

Instruction Manual



DAS 92DM923 88110 Microprocessor Support 070-8794-00

Warning

The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to the Safety Summary prior to performing service.

Please check for change information at the rear of this manual.

First Printing: April 1993
Revised Printing: December 1993
Online Version: April 1997

Instrument Serial Numbers

Each instrument manufactured by Tektronix has a serial number on a panel insert or tag, or stamped on the chassis. The first letter in the serial number designates the country of manufacture. The last five digits of the serial number are assigned sequentially and are unique to each instrument. Those manufactured in the United States have six unique digits. The country of manufacture is identified as follows:

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

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Preface: **GUIDE TO DAS 9200 DOCUMENTATION**

The Digital Analysis System (DAS) 9200 documentation package provides the information necessary to install, operate, maintain, and service the DAS 9200. The DAS 9200 documentation consists of the following:

- a series of microprocessor-specific **microprocessor support instructions** that describe the various microprocessor support packages.
- a **system user manual** that includes a beginning user's orientation, a discussion of DAS 9200 system-level operation, and reference information such as installation procedures, specifications, error messages, and a complete system glossary.
- a series of **module user manuals** that describe each of the DAS 9200 acquisition, pattern generation, and optional I/O modules.
- an **on-line documentation** package that includes context-sensitive technical notes.
- a **programmable command language user manual** that describes the set of programmatic commands available for remotely controlling the DAS 9200.
- a series of **application software user manuals** that describe the various application software packages.
- a **technician's reference manual** that helps a qualified technician isolate DAS 9200 problems to the individual module level and determine corrective action (including on-site removal and replacement of modules).
- a **verification and adjustment procedures manual** that allows a qualified technician to make necessary adjustments and verify specifications of the mainframe and modules.
- a series of **workbooks** that teach concepts about the DAS 9200 acquisition modules and pattern generation modules.

GENERAL SAFETY SUMMARY/ MICROPROCESSOR SUPPORT

The general safety information in this summary is for operating and servicing personnel. Specific warnings and cautions can be found throughout the manual where they apply and may not appear in this summary. While using this product you may need to access parts of the mainframe system; if so, read the General Safety Summary in your system user manual for warnings and cautions related to operating the mainframe system.

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.

TERMS AS MARKED ON EQUIPMENT



CAUTION indicates a hazard to property, including the equipment itself, and could cause minor personal injury.



WARNING indicates solely a personal injury hazard not immediately accessible as you read the marking.

DANGER indicates a personal injury hazard immediately accessible as you read the marking.

SYMBOLS AS MARKED ON EQUIPMENT



DANGER
High Voltage



Protective
ground (earth)
terminal



ATTENTION
Refer to
manual

USE CARE WITH COVERS REMOVED

To avoid personal injury, remove jewelry such as rings, watches, and other metallic objects before removing the cover. Do not touch exposed connections and components within the product while the power cord is connected.

REMOVE FROM OPERATION

If you have reason to believe that the instrument has suffered a component failure, do not operate the instrument until the cause of the failure has been determined and corrected.

USE THE PROPER FUSE

To avoid fire hazard, use only a fuse of the correct type, voltage rating, and current rating.

REMOVE LOOSE OBJECTS

During disassembly or installation procedures, screws or other small objects may fall to the bottom of the mainframe. To avoid shorting out the power supply, do not power on the instrument until such objects have been removed.

DO NOT OPERATE IN EXPLOSIVE ATMOSPHERES

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

Section 1: OVERVIEW

The 92DM900 series of support products are developed by third parties to support buses, microprocessors, microcontrollers, and digital signal processors for specific Tektronix customers. The products are currently being successfully used by these customers. If you need assistance in using this product, contact a Tektronix Technical Support Specialist.

This section provides basic information on the following:

- the 92DM923 Microprocessor Support product
- software compatibility
- DAS 9200 configuration
- your 88110 system requirements
- 92DM923 restrictions
- this manual

The 92DM923 Microprocessor Support product disassembles data from systems that are based on the Motorola 88110 microprocessor. The 92DM923 product runs on a DAS 9200 logic analyzer equipped with two 92A96 Acquisition Modules in adjacent slots.

The 92DM923 package support the 88110 microprocessor in a 299-pin PGA package.

This product consists of software on a floppy disk, a probe adapter, and this manual. The software includes setup files, a demonstration reference memory, symbol tables, and a disassembler program. A complete list of accessories and options is provided at the end of the mechanical parts list in *Appendix D: Parts Lists*.

A demonstration reference memory is provided so you can see an example of disassembled instruction mnemonics. You can view the reference memory without connecting the DAS 9200 to your system under test. The reference memory is automatically installed on the DAS 9200 when you install the disassembler software. Directions for viewing this file are in *Section 4: Acquiring and Viewing Disassembled Data*.

To use this product efficiently, you need to have the following:

- knowledge of your DAS 9200 configuration and its operation
- knowledge of your 88110 system
- this manual
- the *DAS 9200 System User Manual*
- the *92A96 Module User Manual*, Tektronix, Inc. 1992
- a user manual for your 88110 microprocessor
- LA-LINK (if you want to download symbols from your high-level development system)

DAS 9200 SYSTEM SOFTWARE COMPATIBILITY

The 92DM923 Microprocessor Support Product is compatible only with DAS 9200 System Software Release 3, Version 1.3 or higher, DAS 92XTerm System Software Release 3, Version 1.3 or higher, and DAS 9202XT System Software Release 3, Version 1.3 or higher.

DAS 9200 CONFIGURATION

To use the microprocessor support product, your DAS 9200 must be equipped with two 92A96 Modules in adjacent slots and four standard data acquisition probes.

Figure 1-1 shows a standard probe connected to a DAS 9200.

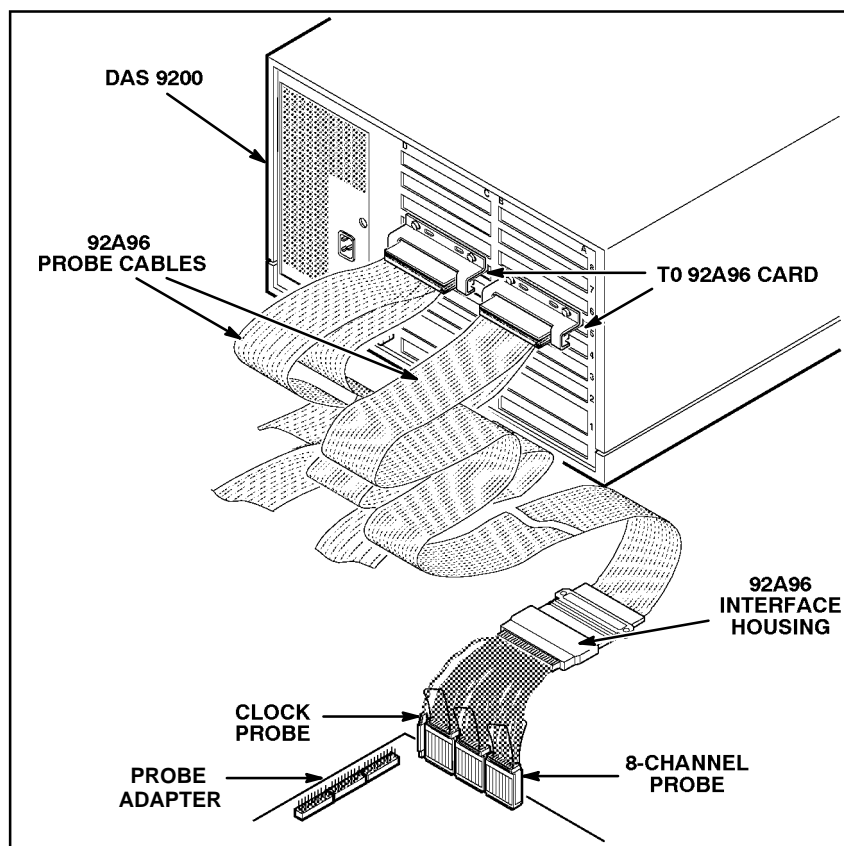


Figure 1-1. DAS 9200 connected to a typical probe adapter.

REQUIREMENTS AND RESTRICTIONS

You should review all electrical, environmental, and mechanical specifications in Appendix C as they pertain to your system under test. The remainder of this section describes other requirements and restrictions of the microprocessor support product.

System Clock Rate. The microprocessor support product supports the 88110 microprocessor at speeds of up to 50 MHz¹.

Probe Adapter Clearance. Your 88110 system must have a minimum amount of clear space surrounding the 88110 microprocessor to accommodate the probe adapter. Figure C-2 in *Appendix C: Service Information* gives these dimensions.

¹ Specification at time of printing. Contact your DAS 9200 sales representative for current information on the fastest devices supported.

Probe Adapter Loading. Any electrical connection to your system adds an additional ac and dc load. The probe adapter was carefully designed to add a minimum load to your system. However, this additional load may affect the operation of the 88110 microprocessor in systems with extremely tight timing margins. Appendix C contains specifications on how the probe adapter affects your system.

88110 System and Probe Adapter Cooling. You must be sure to retain the original level of cooling for your 88110 system after you install the probe adapter. To maintain the required operating temperature, you may need to provide additional cooling for the probe adapter.

ABOUT THIS MANUAL

This manual is based on the assumption that you are familiar with the operation of the DAS 9200 mainframe and the 92A96 Acquisition Module. Therefore, details about system software and how to move through the menu structure are not provided. An overview of those functions is provided so that you do not need to consult another manual.

This manual provides detailed information on how to do the following:

- connect to your system under test
- setup disassembler software and use it
- view acquired data
- maintain disassembler hardware

Read *Section 5: General Purpose Analysis* if you are going to acquire and view timing or state data for purposes other than disassembly.

Manual Conventions

The following conventions are used in this manual:

- the terms disassembler and disassembler software are used interchangeably in reference to the 92DM923 software that disassembles bus cycles into instruction mnemonics and cycle types.
- the term SUT (system under test) is used to refer to the microprocessor system from which data is being acquired.
- references to 92A96 Modules include all versions of those modules unless otherwise noted.
- a signal that is active low has a tilde (~) following its name.

Section 2: INSTALLATION AND CONNECTIONS

This section describes how to do the following:

- install the disassembler software
- configure the probe adapter
- connect the DAS 9200 to the SUT (system under test)

INSTALLING SOFTWARE

Before installing the microprocessor application software, you should be aware that there are three different versions of DAS 9200 system software: the 9201T version, the 92XTerm version, and the 9202XT version. The 9201T version allows you to operate the DAS 9200 from a 9201T terminal. The 92XTerm version allows you to operate the DAS 9200 in an X window on a workstation. The 9202XT version allows you to operate the DAS 9200 in an X window on a 9202XT terminal.

NOTE

To use the microprocessor support package, you must install application software that is compatible with your DAS 9200 mainframe configuration and system software.

Two floppy disks are shipped with the 92DM923 support. To determine which floppy disk contains compatible application software, follow these steps:

1. Note the terminal type that will display the DAS 9200 user interface.
2. Power on the DAS 9200 mainframe or system, and press the Select Menu key.
3. Select the HW/SW Version menu in the Utilities menu column, and press Return.
4. Look at the System Software line to find the version of system software loaded. Use Table 2-1 to choose the correct floppy disk to install. If your system software is an older version than the one listed in the table, you should update your system software before installing the application.

**Table 2-1
Choosing the Correct Floppy Disk**

Terminal Type	System Software Line Information*	Install Floppy Disk Labelled
9200T/9201T	Release 3, Version 1.30†	DAS 9201T Application Software - 92DM923
X window on a workstation or a 9202XT	Release 3, Version 1.30†	DAS 92XTERM Application SW - 92DM923

*Version numbers shown are the lowest supported; higher versions within the same release are also supported.

†The 9201T version of this application should operate properly with DAS 9200 system software Release 2, Version 1.20. However, you should be aware that this application was actually tested using Release 3, Version 1.3, the currently supported version.

If you have any two types of DAS 9200 system software, (9201T, 92XTerm, 9202XT), and you switch between the two, you must install compatible application software on each system.

If you try to install application software onto an incompatible system or terminal using DAS 9200 System Software Release 3, V1.1 or greater, an error message displays.

If you try to install application software onto an incompatible system or terminal using DAS 9200 System Software Release 3, V1.0 or lower, the system will install the software but it will not operate properly when you try to use it.

Install the disassembler software onto the DAS 9200 as follows:

1. Power up the DAS 9200 mainframe.
2. Insert the appropriate disk into the DAS 9200's floppy drive.
3. Press the Select Menu key, and select the Disk Services menu.
4. Select Install Application in the Operation field of the menu.
5. Press F8: EXECUTE OPERATION, and follow the on-screen prompts.

NOTE

After each install and load operation, a message appears on the screen informing you the operation succeeded or failed. If the message tells you the operation failed, you may need to remove applications or files from the hard disk and try installing or loading again. If the operation fails again, refer to Appendix A: Error Messages and Disassembly Problems.

