

Tektronix®

**8048/8021/8041A/8022
EMULATOR PROCESSOR
AND
PROTOTYPE CONTROL PROBES
INSTALLATION
SERVICE**

INSTRUCTION MANUAL

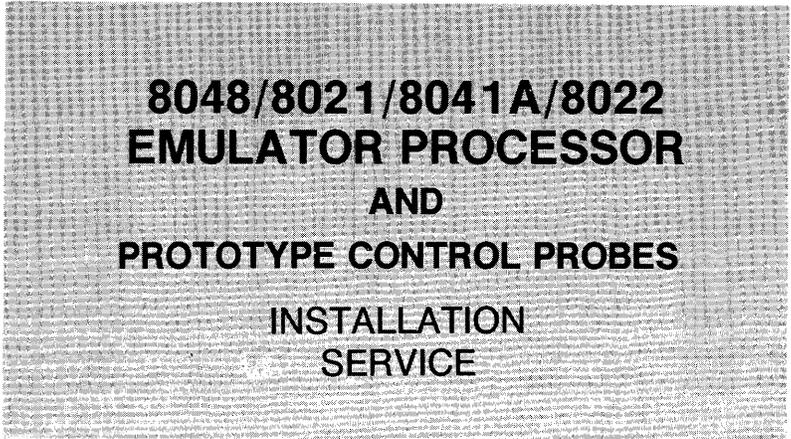
WARNING

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:

Product	Factory Installed Option	Field Installed Option
EMULATOR PROCESSOR		
8550	2H	8300E10
PROTOTYPE CONTROL PROBES		
8550	3K	8300P10
8550	3L	8300P11
8550	3M	8300P12
8550	3N	8300P13



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PREFACE

About This Manual

This manual tells how to install the 8048/8021/8041A/8022 Emulator Processor module and its Prototype Control Probes in any TEKTRONIX microcomputer development system that utilizes 8300-series emulator processors.

To enhance readability of the manual, the term "8048 Emulator Processor module" is used throughout this manual to refer to the TEKTRONIX 8048/8021/8041A/8022 Emulator Processor module.

Manual Organization

The 8048/8021/8041A/8022 Emulator Processor Installation Manual is divided into four sections:

- Section 1 contains general information about the Emulator Processor module and Prototype Control Probes.
- Section 2 contains information about jumpers and switch settings.
- Section 3 provides detailed installation procedures for the Emulator Processor module and the Prototype Control Probes.
- Section 4 describes procedures used to verify proper functional performance of the Emulator Processor module and the three Prototype Control Probes.

General Information

Revision History

Revision history information is included in the text and illustrations as they are revised and reprinted. 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 code and date. New pages added to a section, whether they contain old, new, or revised information, will be identified with the '@' symbol.

Change Information

Change information is located in the back of this manual in the CHANGE section. Change information should be entered into the body of the manual when the manual is received.

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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

In This Manual



This symbol indicates where applicable cautionary or other information is to be found.

As Marked on Equipment



DANGER high voltage.



Protective ground (earth) terminal.



ATTENTION—refer to manual.

Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the power input or output terminals. 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, and which 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.

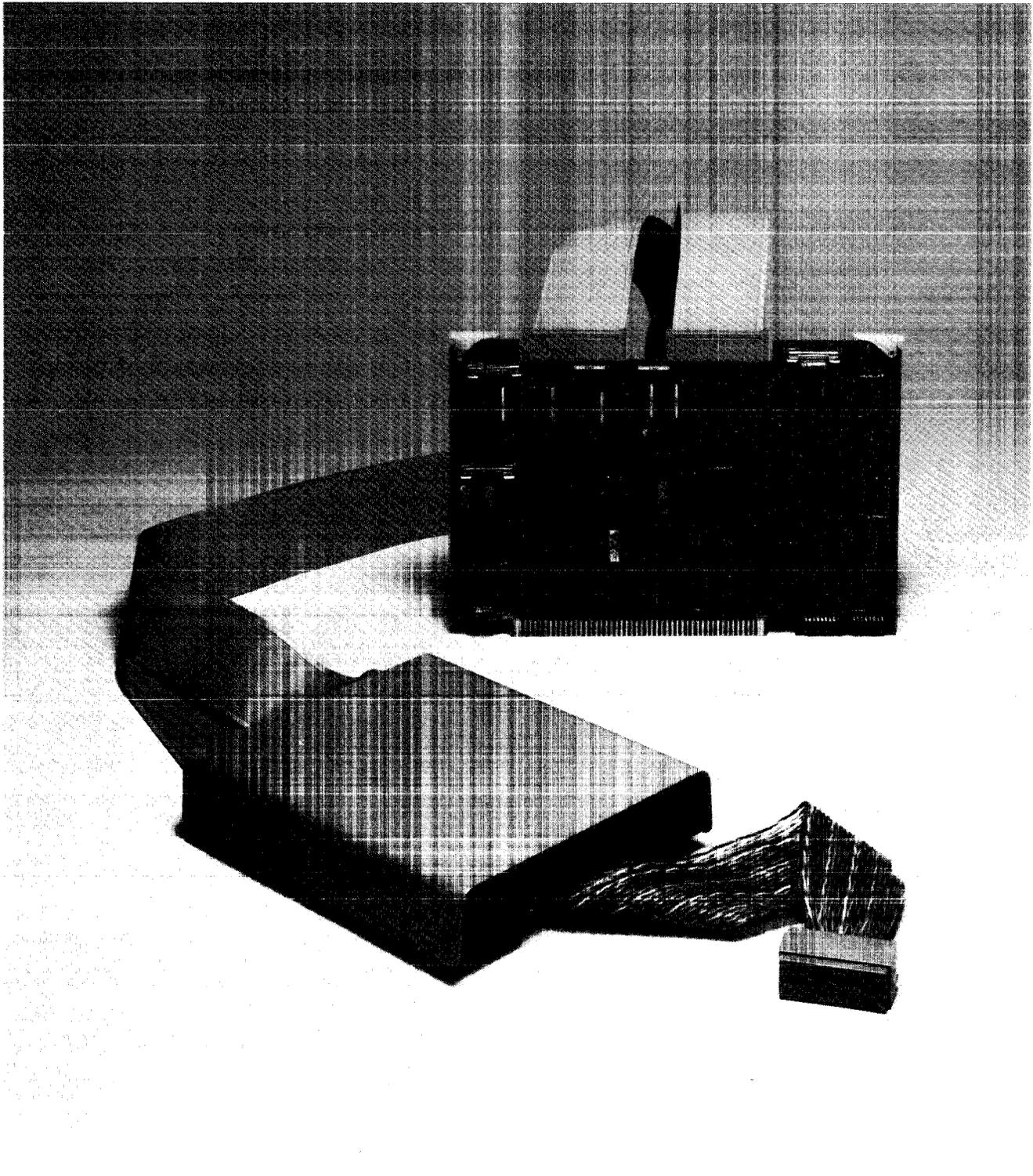
Use Care When Servicing With Power On

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.



3671-1

8048/8021/8041A/8022 Emulator Processor and Prototype Control Probe

Section 1

GENERAL INFORMATION

Introduction

The 8048 Emulator Processor is an accessory designed to function as an integral part of your TEKTRONIX microcomputer development system. The 8048 Emulator Processor module, in conjunction with the appropriate one of its three Prototype Control Probes, emulates the operation of any of a family of 11 microcomputers. Table 1-1 lists devices supported by the 8048 Emulator Processor.

Table 1-1
Devices Supported by the
8048/8021/8041A/8022 Emulator Processor

Device Type	Prototype Control Probe Used
8048 Microcomputer	8048/8021 ↓
8021 Microcomputer	
8035 Microcomputer	
8039 Microcomputer	
8039-6 Microcomputer	
8049 Microcomputer	
8648 Microcomputer	
8749 Microcomputer	
8041A Microcomputer	8041A
8741A Microcomputer	8041A
8022 Microcomputer	8022

In the 8048 Emulator Processor, the emulating microprocessor device is located in the Prototype Control Probe interface assembly. The 8048/8021 Prototype Control Probe utilizes an 8039 emulating microcomputer device. The 8041A and 8022 Probes each use an 8035 emulating microprocessor device.

This manual contains procedures for installing an 8048 Emulator Processor module and its Prototype Control Probe in your TEKTRONIX microcomputer development system. This manual also contains performance verification information.

For user information about the 8048 Emulator Processor, refer to your System User's Manual and its 8048/8021/8041A/8022 Emulator Specifics supplement. Service information about the processor is provided in the optional 8048/8021/8041A/8022 Emulator Processor Service Manual.

Emulator Processor Module

The 8048 Emulator Processor module is a single circuit board that plugs into the main interconnect board in the system mainframe.

The Emulator Processor serves two purposes in the microcomputer development system. First, it has the ability to run a program written specifically for an 8048 microcomputer. With the help of other modules in the system, the Emulator Processor can check the program for run-time errors or program logic errors. Second, by using the Prototype Control Probe, a prototype circuit can be debugged and stepped through the final stages to design completion.

This Emulator Processor emulates the operation of a target 8048 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.

Modes of Operation

The 8048 Emulator Processor operates in one of three emulation modes. The desired emulation mode is selected by the user and controlled by the System Controller. The three emulation modes are:

MODE 0 (System Mode)

Used to develop software for a prototype 8048 microcomputer-based circuit. Mode 0 uses your development system's Program Memory and I/O facilities, and a clock derived from system clock, to develop a software program. In emulation mode 0, the development system acts as an independent 8048-based minicomputer. Prototype circuitry is not involved. Figure 1-1A illustrates mode 0 operation.

MODE 1 (Partial Emulation Mode)

Used to develop some of the hardware functions of the prototype circuit. The appropriate Prototype Control Probe is used in mode 1 to interface with the prototype circuit. Emulation mode 1 allows the prototype circuit's memory, I/O, and clock to be exercised. Mode 1 operation is illustrated in Fig. 1-1B.

