22 Dual 4-Wire Interface and its installation to the matrix, including setting internal jumpers, wiring to external devices, operation of the front panel controls and indicators, and electrical and mechanical specifications. For schematics and component lists see **Volume III**, **Matrix Plus II System Maintenance Manual**.

Description

Each of the two channels of the FOR-22 Dual 4-Wire Interface provides the following functions for a port in the Matrix Plus II System:

- Transformer isolation between an external 4-wire audio device and the port
- A set of relay contacts which are activated by a call signal from the matrix
- An LED indicator that lights when the relay is active as a result of a call signal from the matrix
- An optically isolated call signal input (from the external device to the matrix)
- Separate "send" (to external device) and "receive" (from external device) level controls on front panel
- Send levels adjustable for line level, IFB feed level, and microphone level (set by internal jumpers)
- A 2-color LED indicates correct signal level to external device

The FOR-22 occupies one slot in the IMF-1 Interface Frame. Connections are made to the matrix frame via a 15-pin connector, and to the external device via a 9-pin connector. Figure I1-1 shows the front panel of the FOR-22.

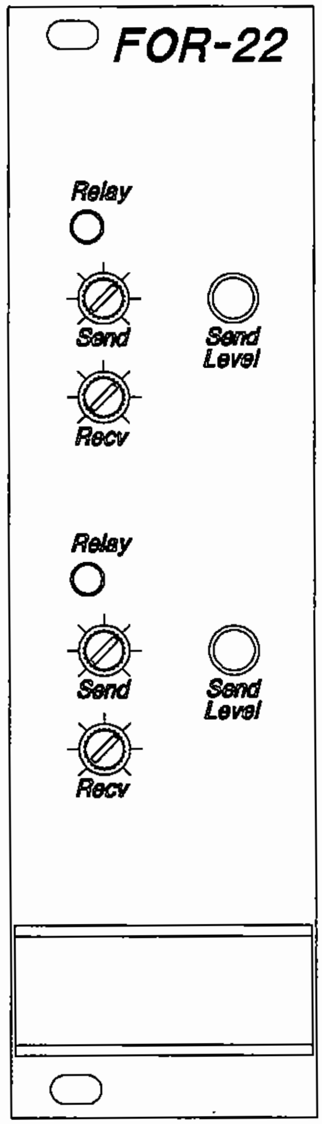


FIGURE I1-1. FOR-22 Front Panel

Installation

Audio Output Level Jumper

The audio output level of each FOR-22 channel is adjustable via the **Send** front panel control, but the nominal level is set using the Audio Output Level jumper to any one of the following levels:

Line level:	0.0 dBv at 600 ohms
Clear-Com	
IFB level:	-15 dBv at 200 Ohms
Microphone Level:	-55 dBv at 20 Ohms

To set the desired nominal level for channel 1, move the jumper on jumper block JP100 on the circuit board so that it connects together the pair of jumper pins labeled with the desired level (Line, IFB, or Mic). For channel 2, move the jumper on jumper block JP200.

Audio Input Level Greater Than +10 dBv

To accommodate input levels greater than +10 dBv, there are provisions on each channel of the FOR-22 circuit board to build a bridging pad on the primary side of each channel's input transformer.

To build the bridging pad, remove the jumpers in R111 and R112 (R211 and R212 for channel 2). The jumpers look like 1/4 watt resistors with a single black band. Then, install resistors with the values shown in Table I1-1. These resistors are located under the Level Detect daughterboard and it may be necessary to disassemble the FOR-22 module to access them.

dBv	R111/R211 (Ohm)	R112/R212 (Ohm)	R113/R213 (Ohm)
15	470	470	1.2k
20	1k	1k	1k
25	1k	1k	470
30	1.2k	4.7k	4.7k

FOR-22 Module Frame Installation

To install the FOR-22 interface module in the IMF-1 interface frame, select a slot to install the interface in. Remove the blank plate covering the slot. Install the FOR-22 in the slot.

Rear Cable Assembly Panel

To install the rear cable assembly panel, first remove the blank filler plate on the rear of the interface frame located directly behind the slot the FOR-22 is to be installed in. Then connect the ribbon cable header connectors as shown in the Figure I1-2.

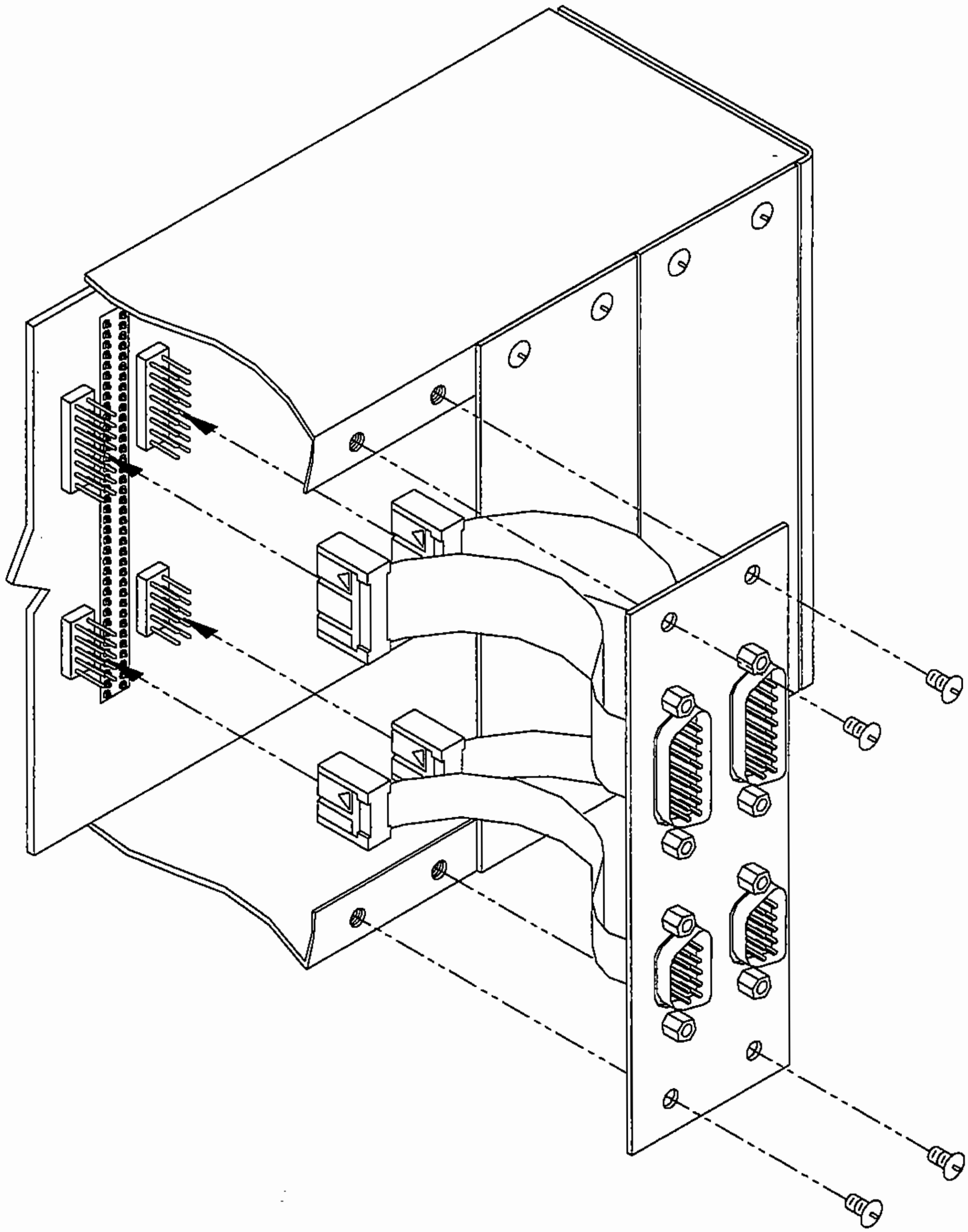


FIGURE I1-2. FOR-22 Interface Rear Cable Assembly Panel

Wiring

The following paragraphs describe connecting the FOR-22 to the matrix frame and external audio devices.

To Matrix Frame

Interfaces are usually located near to the matrix frame, and wired using a 15-connector cable wired straight across (pin 1 to pin 1, pin 2 to pin 2, and so on). However, if the interface is located far from the matrix frame, an alternate "minimum" wiring can be used to reduce the number of conductors required. The minimum wiring is described under the heading **Wiring** in each Frame's Section (MCF-25, MCF-50, MCF-100, and SCF-101) of the **FRAMES** Chapter in this volume.

Figure I1-3 shows the pinout of the DB-15M "**To Matrix**" connector on the rear panel of the interface. Figure I1-4 shows the wiring diagram for a cable connecting the interface to the matrix frame using the standard wiring as viewed from the cable sides of the connectors.

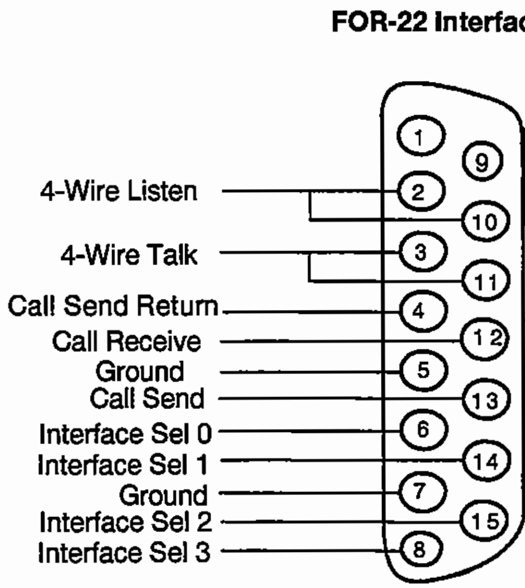


FIGURE I1-3. Pinout of DB-15M To Matrix Connector on Rear Panel of Interface Cable Assembly Panel (Viewed from Rear of Frame)

FOR-22

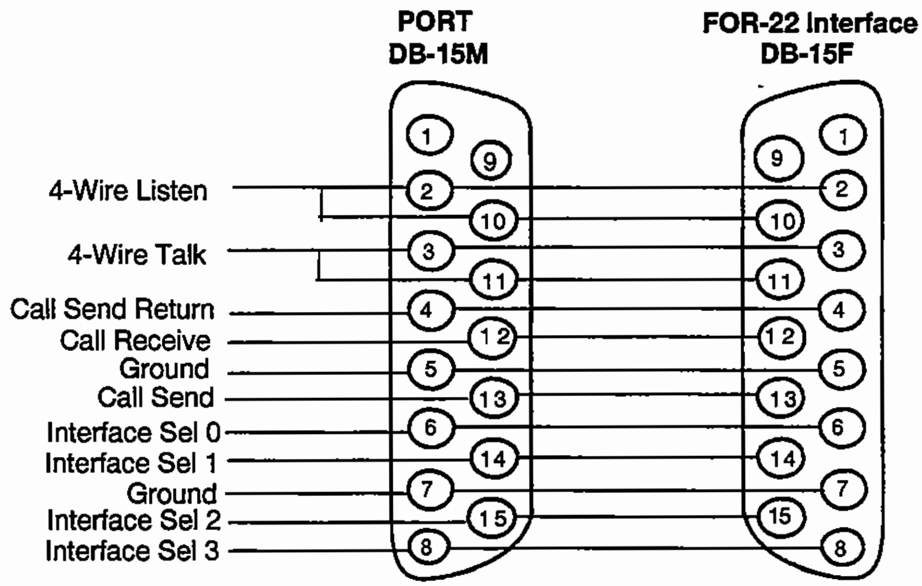


FIGURE I1-4. Wiring for Cable Connecting FOR-22 Interface to Matrix Frame

(Viewed From Cable Sides of Connectors)

To External Device

To connect external audio devices to the FOR-22 ports, use the DB-9M connectors labeled "**Interface I/O**" on the rear cable assembly panel. Figure I1-5 shows the pin assignment of the Interface I/O connectors as viewed from the rear of the frame. Subsequent paragraphs describe the functions of each pin.

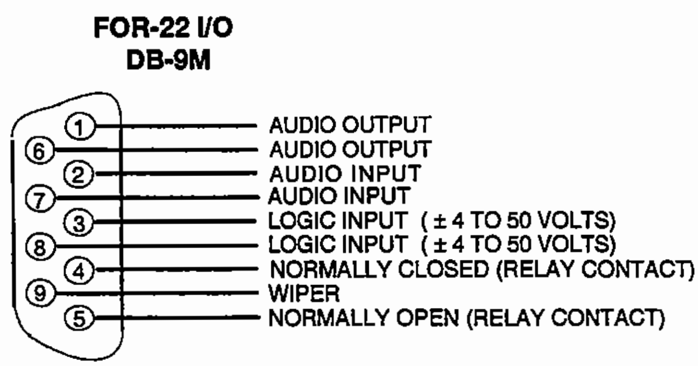


FIGURE I1-5. Pin Assignment of the DB9-M Interface I/O Connector

on Rear Panel Cable Assembly (Viewed from Rear of Frame)

Call Signal Input

The Call Signal input is used to send a call signal from the external device to the matrix. The voltage required across the pins to send a call signal is any voltage above 4 Volts, up to a maximum of 50 Volts. The voltage can be either positive or negative polarity. The current drawn by the input is between 4 and 8 milliamps. Figure I1-6 shows the connection of an external call signal circuit to the Call Signal input of one channel of the FOR-22.

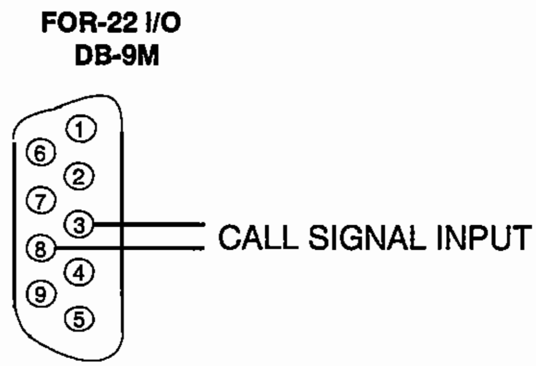


FIGURE I1-6. Cable Wiring for Connecting an External Call Signal Circuit to the Call Signal Input of One Channel of the FOR-22 (Viewed from Cable Side of Connector)

Relay Contacts

Each FOR-22 channel includes a relay. Depending on the port function assigned to the FOR-22 port, these relays may be activated by a call signal, for example to operate a 2-way radio transmitter. Or, the relay can be assigned to operate with any label in the system. When that label is activated (either by a talk, listen, or both as set from the configuration program), the relay will be activated. If no action other than activating the relay is desired, the relay should be assigned to a Control label. For further details see the following entries in the Configuration Program section of the Operation Manual: Setup - Relays and Global - Controls.

you can use the relay to activate an external device, for example an applause light in a studio, a cue light, or a security door lock. Both "normally open" and "normally closed" contacts are provided. They are rated at 1 Amp at 24 Volts DC (resistive load). This relay is not designed for switching mains AC line voltage. To switch an external device that runs on mains AC-line voltage, use an external relay (or other switching mechanism) that is activated by this relay.

Figure I1-7 shows the cable connection of the relay contacts to one channel of the FOR-22 as viewed from the cable side of the connector.

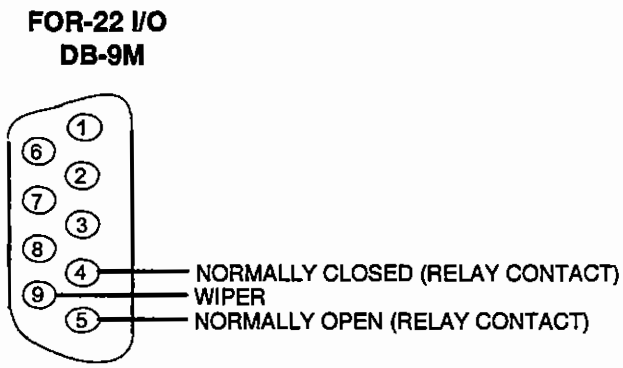


FIGURE I1-7. Cable Wiring for Connections to Relay Contacts of One Channel of the FOR-22 (Viewed from Cable Side of Connector)

Adjustments

The following paragraphs describe the adjustments required to prepare the FOR-22 for use, and the LED indicators on the front panel. These adjustments include **Send** and **Receive** level controls. The LED indicators include the "**Send Level**" LED and the "**Relay Active**" LED, one for each of the two channels.

Send Level Controls

The "**Send**" controls affect the level of the signals from the matrix to the external devices. This control should be adjusted so that the **Send Level LED** lights green when the signal is present. Occasional red flashes due to peaks in the audio signal are acceptable. The **Send** controls have a range of ±10 dB.

Send Level LEDs

The "**Send**" 2-color audio level LED lights green when the audio signal being sent to the external device is at a typical acceptable level. The LED lights red when the audio output signal level is too high.

Receive Level Controls

The "**Recv**" ("Receive") level controls affect the level of the signals sent from the external devices to the matrix. The **Recv** controls have a range of ± 10 dB.

Relay Active LED

The amber "**Relay**" ("Relay Active") LED lights whenever the relay is activated.

Configuration

The **Matrix Plus II System Configuration Program** must be used to assign each FOR-22 interface port a port type, label and other parameters. See the Section on the **FOR-22** in the **Volume 1**, **Matrix Plus II System Operation Manual** for details of the configuration options available from the **Interface Configuration** menus. The paragraph on **Port Types** in the **Configuration** Section of the **Operation Manual** describes the effects of call signals sent to and received from the FOR-22 port depending on the port type assigned to it.

FOR-22

Specifications

0 dBv is Referenced to 0.775 Volts RMS

Audio Output

Nominal Output Level	Selectable by Jumper Between 0 dBv, -15 dBv, or -55 dBv
Impedance	600 ohms at 0 dBv 200 ohms at -15 dBv 20 ohms at -55 dBv
Frequency Response	200-10k Hz, ±3 dB
Maximum Output Level	+20 dBv

Audio Input

Level	0 dBv Nominal
Impedance	Greater than 10K ohms (bridging)
Frequency Response	200-10k Hz, ±3 dB

Call Signal Input

Threshold	4 Volts DC, Positive or Negative Polarity
Maximum Input Voltage	50 Volts
Input Current	Between 4 and 8 milliamperes

Relay Contacts

Contact Type	1 pair SPDT (single form C)
Contact Voltage Rating	24 Volts DC
Contact Current Rating	1 Amp continuous, 2 Amps peak at 24 Volts DC (resistive load)

DC Isolation

DC isolation from an external input or output to the IMF-1 frame is greater than 10 Meg ohms.

Power Supply

Supplied by the matrix frame's PSU-102 power supply module(s)

Voltage Required	± 8 Volts DC Unregulated
Current Required	30 milliamps (per supply, no LEDs or relays active) 160 milliamps (positive supply, LEDs and relays active) 140 milliamps (negative supply, all LEDs and relays active)

Connectors

DB15-M "To Matrix" Connectors	2
DB9-M "Interface I/O" Connectors	2

Operating Environment

Temperature	Between 0 and 70° C (32-150° F)

Package Dimensions

Frame Slot Usage	1 slot of IMF-1
Weight	0.54 lbs (0.22 Kg)

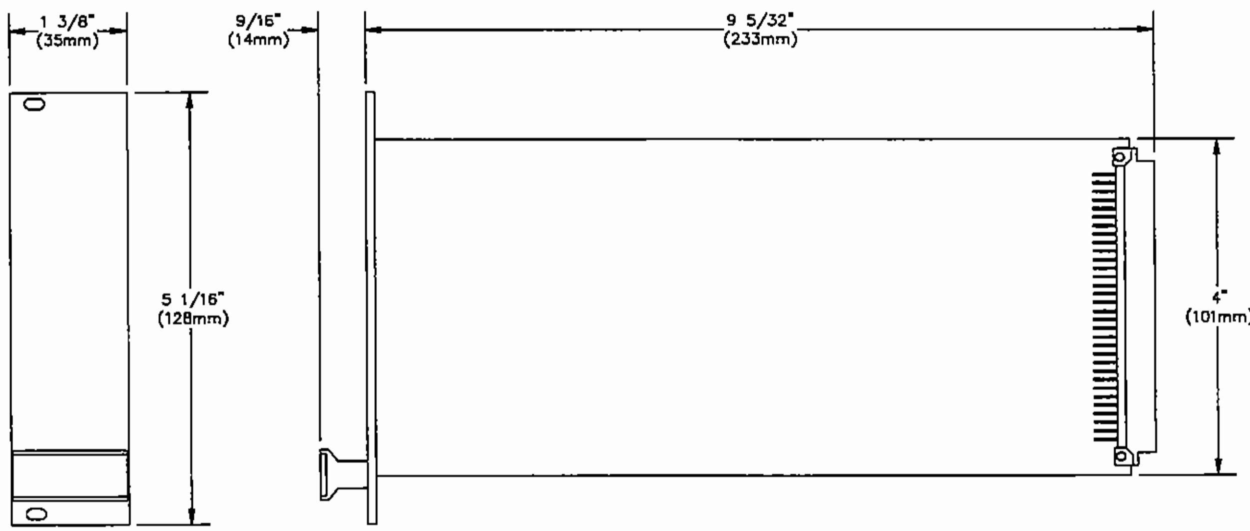
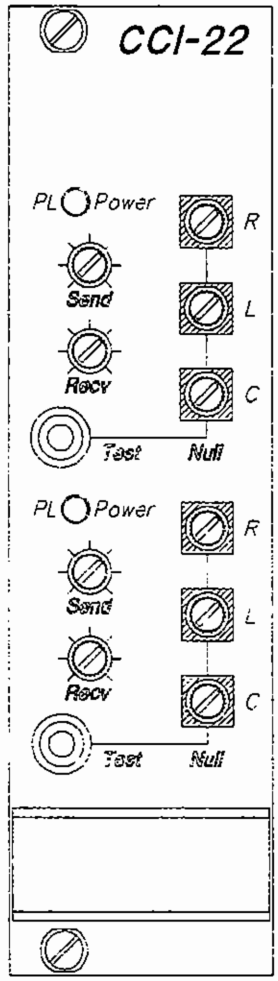


FIGURE I1-8. FOR-22 Package Dimensions



Matrix Plus II System CCI-22

DUAL PARTY-LINE INTERFACE MODULE

Introduction

This Section describes installation of the CCI-22 Dual Party-Line Interface, including wiring it to the matrix frame and to the external party-line systems, setting the internal termination jumpers, and adjusting the side-tone null controls. Specific installation instructions are included for connecting two separate external party-line systems, connecting two external party-line systems with common power connections, connecting multiple Clear-Com party-line channels from a single two-channel power supply, connecting non-Clear-Com 2-wire systems, and connecting a 2-wire camera intercom system. For schematics and component lists see Volume III, Matrix Plus II System Maintenance Manual.

External" party-lines are completely independent of party-lines established within the matrix. In this Section, the term "party-line" or "external party-line" both refer to external party-line hardware, for example Clear-Com or other non-Clear-Com party-line intercom products.

Description

Each CCI-22 Dual Party-Line Interface allows two independent external party-line intercom systems to be connected to the Matrix Plus II System. Both Clear-Com and other non-Clear-Com party-lines are supported.

Call signals between the party-line and the matrix are fully supported for Clear-Com party-lines only. The call signal paths are optically isolated.

All audio paths are transformer isolated, preventing noise induced by ground-loops in the party-line systems. Send and Receive level controls are included on the front panel.

Sophisticated "side-tone nulling" circuitry is included.

Power to the CCI-22 interface channels must be provided by the external party-line. Power is connected to each CCI-22 channel via its "+30 VDC Power" pin on one of the DB9-M Interface I/O connectors on the rear panel assembly. The party-line circuits in the CCI-22 do not receive power from the PSU-102 Power Supply in the matrix, and must be connected to an externally powered party-line to function correctly. For example in a Clear-Com party-line you could use a stand-alone Clear-Com power supply or a main station that includes a power supply for remote stations. Figure I2-1 shows the front panel of the CCI-22.

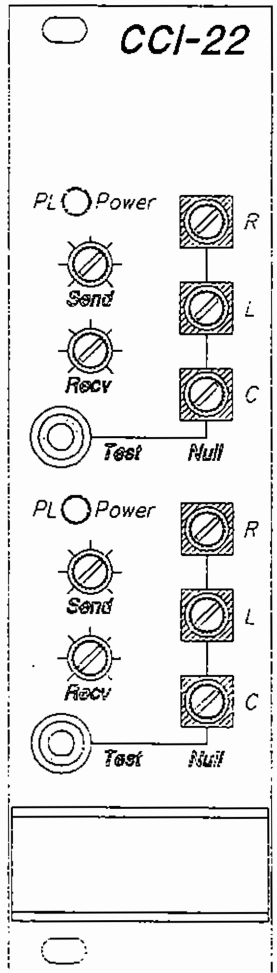


FIGURE I2-1. CCI-22 Front Panel

Installation

The installation of the CCI-22 includes setting the internal termination jumper, and then installing the unit in the IMF-1 Interface Frame.

Termination of Party-Lines

A "Clear-Com termination network", referred to as a "termination", is an RC (Resistor/Capacitor) circuit that must be attached between the Audio and Ground lines of any Clear-Com party-line.

To ensure correct operation of the external party-line, only one termination circuit must be installed on any given party-line.

The termination for a party-line is normally provided by the component that provides power to that party-line. Neither the CCI-22 nor the PSU-102 Power Supply are designed to supply power to an external party-line system.

However, each channel of the CCI-22 does include a Clear-Com termination circuit that can be connected to the party-line by installing a jumper. This termination network is not normally connected, and should only be connected in the rare case that the external party-line does not include a termination circuit. An example of the use of these termination networks is included in this Section under the heading Multiple Clear-Com Beltpack Channels From One Power Supply.

If more than one termination circuit is present on a party-line, the line will not null correctly (the side-tone nulling procedure is described under the heading Side-tone Null Adjustment). The most common symptom of having more than one termination circuit present on the party-line is that when you are nulling it, you can turn the 'R' null control on the CCI-22 all the way counter-clockwise but the line will still not null. In that case, check all components connected to the party-line that are capable of providing a termination to be sure that only one termination is connected to the party-line.

The two termination circuits on the CCI-22 are connected to the channel A and B party-lines by placing the jumpers at JP100 and JP200 (respectively) opposite the label 'A'. When the jumpers are opposite label 'B' they are not connected to their respective party-lines. JP100 and JP200 are located near the center of the CCI-22 main circuit board, and are enlarged as a detail in the assembly drawing for the CCI-22 main circuit board as shown in Volume III, Matrix Plus II System Maintenance Manual.

CCI-22 Module

To install the CCI-22 interface module in the IMF-1 Interface Frame, select a slot to install the interface in. Remove the blank plate covering the slot. Install the CCI-22 in the slot.

Rear Cable Assembly Panel

To install the rear cable assembly panel, first remove the blank filler plate on the rear of the interface frame located directly behind the slot the CCI-22 is to be installed in. Then connect the ribbon cable header connectors as shown in the Figure I2-2, below.

