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WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

PLEASE CHECK FOR CHANGE INFORMATION AT THE REAR OF THIS MANUAL.

This manual supports the following TEKTRONIX products:

8550 Option	8540 Option	Products
2P	2P	8300E26
3U	3U	8300P26
		8300P26 option 01

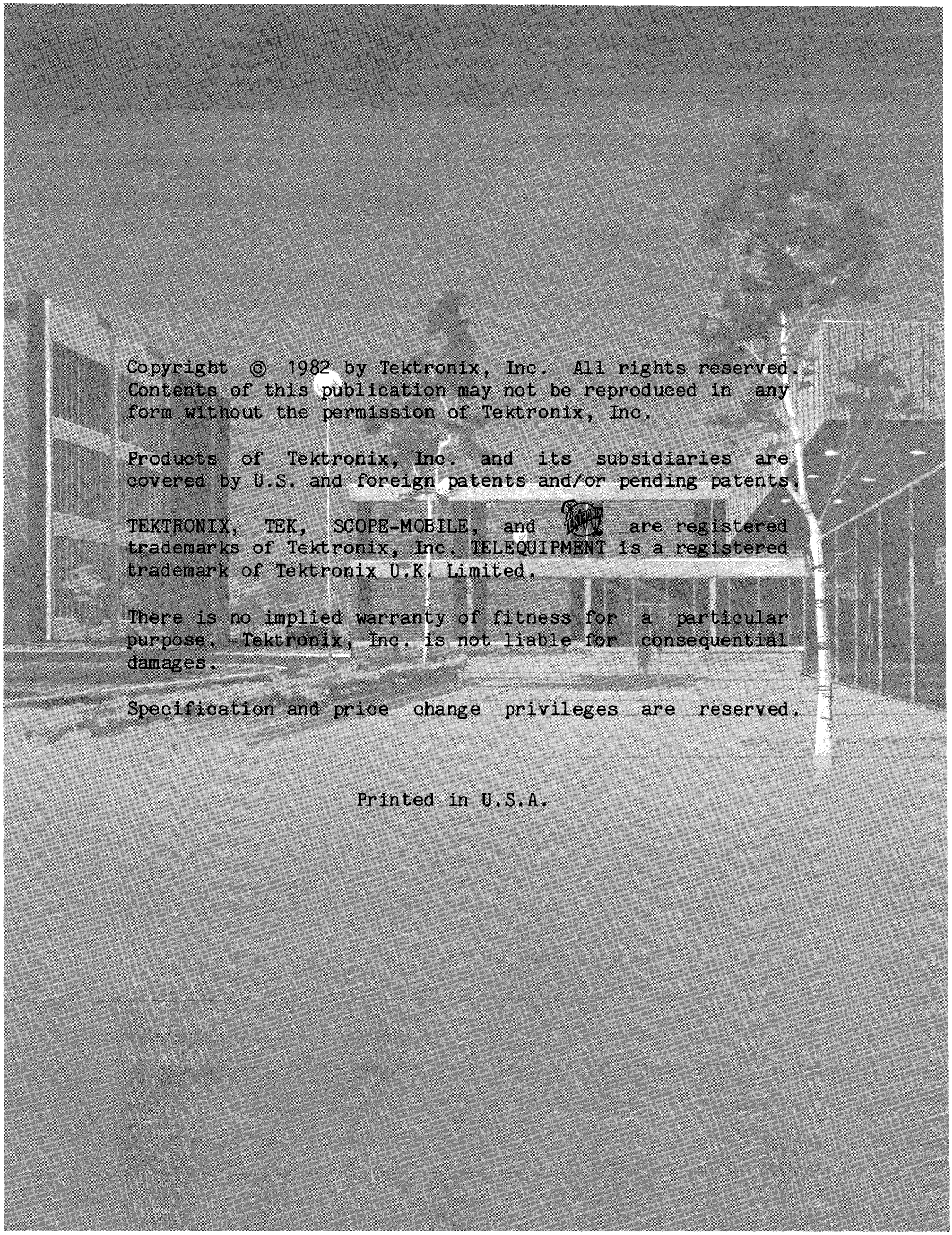
8500
MODULAR MDL SERIES
68000
EMULATOR PROCESSOR
PROTOTYPE CONTROL PROBE
INSTALLATION
SERVICE

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077

070-3771-00
Product Group 61

Serial Number _____

First Printing FEB 1982



Printed in U.S.A.

PREFACE

ABOUT THIS MANUAL

This manual tells how to install the 68000 Emulator Processor module and its Prototype Control Probe in a TEKTRONIX 8550 Microcomputer Development Lab or 8540 Integration Unit. This manual also contains performance verification information.

The TEKTRONIX 68000 Emulator Processor module utilizes a Motorola MC68000 microprocessor to perform the emulation function. All references in this manual to the 68000 microprocessor pertain to the Motorola MC68000 microprocessor.

Throughout this manual, the term "microcomputer development system" (or simply "development system") is used to refer to the TEKTRONIX 8550 Microcomputer Development Lab or 8540 Integration Unit.

For user information about the 68000 Emulator Processor, refer to the appropriate System Users' Manual and its 68000 Emulator Specifics supplement. Service information about the 68000 Emulator Processor is provided in the optional 68000 Emulator Processor and Prototype Control Probe Service Manual.

MANUAL ORGANIZATION

This manual is divided into four sections:

Section 1 contains general information about the Emulator Processor module and the Prototype Control Probe.

Section 2 contains information about configuration jumpers.

Section 3 provides detailed installation procedures for the Emulator Processor module and the Prototype Control Probe.

Section 4 describes procedures used to verify proper functional performance of the Emulator Processor module and the Prototype Control Probe.

GENERAL INFORMATION

REVISION HISTORY

As this manual is revised and reprinted, revision history information is included on the text and diagram pages. Original manual pages are identified with an '@' symbol at the bottom inside corner of the page. When existing pages are revised, the '@' symbol is replaced with a revision date (REV OCT 1981). New pages added to a section, whether they contain old, new, or revised information, will be identified with the '@' symbol and a date (@ OCT 1981).

CHANGE INFORMATION

Change notices are issued by Tektronix, Inc., to document changes in the manual after it has been published. Change information is located in the back of this manual, following the yellow tab marked "CHANGE INFORMATION". When you receive this manual, enter any change information into the body of the manual, as indicated on the change notice.

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OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

As Marked on Equipment

 DANGER high voltage.

 Protective ground (earth) terminal.

 ATTENTION - Refer to manual.

SAFETY PRECAUTIONS

Grounding the Product

This product is grounded through grounding conductors in the interconnecting cables. To avoid electrical shock, plug the supporting system's power cord into a properly wired receptacle. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Use the Proper Power Cord

Use only the power cord and connector specified for your product.

Use only a power cord that is in good condition.

Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for your product. Be sure the fuse is identical in type, voltage rating, and current rating.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an atmosphere of explosive gases unless it has been specifically certified for such operation.

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

SERVICING SAFETY SUMMARY
FOR QUALIFIED SERVICE PERSONNEL ONLY

(Refer also to the preceding Operators Safety Summary)

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

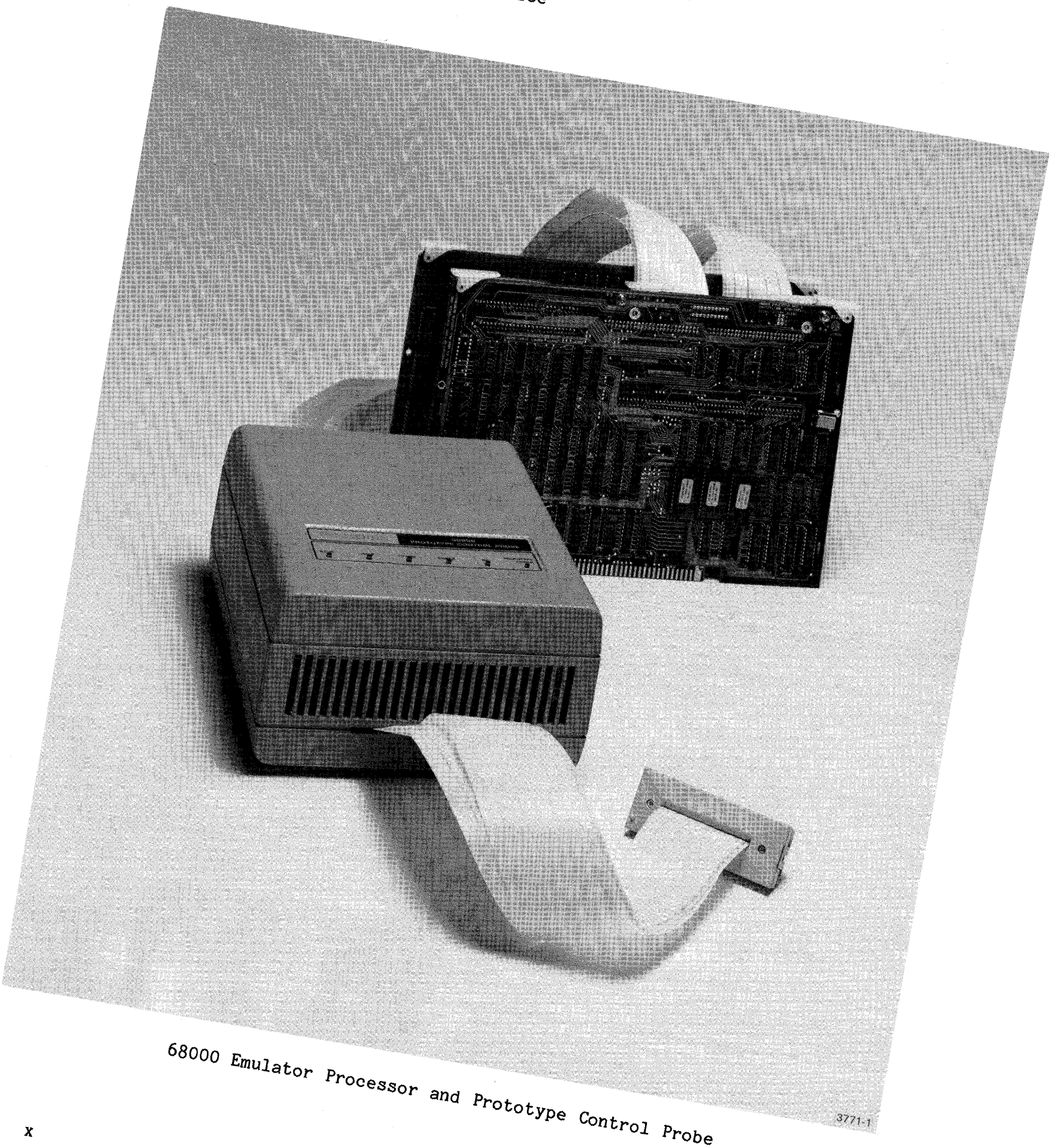
Use Care When Servicing With Power On

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.



68000 Emulator Processor and Prototype Control Probe

Section 1

GENERAL INFORMATION

INTRODUCTION

The 68000 Emulator Processor is a microprocessor design aid that emulates a 68000 microprocessor. The 68000 Emulator Processor is operated in conjunction with the 68000 Prototype Control Probe and a TEKTRONIX microcomputer development system. In this arrangement the 68000 Emulator Processor and Prototype Control Probe effectively replace the 68000 microprocessor in your prototype circuit.

MODES OF OPERATION

The 68000 Emulator Processor module, with its Prototype Control Probe, may be operated in any one of three emulation modes. The mode is determined and set by the user. The emulator is controlled by the System Controller module in the microcomputer development system. The three emulation modes are described in the following paragraphs:

MODE 0 "System" mode. Mode 0 is used to develop software for a prototype 68000 microprocessor-based circuit. Mode 0 operation uses the development system's program memory, I/O facilities, and clock to execute a software program. In Emulation Mode 0, the development system acts as an independent 68000-based microcomputer. Prototype circuitry is not involved. Figure 1-1(a) illustrates Mode 0 operation.

