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MVME712-12, MVME712-13, MVME712A, MVME712AM, and MVME712B Transition Modules and LCP2 Adapter Board User's Manual

(MVME712A/D3)

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Tempe, Arizona 85282

Preface

This manual provides general information, hardware preparation, installation instructions and support information for the following transition modules:

MVME712-12	MVME712A	MVME712B
MVME712-13	MVME712AM	

The manual also provides information about the LCP2 Adapter Board.

The transition modules are used as the interface between Motorola Single Board Computer VMEmodule families, such as the MVME147S, MVME162, MVME167, MVME187, and MVME197, and their peripheral devices. An LCP2 adapter module and a cable are supplied for interconnection between the MVME712 family module and the MVME1*xx* family module.

This manual is intended for anyone who wants to design OEM systems, supply additional capability to an existing compatible system, or for use in a lab environment for experimental purposes.

A basic knowledge of computers and digital logic is assumed.

To use this manual, you should be familiar with the publications listed in the section *Related Documentation*.

Related Documentation

The following manuals are referenced in this document. If not shipped with this product, manuals may be purchased by contacting your Motorola sales office.

Document Title	Motorola Publication Number
MVME147S MPU VMEmodule User's Manual	MVME147S
MVME147 MPU VMEmodule User's Manual	MVME147
MVME162 Embedded Controller User's Manual	MVME162
MVME167 Single Board Computer User's Manual	MVME167
MVME187 RISC Single Board Computer User's Manual	MVME187
MVME197DP and MVME197SP Single Board Computers User's Manual	MVME197
MVME197LE Single Board Computer User's Manual	MVME197LE

Note **Although not shown in the above list, each Motorola Computer Group manual publication number is suffixed with characters which represent the revision level of the document, such as "/D2" (the second revision of a manual); a supplement bears the same number as the manual but has a suffix such as "/D1A1" (the first supplement to the manual).**

Manual Terminology

Unless otherwise specified, throughout this manual all address references are in hexadecimal.

An asterisk (*) following the signal name for signals which are level significant denotes that the signal is true or valid when the signal is low.

An asterisk (*) following the signal name for signals which are edge significant denotes that the actions initiated by that signal occur on high to low transition.

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Safety Summary
Safety Depends On You

The following general safety precautions must be observed during all phases of operation, service, and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment. Motorola, Inc. assumes no liability for the customer's failure to comply with these requirements.

The safety precautions listed below represent warnings of certain dangers of which Motorola is aware. You, as the user of the product, should follow these warnings and all other safety precautions necessary for the safe operation of the equipment in your operating environment.

Ground the Instrument.

To minimize shock hazard, the equipment chassis and enclosure must be connected to an electrical ground. The equipment is supplied with a three-conductor ac power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter, with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

Do Not Operate in an Explosive Atmosphere.

Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

Keep Away From Live Circuits.

Operating personnel must not remove equipment covers. Only Factory Authorized Service Personnel or other qualified maintenance personnel may remove equipment covers for internal subassembly or component replacement or any internal adjustment. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

Do Not Service or Adjust Alone.

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

Use Caution When Exposing or Handling the CRT.

Breakage of the Cathode-Ray Tube (CRT) causes a high-velocity scattering of glass fragments (implosion). To prevent CRT implosion, avoid rough handling or jarring of the equipment. Handling of the CRT should be done only by qualified maintenance personnel using approved safety mask and gloves.

Do Not Substitute Parts or Modify Equipment.

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification of the equipment. Contact your local Motorola representative for service and repair to ensure that safety features are maintained.

Dangerous Procedure Warnings.

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed. You should also employ all other safety precautions which you deem necessary for the operation of the equipment in your operating environment.



WARNING

Dangerous voltages, capable of causing death, are present in this equipment. Use extreme caution when handling, testing, and adjusting.



WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the documentation for this product, 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 the user's own expense, will be required to take whatever measures necessary to correct the interference.

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GENERAL INFORMATION 1

Introduction

This manual provides general information, hardware preparation, installation instructions, and support information for the MVME712A, AM, -12, -13, and B Transition Modules, as well as the LCP2 Adapter Board. The next table defines the references you will see throughout the manual.

Collective Reference	Modules Referred To	
MVME712 family	*all* of the MVME712 modules, including the MVME712B	MVME712-12 MVME712-13 MVME712A MVME712AM MVME712B
MVME712*x*	all MVME712 modules *other* than the MVME712B	MVME712-12 MVME712-13 MVME712A MVME712AM

The MVME712*x* modules are used as the interface between MVME1*xx* family VMEmodules (such as the MVME167 and MVME197) and their internally connected SCSI peripheral devices.

The MVME712B is designed to be used only *in conjunction with* an MVME712*x* board for external SCSI and/or Ethernet connections.

An LCP2 adapter module and a cable are supplied for interconnection between the MVME712 family module and the MVME1*xx* family VMEmodule.

Features of the MVME712 Family Modules

The features of the MVME712 family modules include:

- ❏ Four 9-pin multiprotocol EIA-232D serial ports (through the LCP2 adapter) (MVME712*x*)
- ❏ One independent printer port (through the LCP2 adapter) (MVME712*x*)
- ❏ Small Computer Systems Interface (SCSI) shielded connector bus interface (through the LCP2 adapter) for connection to external devices (MVME712B)

- ❏ External Ethernet interface (through the LCP2 adapter) (MVME712B)
- ❏ Built-in modem (refer to Appendix A) with front panel Telco modular jack (MVME712-13 and MVME712AM)
- ❏ Electrostatic Discharge (ESD) protection on front panel
- ❏ Radio Frequency Interference (RFI) protection on front panel

Features of the LCP2 Adapter Board

The features of the LCP2 Adapter Board include:

- ❏ A 50-pin connector permits SCSI cable connection to other SCSI devices and/or to the MVME712B through a flat ribbon cable
- ❏ SCSI terminating resistors mounted in sockets for *end of cable* or *middle of cable* configuration
- ❏ Terminator power is developed on the LCP2 adapter from the +5 Vdc on connector P2 and is fused (1 amp) on the LCP2 adapter
- ❏ A 64-pin connector interfaces the EIA-232D ports and printer port signals to the MVME712*x*

Specifications

The MVME712 family module specifications are given in Table 1-1.

Table 1-1. MVME712 Family Specifications

Characteristics		Specifications
Power requirements		+ 5 Vdc, 281 mA maximum (255 mA typical) +12 Vdc - 12 Vdc
I/O ports	Serial	Four multiprotocol (connected through the LCP2 adapter)
	Parallel	Parallel printer port (connected through the LCP2 adapter)
Operating temperature		0 degrees to 55 degrees C at point of entry of forced air (approximately 5 CFM)
Storage temperature		- 40 degrees to 85 degrees C
Relative humidity		5% to 90% (non-condensing)
Physical characteristics (excluding front panel and MVME712B)	Height Depth Thickness	9.187 inches (233.35 mm) 3.200 inches (80.00 mm) 0.063 inches (1.60 mm)

Cooling Requirements

Motorola VMEmodules are specified, designed, and tested to operate reliably with an incoming air temperature range from 0 degrees C to 55 degrees C (32 degrees F to 131 degrees F) with forced air cooling. Temperature qualification is performed in a standard Motorola VMEsystem 1000 chassis. Twenty-five watt load boards are inserted in the two card slots, one on each side, adjacent to the board under test to simulate a high power density system configuration. An assembly of three axial fans, rated at 71 CFM per fan, is placed directly under the MVME card cage. The incoming air temperature is measured between the fan assembly and the card cage where the incoming airstream first encounters the module under test. Test software is executed as the module is subjected to ambient temperature variations. Case temperatures of critical, high power density integrated circuits are monitored to ensure component vendors specifications are not exceeded.

While the exact amount of airflow required for cooling depends on the ambient air temperature and the type, number, and location of boards and other heat sources, adequate cooling can usually be achieved with 5 CFM flowing over the module. Less air flow is required to cool the module in environments having lower maximum ambients. Under more favorable thermal conditions it may be possible to operate the module reliably at higher than 55 degrees C with increased air flow. It is important to note that there are several factors, in addition to the rated CFM of the air mover, which determine the actual volume of air flowing over a module.

FCC Compliance

These MVME712 family VMEmodules were tested in an FCC-compliant chassis, and meet the requirements for Class A equipment. FCC compliance was achieved under the following conditions:

1. Shielded cables on all external I/O ports.
2. Cable shields connected to earth ground via metal shell connectors bonded to a conductive module front panel.
3. Conductive chassis rails connected to earth ground. This provides the path for connecting shields to earth ground.
4. Front panel screws properly tightened.

For minimum RF emissions, it is essential that the conditions above be implemented; failure to do so could compromise the FCC compliance of the equipment containing the modules.

General Description

The MVME712 family modules are I/O transition modules for the MVME1*xx* VMEmodule families. The LCP2 adapter assembly routes the I/O signals and grounds from the P2 connector on the backplane at the MVME1*xx* VMEmodule to the MVME712 family module. The MVME712 family module routes the signals to the appropriate industry-standard connectors on its front panel. The MVME712-13 and MVME712AM both have a built-in modem.

The MVME712*x* has four DB-9 connectors for the serial ports, one 25-pin connector for the printer port, and a Telco modular jack on the front panel. The serial ports are configured for use as *to modem* and cannot be changed without null modem cables.

HARDWARE PREPARATION AND INSTALLATION 2

Introduction

This chapter provides unpacking instructions, hardware preparation, and installation instructions for the MVME712 family modules and the LCP2 adapter.

Unpacking Instructions

Note **If the carton is damaged upon receipt, request that carrier's agent be present during unpacking and inspection of equipment.**

Unpack equipment from shipping carton. Refer to packing list and verify that all items are present. Save packing material for storing and reshipping of equipment.

MVME712*x* Module Preparation

To select the desired configuration and ensure proper operation of the MVME712*x* module, certain changes may be made before installation. These changes are made through jumper arrangements on the headers. The locations of the headers and connectors for the MVME712*x* are illustrated in Figure 2-1 through Figure 2-4.

The modules have been factory tested and are shipped with factory-installed jumper configurations that are shown in the following paragraphs with each header description. The modules are operational with the factory-installed jumpers. The modules are configured to provide the system functions required for a VMEbus system. Changes may be made for the following reasons:

- ❏ DSR Line Pull Up Select (J8, J9, J13, J14)
- ❏ Serial Port 2/Modem Port 2 Select (J16, J17)
- ❏ Hardwired as DTE (*to modem*). With the exception of the DSR line, no headers are provided on the module to change this configuration. To use the module as DCE (*to terminal*), a null modem cable must be attached.

