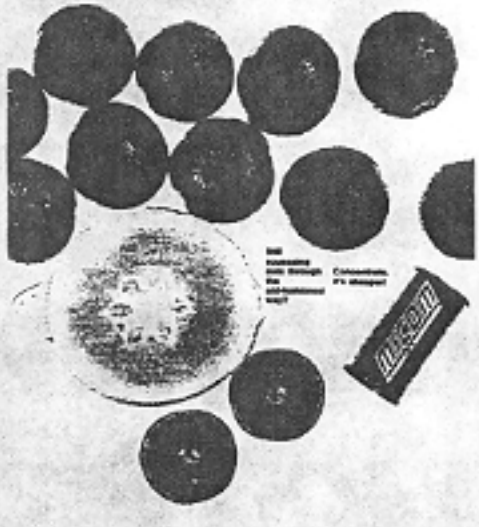

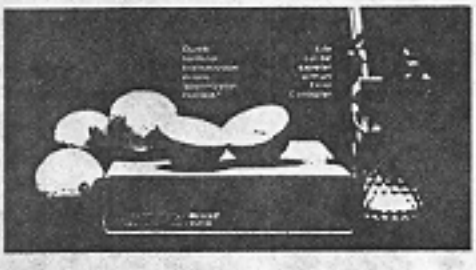

MICOM Instamux470
MULTIPLEXING LINE DRIVER
MODELS M474 and M478
USER'S MANUAL

Stock Number 800-1108

MICOM®

MICOM Instamux470
MULTIPLEXING LINE DRIVER
MODELS M474 and M478
USER'S MANUAL

Stock Number 800-1108

WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

If radio frequency interference is encountered after installation of the equipment, necessary corrective measures are required to reduce this interference. Information about recommendations for such measures can be obtained from the manufacturer. Contact MICOM Corporate Headquarters for assistance.

October 1982

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INTRODUCTION

HOW TO USE THIS MANUAL

This User's Manual, just like your Instamux470 multiplexing line driver, is designed to be easy to use:

Section 1 Do-It-Yourself Installation and Operation contains a simplified procedure for installing your Instamux470. A checklist is included to help you prepare for installation.

Section 2 System Testing and Configuration Details contains additional information on standard and optional features to aid you in your installation and operation.

Appendixes contain less commonly required details on a variety of Instamux470 topics.

INTRODUCING THE Instamux470

The MICOM Instamux470 multiplexing line driver is a low cost asynchronous multiplexing local modem, designed specifically for short-haul data transmission. It offers substantial cost savings to users because of its reduced complexity. The Instamux470 is used over customer-owned, twisted pair cables. The 4-wire full-duplex operation provides channel speeds to 19,200 bps.

Like MICOM's other products, the Instamux470 is designed for do-it-yourself installation. No special tools are required. It has a built-in self-test feature, and diagnostics are done by the user.

Two optional features are available in the Instamux470.

Feature F470/RM, the Rack-Mount Frame, allows standalone units to be mounted in any standard EIA cabinet or rack.

Feature U470/K4, the 4-Channel Expansion Module Option, enables expansion to 8 channels per standalone unit.

LOCAL DATA COMMUNICATION

Local data communication is intrafacility and direct interfacility communications using customer-owned media. A significant portion of data communications occur within the same room, building, or cluster of buildings as the computer. As computers increased in capacity and speed, more complex and more distributed communications have developed. However, the minicomputer and microcomputer developments of the past decade have also resulted in a resurgence in local data communications.

The simplest example of local data communications is the operator console of minicomputers which is often a simple asynchronous terminal directly cabled to the CPU. Usually, there is a nearby terminal room where a cluster of simple asynchronous terminals is available on a shared basis. These terminals are directly cabled to the front-end or communications section of the computer. The cabling distances for the EIA RS-232 standard are identified as a nominal 50-foot limit. A low capacitance cable can meet this specification with longer lengths (100 to 200 feet) but such cables are more expensive. Other factors affect the practical length for cables including data rate, wire gauge and noise interference. Directly cabled terminals use few or no control signals to satisfy the communications protocol, thus requiring cables with significantly fewer than the 25 pins on the connector. Further, data error rates are of little concern when cable length and electromagnetic noise level are reasonable.

Local data communications beyond direct cabling limits occur even in moderate sized single-story buildings. In large single or multi-story buildings, terminals beyond cabling distance are common. Simple Line Drivers or Local Data Sets have been the cost effective means to "extend" the cabling range. A matching pair of such devices must be placed on each end of one or two cable pairs for each terminal. Such devices should have low data error rates when the cable gauge and length meet the device's operating range for the terminal speed. Simple Line Drivers or Local Data Sets introduce negligible character delay when compared to direct cables. These simple devices may or may not pass controls to communications processors.

More processes are being automated including inventory control, bill processing, word processing, and even electronic mail. This means more terminals with wider distribution. Often these terminals will naturally occur in clusters in an accounting or design group. Moreover, with word processing, clusters of three or four terminals are common. Instead of running separate cables with Line Drivers, a 4- or 8-channel Instamux470 can be used requiring only two twisted pairs. This is a very effective method to implement growth when cabling is already installed for a single terminal with a Line Driver and additional terminals are required within direct cable distance. Often, the cost of additional cables, building rework, or time delays exceeds the low cost of an Instamux470. The Instamux470 provides low error rates when used on two 24-gauge twisted pairs of 5000 feet or less (longer distances on heavier gauge cables). The Instamux470 introduces negligible delay for data rates up to 19,200 bps. The Instamux470 can transmit either RTS or DTR to the remote end. It can also constantly hold DSR and RLSD ON, or turn DSR and RLSD ON upon receipt of RTS or DTR.

APPLICATION

Figure Intro-1 below depicts the typical Instamux470 application.

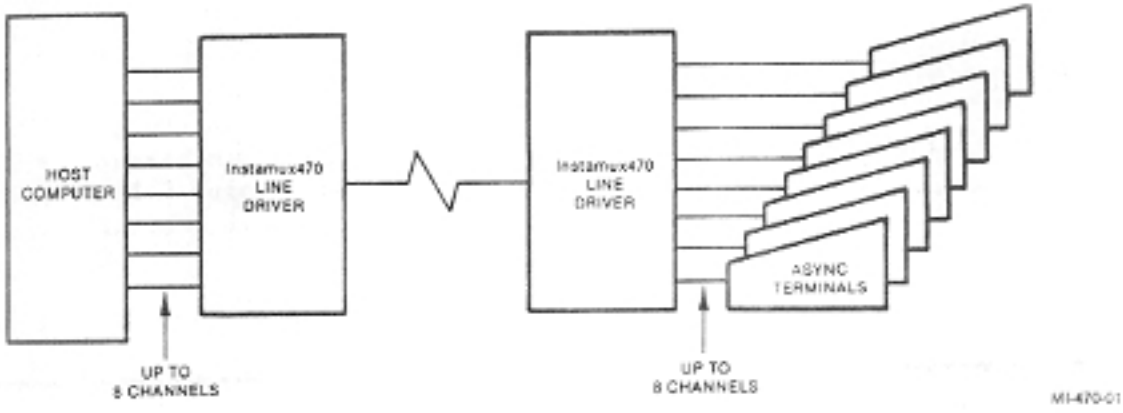


Figure Intro-1. Models M474 and M478 Application

SECTION 1

DO-IT-YOURSELF INSTALLATION AND OPERATION

GETTING READY TO USE SECTION 1

Section 1 is designed to be used as a self-sufficient document. However, you must come prepared. You must have answers for the questions in Table 1-1.

NOTE

If you need help preparing answers to any of these questions, read the referenced portions of Sections 1 and 2 before starting to perform any procedures in Section 1.

Table 1-1. Installation Questions

Questions	Answer on Page
Does your unit rack-mount or standalone?	1-4
What voltage ac power will you use?	1-12
Which control signal (DTR or RTS) will be transmitted (per channel)?	1-9
Will DSR or CD be forced high or transmitted as received (per channel)?	1-11
What is your transmission range?	1-10, 2-8

The Table 1-2 checklist is designed to help you get ready for your initial installation.

(Making a copy of the checklist for mark-up will ensure that you will have a checklist to use in the future.)