CONFIGURING THE DAS 9200

To acquire data from an 88110 microprocessor, two 92A96 Modules are required. They must be configured into one variable-width module.

When using a variable-width module, both 92A96 Modules must be positioned in adjacent DAS 9200 slots. The module in the higher-numbered slot is referred to as the HI module; the module in the lower-numbered slot is referred to as the LO module. You cannot use slots 1 or 8 when creating a variable-width module. The modules do not need to have the same memory depth.

You should check the System Configuration menu to verify that the variable-width module is defined correctly. Figure 2-1 shows how the Sys Config menu looks when two 92A96 Modules are combined into a variable-width module.

Probe connections on the probe adapter board are labeled to identify which module and which probe group connects to them. For example, LO_A0 indicates the A0 group from the LO Module.



Figure 2-1. Sys Config menu with a variable-width module defined.

Refer to your module user manual for additional information about variable-width modules, connecting probe cables, and positioning and installing 92A96 Modules.

In a system with multiple modules, it is easier to identify which modules are connected to the probe adapter if slot number labels are applied to the 92A96 probe interface housings and DAS 9200 mainframe. Figure 2-2 shows how to apply slot number labels.

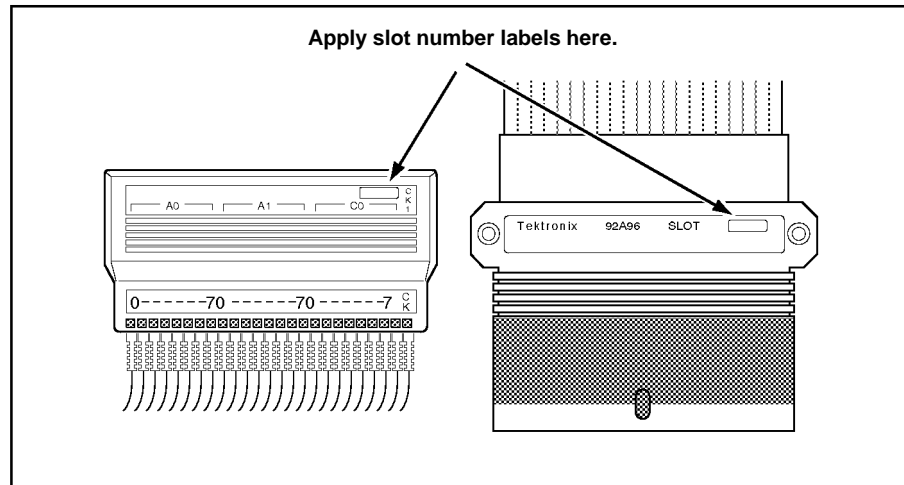


Figure 2-2. Applying slot number labels.

CONFIGURING THE PROBE ADAPTER

You need to set a jumper on the probe adapter before connecting the probe adapter to the SUT. This jumper can be used to disable the microprocessor's internal cache by pulling the DBUG pin to an active low state.

The normal position does not pull the DBUG pin low. DBUG position pulls the signal low. If the jumper is placed in the debug position the DBUG pin should be disconnected from the user SUT. You can disconnect the DBUG pin by removing the W6 pin from the sacrifice socket.

CONNECTING TO THE SYSTEM UNDER TEST

Before you connect to the SUT, you must connect the standard probes to the 92A96 Module card. Your SUT must also have a minimum amount of clear space surrounding the microprocessor to accommodate the probe adapter. Refer to *Appendix C: Service Information* for the required clearances.

To connect the DAS 9200 to the SUT, do the following:

1. Turn off power to your SUT. It is not necessary to turn off power to the DAS 9200.



Static discharge can damage the microprocessor, the probe adapter, the podlets, or the 92A96 Module. To prevent static damage, handle the microprocessor only in a static-free environment.

Always wear a grounding wrist strap or similar device while handling the microprocessor and probe adapter.

2. To discharge your stored static electricity, touch the ground jack located on the back of the DAS 9200. Then, touch any of the ground pins of the probe adapter to discharge stored static electricity from the probe adapter.
3. Place the probe adapter onto the antistatic shipping foam to support the probe as shown Figure 2-3. This prevents the circuit board from flexing and the socket pins from bending.
4. Remove the 88110 microprocessor from your SUT.
5. Line up the pin A1 indicator on the microprocessor with the pin A1 indicator on the probe adapter board.



Failure to correctly place the microprocessor into the probe adapter may permanently damage the microprocessor once power is applied.

6. Place the microprocessor into the probe adapter as shown in Figure 2-3.

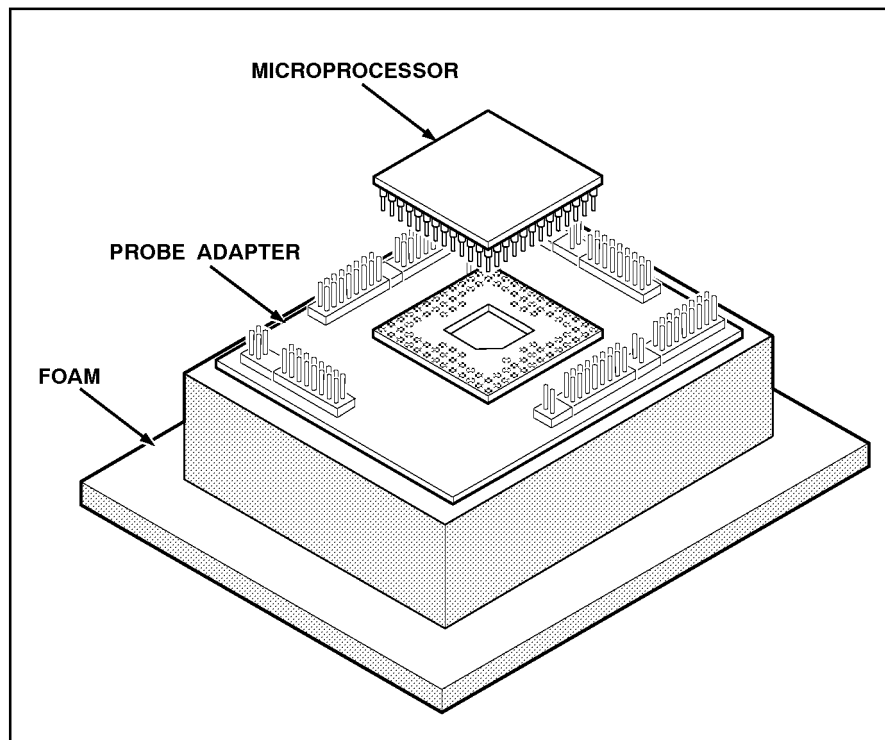


Figure 2-3. Placing the microprocessor into a typical PGA probe adapter.

7. Connect the clock and 8-channel probes to the probe adapter as shown in Figure 2-4. Match the channel groups and numbers on the interface housing to the corresponding pins on the probe adapter.

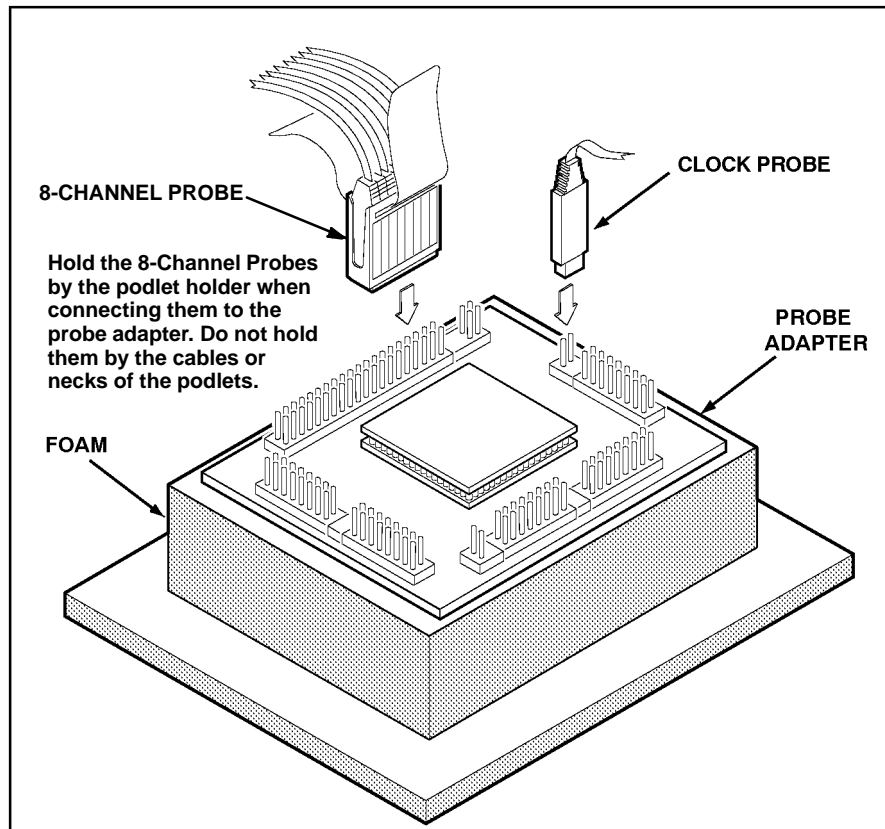


Figure 2-4. Connecting the podlets to a typical PGA probe adapter.

8. Line up the pin A1 indicator on the probe adapter board with the pin A1 indicator on your SUT.
9. Place the probe adapter onto the SUT as shown in Figure 2-5.

NOTE

You may need to stack one or more replacement sockets between the SUT and the probe adapter to provide sufficient vertical clearance from adjacent components. However, keep in mind this may increase loading, which can reduce the electrical performance of your probe adapter.

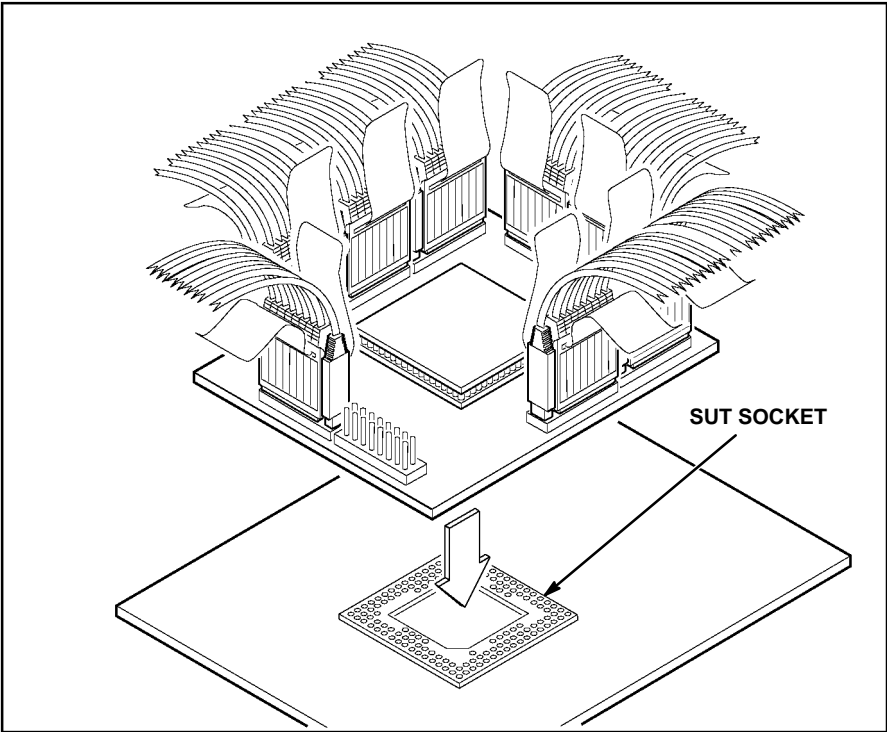


Figure 2-5. Placing a typical PGA probe adapter onto the SUT.

Section 3: **SETTING UP DISASSEMBLER SOFTWARE**

This section tells how to prepare the disassembler software to acquire data and discusses the following:

- loading support software
- channel groups and assignments
- changes that affect disassembly
- clocking options
- symbols
- triggering

Before you acquire and disassemble data, you need to load support software, and specify setups for clocking, triggering, and using symbols. The disassembly software provides default values for each of these setup controls, but you can change them as needed.

LOADING DISASSEMBLER SOFTWARE

To load the 88110 support, follow these steps:

1. Press the Menu Select key, select the appropriate 92A96 Module, select its Configuration menu, and press Return.
2. Select 88110 in the Software Support field.
3. Press F8: EXECUTE OPERATION.

When you load the support software, the Channel, Clock, and Trigger menus are automatically set up to acquire data from your 88110 system. You can change the setups in the Clock and Trigger menus as needed. Refer to *Channel Groups and Assignments* for information on what can be changed in the Channel menu.

CHANNEL GROUPS AND ASSIGNMENTS

The disassembler software automatically defines the channel groups for the microprocessor. The following list describes the channel groups defined for this microprocessor:

ADDRESS	BP	INTR	RL	TSIZ
ARBTR	CACHE	JTAG	SNOOP	TSTATEA
AUX0	CLK	LO_DATA	TCOD	
AUX1	HI_DATA	PSTAT		

These groups cannot be changed; however, you can define and display additional groups. If you want to know which signal is in which group, refer to the channel assignment table in *Appendix C: Service Information*. Channel assignments are also shown in the 92A96 Channel setup menu.