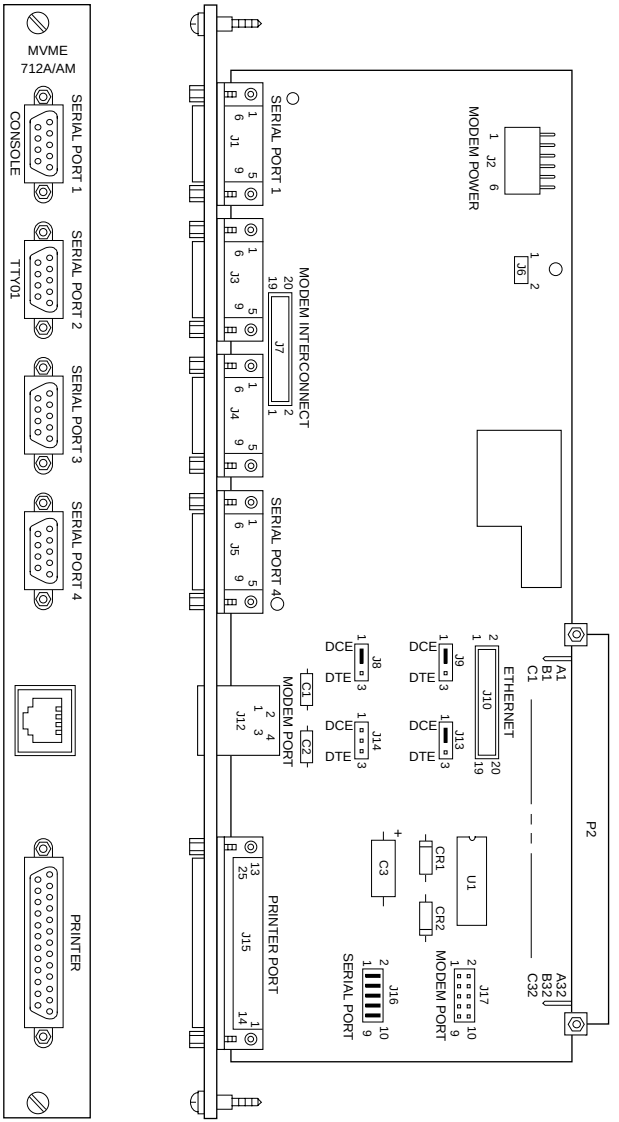


Figure 2-1. MVME712-12 Header Locations

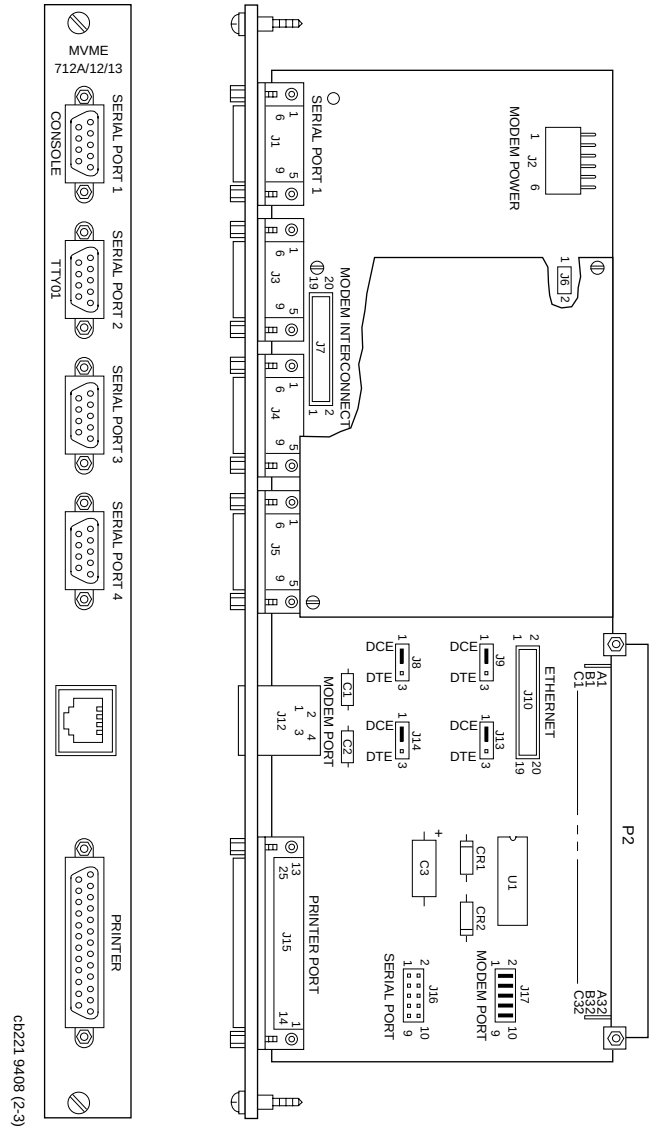


Figure 2-2. MVME712-13 Header Locations

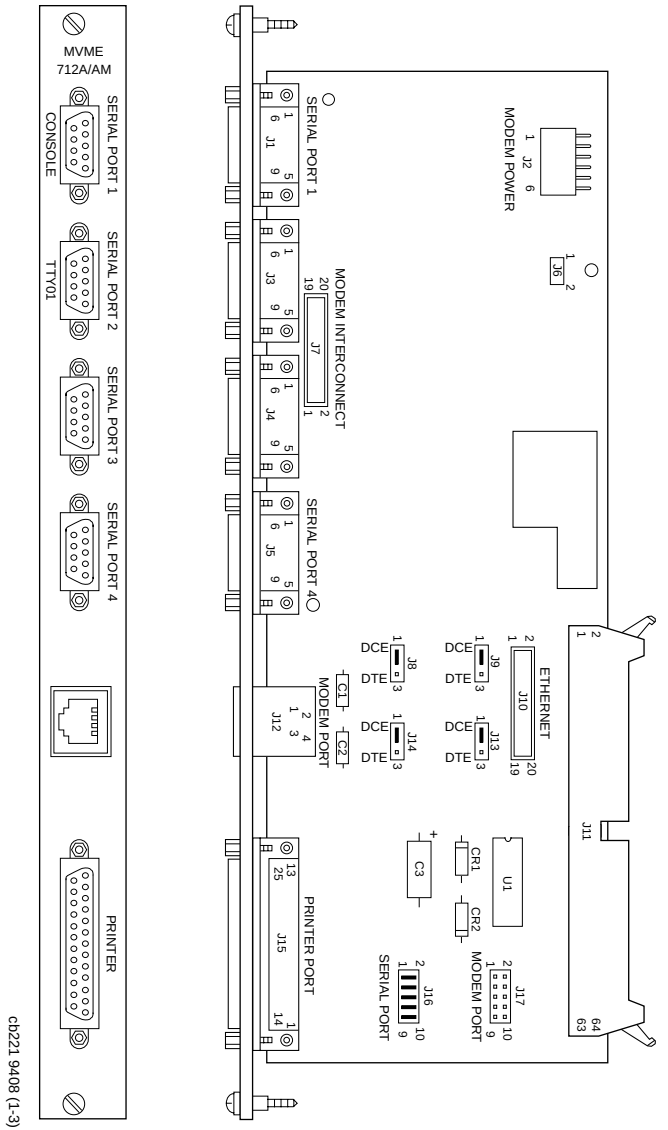


Figure 2-3. MVME712A Header Locations

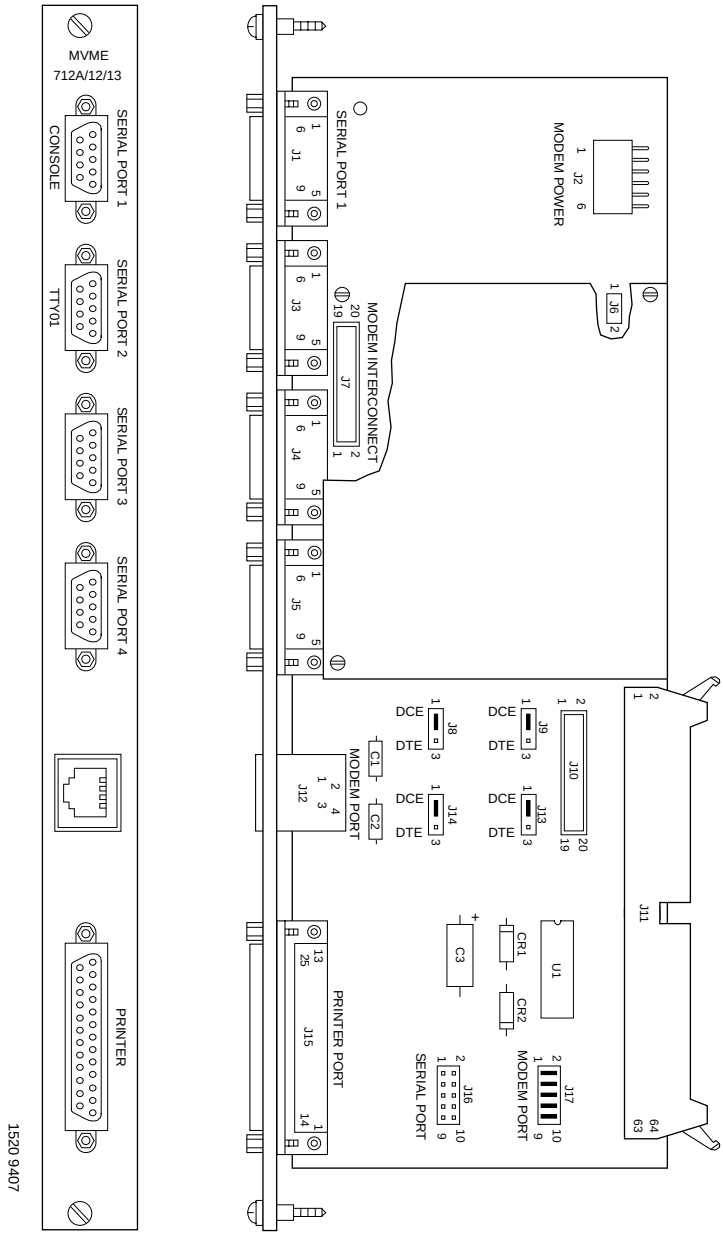
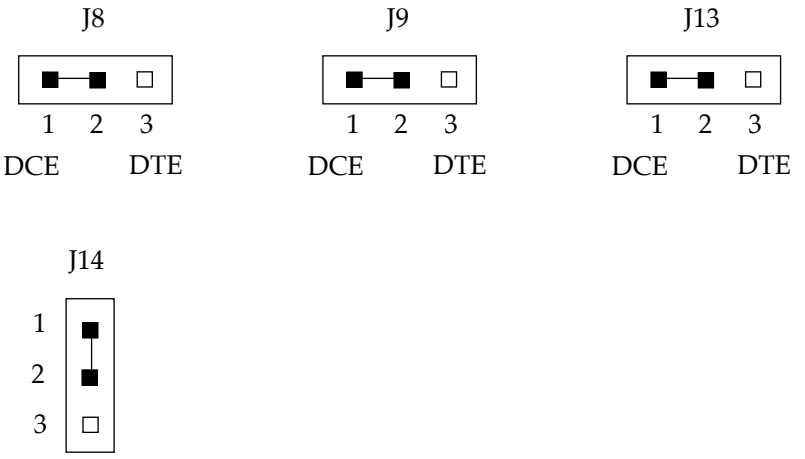


Figure 2-4. MVME712AM Header Locations

DSR Line Pull Up Select Headers (J8, J9, J13, J14)

Headers J8, J9, J13, and J14 are used to pull up the external DSR lines of the serial ports (J1, J3, J4, J5) to a high (+12 Vdc) level when terminals are connected and DSR is to be used as a constantly activated output from the MVME712*x*. The as-shipped configuration is shown below.



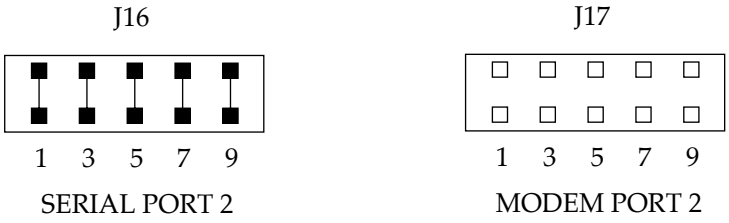
Serial Port 2/Modem Port 2 Select (J16, J17)

Port 2 is shared between the front panel serial port connector and the internal modem. Header J16 or J17 must be configured to select *one or the other* port for proper operation.

Note **Only one port function may be selected at any one time. Otherwise, improper operation will result.**

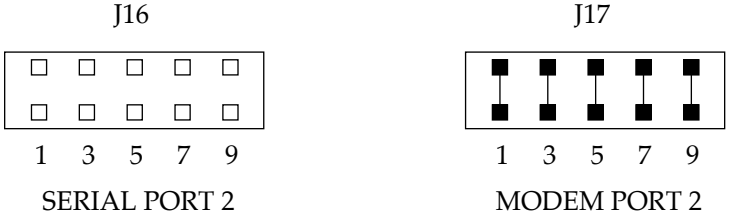
Serial Port Configuration

The MVME712-12 and MVME712A are shipped with port 2 configured for connection as a serial port as shown below.



Modem Port Configuration

The MVME712-13 and MVME712AM are shipped with port 2 configured for connection as a modem port as shown below.



SCSI Termination

Because the MVME712*x* has no provision for SCSI connection, you must ensure that the SCSI bus is terminated properly. The LCP2 adapter has sockets (R1, R2, R3) for terminating the SCSI lines using three 8-pin SIP resistors. Refer to the *Installation Instructions* for use of the terminators.

MVME712B Module Preparation

No preparation of the MVME712B is necessary. The location of the connectors is illustrated in Figure 2-5.

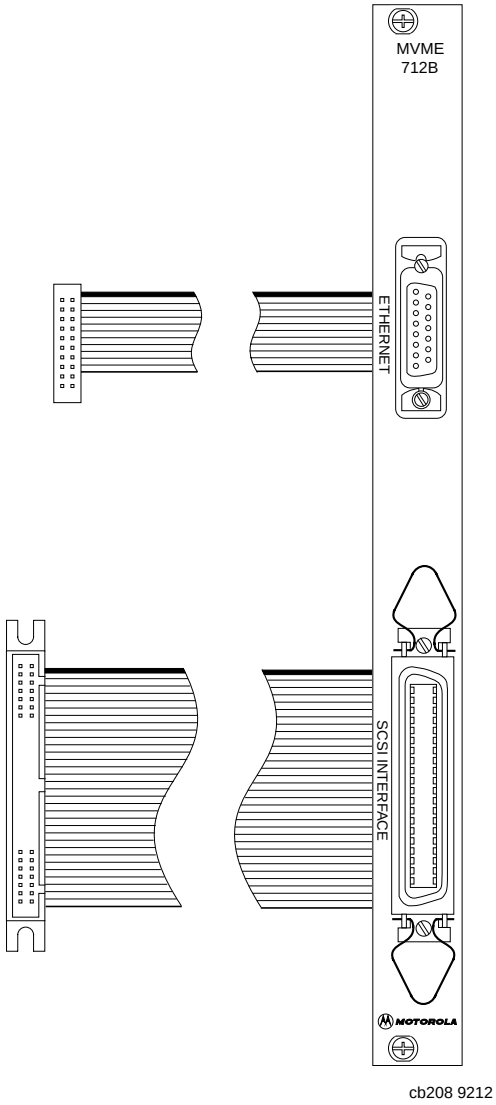


Figure 2-5. MVME712B Connector Locations

LCP2 Adapter Board Preparation

Preparation of the LCP2 adapter consists of removing or replacing the terminating resistors for SCSI. The location of the resistors, fuse, and connectors is illustrated in Figure 2-6. Refer to the *Installation Instructions* for use of the terminators.