GETTING READY TO USE SECTION 1 (continued)

Table 1-2. Installation Preparation Checklist

1.	PACKAGING	☐ STANDALONE		☐ RACK-MOUNT FRAME
2.	AC VOLTAGE	☐ 115 (USA)		☐ 230 (EXPORT)
3.	CONTROL SIGNAL RECEIVED	☐ DTR		☐ RTS
4.	DSR AND CD CONTROL SIGNALS HELD HIGH	☐ YES		☐ NO
5.	WIRE TYPE	☐ TWISTED		☐ NON-TWISTED
6.	WIRE GAUGE	☐ 26	☐ 24 ☐ 22	☐ 19
7.	WIRE LENGTH	_____ FEET		

UNPACKING AND INSPECTING FOR DAMAGE

Your Instamux470 is packed completely assembled, ready for use. Inside the box, you should find (check the Packing List):

- Your Instamux470
- This manual

Your Unit Should Arrive in Good Condition

- MICOM thoroughly inspected and carefully packed your Instamux470.
- The CARRIER accepted responsibility for its safe delivery.

In Case of Damage

- Note visible damages directly on the freight bill and have the CARRIER acknowledge them.
- Report concealed damage to the CARRIER -- immediately upon discovery.
- Submit damage claims to the CARRIER, not to MICOM.

CAUTION

Do not yet plug in your Instamux470.

SELECTING A LOCATION FOR YOUR Instamux470

Your Instamux470 is designed for tabletop placement (standard) or rack-mount frame installation (optional). The rack-mount unit can be installed in a standard 19-inch cabinet or rack. Your Instamux470 should be located near the equipment (computer or terminals) with which it connects so that your interface cables will reach. Your Instamux470 should also be located within 6 feet of a grounded ac outlet so that your ac power cord will reach.

CAUTION

Do not stack other equipment on top of the standalone Instamux470. Make sure the rack-mount cabinet has adequate air flow.

Provide sufficient space for cover removal, switch access, and unobstructed air flow around your unit. To aid you in planning for space requirements, the dimensions of units are listed in Figure 1-1.

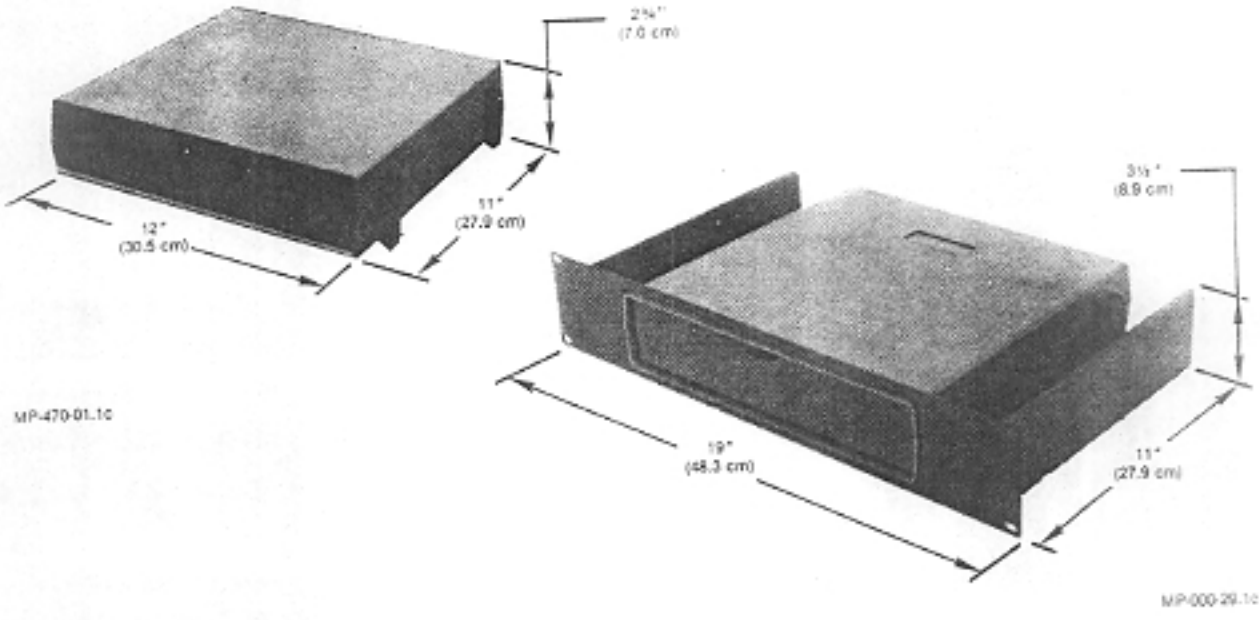


Figure 1-1. Instamux470 Dimensions

CAUTION

Do not yet plug in your Instamux470.

GETTING TO THE HEART OF YOUR Instamux470

To perform the next steps in do-it-yourself installation, you must open your Instamux470 to gain access to switches located in its interior (see Figures 1-2, 1-3, and 1-4):

For Standalone Units

Pull front cover open by handle on top center. The cover tilts outward and provides access to switch groups S1 and S5 (base module) and S1 and S2 (expansion module, if present). In order to access the power supply voltage switch, you must remove the top cover of your Instamux470 by unfastening four latches (two on each side of the unit) -- pull bottoms of latches away from unit to release.

MI-470-05

Figure 1-2. Standalone Unit

GETTING TO THE HEART OF YOUR Instamux470 (continued)

For Rack-Mount Units

Installation Prerequisite:

A closed standalone unit -- with the four latches secured. Input power option is set correctly. All remaining options can be selected with unit rack-mounted.

Procedure: (See corresponding circled numbers on Figures 1-3 and 1-4)

① After peeling the protective strip from the adhesive on the plastic clip, press the clip firmly into molded recess on the bottom of your standalone unit.

② Place the front of the standalone unit through the cutout in the front of the rack-mount frame.

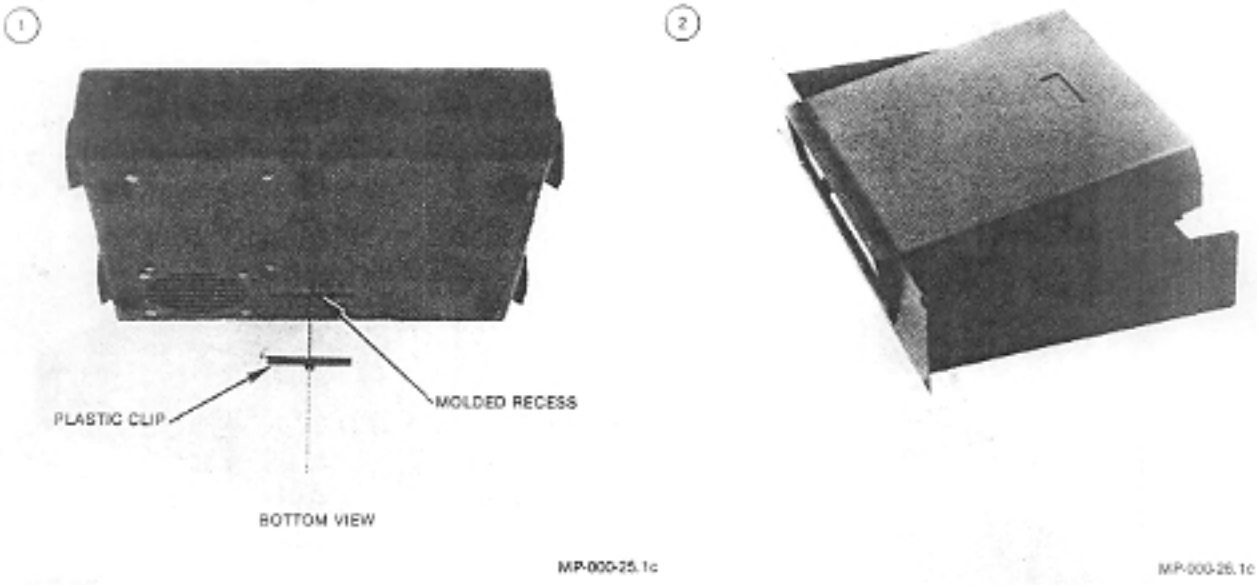


Figure 1-3. Rack-Mount Kit Installation, Steps 1 and 2

③ Press the rear of the standalone unit to engage the male plastic clip into the rack-mount frame's raised receptacle. Aligning the back edge of the standalone with that of the rack-mount frame will aid in proper location.

