

# Instruction Manual



## **DAS 92DM921 TMS320C40 Microprocessor Support 070-8793-00**

### **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

## 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:

B010000	Tektronix, Inc., Beaverton, Oregon, USA
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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 busses, 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 your local Tektronix Application Engineer.

This section provides basic information on the following:

- the 92DM921 Microprocessor Support product
- software compatibility
- DAS 9200 configuration
- your TMS320C40 system requirements
- 92DM921 restrictions
- this manual

The 92DM921 Microprocessor Support product disassembles data from systems that are based on the Texas Instruments, Inc. TMS320C40 microprocessor. The 92DM921 product runs on a DAS 9200 logic analyzer equipped with at least one 92A96 Acquisition Module.

The 92DM921 product supports the TMS320C40 microprocessor in a 325-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 TMS320C40 system
- this manual
- the *DAS 9200 System User Manual*
- the *92A96 Module User Manual*, Tektronix, Inc. 1992
- a user manual for your TMS320C40 microprocessor
- LA-LINK (if you want to download symbols from your high-level development system)

### **DAS 9200 SYSTEM SOFTWARE COMPATIBILITY**

The 92DM921 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 at least one 92A96 Module and four standard data acquisition probes.

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

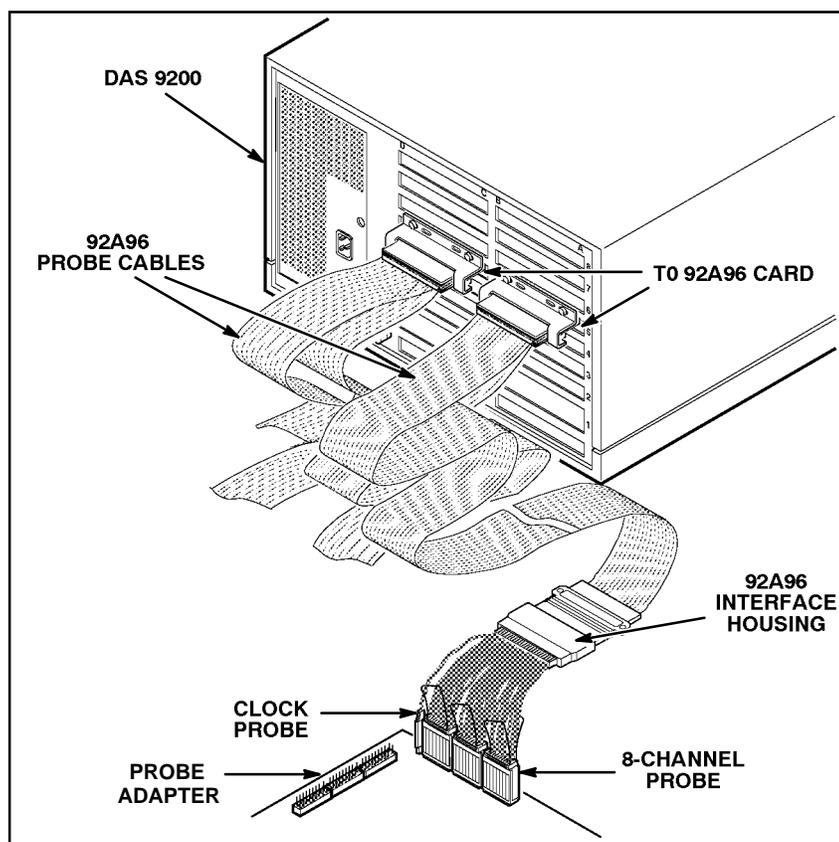


Figure 1-1. DAS 9200 connected to a typical probe adapter.

## 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 TMS320C40 microprocessor at speeds of up to 40 MHz<sup>1</sup>.

**Probe Adapter Clearance.** Your TMS320C40 system must have a minimum amount of clear space surrounding the TMS320C40 microprocessor to accommodate the probe adapter. Figure C-2 in *Appendix C: Service Information* gives these dimensions.