CHANGES THAT AFFECT DISASSEMBLY

You can change part of the default setups for the 92A96 Module. However, keep in mind that if you change any of the following items, the disassembled data will be affected:

- threshold voltage
- display polarity

CLOCKING

The 92DM923 software offers a customized clocking selection for the 88110 microprocessor. This clocking choice (Custom) is the default selection.

The 92DM923 software acquires all terminated cycles. No clock options are available. A description of how cycles are sampled by the disassembler is found in Appendix B.

Disassembly will not be correct with the Internal or External clocking modes. Refer to *Section 5: General Purpose Analysis* for a description of using these other clock selections with this microprocessor support package.

SYMBOLS

Symbols can be used to represent a specific channel group value or a range of channel group values (defined by upper and lower bounds).

You can use symbol tables to display channel group information symbolically in the State and Disassembly menus and to control triggering. There is a symbol table file (named 88110_TCOD) supplied by the disassembler software that replaces specific TCOd channel group values.

Table 3-1 shows the names, bit patterns, and meaning for the symbols in the file 88110_TCOD, the TCOd group symbol table.

Table 3-1
88110_TCOD Symbol Table Definitions

Symbol	TCOD Group Value				Meaning
	TC_3	TC_2	TC_1	TC_0	
USR_D_AC	0	0	0	1	User data access
USR_T,F,A	0	0	1	0	User touch, flush, allocate
D_MMU_TW	0	0	1	1	Data MMU tablewalk
REP_CPB	0	1	0	0	Replace copyback
SUP_D_AC	0	1	0	1	Supervisor data access
SUP_T,F,A	0	1	1	0	Supervisor touch, flush, allocate
SN_CPB	0	1	1	1	Snoop copyback
USR_IN_AC	1	0	0	1	User instruction access
IN_MMU_TW	1	0	1	1	Instruction MMU tablewalk
SUP_IN_AC	1	1	0	1	Supervisor instruction access

Table 3-2 shows the names, bit patterns, and meaning for the symbols in the file 88110_RL, the RL group symbol table.

Table 3-2
88110_RL Symbol Table Definitions

Symbol	RL Group Value		Meaning
	R/W	LK	
READ	1	1	Read
WRITE	0	1	Write
LK_READ	1	0	Locked read
LK_WRITE	0	0	Locked write

Table 3-3 shows the names, bit patterns, and meaning for the symbols in the file 88110_TSIZ, the TSIZ group symbol table.

Table 3-3
88110_TSIZ Symbol Table Definitions

Symbol	TSIZ Group Value			Meaning
	TSIZ_1	TSIZ_0	TBST	
8_W_BURST	X	X	0	8-word burst (32 bytes)
D_W	0	0	1	Double word (64 bits)
W	0	1	1	Word (32 bits)
H_W	1	0	1	Half word (16 bits)
B	1	1	1	Byte (8 bits)

Refer to *Triggering* in this section and *Displaying the Address Group Symbolically* in Section 4 for more information on using and displaying symbolic values. Refer also to *Searching Through Data* in Section 4 for information on how to use symbol table values for data searches.

Copying and Editing the Predefined Symbol Tables. You cannot directly edit any symbol tables supplied by microprocessor support. You can make a copy of a predefined symbol table and then edit the copy for your specific use.

To create a new symbol table, follow these steps:

1. Select the Symbol Editor menu from the Menu Selection overlay.
2. Press F2: FILE FUNCTIONS.
3. Select Open File in the Function field, and press Return.
4. Select New File in the Edit Status field, and press Return.
5. Enter a new symbol table file name in the New File Name field.
6. Select Pattern or Range in the Table Type field to match the symbol table you are copying, and press Return.
7. Press F5: EXECUTE FUNCTION.
8. Select Merge Files in the Function field, and press Return.
9. Select the file to base your new symbol table on, such as the 88110_TCOD file.
10. Press F5: EXECUTE FUNCTION.
11. Press F8: EXIT & SAVE.

12. Edit the file as desired keeping the following in mind:
 - If the new symbol has fewer don't cares than an existing symbol, it must be placed ahead of the existing symbol.
 - If the new symbol has more don't cares than an existing symbol, it must be placed after the existing symbol.
 - Do not duplicate symbol names.

Also refer to your *DAS 9200 System User Manual* for more information on editing the symbol table.

13. Select the Channel menu from the Menu Selection overlay.
14. Change the file name of the symbol table for the TCO group (or whichever group's symbol table you are replacing) to the one that you specified in step 5.

TRIGGERING

All the Trigger menu selections available for use with your 92A96 Module are still valid for disassembly. Refer to your module user manual for a list and description of these selections.

You can use the Home key to quickly clear the word recognizer field of any channel group with a symbolic radix. To clear a word recognizer, open the field, press the Home key, and close the field. The first entry on the list is blank.

The DAS 9200 makes it possible to cross-trigger with other modules or to an external instrument. You may want to consider sending or receiving a signal to or from another module, or to the Sync Out SMB connector on the module. You should refer to your *DAS 9200 System User Manual* for an in-depth description of defining and using signals, and to specific module user manuals for a description of using the Sync Out SMB connector.

Section 4: ACQUIRING AND VIEWING DISASSEMBLED DATA

This section describes how to acquire data and view it disassembled in the Disassembly display. This section explains:

- acquiring data
- viewing disassembled data in various formats
- functions of the Disassembly Format Definition overlay
- displaying groups symbolically
- restoring and viewing the demonstration reference memory
- searching through data
- printing data

ACQUIRING DATA

Once you load the 88110 support, choose a clocking mode, and specify the trigger, you are ready to acquire data. Press the F1: START acquisition key to begin the acquisition. You can press the F1: STOP key at any time to stop acquisition.

If you have any problems acquiring data, refer to *Appendix A: Error Messages and Disassembly Problems*.

VIEWING DISASSEMBLED DATA

Disassembled data is displayed in the Disassembly menu in four different formats: Hardware, Software, Control Flow, and Subroutine. To select a format, follow these steps:

1. Press the Select Menu key, and select the Disasm menu.
2. Press F5: DEFINE FORMAT.
3. Select the desired format in the Display Mode field.
4. Press F1: ESCAPE & CANCEL.

Hardware Display Format

The Hardware display format shows the Address, Data, and Control channel values for each sample of acquired data in the order they occurred. In Hardware data format, the disassembler displays certain cycle type labels in parentheses. Table 4-1 shows these cycle type labels and gives a definition of the cycle they represent. Reads to interrupt and exception vectors will be labeled with the vector name.

**Table 4-1
Cycle Type Definitions**

Cycle Type	Definition
** RESERVED **	Reserved
(TCH/FLSH/ALLOC <CYCLESIZE>)	Touch, flush, or allocate
(DATA MMU TBLWLK)	Data MMU tablesearch
(RLMNT COPYBACK)	Replacement copyback
(SNOOP COPYBACK)	Snoop copyback
(INST MMU TBLWLK)	Instruction MMU tablesearch
(FLUSH)	Flush
(UNUSED PREFETCH)	Unused prefetch
(TRANSFER ERROR CYCLE)	Transfer error cycle
(TRANSFER RETRY CYCLE)	Transfer retry cycle
(RD DATA <CYCLESIZE>)	Read data <cyclesize>
(WR DATA <CYCLESIZE>)	Write data <cyclesize>
(LWR DATA <CYCLESIZE>)	Locked write data <cyclesize>
(LRD DATA <CYCLESIZE>)	Locked read data <cyclesize>

(U) = User mode.
(S) = Supervisor mode.

Figure 4-1 shows an example of the Hardware display.

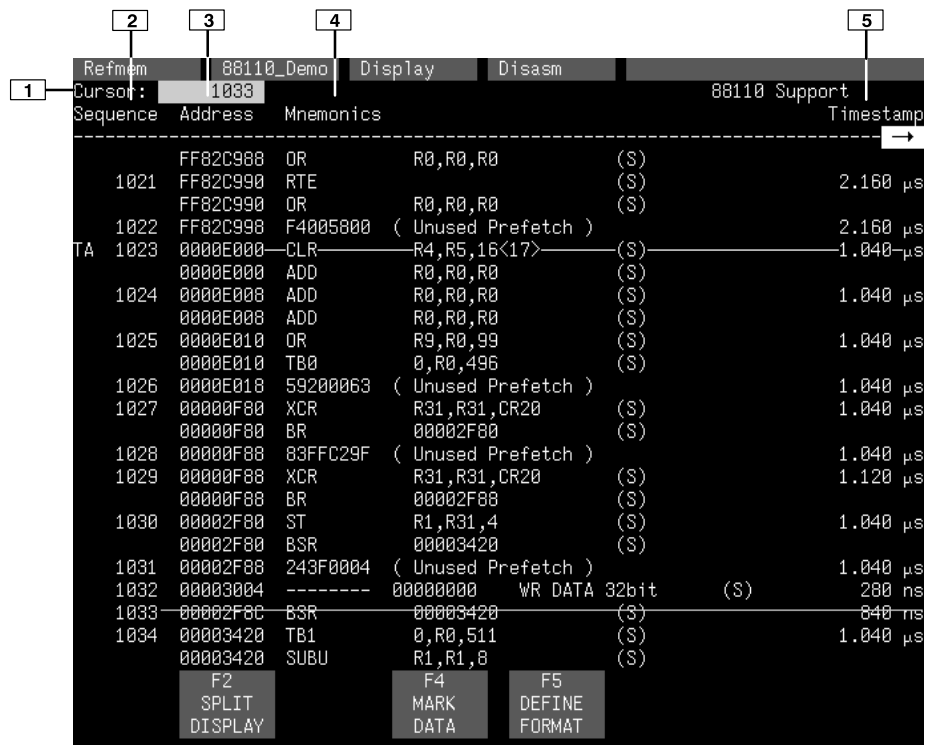


Figure 4-1. Hardware display.

- 1 **Cursor.** Shows the DAS 9200 sequence number on which the cursor is positioned.
- 2 **Sequence Column.** Lists DAS 9200 memory locations for the acquired data.
- 3 **Address Group.** Lists data from channels connected to the 88110 Address bus.
- 4 **Mnemonics Column.** Lists the instructions that have been disassembled.
- 5 **Timestamp Column.** Lists the timestamp values when a timestamp selection is made in the Disassembly Format Definition overlay.

Asterisks in the Mnemonics column indicate that there is insufficient data available for complete disassembly of the instruction. The number of asterisks shows the width of the data that is not available. Two asterisks (**) represent a byte.

Gaps in the acquired data, caused by data qualification specified in the Trigger menu, are indicated by a gray background behind the Address, Hi_Data, and Lo_Data groups.

Software Display Format

The Software data format displays only the first fetch of executed instructions. Flushed cycles and extensions are not shown, even though they are part of the executed instruction. The display is designed to resemble assembly language listings.

Control Flow Display Format

The Control Flow display format displays any instruction that changes the flow of control, such as the following:

- the first fetch of instructions that cause a branch in the address; branches not taken are not displayed
- conditional jumps actually taken
- unconditional branches
- instructions that cause traps
- instructions that cause interrupts
- “UNKNOWN” (“** RESERVED **”) cycles
- exception cycles

Instructions that generate a change in the flow of control in the 88110 microprocessor are as follows:

BBO	BSR	RTE	TCND
BB1	ILLOP	TB0	
BCND	JMP	TB1	
BR	JSR	TBND	

Subroutine Display Format

The Subroutine display format displays the first fetch of subroutine calls and return instructions. Instructions that generate a subroutine call or a return in the 88110 microprocessor are as follows:

BSR	RTE	TBND	UNKNOWN OPCODE
ILLOP	TBO	TCND	
JSR	TB1	EXCEPTION CYCLES	

Disassembly Format Definition Overlay

The Disassembly Format Definition overlay allows you to make optional display selections for the Disassembly menu and tailor it for your applications. To access this overlay, press F5: DEFINE FORMAT.

You can use this overlay to do the following:

- choose the format (mode) in which the Disassembly menu displays disassembled data
- set the interval in which the data cursor will scroll through disassembled data
- display and define the format of the timestamp
- highlight various types of disassembled cycles
- change the position of any channel group in the display
- change the radix for any channel group
- choose which symbol tables are to be used when channel groups are displayed symbolically
- specify the size and starting address of the vector table

The Disassembly Format Definition overlay is shown in Figure 4-2.