MODE 1 "Partial emulation" mode. Mode 1 is used to develop the hardware functions of the prototype circuit. The Prototype Control Probe is used as the interface between the prototype circuit and the Emulator Processor module. Clock and control signals for Emulation Mode 1 are provided by the prototype circuit.

Another function available in Emulation Mode 1 is memory mapping. Execution memory may be mapped (in 4 K blocks) into program memory or to the user prototype. Figure 1-1(b) illustrates Mode 1 operation.

MODE 2 "Full emulation" mode. Mode 2 is used for the final development stages of hardware functions in the prototype circuit. The only difference between Mode 1 and Mode 2 operation is that in Mode 2, prototype memory is the single source of operation code. Program memory cannot be accessed. Figure 1-1(c) illustrates Mode 2 operation.

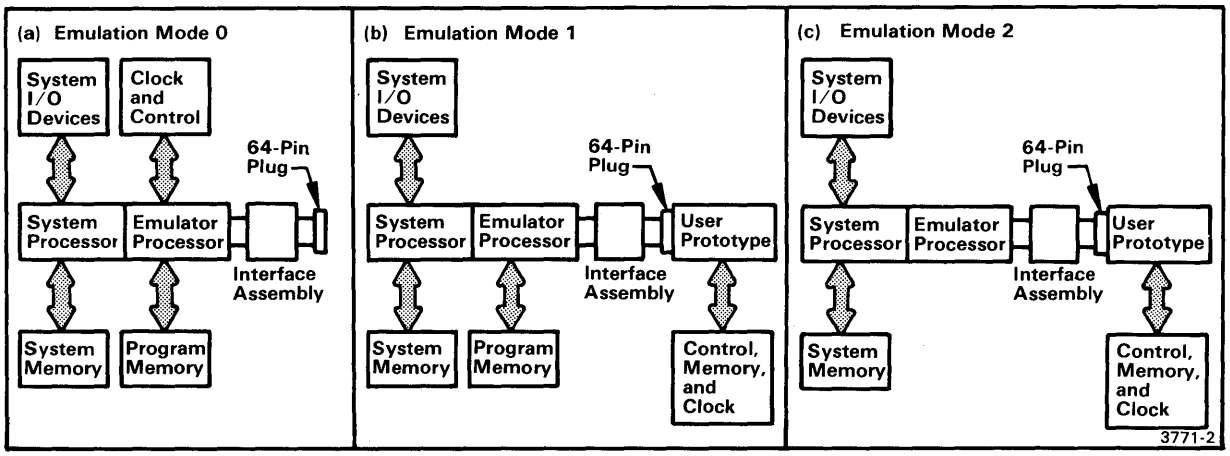


Fig. 1-1. Emulation Modes 0, 1, and 2.

EMULATOR PROCESSOR MODULE

The 68000 Emulator Processor module is illustrated in Fig. 1-2. This module consists of:

- Two emulator circuit boards that plug into the Main Interconnect board in the development system mainframe. Throughout this manual, these circuit boards are referred to as EMU 1 and EMU 2.
- Two short ribbon cables that interconnect EMU 1 and EMU 2.

The Emulator Processor serves two purposes in the development system. First, it has the ability to run a program written specifically for a 68000 microcomputer. With the help of other modules in the development system, the Emulator Processor can check the program for run-time errors or program logic errors. Second, when the Prototype Control Probe's 64-pin plug is used, a prototype circuit can be debugged and stepped through the final stages to design completion.

The 68000 Emulator Processor emulates the operation of a target 68000 microcomputer device that will be used in the final version of a prototype system. The Emulator Processor responds to software in the same way as the target microprocessor, and also allows software debugging.

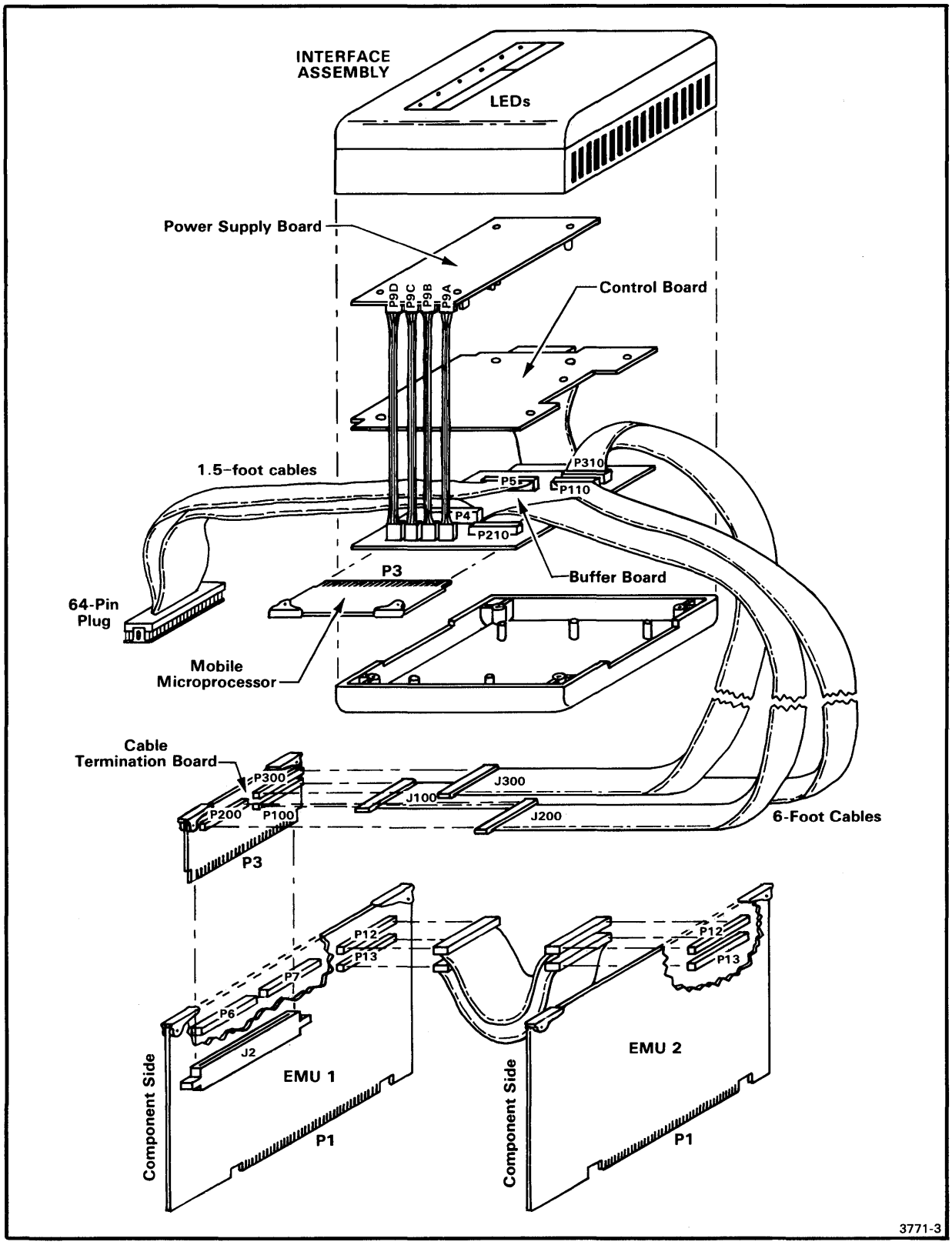


Fig. 1-2. 68000 Emulator Processor and Prototype Control Probe.

PROTOTYPE CONTROL PROBE

As illustrated in Fig. 1-2, the 68000 Prototype Control Probe consists of:

- The Cable Termination board that plugs into EMU 1.
- The Interface Assembly, containing the Buffer, Control, Power Supply, and Mobile Microprocessor boards.
- Three 6-foot ribbon cables that attach the Interface Assembly to the Cable Termination board.
- A 64-pin plug with two 1.5-foot ribbon cables that connect the Interface Assembly to the prototype circuit's 68000 microprocessor socket.

The Prototype Control Probe also includes five strain relief cable clamps to replace the original system cable clamps.

The Prototype Control Probe Interface Assembly contains the emulating microprocessor device. Thus it is required for operation in all three emulation modes. In Mode 0 operation the 64-pin plug may be connected to the prototype circuit, but will not use or drive any signals to or from the prototype. However, in Modes 1 and 2, the Prototype Control Probe acts as the interface between the Emulator Processor module and the prototype circuit. Therefore, in Modes 1 and 2, the 64-pin plug must be connected to the prototype circuit.

SPECIFICATIONS

The electrical and environmental characteristics listed here are general. For detailed environmental test procedures, including failure criteria, contact your local Tektronix Field Office or representative.

ELECTRICAL CHARACTERISTICS

Five supply voltages are used by the 68000 Emulator Processor module and its Prototype Control Probe. Three of these, +5.2 Vdc, +12 Vdc, and -12 Vdc, are generated by the development system and are taken directly from its Main Interconnect board. The remaining two supply voltages, +4.92 Vdc and +5 Vdc, are generated on the Power Supply board located in the Interface Assembly. The Emulator Processor module and its Prototype Control Probe use the supply voltages as follows:

- Emulator Processor Module

  +5.2 Vdc Primary supply voltage.

- Prototype Control Probe

  +5.2 Vdc Used by the Buffer, Control, and Mobile Microprocessor boards.

  -12 Vdc Used to power the fan in the Interface Assembly when the Emulator Processor is active.

  +12 Vdc Used by the Power Supply board to generate the +4.92 Vdc and +5 Vdc supply voltages when the Emulator Processor is active.

  +4.92 Vdc Supplies power for the Buffer and Control boards. This is a regulated supply and is active only when the Emulator Processor is selected (active).

  +5 Vdc Used only by the 64-pin plug when the Emulator Processor is selected (active).

Each of the three supply voltages generated by the development system is protected at the Cable Termination board with a 3AG, 250 Volt, 2 Ampere fuse.

The supply voltages generated on the Power Supply board (located in the Interface Assembly) are not fused.

Table 1-1
Electrical Characteristics

Characteristics	Performance Requirements	Supplemental Information
Supply Voltages	+5.2 Vdc +1%/-2%	
	+12 Vdc ±5%	
	-12 Vdc ±5%	
	+4.92 Vdc ±20 mVdc	Adjustable
	+5 Vdc ±5%	Adjustable
Current		Emulator not selected 6.8 A (max) @ +5.2 Vdc 150 mA (max) @ +12 Vdc Emulator selected 6.8 A (max) @ +5.2 Vdc 1.65 A (max) @ +12 Vdc 300 mA (max) @ -12 Vdc 3.4 A (max) @ +4.92 Vdc 15.3 mA (max) @ +5 Vdc

Table 1-2
Environmental Characteristics

Characteristics	Description
Air Temperature	
Operating	0°C to +50°C (+32°F to +122°F)
Storage	-55°C to +75°C (-67°F to +167°F)
Humidity	90% relative non-condensing, maximum
Altitude	
Operating	4 500 m (15,000 ft) maximum
Storage	15 000 m (50,000 ft) maximum

Section 2

JUMPERS

INTRODUCTION

The 68000 Emulator Processor Module and Prototype Control Probe have user-selectable configuration jumpers. The first part of this section tells how to access these jumpers. The second part of this section describes functional characteristics for the individual jumpers. Table 2-1 lists the jumpers in the order they are discussed in this section. Only user-selectable jumpers are discussed here. All other jumpers are for factory use only and are not user-selectable.