④ The unit is now ready for installation into a standard 19-inch cabinet or rack.

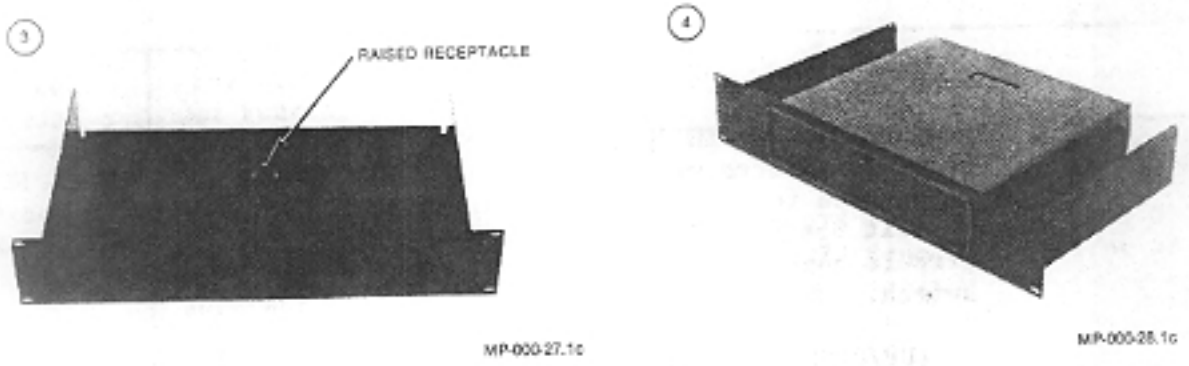


Figure 1-4. Rack-Mount Kit Installation, Steps 3 and 4

CAUTION

Do not yet plug in your Instamux470.

SETTING CONFIGURATION SWITCHES

Your Instamux470 has two configuration switch groups on each module, labeled S1 and S5 on the base module, S1 and S2 on the expansion module. See Figure 1-5 for locations on base module. The expansion module locations are directly above the base module locations.

NOTE

Most units contain "piano-key" type switches. The switch positions will be referred to as UP which is toward the top of your unit away from the printed circuit board; and DN which is toward the printed circuit board. UP is labeled OPEN or OFF on the switch. DN is equivalent to CLOSED or ON.

(UP/OPEN/OFF, DOWN/CLOSED/ON)

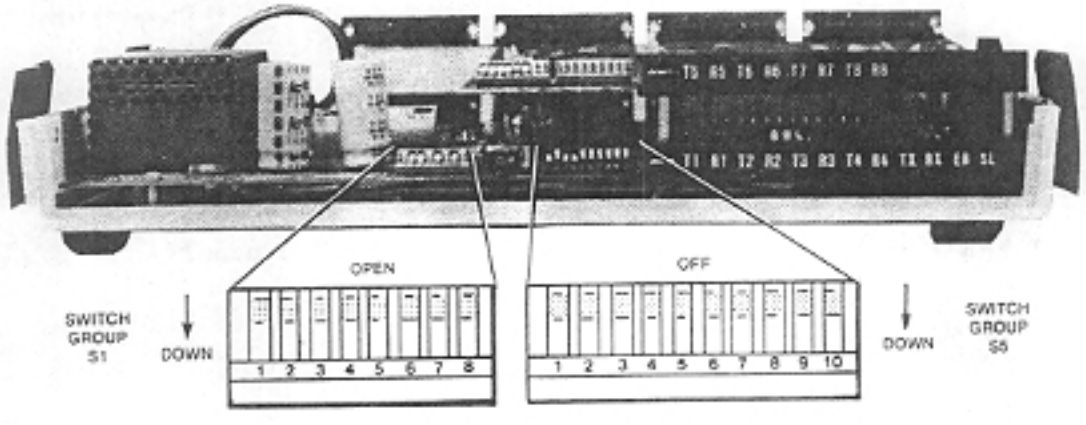


Figure 1-5. Instamux470 Switch Group Locations

Table 1-3 lists the settings for all switch groups (S1 and S5 on the base module, S1 and S2 on the expansion module). Switch group S2 is an 8-position group on the expansion module, of which only four are used. The use of switch group S1 is the same in both base and expansion modules except that reference is to channels 5-8 on the expansion module in place of channels 1-4 respectively on the base module.

Select the settings which meet your requirements.

Table 1-3. Instamux470 Switch Settings

Switch Group	Description or Function	Switch Position Settings and Meaning
S1 Base or Expansion Module	RTS or DTR control passed; each individual channel set separately	1 2 DN UP -- Receive RTS from channel 1 or 5 UP DN -- Receive DTR from channel 1 or 5* 3 4 DN UP -- Receive RTS from channel 2 or 6 UP DN -- Receive DTR from channel 2 or 6* 5 6 DN UP -- Receive RTS from channel 3 or 7 UP DN -- Receive DTR from channel 3 or 7* 7 8 DN UP -- Receive RTS from channel 4 or 8 UP DN -- Receive DTR from channel 4 or 8*
*Factory standard configuration		

NOTES

1. No other combinations than those above are correct, i.e., both of an individual channel's switches can't be DN or UP.
2. Individual channels may differ from one another.
3. Your choice of control depends on the electrical signal(s) of the terminal connected to that channel.
4. At the remote Instamux470, receipt of either RTS or DTR causes both DSR and CD (RLSD) to become active, i.e., transmitted to appropriate channel.

SETTING CONFIGURATION SWITCHES (continued)

Table 1-3. Instamux470 Switch Settings (continued)

Switch Group	Description or Function	Switch Position Settings and Meaning
S5 Base Module	Remote Interface	1 / 2 DN / UP -- Instamux470 at remote end* UP / DN -- Micro600 at remote end
	Cabling Type	3 / 4 UP / DN -- Short distance cabling*† DN / DN -- Medium distance twisted pair cabling DN / UP -- Long distance twisted pair cabling
	Not Used	5 / N/A 6 / N/A

*Factory standard position
†Use for non-twisted pair cabling of 1000 feet or less

NOTES

1. The above functions refer to the entire unit and is only set on the base module.

2. Refer to Section 2, TRANSMISSION RANGES, for additional information on how to configure Cabling Type and a more complete discussion on the types of cabling you can use.

Table 1-3. Instamux 470 Switch Settings (continued)

Switch Group	Description or Function	Switch Position Settings and Meaning
S5 Base Module S2 Expansion Module	Control signal held in active state	7 Base 5 Expansion DN -- DSR and CD permanently held active to channel 1 or 5 UP -- DSR and CD only active to channel 1 or 5 when RTS or DTR received 8 Base 6 Expansion DN -- DSR and CD permanently held active to channel 2 or 6 UP -- DSR and CD only active to channel 2 or 6 when RTS or DTR received 9 Base 7 Expansion DN -- DSR and CD permanently held active to channel 3 or 7 UP -- DSR and CD only active to channel 3 or 7 when RTS or DTR received 10 Base 8 Expansion DN -- DSR and CD permanently held active to channel 4 or 8 UP -- DSR and CD only active to channel 4 or 8 when RTS or DTR received

NOTE

The last portion of Table 1-3 provides settings to control DSR and CD on both the base module (S5: channels 1-4) and the expansion module (S2: channels 5-8).

CAUTION

Do not yet plug in your Instamux470.

YOUR Instamux470 POWER SUPPLY

The power supply is mounted on the Instamux470 base module. One of two settings is available 115 (USA) and 230 (export). The unit accepts either 115 V ac or 230 V ac ±10%. In order to change the power setting via the selector switch, the screen must be removed. Either setting requires a 3/8 ampere slow blow fuse.

Figure 1-6 provides the location of the power supply on the Instamux470 module.