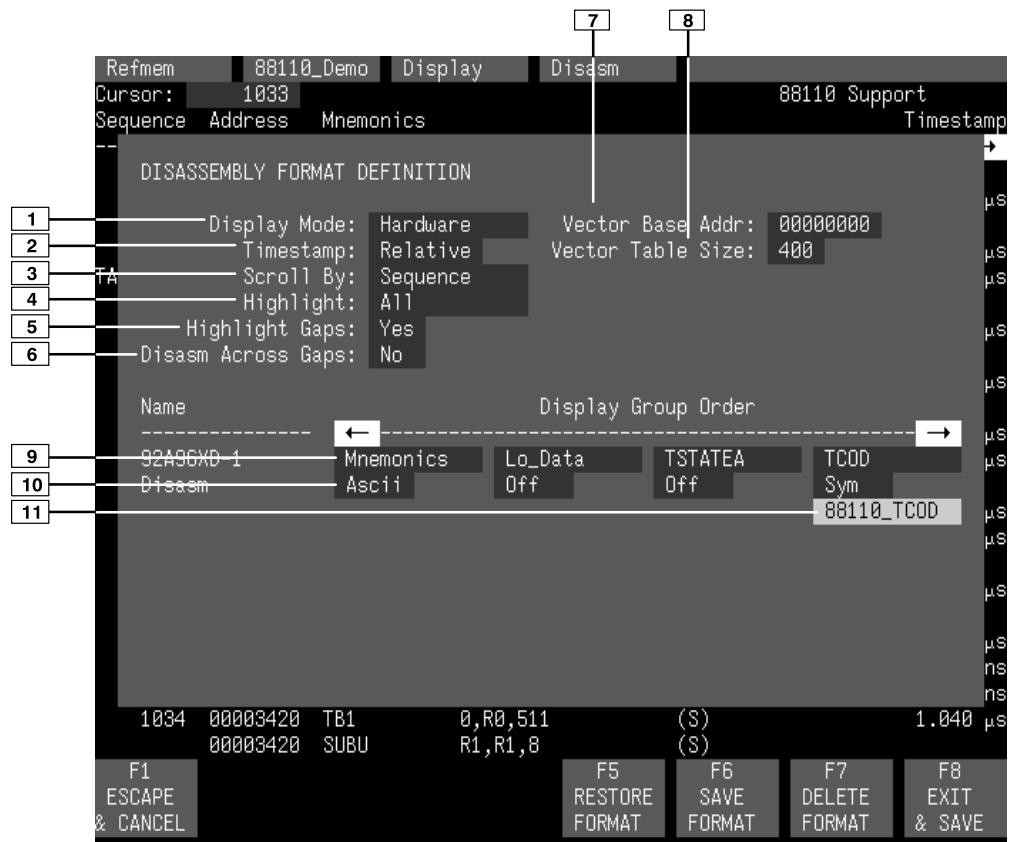


Figure 4-2. Disassembly Format Definition overlay.

- 1 **Display Mode.** You can select either Hardware, Software, Control Flow, or Subroutine format.
- 2 **Timestamp.** You can display the timestamp as an Absolute, Relative, or Delta value. You can also set the timestamp display to Off.

Timestamp values show the amount of time that has elapsed between data samples. An Absolute timestamp shows the amount of time elapsed between when the acquisition was started (after pressing F1: START) and each subsequent data sample. A Relative timestamp shows the amount of time elapsed between successive samples. A Delta timestamp shows the amount of time between the sample with the delta user mark and each previous or subsequent data sample.

- 3 **Scroll By.** You can scroll by Sequence, Instruction, Control Flow, or Subroutine.

- 4 **Highlight.** You can highlight Instructions, Control Flow, or Subroutines. With highlighting on, only the selected type of samples are shown as white text with a black background; all other samples are shown as gray text with a black background. You can also set the highlighting to Off.
- 5 **Highlight Gaps.** You can choose to highlight or not to highlight gaps. Gaps are caused by qualifying data storage in the Trigger menu and are indicated by a gray background behind the address values.
- 6 **Disasm Across Gaps.** You can choose to continue or not to continue to disassemble data across gaps. Disassembling data across gaps causes the disassembler to disassemble data as if no gap existed. Disassembled data will be invalid if the last sample before the gap does not logically match the sample immediately following the gap.
- 7 **Vector Base Address.** If your SUT has had its vector table relocated, you must use this field to inform the disassembler of the new base address. If the value in the Vector Base Address field is incorrect, the disassembler will not interpret interrupts or exceptions correctly.
- 8 **Vector Table Size.** Use this field to specify the size of the vector table.
- 9 **Group Name.** You can specify the name of the group that displays in the column in which the cursor is positioned. When you move a group, the group is inserted in the new column position and removed from its old position. The remaining groups move either one column position to the left or one column position to the right.
- 10 **Group Radix.** You can select the radix in which each group displays. The radix selections for most groups are Binary, Octal, Hexadecimal, Decimal, ASCII, Symbol, and Off. The only selections for the Hi_Data and Lo_Data groups are Hexadecimal or Off. The only selections for Mnemonics group are ASCII or Off. You should only select the symbolic radix when a symbol table is available for that group. The timestamp value always displays in decimal.
- 11 **Symbol Table.** You can specify a symbol table to use for each group where symbolic is the selected radix.

Function Keys

F1: ESCAPE & CANCEL. Closes the overlay and discards any changes you have made since entering it.

F5: RESTORE FORMAT. Displays a list of saved disassembly formats for the current module or cluster setup. Use the cursor keys to select the desired format to restore and press the Open/Close key.

F6: SAVE FORMAT. Saves the current selections for the Disassembly Format Definition overlay in a file on disk. You can enter a file name up to ten characters long.

F7: DELETE FORMAT. Displays a list of saved disassembly format files for the current module or cluster setup. Use the cursor keys to select the desired format to delete and press the Open/Close key. You cannot delete the Default format.

F8: EXIT & SAVE. Exits the overlay and executes or saves any changes made.

Displaying the Address Group Symbolically

The Address group can be displayed as symbolic values in the Disassembly menu similar to the way the TCO group can be displayed as symbol values in the State menu. You can use the Symbol Editor menu to create symbol tables in which symbols are assigned to various address ranges or patterns. You can then change the radix of the Address group in the Disassembly menu using the Disassembly Format Definition overlay. If an address appears in the operand field of a mnemonic, it also will be displayed symbolically.

Exception Vectors

The 88110 microprocessor initially places the exception vector table at address 00000000 (the default value). However, you can relocate the table using the Processor Support submenu by entering the address in the Vector Base Addr field. The Vector Base Addr field provides the disassembler with the offset address; enter an eight-digit hexadecimal value corresponding to the offset of the base address of the exception table. The Vector Table Size field lets you specify a three-digit hexadecimal size for the table.

Table 4-2 lists the 88110 exception vectors (exception cycle types). Interrupt cycle types are computed cycle types and cannot be used to control triggering. When the 88110 microprocessor processes an exception, the disassemble software displays the type of exception, if known.

If you defined the address of the exception table in the FORMAT OVERLAY menu, the exception vector reads are labelled and displayed in parentheses when disassembly is performed.

Table 4-2
Interrupt/Exception Labels

Number	Exception
0	RESET EXCEPTION
1	INTERRUPT EXCEPTION
2	INSTRUCTION ACCESS
3	DATA ACCESS
4	MISALIGNED ACCESS
5	UNIMPLEMENTED OPCODE
6	PRIVILEGE VIOLATION
7	BOUNDS CHK VIOLATION
8	ILLEGAL INTEGER DIV
9	INTEGER OVERFLOW
10	ERROR EXCEPTION
11	NONMASKABLE INTERRUPT
12	DATA MMU READ MISS
13	DATA MMU WRITE MISS
14	INSTR MMU ATC MISS
15-113	RESERVED
114	SFU 1 ILLEGAL OPCODE
115	RESERVED
116	SFU 2 ILLEGAL OPCODE
117	RESERVED
118	SFU 3 ILLEGAL OPCODE
119	RESERVED
120	SFU 4 ILLEGAL OPCODE
121	RESERVED
122	SFU 5 ILLEGAL OPCODE
123	RESERVED
124	SFU 6 ILLEGAL OPCODE
125	RESERVED
126	SFU 7 ILLEGAL OPCODE
127	RESERVED
128-511	USER DEFINED

Searching Through Data

The disassembler does not have a Disassembly Search Definition overlay. However, you can effectively search through disassembled data by following these steps:

1. Press F2: `SPLIT DISPLAY` to use the split-screen display.

Acquiring and Viewing Disassembled Data

2. Press F5: SPLIT HORIZ to split the screen into two horizontal displays.
3. Press F2: LOCK CURSOR. A list of selections appears.
4. Select **lock cursors at the same sequence**, and press Return.
5. Press F8: EXIT & SAVE to display the menus in a split screen.
6. If the active window is the Disassembly menu, press F3: SWITCH WINDOWS to make the State menu active. The cursor and Cursor field are yellow in the active window.
7. Press F6: DEFINE SEARCH to use the search function of the State menu to search for the desired sequence.

To search on TCOD group values, change the radix to binary and refer to Table 3-1 to find the binary equivalent values for the cycles you want to locate.

When searching for data in a clustered module setup in the State menu, the searches are conducted only for the master module. You can, however, define either module to be the master module. Refer to the description of the State Search Definition overlay in your *92A96 Module User Manual* for a description of how to search through state data. Also refer to that manual for a description of how to return to a full screen display.

To abort a search, press the Esc (escape) key.

Figure 4-3 shows the screen split into Disassembly and State windows with the cursors locked on the same bus cycle.

Refmem	88110_Demo	Display	Disasm							
Cursor:		1023								88110 Support
Sequence	Address	Mnemonics	Timestamp							
	FF82C990	OR R0,R0,R0	(S)							
1022	FF82C998	F4005800 (Unused Prefetch)	2.160 μs							
TA 1023	0000E000	CLR R4,R5,16<17>	(S) 1.040 μs							
	0000E000	ADD R0,R0,R0	(S)							
1024	0000E008	ADD R0,R0,R0	(S) 1.040 μs							
	0000E008	ADD R0,R0,R0	(S)							
1025	0000E010	OR R9,R0,99	(S) 1.040 μs							
	0000E010	TB0 0,R0,496	(S)							
1026	0000E018	59200063 (Unused Prefetch)	1.040 μs							
1027	00000F80	XCR R31,R31,CR20	(S) 1.040 μs							
Refmem	88110_Demo	Display	State							
Cursor:		1023								T
Sequence	Address	Hi_Data	Lo_Data	TSTATEA	TSIZ	TCOD	RL	ARBTR	PSTAT	
1021	FF82C990	F400FC00	F4005800	1011011	001	1101	11	11000	1111	
1022	FF82C998	C3FFFDFD	F4005800	1011011	001	1101	11	11000	1111	
T 1023	0000E000	F0858211	F4007000	1011011	001	1101	11	11000	1111	
1024	0000E008	F4007000	F4007000	1011011	001	1101	11	11000	1111	
1025	0000E010	59200063	F000D1F0	1011011	001	1101	11	11000	1111	
1026	0000E018	00000000	00000000	1011011	001	1101	11	11000	1111	
1027	00000F80	83FFC29F	C00007FF	1011011	001	1101	11	11000	1111	
1028	00000F88	83FFC29F	C00007FF	1011011	001	1101	11	11000	1111	
1029	00000F88	83FFC29F	C00007FF	1011011	001	1101	11	11000	1111	
F2		F3	F4	F5	F6	F7	F8			
SPLIT		SWITCH	MARK	DEFINE	DEFINE	SEARCH	SEARCH			
DISPLAY		WINDOW	DATA	FORMAT	SEARCH	BACKWARD	FORWARD			

Figure 4-3. Disassembly and State split-screen display. You can use this method to perform searches.

PRINTING DATA

To print disassembled data, use the Disassembly Print overlay. To access this overlay, press the Shift and Print keys at the same time from the Disassembly menu. The Disassembly Print overlay is exactly the same as the State Table Print overlay. Refer to your *92A96 Module User Manual* for a description of this overlay.

REFERENCE MEMORY

A demonstration reference memory file is provided so you can see an example of how your 88110 microprocessor mnemonics look when they are disassembled. In this discussion, you will view the reference memory. Viewing the reference memory is not a requirement for preparing the 92A96 Module for use. You can view the reference memory file without connecting the DAS 9200 to your SUT.

To view the 88110_Demo Refmem, follow these steps:

1. Press the Select Menu key, and select the 88110_Demo file from the Refmem column.
2. Select the Disasm menu, and press Return.

You can affect the display of the disassembled data from the Disassembly Format Definition overlay, which you can access through the Disassembly menu. Displaying all disassembled instructions and cycle types is the default format.

If there is not enough free space on the hard disk, you can delete the 88110_Demo file. It is not necessary to the operation of the disassembler.

Section 5: GENERAL PURPOSE ANALYSIS

You may need to perform general purpose (timing) analysis on your 88110 system prior to, during, and after attempting to integrate your software with the 88110 system hardware. When performing hardware analysis, you will want to use the data acquisition module to acquire data with a finer resolution. When more data samples are taken in a given period of time, the resolution in the Timing display increases, letting you see signal activity that would otherwise go undetected.

This section provides information on the following:

- clocking
- triggering
- displaying data
- supplied Timing Format Definition file

To acquire and display timing data, you need to change the clocking selection and trigger program, acquire data, and view it in the Timing menu. A predefined Timing Format Definition overlay file called 88110_96 can be used to view 88110 timing data. A description of this file and how to use it can be found later in this section.