<sup>1</sup> 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 TMS320C40 microprocessor in systems with extremely tight timing margins. Appendix C contains specifications on how the probe adapter affects your system.

**TMS320C40 System and Probe Adapter Cooling.** You must be sure to retain the original level of cooling for your TMS320C40 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 92DM921 software that disassembles bus cycles into instruction mnemonics and cycle types.
- the term system under test (SUT) 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 system under test (SUT)

### 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 92DM921 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 - 92DM921
X window on a workstation or a 9202XT	Release 3, Version 1.30†	DAS 92XTERM Application SW - 92DM921

\*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

When there are two or three 92A96 Modules in adjacent slots, they are automatically formed into a variable-width module by the system software at power on. If you need to use one 92A96 Module from a variable-width module, you must reconfigure the DAS 9200 accordingly prior to selecting software support in the 92A96 Configuration menu. Refer to the discussion of the System Configuration menu in the *DAS 9200 System User Manual* for details on how to reconfigure variable-width modules.

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

In a system with many 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 2-1 shows where to apply slot number labels.

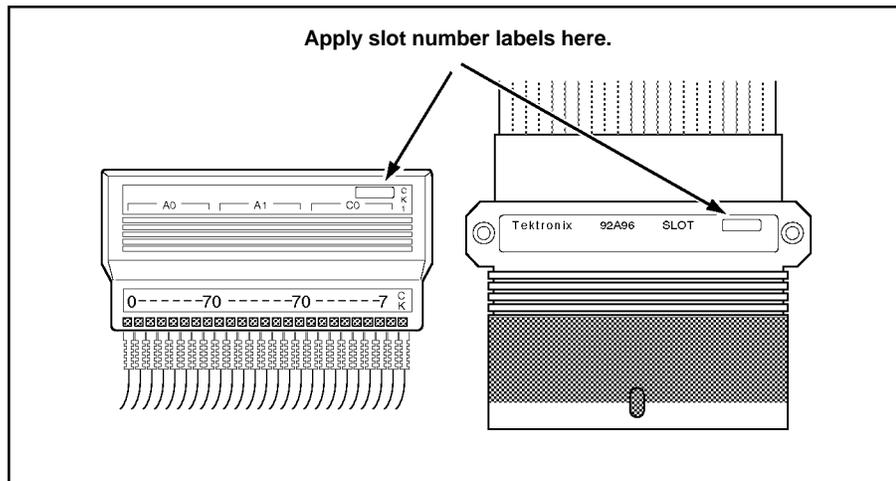


Figure 2-1. Applying slot number labels.

## 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.

Prefixes to indicate various TMS320C40 bus connections are printed on the probe adapter. A G\_ prefix indicates Global bus connections, an L\_ prefix indicates Local bus connections, and a C\_ prefix indicates Communications Port bus connections.

The Communications Ports Bus will not be disassembled.