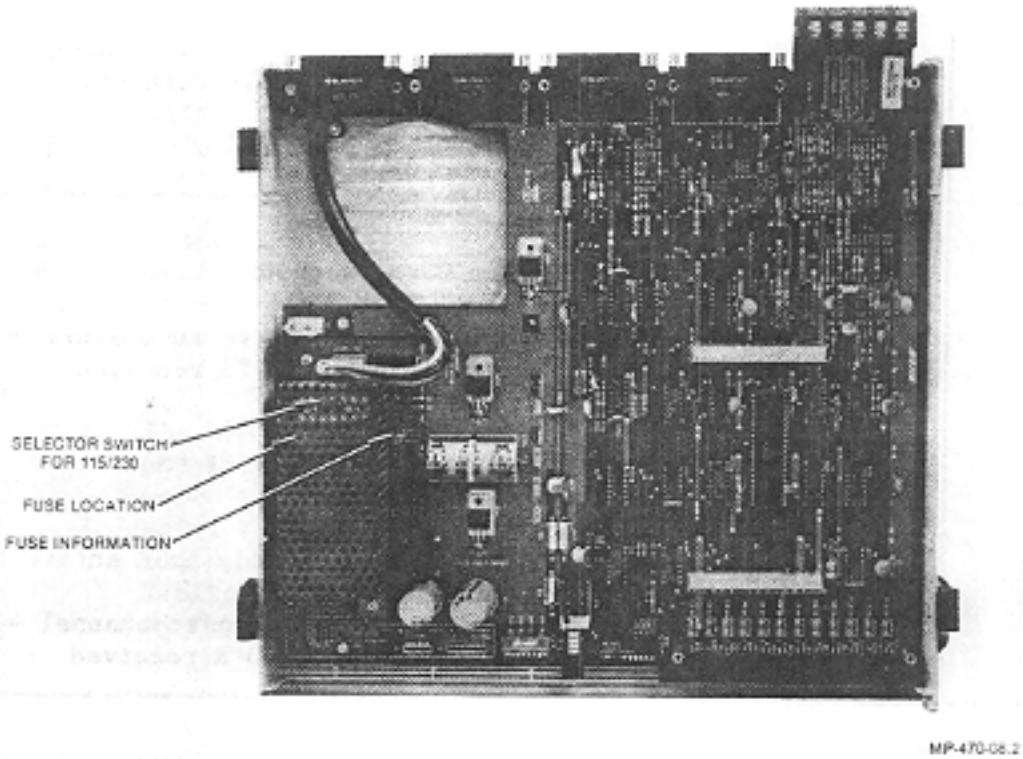


Figure 1-6. Power Supply on Instamux470 Base Module

CONNECTING YOUR Instamux470 AND CHECKING FOR PROPER OPERATION

There are three types of connections you must make to successfully install your Instamux470.

1. Power Supply
2. Communication Line Interface
3. Data Terminal Equipment (DTE)

Perform the following steps in sequence:

1. Plug your power supply cable into an electrical wall outlet. The display should be as described in Table 1-4 Normal Operation. See Figure 1-11 for location of indicators on base and expansion modules.

Table 1-4. Initial Display

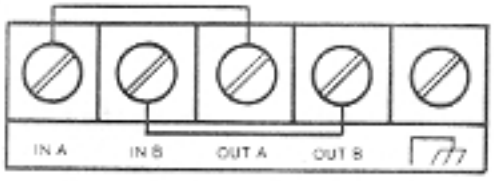
Indicator	Normal Operation	Loopback Switch	External Loopback
T1-T8	OFF	OFF	OFF
R1-R8	OFF	OFF	OFF
TX Composite	DIM to OFF	DIM to OFF	DIM
RX Composite	ON or OFF	ON or OFF	DIM
Control Block Error	ON or OFF	ON or OFF (Refer to discussion below)	ON or OFF (Refer to discussion below)
Sync Loss	ON	OFF	OFF

2. Press the Local Loopback Switch; the display should be as indicated in the Loopback Switch column in Table 1-4. The Control Block Error indicator may or may not be ON. If the unit is configured for remote Micro600 interface, no control data blocks are sent and the indicator may remain ON. By configuring the unit for remote Instamux470, proper operation (OFF) of the Control Block Error indicator may be verified. A further test of the Instamux470 may be made by attaching a full-duplex terminal to each channel and verifying the loopback of data.

CONNECTING YOUR Instamux470 AND CHECKING FOR PROPER OPERATION (continued)

3. Disengage the Local Loopback Switch. You may now perform an optional or first-time-only or only-when-you-suspect-trouble additional test described immediately below; or proceed to Step 4.

   Prepare an external loopback connection by connecting IN A to OUT A and IN B to OUT B as shown in Figure 1-7. See Figure 1-10 for location of terminal block on the base module.



MI-47005

Figure 1-7. External Loopback Connection

The unit must be configured for short-distance mode (see Table 1-3). The display should be as the External Loopback connection in Table 1-4).

Reconfigure the unit to the Distance Mode and Remote Interface required by your particular configuration.

4. You are now ready to connect your Instamux470 to the communication line. Figure 1-10 provides the terminal block location from which the connection is made.

   You should read the paragraph titled TRANSMISSION RANGES in Section 2; and SYSTEM WIRING CONSIDERATIONS, Appendix C, if you aren't absolutely certain you are prepared to handle your cabling requirements. Likewise, if your installation allows a choice of cabling, you should read the above referenced items in order to choose the best option.

CAUTION

Two cautions regarding non-twisted pair cabling should be considered:

1. When the Instamux470 is used in the medium and long distance modes, any amount of non-twisted paired wire must be avoided. Lengths as short as a few feet attached to the twisted pair can cause excessive cross coupling.

2. In a 4-wire non-twisted pair as illustrated in Figure 1-8, select diagonal wires as pairs, e.g., A and C as one pair and B and D as the other.

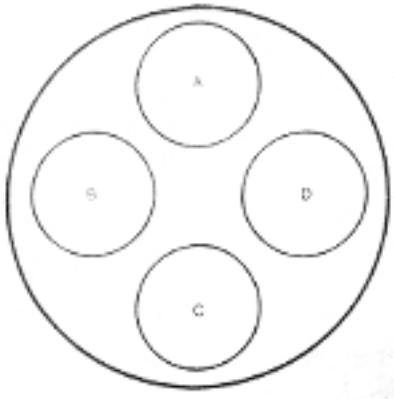


Figure 1-8. End View of 4-Wire Non-Twisted Pair Cable

CONNECTING YOUR Instamux470 AND CHECKING FOR PROPER OPERATION (continued)

Instamux470s are connected "back-to-back", the A and B outputs of one unit are connected to the A and B inputs of the other unit. See Figure 1-9.

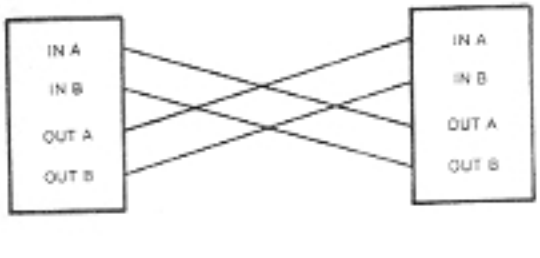


Figure 1-9. Back-To-Back Instamux470 Connection

WARNING

This unit incorporates components to provide secondary protection from lightning and other high voltage discharges and complies with Part 68 of the FCC rules. Connection to lines not provided with primary lightning protection equivalent to the levels outlined in Part 68 could be hazardous.

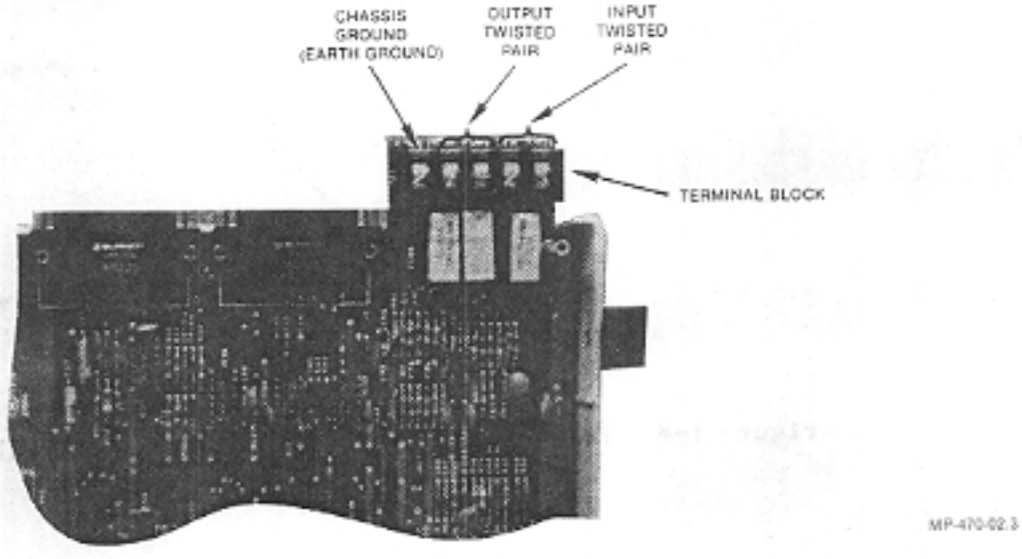


Figure 1-10. Instamux470 Terminal Block Connection to Communications Line

If, after connecting the units to the communications line, the units fail to synchronize (Sync Loss ON), refer to Section 2, HOW TO DETECT AND ISOLATE FAULTS.