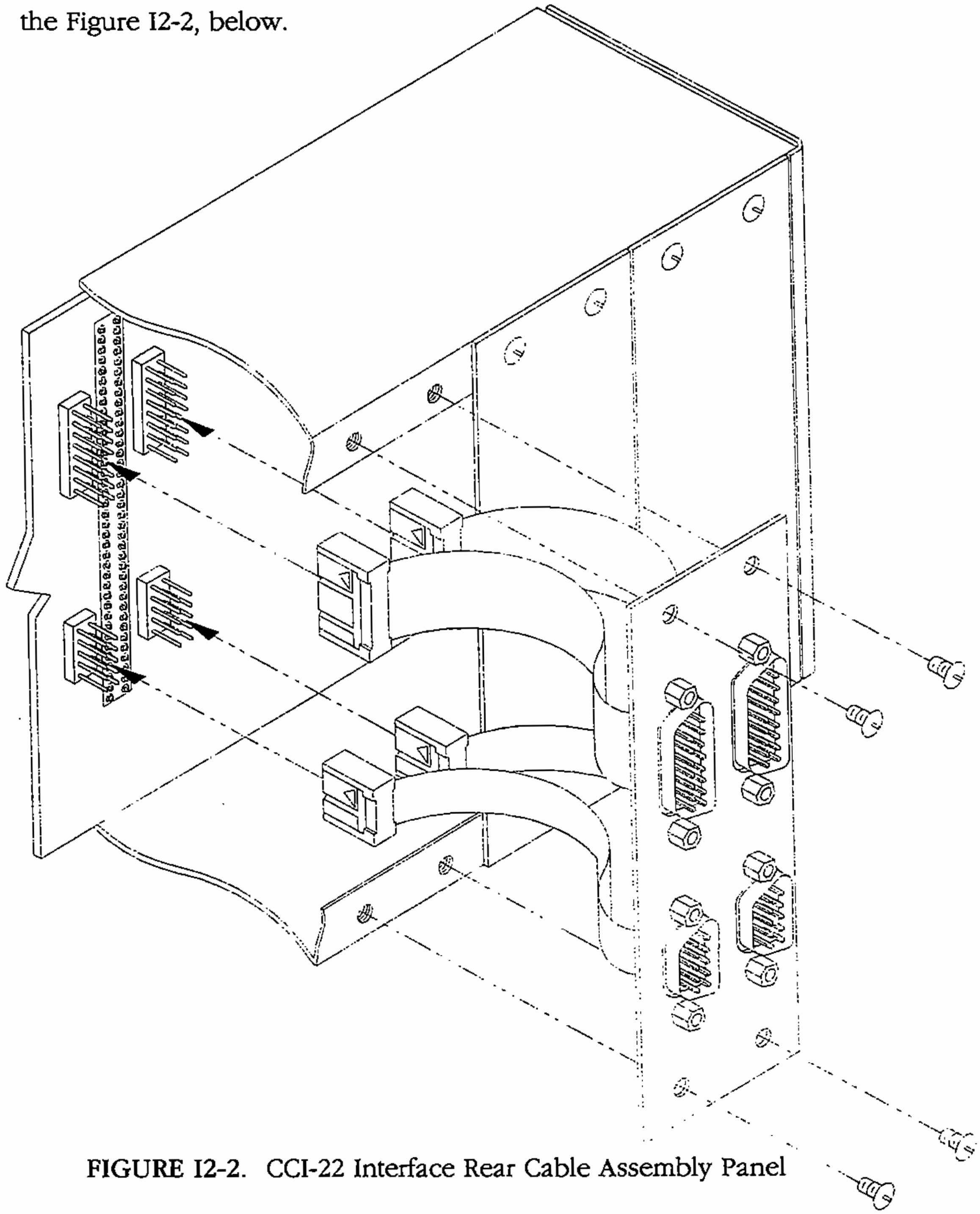


FIGURE I2-2. CCI-22 Interface Rear Cable Assembly Panel

Wiring

The following paragraphs describe how to wire the CCI-22 to the matrix frame and to the external party-lines.

To Matrix Frame

Interfaces are usually located near to the matrix frame, and wired using a 15-connector cable wired straight across (pin 1 to pin 1, pin 2 to pin 2, and so on). However, if the interface is located far from the matrix frame, an alternate "minimum" wiring can be used to reduce the number of conductors required. The minimum wiring is described under the heading Wiring in each frame's Section (MCF-25, MCF-50, MCF-100, and SCF-101) in the FRAMES Chapter in this volume.

Figure I2-3 below shows the pinout of the DB-15M "To Matrix" connector on the rear panel of the interface. Figure I2-4, shows the wiring for a cable for connecting the interface to the matrix frame using the standard wiring.

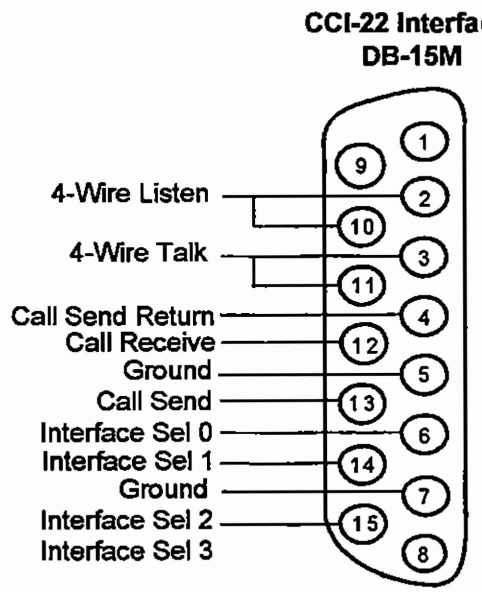


FIGURE I2-3. Pinout of DB-15M To Matrix Connector on Rear Panel of Interface Cable Assembly Panel (Viewed from Rear of Frame)

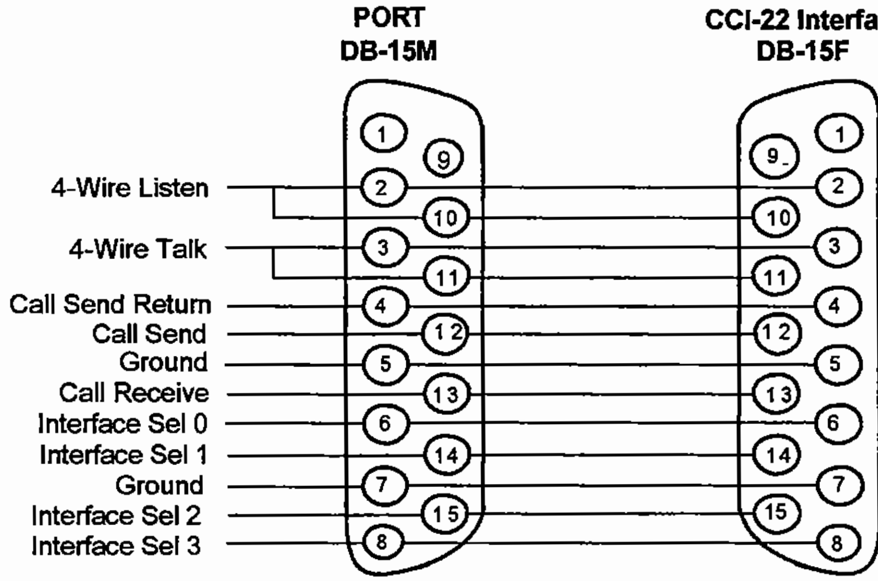


FIGURE I2-4. Wiring for Cable Connecting CCI-22 Interface to Matrix Frame (Viewed From Cable Sides of Connectors)

Interface I/O Connectors

To connect external party-line devices to the CCI-22 ports, use the DB-9M connectors labeled "Interface I/O" on the rear cable assembly panel.

Figure I2-5 shows the pin assignments of each of the two DB-9M Interface I/O connectors on the rear panel assembly of the CCI-22. The two connectors are wired in parallel (pin 1 connected to pin 1, pin 2 to pin 2, etc.), so either of the party-line channels can be obtained from either connector.

Subsequent paragraphs describe wiring, powering, and terminating the party-line connections for both Clear-Com and other (non-Clear-Com) party-lines products.

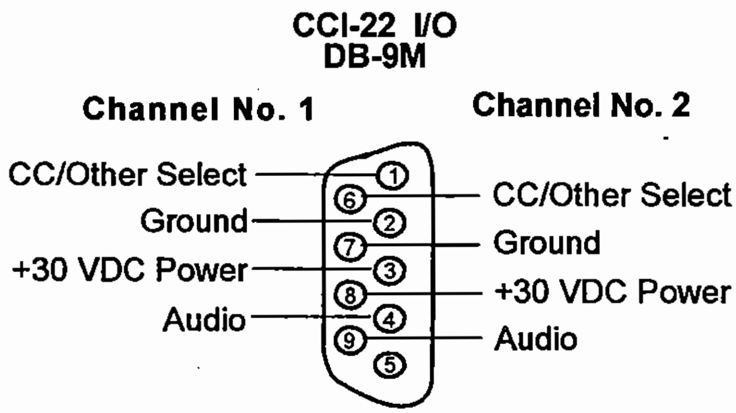


FIGURE 12-5. Pin Assignment of the DB-9M Interface I/O Connectors on Rear Panel Cable Assembly (Viewed from Rear of Frame)

To External Clear-Com Party-Lines

Stations on Clear-Com party-lines are connected to each other with 2-conductor shielded microphone cable. One conductor carries the DC power (28 - 30 Volts) for that channel, the other conductor carries the audio signal for that channel. The shield is a ground common to both power and signal for that channel.

Power to the CCI-22 interface channels must be provided by the external party-line. Power is connected to each CCI-22 channel via its "+30 VDC Power" pin on one of the DB9-M connectors. The CCI-22 channel is essentially just another "beltpack" on the party-line.

Exactly one termination circuit is required for each party-line channel. That termination is usually provided by the system component that provides power to that party-line. Connecting more than one termination circuit to a party-line will degrade the audio quality on that line and may result in a poor sidetone null.

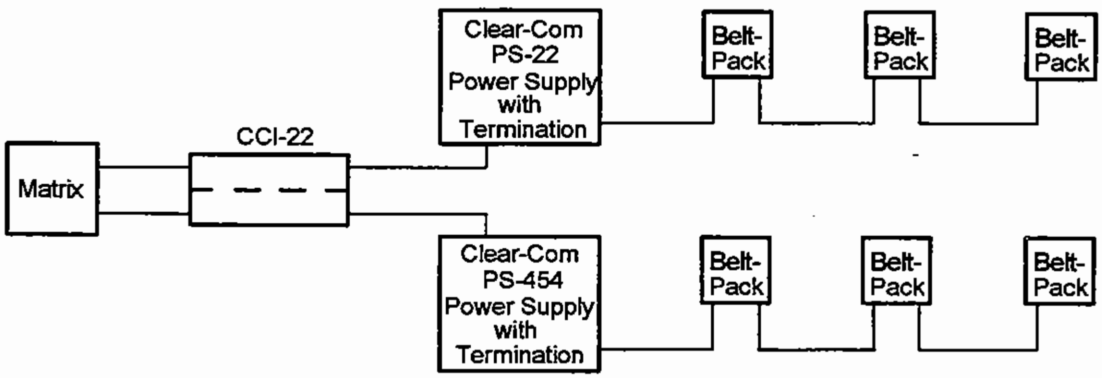
When a CCI-22 party-line channel is connected to a Clear-Com (or compatible) party-line, the Clear-Com/Other Select pin must be left floating. Grounding this pin selects the Other (non-Clear-Com) mode, which is incompatible with Clear-Com (or compatible) party-lines.

The CCI-22 channels can be connected to Clear-Com (or compatible) party-lines in many different configurations, a few of which are described in the following paragraphs.

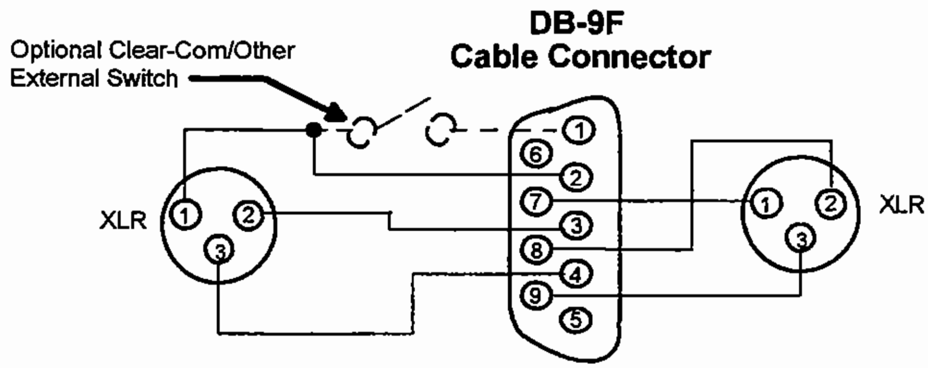
Two Separate Party-Lines

In the diagram shown in Figure I2-6, the two channels of the CCI-22 are used to connect two completely independent external party-lines to the matrix. Each external party-line provides its own power and termination as shown in View A. The wiring diagrams in Figure I2-6 Views B and C show an external switch on the Clear-Com/Other Select pin that allows that CCI-22 channel to be used on either Clear-Com or Other (non-Clear-Com) party-lines. This is useful in a situation where both types of party-lines are installed, such as in a mobile television recording truck.

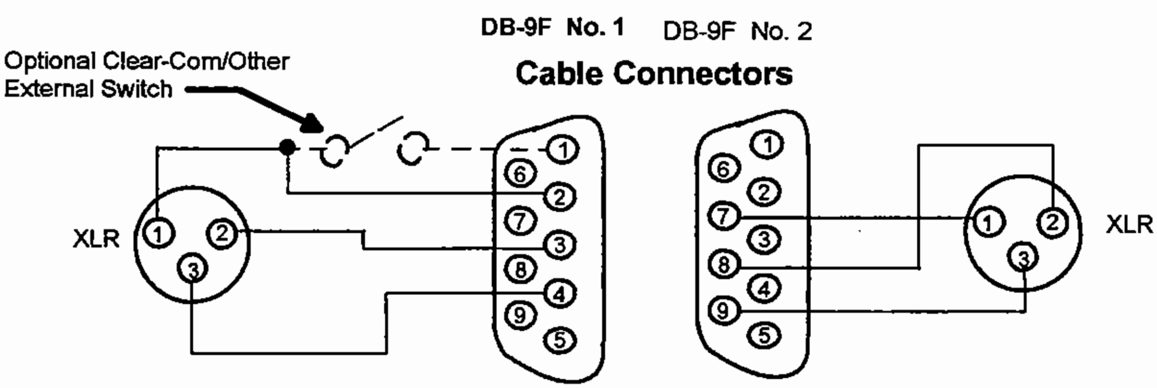
In the Figure I2-6 View B wiring diagram, all connections to the CCI-22 are made via only one of the CCI-22's two parallel DB9-M connectors. In the same Figure, the View C wiring diagram shows the same connections to the CCI-22, but wired using each DB9-M connector separately. You can use the wiring method most convenient for your installation.



VIEW A. Two External Party-Lines Connected to the CCI-22 Interface



VIEW B. Connections to CCI-22 via one of two DB-9 Connectors



VIEW C. Connections to CCI-22 via each DB-9 Connector Separately

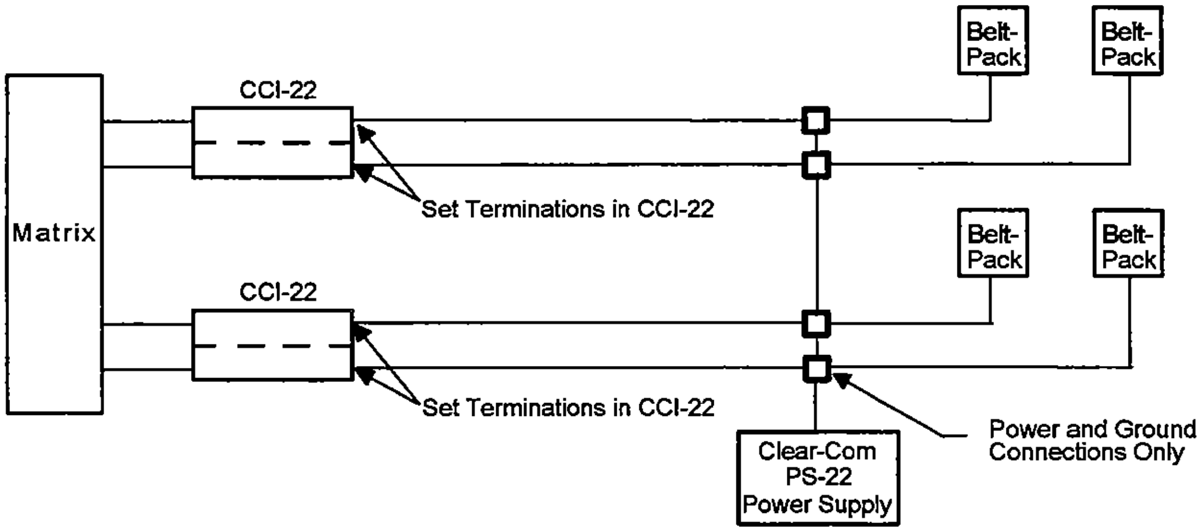
FIGURE I2-6. Cable Wiring for Connecting Two Separate Clear-Com Party-Lines to the Interface I/O Connector (Viewed from Cable Sides of Connectors)

Multiple Clear-Com Beltpack Channels from One Power Supply

This application describes how to use a single two-channel power supply to provide power for more than two CCI-22 party-line channels. To do this you use the power supply to provide power for each party-line, but you use each CCI-22 channel to provide the termination for each party-line. The Clear-Com PS22 Power Supply has a switch that you can use to disconnect the termination circuits from each of its party-line channels. Use the switch to disconnect the terminations inside the power supply. Connect the PS22 channel to all of the CCI-22 channels that it must power, using the standard 3 connections in the XLR connector. Set the termination jumpers for each CCI-22 channel that will be powered by that power supply channel to the 'A' (termination connected) position as described earlier in this Section under the heading Termination of Party- Lines.

On power supplies that do not have a termination disconnect switch, you can use the wiring shown in Figure I2-7. In this wiring, only the power supply channel's power and ground lines are connected to the party-line. The power supply channel's terminated audio line must not be connected to the party-line.

The total current drawn by the devices powered by the power supply channel must not exceed the power supply channel's rated current capability.



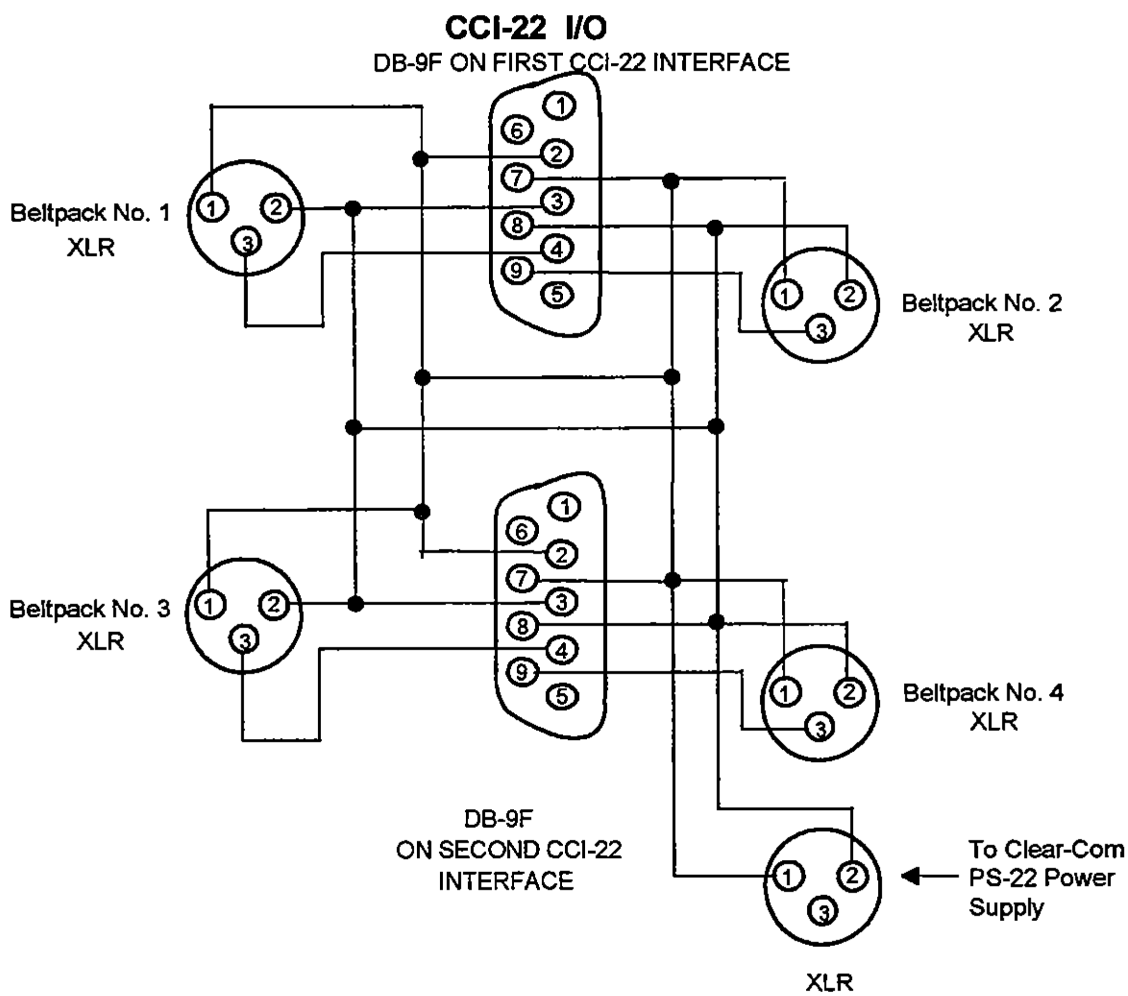


FIGURE I2-7. Cable Wiring for Connecting a Single Two-Channel Power Supply to Provide Power for More than Two Party-Line Channels

To Other (Non-Clear-Com) Two Channel 2-Wire Party-Line

The following paragraphs describe how to connect Other (non-Clear-Com) product party-line devices to the CCI-22. Connections to the Clear-Com party-lines are described under the following headings To External Clear-Com Party Lines, Two Separate Party-Lines, and Multiple Clear-Com Beltpack Channels from One Power Supply within this Section.

Stations on Other (non-Clear-Com) two channel 2-wire party-lines are connected to each other with 2-conductor shielded cable. Each of the two shielded conductors carries both the DC power and the audio signal for one channel, providing two channels per cable. The shield is a ground common to both channels. The two channels available on the CCI-22 interface are used to connect the matrix to a two channel 2-conductor non-Clear-Com line. Call signals are not sent to or received from Other (non-Clear-Com) 2-wire party-lines.

Power to the CCI-22 interface channels must be provided by the external party-line. Power is connected to each CCI-22 channel via its "+30 VDC Power" pin on one of the DB9-M connectors. When connected to an Other (non-Clear-Com) system, the power input circuit of the CCI-22 channel ignores the audio signal present on the Other (non-Clear-Com) line.

Audio is connected to each CCI-22 channel via its "Audio" pin on one of the DB9-M connectors. When connected to an Other (non-Clear-Com) system, the audio input circuit of the CCI-22 channel ignores the power present on the Other (non-Clear-Com) line.

When a CCI-22 party-line channel is connected to an Other (non-Clear-Com) party-line, the Clear-Com/Other pin must be grounded. Leaving this pin floating selects Clear-Com mode, which is incompatible with Other (non-Clear-Com) party-lines.

The termination jumper of each CCI-22 channel must be set to the 'B' (termination disconnected) position.

The CCI-22 channels can be connected to Other (non-Clear-Com) party-lines in different configurations, depending on how the power and grounds are connected between the party-line and the CCI-22 channel. The options are described in the following paragraphs.

Power from Both Audio Lines

Figure I2-8 shows the cable wiring for connecting two Other (non-Clear-Com) party-line channels to the CCI-22 Interface I/O connector as viewed from the cable sides of the connectors. In this wiring, each Other (non-Clear-Com) channel powers the CCI-22 channel that it is connected to, and the grounds are connected together near the CCI-22's DB9 connector.

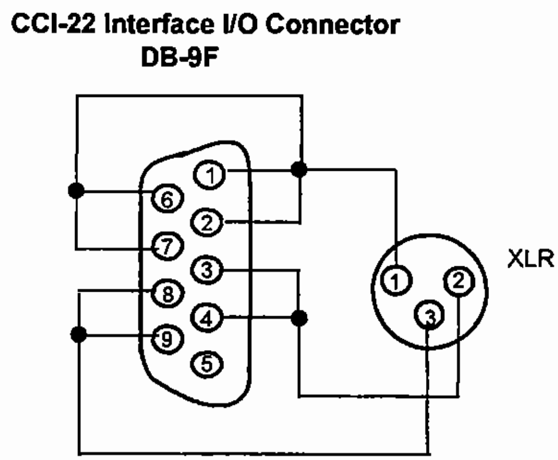


FIGURE I2-8. Cable Wiring for Connecting Two Other (non-Clear Com) Party-Line Channels, Each Powering its Own Channel to the CCI-22 Interface I/O Connector (Viewed from Cable Sides of Connectors)

Power from "Channel A" Line Only

In this wiring, shown in Figure I2-9, only one of the Other (non-Clear-Com) channel powers both of the CCI-22 channels. The grounds are connected together near the CCI-22's DB9 connector.

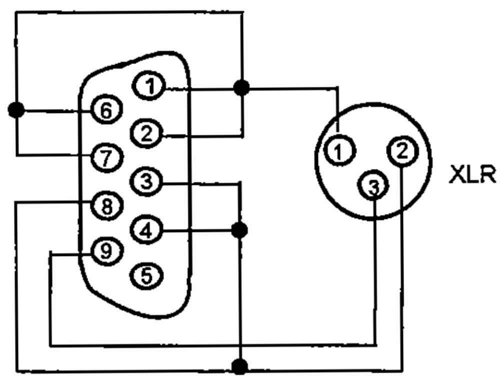


FIGURE I2-9. Cable Wiring for Connecting Two Other (non-Clear-Com) Party-Line Channels, One Other (non-Clear-Com) Channel Powering Both Channels, to the Interface I/O Connector (Viewed from Cable Sides of Connectors)

Two Isolated Other (non-Clear-Com) Lines

In the wiring, shown in Figure I2-10, each Other (non-Clear-Com) channel is completely isolated from the other, including the grounds.