Keep in mind when you view data in the State display that it uses the default channel grouping setup with all groups visible and will look different than the Disassembly display.

There often is a need to view data in a split screen display with state data in one half and timing data in the other. Do not disconnect any of the 92A96 probe cables or interface housings if you are analyzing data in this manner. Instead, use the extra channels available from the 92A96 Module to make other 88110 system connections.

CLOCKING

To change the data sampling rate, use the Clock menu.

When using the 92A96 Module for timing analysis, you will want to use the Internal or External clocking modes. The Internal clock selection can sample data up to 100 MHz, which has a 10 ns resolution between samples. The External clock selection samples data on every active clock edge on the 92A96 clock inputs up to 100 MHz.

The default clocking mode is Custom when microprocessor support is used; you will need to change it to either Internal or External. Your *92A96 Module User Manual* contains an in-depth description of Internal and External clocking.

Custom Clocking

Custom clocking only stores one data sample for each bus transaction, which can take one or more clock cycles. Custom clocking also time-aligns certain signals that otherwise would be skewed relative to the current bus transaction. This clocking selection is generally unproductive for timing analysis. Refer to Appendix B for a more in-depth description of how Custom clocking is used with the probe adapter to acquire data.

Internal Clocking

When you select Internal as the clocking mode, the 92A96 Module stores one data sample as often as every 10 ns (100 MHz). This clocking selection is commonly referred to as asynchronous.

Two typical uses of Internal clocking might be to verify that all the 88110 signals are transitioning as expected or to measure timing relationship between signal transitions.

It is possible to acquire asynchronous data at rates of 200 MHz and 400 MHz. The faster the 92A96 Module acquires data, the fewer channels it can acquire data on. A single 92A96 Module can acquire data on 24 channels at 400 MHz or 2.5 ns resolution. Refer to your *92A96 Module User Manual* for information on sampling data at speeds faster than 100 MHz.

External Clocking

When you select External as the clocking mode, the 92A96 Module acquires and stores data based on the clock channel up to 100 MHz. This clocking selection is commonly referred to as synchronous.

By selecting the rising edge of CLK: 3 on the acquisition module as the clock channel, and turning off the remaining three clocks, the module will sample data on every rising edge of the clock. No data is acquired on the falling clock edge unless you select both edges.

You can also use the other three clock channels as qualifiers or clocks to further modify the clocking in of information from your 88110 system.

TRIGGERING

All the Trigger menu selections available for use with the 92A96 Module are still valid for timing analysis. Refer to your module user manual for a list and description of the selections.

ACQUIRING DATA

You can acquire data as described in the *Acquiring Data* description in Section 4.

DISPLAYING DATA

General purpose analysis requires that you view data in either the State or Timing menus. The following discussion describes these menus.

Timing Menu

In the Timing menu, every channel is shown as a waveform, and groups of channels are shown as bus forms.

A predefined Timing Format Definition overlay file, part of the 88110 microprocessor support, is available for you to use when displaying data in the Timing format. The 88110_96 file is installed on the DAS 9200 with the support software.

The 88110_96 Timing Format file places the CLK= signal first followed by the Lo_Data group displayed as bus forms containing bus values instead of as individual timing waveforms. These groups are followed by the 88110 system clock and other important control signals. The Address and Hi_Data groups are also displayed as bus forms at the bottom of the display. Figure 5-1 shows data displayed using the 88110_96 file.

To select the supplied Timing Format Definition file, follow these steps:

1. Select the Timing menu, and press F5: DEFINE FORMAT.
2. Press F5: RESTORE FORMAT.
3. Select 88110_96, and press the Return key. A message tells you the format file is selected.
4. Press F8: EXIT & SAVE to return to the Timing menu.

Refer to the channel assignment tables in Appendix C for the lists of individual channels and their 88110 signal names.

Refmem	88110_Demo	Display	State							
Cursor:	1040	T								
Sequence	Address	Hi_Data	Lo_Data	TSTATEA	TSIZ	TCOD	RL	ARBTR	PSTAT	
1020	FF82C988	F4005800	F4005800	1011011	001	1101	11	11000	1111	
1021	FF82C990	F400FC00	F4005800	1011011	001	1101	11	11000	1111	
1022	FF82C998	C3FFFDFD	F4005800	1011011	001	1101	11	11000	1111	
T 1023	0000E000	F0858211	F4007000	1011011	001	1101	11	11000	1111	
1024	0000E008	F4007000	F4007000	1011011	001	1101	11	11000	1111	
1025	0000E010	59200063	F000D1F0	1011011	001	1101	11	11000	1111	
1026	0000E018	00000000	00000000	1011011	001	1101	11	11000	1111	
1027	00000F80	83FFC29F	C00007FF	1011011	001	1101	11	11000	1111	
1028	00000F88	83FFC29F	C00007FF	1011011	001	1101	11	11000	1111	
1029	00000F88	83FFC29F	C00007FF	1011011	001	1101	11	11000	1111	
1030	00002F80	243F0004	C8000127	1011011	001	1101	11	11000	1111	
1031	00002F88	243F0004	C8000125	1011011	001	1101	11	00000	1111	
1032	00003004	00000000	00000000	1011011	011	0101	01	00000	1111	
1033	00002F8C	243F0004	C8000125	1011011	001	1101	11	11000	1111	
1034	00003420	F000D9FF	64210008	1011011	001	1101	11	11000	1111	
1035	00003428	48210FFF	F021A003	1011011	001	1101	11	11000	1111	
1036	00003430	243F0350	80204080	1011011	001	1101	11	11000	1111	
1037	00003438	F000D9FF	D8010006	1011011	001	1101	11	00000	1111	
1038	00003350	000001F0	00000000	1011011	011	0101	01	11000	1111	
1039	0000343C	F000D9FF	D8010006	1011011	001	1101	11	11000	1111	
1040	00003440	802040A0	F000D9FF	1011011	001	1101	11	11000	1111	
1041	00003448	64210004	80018081	1011011	001	1101	11	11000	1111	
1042	00003448	64210004	80018081	1011011	001	1101	11	11000	1111	

F2	F4	F5	F6	F7	F8
SPLIT	MARK	DEFINE	DEFINE	SEARCH	SEARCH
DISPLAY	DATA	FORMAT	SEARCH	BACKWARD	FORWARD

Figure 5-2. State data.

SEARCHING THROUGH DATA

To search through data, you can use either the Timing Search Definition overlay or the State Search Definition overlay. You can use these overlays and search through data as described in your *92A96 Module User Manual*.

PRINTING DATA

To print state data, you can use the State Print overlay. To access this overlay, press the Shift and Print keys at the same time from the State menu.

To print timing data, you can use the Timing Print overlay. To access this overlay, press the Shift and Print keys at the same time from the Timing menu.

For detailed information on the State Print overlay or the Timing Print overlay, refer to your *92A96 Module User Manual*.

Appendix A: ERROR MESSAGES AND DISASSEMBLY PROBLEMS

This appendix describes error messages and disassembly problems that you may encounter while acquiring data.

MODULE ERROR MESSAGES

These error messages will appear in the Module Monitor menu when there are problems with acquiring data or satisfying the trigger program. The error messages are listed in alphabetical order; a description of the error message and the recommended solution follow the error message.

Slow Clock. This message appears when the active clock channel (or channels) is not changing, is typically changing at 1 ms or slower intervals, or one of the clock qualifiers is held in the wrong state. Check for the following:

1. The 88110 system is powered on and running. Be sure the system is not halted.
2. 88110 Support is selected in the appropriate 92A96 Configuration menu.
3. Custom is selected in the Clock menu.
4. The connections between the 92A96 Module and the probe adapter are correct.
 - The clock and 8-channel probe connections between the interface housings and probe adapter are correct (module name, clock, section names, and channel numbers match), are properly oriented (GND connects to ground), and are fully engaged.
 - The connections between the interface housings and 92A96 probe cables have matched color labels, matched slot numbers, and are properly keyed.
 - The connections between the 92A96 probe cables and probe connectors have matched color labels, matched slot numbers, and are properly keyed.
5. The orientation of pin A1 on the microprocessor, the probe adapter, and SUT are correct.
6. No pins are bent or missing on the 88110 microprocessor or on either of the probe adapter sockets.
7. The DEBUG jumper is in the Normal position.

Waiting for Stop. This message appears when the trigger condition is satisfied and memory is full but the Manual Stop mode is selected in the Cluster Setup menu. The solution is to manually stop the DAS 9200 by pressing F1: STOP.

This message can also appear when other modules in the cluster have not filled their memories. Wait for the other modules to fill their memories. If the message does not disappear in a short time, press F1: STOP.

Waiting for Stop-Store. This message appears when the trigger condition is satisfied but the amount of post-fill memory specified in the trigger position field is not yet filled. Press F1: STOP to view the acquired data, then check for the following:

1. The trigger program in the Trigger menu is correct.
2. The storage qualification in the Trigger menu is correct.
3. The system or the module does not have an exception or fault. The 88110 system or acquisition module might have experienced a hardware or software exception or fault after the trigger condition was satisfied.

Waiting for Trigger. This message appears when the trigger condition does not occur. Check for the following:

1. The 88110 system is powered on and running. Be sure the system is not halted.
2. The trigger conditions are not being satisfied. The Module Monitor menu shows which state events are not occurring. Press F1: STOP, access the Trigger menu, and redefine the conditions for that state. Also refer to the description on *Triggering* in Section 3.

OTHER DISASSEMBLY PROBLEMS

There may be problems with disassembly for which no error messages are displayed. Some of these problems and their recommended solutions follow.

Incorrect Data. If the data acquired is obviously incorrect, check the following:

1. 88110 Support is selected in the 92A96 Configuration menu.
2. Custom is selected in the Clock menu.
3. The DBUG jumper is in the Normal position.

4. The connections between the 92A96 Module and the probe adapter are correct.
 - The clock and 8-channel probe connections between the interface housings and probe adapter are correct (module name, clock, section names, and channel numbers match), are properly oriented (GND connects to ground), and are fully engaged.
 - The connections between the interface housings and 92A96 probe cables have matched color labels, matched slot numbers, and are properly keyed.
 - The connections between the 92A96 probe cables and probe connectors have matched color labels, matched slot numbers, and are properly keyed.
5. The orientation of pin A1 on the microprocessor, the probe adapter, and SUT are correct.
6. No pins are bent or missing on the 88110 microprocessor or on either of the probe adapter sockets.

Other Suggestions. If the previous suggestions do not fix the problem with acquiring disassembled bus cycles or instruction mnemonics, try the following:

1. Reload the module setup by selecting the 88110 Support in the 92A96 Configuration menu to restore the DAS 9200 to a known state.
2. Possible ac and dc loading problems may be remedied by removing one or both of the protective sockets from the probe adapter. These sockets may add enough additional inductance to your 88110 system to affect it. Refer to Appendix C for a description to remove sockets from the probe adapter.

If the DAS 9200 still is not acquiring data after trying these solutions, there may be a problem with your 88110 system. Try performing hardware analysis with your DAS 9200 system to ensure that the 88110 signals are valid at the time the probe adapter samples them.

Refer to *Section 5: General Purpose Analysis* for information on data sampling rates using either the Internal or External clocking selections in the Clock menu. Also refer to *Appendix B: How Data is Acquired* to see when the disassembler samples the various 88110 system signals.

Appendix B: HOW DATA IS ACQUIRED

This appendix explains how the 92A96 Module acquires 88110 signals using the 92DM923 probe adapter and software. This appendix also provides additional information on microprocessor signals accessible on or not accessible on the probe adapter, and on extra 92A96 channels available for you to use for additional connections.

CUSTOM CLOCKING

A special clocking program (called Custom) is loaded to the 92A96 Module every time the 88110 Support is selected in the Configuration menu. With Custom clocking, the module logs in signals from multiple groups of channels when they are valid on the 88110 bus. The module then sends all the logged-in signals to the trigger machine and to the acquisition memory of the module for storage.

Signals are acquired on the rising edge of CLK where TA~, TEA~, or TRTRY~ are active low. All signals are logged in, as shown in Figure B-1.

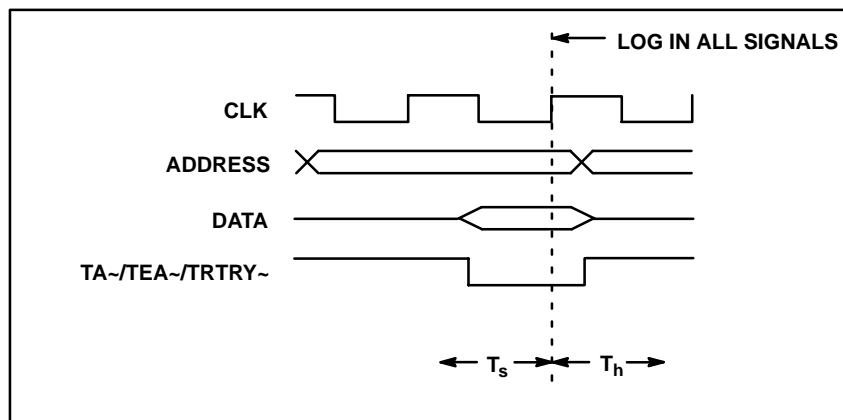


Figure B-1. 88110 bus timing.