If the units are properly connected during normal operation, the indicators should be as shown in the Table 1-5 Normal column.

A common error is to reverse the A and B leads. This can be diagnosed by observing the indicators. The Table 1-5 Reversed column provides the display for this case. If this error is noted, it can be corrected by exchanging the IN A and IN B leads.

Table 1-5. Back-To-Back Connection Display

Indicator	Normal	Reversed
T1-T8	OFF	OFF
R1-R8	OFF	ON
TX Composite	DIM to OFF	DIM to OFF
RX Composite	DIM to OFF	ON
Control Block Error	OFF	ON
Sync Loss	OFF	OFF

5. Now, you may plug in your DTEs. Your T1-T8 and R1-R8 indicators will FLICKER to indicate data activity, on the active terminals connected to your unit.

INDICATOR INTERPRETATION

Figure 1-11 shows the location of the indicators on the Instamux470 base and expansion modules. Table 1-6 provides the indicator interpretation for both base and expansion modules.

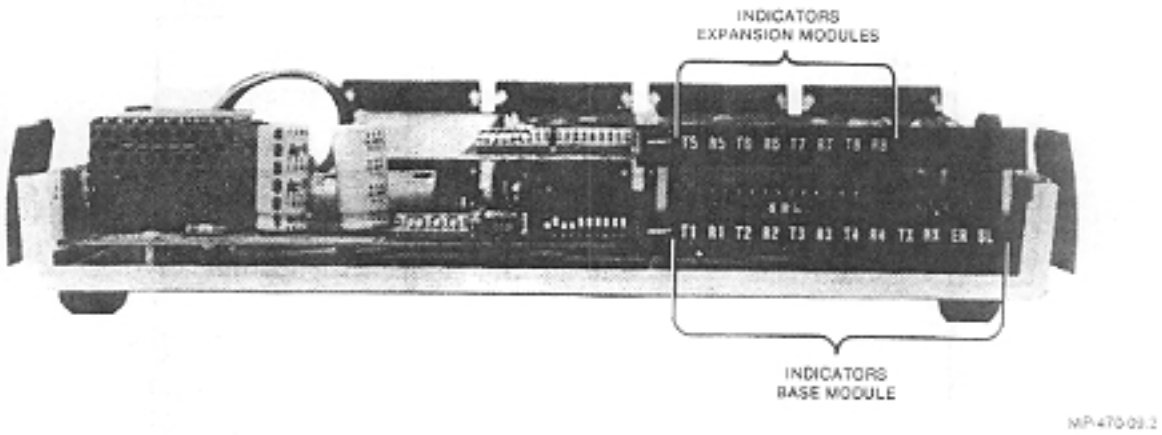


Figure 1-11. Location of Indicators on Instamux470 Base Module

Table 1-6. Indicator Interpretation

Indicator Symbol	Indicator Description
T1	Transmit data on channel 1: The indicator is ON for a spacing bit and is OFF for a marking bit. Transmit data is output by the local DTE and input to the Instamux470.
R1	Receive data on channel 1: The indicator is ON for a spacing bit and is OFF for a marking bit. Receive data is output by the Instamux470 and input to the local DTE.
T2, T3, T4	See T1 above (refers to channels 2-4).
R2, R3, R4	See R1 above (refers to channels 2-4).
T5, T6, T7, T8	See T1 above (refers to channels 5-8 on expansion module).
R5, R6, R7, R8	See R1 above (refers to channels 5-8 on expansion module).
TX	Composite transmit data: The indcator is ON for a spacing bit and is OFF for a marking bit. Composite transmit is data transmitted to the remote Instamux470.
RX	Composite receive data: The indicator is ON for a spacing bit and is OFF for a marking bit. Composite receive is data received from the remote Instamux470.
ER	Control block error: Controls are transmitted in blocks on a separate internal channel in the Instamux470. A parity bit is used to error check the control block. If a parity or framing error occurs in the control block, the indicator is ON. The indicator is OFF when a properly formatted control block is received.
SL	Synchronization loss: Indicator is ON when sync loss occurs.

SECTION 2

SYSTEM TESTING AND CONFIGURATION DETAILS

HOW TO DETECT AND ISOLATE FAULTS

Use of the Loopback Switch

Your Instamux470 provides displays to help you detect faults and a test to help you isolate their cause. The test function is provided by a Push-On/Push-Off switch on the front panel. See Figure 2-1.

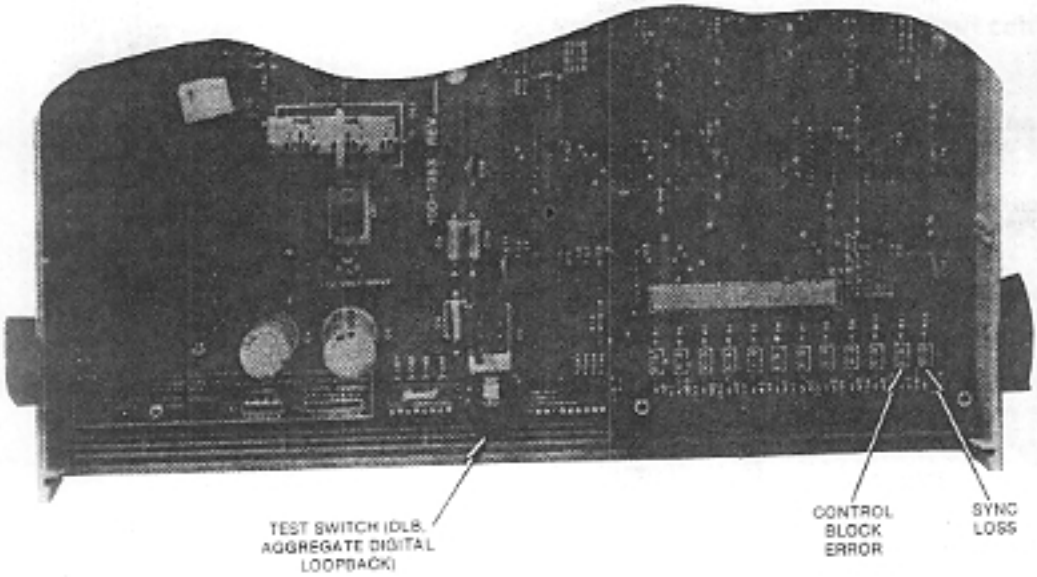


Figure 2-1. Location of Test Switch

HOW TO DETECT AND ISOLATE FAULTS (continued)

The Aggregate Digital Loopback Switch, when pushed in (activated), loops input composite data back through the composite output. Channel input is transmitted back through the multiplexing and demultiplexing circuits to the transmitting channel, where it can be verified on the connected DTE.

At the Instamux470, indicator ER (Control Block Error) and indicator SL (Sync Loss) are OFF. The RX and TX indicators should FLICKER. The Remote Interface should be configured to Instamux470. See Table 1-4 for summary of the display during the loopback test.