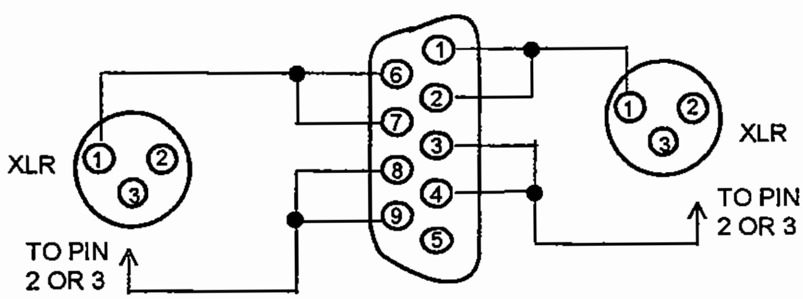


FIGURE I2-10. Cable Wiring for Connecting Two Isolated RTS Party-Line Channels, to the Interface I/O Connector (Viewed from Cable Sides of Connectors)

To 2-Wire Camera

This application describes how to connect a 2-wire camera intercom to a CCI-22 channel. As shown in the wiring diagram in Figure I2-11, the CCI-22 channel is operated in the Other (non-Clear-Com) mode, and must be powered by an external DC power supply providing between 24 and 30 Volts DC.

The termination jumper of each CCI-22 channel must be set to the 'B' (termination disconnected) position. The CCI-22 channel is terminated by the impedance that is presented by the isolation transformer shown. The impedance seen by the CCI-22 channel must be between 150 and 300 Ohms.

The quality of the audio signal will depend on the quality of the isolation transformer used. To be able to achieve a good sidetone null, a high quality transformer must be used.

To set the audio levels to and from the camera, adjust the Send and Receive controls to the desired levels.

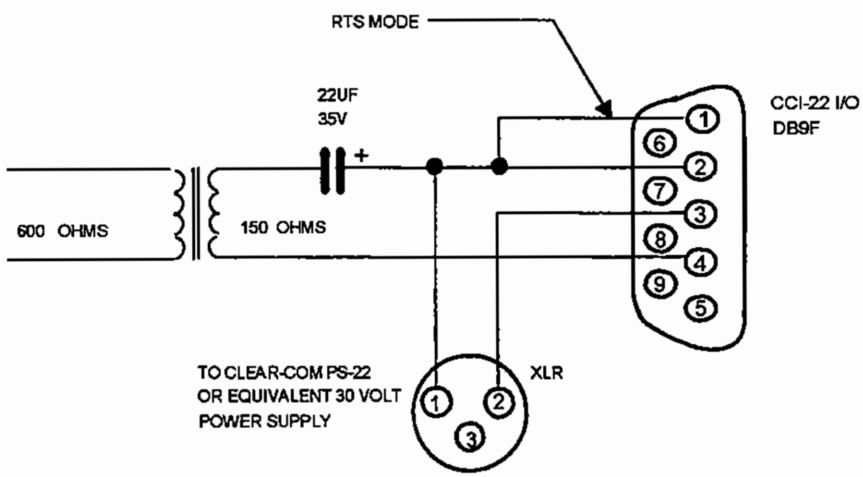


FIGURE I2-11. Cable Wiring for Connecting Camera Intercom to a CCI-22 Channel's Interface I/O Connector (Viewed from Cable Sides of Connectors)

Adjustments

The paragraphs below describe how to check that the CCI-22 has power supplied to it from the external party-line, set the audio levels, and adjust the side-tone null.

Power LED

The green "PL Power" LED when lit indicates that +30 Volt DC power is supplied to the interface from the external party-line that it is connected to. This LED must be lit for the CCI-22 channel to operate.

Level Controls

The "Send" level controls affect the level of the audio signals from the matrix to the external party-line, and the "Recv" ("Receive") control affects the level of the audio from the party-line into the matrix.

The Send and Receive controls have a range of ± 13 dB. They are normally set at the centered position.

Side-tone Null Adjustment

"Side-tone" is the portion of the audio signal that the station operator hears in his headset that is his own voice. In interfaces, it is necessary to minimize ("null") the side-tone when an external party-line is placed in the matrix environment. Ideally, there should be no portion of the TALK signal in the LISTEN signal. The side-tone nulling procedure for each channel of the CCI-22 is described here.

The CCI-22 includes sophisticated built-in nulling circuitry, including a test tone generator and an accessory earphone. The earphone plugs into an 1/8 inch phone jack on the front panel. When the earphone is plugged in, it automatically switches on a test tone, and monitors the output of the null circuit.

Separate 'R' (Resistance), 'L' (Inductance), and 'C' (Capacitance) controls compensate for each component of the impedance of the line, providing a superior null.

The null circuit is effective on line lengths between zero and 4000 feet, line impedances between 120 and 350 ohms, and can reduce local audio heard in the received signal by more than 30 dB over the frequency range between 200 and 8K Hz.

To null one channel of the CCI-22, connect the external party-line wiring and devices to the CCI-22 channel. Plug the accessory earphone into the front panel jack labeled "Test". Connecting the earphone into the jack disconnects the interface from the matrix and enables a test oscillator. The oscillator produces a squarewave that contains both low and high frequency components allowing you to null all frequencies with a single test signal. The test tone is pulsed in approximately half-second intervals.

Begin the null adjustment described below with the R, L, and C controls set to mid-pot.

To adjust the R, L and C controls, listen to the test tone in the earphone, and adjust first the R, then the L, then the C controls for minimum audible tone in the earphone. Because these controls interact with each other, you will need to go back through this sequence several times. Continue refining the null until the test tone is virtually inaudible.

If an almost complete null cannot be obtained, it is likely that something is wrong with the wiring in the external party-line, or with one of the other devices attached to the external party-line. The positions of the R, L, and C controls when the best possible null has been obtained provide clues as to what the problem might be.

If the R control is fully counter-clockwise, the line has more than one termination, or an excessive resistive load on it. If the R control is fully clockwise, then the line has no termination.

If the L control is fully turned in either direction, it is likely that there is a problem in the external party-line. When a Clear-Com party-line is connected, the L control should be just to one side of its mid-pot position. The L control corrects for the low-frequency inductive and capacitive elements that the wiring of the external party-line presents to the line.

If the C control is fully counter-clockwise, this indicates a very short line (under ten feet). If it is indeed a short line then this is a valid setting. If the C control is fully clockwise, this indicates an excessive long line (over 4000 feet). The C control compensates for cable capacitance.

Configuration

The Matrix Plus II System Configuration Program must be used to assign each CCI-22 interface port a port type, label and other parameters. See the Section on the CCI-22 in the Interface Chapter in Volume I, Matrix Plus II System Operation Manual for details of the configuration options available from the Interface Configuration menus.

Specifications

0 dBv is referenced to 0.775 volts RMS

Party-Line Characteristics (Clear-Com or compatible)

Audio Level	-15 dBv nominal
Clipping Level	+3 dBv minimum
Impedance	Greater than 10K ohms (bridging)
Frequency Response	200-10k Hz, ±3 dB

Party-Line Characteristics (Other [non-Clear-Com product] or compatible)

Audio Level	-10 dBv nominal
Clipping Level	+5 dBv minimum
Impedance	Greater than 10K ohms (bridging)
Frequency Response	200-10k Hz, ±3 dB

Call Signal Input (Clear-Com or compatible only)

Threshold	4 Volts DC on Audio Line, Positive or Negative Polarity

Call Signal Output (Clear-Com or compatible only)

Level	11 Volts DC Minimum on Audio Line

Nulling Capability

Line Length	0 to 4000 feet
Line Impedance	120-350 ohms
Depth of Null	Greater than 30 dB, 200-8k Hz

DC Isolation

DC isolation from an external input or output to the IMF-1 frame is greater than 10 Meg ohms.

Power Consumption (Each Channel)

Maximum	40 milliamps at 20 to 30 Volts DC Power is supplied by external party-line

Connectors

DB15-M "To Matrix" Connectors	2
DB9-M "Interface I/O" Connectors	2
1/8 inch phone jack	1 on Front Panel

Operating Environment

Temperature	Between 0 and 70° C (32-150° F)

Package Dimensions

Frame Slot Usage	1 slot of IMF-1
Weight	0.54 lbs (0.22 Kg)

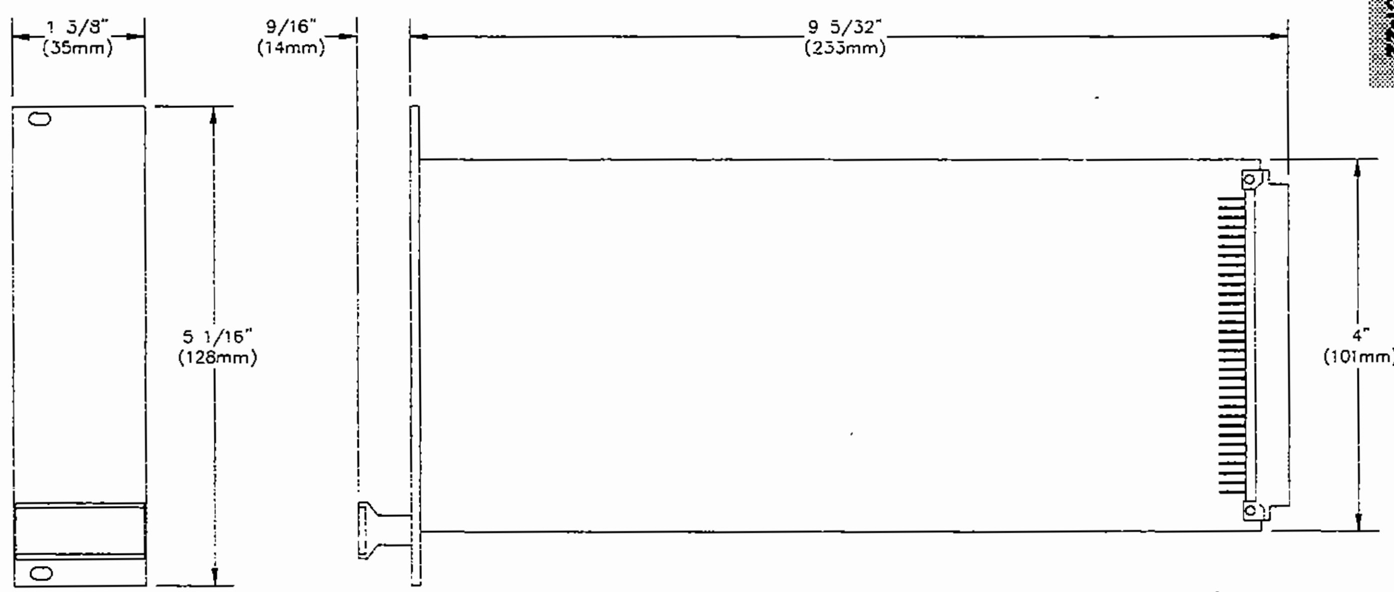
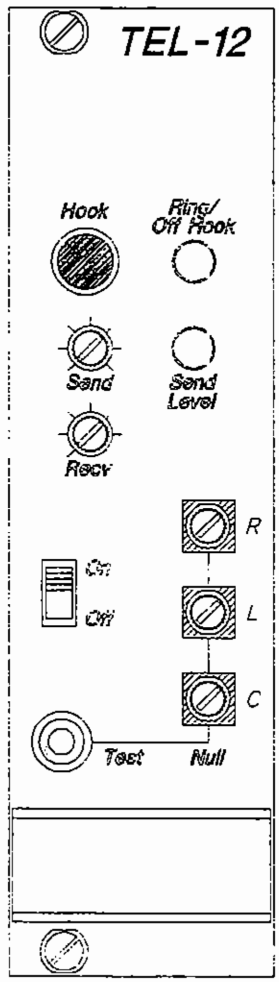


FIGURE I2-12. CCI-22 Package Dimensions



Matrix Plus II System TEL-12

TELEPHONE INTERFACE MODULE

Introduction

This Section describes installation of the TEL-12 Telephone Interface. From the panel controls and internal DIP switches on the TEL-12 Telephone Interface, you can select any one of a number of modes of operation for the TEL-12. For this reason, this Section describes the DIP switches individually and then covers the settings for installation of the TEL-12 in three of the most common modes. These modes are Intercom Station Telephone Access mode, Self-Service Dial-In mode, and Manual Call Screening mode.

Note: In addition to the configurations described here, other configurations are possible. Certain of these may result in undesireable crosstalk as a result of the limitations of the TEL-12's analog circuitry. For example, consider a news reporter who calls into the matrix. You would like to provide him with a program feed, and at the same time route his voice in through the matrix to a live broadcast. However, the TEL-12 cannot perfectly isolate his talk from his listen, so some of his outgoing program feed may leak into his incoming voice.

Description

The TEL-12 Telephone Interface allows a standard 2-wire telephone line to be connected to a port in the Matrix Plus II System. The TEL-12 can answer an incoming call automatically ("Auto-Answer") after either 1 or 4 rings, and can be configured to send a call signal whenever it answers a call. The TEL-12 can be configured to be accessible to intercom station operators, or only to outside callers.

As shown in Figure I3-1, the front panel includes a **Send** level control and Send Level LED, a **Recv** (Receive) level control, a **Hook** pushbutton for Line Seize ("On/Off Hook"), an **Auto-Answer** enable switch, and a **Ring/Off Hook** LED.

The TEL-12 occupies one slot in an IMF-1 Interface Frame. The TEL-12 provides transformer isolation between the telephone line and the matrix frame. The TEL-12 includes a "normally open" relay that closes when the line is in use (off hook). The relay is activated by the call signal mechanism, so neither the relay nor the call signal mechanism are available for other independent use by station operators.

Connections to the matrix are via 15-pin connector, and connections to the telephone line and external relay connections are via screw terminals.

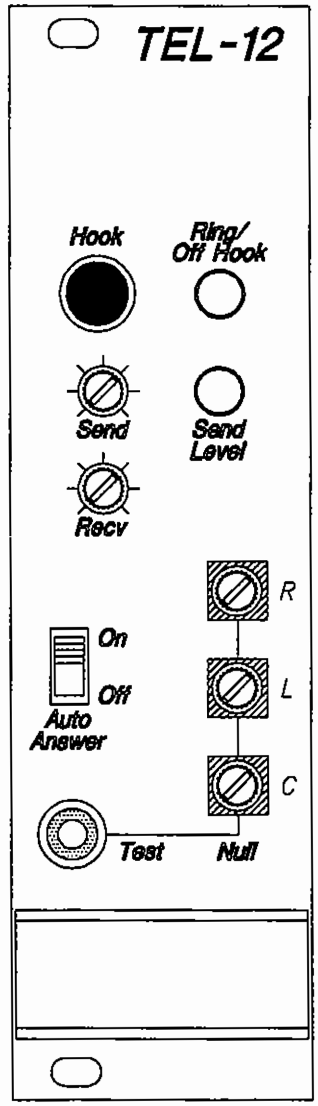


FIGURE 13-1. TEL-12 Front Panel

Installation

The following paragraphs describe setting the TEL-12's DIP switches, and installation of the TEL-12 module and rear cable assembly panel.

DIP Switches

From the TEL-12's panel controls and internal DIP switches, you can select any one of a number of modes of operation for the TEL-12. For this reason, this paragraph first lists the DIP switches along with their default settings, second describes each switch individually, then covers the DIP switch settings for installation of the TEL-12 in three of the most common modes. These modes are Intercom Station Telephone Access mode, Self-Service Dial-In mode, and Manual Call Screening mode.

Default Settings

Figure I3-2 shows the DIP switches in their default setting when they leave the factory. Set the DIP switches for your application based on their individual descriptions below or on one of the applications described. The Factory Test DIP switch (number 8) must remain OFF for the interface to operate.

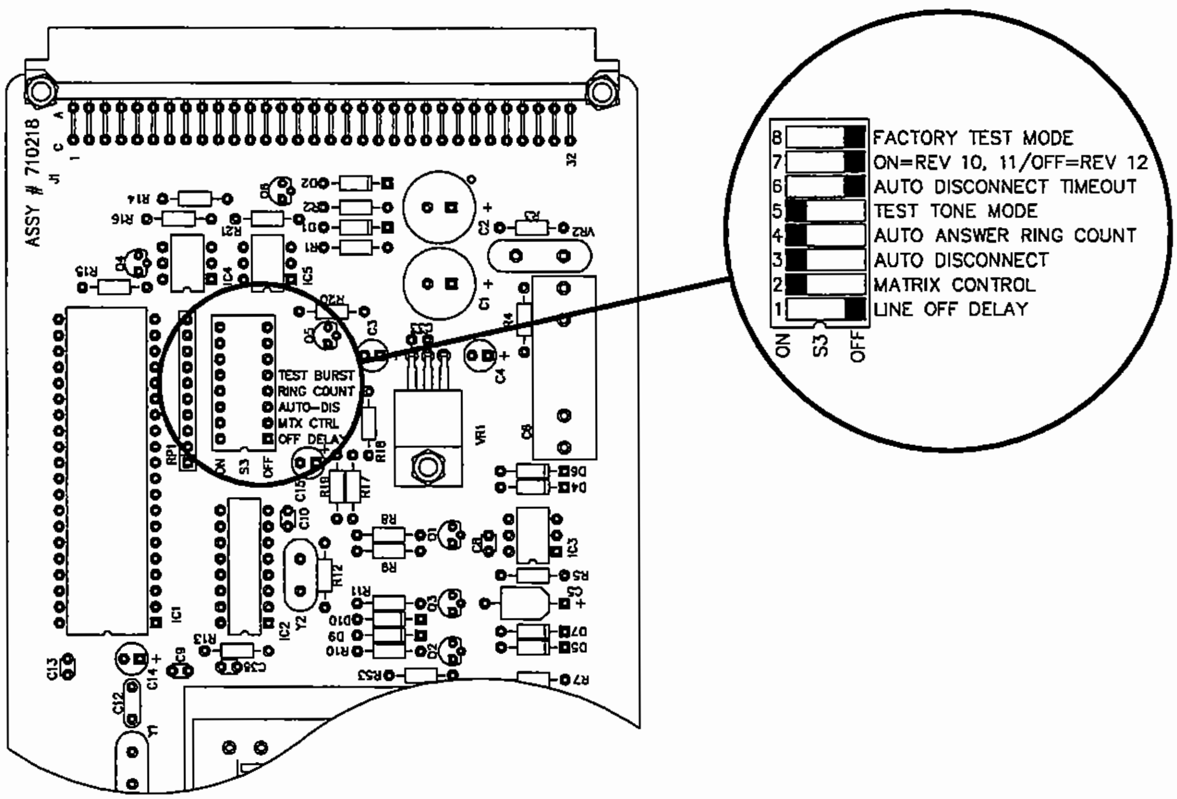


FIGURE I3-2. TEL-12 DIP Switch Block on Main PC Board

Line Off Delay

When enabled, "**line off delay**" adds a delay time between when the line is released by the station operator and when the interface actually releases the telephone line. The delay time is 15 seconds.

This delay helps prevent the station operator from losing the call if he accidentally turns his talk path to the TEL-12 off momentarily, or if he needs to transfer the call to another station.

When **line off delay** is disabled, the interface releases the telephone line as soon as the station operator deactivates his talk path to the TEL-12 port.

Line off delay is enabled when DIP Switch 1 is set to ON.

Matrix Control

This switch is only effective in Matrix Plus II software releases previous to Rev 12.0. As of Rev 12.0, this function is controlled by the Prevent Stations From Calling Out option in the Interfaces - Local Setup for the telephone port. The following description is provided for users of pre- Rev 12.0 systems.

When "**matrix control**" is enabled, any intercom station that has the TEL-12 port (or party-line) label assigned to a selector key can initiate a telephone call (cause the TEL-12 to seize the line) by activating a talk path to the TEL-12 port. The station can also pick up a call on the TEL-12 line.

When **matrix control** is disabled, stations cannot initiate telephone calls, and can only talk on the telephone line after the line has already been seized by the TEL-12. This may be desirable when the interface line is dedicated to manual operation, or to automatic answer of call-ins.

Matrix control is automatically disabled if a telephone line is automatically seized at the interface by auto-answer or manually seized at the interface by pressing the Line Seize pushbutton.

To enable **matrix control**, set DIP switch 2 to ON.

Auto-Disconnect

When enabled, "**auto-disconnect**" causes the TEL-12 to release the telephone line when the TEL-12 detects a dial tone on the telephone line. With **auto-disconnect** disabled, the TEL-12 only releases the telephone line after all talk paths to the TEL-12 port are deactivated, or when the **Hook** pushbutton (line seize) is pressed.

The Auto-Disconnect Timeout DIP switch (described below) allows you to set the amount of time that a dial tone is present on the line before the TEL-12 hangs up. The time is switchable between 2 and 6 seconds.

Auto-disconnect, used in conjunction with the auto-answer function, allows the TEL-12 to provide "self-service dial-in". The TEL-12 answers an incoming call automatically, and then hangs up the telephone line after the caller hangs up.

Auto-disconnect is also useful when using the manual call screening mode described under the heading **Manual Call Screening Mode** in this Section. In manual call screening mode, the incoming telephone call is answered by an operator, who is pressing the **Hook** pushbutton (Line Seize) on the TEL-12. The TEL-12 releases the telephone line automatically after the caller hangs up. The telephone line is not released as a result of the talk path to the TEL-12 port being deactivated. In that case, when a call is answered by pressing the **Hook** (line seize) pushbutton, the line can only be released by either pressing the **Hook** (line seize pushbutton or by auto-disconnect. This prevents a station operator from inadvertently disconnecting an in-bound caller.

Auto disconnect is suspended for a period of 10 seconds whenever the **Hook** (line seize) pushbutton is used to seize the line. This allows sufficient time to dial out without the TEL-12 hanging up the line due to the presence of dial tone.

Auto-disconnect is enabled when DIP switch 3 is set to ON.

Auto-Answer Ring Count

The "**auto-answer ring**" count determines the number of times the line must ring before the TEL-12 automatically answers it. The ring count can be set to either 1 ring or 4 rings.

To set the **auto-answer ring** count to 1 ring, set DIP switch 4 to OFF. To set the **auto-answer ring** count to 4 rings, set DIP switch 4 to ON.

Test Tone Mode

The "**test tone mode**" used in the side-tone null adjustment can be either a continuous tone or a pulsed tone.

The **test tone mode** will be continuous when DIP switch 5 is set to OFF, and pulsed when it is set to ON.

Auto-Disconnect Timeout

The "**auto-disconnect timeout**" switch is only effective when the Auto-Disconnect DIP switch is set to ON. In that case, the Auto-Disconnect Timeout switch allows you to determine the amount of time that the TEL-12 will allow a dial tone on the line before it hangs up (auto-disconnects).

The auto-disconnect timeout is set to 2 seconds when DIP switch 6 is set to OFF (default), and 6 seconds when the switch is ON.

The auto-disconnect timeout is extended by 5 seconds when the line is seized by a station or by pressing the Hook button on the interface. So in these cases the measured amout of dial tone time is actually 7 seconds (5+2) with the auto-disconnect switch off and 11 seconds (5+6) with the switch on.

Software Revision

The "**software compatibility**" switch allows the TEL-12 to be compatible with Matrix Plus II software releases 10.x, 11.x, and 12.x.

When the TEL-12 is shipped with a system, this switch is set at the factory to match the software revision of that system. If the TEL-12 is shipped individually from stock, this switch is set to its default position of OFF, compatible with Matrix Plus II software rev 12.0 and later.

If the TEL-12 is to be installed in a system running rev 10.x or 11.x, you need to set this switch to ON.

Factory Test Mode

The "**factory test mode**" switch, DIP switch 8, must be set to OFF for the TEL-12 to function normally.

DIP Switch Settings for Common Configurations

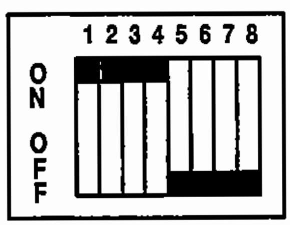
From the TEL-12's panel controls and internal DIP switche, you can select any one of a number of modes of operation for the TEL-12. These modes are Intercom Station Telephone Access mode, Self-Service Dial-In mode, and Manual Call Screening mode.

For details of configuration options and operation instructions for using these modes, see the **INTERFACES** Chapter, **TEL-12** Section, in **Volume I**, **Matrix Plus II System Operation Manual**.

Intercom Station Telephone Access Mode

In Intercom Station Telephone Access mode, any intercom station with the TEL-12 port (or party-line) label assigned to a selector key can answer a call on the TEL-12 line. The ICS-2002 Intercom Station operators can originate a call by using the ICS-2002's Dial Phone mode. If other station operators need to originate a call, they must have access to a touch-tone keypad to dial from. One way to arrange this is to have a standard telephone connected in parallel with the TEL-12 line (for further information refer to the **Manual Call Screening Mode** paragraph in this Section).

To set the TEL-12's controls for Station Access mode, on the front panel, set the **Auto-Answer** switch to OFF, and ensure that the **Matrix Control** and **Auto-Disconnect** DIP switches (2 and 3) are set to ON. The **Line Off Delay** DIP switch can be set to either ON or OFF. Settings for this mode are shown in the DIP switch diagram below.



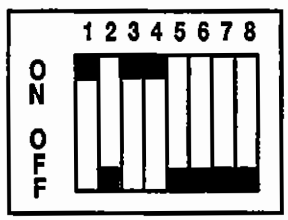
If you want to prevent station operators in the matrix from tying up the outside line by preventing them from dialing out on this line, set the Prevent Stations From Calling Out option in the Interfaces - Local Setup screen for this port. Or, if your system is using a Matrix Plus II software revision older than 12.x, set the **Matrix Control** DIP switch (2) to OFF.

Self-Service Dial-In Mode

In Self-Service Dial-In mode, outside callers dial in and the TEL-12 automatically answers. The caller can be automatically connected to a preset party-line, station, or program feed. Using "direct inward access", the caller can specify paths within the matrix (DTMF Option for MTX-100 ports, only). Auto-Disconnect will release the line automatically after the caller hangs up.

To set the TEL-12's controls for Self-Service Dial-In mode, on the front panel, set the **Auto-Answer** switch to ON, and ensure that the **Auto-Disconnect** DIP switch (3) is ON. The **Line Off Delay** DIP switch (1) can be ON or OFF.

If you want to prevent station operators in the matrix from tying up the outside line by preventing them from dialing out on this line, set the Prevent Stations From Calling Out option in the Interfaces - Local Setup screen for this port. Or, if your system is using a Matrix Plus II software revision older than 12.x, set the **Matrix Control** DIP switch (2) to OFF. Settings for this mode are shown in the DIP switch diagram below.



Manual Call Screening Mode

In Manual Call Screening mode, an intercom station operator, with access to the TEL-12's **Hook** (line seize) pushbutton (the "operator"), answers incoming calls on a standard telephone wired in parallel with the TEL-12.

Once the operator determines which destination should receive the incoming telephone call, he/she presses the **Hook** (line seize) pushbutton on the TEL-12, which takes the TEL-12 off-hook and makes the incoming telephone call available to the telephone party-line that the TEL-12 port is preset to. Then, he/she sends that destination a call signal from his/her intercom station and informs them that a call is waiting. The destination then activates a talk to the telephone party-line to access the call. The operator then hangs up the standard telephone.