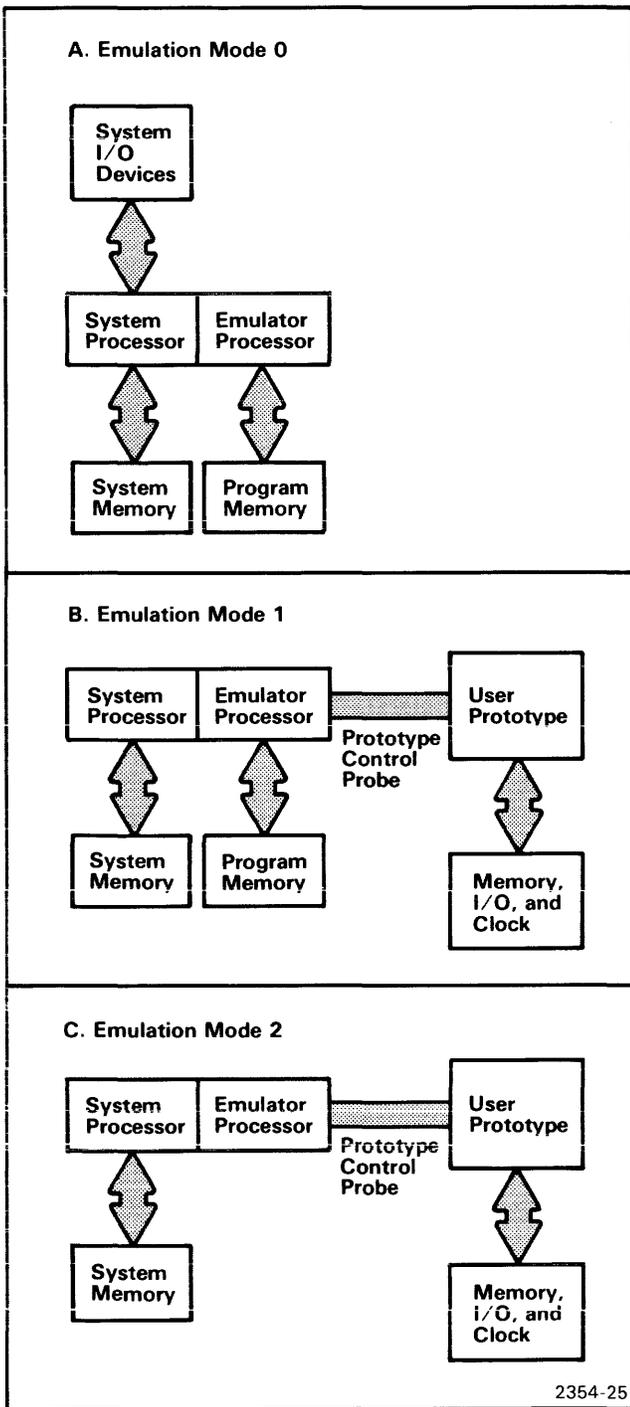


Fig. 1-1. Emulation modes 0, 1, and 2.

Another function available in emulation mode 1 is memory mapping. Memory mapping allows execution of user programs in combinations of prototype memory and Program Memory.

MODE 2 (Full Emulation Mode)

Similar to mode 1, except that prototype memory is now the single source of operation code; Program Memory cannot be accessed. Mode 2 operation is illustrated in Fig. 1-1C.

Prototype Control Probe

The Prototype Control Probe is the interface between the Emulator Processor module and the prototype circuitry. Each Prototype Control Probe (8048/8021, 8041A, or 8022) consists of:

1. Two 6-foot ribbon cables that attach to the Emulator Processor module.
2. The interface assembly, containing two Driver/Receiver circuit boards and the emulating micro-computer device.
3. Two 1.5-foot twisted-pair ribbon cables.
4. A 40-pin dual in-line (DIP) plug that connects to the prototype circuit.

Figure 1-2 illustrates the Prototype Control Probe.

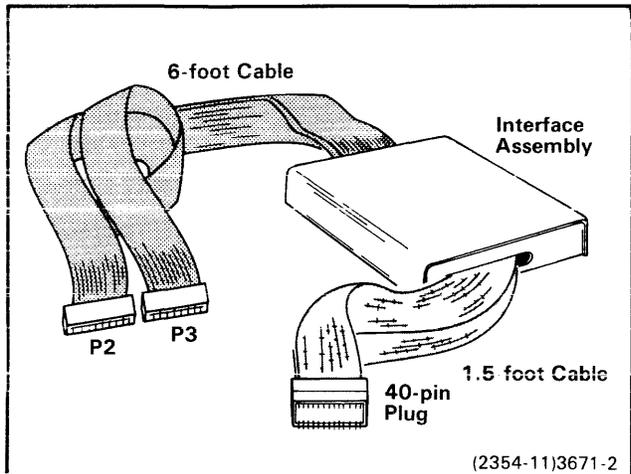


Fig. 1-2. Prototype Control Probe.

SPECIFICATIONS

**Table 1-2
Electrical Characteristics**

Characteristic	Performance Requirement	Supplemental Information
Supply Voltage	+5.2 Vdc ±5% +12.0 Vdc ±5%	
Current	3.0 A (max) @ 5.2 Vdc 2.0 A (max) @ 12.0 Vdc	
Power Dissipation	10 Watts (max)	

**Table 1-3
Environmental Characteristics**

Characteristic	Description
Temperature Operating	0°C to +70°C (+32°F to +158°F)
Storage	-30°C to +80°C (-22°F to +176°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 AND SWITCHES

General

There are no user-selectable jumpers or switches on the 8048/8021/8041A/8022 Emulator Processor module or the 8041A Prototype Control Probe. The 8048/8021 and 8022 Prototype Control Probes each have configuration options which may be selected by the user.

Prototype Control Probe Interface Assembly

Configuration options are selected by positioning switches or jumpers on the Driver/Receiver boards in the Prototype Control Probe's interface assembly. To gain access to the Driver/Receiver boards:

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

NOTE

Your interface assembly may have either a plastic or a metal housing. Disassembly procedures are similar for either assembly housing.

2. Remove the four screws at the corners on the bottom of the interface assembly housing.
3. Remove the top cover of the interface assembly and set it aside.
4. The upper circuit board is Driver/Receiver board "A". If access to Driver/Receiver board "B" is required,

remove the three screws from each side of Driver/Receiver board "A", then swing the board over to reveal board "B". Refer to Fig. 2-1.

NOTE

Do not disconnect interconnecting ribbon cables between Driver/Receiver boards "A" and "B".

5. Set switches or jumpers to the desired positions according to the following paragraphs, then re-assemble the interface assembly in reverse order of disassembly.

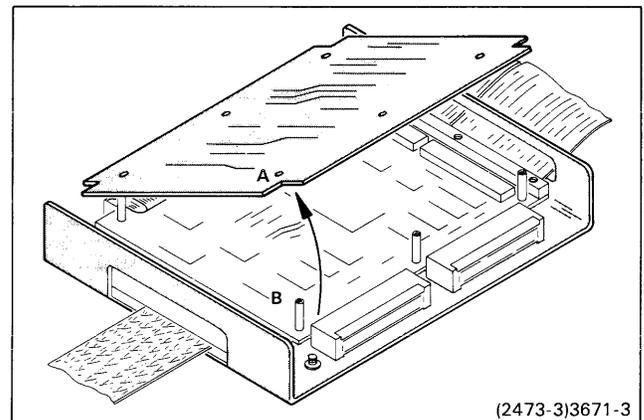


Fig. 2-1. Prototype Control Probe interface assembly; access to Driver/Receiver boards.

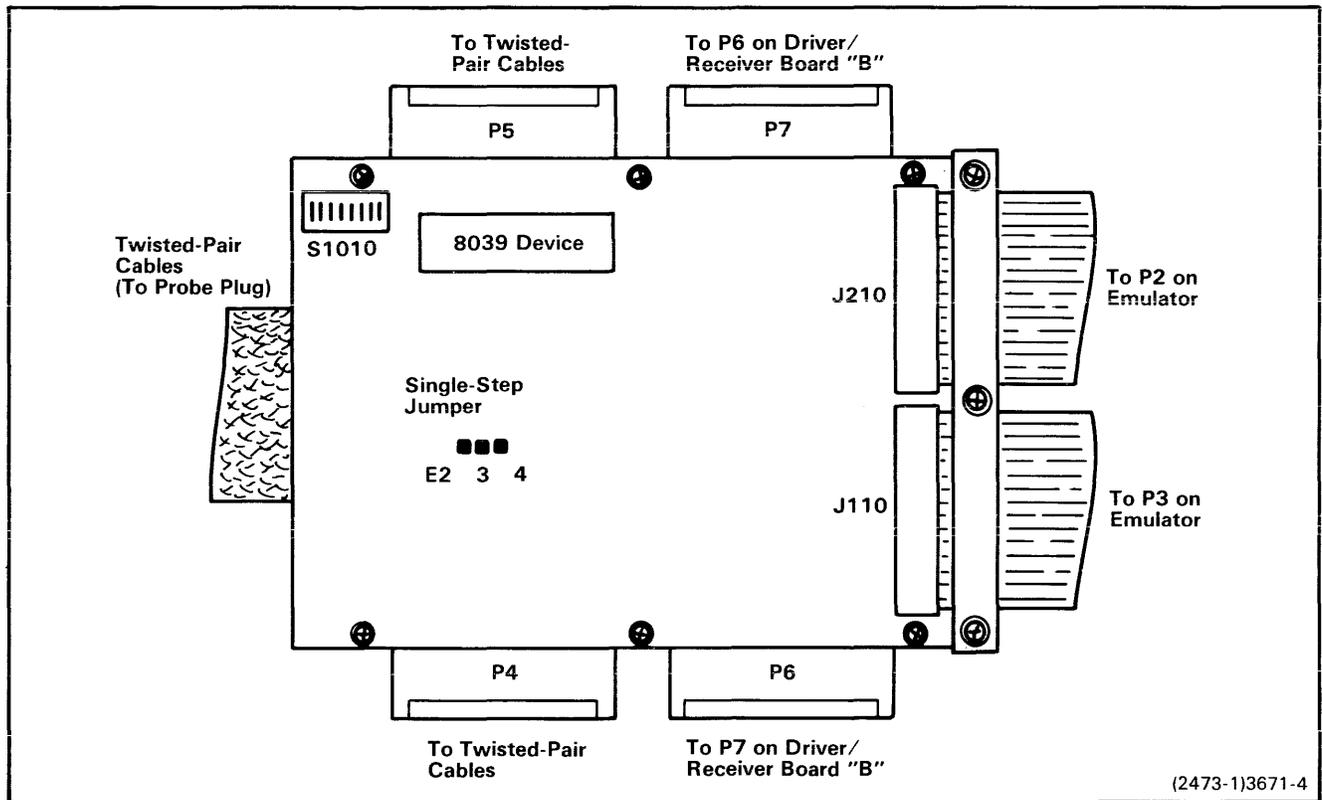


Fig. 2-2. 8048/8021 Prototype Control Probe; switch and jumper locations.