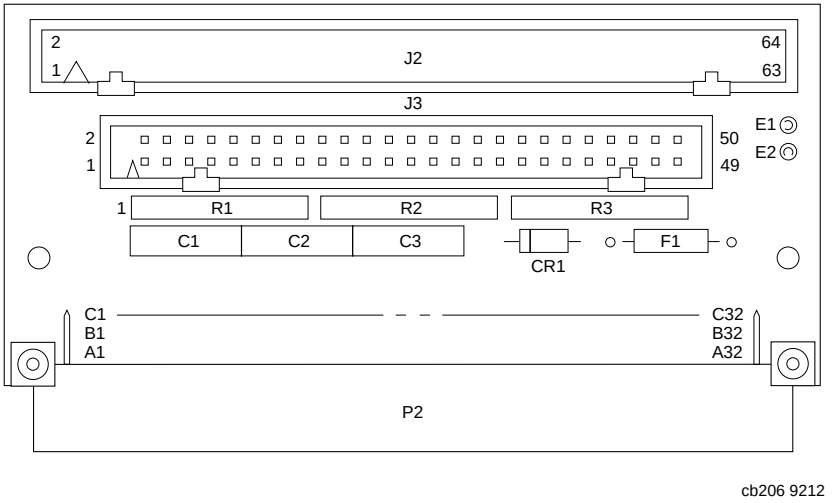


Figure 2-6. LCP2 Adapter Connector Locations

Installation Instructions

The basic procedure for installation of the family of MVME712 modules and the LCP2 adapter is as follows:

1. Turn all equipment power OFF and disconnect the power cable from the AC power source.

Caution **Connecting modules while the power is applied may result in damage to components on the module.**



WARNING **Dangerous voltages, capable of causing death, are present in this equipment. Use extreme caution when handling, testing, and adjusting.**

2. Remove the chassis cover as instructed in the equipment user's manual.
3. Remove the filler panel(s) from the appropriate card slot(s) at the rear of the chassis (if the chassis has a rear card cage). Other modules in the unit may have to be moved to allow space for the cables connected to the LCP2 adapter and the MVME712*x* family module.
4. Continue with the specific procedure for installation:

Installing for Use with Internal SCSI Devices

Installing the MVME712-13 and MVME712AM as a Modem

MVME712B Installation

Installing for Use with Internal SCSI Devices

An MVME1*xx* VMEmodule can be connected through the LCP2 adapter to internal SCSI devices as shown in Figure 2-7. This section describes the procedure for connecting the MVME712x modules for use with internal SCSI devices.

Because the MVME1xx VMEmodule is at one end of the cable, SCSI terminators are required on the LCP2 adapter. The LCP2 adapter module is shipped with SCSI terminators installed.

Note **MVME712-13 and MVME712AM: perform the steps in this procedure to connect to internal SCSI devices or the steps in the next section to connect the modem or the steps in both procedures.**

1. Verify that SCSI terminators are installed on the LCP2 adapter module.
2. Install the LCP2 adapter module to the backplane directly in line with the P2 connector on the MVME1*xx* VMEmodule. Be sure to orient pin 1 of the adapter with pin 1 of the backplane connector.
3. Connect a user-supplied cable with compatible pinouts from connector J3 on the LCP2 adapter to the internal SCSI devices.
4. Verify that terminators are installed on the last SCSI device on the cable. If they are not present, install terminators.
5. **MVME712-12 and MVME712-13**: Attach the cable supplied with the MVME712*x* module from LCP2 adapter connector J2 to connector P2 on the MVME712*x* module. Be sure to orient cable pin 1 with connector pin 1. See Figure 2-7.

   MVME712A and MVME712AM: Attach the cable supplied with the MVME712*x* module from LCP2 adapter connector J2 to connector J11 on the MVME712*x* module. Be sure to orient cable pin 1 with connector pin 1. See Figure 2-7.
6. Insert the transition module into the selected slot and tighten the attaching screws.
7. After making sure you will not pinch cables with the cover, reinstall the cover you previously removed.
8. Connect the power cable to the AC power source and turn on the unit.
9. If SCSI does not work properly, you may have to repair a defective cable and/or replace a blown fuse.

Check the fuse on the LCP2 adapter module and replace it, if necessary. The fuse on the LCP2 adapter module is for SCSI terminator power.

The fuse on the MVME1*xx* VMEmodule is for Ethernet transceiver power.

The resistance of each fuse should be less than 1 Ohm.

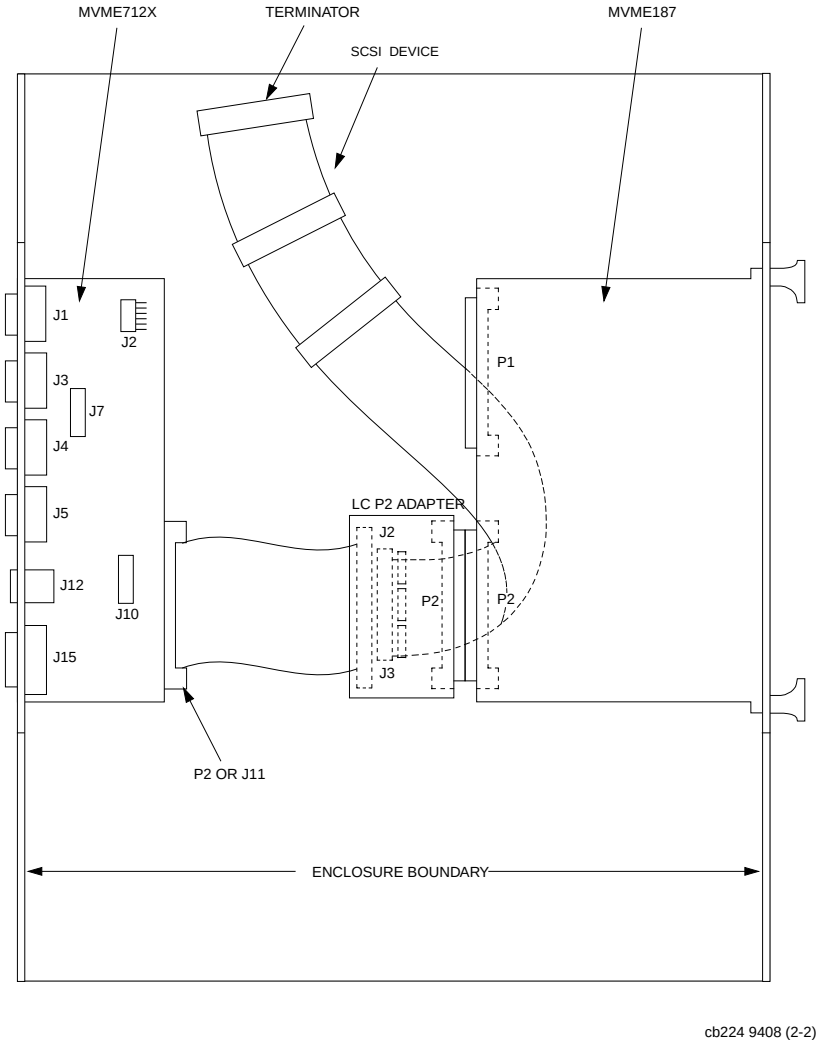


Figure 2-7. Internal SCSI and Serial Port Connections

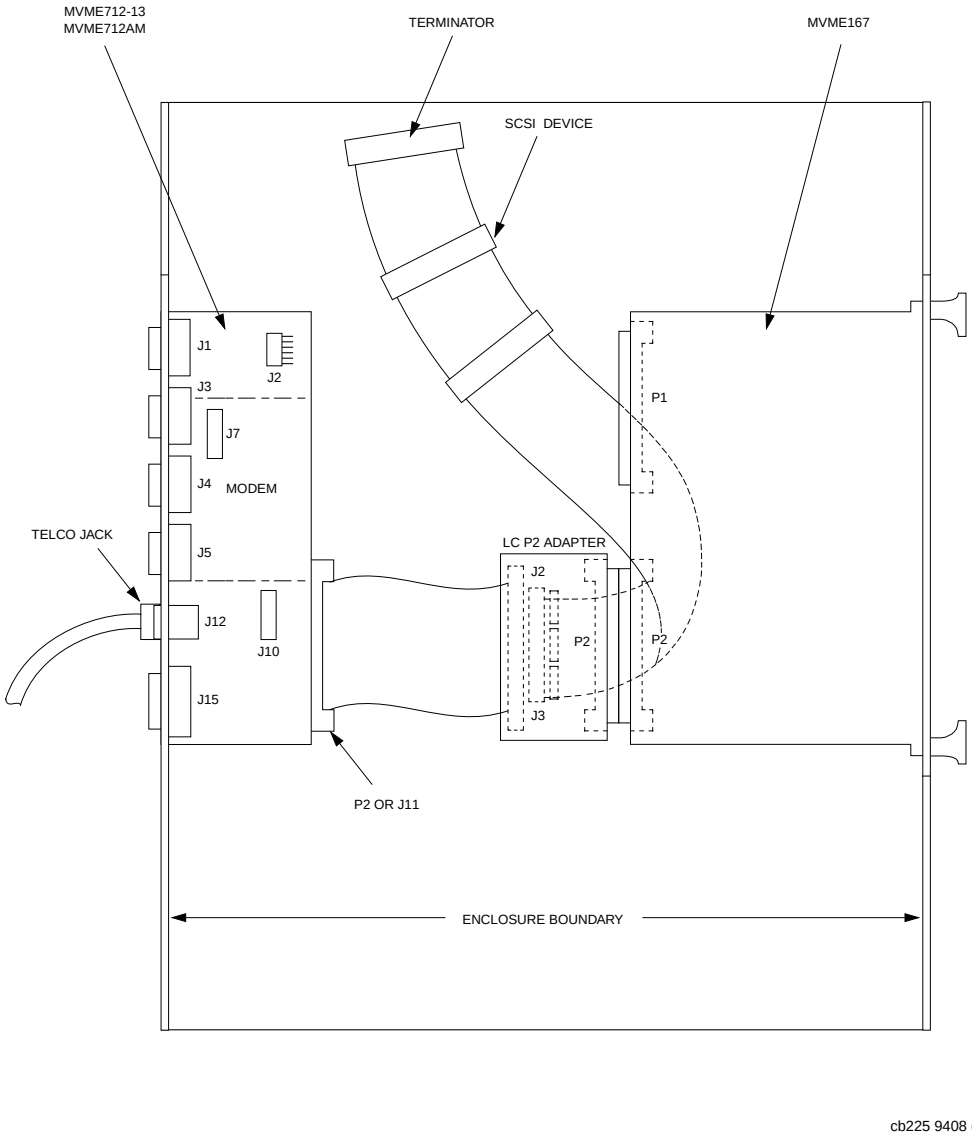
Installing the MVME712-13 and MVME712AM as a Modem

To install the MVME712-13 and MVME712AM with serial port 2 configured as a modem, which is the as-shipped configuration, proceed as described in this section. See also Figure 2-8.

Note **If you have connected your module for use with internal SCSI devices, you may already have performed some of these steps.**

1. Install the LCP2 adapter module to the backplane directly in line with the P2 connector on the MVME1*xx* VMEmodule. Be sure to orient pin 1 of the adapter with pin 1 of the backplane connector.
2. Verify that serial port 2 is configured as a modem port (refer to the *Serial Port 2 Configuration* paragraph).
3. **MVME712-13**: Attach the cable supplied with the MVME712-13 module from LCP2 adapter connector J2 to connector P2 on the MVME712-13 module. Be sure to orient cable pin 1 with connector pin 1. See Figure 2-8.

   MVME712AM: Attach the cable supplied with the MVME712AM module from LCP2 adapter connector J2 to connector J11 on the MVME712AM module. Be sure to orient cable pin 1 with connector pin 1. See Figure 2-8.
4. Connect a user-supplied cable from connector J2 on the MVME712-13 or MVME712AM to backplane connections for +5, +12, and -12 Vdc for modem power.
5. Insert the MVME712-13 or MVME712AM module into the selected slot and tighten the attaching screws.
6. After making sure you will not pinch cables with the cover, reinstall the cover you previously removed.
7. Connect a user-supplied Telco modular cable to the Telco modular jack on the front panel.
8. Connect the power cable to the AC power source and turn on the unit.



cb225 9408 (2-2)

Figure 2-8. Internal SCSI and Modem Connections

MVME712B Installation

The MVME712B is designed to be used *in conjunction with* one of the MVME712*x* modules (MVME712A, MVME712AM, MVME712-12, or MVME712-13). The MVME712*x* can be connected through the MVME712B to external SCSI devices as shown in Figure 2-9.