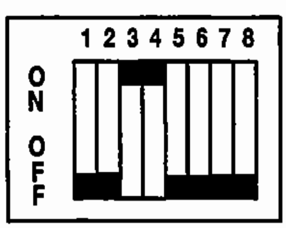
When the call is complete the destination station operator can inform the operator, and the operator can hang up the TEL-12 using the **Hook** (line seize) pushbutton. Or, if the **Auto-Disconnect** DIP switch (3) is set, the TEL-12 will automatically hang up shortly after the destination hangs up.

TEL-12

The operator can also originate outside calls on the standard telephone, and make them available to destinations within the matrix.

To set the TEL-12's controls for Manual Call Screening mode, set the front panel **Auto-Answer** switch to Off. Set the **Line Off Delay** DIP switch (1) to OFF. The **Auto-Disconnect** DIP switch (3) can be OFF or ON, determining whether or not the operator will be required to manually hang up the line after each call by using the **Hook** pushbutton.

Prevent station operators in the matrix from dialing out on this line, by setting the Prevent Stations From Calling Out option in the Interfaces - Local Setup screen for this port. Or, if your system is using a Matrix Plus II software revision older than 12.x, set the **Matrix Control** DIP switch (2) to OFF. Settings for this mode are shown in the DIP switch diagram below.



TEL-12 Module Frame Installation

The TEL-12 module can be installed in any available slot in the IMF-1 Interface Frame.

To install the TEL-12 interface module in the IMF-1 frame, select a slot to install the interface in. Remove the blank plate covering the slot. Install the TEL-12 in the slot.

Rear Cable Assembly Panel

On the rear of the IMF-1 frame, remove the blank filler plate which is directly behind the slot selected for the TEL-12 interface. Connect the 16-pin connector from the ribbon cable on the rear panel assembly to one of the two headers on the rear of the frame mother board as shown in Figure I3-3. Either of the two headers on that frame slot can be used for the TEL-12 interface. For correct connector orientation, be sure that the ribbon cable is not twisted.

Connect the 5-pin connector from the wiring harness on the rear panel assembly to one of the sets of 5 pins on either of the 10-pin headers on the frame mother board. For correct connector orientation, be sure that the brown wire on the harness mates with the topmost pin of the header.

Screw the rear cable assembly panel back onto the frame.

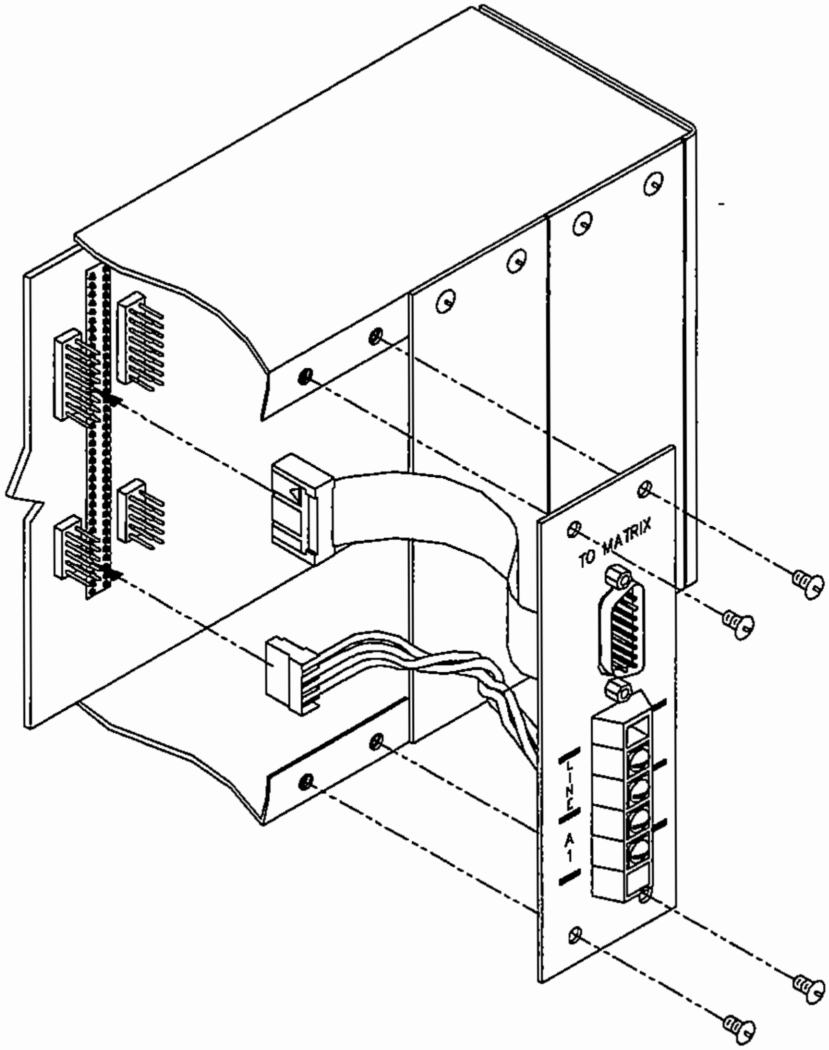


FIGURE I3-3. Connections on the TEL-12 Rear Cable Assembly Panel

Wiring

The following paragraphs describe connecting the TEL-12 to the matrix frame and to the external telephone line. Connections to the TEL-12's relay contacts are also described.

To Matrix Frame

Interfaces are usually located near to the matrix frame, and wired using a 15-connector cable wired straight across (pin 1 to pin 1, pin 2 to pin 2, and so on). However, if the interface is located far from the matrix frame, an alternate "minimum" wiring can be used to reduce the number of conductors required. The minimum wiring is described in the Wiring section in the Frames chapter in this volume.

Figure 13-4 below shows the pinout of the DB-15M "**To Matrix**" connector on the rear panel of the interface. The following diagram, figure 13-5, shows the wiring for a cable for connecting the interface to the matrix frame using the standard wiring.

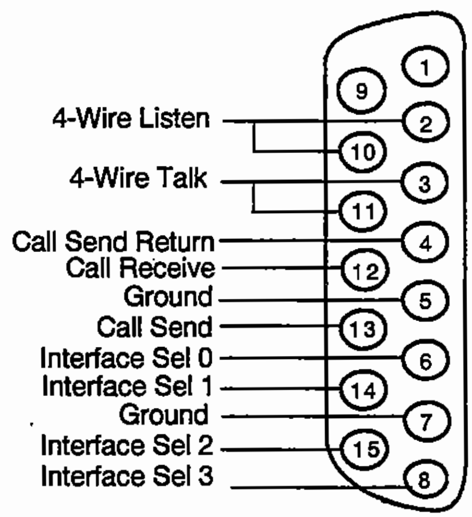


FIGURE 13-4. Pinout of DB-15M To Matrix Connector on Rear Panel of Interface Cable Assembly Panel (Viewed from Rear of Frame)

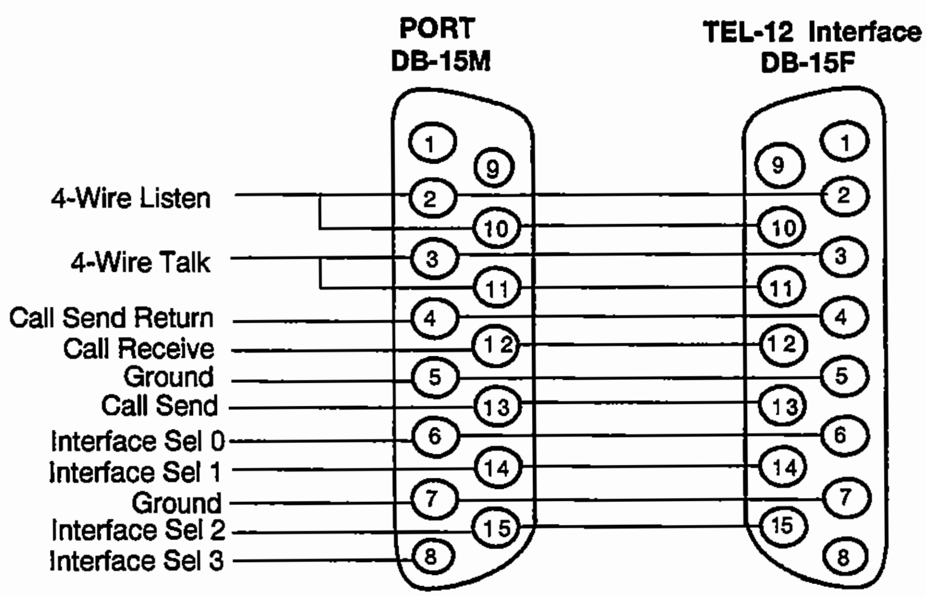


FIGURE 13-5. Wiring for Cable Connecting TEL-12 Interface to Matrix Frame (Viewed From Cable Sides of Connectors)

To Telephone

Telephone Line

Connect the phone line to the terminals marked "**LINE**" on the interface rear cable assembly panel. The phone line should be an outside line directly connected to the telephone company central office, isolated from in-house phone systems. Additional standard telephones can be installed in parallel with this line if desired. When performing the side-tone null adjustment of the TEL-12, all additional standard telephones must be on-hook.

Relay Contacts

A pair of relay contacts rated at 2A @ 125 VAC are available on the rear panel across the terminals marked "**A1**". This pair is normally open when the line is on-hook, and closes when the TEL-12 goes off-hook. These contacts are not connected to any other circuitry inside the TEL-12, and can be used to energize a line-in-use indicator light on a standard multi-line phone set, or for any other low-power application.

Adjustments

This section discusses the use of the front panel controls, including the Sidetone Null adjustment controls.

Front Panel Controls

The front panel includes a **Send** level control and **Send Level** LED, a **Recv** (Receive) level control, a **Hook** pushbutton for Line Seize ("On/Off Hook") , an **Auto-Answer** Enable switch, and a **Ring/Off Hook** LED. In addition, the front panel includes the **R**, **L**, and **C** Null controls and **Test** jack for the Null Test.

Send Level Control

The **Send** control sets the level of the signal from the TEL-12 to the telephone line. The **Send** control has a range of ± 6 dB. Adjust the Send control such that voice peaks always flash green and occasionally flash red on the **Send Level** LED.

Send Level LED

The bi-color **Send Level** LED lights green when the audio signal being sent to the telephone line is at a typical acceptable level. The LED lights red when the audio output signal level is too high.

Receive Level Control

The **Recv** (Receive) control sets the level of the signal from the telephone line to the TEL-12. The **Recv** control has a range of ± 10 dB. To set the appropriate level, listen to the receive level from the telephone line in normal use. Adjust the **Recv** control until the telephone receive level is comparable to the volume level of other intercom activity.

Hook (Line Seize) Pushbutton

The **Hook** (Line Seize) pushbutton allows a local user to manually toggle the TEL-12 line from "on-hook" (telephone line not in use) to "off-hook" (line seized) status and vice versa. If a line is seized at the interface by the pushbutton, the line cannot be released from an intercom station, even if the "**Matrix Control**" DIP switch is set. The line can only be released via the pushbutton or by auto-disconnect (if the "**Auto-Disconnect**" DIP switch is set).

Auto-Answer Switch

The front-panel **Auto-Answer** switch allows the local user to enable or disable the Auto-Answering mode of the TEL-12. The Auto-Answer function, in conjunction with the Auto-Disconnect function, allows a TEL-12 to automatically service incoming calls. An outside caller can automatically be connected to a party-line, IFB program feed, or other Matrix crosspoint connection pre-assigned from the **Configuration Program**.

Auto-Answer is enabled by putting the **Auto-Answer** switch in the UP position. The interface will then automatically answer incoming calls after either 1 or 4 rings (set by the "**Auto-Answer Ring Number**" DIP switch).

Once a line is seized at the interface by Auto-Answer, the line can be released only by Auto-Disconnect (if the "**Auto-Disconnect**" DIP switch is set) or by the **Hook** (Line Seize) pushbutton. Deactivating all talk or listen paths from all intercom stations to the TEL-12 port will not release the line, even if the "**Matrix Control**" DIP switch is set. This prevents intercom station operators from disconnecting the telephone line when it is in automatic use by outside callers, or in manual use by an intercom station operator who has access to the **Hook** (Line Seize) pushbutton.

Ring/Off Hook LED

The **Ring/Off Hook** LED flashes red at the cadence of a ring signal when the line is being called from outside. Once the line has been seized and while it is off-hook, the LED lights green. The LED is off when the line is on-hook and is not ringing.

Null Test Jack

An earphone, which is plugged into the **Test** (null Test Jack), allows you to monitor the output of the side-tone nulling circuitry. Its use is discussed in detail under the heading **Side-tone Null Adjustment** in this Section.

R, L and C Nulling Controls

The **R**, **L**, and **C** nulling controls compensate for the resistance, inductance, and capacitance of the telephone line. Their use is discussed in detail under the heading **Side-tone Null Adjustment** in this Section.

Side-Tone Null Adjustment

"Side-tone" is the portion of the audio signal that the station operator hears in his headset that is his own voice. It is necessary to minimize ("null") the side-tone for proper matrix operation. The side-tone nulling procedure for the TEL-12 is described in the following discussion.

After the initial nulling adjustment is made, the null only needs to be checked periodically, or if there is reason to believe that there have been significant changes in the telephone line impedance. If feedback occurs at the station at a lower volume setting than before, it is a sign that the line impedance has changed.

The TEL-12's built-in nulling circuitry includes a test tone generator and an accessory earphone. The earphone plugs into an 1/8 inch phone jack on the front panel. When the earphone is plugged in, it automatically switches on a test tone, and monitors the output of the null circuit.

Separate "**R**" (Resistance), "**L**" (Inductance), and "**C**" (Capacitance) controls compensate for each component of the impedance of the line, providing a superior null.

Before performing the null adjustment of the TEL-12, connect the external telephone line and any other connections that affect the impedance of the telephone line. These include other telephone extensions connected in parallel on the same line. The phone line must be active (turned on at the central telephone office) at the time the null is adjusted, and all local parallel phone sets must be on-hook so that the line is in its normal operating state.

To perform the null adjustment, make an inbound telephone call to the interface. Seize the line at the interface with the **Hook** (Line Seize) Pushbutton. After the line has been seized, plug the earphone into the front panel jack marked "**Test**".

Connecting the earphone into the **Test** jack disconnects the interface from the matrix and enables a test oscillator. The oscillator produces a squarewave that contains both low and high frequency components allowing you to null all frequencies with a single test signal. The test tone can be either continuous or pulsed, depending on the setting of the "**Test Tone Mode**" DIP switch. If the **Test Tone Mode** DIP switch (switch #5) is set to ON, the tone is turned on and off about once per second.

The null on each TEL-12 module is adjusted at the factory for a typical installation. If you have just received the TEL-12 from the factory, begin the null adjustment described below with the **R**, **L**, and **C** controls left at the positions that they were set at by the factory. If the positions of the **R**, **L**, and **C** controls are far to one side or were set for a different installation, start by setting the **R**, **L**, and **C** controls to mid-pot.

To adjust the **R**, **L** and **C** controls, listen to the test tone in the earphone, and adjust first the **R**, then the **L**, then the **C** controls for minimum audible tone in the earphone. Because these controls interact with each other, you will need to go back through this sequence several times. Continue refining the null until the test tone is virtually inaudible.

If an almost complete null cannot be obtained, it is likely that something is wrong with the wiring in the telephone line or with one or more of the other devices attached to the telephone line. Also note that the null circuits in the TEL-12 are designed for use with central office lines in North America and requires that the signal levels and impedance of the telephone line be within the established standards. For clues as to what the problem might be, check the positions of the **R**, **L**, and **C** controls when the best possible null has been obtained.

If the **R** control is fully counter-clockwise, then the length of the telephone line between the TEL-12 and the Central Telephone Office could be excessively long.

If the **L** control is fully turned in either direction, it is likely that there is a problem in the telephone line. The **L** control corrects for the low-frequency inductive and capacitive elements of the telephone line.

If the **C** control is fully clockwise, then the length of the telephone line between the TEL-12 and the Central Telephone Office could be excessively long.

Configuration

To configure the TEL-12 for use in each of the applications described this Section, see the **CONFIGURATION** Chapter, and **INTERFACES** Chapter, **TEL-12** Section in **Volume I**, **Matrix Plus II System Operation Manual**.

Specifications

Audio

Frequency Response	250 Hz - 3.4 KHz, ± dB
Send Gain Control Range	± 6 dB
Receive Gain Control Range	± 10 dB

Ring Detect Sensitivity

The TEL-12 will operate with most international telephone ring signal standards.

DC Isolation

Isolation between the telephone line and the IMF-1 frame is greater than 10 Meg Ohms.

Power Supply

Supplied by the matrix frame's PSM-1 power supply module(s)

Voltage Required	Between ± 8 and ±10 Volts DC Unregulated
Current Required	210 milliamps (positive supply, Maximum)
	130 milliamps (negative supply)

Connectors

DB15-M "To Matrix" Connector 1
2-Position Screw Terminal Strip1 For Telephone line
1 for Relay Contacts
1/8 inch "Null Test" Phone Jack 1 on Front Panel

Relay Contacts

Type	"A1", "Dry", Normally Open when TEL-12 is On-Hook
Voltage	125 Volts AC
Current	2 Amps Maximum

Operating Environment

Temperature	Between 0 and 70° C (32-150° F)

TEL-12

Package Dimensions

Frame Slot Usage	1 slot of IMF-1
Weight	0.54 lbs (0.22 Kg)

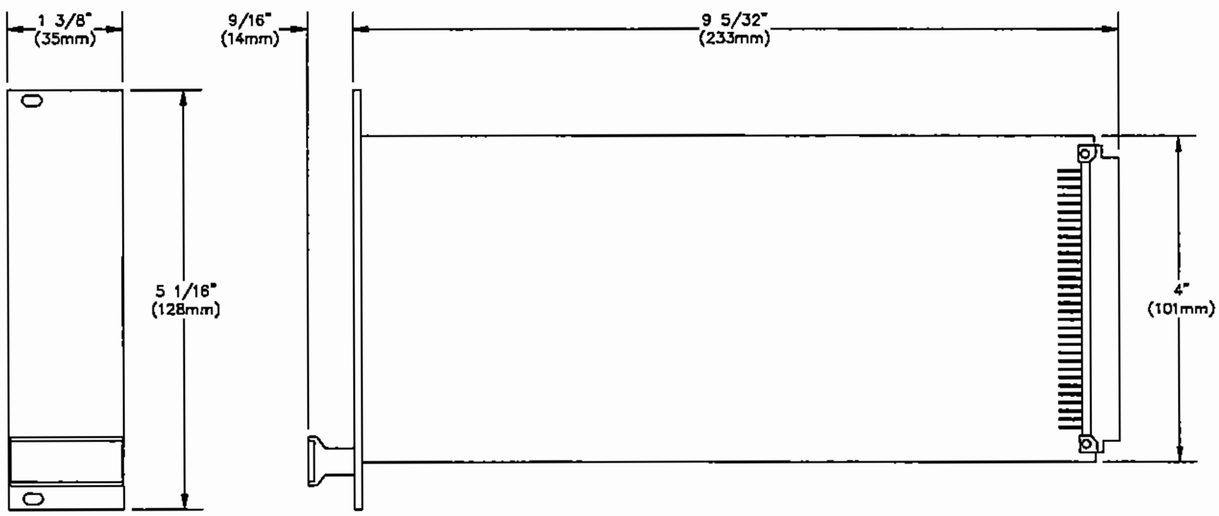
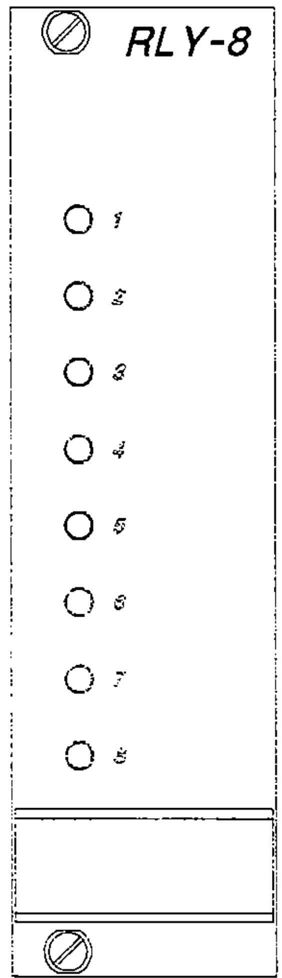


FIGURE I3-7. TEL-12 Package Dimensions



Matrix Plus II System RLY-8

R E L A Y I N T E R F A C E M O D U L E

Introduction

This Section describes the installation of the RLY-8 Relay Interface Module, wiring to the external devices, and provides electrical and mechanical specifications.

Description

The RLY-8 Relay Interface Module provides connection of eight programmable relays to the matrix so that each relay is directly controlled from the matrix. Multiple RLY-8 Interfaces can be daisy-chained to provide connection of up to 64 relays to the matrix.

The RLY-8 provides the following functions:

- Eight independent sets of relay contacts which are activated from the CPU-100 frame controller card in the matrix frame.
- DC isolation between relay device(s) and the system.
- An LED indicator for each relay that lights when the relay is active .

Each RLY-8 Interface relay contact is a single-throw double-pole pair for use by the user. They are rated at 1 Amp at 24 Volts DC (resistive load). The RLY-8 is not designed for switching mains AC line voltage. To switch an external device that runs on the mains AC line voltage, use an external relay that is activated by the RLY-8.

The RLY-8 Interface contains circuitry to ensure that relays are not inadvertently activated during power-up until commanded by the CPU Card in the frame.

Logical control of the relays in the RLY-8 Interface is provided by associating a relay with any other label in the system using the Configuration Program. Activating a TALK or LISTEN label with a relay associated to it will also activate that relay. There is a special classification of labels that can be just relays called Control Labels. See the section on the Configuration Program.

The RLY-8 occupies one slot in the IMF-1 Interface Frame. Connections are made to the matrix frame via a 9-pin connector, and to the external devices via two 15-pin connectors.

Figure I4-1 shows the front panel of the RLY-8. There are no adjustment controls for the RLY-8.

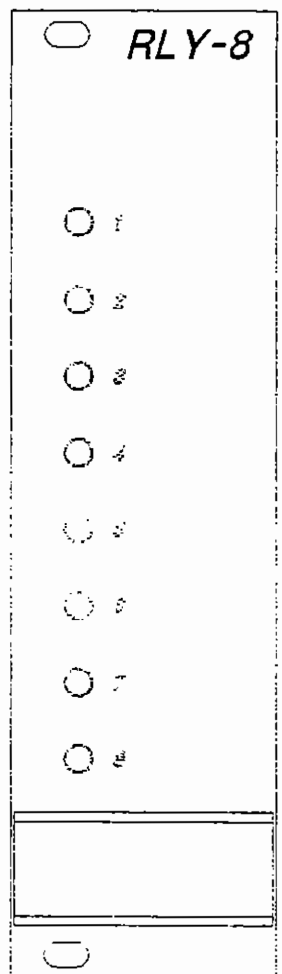


FIGURE 14-1. RLY-8 Interface Module Front Panel

Installation

RLY-8 Interface Module Frame Installation

To install the RLY-8 Interface module in the IMF-1 frame, select a slot to install the interface in. Remove the blank plate covering the slot. Install the RLY-8 in the slot.

Rear Cable Assembly Panel

To install the rear cable assembly panel, first remove the blank filler plate on the rear of the interface frame located directly behind the slot the RLY-8 is to be installed in. Then, connect the ribbon cable header connectors as shown in Figure 14-2.

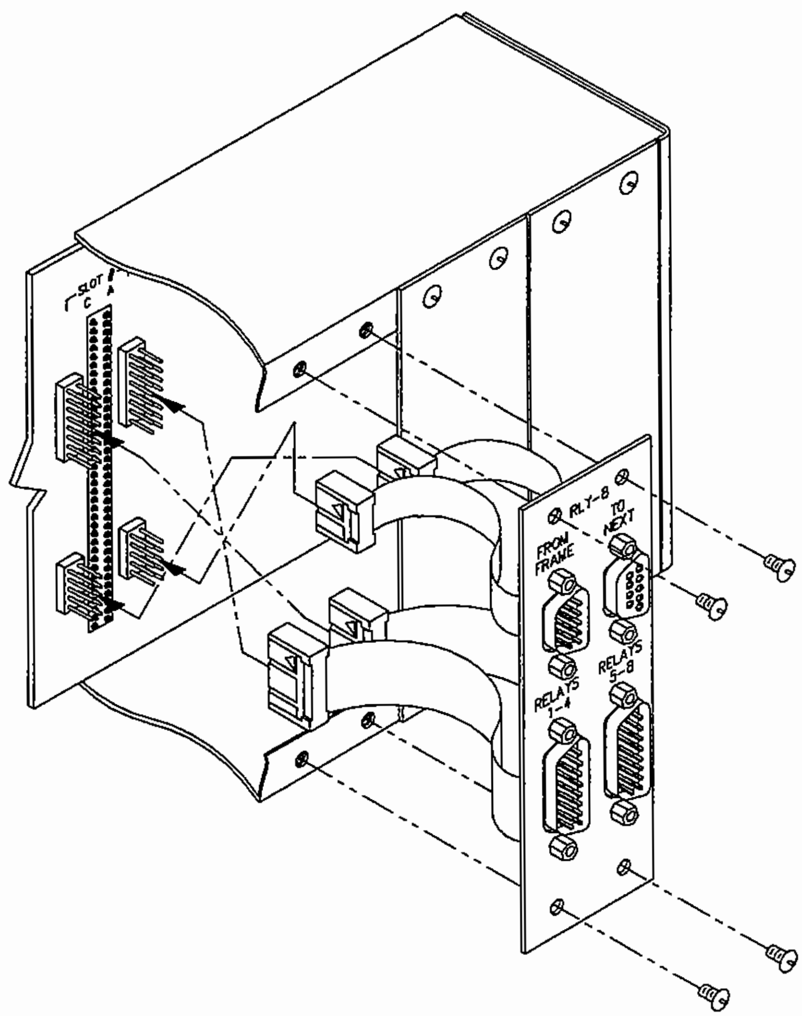


FIGURE 14-2. RLY-8 Interface Rear Cable Assembly Panel

Wiring

The following paragraphs describe connecting the RLY-8 to the matrix frame and external devices.

To Matrix Frame

Each RLY-8 Interface is supplied with a cable to connect the RLY-8 to the matrix frame. Typically, the interface is located near to the matrix frame, and wired using this cable. This distance usually does not exceed 5 feet. However, if your application requires a greater distance you can use a longer cable up to a maximum of 50 feet.

The 5-foot long cable supplied with the RLY-8 has a DB-9F cable on one end and a DB-9M connector on the other end.