8048/8021 Prototype Control Probe

A Configuration Switch (S1010) is located on Driver/Receiver board "A" in the 8048/8021 Prototype Control Probe's interface assembly (see Fig. 2-2). S1010 is an 8-bit DIP switch package that determines which microcomputer is to be emulated, and also selects external memory, if applicable. Refer to Fig. 2-3 for details of S1010 switch settings.

- To emulate the 8021 microcomputer, place switch 7 in the ON position. All other switches must be in the OFF position. The 8021 cannot use external program memory.
- To emulate an 8048 or 8035 microcomputer, place switches 2 and 8 in the ON position. To add external memory capability to either of these microcomputers, place switch 1 in the ON position. All other switches (3, 4, 5, 6, and 7) must be in the OFF position.
- To emulate an 8039 or 8049 microcomputer, place switch 4 in the ON position. To add external memory capability to either of these microcomputers, place switch 1 in the ON position. If the prototype clock rate is greater than 6 MHz, place switch 2 in the OFF position. If

the clock rate is 6 MHz or less, place switch 2 in the ON position. All other switches (3, 5, 6, 7, and 8) must be in the OFF position.

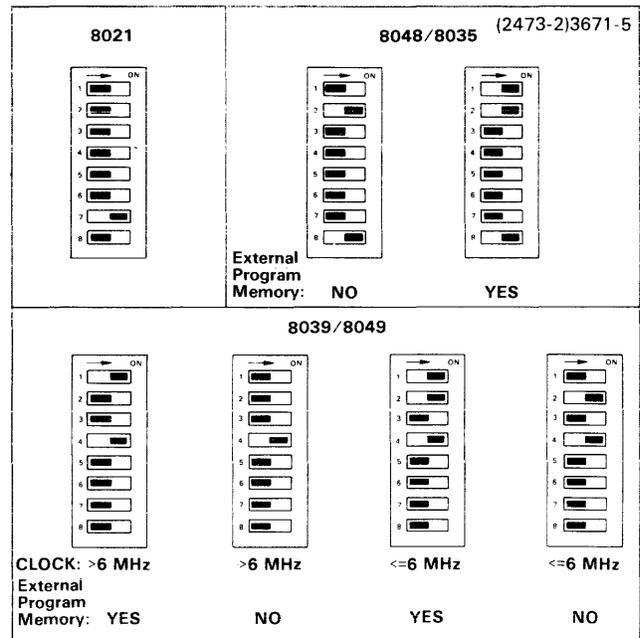


Fig. 2-3. 8048/8021 Prototype Control Probe switch settings.

Functions of the individual switches in switch pack S1010 are summarized in the following table:

Switch	Function
1	Enable external program memory
2	Divide clock rate by 2 for access to development system's program memory
3	Not used
4	Emulate 8039 or 8049 devices
5	Not used
6	Not used
7	Emulate 8021 device
8	Emulate 8048 or 8035 device

Single Step Jumper

The Single Step jumper determines when the user may single-step the processor during program execution. Figure 2-2 shows the location of this jumper on Driver/Receiver board "A".

- When pins E3 and E4 are connected, the user may single-step the processor even during debug routines.
- When pins E2 and E3 are connected, the user may single-step the processor only when the user program is being executed. This setting is used for normal operation.

8021 Probe Adapter

The 8048 and 8021 microcomputers have different pin configurations. The 8021 Probe Adapter allows you to connect an 8048/8021 Prototype Control Probe to an 8021 socket on the prototype.

To install the 8021 Probe Adapter in your 8048/8021 Prototype Control Probe interface assembly, perform the following:

1. Remove the cover of the interface assembly, according to the procedure earlier in this section.
2. Remove the two screws on the bottom of the interface assembly, where the twisted-pair ribbon cables emerge.
3. Remove the six screws that attach Driver/Receiver board "A" to the interface assembly housing.
4. Lift Driver/Receiver board "A" upward, then remove the plate near the opening where the twisted-pair ribbon cables emerge from the assembly. Remove the cables from connectors P4 and P5 on board "A". Carefully pass the cables completely through the opening and set them aside.
5. Install the 8021 Probe Adapter in the interface assembly in place of the 8048 cable assembly that you just removed. Carefully pass the cables through the front of the interface assembly housing, then attach the cable edge-connectors to board "A" connectors P4 and P5, as shown in Fig. 2-2. Ensure that the labels on

the edge-connectors are visible as you look at the component side of Driver/Receiver board "A".

6. Reinstall the strain-relief plate that you removed in step 4. Reinstall the two screws removed in step 2. Then reinstall the six screws removed in step 3.
7. Reassemble the interface assembly housing in reverse order of disassembly.

8021 Probe Plug

The pins on the 8021 Prototype Control Probe plug are larger than those on most probe plugs. Frequent insertion of the 8021 Probe plug into a standard DIP socket could damage the socket. To avoid such a problem:

- Use a zero-insertion-force (ZIF) socket on your prototype circuit board,
or
- Use an additional DIP socket between the probe plug and your prototype's socket.

8022 Prototype Control Probe

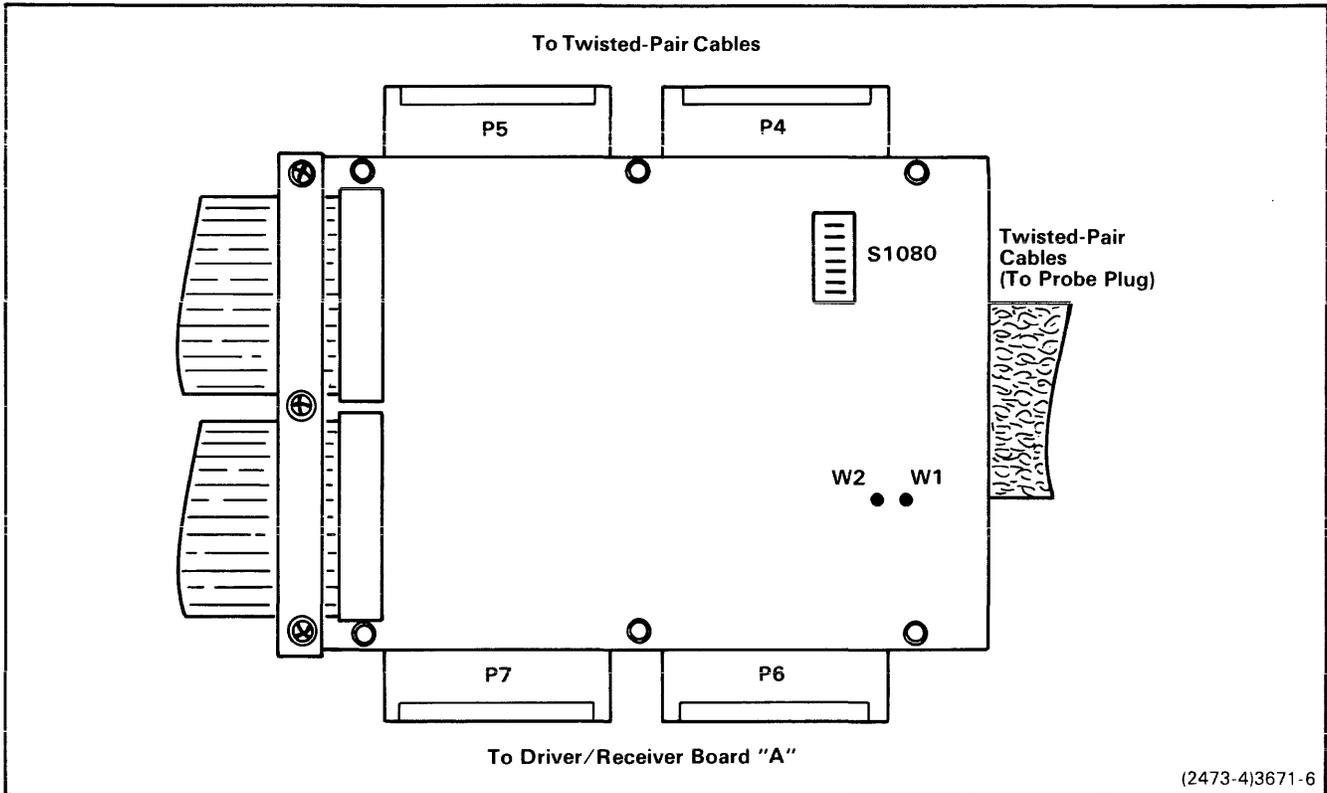
The 8022 microcomputer device has two selectable pullup options. These options are implemented by a high-impedance option switch (S1080) and a cuttable run (T1), located on Driver/Receiver board "B" in the 8022 Prototype Control Probe's interface assembly (see Fig. 2-4). S1080 is an 8-section DIP switch package that allows each of the eight Port 0 lines to connect to a high-impedance pullup device when required by the user.

When the 8022 probe is shipped from the factory, both pullup options are present: the switches are set to ON and run T1 is installed. To change either of these pullup options, perform the following procedure:

1. Disassemble the Prototype Control Probe interface assembly to gain access to Driver/Receiver board "B", according to the procedure earlier in this section.
2. Locate switch pack S1080 (see Fig. 2-4). To implement the 8022 Port 0 high-impedance pullup option, switches 1-8 must be in the ON position.
3. Locate run W1-W2 (in the lower left corner of Driver/Receiver board "B"). This run implements the optional pullup resistor in the 8022's T1 input. To eliminate the pullup resistor option, run W1-W2 must be cut.
4. When the desired settings for these pullup options are established, reassemble the interface assembly in reverse order of disassembly.

NOTE

In order to maintain the required switching point accuracy, the 8022 Prototype Control Probe must be calibrated at initial installation and periodically thereafter. Refer to Section 4 of this manual for calibration procedures for the 8022 probe.



(2473-4)3671-6

Fig. 2-4. 8022 Prototype Control Probe, Driver/Receiver board "B"; location of S1080 and cuttable run.