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.*

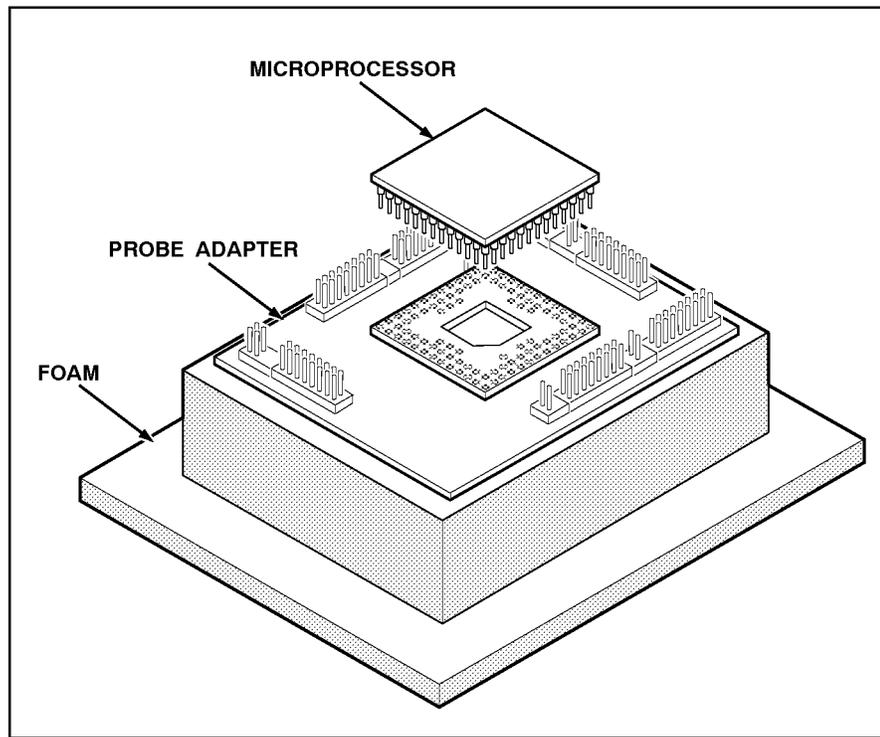
*Always wear a grounding wrist strap or similar device while handling the microprocessor and probe adapter.*

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 2-2. This prevents the circuit board from flexing and the socket pins from bending.
4. Remove the TMS320C40 microprocessor from your SUT.
5. Line up the pin A1 indicator on the microprocessor with the pin A1 indicator on the probe adapter board.

**CAUTION**

*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 2-2.



**Figure 2-2. 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 2-3. Match the channel groups and numbers on the interface housing to the corresponding pins on the probe adapter.

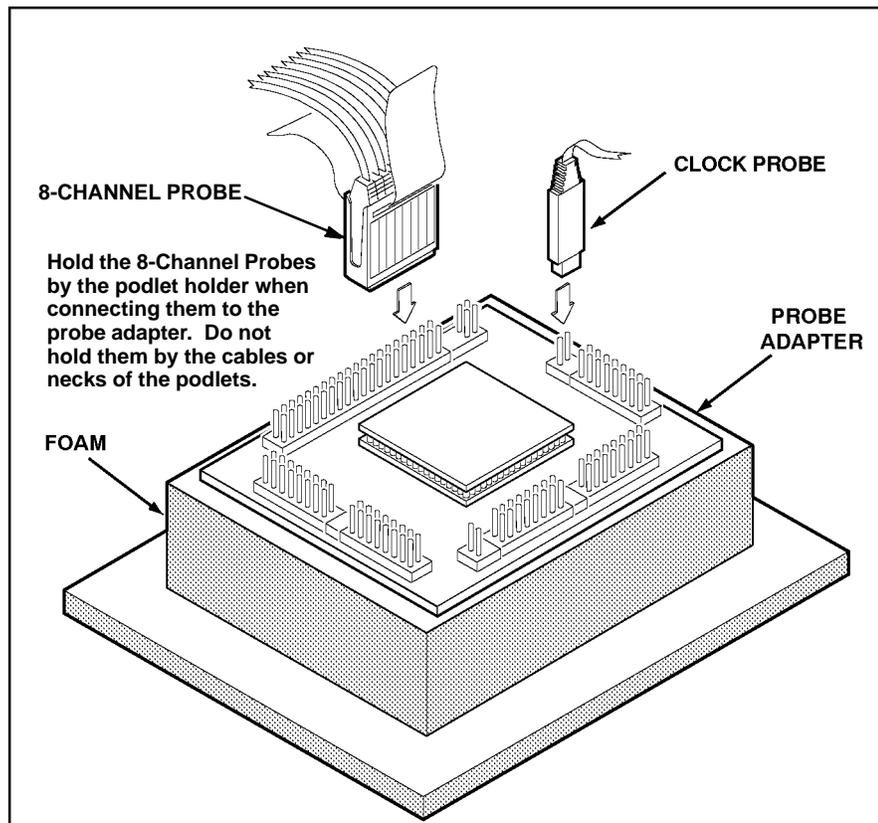


Figure 2-3. Connecting the podlets to a typical PGA probe adapter.