Table 2-1
Jumper Locations

Board	Fig. No.	Jumpers
EMU 2	2-4	J2144
Buffer board	2-5	P1 P2 and P3 P6 P7 P8
Control board	2-6	J4011 J6021
Mobile Microprocessor board	2-7	J1045 and J2045

PROTOTYPE CONTROL PROBE INTERFACE ASSEMBLY

Some configuration options are selected by positioning jumper blocks in the Prototype Control Probe's Interface Assembly. The jumpers are located on the Control, Buffer, and Mobile Microprocessor boards. To gain access to these boards, perform the following procedure:

1. Ensure that primary power (115 Vdc or 230 Vac) to the microcomputer development system is OFF.

2. Remove the four screws at the corners on the bottom of the Interface Assembly housing.

CAUTION

The Power Supply board is mounted to the top cover of the Interface Assembly. The Power Supply board is connected to the main housing by four ribbon cables. Take care not to damage these cables when removing the top cover and housing spacer.

3. Remove the top cover of the Interface Assembly and set it beside the main housing (see Fig. 2-1).

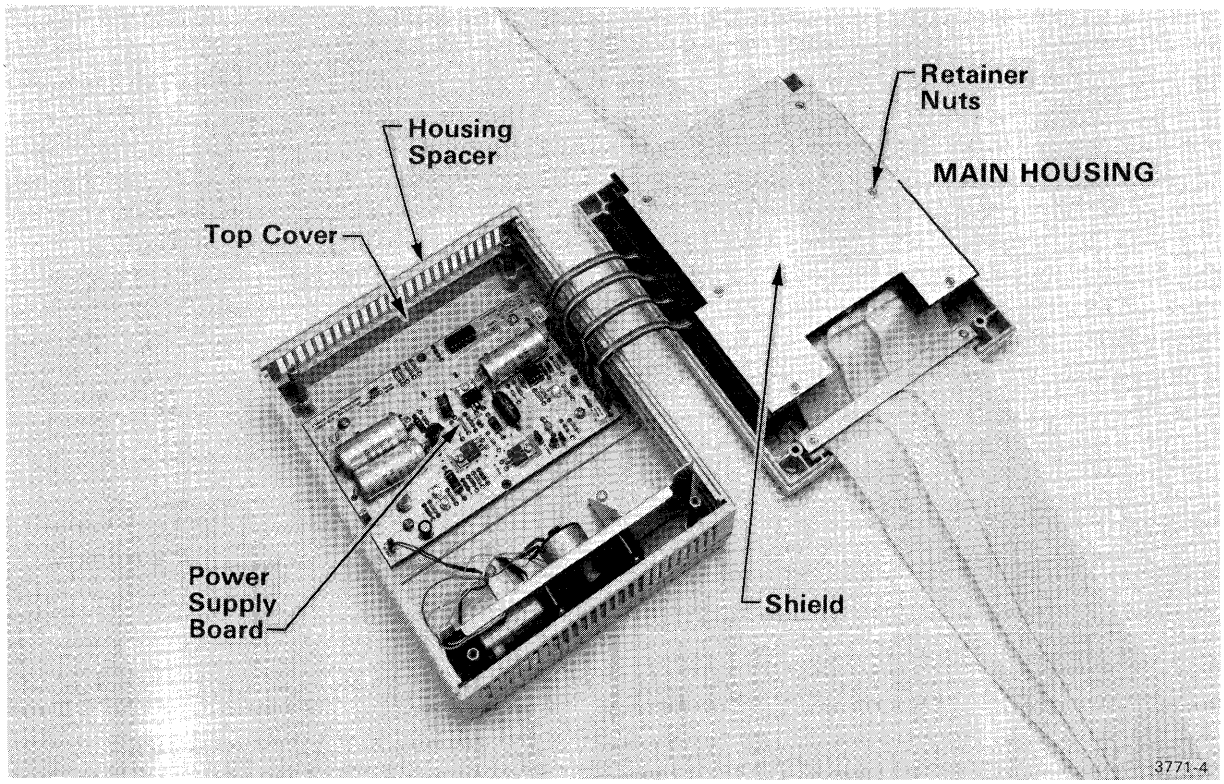


Fig. 2-1. Access to Power Supply board.

4. Lift the housing spacer and rotate it to set on the top cover (see Fig. 2-1).

5. Disconnect the four ribbon cables (J1010, J1020, J1030, and J1040) from the Power Supply board. Then set the top cover and housing spacer aside.

6. Remove the six retaining nuts from the metal shield on top of the main housing. Then remove the shield by lifting straight up, and set it aside.

7. Lift the Control board away from the main housing and drape it to one side, as shown in Fig. 2-2. Take care not to damage the interconnecting ribbon cable.

NOTE

Now you may select configuration jumpers on either the Buffer board or the Control board. Refer to the Configuration Jumpers discussion later in this section, for more specific information.

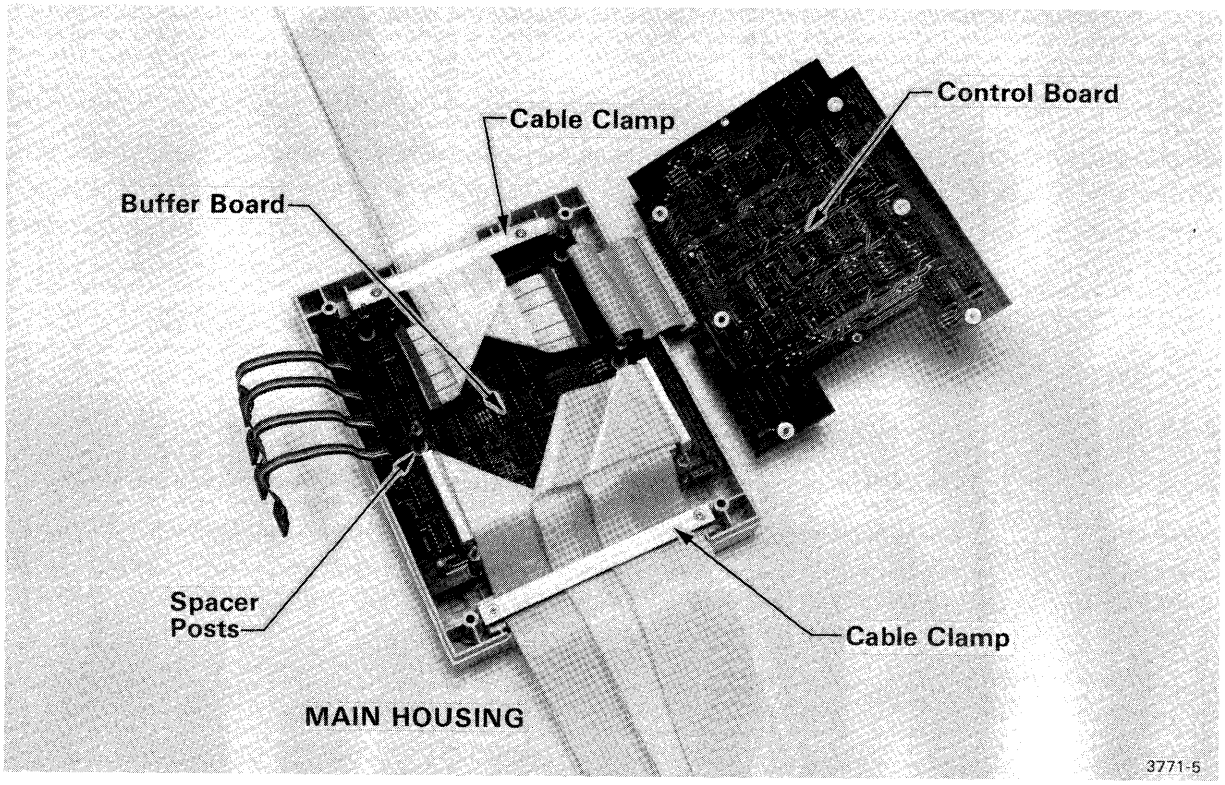


Fig. 2-2. Access to Control board and Buffer board.

8. Remove the six spacer posts. Note that the shorter threads are used to retain the Buffer board in place.

9. Remove the two cable clamps located at each end of the main housing.

10. Lift the Buffer board and turn it over to expose the Mobile Microprocessor board (refer to Fig. 2-3).

NOTE

Now you may select configuration jumpers on the Mobile Microprocessor board. Refer to the Configuration Jumpers discussion later in this section, for more specific information.

11. After you have selected the configuration jumpers, reassemble the Interface Assembly in reverse order of disassembly.

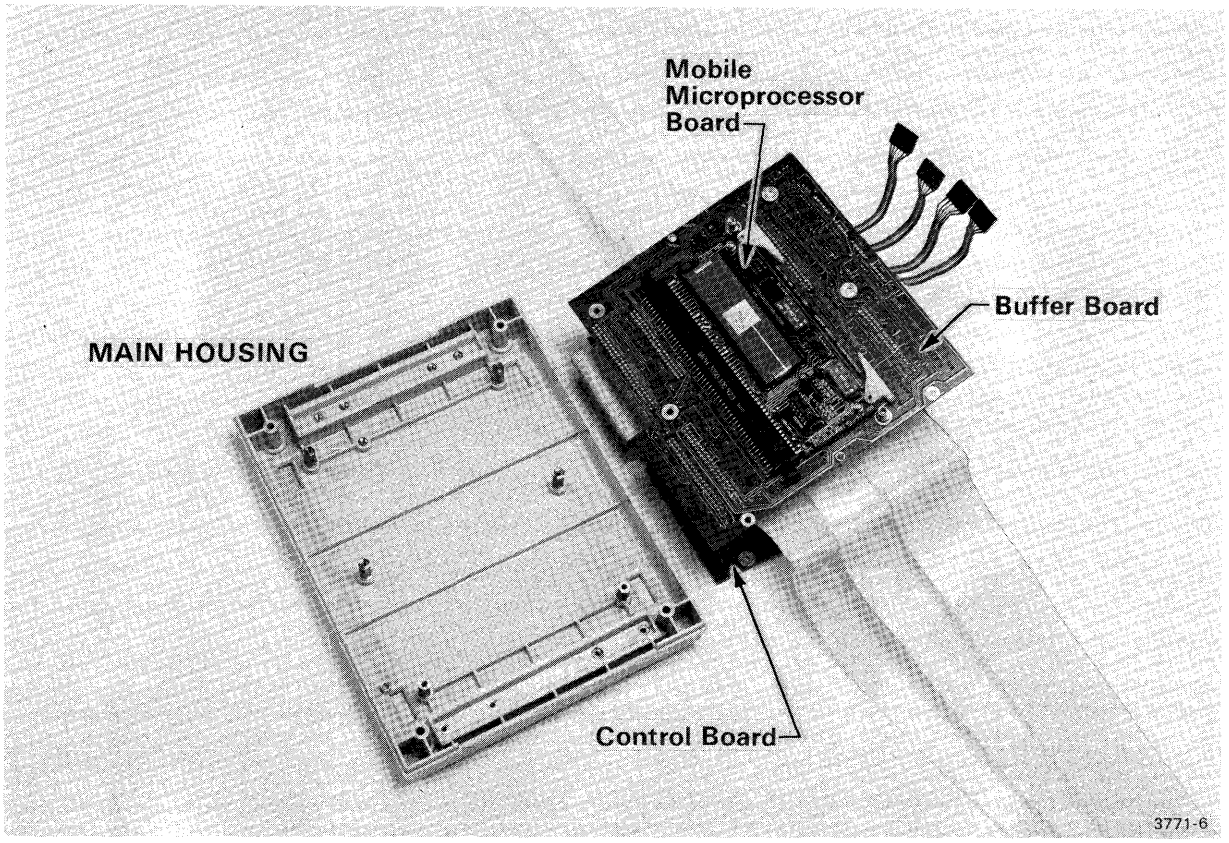


Fig. 2-3. Access to Mobile Microprocessor board.