Section 3

INSTALLATION PROCEDURES

Introduction

The following procedures tell how to install the 8048 Emulator Processor module and its associated Prototype Control Probe (8048/8021, 8041A, or 8022) in your TEKTRONIX microcomputer development system.

CAUTION

Under no circumstances can more than two Emulator Processor modules be installed in any TEKTRONIX microcomputer development system at one time. Excessive power supply loading will result.

Emulator Processor Module

1. Verify that primary power (115 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).

3. Remove the top cover by sliding it straight back, then set it aside.
4. Facing the front of the mainframe, hold the Emulator Processor module by its upper edges and align it with other modules in the mainframe, with its component side facing left.
5. Guide the module down the vertical channels at either of positions J15 or J16 on the main interconnect board (refer to Fig. 3-2).
6. When the module reaches the connector on the main interconnect board, press down firmly and evenly on the top edge of the module until it snaps into place.
7. Remove the two mounting screws at the top and bottom of the strain relief plate (Fig. 3-3), then remove the strain relief/cable clamp assembly from the rear panel.

NOTE

Each ribbon cable has a grounding plate bonded to it. The grounding plate must make contact with the grounding bar of the cable clamp assembly.

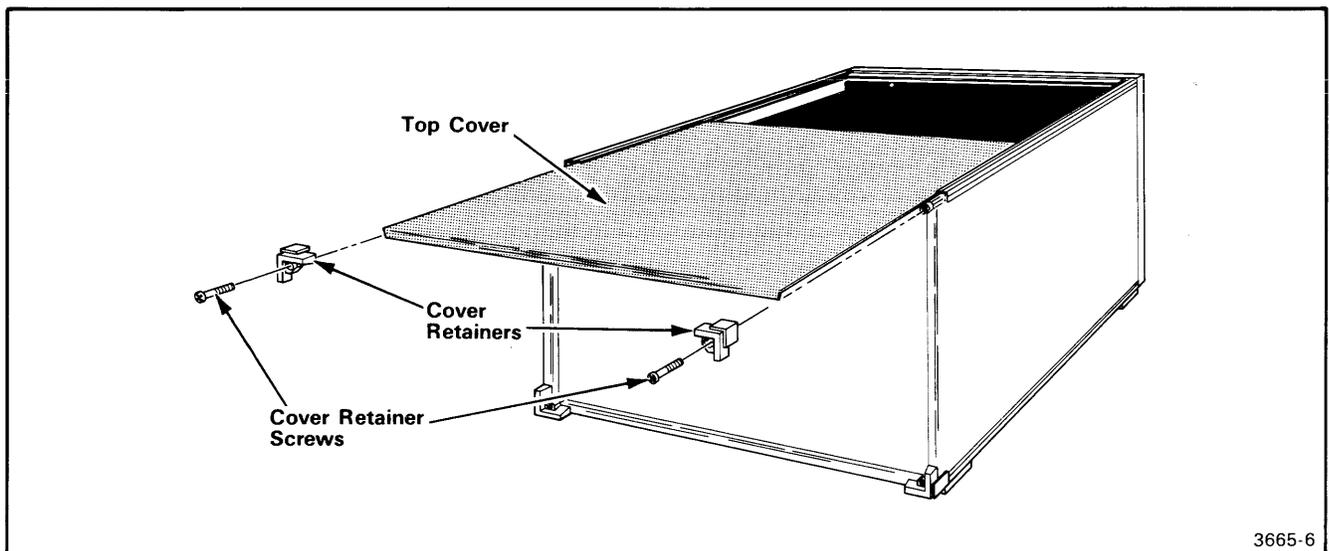
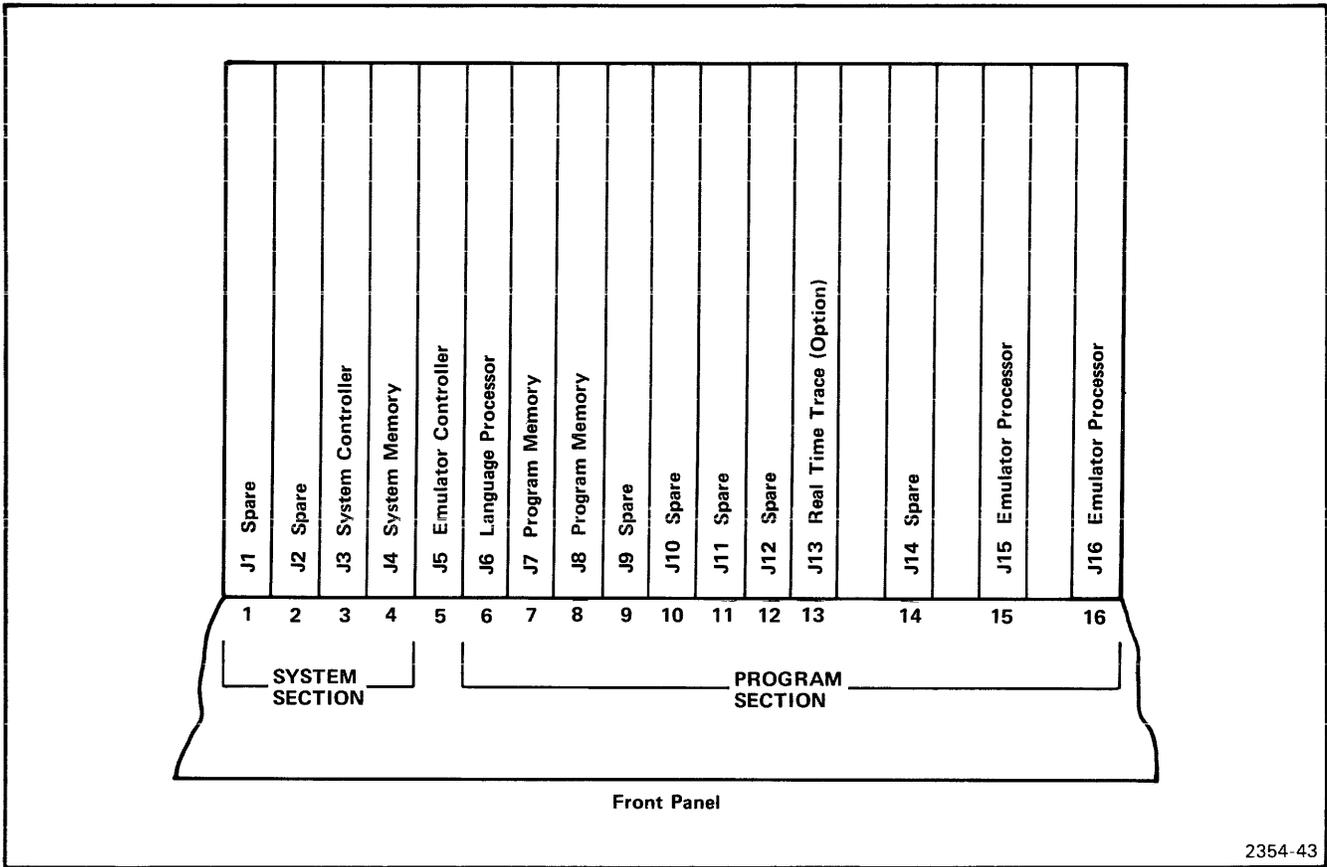
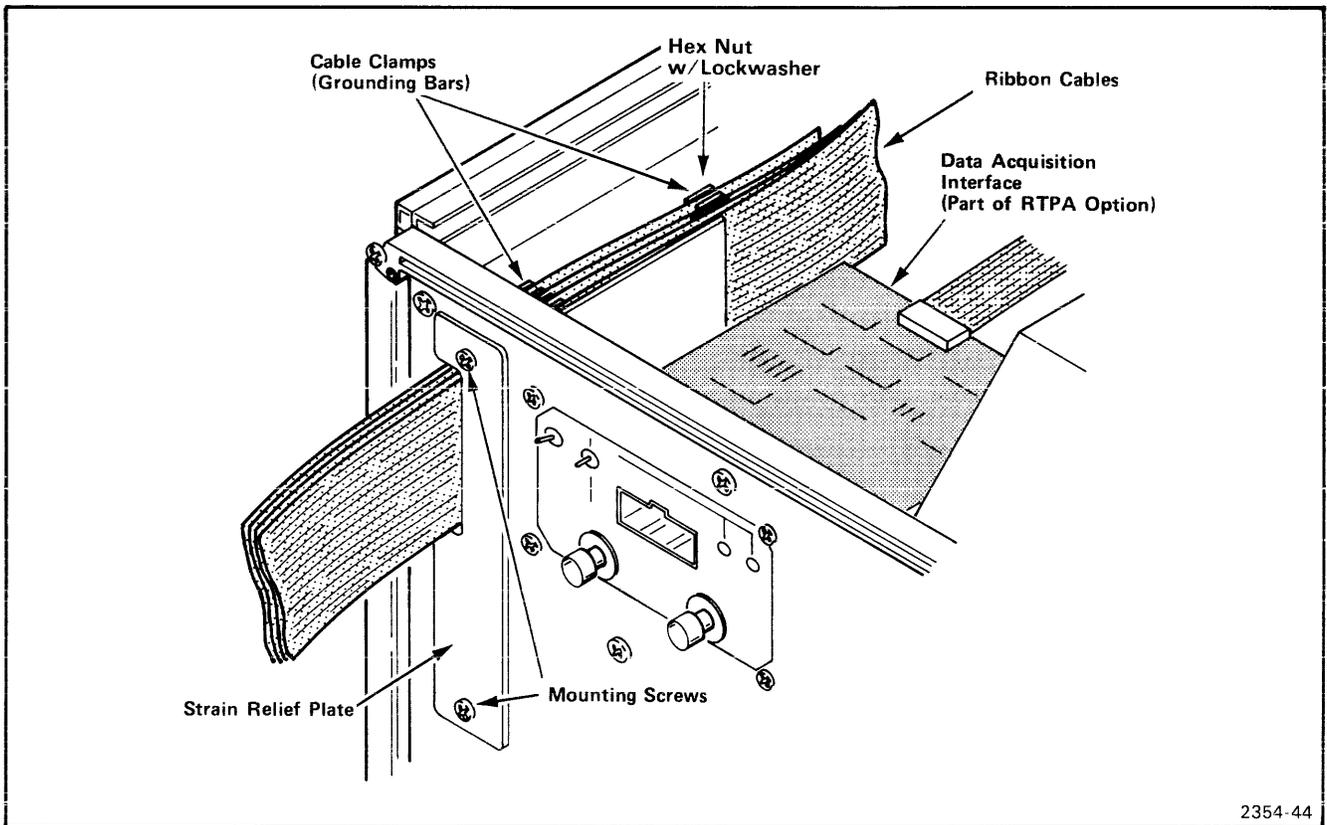


Fig. 3-1. Removal/installation of top cover.