Because the MVME1xx VMEmodule is at one end of the cable, SCSI terminators are required on the LCP2 adapter. The LCP2 adapter module is shipped with SCSI terminators installed.

To install the MVME712B in the system, proceed as follows:

1. Verify that SCSI terminators are installed on the LCP2 adapter module.
2. Install the LCP2 adapter module to the backplane directly in line with the P2 connector on the MVME1*xx* VMEmodule. Be sure to orient pin 1 of the adapter with pin 1 of the backplane connector.
3. **MVME712-12 and MVME712-13**: Attach the cable supplied with the MVME712*x* module from LCP2 adapter connector J2 to connector P2 on the MVME712*x* module. Be sure to orient cable pin 1 with connector pin 1. See Figure 2-9.

   MVME712A and MVME712AM: Attach the cable supplied with the MVME712*x* module from LCP2 adapter connector J2 to connector J11 on the MVME712*x* module. Be sure to orient cable pin 1 with connector pin 1. See Figure 2-9.
4. Connect the SCSI INTERFACE cable on the MVME712B to connector J3 on the LCP2 adapter.
5. Connect the ETHERNET cable on the MVME712B to connector J10 on the MVME712*x*.
6. Insert the MVME712B module into the selected slot and tighten the attaching screws.
7. Connect a user-supplied cable with compatible pinouts from the SCSI interface on the front panel of the MVME712B to the external SCSI devices.
8. Verify that terminators are installed on the last SCSI device on the cable. If they are not present, install terminators.
9. After making sure you will not pinch cables with the cover, reinstall the cover you previously removed.
10. Connect the power cable to the AC power source and turn the unit on.
11. If SCSI does not work properly, you may have to repair a defective cable and/or replace a blown fuse.

Check the fuse on the LCP2 adapter module and replace, if necessary. The fuse on the LCP2 adapter module is for SCSI terminator power.

The fuse on the MVME1*xx* VMEmodule is for Ethernet transceiver power.

The resistance of each fuse should be less than 1 Ohm.

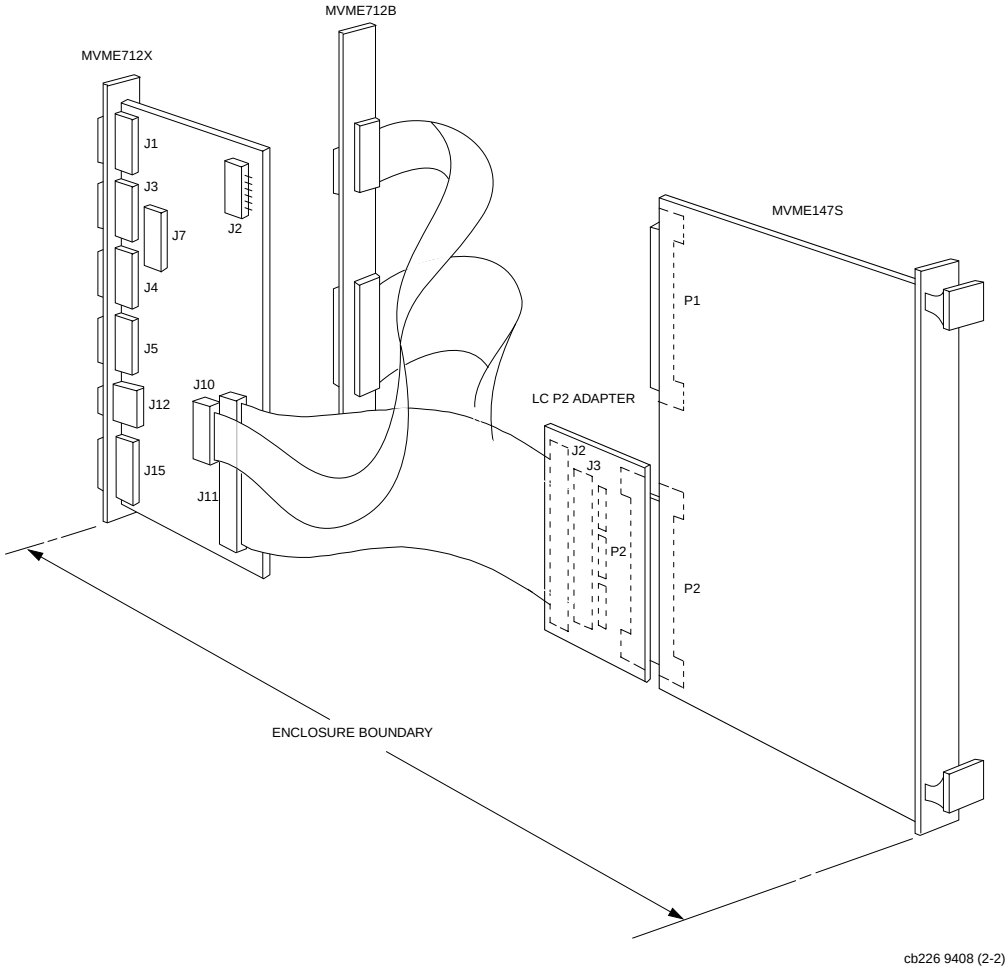


Figure 2-9. MVME712B External SCSI Connections

SUPPORT INFORMATION 3

Introduction

This chapter provides the interconnection signals, parts lists, parts location illustrations, and schematic diagrams for the MVME712 family modules and LCP2 adapter.

Interconnect Signals

Table 3-1 describes the connections from the LCP adapter to the MVME712*x* and VMEmodules:

Table 3-1. LCP2 and MVME712 Connectors

From	To
LCP2 adapter J2	J11 on the MVME712A J11 on the MVME712AM
LCP2 adapter J2	P2 on the MVME712-12 P2 on the MVME712-13
LCP2 adapter P2	backplane at the MVME1*xx* VMEmodule P2 connector

Table 3-2 lists the jumpers on the MVME712 modules.

Table 3-2. MVME712 Jumpers

Jumper	Description	Modules
J1 and J3-J5	9-pin EIA-232D serial port connectors on the front panel	MVME712*x*
J15	25-pin printer port connector on the front panel	MVME712*x*
J2	6-pin modem power connector	MVME712*x*
J6	2-pin modem TIP/RING connector	MVME712*x*
J7	20-pin modem interconnect connector	MVME712*x*
J10	20-pin Ethernet connector	MVME712*x*
J12	Telco modular jack on the front panel	MVME712-13 MVME712AM

All front panel connectors have metal shells and jack posts that are electrically connected to the front panel. If the front panel is electrically connected to the chassis ground, then the shells and jack posts are connected to chassis ground. This allows shielded cable to be used for effective reduction of EMI and EMC problems.

Connector P2 Interconnect Signals (LCP2 Adapter)

Connector P2 on the LCP2 adapter board is a standard DIN 41612 triple-row, 96-pin male connector. Each pin connection, signal mnemonic, and signal characteristic for the connector rows A and C are the same pin-for-pin as connector P2 on the MVME1*xx* VMEmodule. Row B has only +5 Vdc and ground connected on the LCP2 adapter.

Connectors J1, J3-J5 Interconnect Signals (MVME712*x*)

Connectors J1 and J3-J5 are EIA-232D 9-pin front panel connectors. Each pin connection, signal mnemonic, and signal characteristic for the connectors is listed in Table 3-3.

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Table 3-3. Connectors J1, J3-J5 Interconnect Signals (MVME712*x*)

Pin Number	Signal Mnemonic	Signal Name and Description
1	DCD	DATA CARRIER DETECT - Sent by the modem to the terminal to indicate that a valid carrier is being received. Not used by port 1 (J1).
2	RXD	RECEIVE DATA - data that is demodulated from the receive line is presented to the terminal by the modem.
3	TXD	TRANSMIT DATA - data to be transmitted is furnished on this line to the modem from the terminal.
4	DTR	DATA TERMINAL READY - A signal from the terminal to the modem indicating that the terminal is ready to send or receive data.
5	GND	GROUND
6	DSR	DATA SET READY - DSR is a function supplied by the modem to the terminal to indicate that the modem is ready to transmit data. This signal can be held high or low through header J8, J9, J13, J14.

Table 3-3. Connectors J1, J3-J5 Interconnect Signals (MVME712*x*) (Continued)

Pin Number	Signal Mnemonic	Signal Name and Description
7	RTS	REQUEST TO SEND - RTS is supplied by the terminal to the modem when it is required to transmit a message. With RTS off, the modem carrier remains off. When RTS is turned on, the modem immediately turns on the carrier.
8	CTS	CLEAR TO SEND - CTS is a function supplied to the terminal by the modem, and indicates that it is permissible to begin transmission of a message. When using a modem, CTS follows the off-to-on transition of RTS after a time delay.
9		Not used.

Connector J2 Interconnect Signals (LCP2 Adapter)

Connector J2 on the LCP2 adapter is a 64-pin connector. Each pin connection, signal mnemonic, and signal characteristic for the connector is listed in Table 3-4.

Table 3-4. Connector J2 Interconnect Signals (LCP2 Adapter)

Pin Number	Signal Mnemonic	Signal Name and Description
1	C+	COLLISION + (Input) (Ethernet) - a signal to indicate that multiple stations are contending for access to the transmission medium.
2	C-	COLLISION - (Input) (Ethernet) - part of a differential pair.
3	T+	TRANSMIT + (Output) (Ethernet) - this line is intended to operate into terminated transmission lines.
4	T-	TRANSMIT - (Output) (Ethernet) - part of a differential pair.
5	R+	RECEIVE + (Input) (Ethernet) - a data input sourced by the MAU.
6	R-	RECEIVE - (Input) (Ethernet) - part of a differential pair.
7	PRSTB*	DATA STROBE (Printer) - an active low output pulse used to clock data from the system to the printer.
8	+12VF	+12 Vdc Power - fused on MPU board.
9	PRD00	DATA (bit 1) (Printer)
10	GND	GROUND
11	PRD02	DATA (bit 2) (Printer)
12	PRD01	DATA (bit 0) (Printer)
13	PRD04	DATA (bit 3) (Printer)
14	PRD03	DATA (bit 3) (Printer)
15	PRD06	DATA (bit 4) (Printer)
16	PRD05	DATA (bit 5) (Printer)
17	GND	GROUND
18	PRD07	DATA (bit 7) (Printer)
19	GND	GROUND

Table 3-4. Connector J2 Interconnect Signals (LCP2 Adapter) (Continued)

Pin Number	Signal Mnemonic	Signal Name and Description
20	PRACK*	DATA ACKNOWLEDGE (Printer) - a low level input pulse indicating that the next character may be sent.
21	PRPE	PAPER EMPTY (Printer) - out of paper.
22	PRBSY	BUSY (Printer) - an input signal indicating that the printer cannot receive data.
23	INPRIME*	INPUT PRIME (Printer) - an output signal that clears the printer buffer and initializes the logic.
24	PRSEL	SELECTED (Printer) - an input signal indicating that the printer is selected.
25	GND	GROUND
26	PRFAULT*	FAULT (Printer) - an input signal that indicates a printer fault condition.
27	GND	GROUND
28	TXD3	TRANSMIT DATA (serial port 3) - data to be transmitted is furnished on this line to the modem from the terminal.
29	GND	GROUND
30	RXD3	RECEIVE DATA (serial port 3) - data that is demodulated from the receive line is presented to the terminal by the modem.
31	CTS3	CLEAR TO SEND (serial port 3) - CTS is a function supplied to the terminal by the modem, and indicates that it is permissible to begin transmission of a message. When using a modem, CTS follows the off-to-on transition of RTS after a time delay.
32	RTS3	REQUEST TO SEND (serial port 3) - RTS is supplied by the terminal to the modem when it is required to transmit a message. With RTS off, the modem carrier remains off. When RTS is turned on, the modem immediately turns on the carrier.
33	DCD3	DATA CARRIER DETECT (serial port 3) - sent by the modem to the terminal to indicate that a valid carrier is being received.