Figure 2-2 illustrates the use of the DLB test switch:

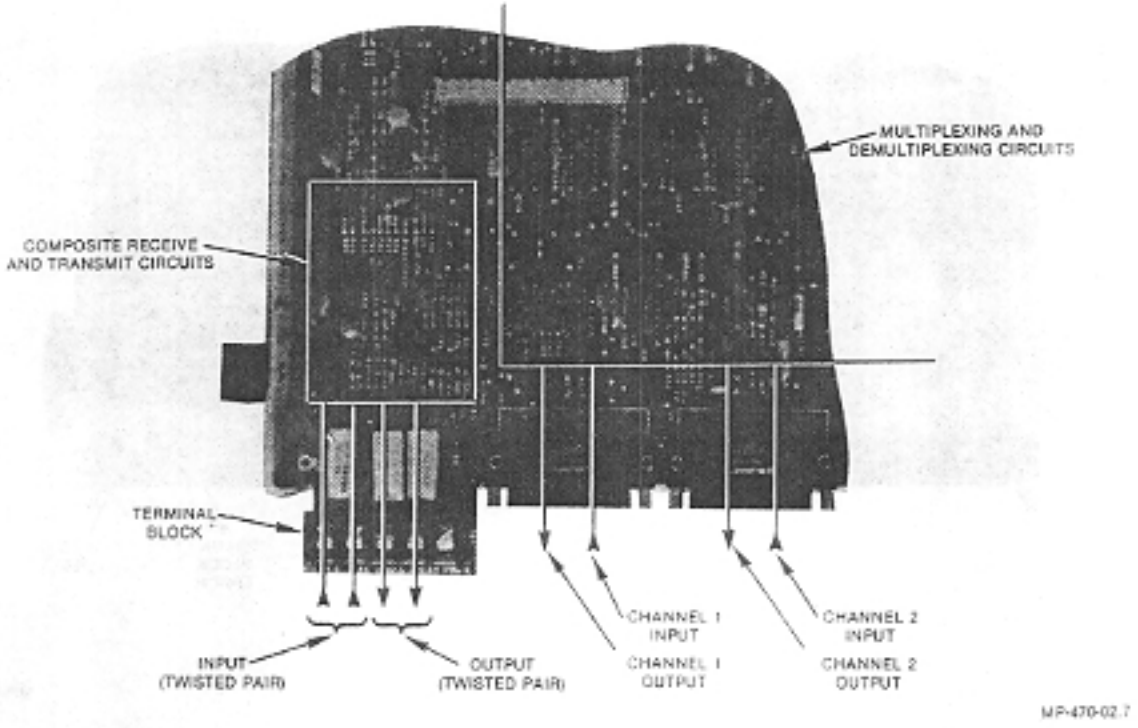


Figure 2-2. Aggregate Digital Loopback Data Flow

To end this test:

Disengage (Push-Off) the DLB switch.

Problem Checklist

The Problem Checklist below enumerates some of the most commonly encountered problems and diagnostic procedures to handle them:

Problem: All indicators OFF.

Answer : Check the power cord and fuse. Verify the proper voltage selection.

Problem: SL indicator ON.

Answer : Place the unit in local loopback by engaging the DLB switch. If the SL indicator fails to go OFF, replace the unit.

Disengage the DLB switch and verify that the communications line is properly connected.

Disconnect the data out pair. If the SL indicator goes OFF, excessive cross coupling is present. Refer to Appendix C.

Try other distance configuration settings.

Problem: The ER indicator and all receive data indicators are ON.

Answer : The receive A and B wires are reversed.

Problem: SL indicator OFF and ER indicator ON.

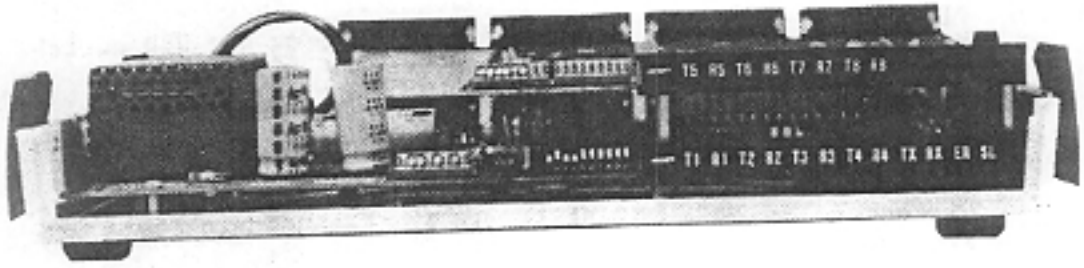
Answer : Verify remote interface configuration setting on the remote unit.

Problem: Unit fails to pass input data.

Answer : Check DTE and also check DTE-to-Instamux470 cable and connection.

8-CHANNEL CONFIGURATION

In order to configure the 8-channel version, another Instamux470 module is connected to the base module. The expansion module is similar to the base module. The expansion module is connected to the base module via a 15-pin signal row of headers at J6 and J8. The base module terminal block serves both modules. Figure 2-3 below illustrates the 8-channel configuration.



MP-470-09

Figure 2-3. 8-Channel Configuration

FIELD UPGRADE PROCEDURE (4- TO 8-CHANNEL)

Your Field Upgrade Kit should contain the following items:

1. 8-channel plastic top enclosure
2. 4-channel expansion module
3. LED block
4. LED label strip
5. 4 sets of #4-40 screws, washers, and lock washers

Perform the following steps in sequence in order to upgrade your Instamux470 to 8-channel.

1. Slide/install the LED strip into the LED block as illustrated in Figure 2-4.

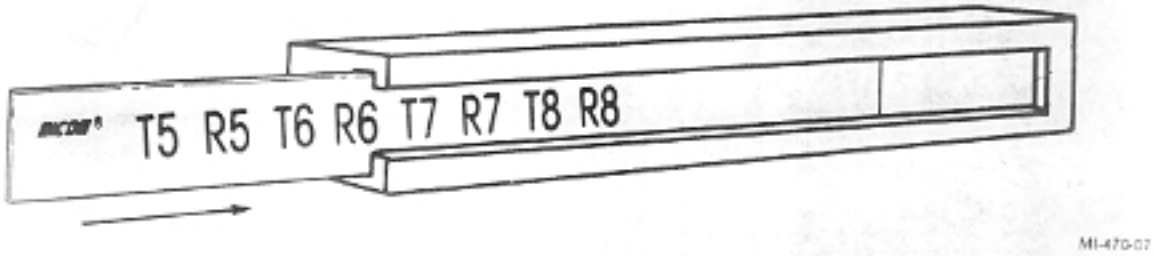


Figure 2-4. Installing LED Strip into LED Block

2. Mount LED block on expansion module.
3. Open plastic case and remove top.

FIELD UPGRADE PROCEDURE (4- TO 8-CHANNEL) (continued)