2354-43

Fig. 3-2. Recommended module arrangement.



2354-44

Fig. 3-3. Ribbon cable installation and grounding.

Installation Procedures: 8048/8021/8041A/8022 Emulator Processor Installation

8. Mount the grounding plates of the long Prototype Control Probe ribbon cables to the cable clamp assembly; use one grounding bar for each ribbon cable. Secure the cable clamps with hex nuts (with lock washers). (Refer to Fig. 3-3.)
9. Feed the Prototype Control Probe connectors (P2 and P3) 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 7.
10. Dress the cables along the cableway at the side of the mainframe and over the side of the card cage. Ensure that the cables pass over the notched area of the card cage and are dressed to lie flat, to allow clearance for the top cover.
11. Attach the ribbon cable labeled P2 to the edge connector marked P2 (see Fig. 3-4). Be sure that pin 1 of the cable (red stripe) and pin 1 of the module edge connector align and are to the left when viewed from the component side of the module.
12. Following the procedure of step 11, connect ribbon cable P3 to edge connector P3 on the Emulator Processor module.
13. 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 guide tracks.
14. Install the cover retainers (removed in step 2) at the upper corners on the rear of the mainframe (see Fig. 3-1). Tighten the cover retainer screws securely.

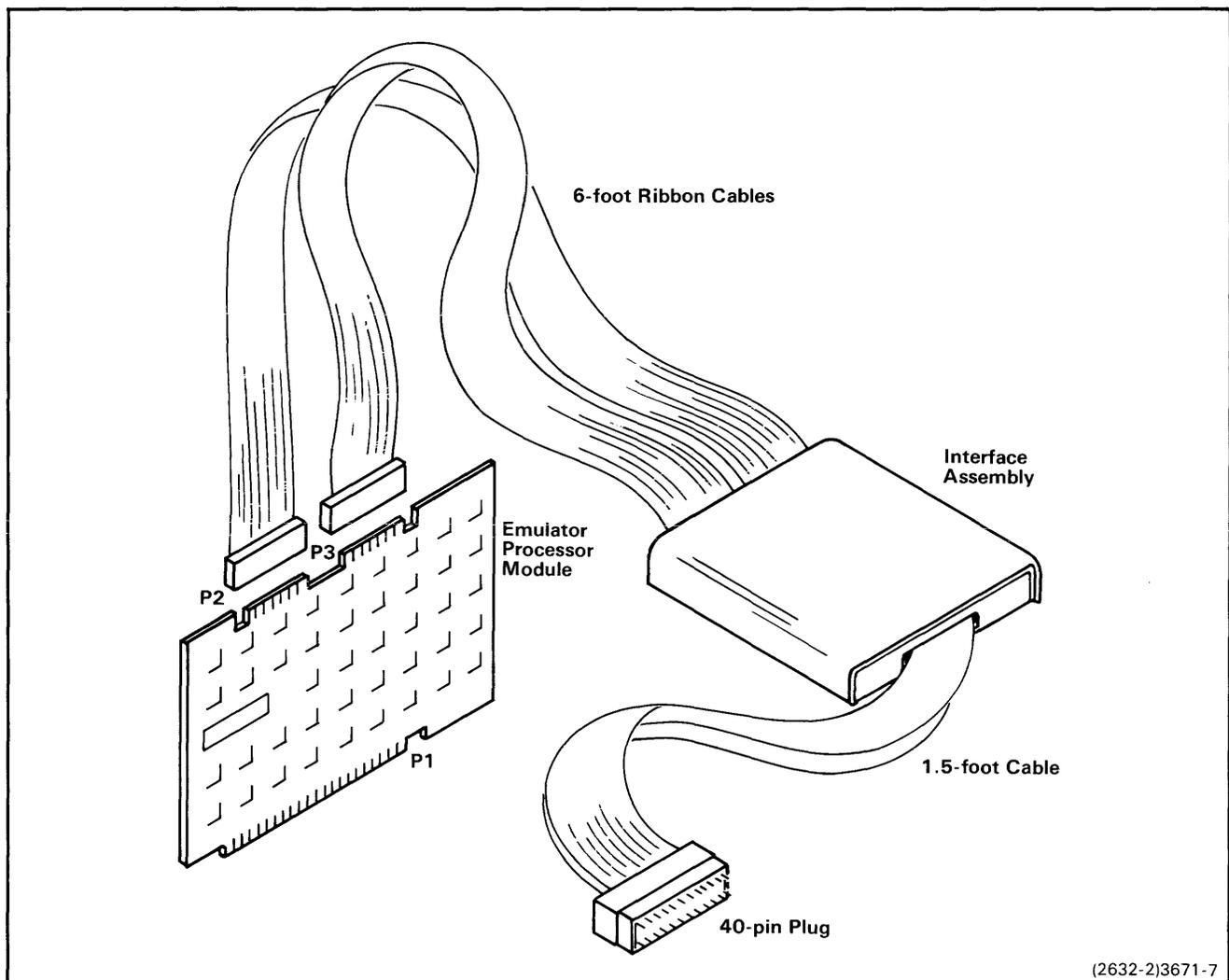


Fig. 3-4. Emulator Processor Module and Prototype Control Probe.

Connecting to the Prototype

The 40-pin plug at the end of the 1.5-foot twisted-pair cables fits into the 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. 3-5).

If you are using a zero-insertion-force (ZIF) socket for the microcomputer on your prototype, you should insert a standard low-profile 40-pin DIP socket between the probe plug and the prototype's ZIF socket, to ensure a secure mechanical and electrical connection (see Fig. 3-6).

CAUTION

If the Prototype Control Probe plug is incorrectly inserted in the prototype socket, damage to the Prototype Control Probe will result. Figure 3-5 shows the proper method of plug insertion.

If the plug is incorrectly inserted, it may be necessary to replace components listed in Table 3-1, 3-2, or 3-3, as applicable.

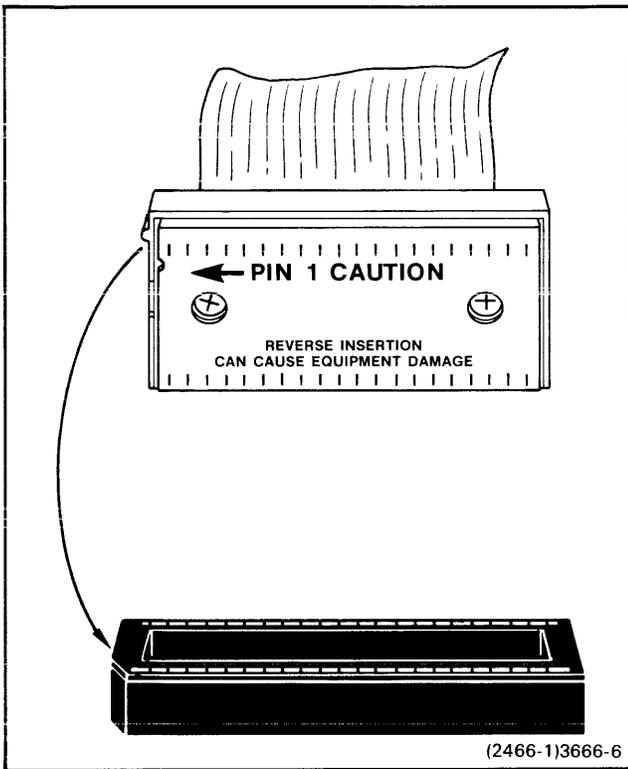


Fig. 3-5. Pin identification and proper plug insertion.

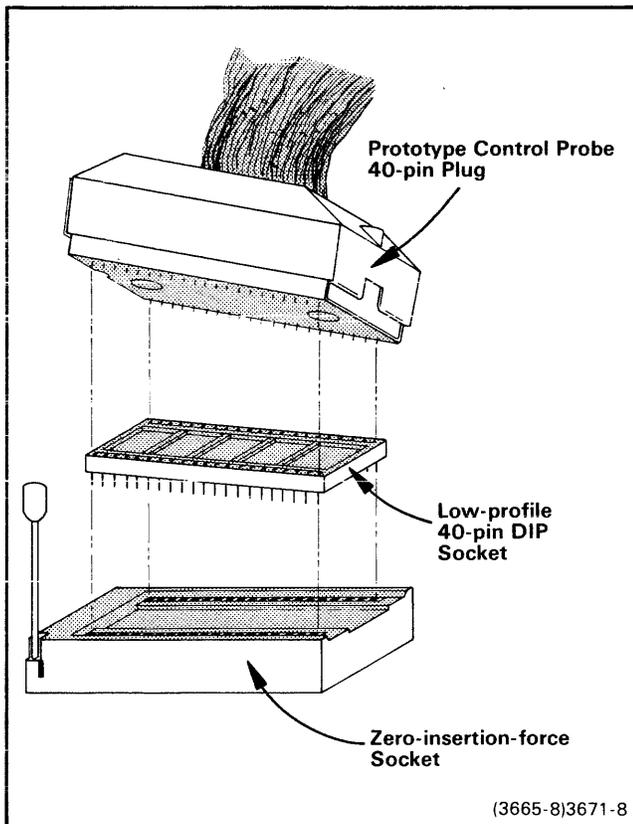


Fig. 3-6. Using a zero-insertion-force socket.