CONFIGURATION JUMPERS

The following pages describe each of the jumpers used to select specific operations of the 68000 Emulator Processor. All jumpers are in their 'normal' position (1--2) when shipped from the factory. These jumpers affect the operation of all three emulation modes unless otherwise indicated within the text. Some of the jumper configurations available may cause the system to hang (not respond) and are noted accordingly.

EMU 2

EMU 2 of the 68000 Emulator Processor module contains one configuration jumper: J2144. Figure 2-4 shows the location of J2144 on EMU 2.

NOTE

EMU 2 must be removed from your microcomputer development system, to allow access to J2144. Section 3 of this manual contains a procedure for the removal of EMU 2 from your development system.

J2144 controls the break cycle of the Emulator Processor after the emulator has executed a stop instruction.

Normal (1--2) — When a stop instruction is executed, the Emulator Processor will break and return control to the operating system only while the emulator is operating in Emulation Mode 0.

Option (2--3) — When a stop instruction is executed, the Emulator Processor will break and return control to the operating system.

NOTE

When J2144 is in its normal (1--2) configuration and the Emulator Processor is being operated in Emulation Mode 1 or 2, the system will appear to hang (not respond). To return control to the operating system, you must request that the Emulator Processor break or issue a prototype interrupt. For information on how to request the Emulator Processor to break, refer to your System Users' Manual and its 68000 Emulator Specifics supplement.

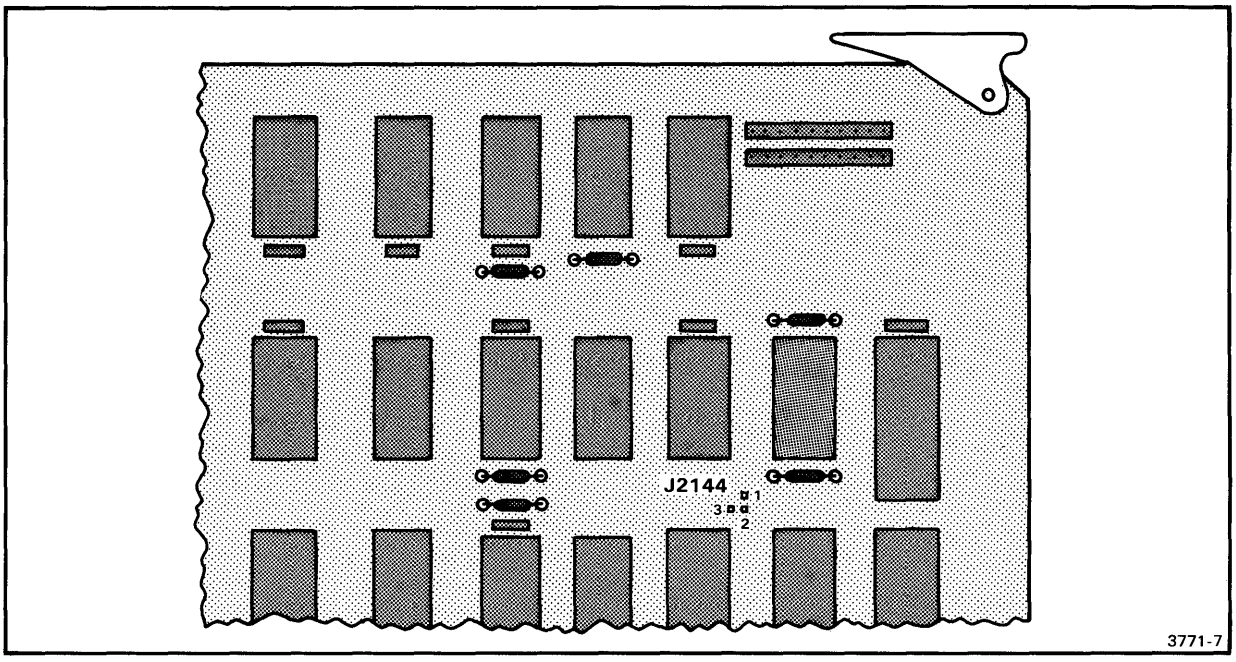


Fig. 2-4. EMU 2 jumper location.

BUFFER BOARD

The Buffer board contains six configuration jumpers: P1, P2, P3, P6, P7, and P8. Figure 2-5 shows the location of these jumpers on the Buffer board. To gain access to these jumpers, perform steps 1--7 of the Prototype Control Probe Interface Assembly procedure, earlier in this section.

P1 inserts or removes a delay of the prototype circuit's Data Transfer ACKnowledge (DTACK) to the 68000 microprocessor while the emulator is operating in Emulation Mode 1.

NOTE

The configuration of jumper P1 depends on the configuration of Mobile Microprocessor board jumpers J1045 and J2045. See the discussion of the Mobile Microprocessor board jumpers, later in this section for more information.

Normal (1--2)	The prototype's DTACK is delayed at the rate determined by J1045 and J2045. This prevents overdriving the Program Memory's access time.
Option (2--3)	This configuration bypasses J1045 and J2045, allowing the prototype to return DTACK without delay.

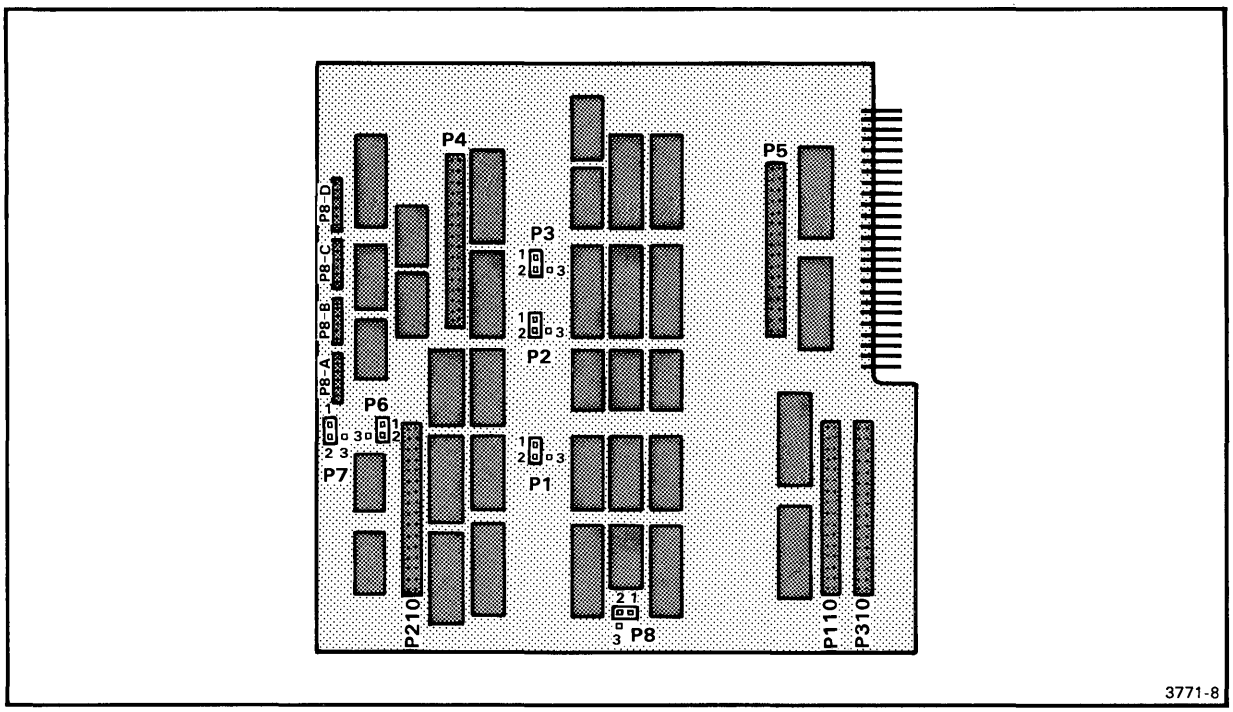


Fig. 2-5. Buffer board jumper locations.

NOTE

When P1 is in its optional (2--3) configuration, data may be invalid or lost if the Program Memory is accessed beyond its limitations. However, no component damage will result.

P2 and P3 control prototype bus arbitration during an Emulator Processor Dump and Restore routine.

Normal (both jumpers 1--2)

The prototype's Bus Request and Bus Grant Acknowledge signals will be disabled to the 68000 microprocessor whenever the Emulator Processor has returned control to the operating system.

Option (both jumpers 2--3)

The prototype's Bus Request and Bus Grant Acknowledge signals will be allowed to request and hold the 68000 microprocessor bus. This is valid even while the Emulator Processor has entered Dump and Restore, and returned control to the operating system.

NOTE

In the optional (2 to 3) configuration for P2 and P3, the system may hang (not respond). To return to normal operation, you must release the bus. Refer to System Users Manual and its 68000 Emulator Specifics supplement for information on how to release the bus.

P6 determines when the 68000 microprocessor address strobe is driven to the prototype circuit.

Normal (1--2)	The 68000 microprocessor address strobe is driven in all cycles except during an Emulator Processor Dump and Restore, or during an interrupt acknowledge of a Non-Maskable Interrupt (NMI) issued by the Emulator Processor.
Option (2--3)	The 68000 microprocessor address strobe is driven in all cycles except during an interrupt acknowledge of an NMI issued by the Emulator Processor.

P7 controls how the Emulator Processor will react to a DTACK timeout (no prototype DTACK within 1 ms). This jumper is used when any of the following conditions exist:

- P8 is in its 'normal' position and no prototype DTACK is generated with memory is mapped to the prototype.
- P8 is in its 'optional' position and no DTACK is generated by the prototype circuitry.
- The development system is operating in Emulation Mode 2 and no prototype DTACK is generated.

Normal (1--2)	The system will hang (not respond) until a DTACK is received from the prototype or a break condition occurs.
Option (2--3)	The system will hang until a DTACK is received from the prototype, at which time the system will continue normal operation. A break condition will not clear the system.

P8 allows or prevents the internal generation of a Data Transfer ACKnowledge (DTACK) signal by the 68000 Emulator Processor while operating in Emulation Mode 1.

Normal (1--2) Uses the prototype's DTACK until the map decision is made. If memory is mapped to the development system's Program Memory, then an internal DTACK is generated. If memory is mapped to the prototype, then DTACK must be generated by the prototype circuitry.

Option (2--3) No internal generation of a DTACK signal is allowed, regardless of mapping. All DTACK signals must originate from the prototype circuitry.

NOTE

When P8 requires a prototype DTACK, the prototype circuit must generate a DTACK within 1 ms. If a prototype DTACK is required by P8 and no DTACK is generated by the prototype within 1 ms, then a DTACK timeout occurs. For more information regarding when a DTACK timeout may occur, see the discussion of jumper P7, earlier in this section.

CONTROL BOARD

Two configuration jumpers are located on the Interface Control board: J4011 and J6021. Figure 2-6 shows the location of these jumpers on the Control board. To gain access to these jumpers, perform steps 1--7 of the Prototype Control Probe Interface Assembly procedure, earlier in this section.

J4011 controls whether Non-Maskable Interrupts (NMIs) are saved during Dump and Restore (D/R) routines.

Normal (1--2) NMIs are saved during D/R routines (such as when the development system has control and the emulator is not running).

Option (2--3) NMIs are never saved.

NOTE

Saved NMIs are issued to the 68000 microprocessor when the development system relinquishes control, and the Emulator Processor begins program execution.