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 2-4.

**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.*

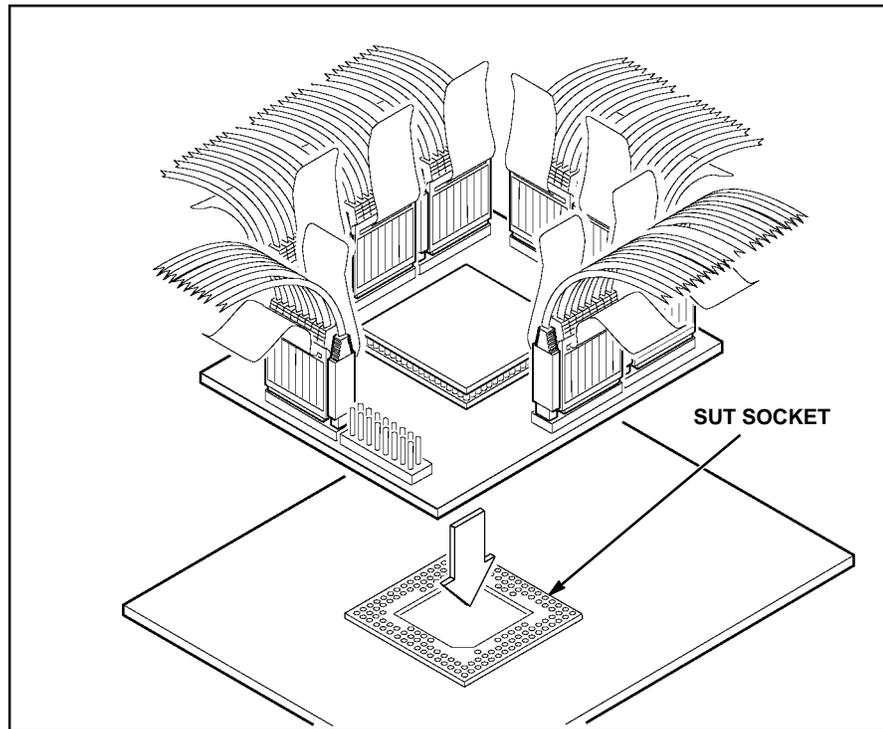


Figure 2-4. Placing a typical PGA probe adapter onto the SUT.

**Installation and Connections**

## 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 TMS320C40 support, follow these steps:

1. Press the Menu Select key, select the appropriate 92A96 Module, select its Configuration menu, and press Return.
2. Select 320C4X 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 TMS320C40 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 channel groups for the TMS320C40 microprocessor are:

Address	Data	Control	Misc
BusCtl	BusCtl1	COMMxD	CxCTRL

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 92DM921 software offers a customized clocking selection for the TMS320C40 microprocessor. This clocking choice (Custom) is the default selection whenever you select the TMS320C40 Support in the Configuration menu. 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.

All microprocessor cycles are captured by the DAS; you cannot select a specific clocking type.

## 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 320C4X\_Ctrl) supplied by the disassembler software that replaces specific Control channel group values.

Table 3-1 shows the name, bit pattern, and meaning for the symbols in the file 320C4X\_Ctrl, the Control group symbol table.