Table 3-1
Component Identification
8048/8021 Prototype Control Probe

Location	DIP No.	Tektronix Part No.	Manufacturer No.
Driver/ Receiver Board A	U2020	156-1387-00	8039
	U3010	156-0745-00	4069
	U4020	156-0956-00	74LS244
	U4040	156-0384-00	74LS03
	U4050	156-0384-00	74LS03
	U5020	156-0383-00	74LS02
	5040	156-0384-00	74LS03
	5050	156-0384-00	74LS03
	U6020	156-0382-00	74LS00
	U6050	156-0385-00	74LS04
	U7030	156-0998-00	8T97
8048/8021 Prototype Control Probe Plug	U1010	156-0645-00	74LS14
	Q1011	151-1049-00	1N3811 (Dual JFET)

Table 3-2
Component Identification
8041A Prototype Control Probe

Location	DIP No.	Tektronix Part No.	Manufacturer No.
Driver/ Receiver Board B	U2030	156-0956-00	74LS244
	U3060	156-1434-00	8035
	U3070	156-0956-00	74LS244
	U3090	156-0956-00	74LS244
	U4030	156-0384-00	74LS03
	4040	156-0645-00	74LS14
	U4070	156-0153-00	7406
	U4080	156-0914-00	74LS240
	U4090	156-0956-00	74LS244

Table 3-3
Component Identification
8022 Prototype Control Probe

Location	DIP No.	Tektronix Part No.	Manufacturer No.
Driver/ Receiver Board A	U1040	156-1434-00	8035
	U2060	156-0645-00	74LS14
Driver/ Receiver Board B	U1060	156-0515-00	CD4053
	U1070	156-0384-00	74LS03
	U2010	156-0916-00	81LS97
	U2020	156-0916-00	81LS97
	U2060	156-0158-00	LM1458
	U2080	156-0384-00	74LS03
	U3010	156-0916-00	81LS97
	U3020	156-0916-00	81LS97
	U3090	156-0411-00	LM339
	U4020	156-0384-00	74LS03
	U4030	156-1479-00	81LS98
	U4050	156-0645-00	74LS14

Grounding

A proper ground system is mandatory for satisfactory operation of your microcomputer development system. The 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. Figure 3-7 illustrates system grounding for a typical development system. 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 grounding lug.
- When installing a Prototype Control Probe, tighten the two strain relief plate mounting screws (Fig. 3-3) securely to ensure a good ground connection between the strain relief/cable clamp assembly and the rear panel of the mainframe.

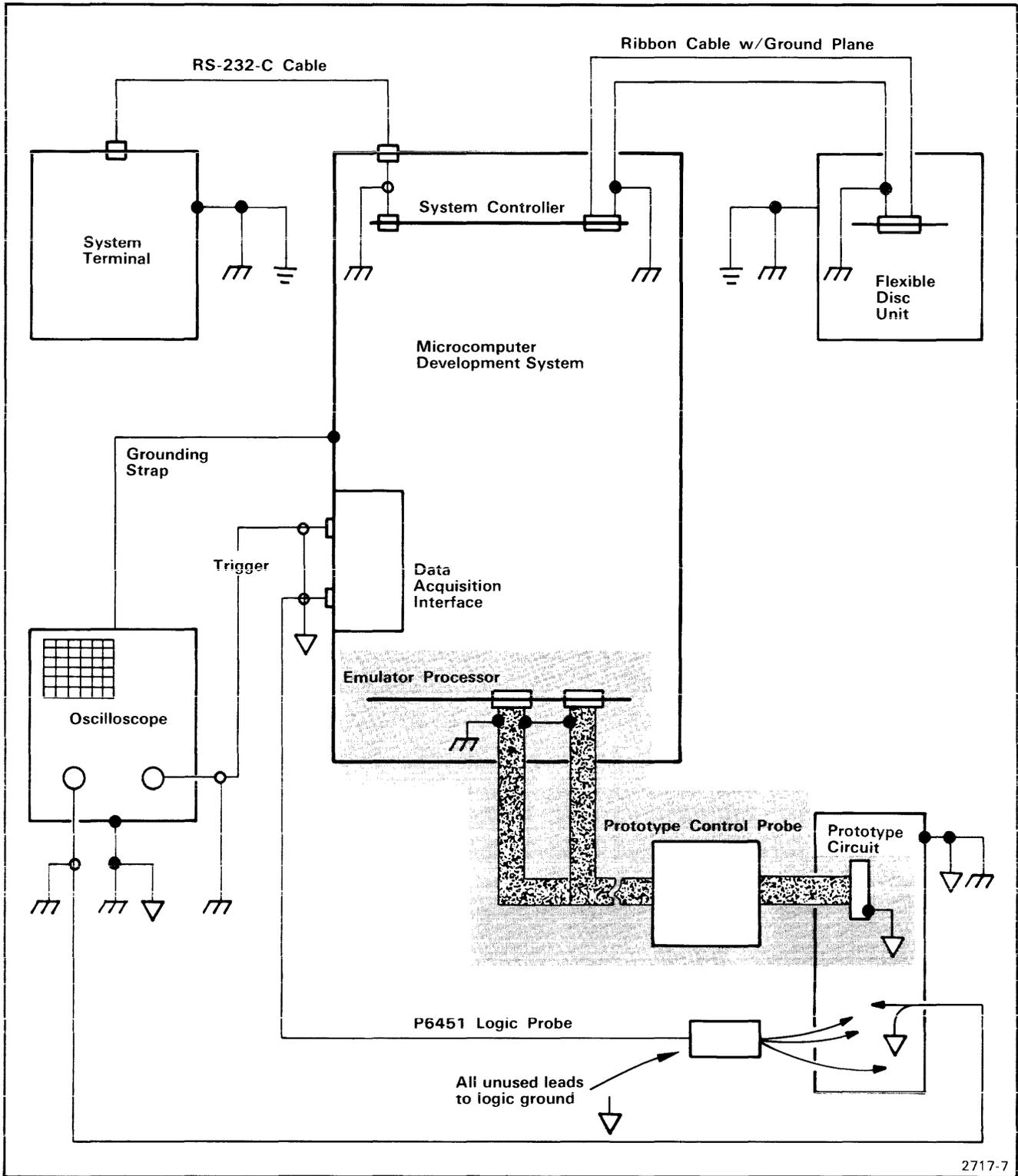


Fig. 3-7. Typical system grounding.

Section 4

PERFORMANCE VERIFICATION

Introduction

After you have installed the 8048/8021/8041A/8022 (8048) Emulator Processor and its associated Prototype Control Probe in your microcomputer development system, the Emulator Processor should be tested for proper operation. The first part of this section discusses equipment necessary to verify functional operation of the 8048 Emulator Processor and selected Prototype Control Probe. The second part of this section discusses equipment necessary to verify timing relationships of signals available at the Prototype Control Probe. Special calibration procedures for the 8022 Prototype Control Probe are discussed in the last part of this section.

Performance Verification

Equipment Required

To verify functional performance of the installed 8048 Emulator Processor, the following equipment is required:

- TEKTRONIX MicroLab I (067-0892-xx)
- MCS-48 Personality Card (018-0152-xx)

The MicroLab I checks the 8048 Emulator Processor and its Prototype Control Probe by providing a circuit with known characteristics. This circuit is monitored by MicroLab I circuitry, and test results are indicated on the MicroLab I LED display. The MicroLab I operating system also contains tests that functionally exercise the Emulator Processor and its Prototype Control Probe.

The information presented in this section assumes that you are familiar with the MicroLab I and its characteristics. For more information about this equipment, refer to the MicroLab I Instruction Manual (with the MCS-48 Personality Card supplement).

Test Procedures

Equipment Setup.

1. Ensure that primary power (115 or 230 Vac) to the microcomputer development system and to the MicroLab I is OFF.
2. Verify that the correct device identifier and (if required) socket adapter for the selected Prototype Control Probe

are installed on the MCS-48 Personality Card (see Fig. 4-1). Table 4-1 lists identifiers and adapters required for this test. Refer to the MCS-48 Personality Card supplement for additional information.

Table 4-1
Device Identifiers and Socket Adapters

Prototype Control Probe	Device Identifier	Socket Adapter
8048/8021	8048/49	Not Required
8041A	8041A	Not Required
8022	8022	8022

3. Install jumper J4 on the MCS-48 Personality Card (see Fig. 4-2).
4. Verify that jumpers J1, J2, and J3 are not installed (see Fig. 4-2).

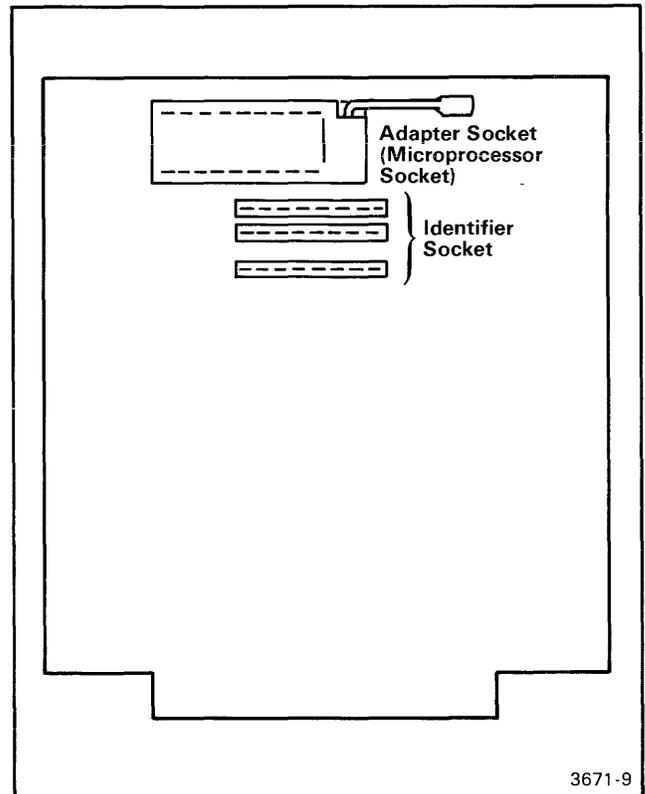


Fig. 4-1. Identifier and adapter socket locations.