ALTERNATE MICROPROCESSOR CONNECTIONS

You can connect to microprocessor signals that are not required for disassembly so you can do more advanced timing analysis. These signals may or may not be accessible on the probe adapter board. The following paragraphs and tables list signals that are accessible on or are not accessible on the probe adapter board.

For a list of signals required or not required for disassembly, refer to the channel connections tables in Appendix C.

Signals On the Probe Adapter

The probe adapter board contains pins for microprocessor signals that are not acquired by the support software. You can connect extra podlets to these pins because they can be useful for general purpose analysis. However, these signals are not defined in the Channel setup menu; you must enter the Channel setup menu and assign those signals to a new channel group.

There are three 2-pin groups of square pins on the probe adapter with printed 88110 signal names. These pins connect to the UPA1~, UPA0~, and DEBUG~ signals.

Signals Not On the Probe Adapter

All microprocessor signals are accessible on the probe adapter.

Extra 92A96 Channels

Table B-1 shows the extra 92A96 channels available for you to use to make alternate microprocessor connections. You can also disconnect channels not required for disassembly to make alternate connections. The channel assignment tables in Appendix C indicate channels not required for disassembly.

Table B-1
Extra 92A96 Channels

92A96 Section: Channel				
HI_C1:7	HI_C0:7	LO_A0:7	LO_C1:7	LO_C0:7
HI_C1:6	HI_C0:6	LO_A0:6	LO_C1:6	LO_C0:6
HI_C1:5	HI_C0:5	LO_A0:5	LO_C1:5	LO_C0:5
HI_C1:4	HI_C0:4	LO_A0:4	LO_C1:4	LO_C0:4
HI_C1:3	HI_C0:3	LO_A0:3	LO_C1:3	LO_C0:3
HI_C1:2	HI_C0:2	LO_A0:2	LO_C1:2	LO_C0:2
HI_C1:1	HI_C0:1	LO_A0:1	LO_C1:1	LO_C0:1
HI_C1:0	HI_C0:0	LO_A0:0	LO_C1:0	LO_C0:0

If you use extra channels to make alternate connections to your SUT, then these signals will be logged in at the same time as the signals normally sampled (see Figure B-1).

The extra channels have already been assigned to three channel groups: AUX1 HI, AUX1 LO, and AUX0. If you use extra channels, you can use these channel groups as defined or remove channels from these groups to create new channel groups.

Table B-2 shows the 92A96 section and channel assignment for the AUX1 HI group, starting with the MSB.

Table B-2
92DM923 AUX1 HI Group Channel Assignment

Bit Order	92A96 Channel	88110 Signal Name	Bit Order	92A96 Channel	88110 Signal Name
MSB	HI_C1:7	AUX_39		HI_C0:7	AUX_31
	HI_C1:6	AUX_38		HI_C0:6	AUX_30
	HI_C1:5	AUX_37		HI_C0:5	AUX_29
	HI_C1:4	AUX_36		HI_C0:4	AUX_28
	HI_C1:3	AUX_35		HI_C0:3	AUX_27
	HI_C1:2	AUX_34		HI_C0:2	AUX_26
	HI_C1:1	AUX_33		HI_C0:1	AUX_25
	HI_C1:0	AUX_32		LSB	HI_C0:0

Table B-3 shows the 92A96 section and channel assignment for the AUX1 LO group, starting with the MSB.

Table B-3
92DM923 AUX1 LO Group Channel Assignment

Bit Order	92A96 Channel	88110 Signal Name	Bit Order	92A96 Channel	88110 Signal Name
MSB	LO_C1:7	AUX_15		LO_C0:7	AUX_7
	LO_C1:6	AUX_14		LO_C0:6	AUX_6
	LO_C1:5	AUX_13		LO_C0:5	AUX_5
	LO_C1:4	AUX_12		LO_C0:4	AUX_4
	LO_C1:3	AUX_11		LO_C0:3	AUX_3
	LO_C1:2	AUX_10		LO_C0:2	AUX_2
	LO_C1:1	AUX_9		LO_C0:1	AUX_1
	LO_C1:0	AUX_8		LSB	LO_C0:0

Table B-4 shows the 92A96 section and channel assignment for the AUX0 group, starting with the MSB.

Table B-4
92DM923 AUX0 Group Channel Assignment

Bit Order	92A96 Channel	88110 Signal Name	Bit Order	92A96 Channel	88110 Signal Name
MSB	LO_A0:7	AUX_23		LO_A0:3	AUX_19
	LO_A0:6	AUX_22		LO_A0:2	AUX_18
	LO_A0:5	AUX_21		LO_A0:1	AUX_17
	LO_A0:4	AUX_20		LSB	LO_A0:0



WARNING

The following servicing instructions are for use only by qualified personnel. To avoid personal injury, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer to the General Safety Summary and the Servicing Safety Summary prior to performing any service.

Appendix C: SERVICE INFORMATION

This appendix contains the following information:

- safety summary
- brief description of the probe adapter and how it works
- care and maintenance procedures
- specification tables
- channel assignment tables
- dimensions of the probe adapter
- removing and replacing individual signal leads
- removing and replacing sockets

SERVICING SAFETY INFORMATION

The following servicing safety information is for service technicians. Follow these safety precautions, along with the general precautions outlined in your *92A96 Module User Manual*, while installing or servicing this product.

Do Not Service Alone. Do not perform internal service or adjustment on this product unless another person is present and able to give first aid and resuscitation.

Use Care When Servicing With Power On. To avoid personal injury from dangerous voltages, remove jewelry such as rings, watches, and other metallic objects before servicing. Do not touch the product's exposed connections and components while power is on.

PROBE ADAPTER DESCRIPTION

The probe adapter is a nonintrusive piece of hardware that allows the 92A96 Module to acquire data from an 88110 microprocessor in its own operating environment with little affect, if any, on that system. Refer to Figure C-1 while reading the following discussion.

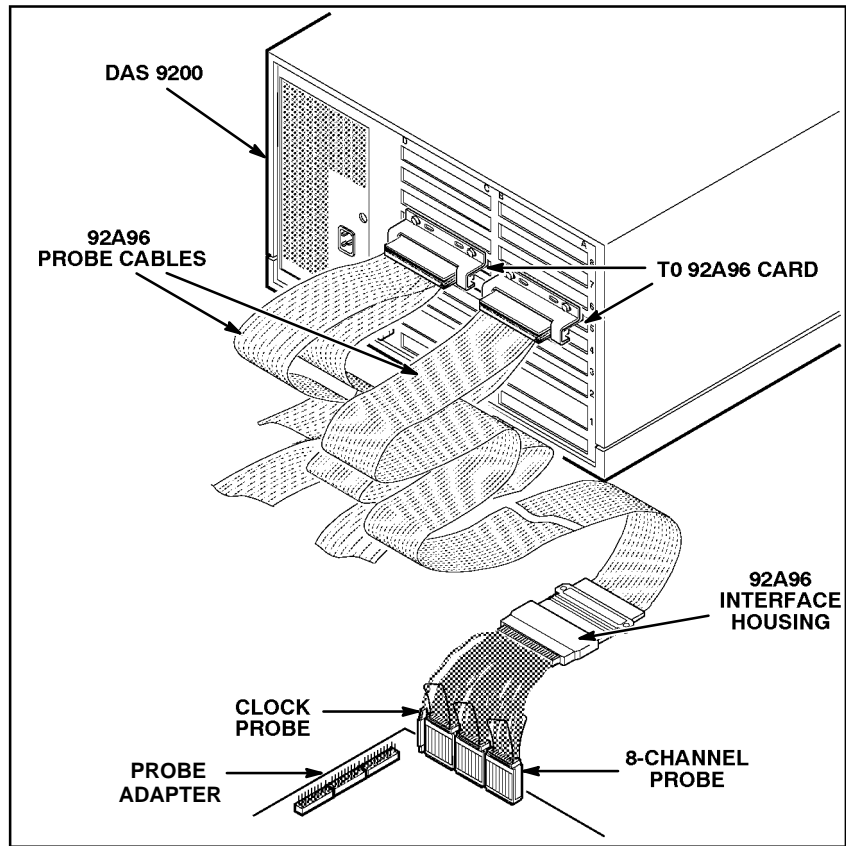


Figure C-1. Overview of the standard probe and probe adapter.

The probe adapter consists of a circuit board and a socket for the 88110 microprocessor. The probe adapter connects to the SUT. Signals from the 88110 system flow from the probe adapter to the podlet groups. The signals flow through the probe signal leads to the 92A96 Module.

The probe adapter accommodates the Motorola 88110 microprocessor in a 299-pin PGA package.

Probe Adapter Circuit Description

The probe adapter contains no active circuitry.

CARE AND MAINTENANCE

The probe adapter does not require scheduled or periodic maintenance. To maintain good electrical contact, keep the probe adapter free of dirt, dust, and contaminants. Also, ensure that any electrically conductive contaminants are removed.

Dirt and dust can usually be removed with a soft brush. For more extensive cleaning, use only a damp cloth. Abrasive cleaners and organic solvents should never be used.



Exercise care when soldering on a multilayer circuit board. Excessive heat can damage the through-hole plating or lift a run or pad and damage the board beyond repair. Do not apply heat for longer than three seconds. Do not apply heat consecutively to adjacent leads. Allow a moment for the board to cool between each operation.

If you must replace an electrical component on a circuit board, exercise extreme caution while unsoldering or soldering the new component. Use a pencil-type soldering iron of less than 18 watts and an approved desoldering tool. Ensure that the replacement is an equivalent part by comparing the description as listed in the replaceable parts list.

SPECIFICATIONS

These specifications are for a probe adapter connected to a 92A96 Acquisition Module and the SUT. Table C-1 shows the electrical requirements the SUT must produce for the disassembler to acquire correct data. Table C-2 shows environmental specifications.

**Table C-1
Electrical Specifications**

Characteristics	Requirements
SUT Clock	
Clock Rate	50 MHz
Minimum Setup Time Required	
All Signals	5 ns
Minimum Hold Time Required	
All Signals	0 ns
	Specification, DC Load
Measured Typical SUT Signal Loading	
CLK	3 podlets
TEA	3 podlets
TA~	3 podlets
TRTRY~	2 podlets
DBB~	2 podlets
ABB~	2 podlets
TS~	2 podlets
ALL OTHERS	1 podlet

Figure C-2 shows the dimensions of the PGA probe adapter with the podlet holders attached.

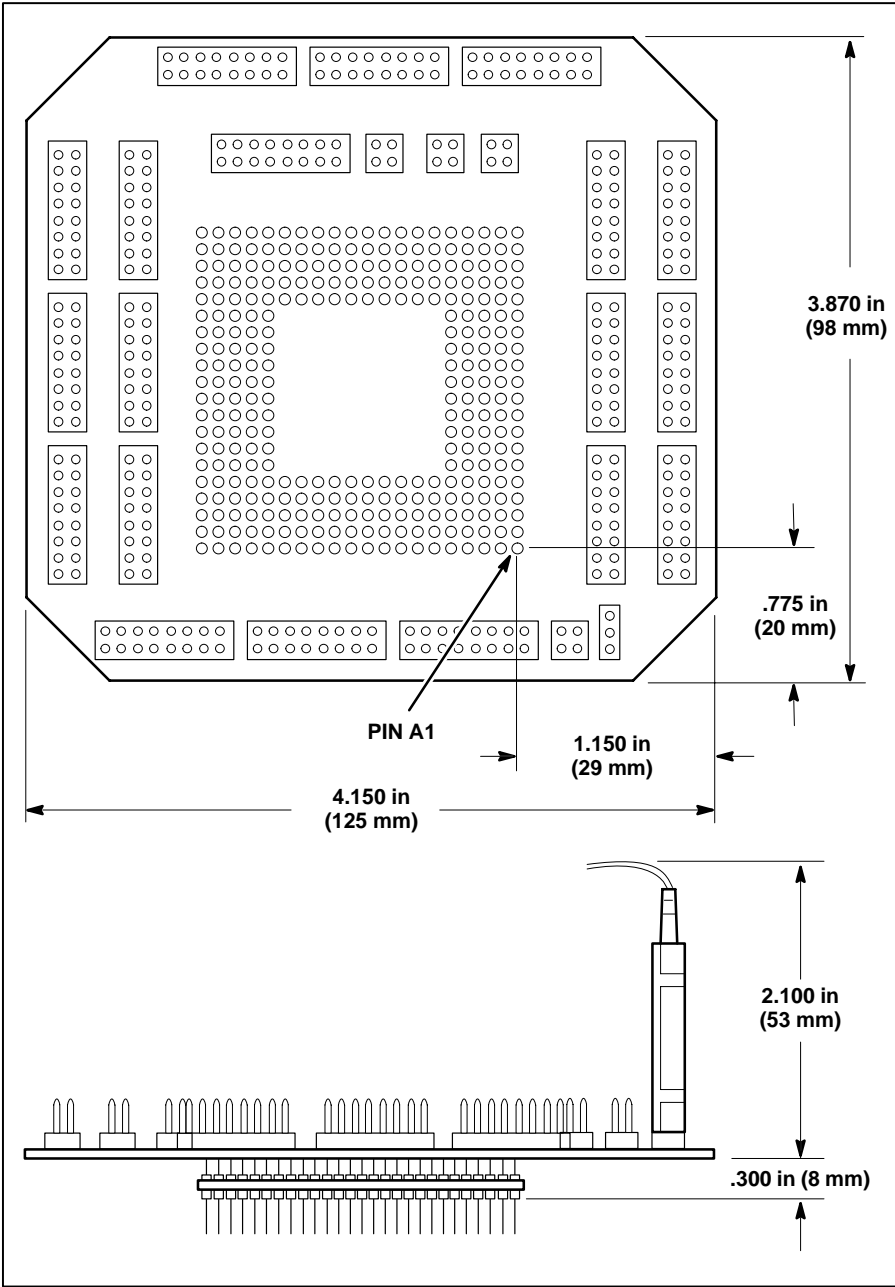


Figure C-2. Minimum clearance of the probe adapter.