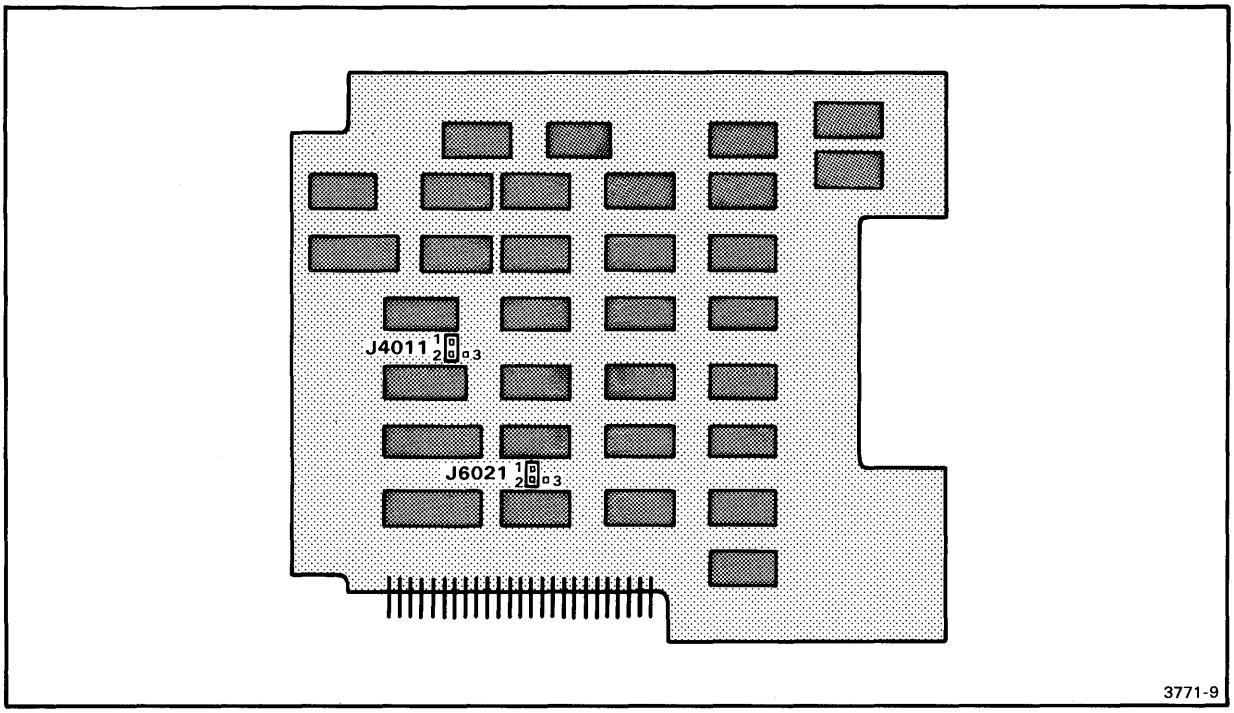


Fig. 2-6. Control board jumper locations.

J6021 controls whether prototype circuit interrupts (interrupt levels other than level 7) are saved during Dump and Restore (D/R) routines.

Normal (1--2) Prototype circuit interrupts (if held until acknowledged), are saved during D/R routines (such as when the development system has control and the emulator is not running).

Option (2--3) Prototype circuit interrupts are never saved.

NOTE

Saved interrupts are issued to the 68000 microprocessor when the development system relinquishes control, and the Emulator Processor begins program execution.

MOBILE MICROPROCESSOR BOARD

Two configuration jumpers are located on the Mobile Microprocessor board: J1045 and J2045. Figure 2-7 shows the location of these jumpers on the Mobile Microprocessor board. To gain access to these jumpers, perform steps 1--9 of the Prototype Control Probe Interface Assembly procedure, earlier in this section.

J1045 and J2045. In their 'option' positions, these jumpers delay assertion of Data Transfer ACKnowledge (DTACK) signals to the Emulator Processor. The delay is inserted to prevent the Program Memory from being accessed faster than its limitations will allow. Two different DTACK signals may be issued to the Emulator Processor: the 68000 microprocessor's DTACK and the prototype's DTACK. With J1045 and J2045 in their 'option' positions:

- Assertion of all 68000 microprocessor DTACK signals are delayed to the Emulator Processor.
- Assertion of the prototype's DTACK signals are delayed to the Emulator Processor only when operating in Emulation Mode 1 and jumper P1 is in its 'normal' position. (See the discussion of Interface Buffer board jumper P1, earlier in this section.)

The jumper's positioning, as shown in Table 2-2, is based on which Program Memory configuration is installed in your development system.

NOTE

Use of J1045 and J2045 in their 'normal' configuration may cause invalid data or loss of data if Program Memory is accessed beyond its limitations. However, no component damage will result.

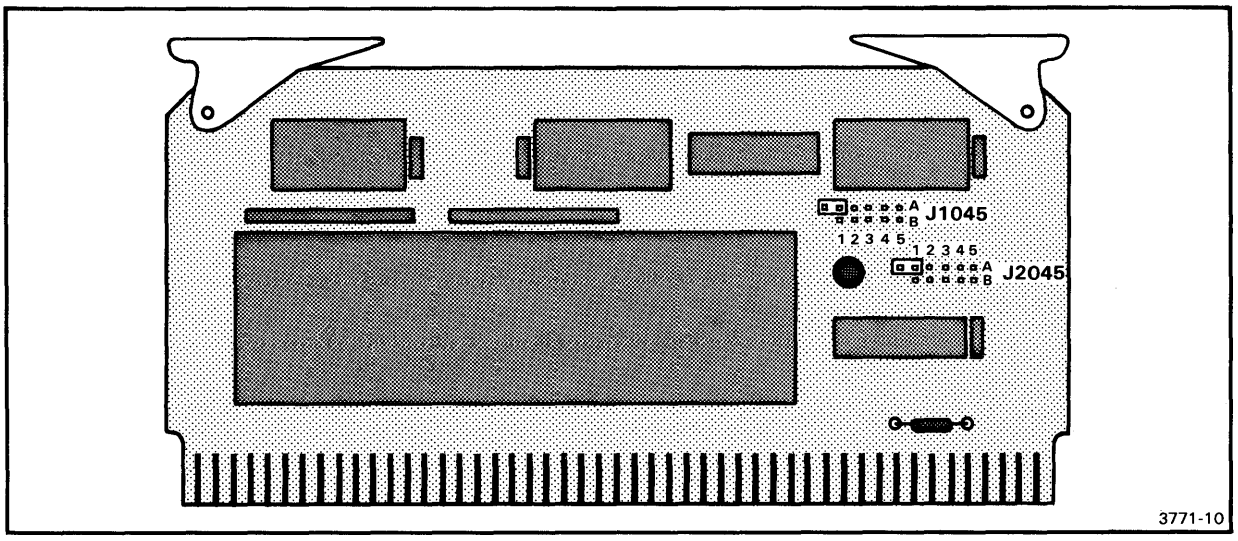


Fig. 2-7. Mobile Microprocessor board jumper locations.

Table 2-2
J1045 and J2045 Configurations (a)

Memory Configuration	Jumper Configuration(b)		Characteristic
	J1045	J2045	
32K Program Memory board	A1 to A	A1 to A	Normal (no delay)
64K or 128K Static Program Memory board	A1 to A	A1 to A	Normal (no delay)
64K or 128K Static Program Memory board and Memory Allocation Control	A1 to A	A1 to A	Normal (no delay)
32K Program Memory board and Memory Allocation Control	A5 to B	A1 to A	Option (one wait state delay at ≥ 6.4MHz) (c)

(a) Jumper configurations listed are for ≤ 8 MHz operation.

(b) Jumper configurations not listed for J1045 and J2045 are for future use.

(c) One wait state is equivalent to one extra clock cycle per memory cycle.

Section 3

INSTALLATION PROCEDURES

INTRODUCTION

This section tells how to install the 68000 Emulator Processor and its Prototype Control Probe in your TEKTRONIX microcomputer development system. This section also contains information for connecting the 64-pin probe plug to your prototype circuit.

CAUTION

Before inserting or removing any module, ensure that primary power to the microcomputer development system is OFF. Inserting or removing a module (or board) while the power is ON may result in component damage.

CAUTION

Under no circumstances can any other Emulator Processor module be installed in any TEKTRONIX microcomputer development system while the 68000 Emulator Processor module is installed. Excessive power supply loading will result.

INSTALLING THE EMULATOR PROCESSOR AND PROTOTYPE CONTROL PROBE

The 68000 Prototype Control Probe, with its Cable Termination board, is attached to EMU 1 of the 68000 Emulator Processor module. The 68000 Emulator Processor module, with the Prototype Control Probe attached, is then installed in your development system. To install the 68000 Emulator Processor module, perform the following procedure:

1. Verify that primary power (115 Vac or 230 Vac) to the microcomputer development system is OFF.

2. Remove the cover retainers at the upper corners on the rear of the mainframe (Fig. 3-1).

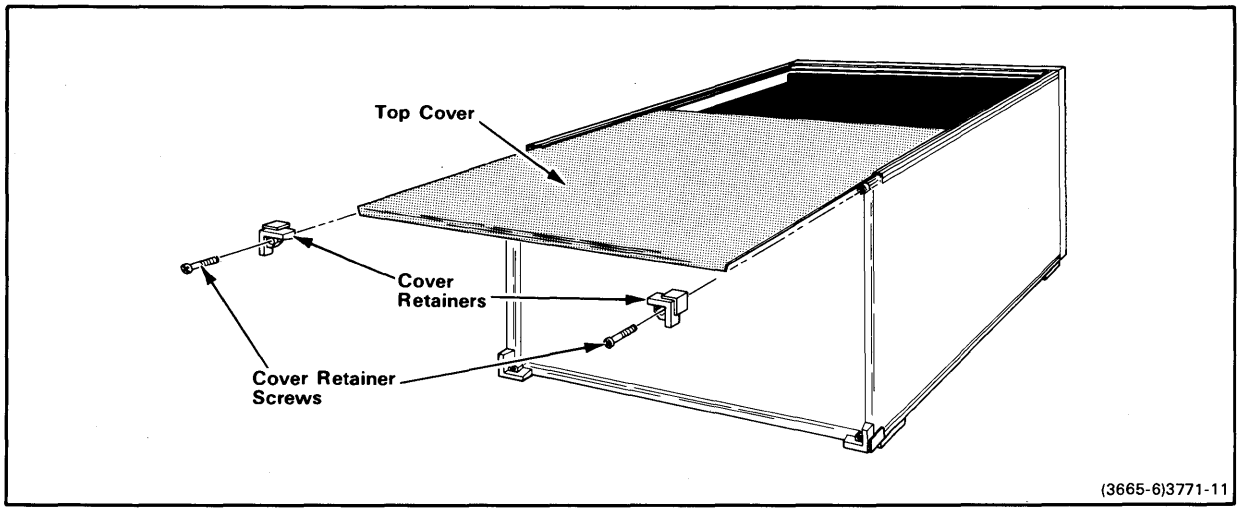


Fig. 3-1. Removal/installation of top cover.

3. Remove the top cover by sliding it straight back, then set it aside.

4. Remove the two retaining screws from the Cable Termination board mounting posts located on EMU 1 (see Fig. 3-2).

5. Hold the Cable Termination board above J2 on EMU 1. Make sure the component side of the Cable Termination board faces away from EMU 1.