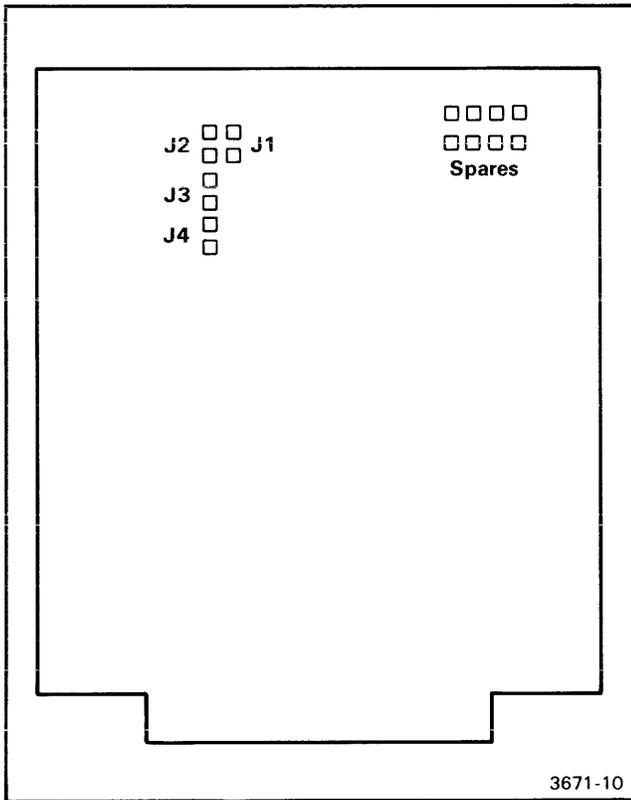


Fig. 4-2. MCS-48 Personality Card jumper locations.

5. Install the MCS-48 Personality Card in the MicroLab I.

NOTE

To ensure a secure mechanical and electrical connection between the prototype control probe's 40-pin DIP plug and the zero-insertion-force (ZIF) socket on the personality card, you should attach a standard 40 pin DIP circuit board socket to the probe plug, then plug the socket pins into the ZIF socket.

6. Plug the selected (8048/8021, 8041A, or 8022) Prototype Control Probe's 40-pin DIP plug into the ZIF socket on the MCS-48 Personality Card.

Functional Test Procedure.

1. Turn on primary power to the microcomputer development system.
2. Turn on power to the MicroLab I test fixture.

NOTE

For detailed information on operating procedures for your microcomputer development system, refer to your System User's Manual.

3. Start up (boot if necessary) the development system's Operating System.

4. At the system terminal, enter the following command line:

```
>SELECT 8048 <CR>
```

This identifies the Emulator Processor to be tested.

5. Enter the desired emulation mode.
 - a. To verify memory mapping capability, enter:

```
>EM 1 <CR>
```

When the prompt character (>) is displayed, enter:

```
>MAP U 0000-FFFF <CR>
```

- b. If only the functional operation of the Emulator Processor is to be tested, enter:

```
>EM 2 <CR>
```

6. To initiate program execution in the Emulator Processor, enter:

```
>GO 0 <CR>
```

If the 8048 Emulator Processor and selected Prototype Control Probe are operating properly, the MicroLab I will display "HELLO". This display on the MicroLab I indicates that most of the 8048 Emulator Processor logic circuitry is functioning properly. However, several control lines are not checked during initialization and should be verified with the Processor Test.

No "HELLO" Display. If the MicroLab I LEDs do not display "HELLO", a problem in the 8048 Emulator Processor module, the Prototype Control Probe, or the MicroLab I is indicated. The following procedure may be used to determine which unit is malfunctioning:

1. Turn off power to the MicroLab I and the microcomputer development system.
2. Disconnect the Prototype Control Probe from the ZIF socket on the MCS-48 Personality Card.

NOTE

Any of the 8048 family of microcomputer devices is subject to damage by static discharge when not installed in its socket. Be careful when handling one of these devices; hold it by its ends only and do not touch the pins. When the device is not in use, it should be stored in its conductive foam packing.

3. Obtain a microcomputer device, of the type being emulated, that is known to be operating properly. Install the device in the ZIF socket on the MCS-48 Personality Card.
4. Turn on power to the MicroLab I test fixture.

If the MicroLab I now displays "HELLO", the problem is in either the Emulator Processor module or the Prototype Control Probe. Refer to the optional 8048/8021/8041A/8022 Emulator Processor Service Manual for corrective maintenance information.

If "HELLO" is not displayed, a malfunction of the MicroLab I is indicated. Refer to the MicroLab I Instruction Manual for corrective maintenance information.

Processor Test Procedure.

1. Press the RESET key on the MicroLab I keypad. This initializes the processor test hardware in the MicroLab I.
2. Press the PROC TEST (Shift 1) key to start the Processor Test. The display will show "Pn".
3. Press the 0 key. The MicroLab I will begin the Processor Test sequence at PROC 0 and perform each of the Processor Tests in order. While each test is being performed, the display will show "Proc x" (where x is the number of the test being performed).

8048/8021 Processor Test. For the 8048 Emulator Processor with the 8048/8021 Prototype Control Probe attached, and the 8048/49 Identifier installed on the MCS-48 Personality Card, there are seven Processor Tests.

- PROC 0 Test of Port 1 (lines P10 through P17).
- PROC 1 Test of the PROG pulse input.
- PROC 2 Test of the T0 pin testable input function.
- PROC 3 Test of the T1 pin testable input function.
- PROC 4 Test of the interrupt input line.
- PROC 5 Test of Port 2 (lines P20 through P27).
- PROC 6 Test of the RESET function.

If any of the PROC tests fails, the LED display will indicate "Error Px", where x is the number of the PROC test that failed. If all the PROC tests are successfully completed, the LED display will indicate "rEAdY".

Successful completion of both the Functional Test and the Processor Test verifies that the 8048 Emulator Processor and 8048/8021 Prototype Control Probe are operational.

8041A and 8022 Processor Tests. For the 8048 Emulator Processor with either the 8041A or 8022 Prototype Control Probe installed, and with the appropriate identifier installed on the MCS-48 Personality Card, there are nine Processor Tests:

- PROC 0 Test of Port 1 (lines P10 through P17).
- PROC 1 Test of the PROG pulse input.
- PROC 2 Test of the T1 testable input function.
- PROC 3 Test of the RESET function.
- PROC 4 Test of Port 2 (lines P20 through P27).
- PROC 5 Test of Port 0 (lines P00 through P07).
- PROC 6 Tests the T0 interrupt input function.
- PROC 7 Tests the analog input line (AN0 on the 8022, A0 on the 8041A).
- PROC 8 Tests the analog input line AN1 (on the 8022 only).

If any of the PROC tests fails, the LED display will indicate "Error Px", where x is the number of the PROC test that failed. If all the PROC tests are successfully completed, the LED display will indicate "rEAdY".

Successful completion of both the Functional Test and the Processor Test verifies that the 8048 Emulator Processor and selected Prototype Control Probe (8041A or 8022) are operational.

Emulator Timing Verification

You may occasionally wish to verify timing relationships between the signals available at the pins of the Prototype Control Probe. The following paragraphs discuss equipment necessary to perform these timing verifications.

Details of these timing relationships are provided in the 8048/8021/8041A/8022 Emulator Specifics section of your System User's Manual.

Measurement Considerations

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 timings.

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. To measure timing relationships with the preferred accuracy and resolution, the following equipment may be used:

- TEKTRONIX 7844 Dual Beam Oscilloscope, or equivalent
- TEKTRONIX 7A26 Vertical Amplifier, 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.

8022 Prototype Control Probe Calibration

The 8022 microcomputer contains an internal analog-to-digital converter (ADC). Since the 8035 emulating microcomputer does not have an internal ADC, this function exists as hardware circuitry on the 8022 Prototype Control Probe. To establish and maintain the required accuracy of these analog-to-digital conversions, the 8022 Prototype Control Probe must be calibrated at initial installation and periodically thereafter.

ADC Calibration Procedure

The ADC in the 8022 microcomputer is accurate to ± 1 LSB. The switching point accuracy is $\pm 1/2$ LSB. In order to maintain the 8022 Prototype Control Probe at the same degree of accuracy as the 8022 microcomputer, the ADC should be checked and adjusted approximately every six months (or 1000 hours of operation).

Equipment Required.

- TEKTRONIX microcomputer development system, with the 8048 Emulator Processor module and 8022 Prototype Control Probe installed
- TEKTRONIX MicroLab I with an MCS-48 Personality Card (configured for an 8022 microcomputer) installed
- DVM with 100 μ V resolution and $\pm 0.1\%$ accuracy (TEKTRONIX DM501 or equivalent)
- Two precision power supplies, with output voltages variable from 0.000 to +5.000 Vdc (TEKTRONIX PS503 or equivalent)

Procedure.

1. Ensure that primary power (115 or 230 Vac) to all equipment is OFF.

NOTE

Your interface assembly may have either a plastic or a metal housing. Disassembly procedures are similar for either interface assembly housing.

2. Remove the four screws at the corners on the bottom of the interface assembly housing.
3. Remove the top cover of the interface assembly and set it aside.

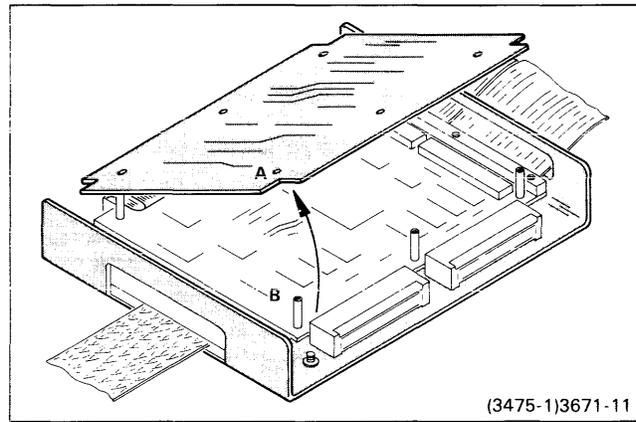


Fig. 4-3. Prototype Control Probe interface assembly; access to Driver/Receiver board "B".

4. The upper circuit board is Driver/Receiver board "A". Remove the three screws from each side of Driver/Receiver board "A", then swing the board over to the left to gain access to Driver/Receiver board "B". Refer to Fig. 4-3.

NOTE

Do not disconnect the interconnecting ribbon cables between Driver/Receiver boards "A" and "B".

5. Connect the ground lead of each of the two precision power supplies to the negative (-) test probe of the DVM.
6. Designate one power supply as power supply A and the other as power supply B.
7. Set the output voltage of power supply A (VAREF) to +5.000 Vdc.
8. Locate the 8022 Identifier on the MCS-48 Personality Card (see Fig. 4-1). There are two rows of square jumper pins on the identifier; remove all jumpers from these pins. Connect the positive (+) output of power supply A to pin 1 of the numbered row of jumper pins.
9. Set the voltage of power supply B (ANO) at +2.500 Vdc.
10. Connect the positive (+) output of power supply B to jumper pin 3 on the identifier.
11. Connect the negative (-) DVM test probe, and the attached power supply ground leads, to jumper pin 4 on the identifier.
12. Turn on your microcomputer development system.
13. Turn on the MicroLab I.
14. Turn on the DVM and power supplies A and B.