**Table C-2
Environmental Specifications**

Characteristic	Description
Temperature	
Max. Operating	+50°C (122°F)*
Min. Operating	0°C (+32°F)
Nonoperating	-55°C to +75°C (-67° to +167°F)
Humidity	10 to 95% relative humidity†
Altitude	
Operating	4.5 km (15,000 ft) maximum
Nonoperating	15 km (50,000 ft) maximum
Electrostatic Immunity	The probe adapter contains no static-sensitive components.

* **Not to exceed 88110 thermal considerations.**
Forced air cooling may be required across the CPU.
† **Tested to Tektronix standard 062-2847-00 class 5.**

Channel Assignments

Table C-3 shows the 92A96 section and channel assignments for the Address group and the microprocessor signal to which each channel connects, starting with the most significant bit (MSB).

When using these tables, keep in mind that the 92DM923 support requires a variable-width module. The module in the higher-numbered slot is referred to as the HI module; the module in the lower-numbered slot is referred to as the LO module.

Table C-3
92DM923 Address Group Channel Assignments

Bit Order	92A96 Channel	88110 Signal Name
MSB	LO_D3:7	A31
	LO_D3:6	A30
	LO_D3:5	A29
	LO_D3:4	A28
	LO_D3:3	A27
	LO_D3:2	A26
	LO_D3:1	A25
	LO_D3:0	A24
	LO_D2:7	A23
	LO_D2:6	A22
	LO_D2:5	A21
	LO_D2:4	A20
	LO_D2:3	A19
	LO_D2:2	A18
	LO_D2:1	A17
	LO_D2:0	A16
	LO_D1:7	A15
	LO_D1:6	A14
	LO_D1:5	A13
	LO_D1:4	A12
	LO_D1:3	A11
	LO_D1:2	A10
	LO_D1:1	A9
	LO_D1:0	A8
	LO_D0:7	A7
	LO_D0:6	A6
	LO_D0:5	A5
	LO_D0:4	A4
	LO_D0:3	A3
	LO_D0:2	A2
	LO_D0:1	A1
	LSB	LO_D0:0

**All signals required for disassembly.
 Default radix is HEX.**

Table C-4 shows the 92A96 section and channel assignments for the Hi_Data group and the microprocessor signal to which each channel connects, starting with the most significant bit (MSB).

Table C-4
92DM923 Hi_Data Group Channel Assignments

Bit Order	92A96 Channel	88110 Signal Name
MSB	HI_A3:7	D63
	HI_A3:6	D62
	HI_A3:5	D61
	HI_A3:4	D60
	HI_A3:3	D59
	HI_A3:2	D58
	HI_A3:1	D57
	HI_A3:0	D56
	HI_A2:7	D55
	HI_A2:6	D54
	HI_A2:5	D53
	HI_A2:4	D52
	HI_A2:3	D51
	HI_A2:2	D50
	HI_A2:1	D49
	HI_A2:0	D48
	HI_A1:7	D47
	HI_A1:6	D46
	HI_A1:5	D45
	HI_A1:4	D44
	HI_A1:3	D43
	HI_A1:2	D42
	HI_A1:1	D41
	HI_A1:0	D40
	HI_A0:7	D39
	HI_A0:6	D38
	HI_A0:5	D37
	HI_A0:4	D36
	HI_A0:3	D35
	HI_A0:2	D34
	HI_A0:1	D33
	LSB	HI_A0:0

**All signals required for disassembly.
Default radix is HEX.**

Table C-5 shows the 92A96 section and channel assignments for the Lo_Data group and the microprocessor signal to which each channel connects, starting with the most significant bit (MSB).

Table C-5
92DM923 Lo_Data Group Channel Assignments

Bit Order	92A96 Channel	88110 Signal Name
MSB	HI_D3:7	D31
	HI_D3:6	D30
	HI_D3:5	D29
	HI_D3:4	D28
	HI_D3:3	D27
	HI_D3:2	D26
	HI_D3:1	D25
	HI_D3:0	D24
	HI_D2:7	D23
	HI_D2:6	D22
	HI_D2:5	D21
	HI_D2:4	D20
	HI_D2:3	D19
	HI_D2:2	D18
	HI_D2:1	D17
	HI_D2:0	D16
	HI_D1:7	D15
	HI_D1:6	D14
	HI_D1:5	D13
	HI_D1:4	D12
	HI_D1:3	D11
	HI_D1:2	D10
	HI_D1:1	D9
	HI_D1:0	D8
	HI_D0:7	D7
	HI_D0:6	D6
	HI_D0:5	D5
	HI_D0:4	D4
	HI_D0:3	D3
	HI_D0:2	D2
	HI_D0:1	D1
	LSB	HI_D0:0

**All signals required for disassembly.
Default radix is HEX.**

Table C-6 shows the 92A96 section and channel assignments for the TSTATEA group channels and the microprocessor signal to which each channel connects, starting with the most significant bit (MSB).

Table C-6
92DM923 TSTATEA Group Channel Assignments

Bit Order	92A96 Channel	88110 Signal Name
MSB	HI_C2:3	TS~†
	HI_C2:6	TA=~†
	HI_C2:7	TEA=~†
	HI_C2:0	TRTRY~*
	LO_A2:7	PTA~†
	LO_A2:6	AACK~†
LSB	LO_A2:4	ARTRY~†

*This signal required for disassembly.

†This signal is not required for disassembly.

Default radix is OFF.

Table C-7 shows the 92A96 section and channel assignments for the TCOD group and the microprocessor signal to which each channel connects, starting with the most significant bit (MSB).

Table C-7
92DM923 TCOD Group Channel Assignments

Bit Order	92A96 Channel	88110 Signal Name
MSB	LO_C3:3	TC_3
	LO_C3:2	TC_2
	LO_C3:1	TC_1
LSB	LO_C3:0	TC_0

All signals are required for disassembly.

Default radix is SYM.

Table C-8 shows the 92A96 section and channel assignments for the DataSize group and the microprocessor signal to which each channel connects, starting with the most significant bit (MSB).

Table C-8
92DM923 DataSize Group Channel Assignments

Bit Order	92A96 Channel	88110 Signal Name
MSB	LO_C3:5	TSIZ_1
	LO_C3:4	TSIZ_O
LSB	LO_C3:6	TBST~

All signals are required for disassembly.
Default radix is SYM.

Table C-9 shows the 92A96 section and channel assignments for the RL group and the microprocessor signal to which each channel connects, starting with the most significant bit (MSB).

Table C-9
92DM923 RL Group Channel Assignments

Bit Order	92A96 Channel	88110 Signal Name
MSB	LO_C3:7	R/W~
LSB	HI_C3:6	LK~

All signals are required for disassembly.
Default radix is SYM.

Table C-10 shows the 92A96 section and channel assignment for the BP group and the microprocessor signal to which the channel connects.

Table C-10
92DM923 BP Group Channel Assignment

Bit Order	92A96 Channel	88110 Signal Name
MSB	LO_A1:7	BP_7†
	LO_A1:6	BP_6†
	LO_A1:5	BP_5†
	LO_A1:4	BP_4†
	LO_A1:3	BP_3†
	LO_A1:2	BP_2†
	LO_A1:1	BP_1†
LSB	LO_A1:0	BP_0†

†This signal is not required for disassembly.
Default radix is OFF.

Table C-11 shows the 92A96 section and channel assignments for the CACHE group channels and the microprocessor signal to which each channel connects, starting with the most significant bit (MSB).

Table C-11
92DM923 CACHE Group Channel Assignments

Bit Order	92A96 Channel	88110 Signal Name
MSB	HI_C3:4	CI~†
LSB	HI_C3:5	WT~†

†This signal is not required for disassembly.
Default radix is OFF.

Table C-12 shows the 92A96 section and channel assignment for the SNOOP group and the microprocessor signal to which the channel connects, starting with the most significant bit (MSB).

Table C-12
92DM923 SNOOP Group Channel Assignment

Bit Order	92A96 Channel	88110 Signal Name
MSB	HI_C2:5	SR~†
	LO_C2:6	GBL~†
	HI_C3:2	INV~†
	HI_C3:7	MC~†
	LO_C2:7	SHARED~†
	LO_C2:5	SSTAT1~†
LSB	LO_C2:4	SSTAT0~†

†This signal is not required for disassembly.
Default radix is OFF.

Table C-13 shows the 92A96 section and channel assignments for the ARBTR group channels and the microprocessor signal to which each channel connects, starting with the most significant bit (MSB).

Table C-13
92DM923 ARBTR Group Channel Assignments

Bit Order	92A96 Channel	88110 Signal Name
MSB	LO_A2:2	BR~†
	LO_A2:1	BG~†
	LO_C2:1	ABB~†
	LO_A2:0	DBG~†
LSB	LO_C2:2	DBB~†

†This signal is not required for disassembly.
Default radix is OFF.

Table C-14 shows the 92A96 section and channel assignment for the CLK group and the microprocessor signal and pin to which it connects.

Table C-14
92DM923 CLK Group Channel Assignment

92A96 Channel	88110 Signal Name
LO_A2:5	CLK=

This signal is required for disassembly.
Default radix is OFF.

Table C-15 shows the 92A96 section and channel assignments for the PSTAT group channels and the microprocessor signal to which each channel connects, starting with the most significant bit (MSB).

Table C-15
92DM923 PSTAT Group Channel Assignments

Bit Order	92A96 Channel	88110 Signal Name
MSB	LO_A3:2	PSTAT2†
	LO_A3:1	PSTAT1†
	LO_A3:0	PSTAT0†
LSB	HI_C3:3	CL†

†This signal is not required for disassembly.
Default radix is OFF.

Table C-16 shows the 92A96 section and channel assignment for the INTR (Interrupt) group and the microprocessor signal to which the channel connects, starting with the most significant bit (MSB).

Table C-16
92DM923 INTR Group Channel Assignment

Bit Order	92A96 Channel	88110 Signal Name
MSB	HI_C3:1	NMI~†
	HI_C3:0	INT~†
	HI_C2:4	RST~†
LSB	LO_A2:3	BPE~†

†This signal is not required for disassembly.
Default radix is OFF.

Table C-17 shows the 92A96 section and channel assignment for the JTAG group and the microprocessor signal to which the channel connects, starting with the most significant bit (MSB).

Table C-17
92DM923 JTAG Group Channel Assignment

Bit Order	92A96 Channel	88110 Signal Name
MSB	LO_A3:7	TDO~†
	LO_A3:6	TRST~†
	LO_A3:5	TMS~†
	LO_A3:4	TCK~†
LSB	LO_A3:3	TDI~†

†This signal is not required for disassembly.
Default radix is OFF.

Table C-18 shows the 92A96 section and channel assignments for the clock channels (not part of any group) and the microprocessor signal to which each channel connects.

Table C-18
92DM923 Clock Channel Assignments

92A96 Channel	88110 Signal Name
CLK3	CLK‡
CLK2	TEA~‡
CLK1	TA~‡

All signals are required for disassembly.
‡This channel is double probed so that it will be stored in the acquisition.

DISCONNECTING PROBES

You may need to disconnect the clock and 8-channel probes from the probe adapter to use them on another application, to connect individual podlets to other signals in your 88110 system, or to replace defective clock or probe channels (podlets). Refer to Figure C-3 and the following procedure to disconnect the clock and 8-channel probes from the probe adapter. Use the antistatic shipping material to support the probe adapter while disconnecting the clock and 8-channel probes.