To connect the RLY-8 to the matrix frame, plug the DB-9M end of the cable into the **Accessory Panel** connector on the back of the frame. Plug the DB-9F end into the rear cable assembly panel for the RLY-8.

To connect an additional RLY-8 Interface, plug the DB-9M end of the additional RLY-8's cable into the rear cable assembly panel for the first RLY-8 and then, plug the DB-9F end into the rear cable assembly for the additional RLY-8. Additional RLY-8 Interfaces are added in the same way, using "daisy-chain" wiring. If there are multiple RLY-8s used, the relays in the first will be numbered 1 to 8, second will be 9 to 16, and ect.

To associate a relay to a label, use the Configuration Program, as described in Volume I, Matrix Plus II System Operation Manual.

To External Device

To connect external devices to the RLY-8 Interface, use the two DB-15M connectors on the rear cable assembly panel for the interface. Figure I4-3 shows the pin assignment of these connectors as viewed from the frame side of the connector.

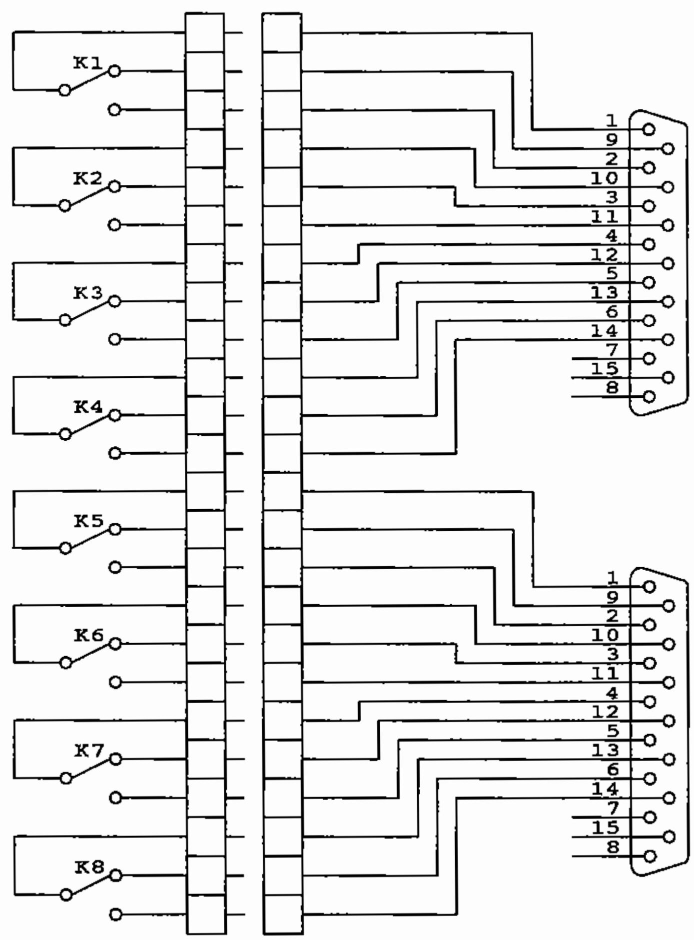


FIGURE 14-3. RLY-8 Interface DB-15M Connectors Pinout
(Viewed from Frame Side of Connectors)

Specifications

Relay

Type	1 Form C
Quantity	8
Contact Max. Volts	24 Volts DC
Contact Max. Cur.	1 Amp continuous, (2 amps peak at 24 volts DC (resitive load)
DC Isolation	> 10 Meg ohms.

Module Power Supply Requirements

Voltage Required	8 – 10 Volts DC
Current Required	200 mA max (25 mA per relay when active)

Connectors

Relay contacts	2 ea. DB15M
Matrix Connection	1 ea. DB-9M
Loop Thru	1 ea. DB-9F

Indicators

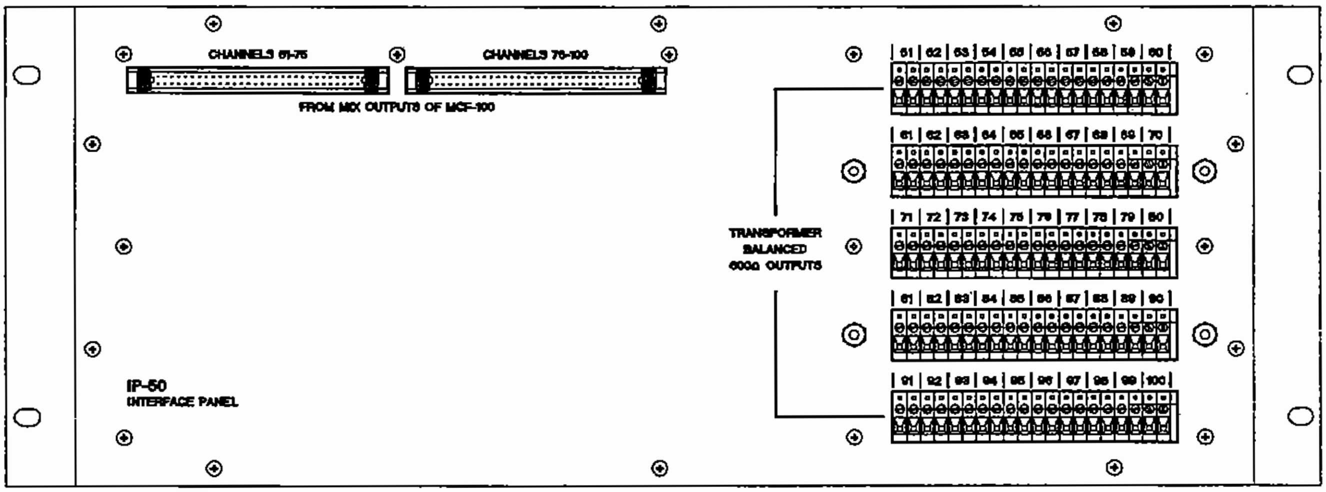
Quantity	8 (1 ea. per relay)
Type	Green LED

Operating Environment

Temperature	0 and 70° C (32 -150° F)

Package Dimensions

Height	5 1/16" (129 mM)
Width	1 3/8" (35 mM)
Depth	9 5/32" (233 mM)
Weight	.35 LBS (.15 Kg)



Matrix Plus II System IP-50
INTERFACE PANEL

Introduction

This section describes how to install and configure the IP-50 Frame Interface Panel. For information on operating the IP-50 see the Matrix Plus II Operation Manual. For information on troubleshooting and maintenance see the Matrix Plus II Maintenance Manual.

Description

The IP-50 is an interface panel for the purpose of directly using the extra 50 outputs of a MCF-100 frame that normally connect to a SCF-101 frame for expansion beyond 50 ports. With the IP-50 these 50 outputs can be used as outputs only for such uses as IFB feeds and paging systems.

The IP-50 is a passive device providing transformer isolation and a convenient pair of screw terminals for each output of the fifty channels. There is no provision for output level adjustment. It is assumed level adjustments would be accomplished by the device being fed. NOTE: Using the input gain controls of each matrix card to affect the output level of the IP-50 should not be done. These input gain controls should only be used to compensate for a particular input channel, not for changing all outputs globally.

The outputs from STX-101 cards in the MCF-100 that would normally feed to the SCF-101 are now available as outputs for direct connection to the inputs of external devices. Each channel in the MCF-100 frame that needs to have access to these outputs must have a companion STX-101 installed in the slot below its MTX matrix card.

Installation

The installation of the IP-50 is divided into three categories, Physical Installation, STX-101 Allocation, and Software Configuration.

Physical Installation

The following steps describe the physical installation of an IP-50.

1 Install IP-50 in standard 19" rack directly below the MCF-100 frame with its connectors facing the rear of the rack.

2 Connect the two ribbon cables supplied from the IP-50 marked 51-75 and 76-100 on the rear of the MCF-100 frame. The connectors are keyed on both ends for proper orientation.

3 Connect the outgoing audio channels (IFB, paging, ect.) to terminal blocks on the IP-50. The output level is a nominal 0.0dB (0.77 VRMS) level with a source impedance of approximately 50 ohms and it is transformer isolated.

STX-101 Allocation

For each pair of Matrix ports that need access to the IP-50, place one STX-101 card in the slot directly below the associated MTX card. For instance, if ports 1 or 2 in the main matrix frame are connected to stations that need access to any of the IP-50 ports (ports 51-100) place an STX-101 card in the leftmost slot directly below the crosspoint card for ports 1 and 2. Install each STX-101 card in this manner being careful to account for each sport that needs to source audio to ports 51-100, this includes stations and interfaces (program feeds, ect.)

Configuration

The following steps using the configuration program must be followed to insure proper operation IP-50 outputs:

1 Follow the instructions in the MXPLUSII Operations manual to configure ports 1-50 including label assignments, station key assignments, etc..

2 Select Setup Frame screen in the Configuration program and define each port used from the IP-50 as a Four-Wire port.

3 Select Setup Labels and give each IP-50 port a talk and listen label.

4 From the Global Advanced menu set each IP-50 port to hide the listen label.

5 Set and desired forced crosspoints (program feeds, ect.) from the Interface Advanced or Station Advanced menus.

6 Assign each IP-50 port as a global or local IFB destination as desired from the Global Advanced or Station/Interface Advanced menus.

7 Assign the IP-50 talk labels to appropriate station keys, fixed groups, party-lines, ect..

Specifications

0 dBv is Referenced to 0.775 Volts RMS

Audio Output

Type	Transformer Balanced
Nominal Output Level	0 dBv
Impedance	50 ohms
Frequency Response	200-10k Hz, ±3 dB
Maximum Output Level	+10 dBv

Connectors

64 Pin Headers	2
Screw Terminals	50 pairs (1 pair for each channel)

Operating Environment

Temperature	Between 0 and 70° C (32-150° F)

Package Dimensions

Rack Space	4 RU 19 inch rack mount
Physical dimensions	19" x 7" x 6.375" (483 x 178 x 162 mm)
Weight	5.7 lbs (2.6 kg)

Matrix Plus II System PSU-102

POWER SUPPLY MODULE

PSU-102

Introduction

This Section contains the installation procedure and the electrical and mechanical specifications for the PSU-102 Power Supply.

The PSU-102 contains three regulated power supplies sufficient to power one complete Matrix Frame or supply power to an IMF-1 Frame for Interface Module power. Each PSU-102 has three separate 9 VDC power supplies with green LED indicators. One of the supplies powers the digital circuitry of the frame cards. The other two supplies are the plus and minus analog supplies for the audio circuitry on the Matrix Cards.

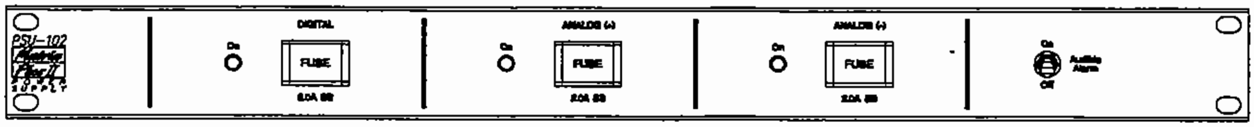
PSU-102 Specifications

- Digital 3.0 A Slo-Blow fuse, digital processor circuitry
- Analog (+) 2.5 A Slo-Blow fuse, plus side of operational amplifiers
- Analog (-) 2.5 A Slo-Blow fuse, minus side of operational amplifiers

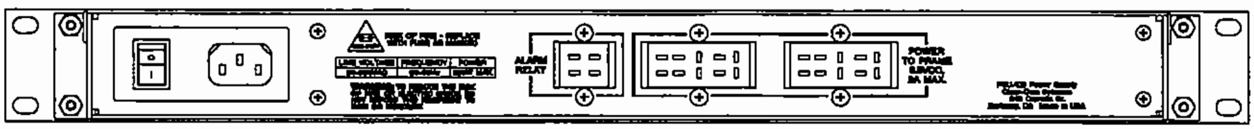
The PSU-102 includes a power supply sense circuit that closes a relay if any of the three supplies fail. An audible alarm is available in the unit with a front panel disable switch.. Relay contacts are also made available that can be wired to an external alarm to inform personnel of the failure of the PSU-102. When redundant powering is implemented it is important to know if a single element of the power supply has failed

PSU-102 Power Supply Redundancy

The PSU-102 is designed to operate two in parallel for redundancy. Internal diodes isolate the power supplies. Installing two PSU-102 power supplies per application provides redundancy because either of the two PSU-102 power supplies can power a complete system. If one fails, it can be removed without interruption of the entire system. Connectors on the rear panel of the Matrix Frames provide easy parallel connection. A third connector is provided to feed an Interface Module Frame (IMF-1).



A. PSU-102 Front Panel



B. PSU-102 Rear Panel

FIGURE F1-1. PSU-102 Front and Rear Panels

System Power Requirements

The Matrix Plus II systems are shipped in five different basic configurations. Interface Modules for each individual system will be different. The system you purchase will have special power requirements.

Upgrading or expanding present systems with different Interface Modules or extra Matrix cards that may be purchased at a later date may change system power supply requirements.

The power supply requirements for the Matrix Plus II is discussed in the Overview chapter of this volume.

Installation

The following paragraphs discuss the rack space requirements and the wiring of the PSU-102 to the matrix.

Rack Space Requirements

The PSU-102 requires 1 rack space above and below the unit in a standard 19-inch rack. Allow at least 3 inches of clearance behind the PSU-102 for cables to plug in.

Wiring

On the back panel of the PSU-102 are four connectors as follows:

- 1 ea. To Mains AC Power
- 1 ea. Alarm Relay
- 2 ea. Power to Frame

The following paragraphs describe connecting cables to these connectors.

To Mains AC Power

Each PSU-102 Power Supply has its own mains AC power input cord. When paralleling two PSU-102 for redundancy each unit should also be powered from separate AC Mains source.

Each PSU-102 has a mains AC power line voltage selector switch located inside the rear panel assembly on the mains AC power input module that is not wired. This selector switch is not wired as this module automatically selects which line voltage operation (110 or 220 volts) to use. This module allows houses a spare fuse (2.00 Amp 250 Volt) that is supplied by the factory.

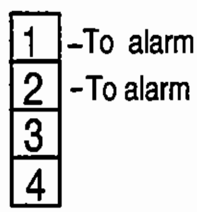
To replace the fuse and/or spare fuse, use a small screwdriver to pry out the fuse block. The fuse block press-fits tightly into the mains AC power input module adjacent to where the line cord plugs into the module. The fuse block has a small slot in it that is used to pry it out. The slot is located on the side of the fuse block just inside the area that the line cord would occupy if it were plugged in. The fuse block holds both the fuse and the spare fuse. The fuse is held in the exposed clips at the back of the fuse block, and the spare fuse is held inside a press-fit insert inside the fuse block.

To access the spare fuse, pop the insert out by using a small screwdriver to push on one end of the press-fit insert.

Alarm Relay

Each PSU-102 includes an **Audible Alarm** switch on the front panel. If this switch is ON, an audible alarm will inform personnel that power to one of the three supplies in the unit has failed.

The PSU-102 includes a set of "alarm relay" contacts that close when one of the three supplies in the unit has failed. These contacts are Normally Closed and are energized by each powersupply and therefor will be open if the supply is working. The three relays for each power supply are wired in parallel providing a closure if any one of the supplies fail. These contacts can be wired to an external alarm which informs personnel whenever any of the supply outputs on one or both supplies have shut down. The relay contacts consist of a pair of pins on the **Alarm Relay** connector on the rear panel.



4 PIN JONES CONNECTOR FOR ALARM

Figure F1-4. Alarm Contact Connection

Power To Frame

Each PSU-102 has two **Power To Frame** connectors on the rear panel. One power cord is supplied by the factory to connect the PSU-102 to the frame through one of these connectors. The second connector is provided convenience for more complicated systems.

Specifications

Front Panel Controls and Indicators

Indicators	3 Green power output indicator leds
Fuses	3 Fuseholders for the three power supplies
Switches	1 Audible Alarm Enable

Rear Panel Connectors and Controls

Output Conn.	2 300 Series 10 Pin Cinch Jones
Alarm Out	1 300 Series 4 Pin Cinch Jones
Power In Conn.	IEC 320 Type
Fuse	AC Mains

Internal Regulated Power Supplies

Quantity	3
Type	Switching
Output Volt.	9.0 VDC
Output Cur.	4.4 Amp. Max.
Output fuse	3.0 Amp Digital supply
	2.5 Amp + Analog supply
	2.5 Amp - Analog Supply

Mains AC Power Input

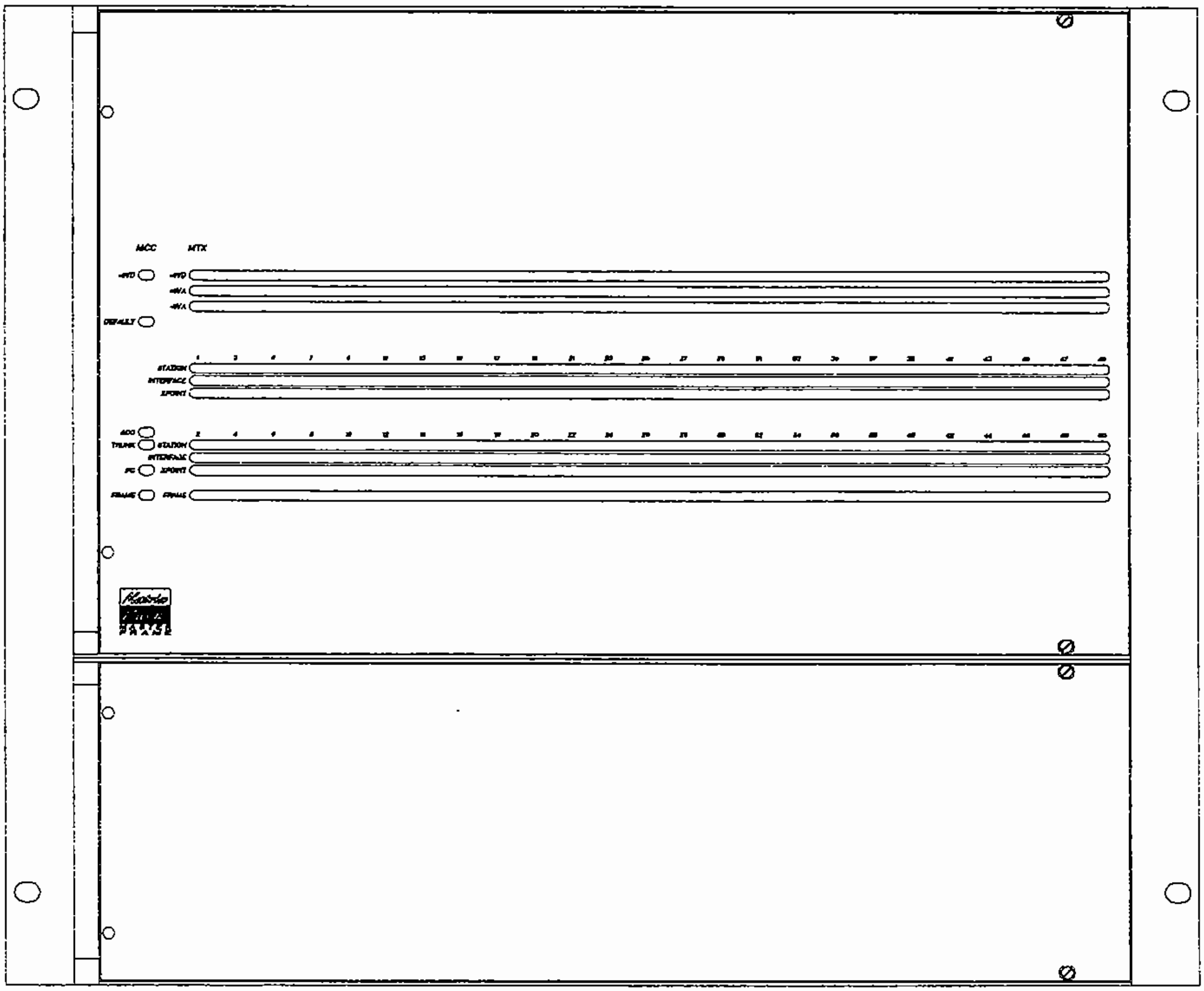
Voltage	90 - 260 VAC
Power	125 Volt-Amps Max.
Frequency	50 to 60 Hz
Fusing	2.0 Amp.

Operating Environment

Temperature	0 to 50° C (32 to 1220° F)
Humidity	20 % to 90 % Relative Humidity (Non-Condensing)

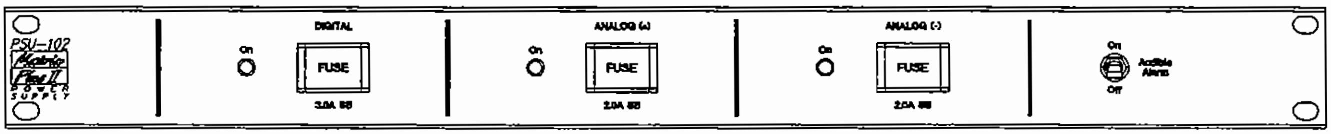
Package Dimensions

Height	1.75 inches (4.45 cm), (1 RU)
Width	19.0 inches (48.26 cm)
Depth	7.75 inches (19.69 cm)
Weight	4.5 lbs (2.0 Kg)



Matrix Plus II System MCF-100

MASTER CARD FRAME 50x100 - 25 SLOT



Matrix Plus II System PSU-102

POWER SUPPLY MODULE

Introduction

This Section describes the installation of the MCF-100 Master Card Frame as well as system linking that allows multiple Matrix Plus II Systems to be connected together.

Many aspects of this Section also describes the installation of the SCF-101, MCF-50, MCF-25, and MFC-10 Card Frames. The sections on those products will refer to this section when it is applicable.

Description

The MCF-100 Master Card Frame is the housing for the central switching part of the Matrix Plus II System. The MCF-100 is the first of two card frames that are needed to build a 100 X 100 matrix system. The SCF-101 is the second frame in a 100 X 100 system. It is intended that the two frames will be connected together to form a 100 X 100 system however, the MCF-100 will operate alone as a 50 X 50 system. A SCF-101 could be added at a later date when expansion is needed beyond the 50 X 50 original installation.

The MCF-100 frame provides a housing for the CPU-100 Master CPU Controller Card, up to 25 each matrix crosspoint cards (MTX-100 or MTX-200), and up to 25 each STX-101 Expansion Crosspoint Cards.

The circuitry necessary to expand the 50 ports that a MCF-100 can hold is built in and is ready to expand its intercom buses to a SCF-101 Expansion frame.

The rear Panel of the MCF-100 contains all of the connectors necessary to interconnect to all intercom stations, interfaces, external configuration computer, and linking to another separate Matrix Plus II system.

Matrix Frame Installation

When you receive your matrix frame from the factory, it will already be assembled and configured for your application. You must supply the wire and connectors for all cables to stations, interfaces and the configuration computer.

The MCF-100 frame requires 9 RU of space in a standard 19 inch rack. Normally the PSU-102 necessary to power the matrix frame is mounted directly below the MCF-100 and it is 1 RU high.

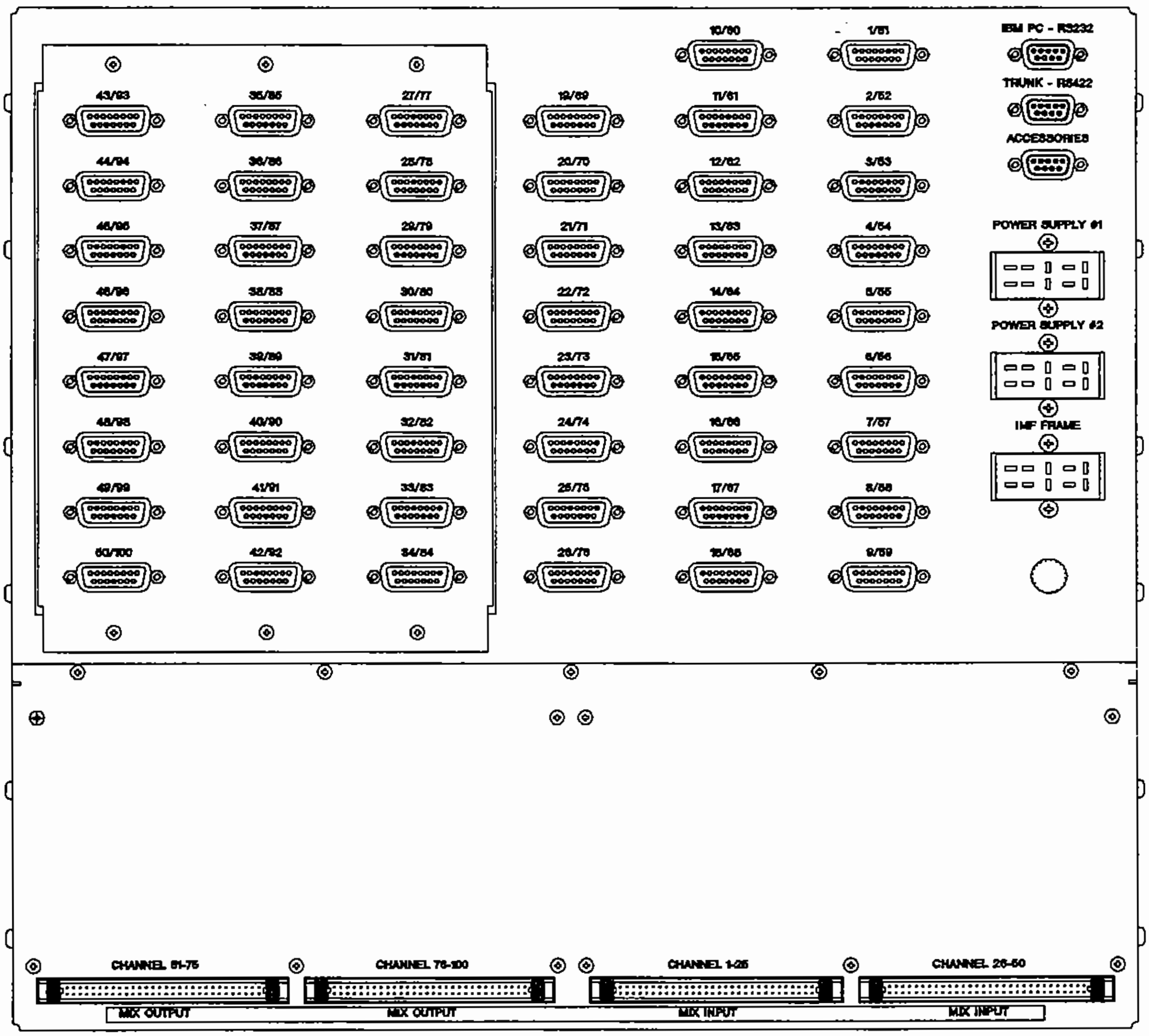


FIGURE F2-1. MCF-100 Rear Panel

Rear Panel Connector Description

The following paragraphs discuss the connectors on the back of the MCF-100 matrix frame and the figures show either the pinouts of the connectors or the wiring diagrams for building cables to connect stations, interfaces, and other external devices to the ports of the matrix frame. Requirements for the cable used to connect each type of device to the matrix frame are discussed under the heading of each type of device.