Performance Verification: 8048/8021/8041A/8022 Emulator Processor Installation

15. At the system terminal, enter the following commands:
 - PA 00 85800400 <CR>
 - TRACE ALL <CR>
 - GO 00 <CR>
16. Observe the trace line displayed on the system terminal. The number in column RA indicates the digital value of the analog signal being converted.
17. Variable resistor R1052 is located on the component side of Driver/Receiver board "B", near edge connector P4 (see Fig. 4-4). Adjust R1052 until RA indicates a value of 7F. To increase the value of RA, turn R1052 counterclockwise; to decrease the value, turn R1052 clockwise.
18. Slowly rotate R1052 counterclockwise until the value of RA changes to 80, then stop. Carefully note the position of the R1052 adjusting screw.
19. Slowly, while counting the number of turns, rotate R1052 counterclockwise until RA changes to 81, then stop.
20. Turn R1052 clockwise exactly half the number of turns noted in the preceding step. RA should now equal 80, and R1052 should be precisely centered between RA values of 7F and 81.
21. To verify the accuracy of the ADC calibration, perform the following steps:
 - a. Adjust power supply B to +5.000 Vdc. RA should read FF or FE (± 1 LSB).
 - b. Adjust power supply B to 0.000 Vdc. RA should read 00 or 01 (± 1 LSB).
 - c. Adjust power supply B to +1.250 Vdc and power supply A to +2.500 Vdc. RA should read 80 (± 1 LSB).
22. Turn off power to all equipment.
23. Disconnect all test equipment. Reinstall all 8022 Identifier jumpers removed previously.
24. Return Driver/Receiver board "A" to its installed position, then install the six screws removed in step .
25. Reassemble the Prototype Control Probe interface assembly in reverse order of disassembly.

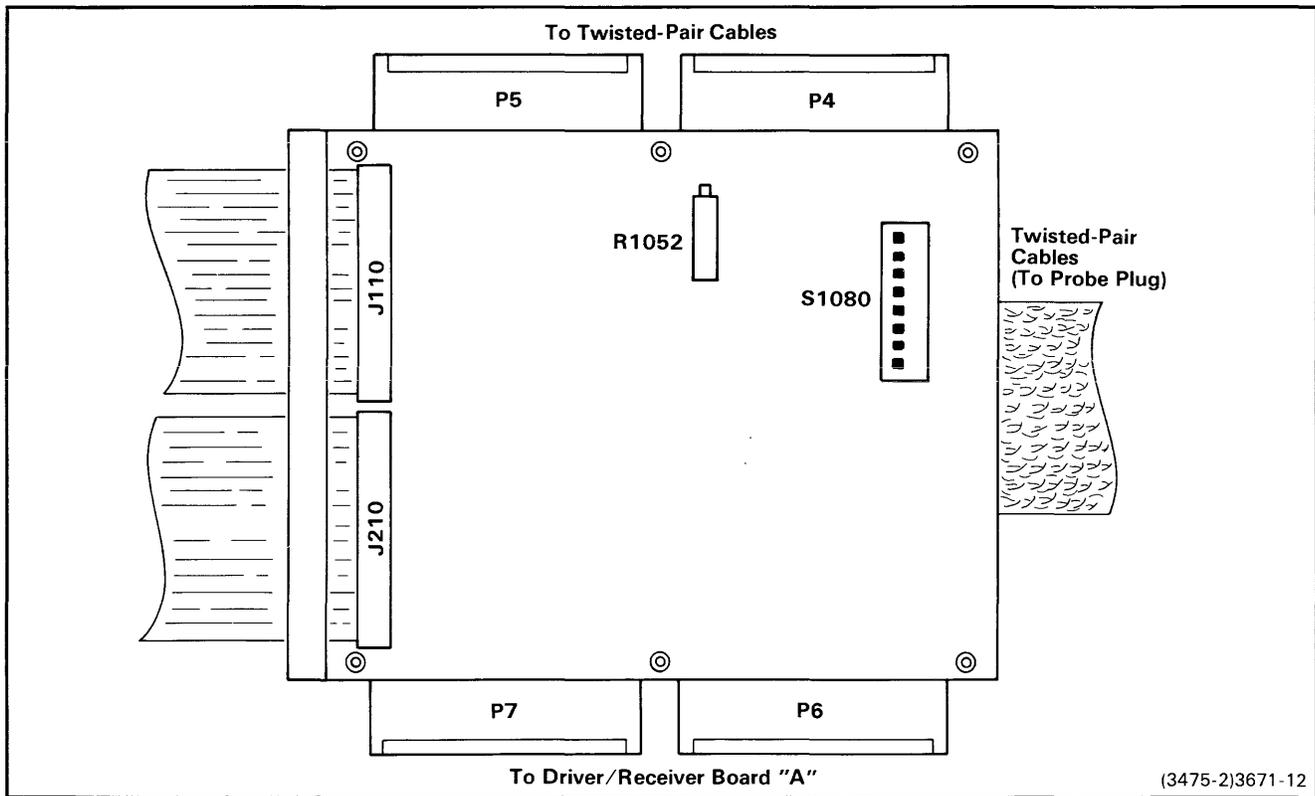


Fig. 4-4. Driver/Receiver board "B"; location of R1052.

MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

DESCRIPTION

Product Group 61

TEXT ADDITIONS

Page ii At the end of the list of Section 3 - Installation Procedures subheadings, add the following subheading:

Installing 8540 Option ROM

Page 3-6 At the end of Section 3 - Installation Procedures, add the following information:

Installing 8540 Option ROM

When you are installing a new 8540 option or installing an 8550 to 8540 Option Conversion Kit, it is necessary to install option ROM devices on the System ROM Board. There is no requirement for the ROM to be installed in specific sockets. However, it is recommended that the option ROM be installed in the following locations:

- The Emulator Option ROM should be installed in the sockets labeled CS82 through CS8B as shown in Fig. 3-8 (circuit numbers U1010 through U1070 and U3010 through U3070 on the System ROM Board).
- Install the PROM Programmer Option ROM in locations CS90 and CS91 as shown in Fig. 3-8 (circuit numbers U1110 and U1120 on the System ROM Board).
- The Communications Option (COMM Option) ROM should be installed in location CS8F as shown in Fig. 3-8 (circuit number U4060 on the System ROM Board).
- Install the Trigger Trace Analyzer Option ROM in locations CS8E, CS8D and CS8C as shown in Fig. 3-8 (circuit numbers U4050, U4030 and U4010 on the System ROM Board).

DESCRIPTION

The spare ROM sockets for options are limited. When you add or replace Emulator Processor Boards, it may be necessary to remove unneeded ROM to allow installation of required ROM.

Figure 3-8 shows the locations and the assigned labels for the 32 ROM sockets on the System ROM Board.

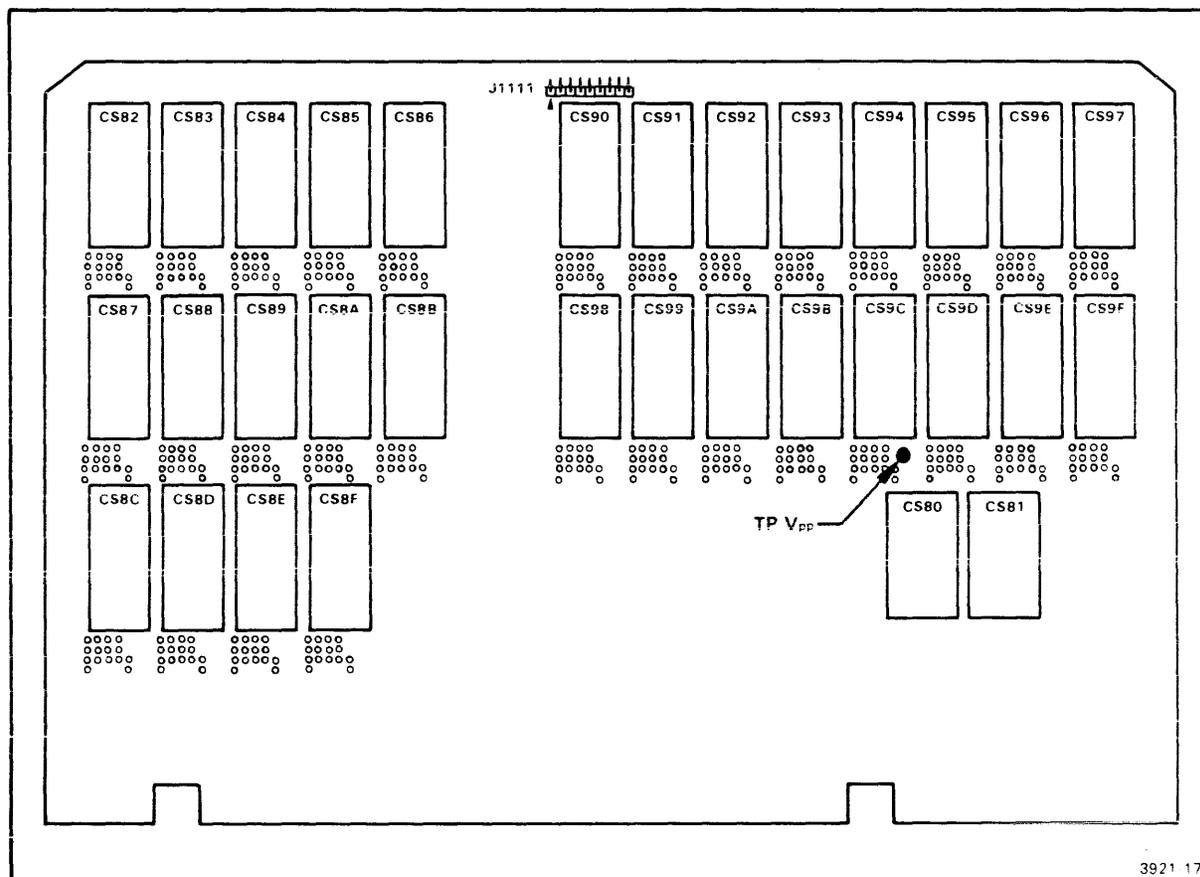


Fig. 3-8. System ROM Board socket locations.