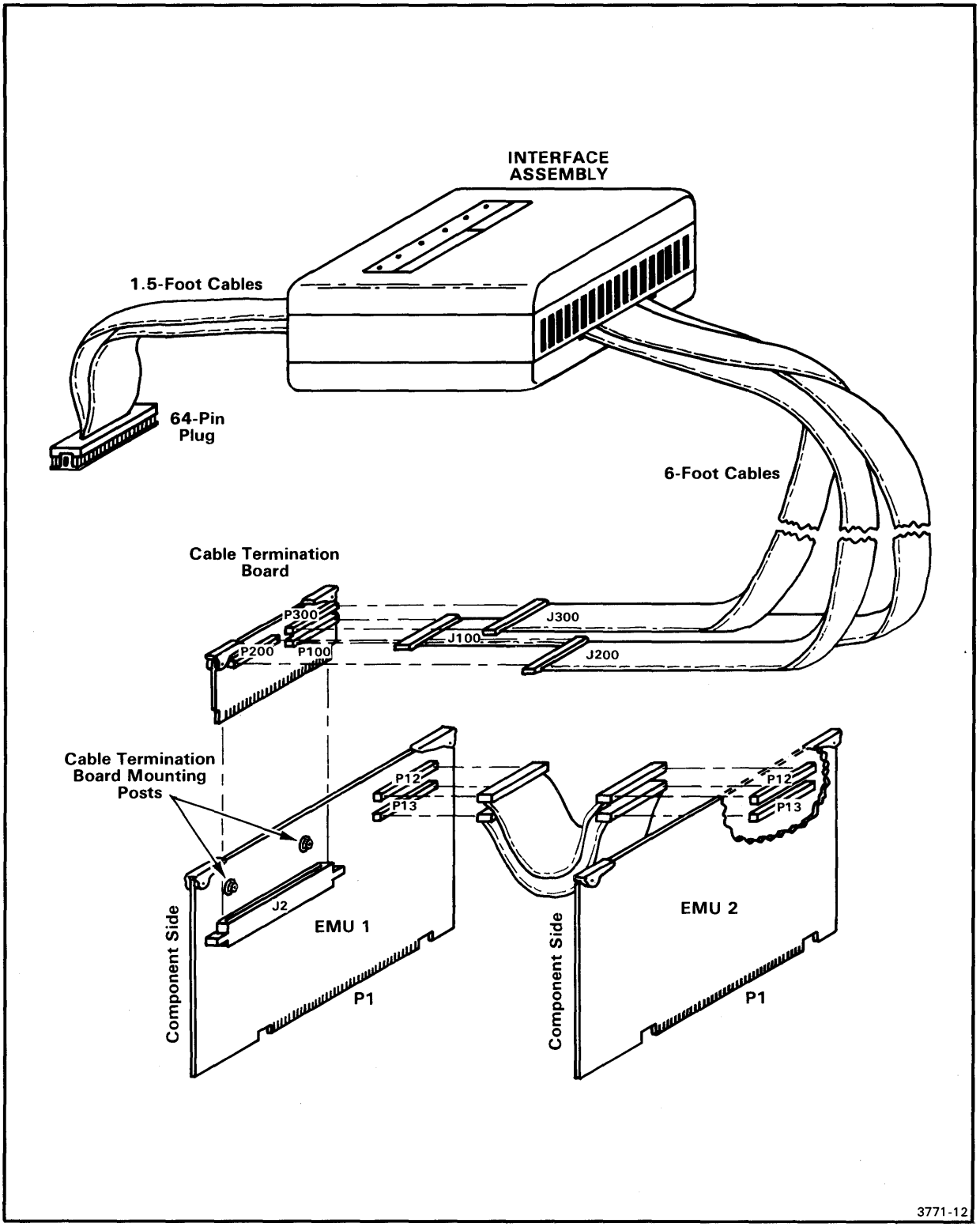


Fig. 3-2. 68000 Emulator Processor with Prototype Control Probe.

6. Guide edge connector P2 of the Cable Termination board into socket J2 on EMU 1.

7. Install the two retaining screws, removed in step 4, at the upper corners of the Cable Termination board. Tighten the screws securely.

8. Connect EMU 1 (with Cable Termination board) to EMU 2, using the two short ribbon cables provided. Dress the cables as illustrated in Fig. 3-3.

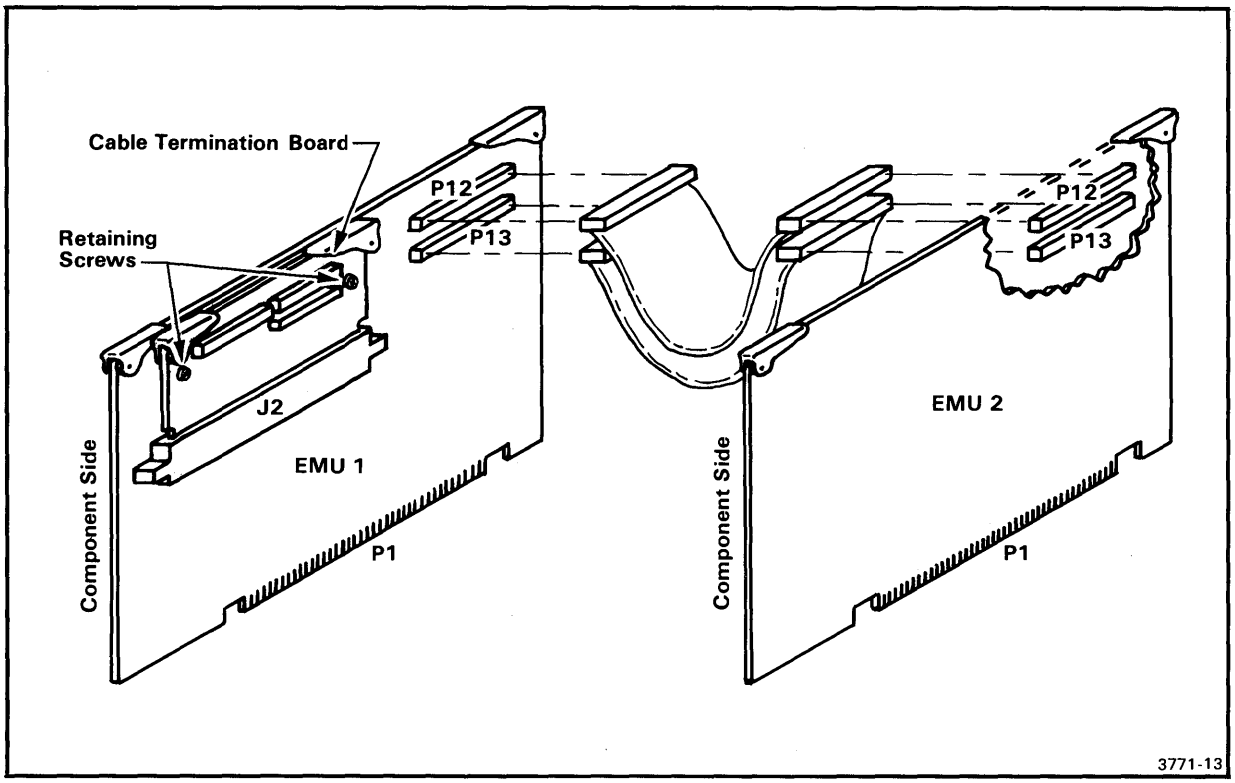


Fig. 3-3. EMU 1/EMU 2 interconnection with Cable Termination board.

9. Facing the front of the mainframe, hold EMU 1 and EMU 2 by their upper edges. With the component sides facing left, align the boards with other modules in the mainframe.

10. Guide EMU 1 and EMU 2 down the vertical channels to J15 and J16, respectively, on the Main Interconnect board (refer to Fig. 3-4).

NOTE

When EMU 1 and EMU 2 reach their connectors on the Main Interconnect board, do not snap them into place yet. You may need to lift the boards slightly when performing later steps in this procedure.

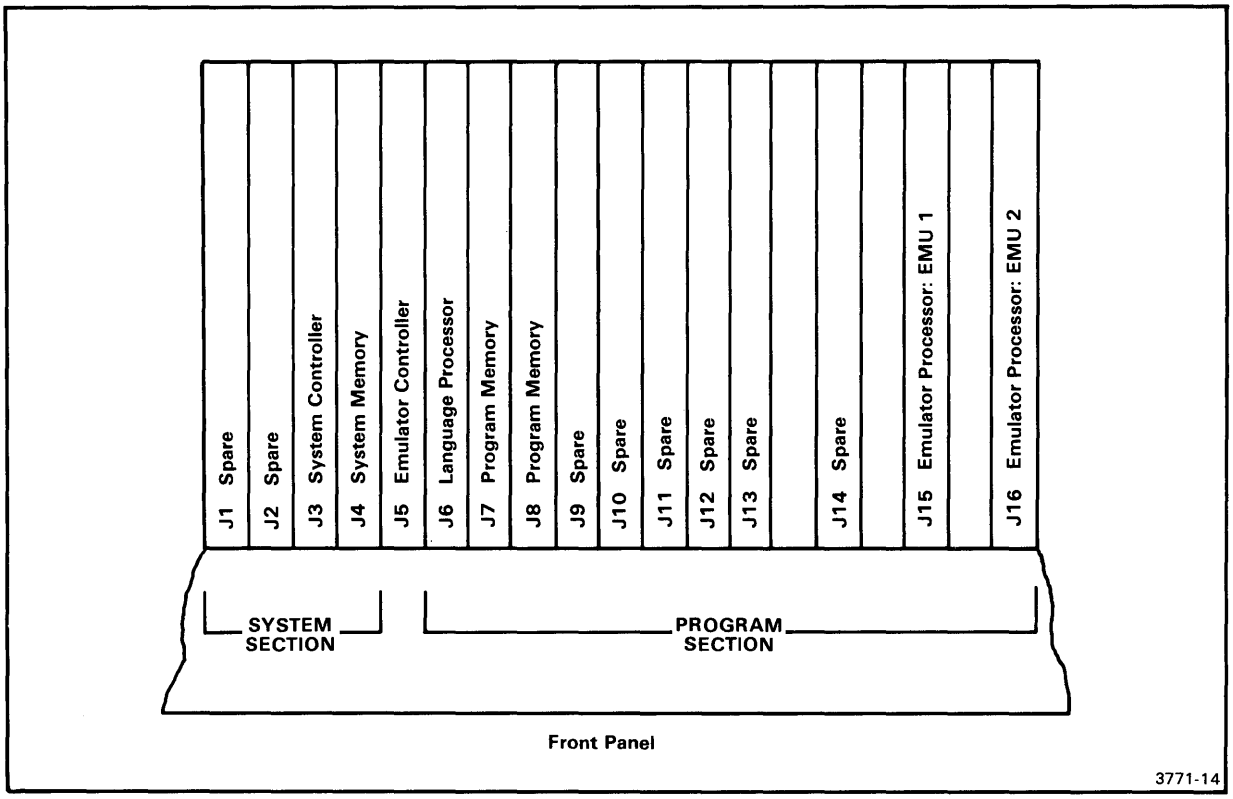


Fig. 3-4. Recommended module arrangement.

11. Remove the two mounting screws at the top and bottom of the strain relief plate, as shown in Fig. 3-5. Then remove the strain relief/cable clamp assembly from the rear panel.