Table 3-4. Connector J2 Interconnect Signals (LCP2 Adapter) (Continued)

Pin Number	Signal Mnemonic	Signal Name and Description
34	DTR3	DATA TERMINAL READY (serial port 3) - a signal from the terminal to the modem indicating that the terminal is ready to send or receive data.
35	TXD1	TRANSMIT DATA (serial port 1) - data to be transmitted is furnished on this line to the modem from the terminal.
36	GND	GROUND
37	RXD1	RECEIVE DATA (serial port 1) - data that is demodulated from the receive line is presented to the terminal by the modem.
38	GND	GROUND
39	RTS1	REQUEST TO SEND (serial port 1) - RTS is supplied by the terminal to the modem when it is required to transmit a message. With RTS off, the modem carrier remains off. When RTS is turned on, the modem immediately turns on the carrier.
40,41	GND	GROUND
42	CTS1	CLEAR TO SEND (serial port 1) - CTS is a function supplied to the terminal by the modem, and indicates that it is permissible to begin transmission of a message. When using a motmots follows the off-to-on transition of RTS after a time delay.
43	GND	GROUND
44	TXD4	TRANSMIT DATA (serial port 4) - data to be transmitted is furnished on this line to the modem from the terminal.
45	GND	GROUND
46	RXD4	RECEIVE DATA (serial port 4) - data that is demodulated from the receive line is presented to the terminal by the modem.
47	GND	GROUND

Table 3-4. Connector J2 Interconnect Signals (LCP2 Adapter) (Continued)

Pin Number	Signal Mnemonic	Signal Name and Description
48	RTS4	REQUEST TO SEND (serial port 4) - RTS is supplied by the terminal to the modem when it is required to transmit a message. With RTS off, the modem carrier remains off. When RTS is turned on, the modem immediately turns on the carrier.
49	GND	GROUND
50	TRXC4	TRANSMIT CLOCK (serial port 4) - this line can be configured to clock output data to the modem from the terminal.
51	DTR4	DATA TERMINAL READY (serial port 4) - a signal from the terminal to the modem indicating that the terminal is ready to send or receive data.
52	CTS4	CLEAR TO SEND (serial port 4) - CTS is a function supplied to the terminal by the modem, and indicates that it is permissible to begin transmission of a message. When using a modem, CTS follows the off-to-on transition of RTS after a time delay.
53	GND	GROUND
54	DCD4	DATA CARRIER DETECT (serial port 4) - sent by the modem to the terminal to indicate that a valid carrier is being received.
55	GND	GROUND
56	RTXC4	RECEIVE CLOCK (serial port 4) - this line can be configured to clock input data from a terminal to a modem.
57	GND	GROUND
58	TXD2	TRANSMIT DATA (serial port 2) - data to be transmitted is furnished on this line to the modem from the terminal.
59	GND	GROUND
60	RXD2	RECEIVE DATA (serial port 2) - data that is demodulated from the receive line is presented to the terminal by the modem.

Table 3-4. Connector J2 Interconnect Signals (LCP2 Adapter) (Continued)

Pin Number	Signal Mnemonic	Signal Name and Description
61	CTS2	CLEAR TO SEND (serial port 2) - CTS is a function supplied to the terminal by the modem, and indicates that it is permissible to begin transmission of a message. When using a modem, CTS follows the off-to-on transition of RTS after a time delay.
62	RTS2	REQUEST TO SEND (serial port 2) - RTS is supplied by the terminal to the modem when it is required to transmit a message. With RTS off, the modem carrier remains off. When RTS is turned on, the modem immediately turns on the carrier.
63	DCD2	DATA CARRIER DETECT (serial port 2) - sent by the modem to the terminal to indicate that a valid carrier is being received.
64	DTR2	DATA TERMINAL READY (serial port 2) - a signal from the terminal to the modem indicating that the terminal is ready to send or receive data.

Connector J2 Interconnect Signals (MVME712-13, MVME712AM)

Connector J2 is a backplane modem power connector. Each pin connection, signal mnemonic, and signal characteristic for the connector is listed in Table 3-5.

Table 3-5. Connector J2 Interconnect Signals (MVME712-13/AM)

Pin Number	Signal Mnemonic	Signal Name and Description
1	+5VMODEM	+5 Vdc Power - supplied by the backplane and routed to J20.
2	+12VMODEM	+12 Vdc Power - supplied by the backplane and routed to J20.
3	-12VMODEM	-12 Vdc Power - supplied by the backplane and routed to J20.
4	GND	GROUND
5,6		Not used.

Connector J3 Interconnect Signals (LCP2 Adapter) Connector:

Connector J3 on the LCP2 adapter is the SCSI port. Each pin connection, signal mnemonic, and signal characteristic for the connectors is listed in Table 3-6.

Table 3-6. Connector J3 Interconnect Signals (LCP2 Adapter)

Pin Number	Signal Mnemonic	Signal Name and Description
1	GND	GROUND
2	DB00*	DATA bus (bit 0) - least significant bit and the lowest priority during the arbitration phase.
3	GND	GROUND
4	DB01*	DATA bus (bit 1)
5	GND	GROUND
6	DB02*	DATA bus (bit 2)
7	GND	GROUND
8	DB03*	DATA bus (bit 3)
9	GND	GROUND

Table 3-6. Connector J3 Interconnect Signals (LCP2 Adapter) (Continued)

Pin Number	Signal Mnemonic	Signal Name and Description
10	DB04*	DATA bus (bit 4)
11	GND	GROUND
12	DB05*	DATA bus (bit 5)
13	GND	GROUND
14	DB06*	DATA bus (bit 6)
15	GND	GROUND
16	DB07*	DATA bus (bit 7) - most significant bit and the highest priority during the arbitration phase.
17	GND	GROUND
18	DBP*	DATA bus (parity) - data parity is odd. Use of parity is a system option. Parity is not valid during the arbitration phase.
19-24	GND	GROUND
25		Not used.
26	TERMPWR	TERMINATOR POWER
27-31	GND	GROUND
32	ATN*	ATTENTION - signal driven by the initiator. Indicates the attention condition.
33-35	GND	GROUND
36	BSY*	BUS BUSY - OR-tied signal that indicates that the bus is being used.
37	GND	GROUND
38	ACK*	ACKNOWLEDGE - signal driven by an initiator to indicate an acknowledgment for a REQ/ACK data transfer handshake.
39	GND	GROUND
40	RST*	RESET - OR-tied signal that indicates the RESET condition.
41	GND	GROUND
42	MSG*	MESSAGE - signal driven by the target during the message phase.
43	GND	GROUND
44	SEL*	SELECT - signal used by an initiator to select a target or by a target to reselect an initiator.
45	GND	GROUND

Table 3-6. Connector J3 Interconnect Signals (LCP2 Adapter) (Continued)

Pin Number	Signal Mnemonic	Signal Name and Description
46	D/C*	DATA/COMMAND - signal driven by the target. It indicates whether command or data information is on the data bus. True (low) indicates command.
47	GND	GROUND
48	REQ*	REQUEST - signal driven by a target to indicate a request for a REQ/ACK data transfer handshake.
49	GND	GROUND
50	O/I*	OUTPUT/INPUT - signal driven by a target that controls the direction of data movement on the bus. True (low) indicates input to the initiator. False (high) indicates output from the initiator. This signal is also used to distinguish between selection and reselection phases.

Connector SCSI INTERFACE Interconnect Signals (MVME712B)

Each pin connection, signal mnemonic, and signal characteristic for the connector is listed in Table 3-7.

Table 3-7. SCSI INTERFACE Interconnect Signals (MVME712B)

Pin Number	Signal Mnemonic	Signal Name and Description
1-25	GND	GROUND
26	DB00*	DATA bus (bit 0) - least significant bit and the lowest priority during the arbitration phase.
27	DB01*	DATA bus (bit 1)
28	DB02*	DATA bus (bit 2)
29	DB03*	DATA bus (bit 3)
30	DB04*	DATA bus (bit 4)
31	DB05*	DATA bus (bit 5)
32	DB06*	DATA bus (bit 6)

Table 3-7. SCSI INTERFACE Interconnect Signals (MVME712B) (Continued)

Pin Number	Signal Mnemonic	Signal Name and Description
33	DB07*	DATA bus (bit 7) - most significant bit and the highest priority during the arbitration phase.
34	DBP*	DATA bus (parity) - data parity is odd. Use of parity is a system option. Parity is not valid during the arbitration phase.
35-37	GND	GROUND
38	TERMPWR	TERMINATOR POWER
39,40	GND	GROUND
41	ATN*	ATTENTION - signal driven by the initiator. Indicates the attention condition.
42	GND	GROUND
43	BSY*	BUS BUSY - OR-tied signal that indicates that the bus is being used.
44	ACK*	ACKNOWLEDGE - signal driven by an initiator to indicate an acknowledgment for a REQ/ACK data transfer handshake.
45	RST*	RESET - OR-tied signal that indicates the RESET condition.
46	MSG*	MESSAGE - signal driven by the target during the message phase.
47	SEL*	SELECT - signal used by an initiator to select a target or by a target to reselect an initiator.
48	D/C*	DATA/COMMAND - signal driven by the target. It indicates whether command or data information is on the data bus. True (low) indicates command.
49	REQ*	REQUEST - signal driven by a target to indicate a request for a REQ/ACK data transfer handshake.
50	O/I*	OUTPUT/INPUT - signal driven by a target that controls the direction of data movement on the bus. True (low) indicates input to the initiator. False (high) indicates output from the initiator. This signal is also used to distinguish between selection and reselection phases.

Connector ETHERNET Interconnect Signals (MVME712B)

Each pin connection, signal mnemonic, and signal characteristic for the connector is listed in Table 3-8.

Table 3-8. ETHERNET Interconnect Signals (MVME712B)

Pin Number	Signal Mnemonic	Signal Name and Description
1		Not used.
2	C+	COLLISION + (Input) - a signal to indicate that multiple stations are contending for access to the transmission medium.
3	T+	TRANSMIT + (Output) - this line is intended to operate into terminated transmission lines.
4		Not used.
5	R+	RECEIVE + (Input) - a data input sourced by the MAU.
6	GND	GROUND
7,8		Not used.
9	C-	COLLISION - (Input) - part of a differential pair.
10	T-	TRANSMIT - (Output) - part of a differential pair.
11		Not used.
12	R-	RECEIVE - (Input) - part of a differential pair.
13	+12VF	+12 Vdc Power - fused on MPU board.
14,15		Not used.

Connector J6 Interconnect Signals (MVME712-13, MVME712AM)

Connector J6 is the modem RING and TIP from the Telco front panel jack on the MVME712-13 and MVME712AM. Each pin connection, signal mnemonic, and signal characteristic for the connector is listed in Table 3-9.

Table 3-9. Connector J6 Interconnect Signals (MVME712-13/AM)

Pin Number	Signal Mnemonic	Signal Name and Description
1	TIP	Tip side of telephone line.
2	RING	Ring side of telephone line.

Connector J7 Interconnect Signals (MVME712-13, MVME712AM)

Connector J7 is the onboard modem interconnect (refer to Appendix A for details on the modem). Each pin connection, signal mnemonic, and signal characteristic for the connector is listed in Table 3-10.

Table 3-10. Connector J7 Interconnect Signals (MVME712-13/AM)

Pin Number	Signal Mnemonic	Signal Name and Description
1	MDMTXD2	TRANSMIT DATA - data to be transmitted is furnished on this line to the modem from the terminal.
2,3		Not used.
4	-12VMODEM	-12 Vdc Power - used by the modem.
5	+5VMODEM	+5 Vdc Power - used by the modem.
6		Not used.
7	MDMDTR2	DATA TERMINAL READY - an active low signal from the terminal to the modem indicating that the terminal is ready to send or receive data.
8,9		Not used.
10	GND	GROUND - modem circuit ground interface.
11	MDMCTS2	CLEAR TO SEND - an active low signal that the modem maintains in the on state.
12		Not used.

Table 3-10. Connector J7 Interconnect Signals (MVME712-13/AM) (Continued)

Pin Number	Signal Mnemonic	Signal Name and Description
13	+12VMODEM	+12 Vdc Power - used by the modem.
14	+5VMODEM	+5 Vdc Power - used by the modem.
15	MDMRXD2	RECEIVE DATA - data that is demodulated from the receive line is presented to the terminal by the modem.
16		Not used.
17	MDMDCD2	DATA CARRIER DETECT - sent by the modem to the terminal to indicate that a valid carrier is being received.
18	GND	GROUND - modem circuit ground interface.
19	+5VMODEM	+5 Vdc Power - used by the modem.
20	GND	GROUND - modem circuit ground interface.

Connector J10 Interconnect Signals (MVME712*x*)

Connector J10 is the Ethernet interconnect on the MVME712*x* (MVME712A, MVME712AM, MVME712-12, and MVME712-13). Each pin connection, signal mnemonic, and signal characteristic for the connector is listed in Table 3-11.

Table 3-11. Connector J10 Interconnect Signals (MVME712*x*)

Pin Number	Signal Mnemonic	Signal Name and Description
1		Not used.
2	C-	COLLISION - (Output) - part of a differential pair.
3	C+	COLLISION + (Input) - a signal to indicate that multiple stations are contending for access to the transmission medium.
4	T-	TRANSMIT - (Output) - part of a differential pair.
5	T+	TRANSMIT + (Output) - this line is intended to operate into terminated transmission lines.
6,7		Not used.
8	R-	RECEIVE - (Input) - part of a differential pair.

Table 3-11. Connector J10 Interconnect Signals (MVME712*x*) (Continued)

Pin Number	Signal Mnemonic	Signal Name and Description
9	R+	RECEIVE + (Input) - a data input sourced by the MAU.
10	+12VF	+12 Vdc Power - fused on MPU board.
11-20		Not used.