4. Install (place) expansion module on 15-pin connections. See Figure 2-5 for locations.

5. Connect expansion module with four #4 screws and washers. See Figure 2-5 for locations.

6. Replace original 4-channel plastic case top with 8-channel cut-out plastic top. See Figure 2-6.

7. On bottom of unit relabel the Model number from M474 to M478.

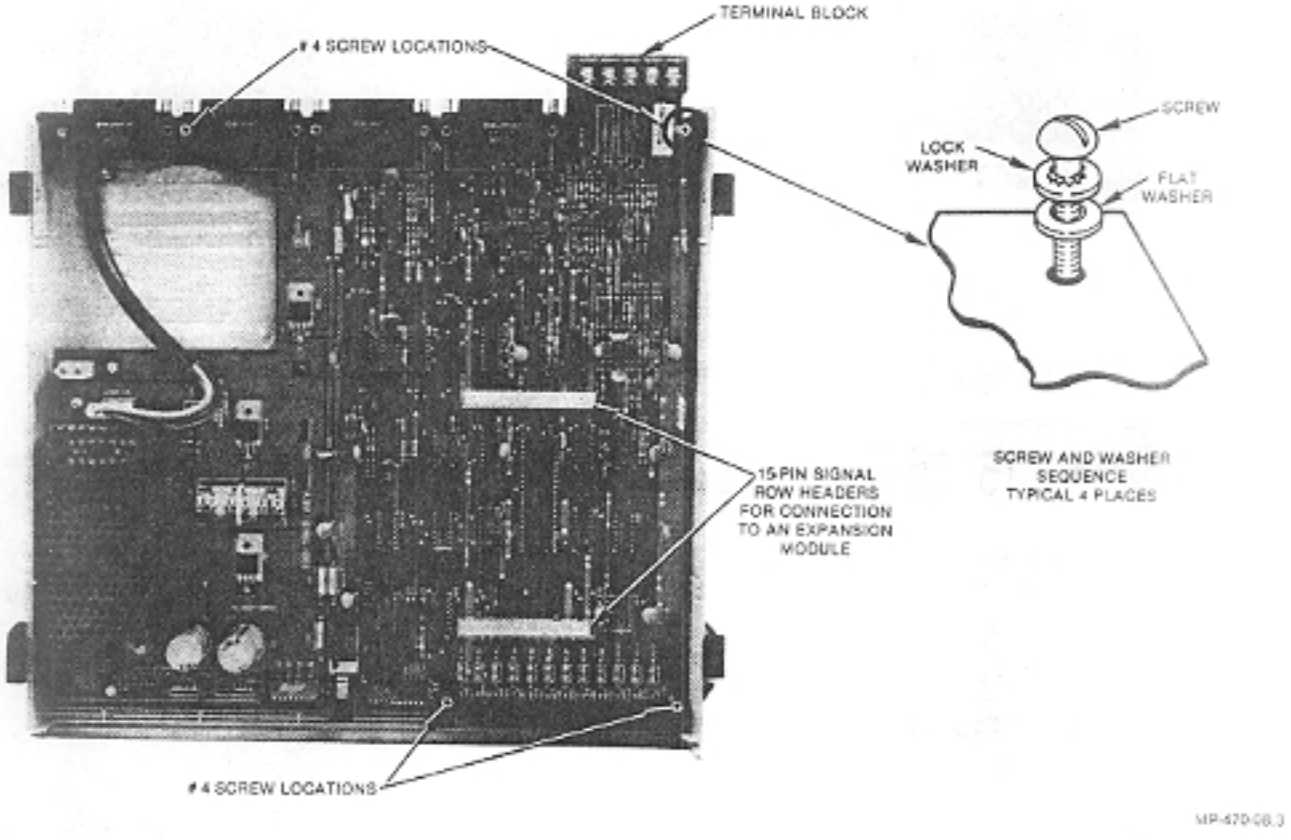


Figure 2-5. Expansion Module Connections and Screw Locations

8. Connect the communications line and the DTEs as indicated in Figure 2-6.

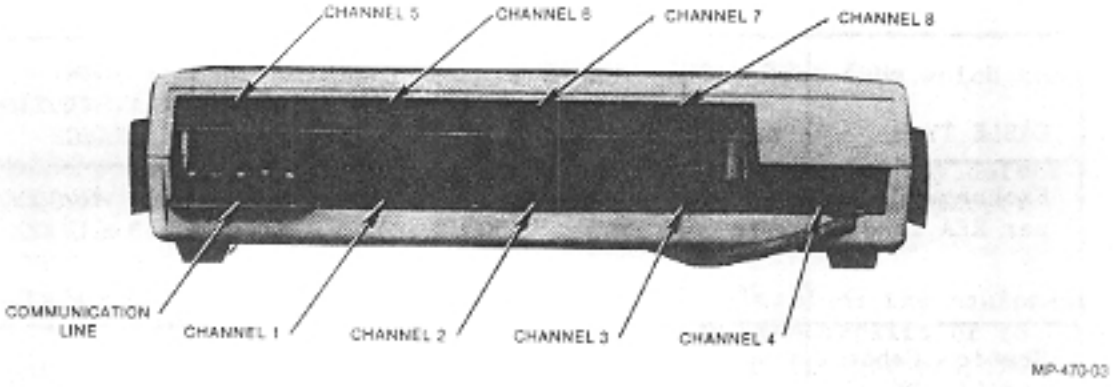


Figure 2-6. 8-Channel Model M478 Rear View

TRANSMISSION RANGES

The distance/performance of the Instamux470 depends on the type and gauge of wire used. Table 2-1 specifies transmission ranges by cable type and gauge.

Table 2-1. Cabling and Performance Specifications

CABLE TYPE	GAUGE	MAXIMUM TRANSMISSION RANGE (Ft.)	MEDIUM TRANSMISSION RANGE	SHORT TRANSMISSION RANGE
Exchange Cable per REA PE-22	19 22 24 26	3500 - 12000 2500 - 9000 2000 - 6800 1700 - 5900	2100 - 6900 1500 - 5000 1200 - 3800 800 - 3200	0 - 4000 0 - 3000 0 - 2200 0 - 2000
Station Cable per REA PE-72	24	1250 - 5000	750 - 2250	0 - 1500
Non-Twisted Pair	--	--	--	0 - 1000
Individually Shielded Twisted Pair	22	--	500 - 2000	0 - 1000

Exchange telephone cable is typically used to connect separated facilites. Station cable is typically used for connections within a given facility.

Configure your Instamux470 to the short-distance setting on Switch Group S5, positions 3 and 4 whenever non-twisted pair cabling is used.

Additionally, if the cable length is less than one quarter (1/4) of the maximum distance specified in Table 2-1 for the particular cable type and gauge, then the short-distance setting is also recommended. The long-distance setting is recommended on twisted pair wire which is greater than 1/2 of the maximum distance rating.

The medium-distance setting is recommended for lengths between 1/4 and 1/2 of the maximum range.

If the cabling length is unknown, it is recommended that the unit be initially configured for short distance. Operating results are checked and the longer distances used only if results are unsatisfactory.

Typically, the short-distance setting (where feasible) will result in the greatest noise immunity and fewest errors.

YOUR MICOM EQUIPMENT COMES WITH A WARRANTY

MICOM warrants that the equipment delivered shall be free from defective material and workmanship for a period of 1 year from the date of delivery of equipment when given normal, proper and intended usage, and agrees to repair or replace, without cost, any part manufactured by MICOM provided that:

(a) MICOM is promptly notified upon discovery that the equipment is defective;

(b) The equipment is returned prepaid to the MICOM plant from which the equipment was shipped; and

(c) MICOM's examination of the equipment shall disclose that any defect was not caused by accident, misuse, neglect, alteration, improper installation, unauthorized repair or improper testing.

MICOM may, in its sole discretion, elect to repair or replace the equipment, in which event MICOM shall have a reasonable time to make repairs or to replace the equipment. MICOM will return the equipment freight prepaid.

THE PROVISIONS OF THIS WARRANTY ARE IN LIEU OF ANY OTHER WARRANTY, WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), AND MICOM'S LIABILITY ARISING OUT OF THE MANUFACTURE, SALE, OR SUPPLYING OF THE EQUIPMENT OR ITS USE, WHETHER BASED UPON WARRANTY, CONTRACT, NEGLIGENCE, PRODUCTS LIABILITY OR OTHERWISE, SHALL NOT EXCEED THE ORIGINAL COST TO THE BUYER OF THE EQUIPMENT. IN NO EVENT SHALL MICOM BE LIABLE TO THE BUYER OR ANY OTHER PERSON OR ENTITY FOR UNINTENDED OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR USE DAMAGES) ARISING OUT OF THE MANUFACTURE, SALE OR SUPPLYING OF THE EQUIPMENT.

MICOM warrants all repairs or upgrades performed at its factory location or performed by MICOM Customer Service for a period of 90 days after completion.

HOW TO GET YOUR EQUIPMENT FIXED BY MICOM CUSTOMER SERVICE

MICOM's Customer Service offers a wide range of support functions, including complete factory repair for both in-warranty and out-of-warranty equipment.

Before returning any equipment, however, please call MICOM Customer Service: our Eastern Regional Office at (201) 750-1120; our Central Regional Office at (314) 576-7626; or, in the West, our Corporate Office at (213) 998-8844.

A Customer Service engineer will answer warranty-related questions, discuss your specific equipment problems, and -- when necessary -- give you shipping instructions for returning equipment to MICOM for repair. To return a product for service or repair, you must obtain a Return Authorization number from MICOM Customer Service.

Shipping charges must be prepaid.