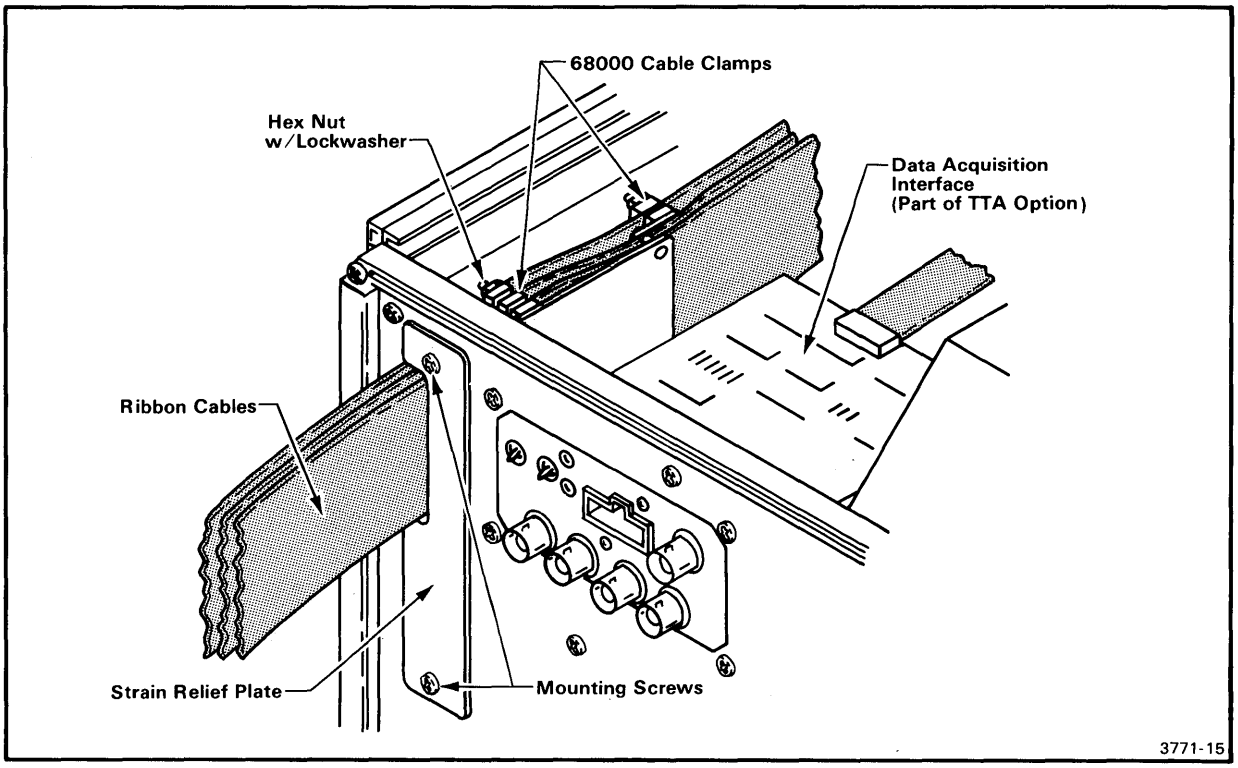


Fig. 3-5. Strain relief plate installation/removal.

NOTE

The standard cable clamps provided with your development system are not compatible with the ribbon cables used with the 68000 Prototype Control Probe. The standard clamps must be replaced with the clamps provided with your 68000 Prototype Control Probe.

12. Ensure that you have allowed enough ribbon cable to reach the Cable Termination board (already attached to EMU 1), which is now located in the development system's card cage. Then mount the long Prototype Control Probe ribbon cables to the cable clamp assembly, using the new clamps provided. Secure the cable clamps with hex nuts and lock washers. Refer to Fig. 3-6.

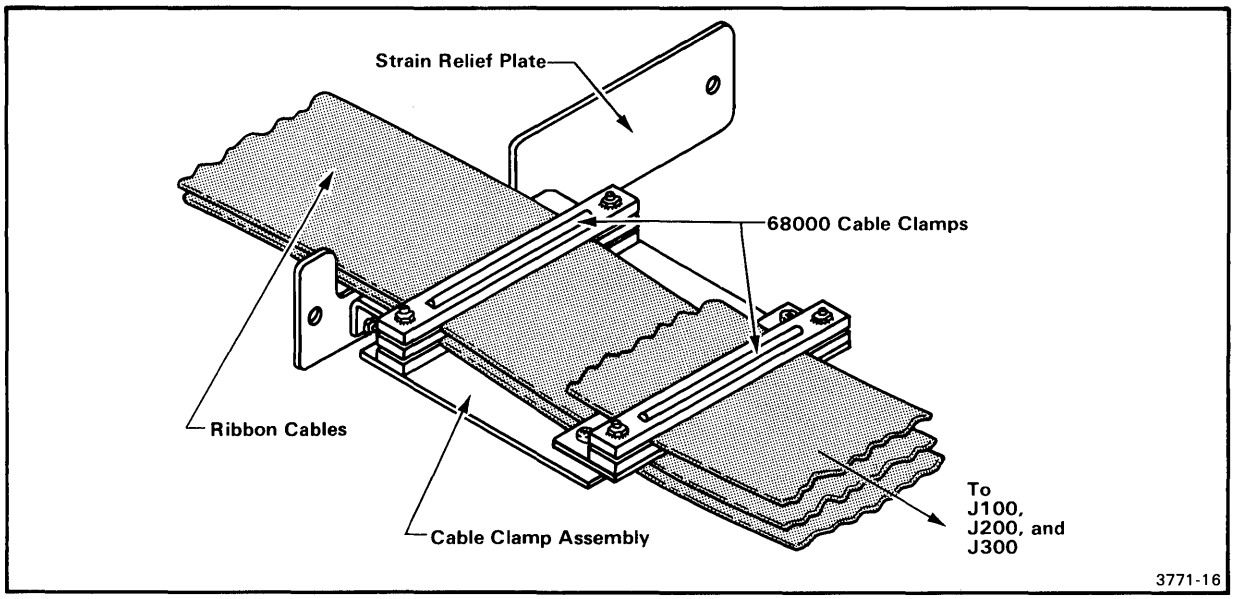


Fig. 3-6. Ribbon cable installation.

13. Feed the Prototype Control Probe connectors (J100, J200, and J300) through the cableway opening. Then guide the strain relief/cable clamp assembly into the cableway opening. Attach the strain relief plate to the rear panel, using the two screws removed in step 11.

14. Attach the ribbon cable connector labeled J300 to P300 (refer back to Fig. 3-2). Be sure that pin 1 of the cable connector (blue stripe) and pin 1 of the module socket align and are to the left when viewed from the component side of the module.

15. Following the procedure of step 14, attach ribbon cable connector J200 to P200 on the Cable Termination board.

16. Following the procedure of step 14 again, attach ribbon cable connector J100 to P100 on the Cable Termination board.

17. Now slide EMU 1 and EMU 2 down until they reach their respective connectors on the Main Interconnect board in your development system's mainframe. Then press down firmly and evenly on the top edges (one board at a time), until each board snaps into place.

18. Dress the cables along the cableway at the side of the mainframe and over the side of the card cage. Make sure the cables are dressed to lie flat, to allow clearance for the top cover.

19. Slide the top cover back into the guide tracks at the top of the mainframe. Be sure the cover is properly seated in the slot at the front of the mainframe.

20. Install the cover retainers at the upper corners on the rear of the mainframe (see Fig. 3-1). Tighten the cover retainer screws securely.

CONNECTING TO THE PROTOTYPE

The 64-pin plug at the end of the 1.5-foot ribbon cables fits into the 68000 microcomputer socket on the prototype. Pin 1 on the plug must be mated with receptacle 1 on the socket. A notch is located near pin 1 on both the protective spring-loaded plate and the body of the plug, to aid in pin identification (see Fig. 3-7).

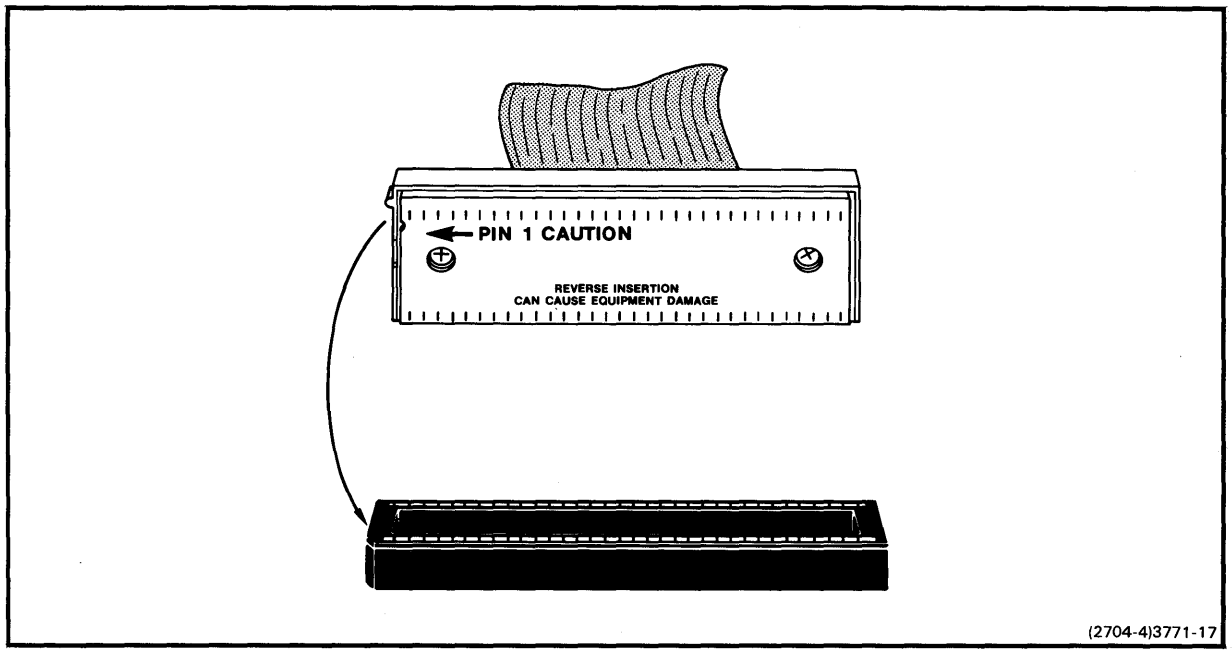


Fig. 3-7. Pin identification and proper plug insertion.

CAUTION

If the Prototype Control Probe plug is incorrectly inserted in the prototype socket, damage to the Prototype Control Probe will result. Figure 3-7 shows the proper method of plug insertion.

If you are using a zero-insertion-force (ZIF) socket for the 68000 microprocessor on your prototype, you should insert a standard low-profile 64-pin DIP socket between the probe plug and the prototype's ZIF socket, to ensure a secure mechanical and electrical connection (see Fig. 3-8).

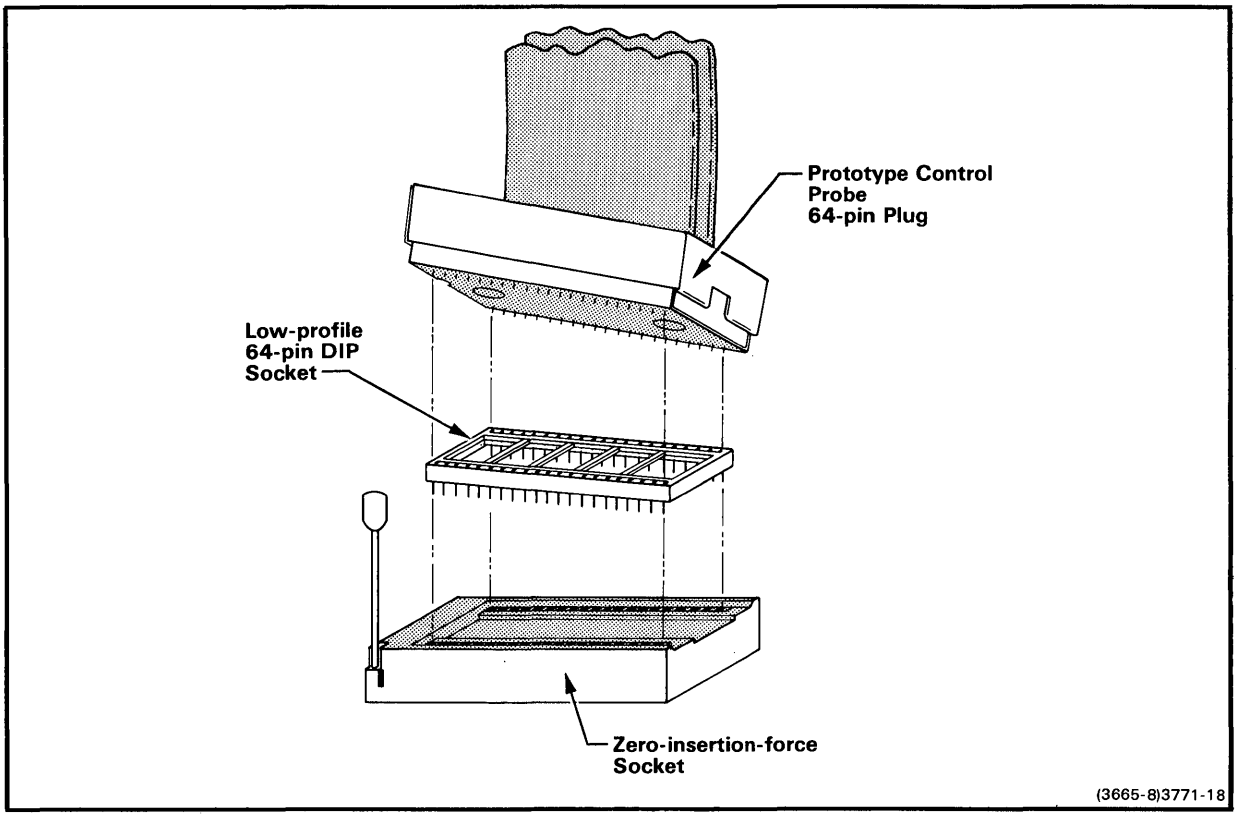


Fig. 3-8. Using a zero-insertion-force socket.