Connector P2 and J11 Interconnect Signals (MVME712*x*)

Connector P2 on the MVME712-12 or MVME712-13, or connector J11 on the MVME712A or MVME712AM, receives the signals from the LCP2 adapter. Each pin connection, signal mnemonic, and signal characteristic for the connectors is listed in Table 3-12.

Table 3-12. Connector P2, J11 Interconnect Signals (MVME712*x*)

Pin Number		Signal Mnemonic	Signal Name and Description
P2	J11		
C1	1	C+	COLLISION + (Input) (Ethernet) - a signal to indicate that multiple stations are contending for access to the transmission medium.
A1	2	C-	COLLISION - (Input) (Ethernet) - part of a differential pair.
C2	3	T+	TRANSMIT + (Output) (Ethernet) - this line is intended to operate into terminated transmission lines.
A2	4	T-	TRANSMIT - (Output) (Ethernet) - part of a differential pair.
C3	5	R+	RECEIVE + (Input) (Ethernet) - a data input sourced by the MAU.
A3	6	R-	RECEIVE - (Input) (Ethernet) - part of a differential pair.
C4	7	PRSTB*	DATA STROBE (Printer) - an active low output pulse used to clock data from the system to the printer.
A4	8	+12VF	+12 Vdc Power - fused on MPU board.
C5	9	PRD00	DATA (bit 0) (Printer)
A5	10	GND	GROUND

Table 3-12. Connector P2, J11 Interconnect Signals (MVME712*x*) (Continued)

Pin Number		Signal Mnemonic	Signal Name and Description
P2	J11		
C6	11	PRD02	DATA (bit 2) (Printer)
A6	12	PRD01	DATA (bit 1) (Printer)
C7	13	PRD04	DATA (bit 4) (Printer)
A7	14	PRD03	DATA (bit 3) (Printer)
C8	15	PRD06	DATA (bit 6) (Printer)
A8	16	PRD05	DATA (bit 5) (Printer)
C9	17	GND	GROUND
A9	18	PRD07	DATA (bit 7) (Printer)
C10	19	GND	GROUND
A10	20	PRACK*	DATA ACKNOWLEDGE (Printer) - a low level input pulse indicating that the next character may be sent.
C11	21	PRPE	PAPER EMPTY (Printer) - out of paper.
A11	22	PRBSY	BUSY (Printer) - an input signal indicating that the printer cannot receive data.
C12	23	INPRIME*	INPUT PRIME (Printer) - an output signal that clears the printer buffer and initializes the logic.
A12	24	PRSEL	SELECTED (Printer) - an input signal indicating that the printer is selected.
C13	25	GND	GROUND
A13	26	PRFAULT*	FAULT (Printer) - an input signal that indicates a printer fault condition.
C14	27	GND	GROUND
A14	28	TXD3	TRANSMIT DATA (serial port 3) - data to be transmitted is furnished on this line to the modem from the terminal.
C15	29	GND	GROUND
A15	30	RXD3	RECEIVE DATA (serial port 3) - data that is demodulated from the receive line is presented to the terminal by the modem.
C16	31	CTS3	CLEAR TO SEND (serial port 3) - CTS is a function supplied to the terminal by the modem, and indicates that it is permissible to begin transmission of a message. When using a modem, CTS follows the off-to-on transition of RTS after a time delay.

Table 3-12. Connector P2, J11 Interconnect Signals (MVME712*x*) (Continued)

Pin Number		Signal Mnemonic	Signal Name and Description
P2	J11		
A16	32	RTS3	REQUEST TO SEND (serial port 3) - RTS is supplied by the terminal to the modem when it is required to transmit a message. With RTS off, the modem carrier remains off. When RTS is turned on, the modem immediately turns on the carrier.
C17	33	DCD3	DATA CARRIER DETECT (serial port 3) - sent by the modem to the terminal to indicate that a valid carrier is being received.
A17	34	DTR3	DATA TERMINAL READY (serial port 3) - a signal from the terminal to the modem indicating that the terminal is ready to send or receive data.
C18	35	TXD1	TRANSMIT DATA (serial port 1) - data to be transmitted is furnished on this line to the modem from the terminal.
A18	36	GND	GROUND
C19	37	RXD1	RECEIVE DATA (serial port 1) - data that is demodulated from the receive line is presented to the terminal by the modem.
A19	38	GND	GROUND
C20	39	RTS1	REQUEST TO SEND (serial port 1) - RTS is supplied by the terminal to the modem when it is required to transmit a message. With RTS off, the modem carrier remains off. When RTS is turned on, the modem immediately turns on the carrier.
A20,C21	40,41	GND	GROUND
A21	42	CTS1	CLEAR TO SEND (serial port 1) - CTS is a function supplied to the terminal by the modem, and indicates that it is permissible to begin transmission of a message. When using a modem, CTS follows the off-to-on transition of RTS after a time delay.
C22	43	GND	GROUND
A22	44	TXD4	TRANSMIT DATA (serial port 4) - data to be transmitted is furnished on this line to the modem from the terminal.
C23	45	GND	GROUND

Table 3-12. Connector P2, J11 Interconnect Signals (MVME712*x*) (Continued)

Pin Number		Signal Mnemonic	Signal Name and Description
P2	J11		
A23	46	RXD4	RECEIVE DATA (serial port 4) - data that is demodulated from the receive line is presented to the terminal by the modem.
C24	47	GND	GROUND
A24	48	RTS4	REQUEST TO SEND (serial port 4) - RTS is supplied by the terminal to the modem when it is required to transmit a message. With RTS off, the modem carrier remains off. When RTS is turned on, the modem immediately turns on the carrier.
C25	49	GND	GROUND
A25	50		Not used.
C26	51	DTR4	DATA TERMINAL READY (serial port 4) - a signal from the terminal to the modem indicating that the terminal is ready to send or receive data.
A26	52	CTS4	CLEAR TO SEND (serial port 4) - CTS is a function supplied to the terminal by the modem, and indicates that it is permissible to begin transmission of a message. When using a modem, CTS follows the off-to-on transition of RTS after a time delay.
C27	53	GND	GROUND
A27	54	DCD4	DATA CARRIER DETECT (serial port 4) - sent by the modem to the terminal to indicate that a valid carrier is being received.
C28	55	GND	GROUND
A28	56		Not used.
C29	57	GND	GROUND
A29	58	TXD2	TRANSMIT DATA (serial port 2) - data to be transmitted is furnished on this line to the modem from the terminal.
C30	59	GND	GROUND
A30	60	RXD2	RECEIVE DATA (serial port 2) - data that is demodulated from the receive line is presented to the terminal by the modem.

Table 3-12. Connector P2, J11 Interconnect Signals (MVME712*x*) (Continued)

Pin Number		Signal Mnemonic	Signal Name and Description
P2	J11		
C31	61	CTS2	CLEAR TO SEND (serial port 2) - CTS is a function supplied to the terminal by the modem, and indicates that it is permissible to begin transmission of a message. When using a modem, CTS follows the off-to-on transition of RTS after a time delay.
A31	62	RTS2	REQUEST TO SEND (serial port 2) - RTS is supplied by the terminal to the modem when it is required to transmit a message. With RTS off, the modem carrier remains off. When RTS is turned on, the modem immediately turns on the carrier.
C32	63	DCD2	DATA CARRIER DETECT (serial port 2) - sent by the modem to the terminal to indicate that a valid carrier is being received.
A32	64	DTR2	DATA TERMINAL READY (serial port 2) - a signal from the terminal to the modem indicating that the terminal is ready to send or receive data.

Connector J12 Interconnect Signals (MVME712-13, MVME712AM)

Connector J12 is an RJ-11 modular jack on the front panel of the MVME712-13 and MVME712AM. Each pin connection, signal mnemonic, and signal characteristic for the connector is listed in Table 3-13.

Table 3-13. Connector J12 Interconnect Signals (MVME712-13/12AM)

Pin Number	Signal Mnemonic	Signal Name and Description
1		Not used.
2	TIP	Tip side of telephone line.
3	RING	Ring side of telephone line.
4		Not used.

Connector J15 Interconnect Signals (MVME712*x*)

Connector J15 is the printer port on the MVME712*x* (MVME712-12, MVME712-13, MVME712A, and MVME712AM). Each pin connection, signal mnemonic, and signal characteristic for the connector is listed in Table 3-14.

Table 3-14. Connector J15 Interconnect Signals (MVME712*x*)

Pin Number	Signal Mnemonic	Signal Name and Description
1	PRSTB*	DATA STROBE - an active low output pulse used to clock data from the system to the printer.
2	PRD0	DATA (bit 0)
3	PRD1	DATA (bit 1)
4	PRD2	DATA (bit 2)
5	PRD3	DATA (bit 3)
6	PRD4	DATA (bit 4)
7	PRD5	DATA (bit 5)
8	PRD6	DATA (bit 6)
9	PRD7	DATA (bit 7)
10	PRACK*	DATA ACKNOWLEDGE - a low level input pulse indicating that the next character may be sent.
11	PRBSY	BUSY - an input signal indicating that the printer cannot receive data.
12	PRPE	PAPER EMPTY - out of paper.
13	PRSEL	SELECTED - an input signal indicating that the printer is selected.
14		Not used.
15	PRFAULT*	FAULT - an input signal that indicates a printer fault condition.
16	INPRIME*	INPUT PRIME - an output signal that clears the printer buffer and initializes the logic.
17		Not used.
18-25	GND	GROUND

Parts Lists and Locations

The following parts lists and parts location drawings reflect the latest issue of hardware at the time of printing.

Parts locations are illustrated as follows:

Model	Parts List	Parts Location Drawing
MVME712*x*		
MVME712-12		Primary side - Figure 3-1
MVME712-13		Primary side - Figure 3-2
MVME712A		Primary side - Figure 3-3
MVME712AM		Primary side - Figure 3-4
MVME712*x*	Table 3-15	Secondary side - Figure 3-5
MVME712B	Table 3-16	Figure 3-6
LCP2 adapter	Table 3-17	Figure 3-7

Table 3-15. MVME712*x* Module Parts List

Reference Designation	Motorola Part Number	Description
	84-W8832B01A	Printed wiring board (MVME712-12, MVME712-13)
	84-W8838B01B	Printed wiring board (MVME712A, MVME712AM)
CR1,CR2	48NW9607A20	Rectifier, Schottky
CR3-CR29	48NW9644A01	Diodes, zener, 2V and 15V
C1,C2	21NW9604A81	Capacitor, fixed, ceramic, 330 pF @ 1K Vdc
C3	23NW9618A33	Capacitor, electrolytic, 22 µF @ 25 Vdc
C4-C7	21NW9711A14	Capacitor, SMD, ceramic, 330 pF @ 50 Vdc
C8-C10	21NW9711A02	Capacitor, SMD, ceramic, 0.1 µF @ 50 Vdc
J1,J3-J5	29NW9802H73	Connector, subminiature, 9-pin plug
J2	28NW9802J57	Connector, 6-pin
J6	28NW9802H56	Connector, double row, 2-pin socket
J7	28NW9802H49	Connector, double row, 20-pin socket
J8,J9,J13,J14 J16,J17	29NW9805C07	Pin, autoinsert (32 required)

Table 3-15. MVME712*x* Module Parts List (Continued)

Reference Designation	Motorola Part Number	Description
J10	28NW9802G09	Connector, 20-pin IDC
J11	28NW9802J55	Connector, 64-pin IDC (MVME712A, MVME712AM)
J12	09NW9803A52	Jack, modular, RJ-11
J15	28NW9802H21	Connector, 25-pin socket
P2	28NW9802E05	Connector, 64-Pin DIN (MVME712-12, MVME712-13)
R1-3,R5,R11-R16,R19-R24, R27-R32	06SW-965A02	Resistor, SMD, 100 ohm, 5%, 1/8W
R4,R7,R10 R18,R26	06SW-965A02	Resistor, SMD, 100 ohm, 5%, 1/8W (MVME712-12, MVME712-13)
R6,R8,R17 R25,R33	06SW-965A02	Resistor, SMD, 100 ohm, 5%, 1/8 W (MVME712A, MVME712AM)
R9	06SW-967A15	Resistor, SMD, 39 ohm, 5%, 1/4W
R17,R25,R33	06SW-967A15	Resistor, SMD, 39 ohm, 5%, 1/4 W (MVME712-12, MVME712-13)
R18,R26,R34	06SW-967A15	Resistor, SMD, 39 ohm, 5%, 1/4 W (MVME712A, MVME712AM)
R6,R8,R34, R42	06SW-967A46	Resistor, SMD, 750 ohm, 5%, 1/4 W (MVME712-12, MVME712-13)
R7,R10,R38, R46	06SW-967A46	Resistor, SMD, 750 ohm, 5%, 1/4 W (MVME712A, MVME712AM)
R35-R37,R43-R45	06SW-967A46	Resistor, SMD, 750 ohm, 5%, 1/4 W
R38,R46	06SW-967A57	Resistor, SMD, 2.2K ohm, 5%, 1/4 W (MVME712-12, MVME712-13)
R39-41,R47-R49	06SW-967A57	Resistor, SMD, 2.2K ohm, 5%, 1/4 W
R42,R50	06SW-967A57	Resistor, SMD, 2.2K ohm, 5%, 1/4 W (MVME712A, MVME712AM)
U1	51NW9615S83	I.C. MC145406P, 16 pin
	29NW9805B17	Jumper, shorting, insulated (use at J8, J9, J13, J14, J16, J17)
	64-W6845B02A	Front panel (MVME712-12, MVME712-13)
	64-W6845B01A	Front panel (MVME712A, MVME712AM)