**Table 3-1**  
**320C4X\_Ctrl Symbol Table Definitions**

Symbol	Control Group Value				Meaning
	STAT3	STAT2	STAT1	STAT0	
STRB0 PRGM READ	0	0	0	0	Read program strobe 0
STRB0 DATA READ	0	0	0	1	Read data strobe 0
STRB0 DMA READ	0	0	1	0	Read DMA strobe 0
STRB0 SIGI READ	0	0	1	1	Read SIGI strobe 0
STRB0 DATA WRITE	0	1	0	1	Write data strobe 0
STRB0 DMA WRITE	0	1	1	0	Write DMA strobe 0
STRB1 PRGM READ	1	0	0	0	Read program strobe 1
STRB1 DATA READ	1	0	0	1	Read data strobe 1
STRB1 DMA READ	1	0	1	0	Read DMA strobe 1
STRB1 SIGI READ	1	0	1	1	Read SIGI strobe 1
STRB1 DATA WRITE	1	1	0	1	Write data strobe 1
STRB1 DMA WRITE	1	1	1	0	Write DMA strobe 1
IDLE	1	1	1	1	Idle

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 320C4X\_Ctrl 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 Control 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.

**Setting Up Disassembler Software**

## 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 TMS320C40 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.

#### NOTE

*Selections in the Disassembly Format Definition overlay must be set correctly in order for your acquired data to be disassembled correctly. Refer to Disassembly Format Definition Overlay later in this section.*

## 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 within the vector name.

**Table 4-1**  
**Cycle Type Definitions**

<b>Cycle Type</b>	<b>Definition</b>
(STRB0 PROGRAM READ)	A read from program strobe 0
(STRB0 DATA READ)	A read from data strobe 0
(STRB0 DMA READ)	A read from DMA strobe 0
(STRB0 SIGI READ)	A read from SIGI strobe 0
(RESERVED)	A reserved cycle
(STRB0 DATA WRITE)	A write to data strobe 0
(STRB0 DMA WRITE)	A write to DMA strobe 0
(STRB1 PROGRAM READ)	A read from program strobe1
(STRB1 DATA READ)	A read from data strobe1
(STRB1 DMA READ)	A read from DMA strobe 1
(STRB1 SIGI READ)	A read from SIGI strobe 1
(STRB1 DATA WRITE)	A write to data strobe1
(S/W WAIT STATE)	A software wait state cycle
(FLUSH)	A flush cycle
(WAIT)	A wait cycle
(READ EXTENSION)	A read extension cycle
** UNKNOWN CYCLE TYPE **	Unrecognized cycle type
(IDLE)	No cycle detected

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

Sequence	Address	Data	Mnemonics	Timestamp
0	003020EC	1EC80709	LDA *+AR7(9),AR0	
1	00310FEF	00000045	( STRB0 DATA READ )	350 ns
2	00310FEF	00000045	( STRB0 DATA READ )	2.300 μs
3	00310FF0	80000010	( STRB0 DATA READ )	450 ns
4	003020ED	35C08801	OR3 1,AR0(17),R0	1.000 μs
5	003020EE	1EC90304	LDA *+AR3(4),AR1	50 ns
6	003020EE	1EC90304	( S/W Wait State )	50 ns
7	003020EF	1540C100	STI R0,*AR1	50 ns
8	003020EF	1540C100	( S/W Wait State )	50 ns
9	003020F0	08400013	LDI *+AR0(13),R0	650 ns
10	003020F0	08400013	( S/W Wait State )	50 ns
11	003020F1	1540030A	STI R0,*+AR3(A)	400 ns
12	003020F2	1A640002	TSTB 02h,R4	50 ns
13	003020F3	6A050009	BEQ \$003020FD	50 ns
14	003020F3	6A050009	( S/W Wait State )	50 ns
15	003020F4	1E8A0000	( FLUSH )	750 ns
16	003020F5	35411A03	MPYI3 3,AR2(3),R1	200 ns
17	003020F6	02010000	ADDI R0,R1	50 ns
18	003020F6	02010000	( S/W Wait State )	50 ns
19	003020F7	02610004	ADDI 04h,R1	50 ns
20	003020F8	15410308	STI R1,*+AR3(8)	50 ns

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 TMS320C40 Address bus.
- 4 **Data Group.** Lists data from channels connected to the TMS320C40 Data bus.
- 5 **Mnemonics Column.** Lists the instructions that have been disassembled.
- 6 **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 and 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 might change the flow of control, such as the following:

- conditional jumps taken or not
- unconditional jumps (whether or not the destination address is on the bus)
- instructions that cause traps or interrupts (taken or not)

Instructions that generate a change in the flow of control in the TMS320C40 microprocessor are as follows:

CALL	SWI	RETS	RPTS
LAJ	TRAP	BR	RPTB
LAT	RETI	BRD	RPTBD

Conditional branch instructions in the following forms also generate a change in the flow of control:

Bcond	BcondAT	DBcond
BcondD	BcondAF	DBcondD

## 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 TMS320C40 microprocessor are as follows:

CALL	LAT	TRAP	RETS
LAJ	SWI	RETI	

## 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 a data-page pointer value

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

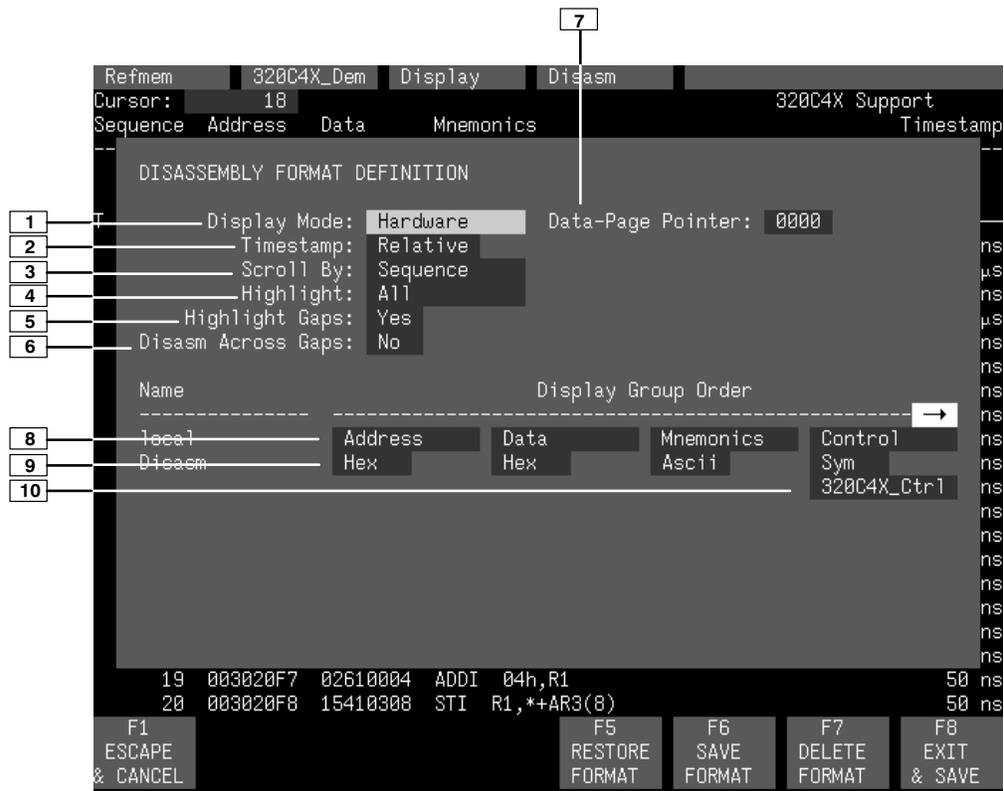


Figure 4-2. Disassembly Format Definition overlay.

- 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 **Data-Pointer.** You can use this field to enter a value for the TMS320C40 data-page pointer, which is used by the product to calculate several operand display values.
- 8 **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.
- 9 **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 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.
- 10 **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 Control 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.

### 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.
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 Control 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.