APPENDIX A

CABLE WIRING

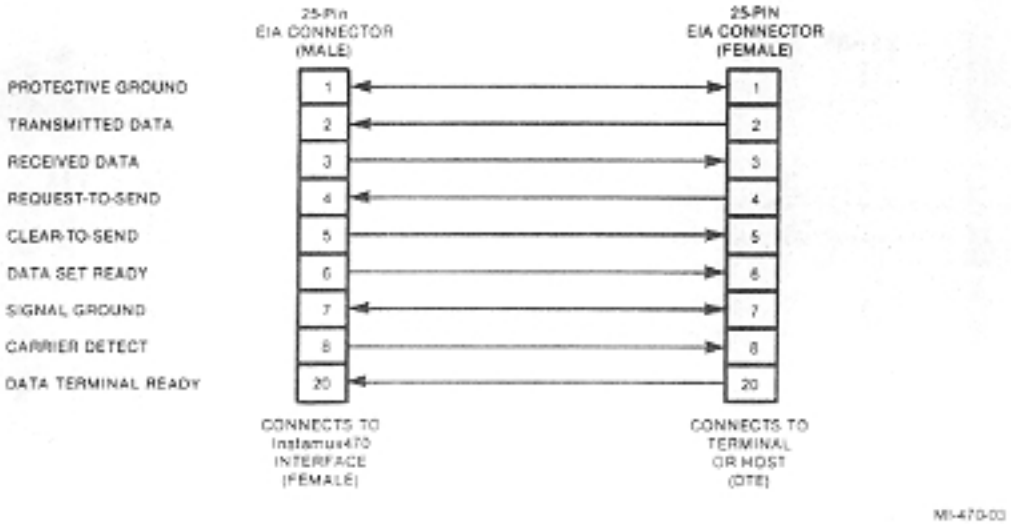


Figure A-1. DTE Extension Cable

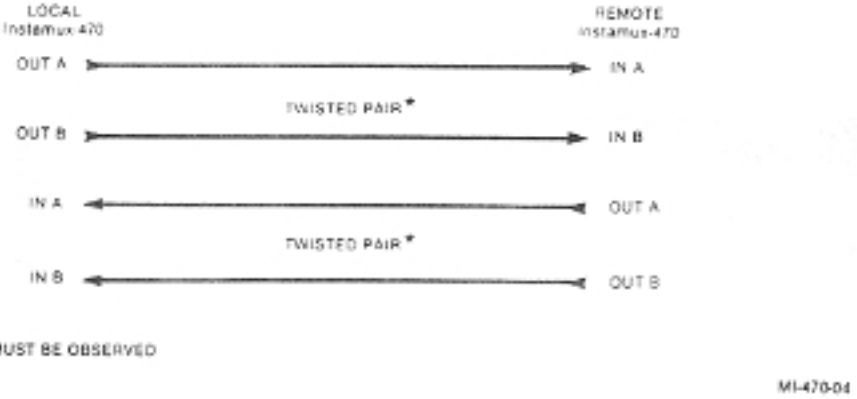


Figure A-2. Communication Line

APPENDIX B

TECHNICAL SPECIFICATIONS

Channel Rate: Asynchronous; any, to 19,200 bps

Composite Range: Up to 9,000 feet, 22 AWG, Exchange Cable per REA PE-22

Composite Rate: 819.6 kbps

Control Delay:
Minimum -- 415 us (micro -- 10^{-6} seconds)
Average -- 780 us (micro -- 10^{-6} seconds)
Maximum -- 1.15 ms (milli -- 10^{-3} seconds)

Distortion: Dependent on data rate:

19200 bps = 23.4%
9600 bps = 11.7%
4800 bps = 5.85%
2400 bps = 2.92%

End-To-End Delay: 100 us maximum

Number of Channels: 4, expandable to 8

Operating Environment: 32-122°F (0-50°C), 0-95% relative humidity, non-condensing

Power:

Standalone

USA: 115 V ac ±10%, 48-62 Hz, 15 watts
Export: 230 V ac ±10%, 48-62 Hz, 15 watts

Size:

Standalone (4- or 8-channel)	Rack-Mount Frame Option
12 inches (30.5 cm) wide	19 inches (48.3 cm) wide
2 3/4 inches (7.0 cm) high	3 1/2 inches (8.9 cm) high
11 inches (27.9 cm) deep	11 inches (27.9 cm) deep
Weight: 4 pounds (1.8 kg)	Weight: 10 pounds (4.5 kg)

APPENDIX B

TECHNICAL SPECIFICATIONS (continued)

Figure B-1 provides a simplified view of the options to transmit controls in each direction for each channel.

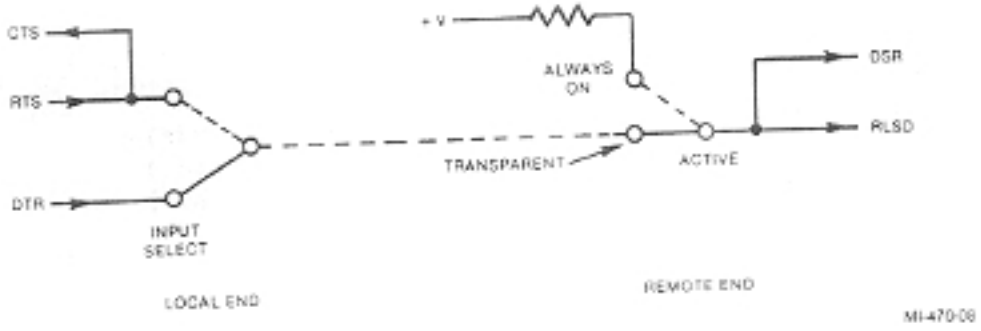


Figure B-1. Control Input/Output Diagram

APPENDIX C

SYSTEM WIRING CONSIDERATIONS

The Instamux470 is designed to be used on four different types of cables. They are 1) Exchange Cable, 2) Station Cable, 3) Non-Twisted Paired Cable, and 4) Individually Shielded Twisted Pairs.

1. Exchange Cable: This cable is used by telephone companies to connect users to the local exchange. It comes in gauges from 19 to 28 AWG. It is used outdoors and is designed to withstand the elements. The Instamux470 user will normally encounter this cable during interfacility applications. Typically, the cable will enter a building, go through the primary lightning protection circuits, and then to a distribution panel. Distribution of the signals throughout the building should be done using station cable.

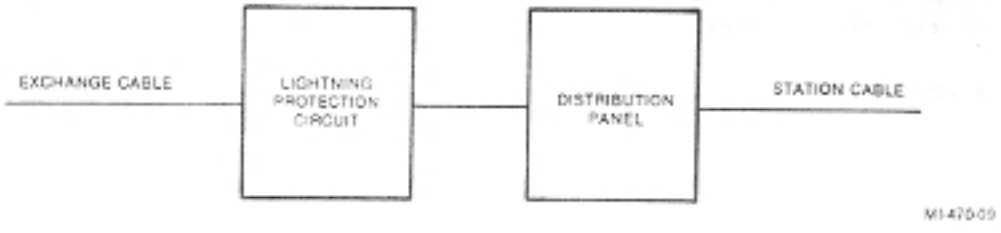


Figure C-1. Exchange Cable

Recommended exchange cable will meet the Rural Electrification Association (REA) specifications. Applicable specifications are PE-22, PE-23, and PE-39. The essential areas of concern are low loss and minimal cross coupling. These are staggered twisted pairs and low dielectric insulation.

2. Station Cable: This cable is used by telephone companies for the internal distribution of telephone signals. It differs electrically from exchange cable by exhibiting more loss per foot, but it maintains the cross coupling characteristics of exchange cable. It meets REA specification PE-72.

3. Non-Twisted Pair: This category of wire is not formed into pairs and does not exhibit the low cross coupling characteristics of station and exchange cables.

For Instamux470 applications, non-twisted paired cable can only be used for short distances, typically less than 1,000 feet. Additionally, only one Instamux470 should be used in a multiconductor non-twisted paired cable. Only four-wire non-twisted pair cable is recommended.

4. Individually Shielded Twisted Pairs: This cable provides a shield for each twisted wire pair to reduce cross coupling. It provides excellent noise immunity but generally results in higher loss characteristics. These higher loss characteristics reduce the maximum distance of the Instamux470. Low loss varieties of Individually Shielded Twisted Pair Cables exist, such as those that meet the RS-422 specification and will substantially increase the rated performance.

In order to select wire pairs, utilize the following guidelines. A good system design separates the composite transmit and receive signals as much as possible. When wiring multiple transmitting devices, it is best to run both the receive signals and the transmit signals in separate cables. This achieves the maximum separation. If this is not possible and the signals must be run in the same cable, then it is best to separate the transmit and receive signals into different binder groups. Binder groups appear on cables with more than 25 pairs. Another alternative is to use cables with internal screens to separate the receive and transmit pairs.

A copy of the REA Specifications may be obtained free of charge by writing to:

United States Department of Agriculture
Rural Electrification Association
Washington D.C. 20250

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