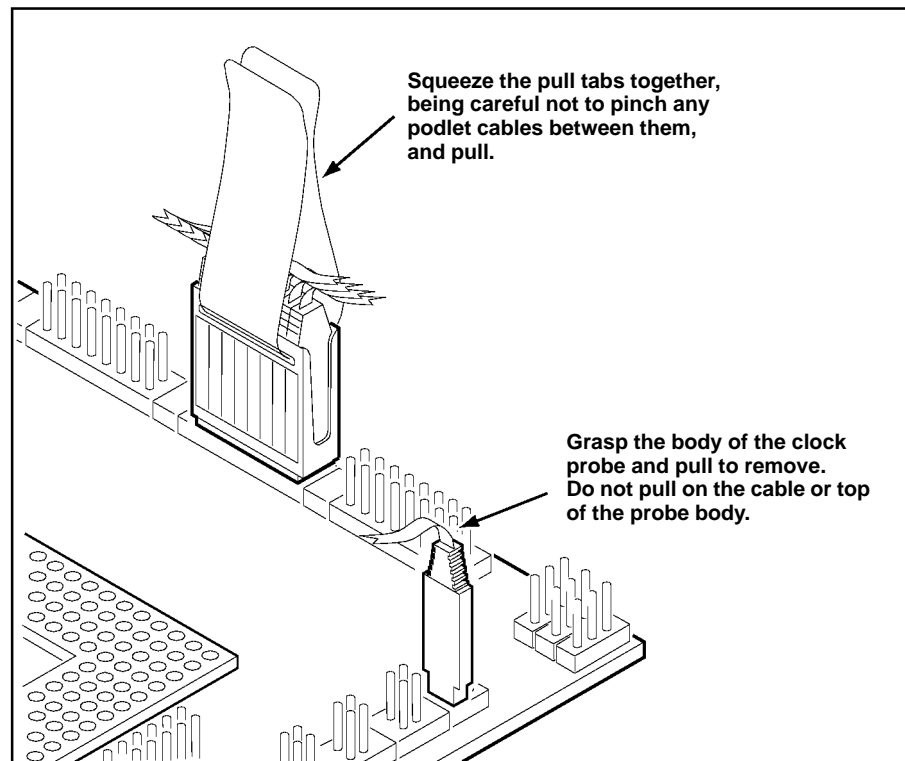


Figure C-3. Disconnecting clock and 8-channel probes.

1. Power off the SUT. It is not necessary to power off the DAS 9200.

CAUTION

Pulling on the cables, on the neck of the clock probe, or pinching the cables between the pull tabs can damage the probes. Always handle the probes by their bodies.

2. Firmly grasp the body of a clock probe and gently pull it off of the square pins.

3. Squeeze the pull tabs on the podlet holder together; be careful not to pinch any podlet cables between them.
4. Gently pull the 8-channel probe off of the square pins.

REMOVING AND REPLACING PROBE PODLETS

Each 8-channel probe consists of 8 single-channel podlets ganged together in a podlet holder. You may need to remove these podlets from the 8-channel probe to use for alternate connections to 88110 system signals.

Refer to the discussions on *Alternate Microprocessor Connections* in Appendix B and *Channel Assignments* in Appendix C for information about which channels you can use to make alternate connections between the DAS 9200 and system under test without disturbing the channel connections required for disassembly.

You can also use these procedures to replace a defective clock probe or a defective podlet from an 8-channel probe.

Removing Probe Podlets from the Interface Housing

Refer to Figure C-4 and the following procedure to remove a clock probe or an 8-channel probe podlet from the interface housing.

1. Power off the SUT. It is not necessary to power off the DAS 9200.
2. Use a small pointed tool such as a ballpoint pen, pencil, or straightened paper clip to press down on the latch detent of the podlet through an opening on the interface housing.
3. Gently pull the podlet connector out of the housing with one hand while pressing down on the latch detent with the pointed tool.

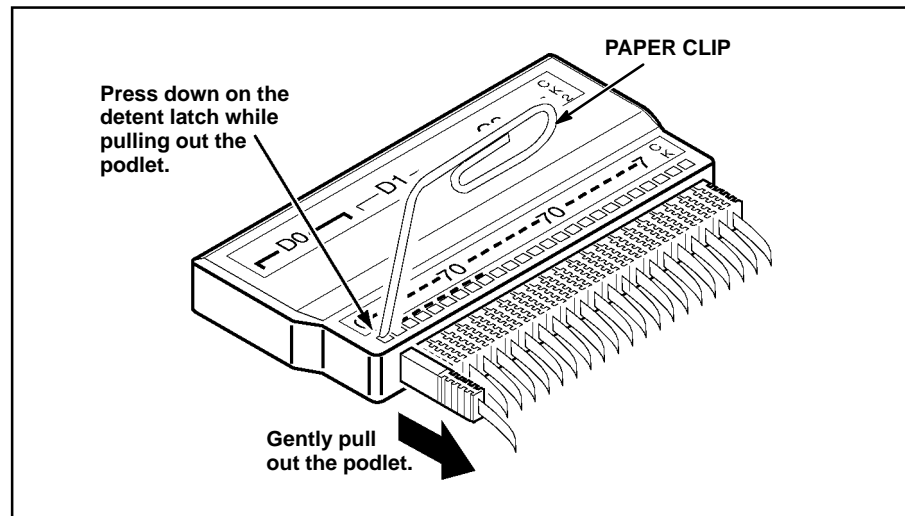


Figure C-4. Removing a clock or probe podlet from the interface housing.

Replacing a Clock Probe

To replace a clock probe, insert a new clock probe into the same clock channel position on the interface housing. Insert the clock probe into the interface housing with the detent latch oriented to the label side of the housing. Refer to Figure C-4.

Removing Probe Podlets from the Podlet Holder

Refer to Figure C-5 and the following procedure to remove the 8-channel probe podlets from the podlet holder.



Excessive pulling on the sides of the holder can damage the podlet holder. Spread the holder open wide enough to clear and remove the podlets.

1. To remove podlets from the podlet holder, grasp the plastic pull tab on each side of the podlet holder and gently spread the sides of the holder open just enough to clear a podlet.
2. Remove the middle two podlets from the podlet holder by pushing up on the metal pin receptacles.
3. Release the tabs on the podlet holder.
4. Remove the remaining podlets by turning and extracting each one at a time.

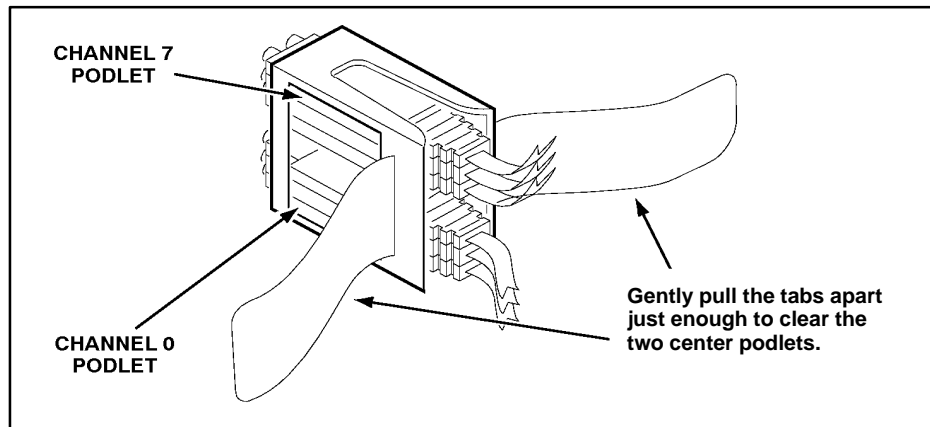


Figure C-5. Ganging together the 8-channel probe podlets.

Replacing 8-Channel Probe Podlets

The channel podlets must retain the same channel order on both the interface housing and in the podlet holder. Be sure to replace the old podlet with a podlet of the same color. Table C-19 shows the color code and channel number of each podlet for an 8-channel probe.

Table C-19
Podlet-to-Channel Color Code

Podlet Color	Channel
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7

Refer to Figure C-5 and the following procedure to replace an 8-channel probe podlet.

1. Insert the appropriately colored podlet into the interface housing with the detent latch oriented to the label side of the housing.
2. If you are replacing a single podlet, orient the podlet connector marked GND towards the side of the podlet holder labeled GROUND.
3. Grasp the plastic pull tab on each side of the holder and gently spread the sides of the holder open just enough to clear the podlet.

4. Hold the podlet body with the other hand and place it in the holder in the correct channel order. Do not grasp and turn the podlet cable.
5. If you are reganging all the podlets of an 8-channel probe, begin ganging the podlets together starting with either channel 0 or channel 7. Orient the podlet channel marked GND towards the side of the podlet holder labeled GROUND.



Avoid twisting the podlet cables between the interface housing and the podlet holder. To prevent damage to the podlets, keep the podlet cables parallel to each other when ganging them into the holder.

6. Hold the podlet body, turn the podlet body parallel to the sides of the holder, move it into the holder, and use your fingers to press it into place perpendicular to the sides of the holder. Be sure to gang the podlets in the correct channel order according to the channel label on the podlet holder and podlet color code, with all ground channels toward the Ground side of the holder. Do not place the podlet into the holder by grasping the podlet cable.
7. Continue placing the next two podlets, one at a time, in channel order, in the podlet holder. Orient all ground channels toward the Ground side of the holder.
8. The fourth podlet should be either channel 0 or 7, whichever one is not already placed in the holder. Place this podlet in the other end of the podlet holder and orient the ground channel correctly.
9. Continue placing the next two podlets, one at a time, in channel order, in the podlet holder. Continue orienting the ground channels correctly.



Excessive pulling on the sides can break the podlet holder. Spread the holder open only wide enough to clear the podlet.

10. Grasp the plastic pull tab on each side of the holder and gently spread the sides of the holder open just enough to clear a podlet.
11. Place the last pair of podlets (channels 3 and 4) in the podlet holder in proper channel order, orienting the ground channels to the Ground side of the holder.

REMOVING AND REPLACING SOCKETS

The probe adapter board contains sockets designed to protect the probe adapter, and to make it easy to insert and remove the microprocessor. The socket on top of the probe adapter board is soldered and cannot be removed. The protective socket on the bottom of the probe adapter board can be removed.

You should not have to remove the replaceable protective socket on the probe adapter unless the pins on the socket are damaged. To remove the protective socket, refer to Figure C-6 and follow these steps:

1. Place a proper (nonmetallic) socket removal tool between the socket and the probe adapter board. Figure C-6 shows an AMP PGA removal tool.

CAUTION

Do not use a screwdriver to remove the protective socket from the probe adapter board. You can easily damage the etched runs on the board.

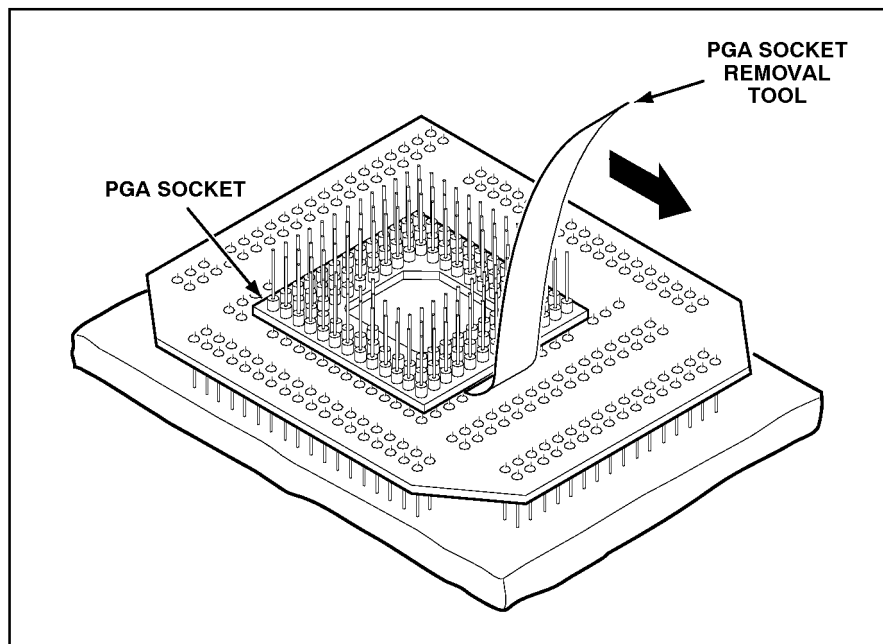


Figure C-6. Removing a protective socket from a typical PGA probe adapter board.

2. Push down on the handle of the tool until the socket begins to separate from the probe adapter board pins.



Do not completely pry off one side of the protective socket and then the other. Applying uneven pressure can damage the socket's pins. Do not use board components as leverage to remove the socket.

3. Perform step 2 on all sides of the socket. Use even pressure alternately on all sides until the socket is loose.
4. Remove the socket from the board.

To replace the protective socket, follow these steps:

1. Spray an electrical contact lubricant on the probe adapter socket so the replacement socket can be easily inserted.
2. Check that the new socket's pins are straight.
3. Place the socket on the pins of the probe adapter board aligning pin A1 with pin A1; make sure that all pins line up correctly.
4. Press the socket onto the board by applying equal pressure on two opposed sides of the socket.

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