GROUNDING

A proper ground system is mandatory for satisfactory operation of your microcomputer development system. The 68000 Emulator Processor module and its Prototype Control Probe, as well as any other optional and peripheral equipment, must be properly grounded to eliminate ground loops and to reduce susceptibility to static discharge. The following grounding procedures are recommended:

- Ensure that primary power cords of all units (including your prototype system) are connected to outlets that are on the same ground system.

- Attach all grounding strap lugs to the chassis of any unit being grounded. Ensure that the lugs make good contact with bare metal; remove any paint or protective coating from the metal before attaching the ground lug.

Section 4

PERFORMANCE VERIFICATION

INTRODUCTION

This section is divided into two parts. The first part discusses equipment required to verify timing relationships between the signals available at the pins of the Prototype Control Probe. Details of these timing relationships are provided in the 68000 Emulator Specifics section of your System Users Manual. The second part describes how to calibrate the supply voltages generated on the Power Supply board (located in the Prototype Control Probe's Interface Assembly).

EMULATOR TIMING VERIFICATION

Verifying the timing relationships of emulator processor signals involves measurement of very small time increments. Test equipment used for these measurements should be able to resolve timing differences between two signals of 5 ns or less. A resolution of 1 ns is preferred for verification of the most critical timing.

Be careful that errors are not introduced by the test equipment being used. Test equipment calibration should be checked carefully. If you are using a dual trace oscilloscope, rather than a dual beam model, be sure to account for any possible skew between the two input channels. In general, good laboratory measurement practices should be followed to ensure accurate measurement of these timing relationships.

EQUIPMENT REQUIRED

The following equipment may be used to measure timing relationships with the preferred accuracy and resolution:

- TEKTRONIX 7844 Dual Beam Oscilloscope, or equivalent
- Two TEKTRONIX 7A26 Vertical Amplifiers, or equivalent
- TEKTRONIX 7B85 Delaying Time Base, or equivalent

CONTROLLING THE SIGNAL LINES UNDER TEST

Some processor signal lines, such as interrupt lines, are normally connected to asynchronous circuits. Timing relationships of these asynchronous signals may be difficult to measure with an oscilloscope. To exercise these signal lines in a periodic manner, you may find it necessary to develop software routines, or use an external test fixture such as the TEKTRONIX MicroLab I.

PROTOTYPE CONTROL PROBE POWER SUPPLY CALIBRATION

The 68000 Prototype Control Probe's power supply board generates two regulated supply voltages: +4.92 Vdc and +5 Vdc. The +4.92 Vdc supplies voltage for much of the Interface Assembly circuitry. The +5 Vdc is only used by the 64-pin plug. Both of these voltages are adjustable and may require occasional calibration.

EQUIPMENT REQUIRED

- TEKTRONIX microcomputer development system, with the 68000 Emulator Processor and Prototype Control Probe installed
- DVM with 100 µV resolution and ±0.1% accuracy (TEKTRONIX DM501 or equivalent)

PROCEDURE

1. Ensure that primary power (115 Vac or 230 Vac) to the development system is OFF.
2. Remove the four screws at the corners on the bottom of the Interface Assembly housing.

CAUTION

The Power Supply board is mounted to the top cover of the Interface Assembly. The power supply is connected to the main housing by four ribbon cables. Take care not to damage these cables when removing the top cover.

3. Remove the top cover of the Interface Assembly and set it beside the main housing (see Fig. 4-1).

NOTE

Do not disconnect any of the interconnecting ribbon cables.

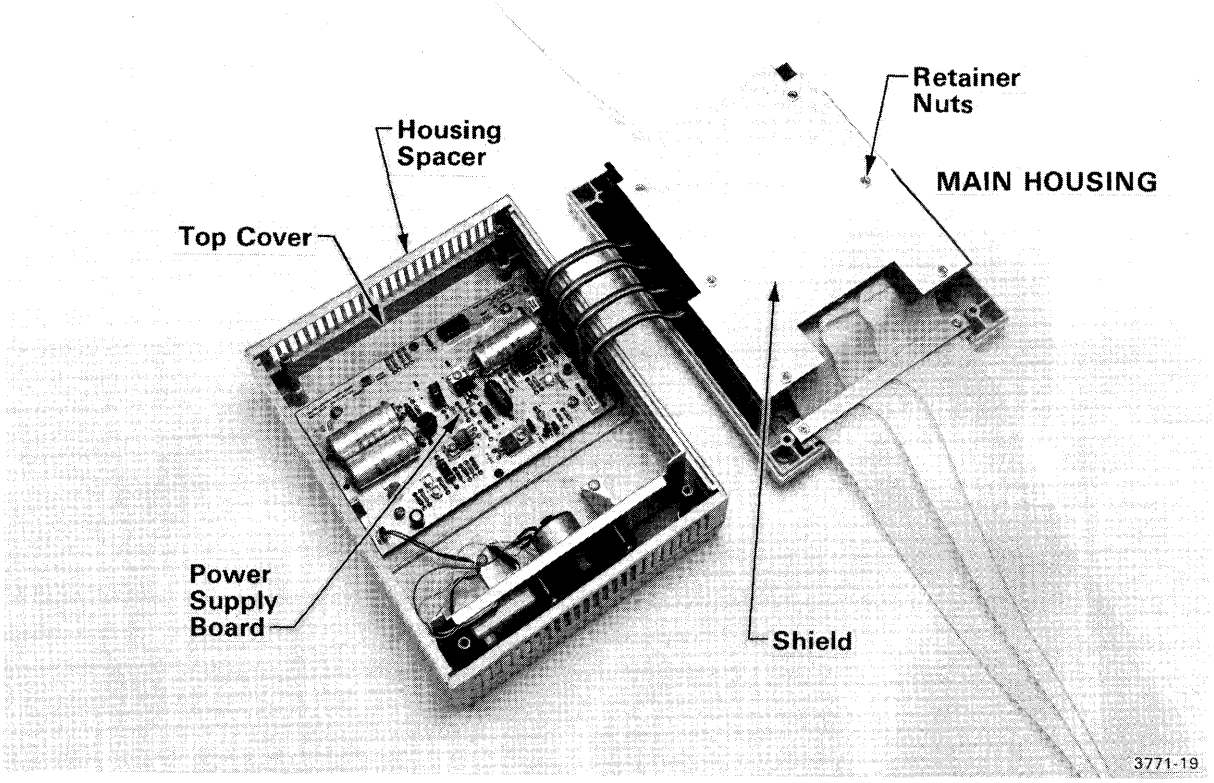


Fig. 4-1. Access to Power Supply board.

NOTE

For the remainder of this procedure, refer to Fig. 4-2.

4. Connect the negative (-) test probe of the DVM to GROUND.

5. Connect the positive (+) test probe of the DVM to TP1061 on the Power Supply board (see Fig. 4-2).

6. Turn on the DVM and the microcomputer development system.

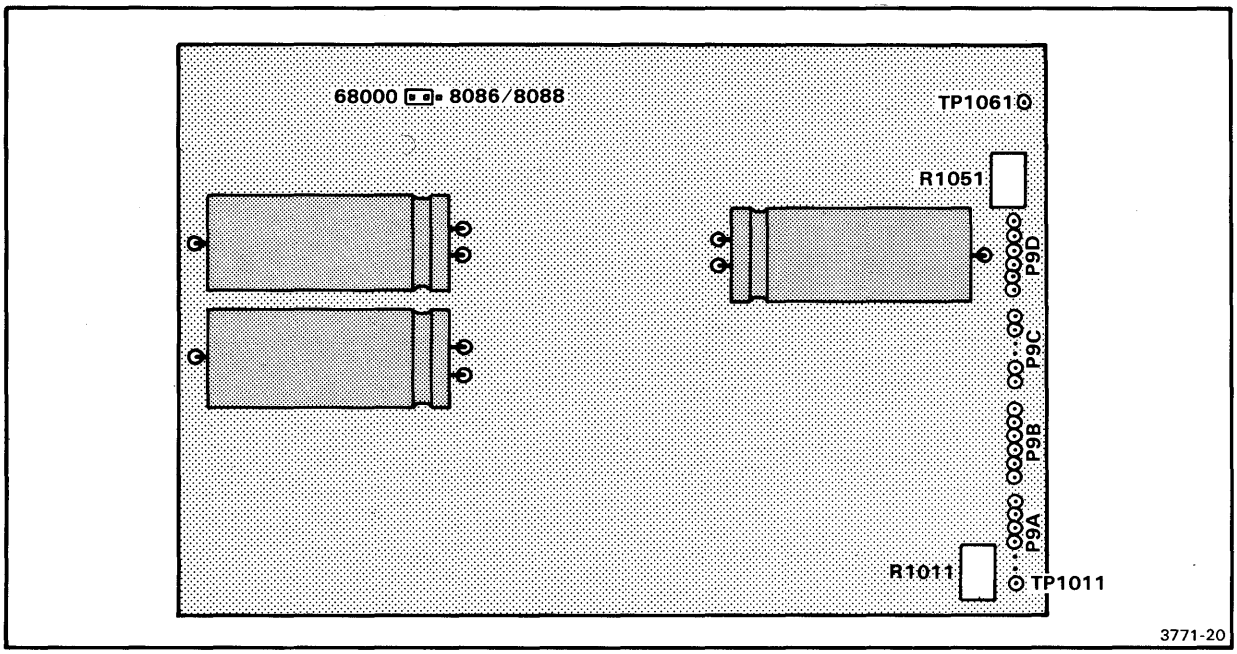


Fig. 4-2. Power Supply board.

7. At the system terminal, enter the following command:

   > SEL 68000

8. Observe the voltage measured by the DVM.

9. Adjust R1051 on the Power Supply board, until the DVM reads +4.92 Vdc (+20mV).

10. Disconnect the positive (+) test probe of the DVM from TP1061.

11. Connect the positive (+) test probe of the DVM to TP1011 on the Power Supply board (see Fig. 4-2).

12. Observe the voltage measured by the DVM.

13. Adjust R1011 on the Power Supply board, until the DVM reads +5 Vdc (+5%).

14. Turn off power to all equipment.

15. Disconnect the DVM from the Power Supply board.

16. Reassemble the Prototype Control Probe Interface Assembly in reverse order of disassembly.