Table 3-15. MVME712*x* Module Parts List (Continued)

Reference Designation	Motorola Part Number	Description
	01-W2368C01A	Modem kit (MVME712-13 and MVME712AM)

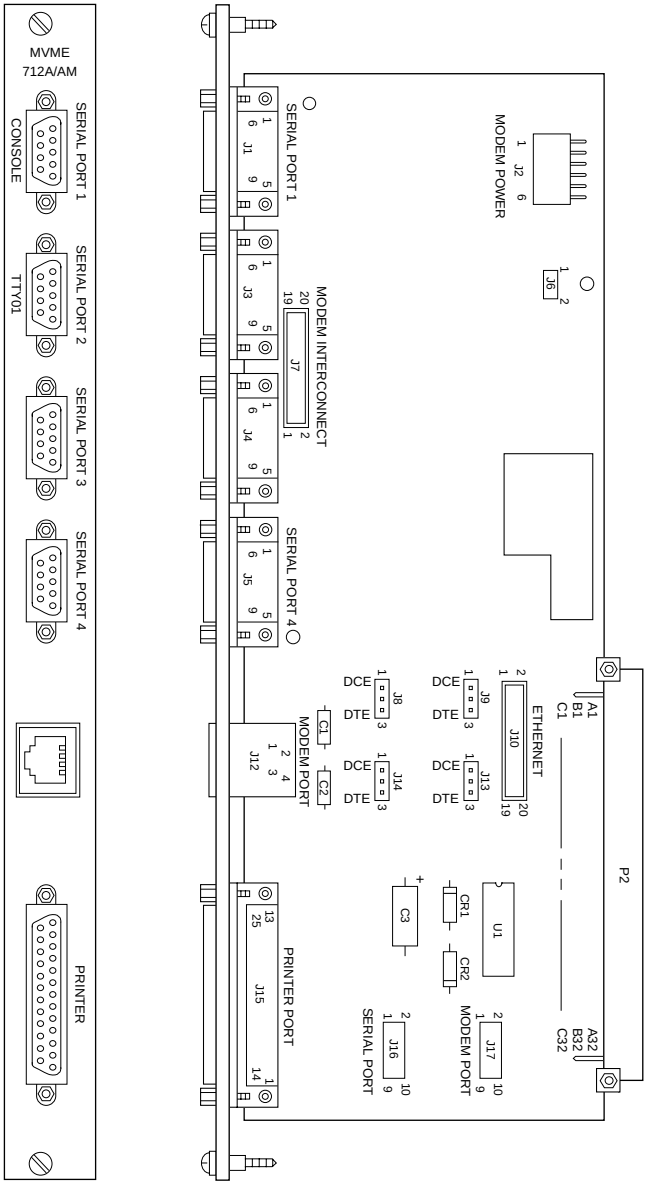


Figure 3-1. MVME712-12 Parts Location Drawing (Primary Side)

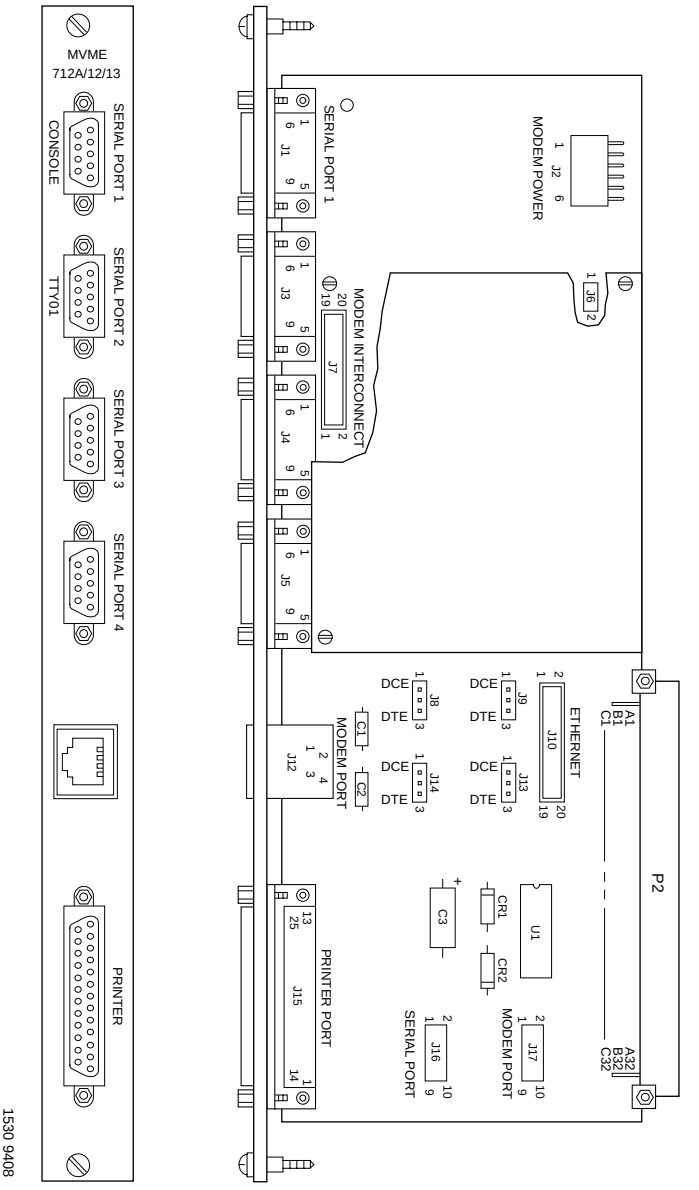


Figure 3-2. MVME712-13 Parts Location Drawing (Primary Side)

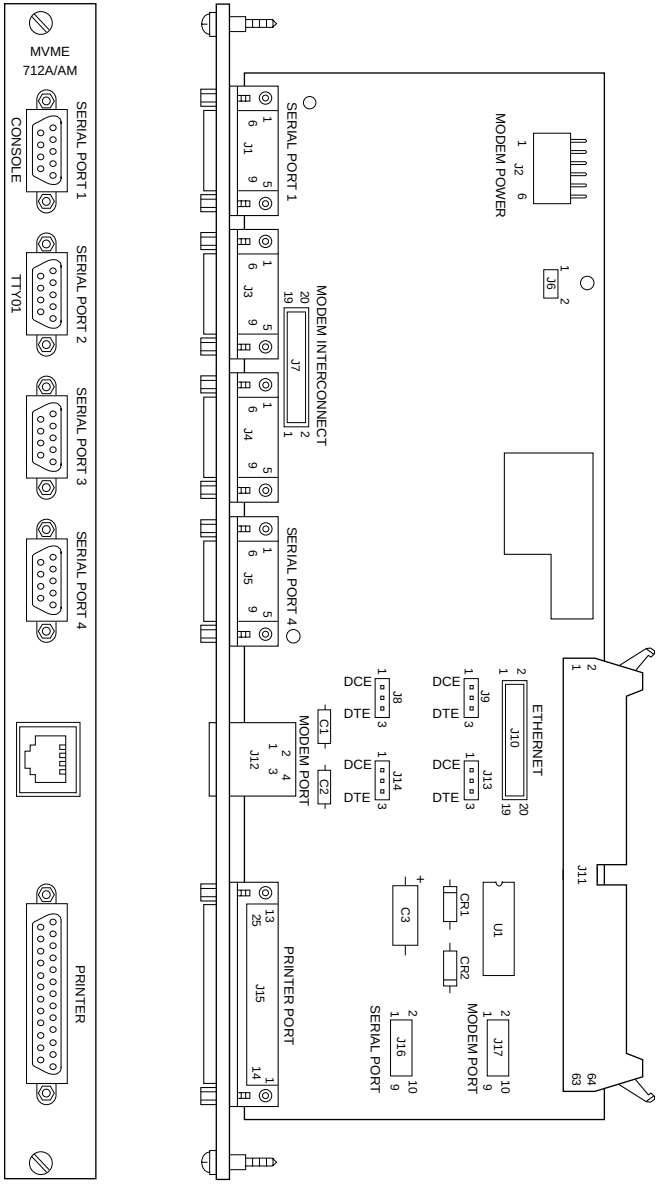


Figure 3-3. MVME712A Parts Location Drawing (Primary Side)

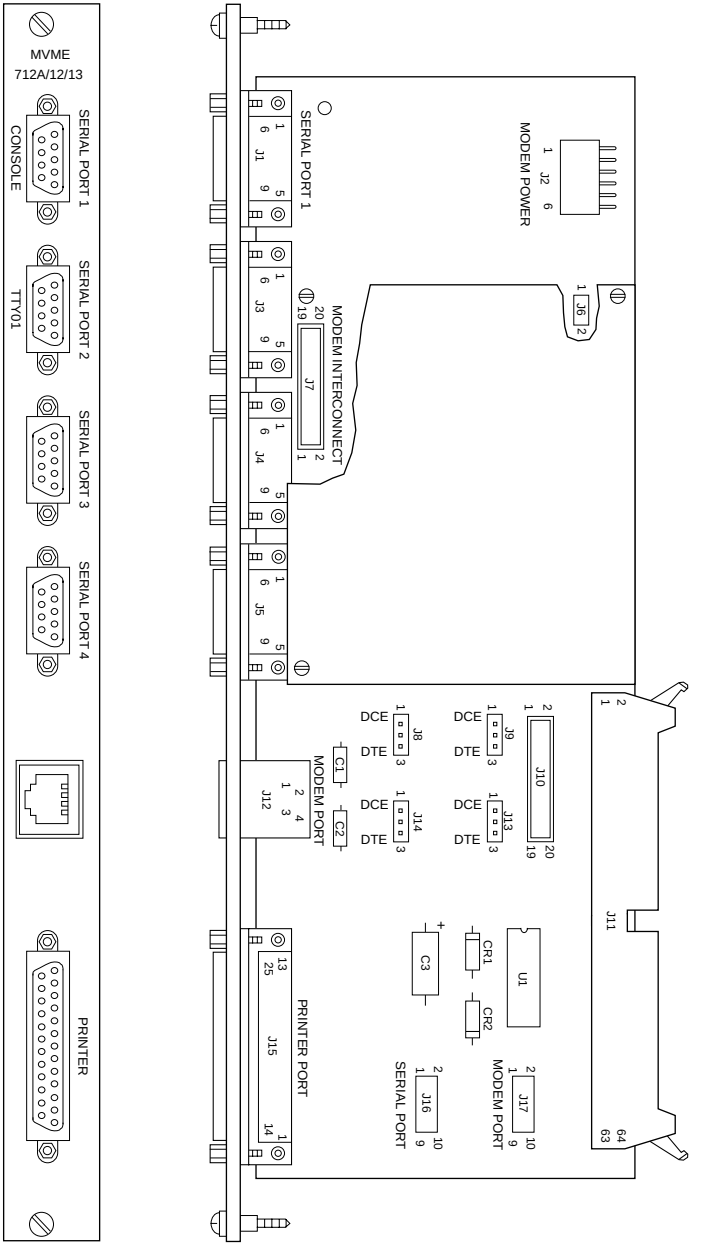
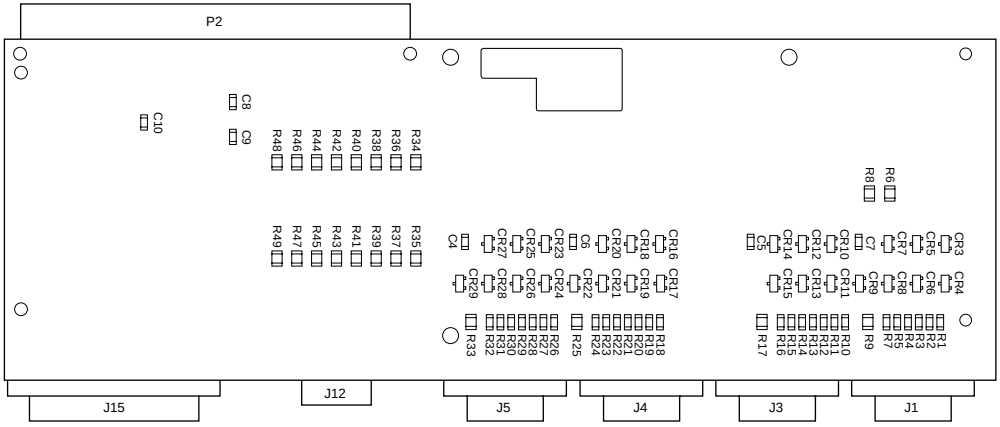