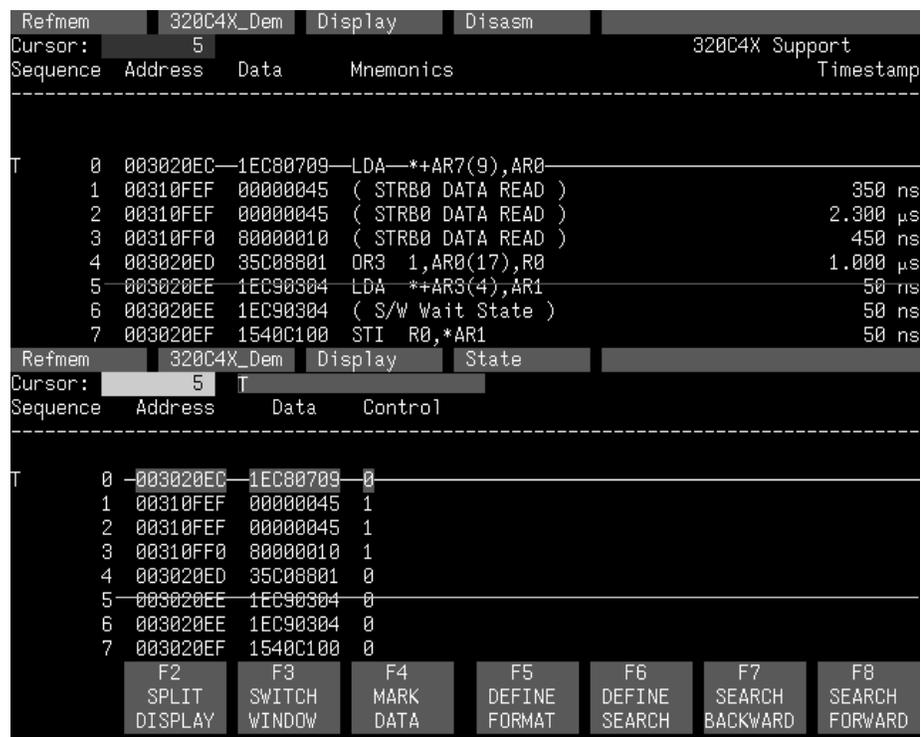


Figure 4-3. Disassembly and State split-screen display. You can use this method to perform searches.

## 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 TMS320C40 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 320C4X\_Demo Refmem, follow these steps:

1. Press the Select Menu key, and select the 320C4X\_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 320C4X\_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 TMS320C40 system prior to, during, and after attempting to integrate your software with the TMS320C40 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 320C4X\_96 can be used to view TMS320C40 timing data. A description of these files and how to use them 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 TMS320C40 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 TMS320C40 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 falling edge of CLK: 0 on the acquisition module as the clock channel, and turning off the remaining three clocks, the module will sample data on every falling edge of the clock. No data is acquired on the rising 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 TMS320C40 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 TMS320C40 microprocessor support, is available for you to use when displaying data in the Timing format. The 320C4X\_96 file is installed on the DAS 9200 with the support software.

The 320C4X\_96 Timing Format file places the Address and Data groups first as bus forms containing bus values instead of as individual timing waveforms. These groups are followed by TMS320C40 control signals. Figure 5-1 shows data displayed using the 320C4X\_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 320C4X\_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 TMS320C40 signal names.



Refmem	320C4X_Dem	Display	State
Cursor:	18	T	
Sequence	Address	Data	Control
T	0	003020EC	1EC80709 0
	1	00310FEF	00000045 1
	2	00310FEF	00000045 1
	3	00310FF0	80000010 1
	4	003020ED	35C08801 0
	5	003020EE	1EC90304 0
	6	003020EE	1EC90304 0
	7	003020EF	1540C100 0
	8	003020EF	1540C100 0
	9	003020F0	00400013 0
	10	003020F0	00400013 0
	11	003020F1	1540030A 0
	12	003020F2	1A640002 0
	13	003020F3	6A050009 0
	14	003020F3	6A050009 0
	15	003020F4	1E8A0000 0
	16	003020F5	35411A03 0
	17	003020F6	02010000 0
	18	003020F6	02010000 0
	19	003020F7	02610004 0
	20	003020F8	15410308 0
	21	003020F8	15410308 0
	22	003020F9	1E890001 0

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*.