In this Installation Manual, "DB-15F" and "DB-9F" refer to female D-shell connector types, while "DB-15M" and "DB-9M" refer to male D-shell connector types. The connectors on the rear panel of the MCF-100 frame include:

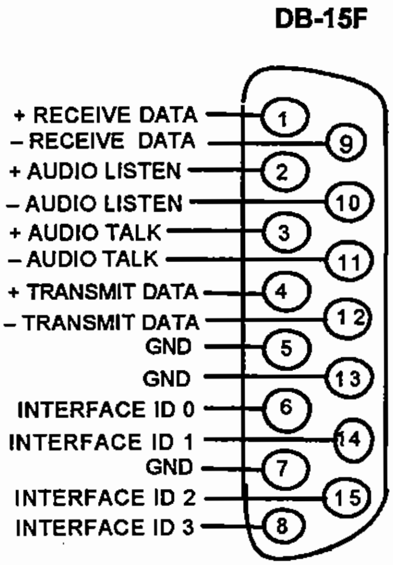
DB-15F	50 Port Connections
DB-9F	IBM-PC RS-232
DB-9F	Trunk RS-422
DB-9F	Accessories Connector
10 Pin Jones	2 Power Input Connectors
10 Pin Jones	1 Power Output connector to Interface Frames
64 pin Headers	4 Interconnection to SCF-101 Expansion Frame

15-Pin Port Connectors (DB-15F)

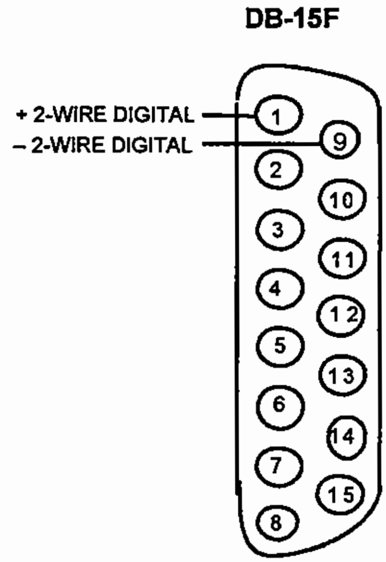
The 15-Pin Port Connectors (1/51 – 50/100) are used to connect stations and interfaces matrix frame. There is one 15-Pin connector for each port in the system. The numbers "1/51, "1/52", etc. refer to the audio port numbers. The MCF-100 Frame and SCF-101 Expansion Card Frame have the same backplate. On the MCF-100, the ports are 1 - 50, and on the SCF-101, the ports are 51 - 100.

All standard intercom stations (non "D" suffix) can be wired with either 3 or 4 pair wiring from the matrix to the station. 3 pair wiring is the normal mode and is accomplished by paralleling the SEND and Receive data pins on the port connector. 4 pair operation is reserved for data repeaters or modems or other data transmission methods that require separate SEND and RECEIVE paths. 3/4 pair operation assumes that a MTX-100 is used for a matrix card for that port.

1 pair operation is possible with all "D" suffix stations and a MTX-200 matrix card installed for the port being used.



A. 6-WIRE/3-PAIR (MTX-100)



B. 2-WIRE DIGITAL (MTX-200)

FIGURE F2-2. 15-Pin Port Connector

IBM-PC RS-232 Connector

The IBM-PC RS-232 connector is used to connect an external IBM-PC (or compatible) computer to the matrix frame. This computer is used to run the Matrix Plus II System Configuration Program.

Figure F2-3 shows the pinout of IBM-PC RS-232 connector as viewed from the rear of the frame. Refer to the Configuration Chapter under the heading Serial Port Connection for connections for a cable that connects the matrix frame to the computer.

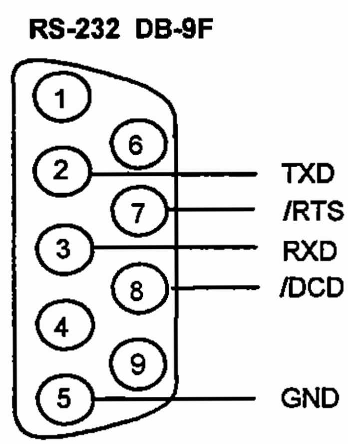


FIGURE F2-3. IBM-PC RS-232 Connector

Trunk RS-422 Connector (DB-9F)

The Trunk RS-422 connector is used to connect the RS-422 data line bus when linking multiple Matrix Plus II Systems together. The RS-422 data line provides control of the linking function.

Figure F2-4 shows the pinout of the Trunk RS-422 connector as viewed from the rear of the matrix frame.

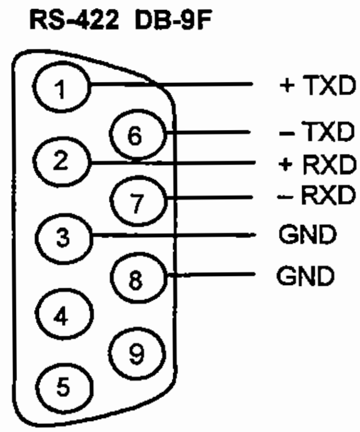


FIGURE F2-4. Trunk RS-422 Connector

Accessories Connector (DB-9F)

The Accessories connector is used to connect the data bus for accessory devices to the matrix such as the RLY-8 Relay Interface Module.

Figure F2-5 shows the pinout of the Accessories connector as viewed from the rear of the matrix frame.

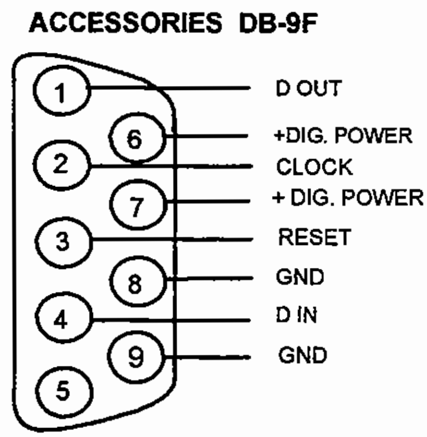


FIGURE F2-5. Accessories Connectors

Power Connectors

There are three power connectors (Jones 10-pin) as follows: Two 10 Pin Jones Power Input Connector and one 10 Pin Jones Power Output connector to Interface Frames

Expansion Frame Connectors

There are four Expansion Frame connectors at the bottom of the MCF-100 Master Card Frame for connecting a SCF-101 Expansion frame.. These connectors are only used in those applications that are using 51 or more audio ports.

Cable Wiring Requirements

Each intercom station and interface device must be connected to the matrix card frame. All Matrix Plus II System intercom stations can communicate with the matrix frame using either 6-Wire/3-Pair, 8-Wire/4-Pair, or 2-Wire Digital. The following paragraphs provide the wiring requirements and cable wiring for the three wiring configurations.

6-Wire and 8-Wire Wiring Requirements

The 6-Wire/3-Pair wiring configuration requires three pairs of twisted wires to wire a station to the frame. The data is are sent over one pair while the audio is sent and received in analog form over the two additional pairs of wires.

The 8-Wire/4-Pair wiring configuration requires four pairs of twisted wires to wire a station to the frame. The data is sent over one pair while the audio is sent and received in analog form over the three additional pairs of wires.

The wiring requirements for 6-Wire/3-Pair and 8-Wire/4-Pair are exactly the same. Wire gauges between 20 and 26 can be used, either solid or stranded. The most common are the #24 or #26 gauge pairs commonly used in the telephone industry. Shielded cable can be used but is not mandatory.

6-Wire/3-Pair Station Connection

Figure F2-6 shows the wiring of a cable connecting an intercom station to the matrix frame using 6-wire/3-pair. The connector connecting the cable to the matrix frame port should be a DB-15M and the connector connecting the cable to the intercom station at the To Matrix connector should be a DB-15F. All of the connections required between the station and frame are shown. In the diagram, the connector is viewed from the rear (cable side).

A MTX-100 matrix card must be used for this configuration.

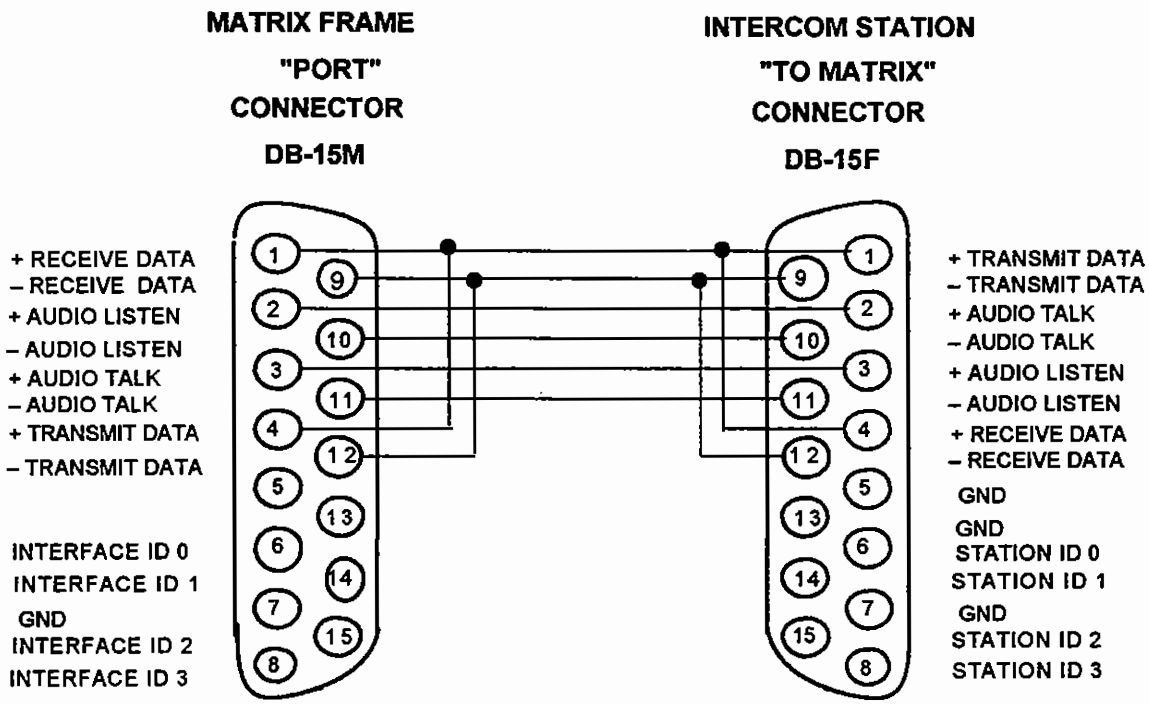


FIGURE F2-6 Wiring of Cable Connecting Intercom Station to Matrix Frame Using 6-Wire/3- Pairs

8-Wire/4-Pair Station Connection

Figure F2-7 shows the wiring of a cable connecting an intercom station to the matrix frame using 8-wire/4-pair. The cable connector for the matrix frame port should be a DB-15M and the cable connector connecting for the intercom station at the To Matrix connector should be a DB-15F. All of the connections required between the station and frame are shown. In the diagram, the connector is viewed from the rear (cable side).

A MTX-100 matrix card must be used for this configuration.

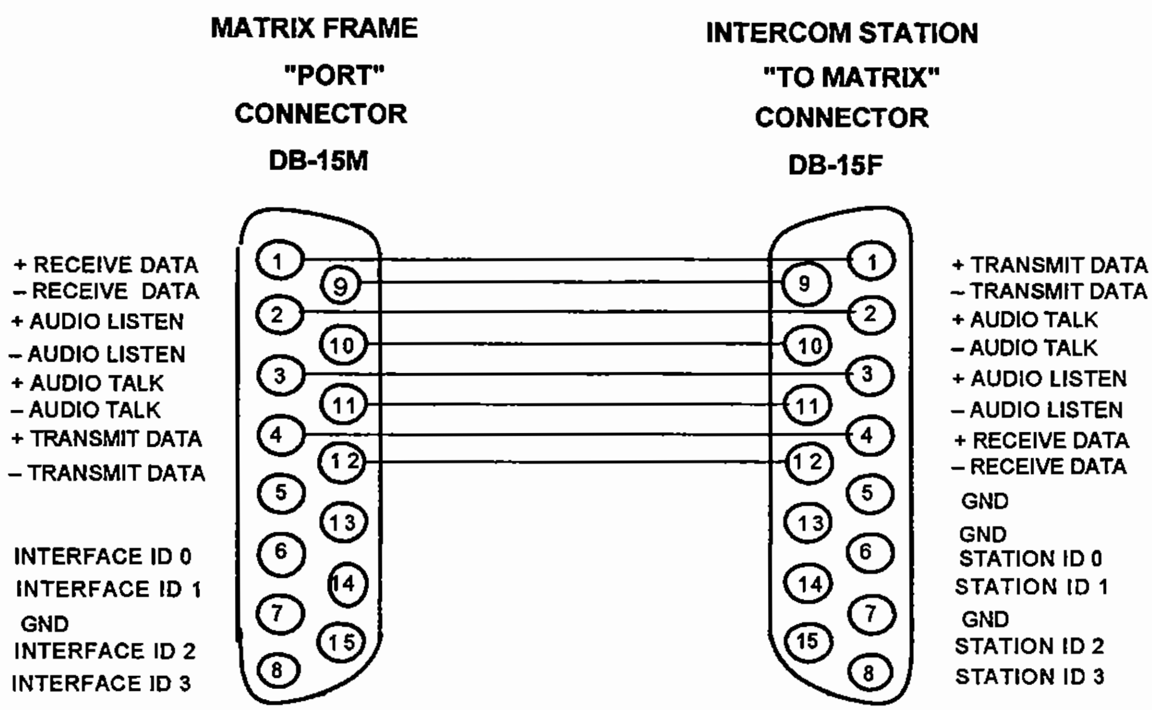


FIGURE F2-7 To Matrix DB-15M Connector Pinout Using 8-Wire/4-Pair

2-Wire Digital Wiring Requirements

The 2-Wire Digital wiring configuration is identifiable by the letter "D" in the model number of the intercom station (ICS-2002D, ICS-1802D, etc.) and a MTX-200 matrix card must be used. The 2-Wire configuration requires a single twisted pair of wires to connect the station to the matrix frame. All audio and control signals are transmitted in a proprietary digital format over a single pair of wires.

Wire gauges between 20 and 26 can be used, either solid or stranded. The most common are the #24 or #26 gauge pairs commonly used in the telephone industry. The Matrix Plus II System is immune to crosstalk, so the pairs can be routed in large multiple-pair cables. Shielding is acceptable, but not necessary. When using shielded cable, connect the shield to ground only at the matrix frame, and leave it unconnected at the other end.

The transmission scheme a wide-band (120 kHz), full duplex channel and therefore has the following special requirements:

- The wiring pair must be a twisted pair.
- The pair must be a DC path.
- The pair must be completely isolated from other circuits (a "dry" pair).
- Loading coils must not be connected to the pair.
- Only one gauge of wire must be used throughout a pair; no changes in wire gauge are permitted between a station and the matrix frame. (A pair that connects one station to the frame does not need to be the same gauge as a separate pair used to connect a different station to the frame).
- Terminal blocks and other standard splicing techniques can be used.
- Line bridging (whether loaded or unloaded) is not permitted
- Maximum length is 4.2 kilometers (approximately 2.5 miles) on #24 gauge pairs or 3.0 kilometers (approximately 1.9 miles) on #26 gauge pairs.
- Repeaters cannot be used because they are not available for this form of transmission

2-Wire Digital Station Connection

Figure F2-8 shows the wiring of a cable connecting an intercom station to the matrix frame using 2-Wire digital. The cable connector for the matrix frame port should be a DB-15M and the cable connector for the intercom station at the To Matrix connector should be a DB-15F. All of the connections required between the station and frame are shown. The remaining connections in the cable connector on the frame side should be left floating as shown in the diagram. In the diagram, the connector is viewed from the rear (cable side).

A MTX-200 matrix card must be used for this configuration.

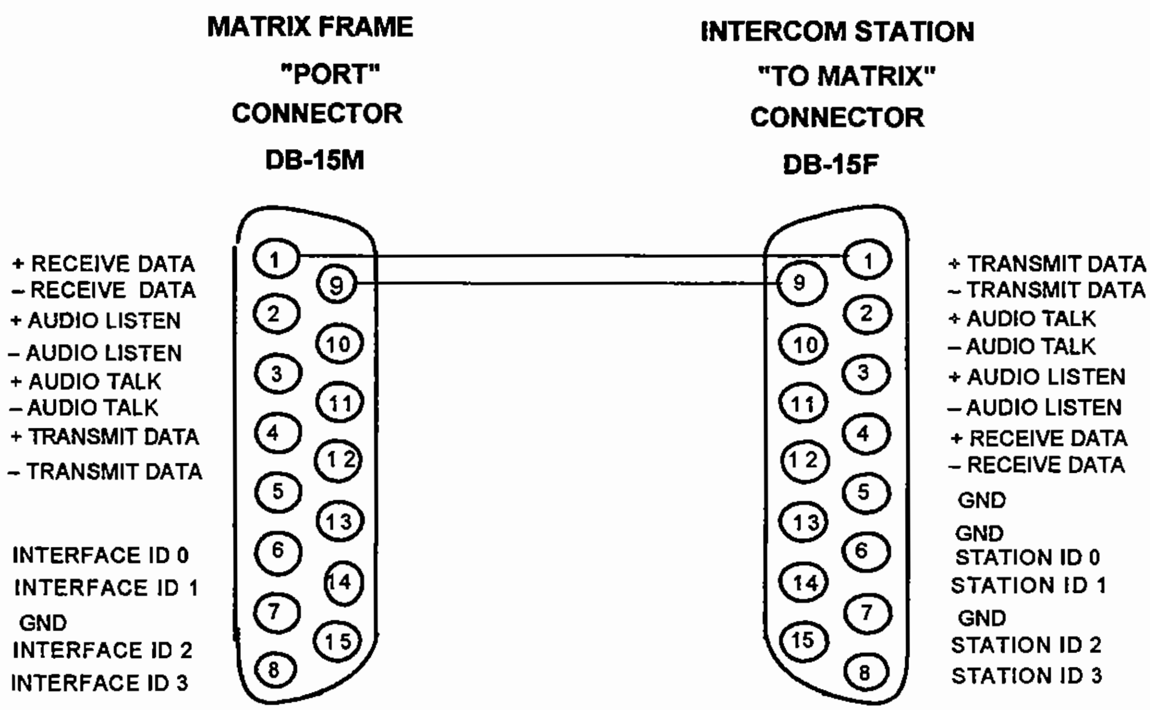


FIGURE F2-8 To Matrix DB-15M Connector Pinout Using 2-Wire Digital

MCF-100

Interface Wiring Requirements

Interfaces are usually located near to the matrix frame (less than six feet), and wired using the "standard" wiring method where all fifteen pins of the connector are wired between the Matrix Frame and the Interface Frame using a ribbon cable. However, if the interface is located far from the matrix frame, an alternate "minimum" wiring scheme that minimizes the number of conductors can be used.

Interfaces Standard Wiring Method

In the standard wiring method, all conductors are wired straight across for simplicity.

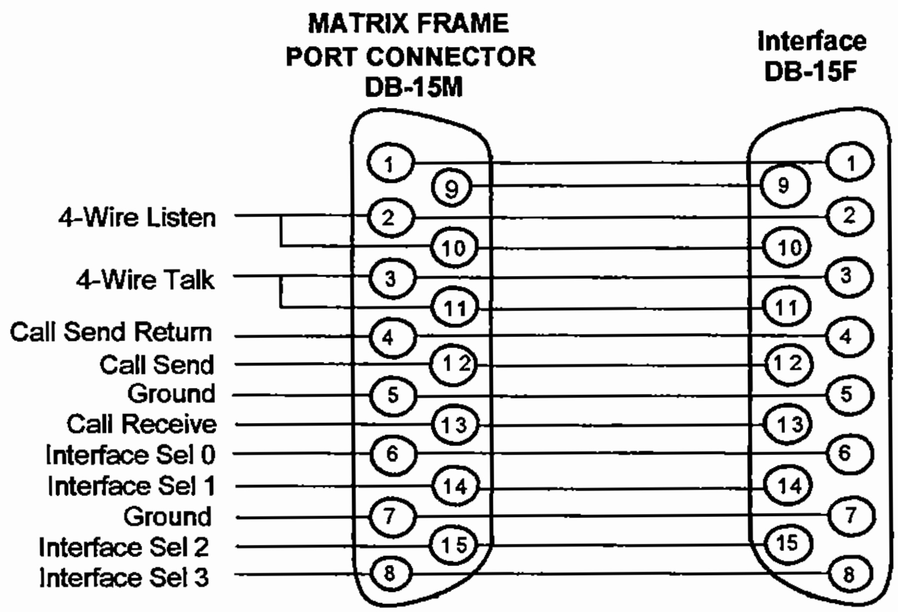


FIGURE F2-9 Wiring of Cable Connecting Interface to Matrix Frame Using Interfaces Standard Wiring Method (Viewed from Cable Sides of Connectors)

Interfaces Minimum Wiring Method

It is possible to reduce the number of conductors in the cables connecting the interfaces to the matrix frame by eliminating the 2-Wire digital pair of conductors and the 4 conductors used for the interface identification (interface ID).

The interface ID inputs allow the Matrix Plus II System to identify which type of interfaces are connected to each port. Normally, each interface identifies itself by grounding one of the Interface ID pins on the 15-pin cable connecting the interface to the matrix frame.

If the interface ID connections are not wired between the interface and the matrix frame, the Matrix Plus II System will assume that a station is connected to the port. To select a interface type for a given port wire a jumper in the matrix connector. Table F2-1 shows the interface ID pin that must be grounded to identify each interface type.

Interface Type	Ground Pin No.	Interface Select
FOR-22	Pin 8	Interface Sel 3
CCI-22	Pin 6	Inteface Sel 0
TEL-12	Pin 15	Interface Sel 2

TABLE F2-1. Interface ID Pin Number Ground

The wiring diagram for a cable connecting an interface to the matrix frame using the minimum wiring method is shown in Figure F2-10 as viewed from the cable side of the connectors. The cable illustrated has the Interface ID pins jumped for connecting a CCI-22 Dual Party-Line Interface to the matrix.

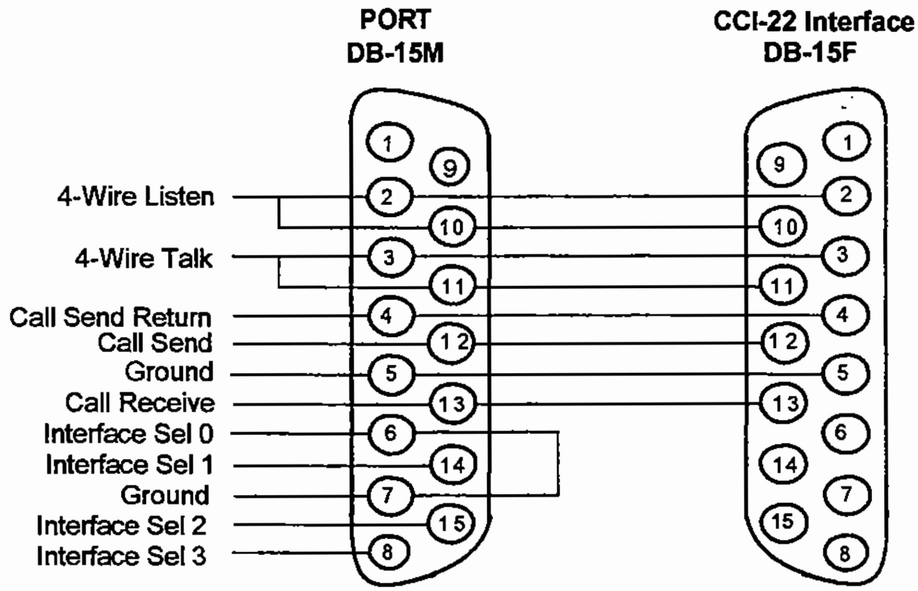


FIGURE F2-10 Wiring of Cable Connecting CCI-22 Interface to MCF-100 Using Interfaces Minimum Wiring Method (Viewed from Cable Sides of Connectors)

To 4-Wire Audio Device (Direct from Port Connector)

To connect an external 4-wire audio device directly to a Port Connector use the wiring shown in Figure F2-11.

The effect of call signals is determined by the port type assigned to the port from the Matrix Plus II System Configuration Program.

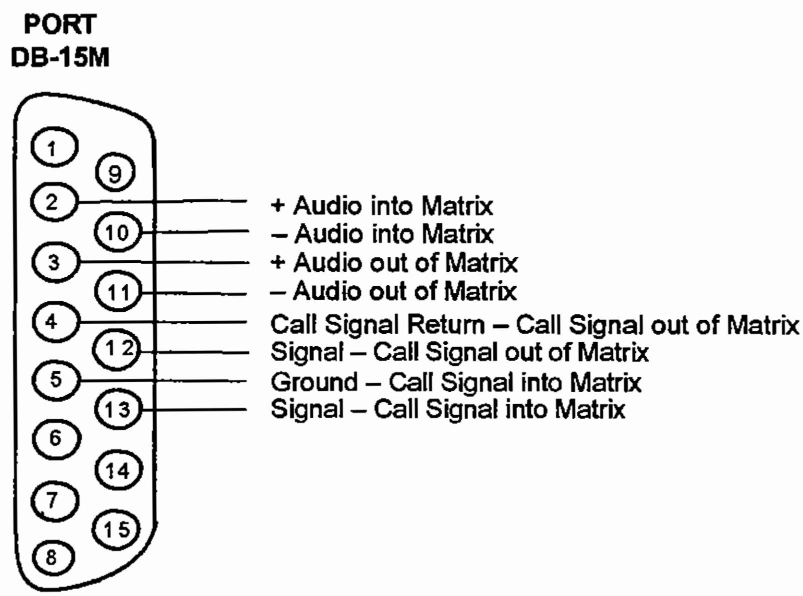


FIGURE F2-11 Wiring of Cable Connecting an External Device Directly to a 15-pin DB-15F Port Connector on MCF-100 Frame

MCF-100

Party Line Connection of Two Matrixes

The simplest method of connecting two Matrix Plus II systems together is to connect the TALK and LISTEN lines of a port in one system to the LISTEN and TALK lines of a port in a second system and assign the ports in each system to a Party-Line Label. By also interconnecting the CALL signal lines between the two systems, CALL signals will also pass from one system to the other

This concept should not be confused with LINKING of multiple systems together. LINKING is the "smart" interconnection of systems whereby the systems talk to each other through a data link to establish intercom activity between systems. LINKING will be discussed in the next section of the chapter.

The following illustration is a wiring diagram to accomplish this Party Line Connection of Two Matrixes.