MVME
712A/12/13
SERIAL PORT 1
CONSOLE
SERIAL PORT 2
TTY01
SERIAL PORT 3
SERIAL PORT 4
PRINTER
MODEM POWER
J2
J6
SERIAL PORT 1
J1
J3
J4
J5
MODEM INTERCONNECT
J7
J8
J9
J13
J14
DCE
DTE
C1
C2
MODEM PORT
J12
J10
J11
U1
CR1
CR2
C3
PRINTER PORT
J15
J16
SERIAL PORT
J17
MODEM PORT
1532 9408

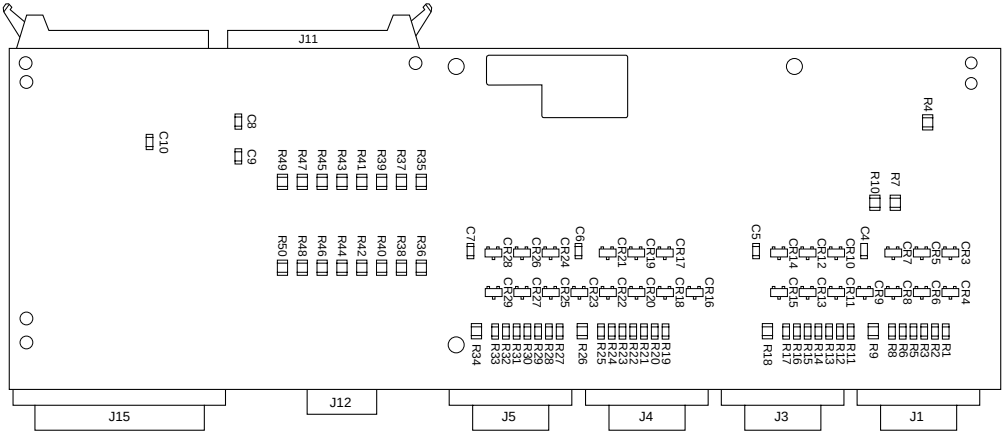
Figure 3-4. MVME712AM Parts Location Drawing (Primary Side)



SECONDARY SIDE

cb223 9310

MVME712-12 and MVME712-13



SECONDARY SIDE

cb227 9212

MVME712A and MVME712AM

Figure 3-5. MVME712*x* Parts Location Drawing (Secondary Side)

Table 3-16. MVME712B Module Parts List

Reference Designation	Motorola Part Number	Description
	64-W6846B01A	Front panel
	30-W2348C01A	Cable Assembly, Ethernet
	30-W2349C01A	Cable Assembly, SCSI

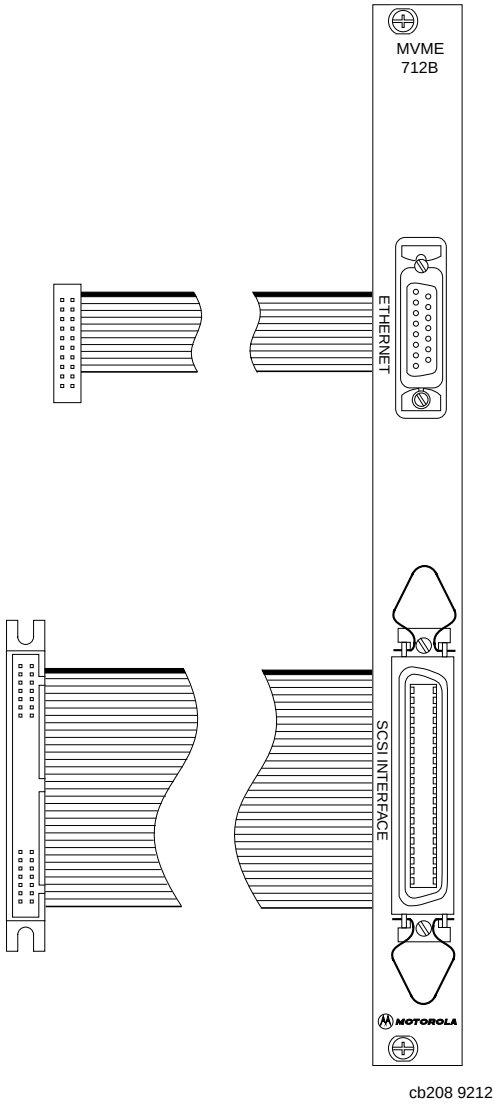


Figure 3-6. MVME712B Parts Location Drawing

Table 3-17. LCP2 Adapter Module Parts List

Reference Designation	Motorola Part Number	Description
	84-W8570B01A	Printed wiring board
CR1	48NW9607A20	Rectifier, 1N5817, 20 V
C1-C3	21NW9632A03	Capacitor, fixed, ceramic, 0.1 µF @ 50 Vdc
F1	65NW9622A37	Fuse, axial, micro, 1 A, 125 V, Slo Blo
J2	28NW9802H59	Connector, 64-pin
J3	28NW9802F67	Connector, 50-pin
P2	28NW9802E71	Connector, 96-pin DIN
R1-R3	51NW9626C17	Terminator, resistor network, 6/220/330 ohm
	28NW9802E08	Connector, single socket (use at F1)
	09NW9811A90	Socket, SIL, 8-pin (use at R1-R3)

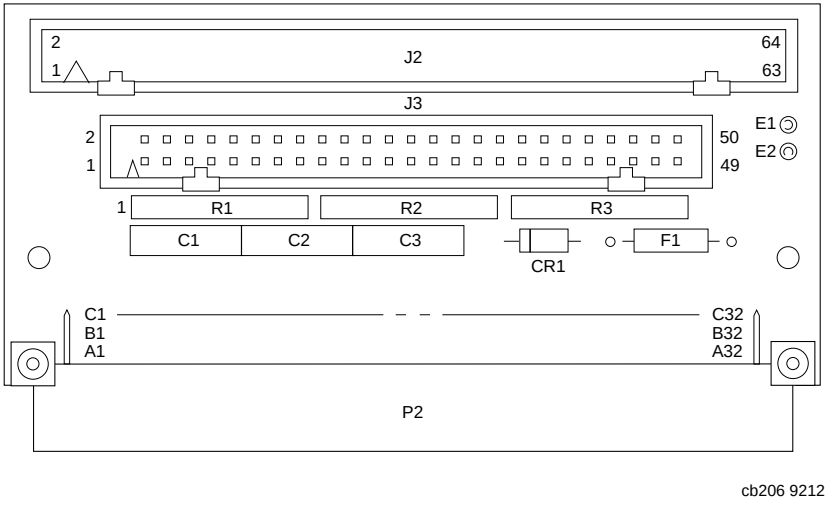


Figure 3-7. LCP2 Adapter Module Parts Location Drawing

Schematic Drawings

This section includes the schematic drawings for the MVME712*x* Transition Modules and the LCP2 Adapter Board, as follows:

Module	Board Part Number	Pages
MVME712-12 MVME712-13	63BW3832B0A	Pages 3-33 to 3-38
MVME712A MVME712AM	63BW3838B0A	Pages 3-39 to 3-44
LCP2	63BW3570B0A	Pages 3-45 to 3-47

MODEM A

General Description

The UDS 2242980 modem installed on the MVME712-13 or MVME712AM module provides full duplex operation over the 2-wire Public Switch Telephone Network (PSTN). The unit operates asynchronously at data rates of 0 to 300, 600, 1200, or 2400 bps, and synchronously at data rates of 1200 and 2400 bps. The modem uses both LSI and surface mount technologies to fit an auto dial 224 modem on just 9.6 square inches of board space.

The modem provides transmit and receive filtering, adaptive equalization, and modulation and demodulation. Dual Tone Multi-Frequency (DTMF) tone encoding is also provided. Circuitry is included to aid you in telephone call progress monitoring for busy tone, reorder, and dial tone detection, and a buffered audio output is also provided.

The modem provides command selection of either pulse or DTMF auto dialing. Also included is automatic answer and automatic speed adjustment to the speed of the originating modem. For applications requiring unattended operation, these features make the 2242980 card an ideal solution. The auto dialing command set is compatible with the popular "AT" command set.

The modem also includes integral diagnostic test features which aid in isolating communication faults to the phone line, the modem, or the data terminal equipment. Tests that may be performed include Analog Loopback, Analog Loopback Self Test, Digital Loopback, Remote Digital Loopback, and Remote Digital Loopback Self Test.

Modem Features

Table A-1 lists the features of the modem.

Table A-1. Modem Features

Features	Benefits
0-300, 600, 1200, 2400 bps, asynchronous; 1200 and 2400 bps, synchronous.	Versatility. The modem can operate with either Bell 103J or 212A or CCITT V.22 bis modems.
Auto dial	Convenience. Saves time. With auto dial capability, you can utilize telephone lines late at night when the telephone rates are lower without the presence of an operator.
Auto answer	Convenience. Automatic answer allows data to be transferred to the terminal without the presence of an operator.
Surface mount technology	Design space savings. Use of surface mount technology allows the modem size to be reduced to 9.6 square inches. Increased reliability.
Call progress monitoring	Convenience. Allows an operator to monitor the status of a call while it is being placed.
Audio output	Convenience. Speaker (user supplied) is noiseless after call has been established.
Low power consumption	Energy savings. Low power consumption makes the modem ideal for battery powered circuits.
Low power requirements	Cost savings. More efficient power usage for the end user. Energy savings. Low power and compact size allows easy integration within the equipment.
Integral test features	Convenience. Integral diagnostics permit easy isolation of communication faults.

Technical Specifications

Table A-2 lists the technical specifications of the manual and Table A-3 lists the characteristics of the Autodialer.

Table A-2. Technical Specifications

Characteristic	Specification
Operating mode	Full duplex on 2-wire PSTN.
Data rates	Low speed: 0-300 and 600 bps asynchronous. Medium speed: 1200 bps (+1%, -2.5%), character asynchronous and synchronous. High speed: 2400 bps (+1%, -2.5%), character asynchronous and synchronous.
Modulation	Low speed: Frequency Shift Keying (FSK). Medium speed: Differentially Coherent Phase Shift Keying (DPSK). High speed: Quadrature Amplitude Modulation (QAM).
Compatibility	WECO 103, 113, 212A, CCITT V.22, and CCITT V.22 bis modems.
Digital interface	TTL/CMOS.
Transmit carrier frequency	Originate Answer Low Speed: Mark: 1270 Hz 2225 Hz Space: 1070 Hz 2025 Hz Medium speed: 1200 Hz 2400 Hz High speed: 1200 Hz 2400 Hz
Transmitter output level	Permissive (-10.5 dBm +/- 1.5 dB).
Line impedance	600 Ohm +/- 10%, transformer coupled.
Line protection	Lightning and transient protection.
Receiver dynamic range	-10 dBm to -45 dBm.
Carrier detect hysteresis	No less than 2 dB.
Clamping	Mark hold upon loss of carrier.
Line disconnect	Abort timer (30 seconds, adjustable). Loss of carrier (1.4 seconds, adjustable). DTR disconnect (80 ms after DTR is dropped).
Scrambling/descrambling of data bits	High speed only: self synchronizing using polynomial (1 + X-14 + X-17) per CCITT v.22.
DTE connector	20-pin double row header.

Table A-2. Technical Specifications (Continued)

Characteristic	Specification
Input command format	Asynchronous; ASCII 10-bit or 11-bit upper- and lowercase characters (including start, stop, and parity bits). Accepts input gross start/stop (switching) distortion up to 35%.
Output format	Same as input format; output character distortion less than 3%.
Dimensions	L = 3.5 in.; W = 2.75 in.; H = .562 in.
Power requirements	+5 Vdc @ 100 mA maximum. -12 Vdc @ 25 mA. +12 Vdc @ 25 mA.
Environmental requirements	Operating: 0 to 65 degrees C. Storage: -40 to 70 degrees C. Relative humidity: 0 to 95% noncondensing.
Certification	FCC rules, part 68 certified; DOC certified for Canadian use.

Table A-3. Autodialer Characteristics

Characteristic	Specification
Dialer type	Command selection of pulse or DTMF.
Pulse dialing	Pulse rate: 10 pulses per second +/- 10% Duty cycle: 61% +/- 3% or 67% +/- 3%.
DTMF dialing	Per Bell DTMF specifications.
DTMF tone pair amplitude difference	Less than 4 dB.
DTMF composite tone transmit level	-3 dBm +/- 2 dB into 600 Ohm termination.
Input string storage	Up to 40 commands.
Answer back tone detector	Frequency 2100 or 2225 Hz, threshold: -43 dBm +/- 3 dB.
Failed call timer	Delay: 30 +/- 1 second. Start: from last digit dialed (adjustable).
Billing delay	2 seconds following off-hook upon answer.
Call progress messages	OK, connect, connect 600, connect 1200, connect 2400, ring, no carrier, error, no dial tone, busy, no answer.

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