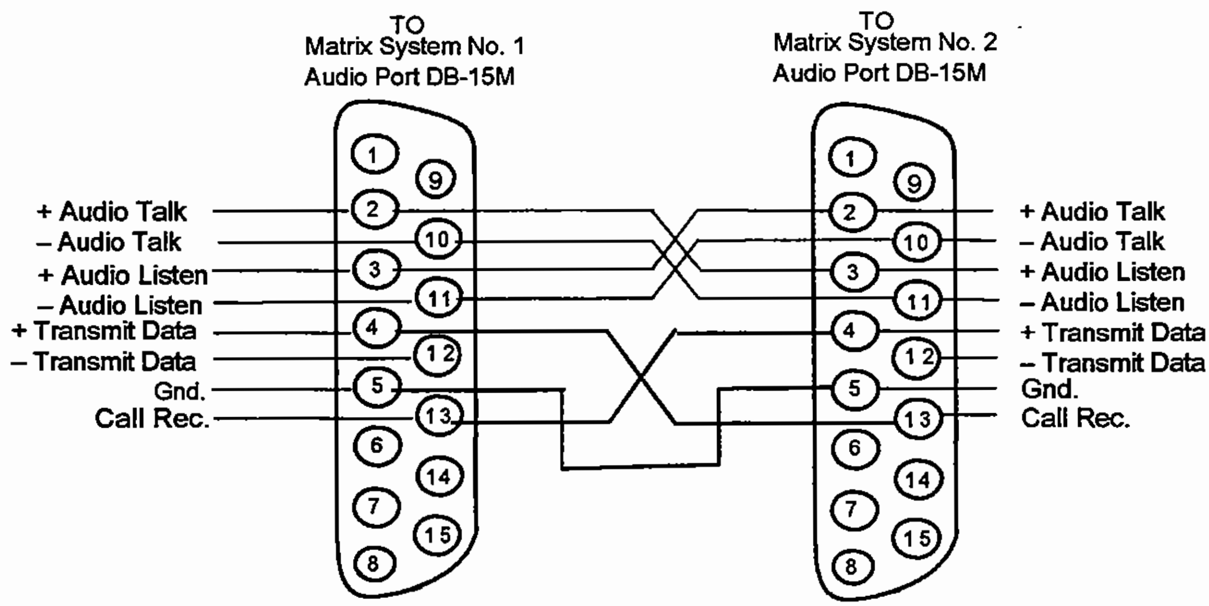


FIGURE F2-12 Party-Line Interconnecting of two Matrixes

(Viewed from the cable side of the connectors)

Specifications

Plug-in Card Capacity

CPU Slot	1
MTX slots	25
STX slots	25
Bus Expansion	Yes

Connectors (Rear Panel)

DB-15F	50 Port Connections
DB-9F	IBM-PC RS-232
DB-9F	Trunk RS-422
DB-9F	Accessories Connector
10 Pin Jones	2 Power Input Connectors
10 Pin Jones	1 Power Output connector to Interface Frames
64 pin Headers	4 Interconnecton to SCF-101 Expansion Frame

Power Requirements (Frame Only No Cards)

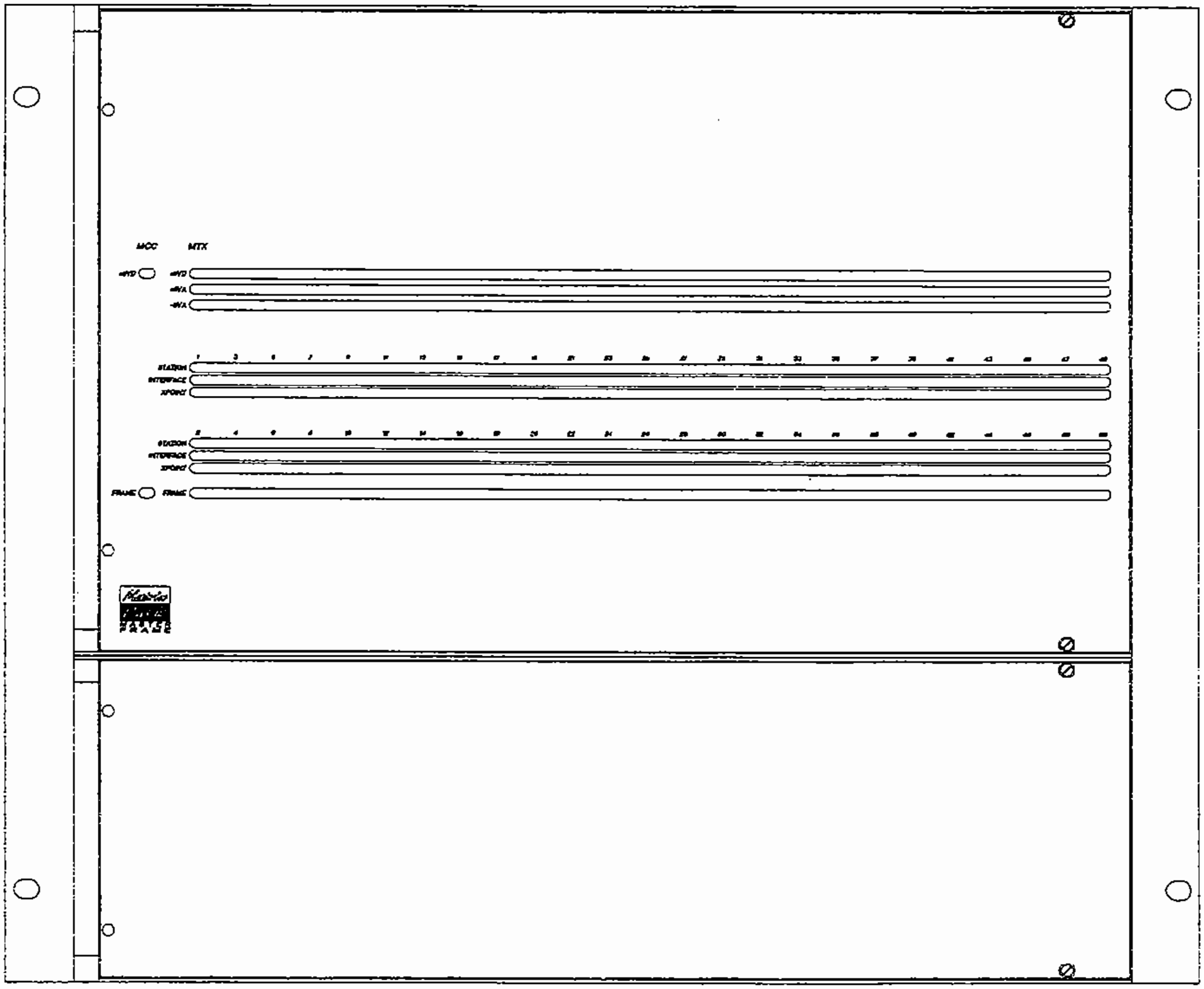
+ 9 V Digital	0.0 A
+ 9 V Analog	0.4 A
- 9 V Analog	0.4 A
Max. Dissipation	75 Watts full of cards

Operating Environment

Temperature	32 to 122 deg F (0 to 50 deg C)
Humidity	40 to 90 % relative humidity (non-condensing)

Dimensions

Width	19 inches (48.26 cm)
Height	15.09 inches (38.33 cm)
Depth	13.56 inches (34.44 cm)
Weight	22.20 lbs (10.08 Kg)



Matrix Plus II System SCF-101

EXPANSION CARD FRAME 50x100 - 25 SLOT

Introduction

This Section covers description, installation and specifications of the SCF-101 Master Card Frame. The SCF-101 Expansion Frame is only used for those applications that are using 51 or more audio ports. The maximum number of audio ports that can be used is 100.

Description

The SCF-101 Expansion Card Frame is the second frame in a 100 X 100 system. The SCF-101 frame houses the CPU-150 Slave CPU Controller Card, up 25 matrix crosspoint cards (MTX-100 or MTX-200), and up to 25 STX-101 Expansion Crosspoint Cards.

The circuitry necessary to interface the SCF-101 to the MCF-100 is built in. Simply connecting the four ribbon cables between the two frames is all that is needed to expand the 50 X 50 MCF-100 to a 100X 100 system.

The SCF-101 Expansion Frame cannot be added to either the MCF-50, MCF-25, or MCF-10 Master Card Frame.

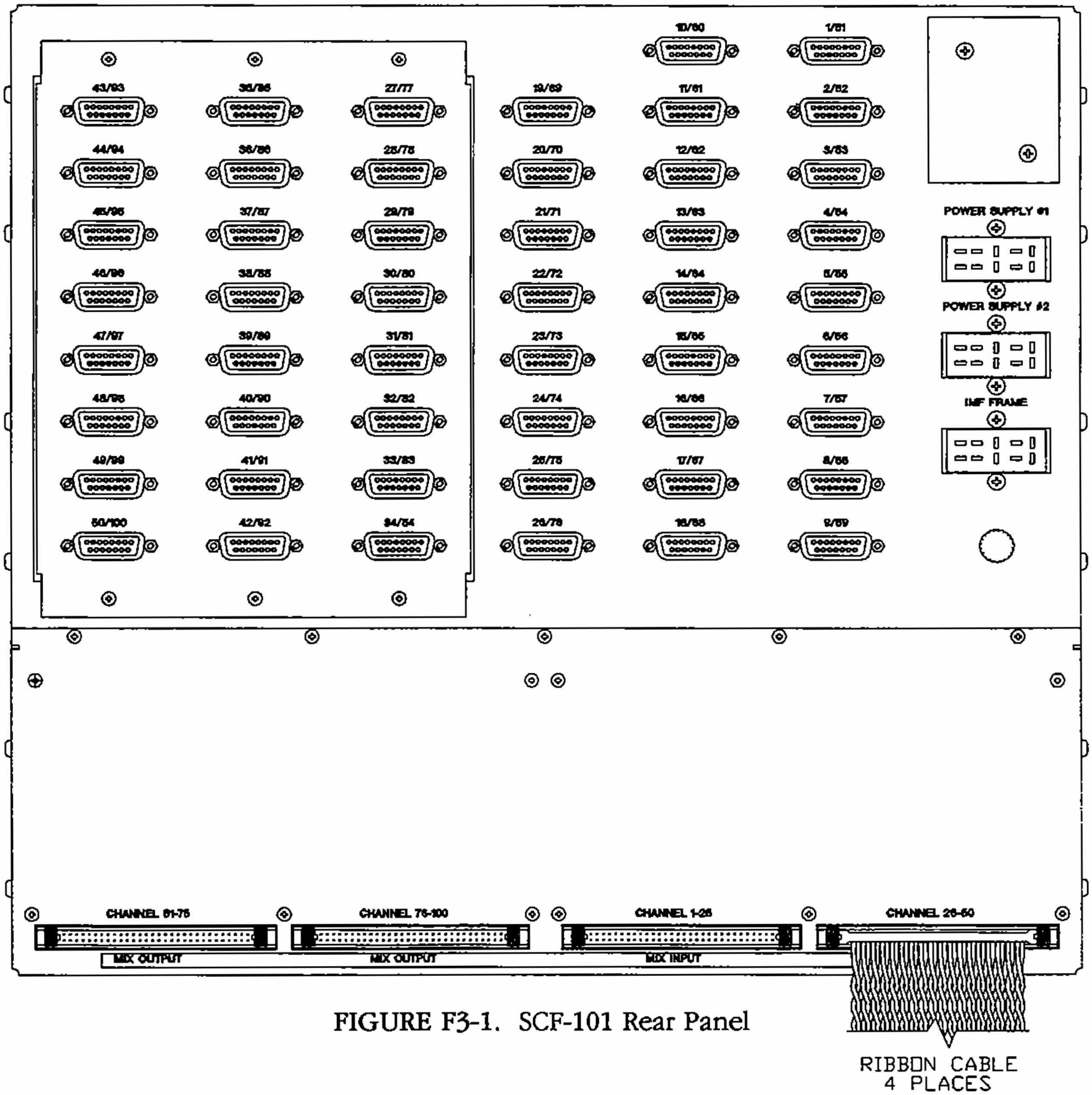


FIGURE F3-1. SCF-101 Rear Panel

Installation

The SCF-101 Expansion Frame is similar to the MCF-100 Master Card Frame except that the SCF-101 does not contain the serial port connectors (RS-232 Computer and RS-422 Trunk).

The installation procedures of the SCF-101 are identical to those described for the MCF-100 Frame in the MCF-100 Master Card Frame Section of this Installation Manual and are not duplicated in this Section.

Except for connecting ribbon cables, as described in the paragraph below, the requirements for wiring and linking of multiple Matrix Plus II Systems using the SCF-101 Frame are exactly the same as those described in the MCF-100 Master Card Frame Section of this manual and are not duplicated in this Section.

Connecting Ribbon Cables

The ribbon cables used to connect the SCF-101 to the MCF-100 is constructed of 30 twisted pairs for isolation of the audio signals. These ribbon cables are 40 inches long. If your application requires longer lengths up to the maximum of 20 feet, contact Technical Support for special ordering of longer lengths.

As shown in Figure F3-2 connect the four ribbon cables to both the SCF-101 and MCF-100 Frame Interconnect Connectors by connecting one cable to each connector straight across so that the same Channel ports (inputs and outputs) are together as follows:

- SCF-101 Channel 51-75 input with MCF-100 Channel 51-75 output
- SCF-101 Channel 76-100 input with MCF-100 Channel 76-100 output
- SCF-101 Channel 1-25 output with MCF-100 Channel 1-25 input.
- SCF-101 Channel 26-50 output with MCF-100 Channel 26-50 input

In a normal installation where the SCF-101 is mounted directly below the MCF-100 it is possible to dress the ribbon cables to either side of the rack allowing easy access to the DB-15 port connectors..

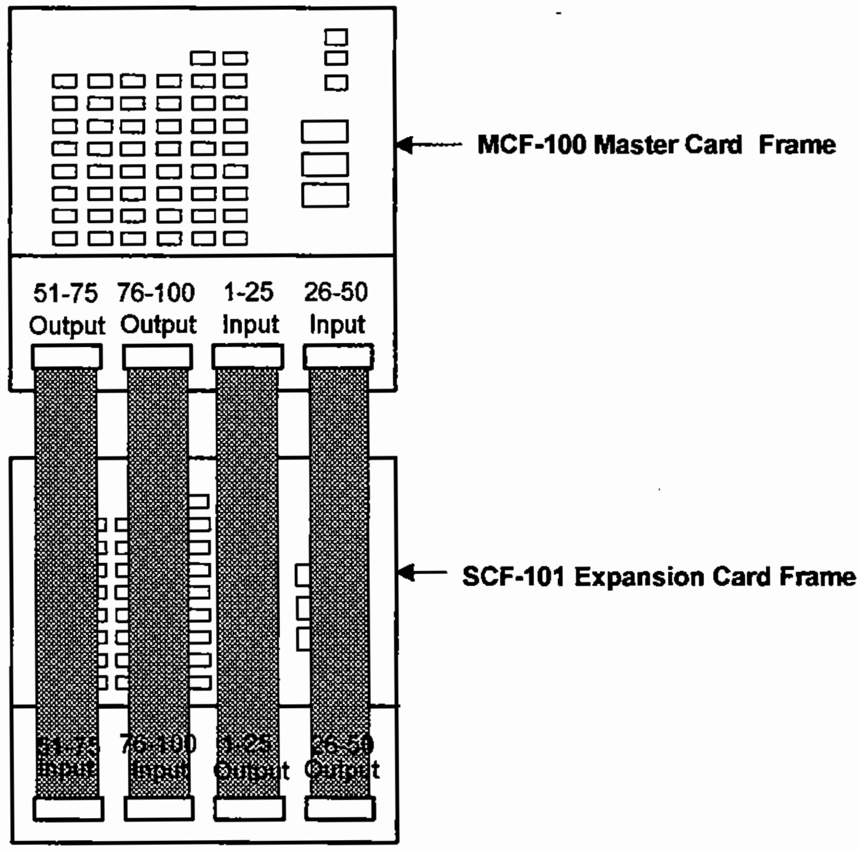


FIGURE F3-2. Connecting Ribbon Cables to Frame Interconnect Connectors on Rear Panel of SCF-101 and MCF-100

Power For Frame

The SCF-101 should have its own PSU-102 power supply separate from the power supply for the MCF-100. Refer to the Overview section of this manual for guidelines on system powering.

Specifications

Plug-in Card Capacity

CPU Slot	1
MTX slots	25
STX slots	25
Bus Expansion	Yes

Connectors (Rear Panel)

DB-15F	50 Port Connections
10 Pin Jones	2 Power Input Connectors
10 Pin Jones	1 Power Output connector to Interface Frames
64 pin Headers	4 Interconnection to SCF-101 Expansion Frame

Power Requirements (Frame Only no Cards)

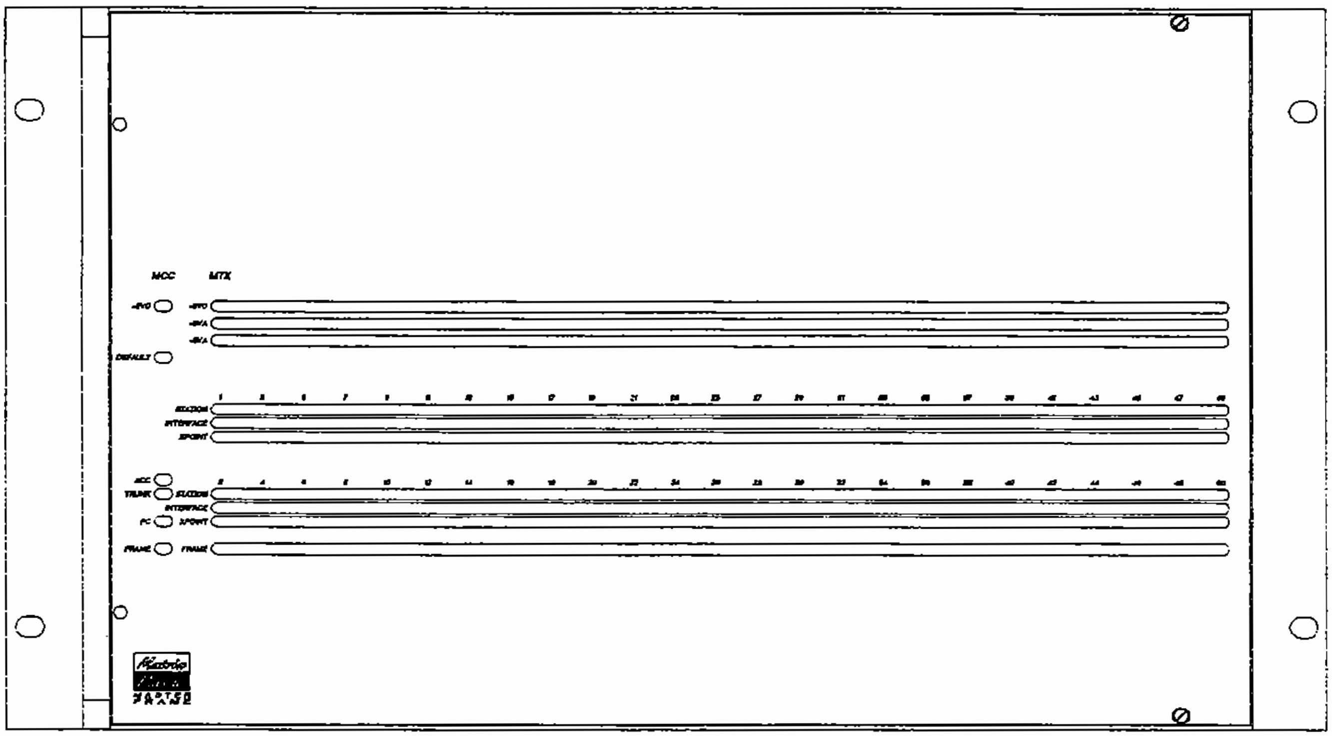
+ 9 V Digital	0.0 A
+ 9 V Analog	0.4 A
- 9 V Analog	0.4 A
Max. Dissipation	75 Watts full of cards

Operating Environment

Temperature	32 to 122 deg F (0 to 50 deg C)
Humidity	40 to 90 % relative humidity (non-condensing)

Dimensions

Width	19 inches (48.26 cm)
Height	15.09 inches (38.33 cm)
Depth	13.56 inches (34.44 cm)
Weight	22.20 lbs (10.08 Kg)



Matrix Plus II System MCF-50

MASTER CARD FRAME 50x50 - 25 SLOT

Introduction

This Section covers description, installation and specifications of the MCF-50 Master Card Frame.

The MCF-50 is identical to the MCF-100 except that it is not intended for expansion beyond 50 X 50. All of the installation procedures and wiring diagrams shown in the Chapter on the MCF-100 apply to the MCF-50.

Description

The MCF-50 Master Card Frame is the housing for the central switching part of the Matrix Plus II System. The MCF-50 is intended for systems of up to 50 ports with no plans for expansion.

The MCF-50 frame provides a housing for the CPU-100 Master CPU Controller Card and up to 25 each matrix crosspoint cards (MTX-100 or MTX-200).

The rear Panel of the MCF-50 contains all of the connectors necessary to interconnect to all intercom stations, interfaces, external configuration computer, and linking to another separate Matrix Plus II system.

Installation

The MCF-50 frame requires 6 RU of space in a standard 19 inch rack. Normally the PSU-102 power supply is mounted directly below the MCF-50 and it is 1 RU high.

The installation procedures of the MCF-50 are identical to those described for the MCF-100 Frame in the MCF-100 Master Card Frame Section of this Installation Manual and are not duplicated in this Section.

The MCF-50 cannot be expanded beyond the 50 audio ports it contains.

The requirements for wiring and linking of multiple Matrix Plus II Systems using the MCF-50 Frame are exactly the same as those described in the MCF-100 Master Card Frame Section of this Installation Manual and are not duplicated in this Section.

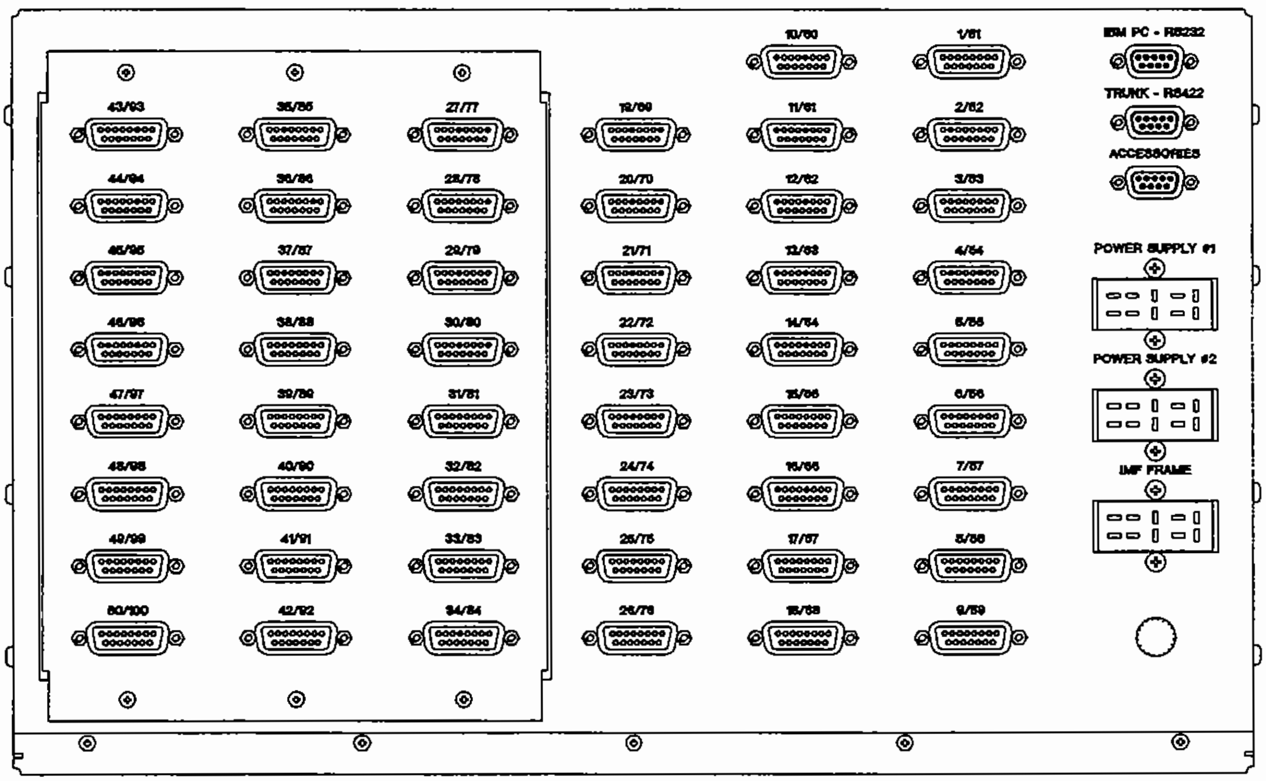


FIGURE F4-1. MCF-50 Rear Panel

Specifications

Plug-in Card Capacity

CPU Slot	1
MTX slots	25
Bus Expansion	No

Connectors (Rear Panel)

DB-15F	50 Port Connections
DB-9F	IBM-PC RS-232
DB-9F	Trunk RS-422
DB-9F	Accessories Connector
10 Pin Jones	2 Power Input Connectors
10 Pin Jones	1 Power Output connector to Interface Frames

Power Requirements (Frame Only no Cards)

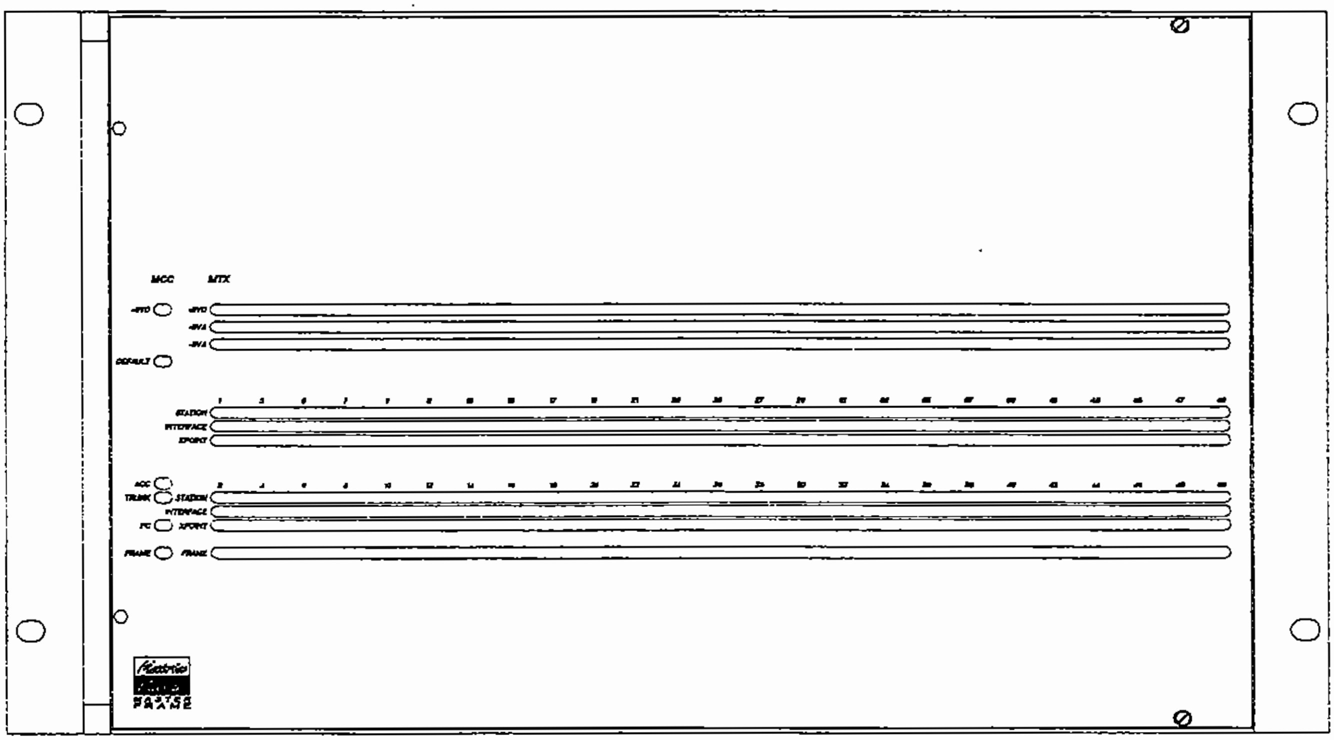
+ 9 V Digital	0.0 A
+ 9 V Analog	0.0 A
- 9 V Analog	0.0 A
Max. Dissipation	75 Watts full of cards

Operating Environment

Temperature	32 to 122 deg F (0 to 50 deg C)
Humidity	40 to 90 % relative humidity (non-condensing)

Dimensions

Width	19 inches (48.26 cm)
Height	10.50 inches (26.7 cm)
Depth	13.56 inches (34.44 cm)
Weight	15.20 lbs (6.9 Kg)



Matrix Plus II System MCF-25

MASTER CARD FRAME 50x50 - 13 SLOT

Introduction

This Section covers description, installation and specifications of the MCF-25 Master Card Frame.

The MCF-25 is identical to the MCF-50 except that it has slots for 13 matrix cards instead of 25. All of the installation procedures and wiring diagrams shown in the Chapter on the MCF-100 apply to the MCF-50.

Description

The MCF-25 Master Card Frame is the housing for the central switching part of the Matrix Plus II System. The MCF-25 is intended for systems of up to 26 ports with no plans for expansion.

The MCF-25 frame provides a housing for the CPU-100 Master CPU Controller Card and up to 13 each matrix crosspoint cards (MTX-100 or MTX-200).

The rear Panel of the MCF-25 contains all of the connectors necessary to interconnect to all intercom stations, interfaces, external configuration computer, and linking to another separate Matrix Plus II system.

Installation

The MCF-25 frame requires 6 RU of space in a standard 19 inch rack. Normally the PSU-102 power supply is mounted directly below the MCF-25 and it is 1 RU high.

The installation procedures of the MCF-25 are identical to those described for the MCF-100 Frame in the **MCF-100 Master Card Frame** Section of this **Installation Manual** and are not duplicated in this Section.

The MCF-25 cannot be expanded beyond the 26 audio ports it contains.

The requirements for wiring and linking of multiple Matrix Plus II Systems using the MCF-25 Frame are exactly the same as those described in the **MCF-100 Master Card Frame** Section of this **Installation Manual** and are not duplicated in this Section..

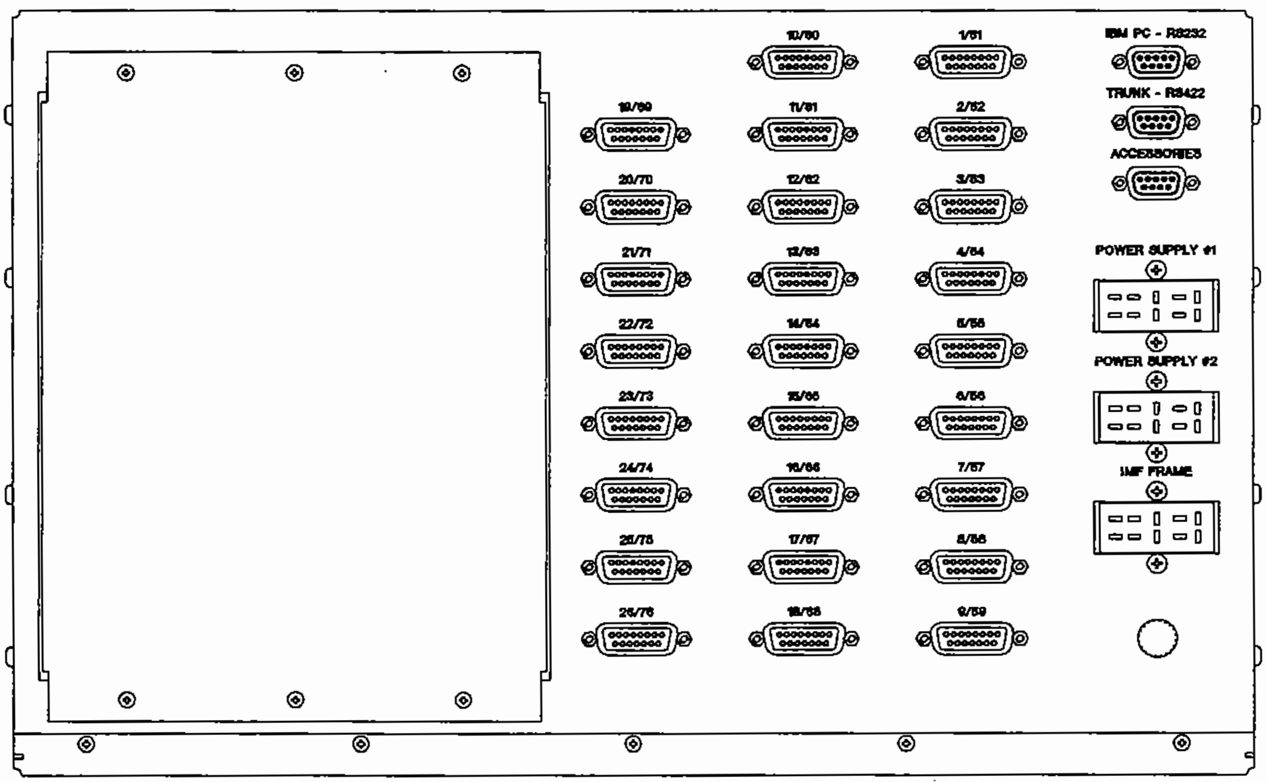


FIGURE F5-1. MCF-25 Rear Panel

Specifications

Plug-in Card Capacity

CPU Slot	1
MTX slots	13
Bus Expansion	No

Connectors (Rear Panel)

DB-15F	26 Port Connections
DB-9F	IBM-PC RS-232
DB-9F	Trunk RS-422
DB-9F	Accessories Connector
10 Pin Jones	2 Power Input Connectors
10 Pin Jones	1 Power Output connector to Interface Frames

Power Requirements (Frame Only no Cards)

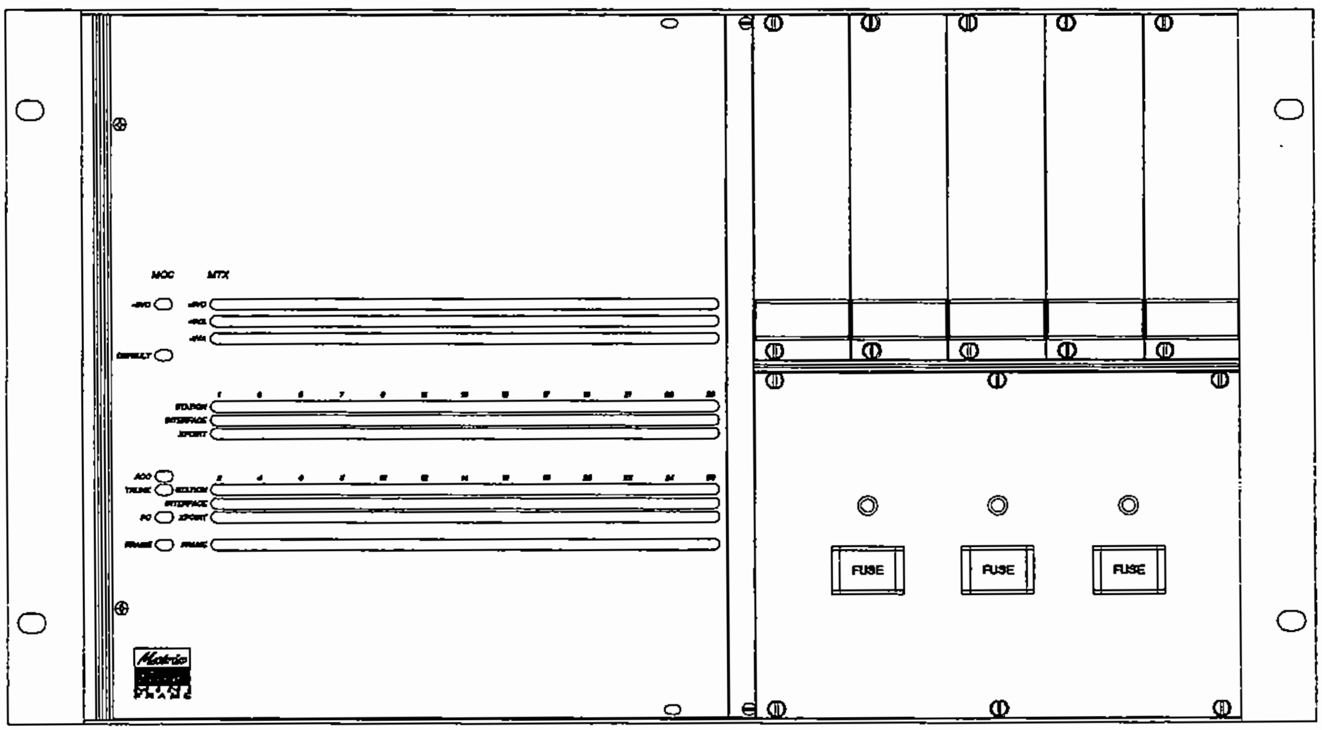
+ 9 V Digital	0.0 A
+ 9 V Analog	0.0 A
- 9 V Analog	0.0 A
Max. Dissipation	50 Watts full of cards

Operating Environment

Temperature	32 to 122 deg F (0 to 50 deg C)
Humidity	40 to 90 % relative humidity (non-condensing)

Dimensions

Width	19 inches (48.26 cm)
Height	10.50 inches (26.7 cm)
Depth	13.56 inches (34.44 cm)
Weight	12.25 lbs (5.6 Kg)



Matrix Plus II System MCF-10

MINI MATRIX 26 x 26 - 13 SLOT

Introduction

This Section covers description, installation and specifications of the MCF-10 Mini-Matrix Card Frame.

The MCF-10 is a combination of a MCF-25, 5 interface module slots, and the equivalent of a PSU-102 built in.

Description

The MCF-10 Mini-Matrix Card Frame is the housing for a complete matrix system including some interface modules and build in power supplies. The MCF-10 is intended for systems of up to 26 ports with no plans for expansion.

The MCF-10 frame provides a housing for the CPU-100 Master CPU Controller Card, up to 13 each matrix crosspoint cards (MTX-100 or MTX-200), up to 5 Interface modules, and contains power supplies to power a system.

The rear Panel of the MCF-10 contains all of the connectors necessary to interconnect to all intercom stations, interfaces, external configuration computer, linking to another separate Matrix Plus II system, and AC Mains Power.

Matrix Frame Installation

When you receive your matrix frame from the factory, it will already be assembled and configured for your application. You must supply the wire and connectors for all cables to stations, interfaces and configuration computer.

The MCF-10 frame requires 6 RU of space in a standard 19 inch rack. Unless redundant powering or extra interface modules are necessary the installation will require only 6 RU of space.

F6-1 shows the front panel of the MCF-10. F6-2 shows the rear panel of the MCF-10.

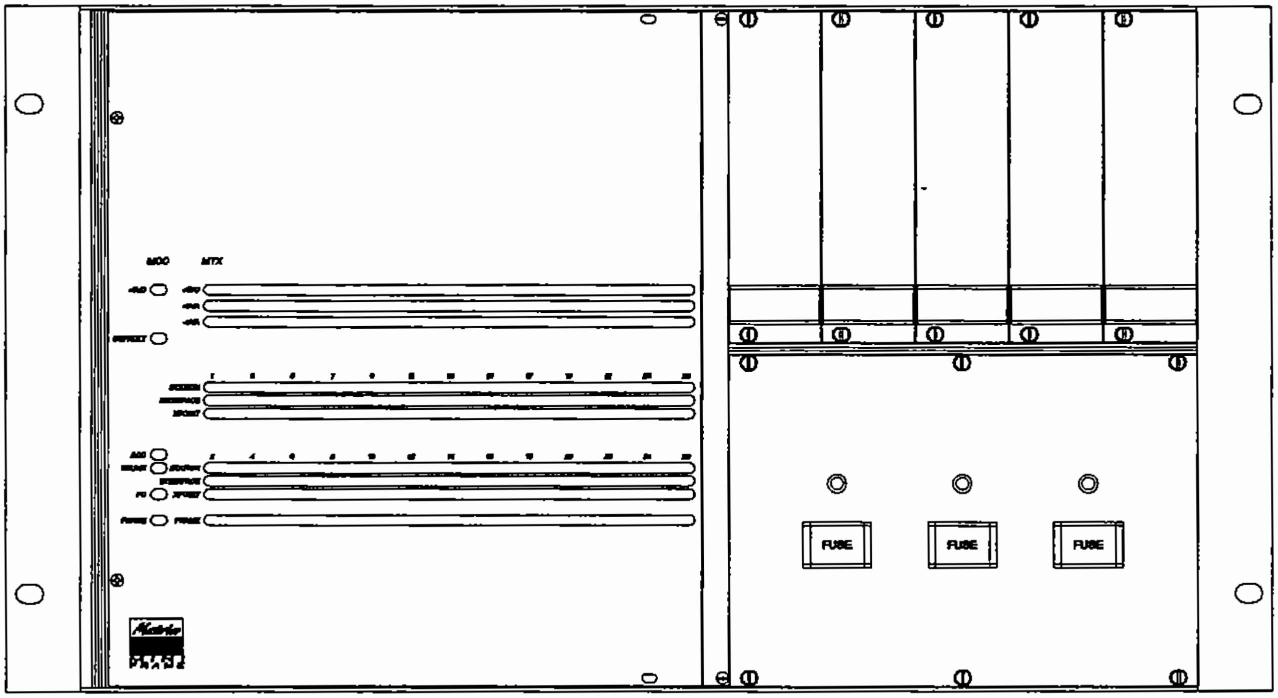


FIGURE F6-1. MCF-10 Front Panel

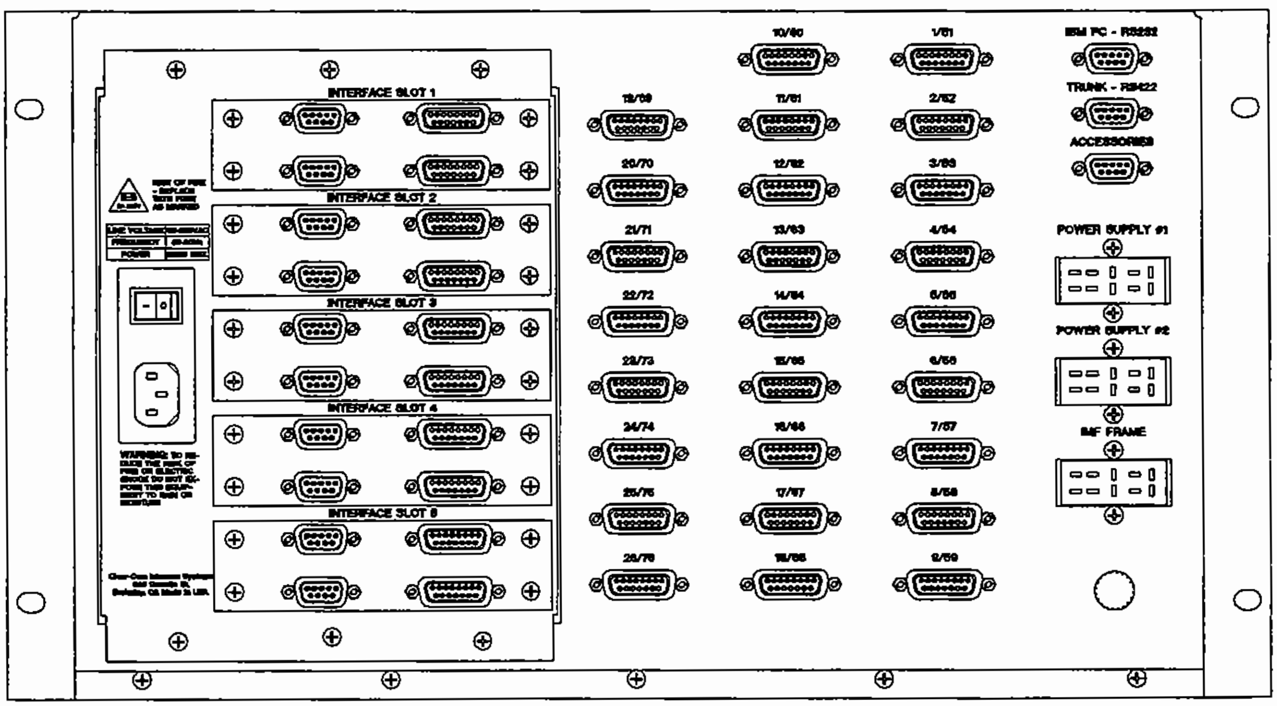


FIGURE F6-2. MCF-10 Rear Panel

Installation

The installation procedures of the MCF-10 are similar to other frames with some exceptions due to the combined features provided The following sections point out the similarities and variations from other frame installations described in this manual.

The MCF-10 cannot be expanded beyond the 26 audio ports it contains.

Port Connections

The 26 DB-15F port connectors on the rear panel are identical in purpose and wiring to those described in the MCF-100 Installation Section.

IBM PC - RS232 Connector

The purpose and wiring of the PC - RS-232 connector is identical to that described for the MCF-100.

TRUNK - RS422 Connector

The purpose and wiring of the TRUNK - RS-422 connector is identical to that described for the MCF-100.

ACCESSORIES Connector

The purpose and wiring of the ACCESSORIES connector is identical to that described for the MCF-100.

10 Pin Power Supply Connectors

The three ten pin power supply connectors marked POWER SUPPLY #1, POWER SUPPLY #2, and IMF FRAME have a similar purpose as those in other master frames except that the MCF-10 has power supplies built in and does not need DC power from an external source unless redundant powering is desired. If redundant powering is desired, plug in an external PSU-102 to the POWER SUPPLY #2 connector. The IMF FRAME connector can be used to power interface modules in an IMF frame the same as with other Master Frames.

The power supplies in the MCF-10 should be considered the same as a PSU-102 and therefor come under the same constraints as the PSU-102. Refer to the PSU-102 Installation Section of this manual for more details on system power planning.

AC Mains Power Input

The MCF-10 contains internal power supplies equivalent to a PSU-102 and needs AC Mains power input. The AC power requirements are identical to a PSU-102 and are listed in the Specifications section of this chapter.

Interface Module Slots

The MCF-10 has the space to install up to five Matrix Plus II standard interfaces.

To install the Interface Modules remove the blank panels shipped with the frame and install the modules from the front of the unit as desired.

To install the Interface Module rear panels, use the following procedure. Disconnect the unit from AC Mains Power. On the rear panel, remove the blank panels for those slots being used and install the appropriate rear panels for each module on the front side of the frame. To make installation of the cables from the interface rear panels easier, remove the large plate that contains the interface module rear panel plates and the power entry module. Install the ribbon cables as described in each Interface Module's installation instructions. Replace the plate containing the interface module rear plates and the power entry module.

Specifications

Plug-in Card Capacity

CPU Slot	1
MTX slots	13
Interface Modules	5
Bus Expansion	No

Front Panel Controls and Indicators

Indicators	3 Green power output indicator leds
Fuses	3 Fuseholders for the three power supplies

Connectors (Rear Panel)

DB-15F	26 Port Connections
DB-9F	IBM-PC RS-232
DB-9F	Trunk RS-422
DB-9F	Accessories Connector
10 Pin Jones	2 Power Input Connectors
10 Pin Jones	1 Power Output connector to Interface Frames
AC Mains	IEC 320 Type
Fuse	AC Mains

Internal Regulated Power Supplies

Quantity	3
Type	Switching
Output Volt.	9.0 VDC
Output Cur.	4.4 Amp. Max.
Output fuse	3.0 Amp Digital supply
	2.5 Amp + Analog supply
	2.5 Amp - Analog Supply

Mains AC Power Input

Voltage	90 - 260 VAC
Power	125 Volt-Amps Max.
Frequency	50 to 60 Hz
Fusing	2.0 Amps

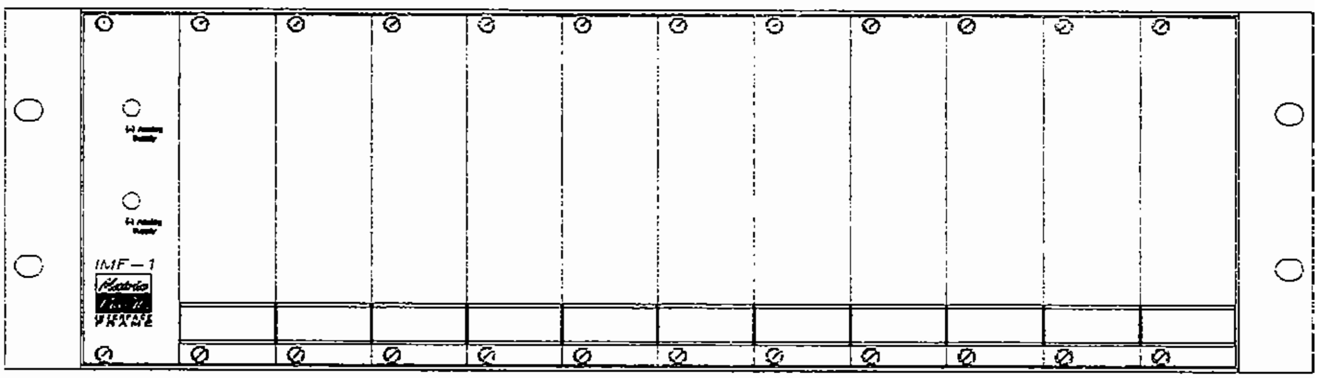
Operating Environment

Temperature	32 to 122 deg F (0 to 50 deg C)
Humidity	40 to 90 % relative humidity (non-condensing)

Dimensions

Width	19 inches (48.26 cm)
Height	10.50 inches (26.7 cm)
Depth	13.56 inches (34.44 cm)
Weight	16.75 lbs (7.6 Kg)

MCF-10



Matrix Plus II System IMF-1

INTERFACE MODULE FRAME

Introduction

This Section covers description, installation and specifications of the IMF-1 Interface Frame.

Description

The IMF-1 Interface Frame is a passive backplane card cage containing no active electronic components. The IMF-1 Interface Frame houses the interface modules described in the **Interfaces** Chapter in this **Installation Manual**. The maximum number of interfaces that can be installed in the IMF-1 is 11. The IMF-1 Frame requires 3 rack spaces for installation.

Front panel power indicator leds have been provided to indicate the presence of DC power in the IMF frame. Refer to the **Overview** Section in this manual for more information on power supply usage and planning.

Figure F7-1 shows the rear panel of the IMF-1.

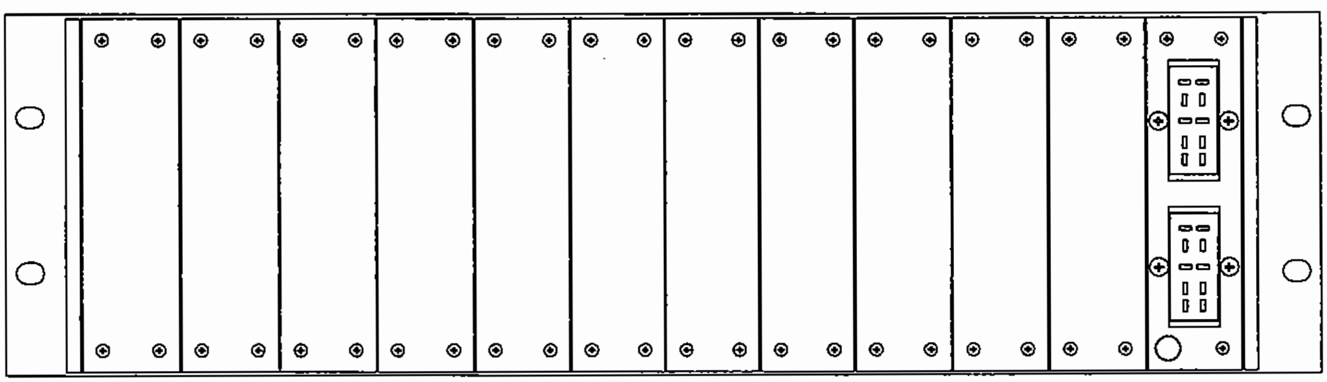


FIGURE F7-1. IMF-1 Rear Panel

IMF-1

Installation

Before installation in the rack, install the interface modules and their companion back panels to be used in the unit. Refer to each section of the installation manual that relates to the individual interface module for installation instructions.

Install the IMF-1 in the rack. Connect the cable from the IMF-1 to the IMF connector on the MCF-100 (MCF-50, MCF-25, or MCF-10) or directly to a PSU-102 Power Supply.

Specifications

Plus-in Module Capacity

Quantity	11

Connectors (Rear Panel)

10 Pin Jones	2 Power Input Connectors

Power Requirements (Frame Only no Modules)

+ 9 V Analog	0.015 A
- 9 V Analog	0.015 A
Max. Dissipation	50 Watts full of cards

Operating Environment

Temperature	32 to 122 deg F (0 to 50 deg C)
Humidity	40 to 90 % relative humidity (non-condensing)

Dimensions

Width	19 inches (48.26 cm)
Height	5.25 inches (13.3 cm)
Depth	13.56 inches (34.44 cm)
Weight	6.25 lbs (2.8 Kg) (No modules installed)

- A -

- B -

- C -

- D -

- E -

- F -

- G -

- H -

- I -

- Q -

- R -

- S -

- T -

- U -

- V -

- W -

- X -

- Y -

- Z -