**General Purpose Analysis**

# 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 TMS320C40 system is powered on and running. Be sure the system is not halted.
2. 320C4X 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 TMS320C40 microprocessor or on either of the probe adapter sockets.

**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 TMS320C40 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 TMS320C40 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. 320C4X Support is selected in the 92A96 Configuration menu.
2. Custom is selected in the Clock menu.
3. 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.
4. The orientation of pin A1 on the microprocessor, the probe adapter, and SUT are correct.
  5. No pins are bent or missing on the TMS320C40 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 320C4X 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 TMS320C40 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 TMS320C40 system. Try performing hardware analysis with your DAS 9200 system to ensure that the TMS320C40 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 TMS320C40 system signals.

## **Error Messages and Disassembly Problems**

## Appendix B: HOW DATA IS ACQUIRED

This appendix explains how the 92A96 Module acquires TMS320C40 signals using the 92DM921 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 TMS320C40 Support is selected in the Configuration menu. With Custom clocking, the module logs in all signals from multiple groups of channels when they are valid on the TMS320C40 bus. The module then sends all the logged-in signals to the trigger machine and to the acquisition memory of the module for storage.

Custom clocking has one option: H1 Falling Qualified. All signals are logged in on H1's falling edge when STRB(0/1)~ and RDY(0/1)~ are active low, as shown in Figure B-1. The setup time ( $T_s$ ) is 5 ns minimum for all signals with respect to falling H1, and the hold time ( $T_h$ ) is 0 ns minimum for all signals with respect to the falling H1.

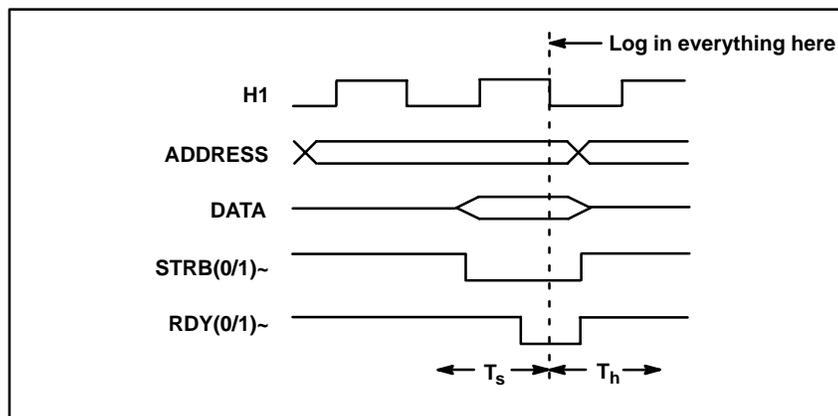


Figure B-1. TMS320C40 bus timing.

## 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.

Table B-1 shows the microprocessor signals available on J10 on the probe adapter.

**Table B-1**  
**TMS320C40 Signals on J10**

Pin No.	TMS320C40 Signal Name
1	TMS
3	PCK
5	PD0~
7	PD1~
9	PRST~
11	EMU0~
13	EMU1~

All even-numbered pins are grounded.

Table B-2 shows the microprocessor signals available on J3 on the probe adapter.

**Table B-2**  
**TMS320C40 Signals on J3**

<b>Pin No.</b>	<b>TMS320C40 Signal Name</b>
19	RESETLOC1
21	RESETLOC0
23	TCLK1
25	TCLK0
27	IIOF3
29	IIOF2
31	IIOF1
33	IIOF0

All even-numbered pins are grounded.

### Signals Not On the Probe Adapter

All microprocessor signals are accessible on the probe adapter.

### Extra 92A96 Channel

The extra 92A96 channel available for you to use to make alternate microprocessor connections is C1:0. 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.

## How Data is Acquired



**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

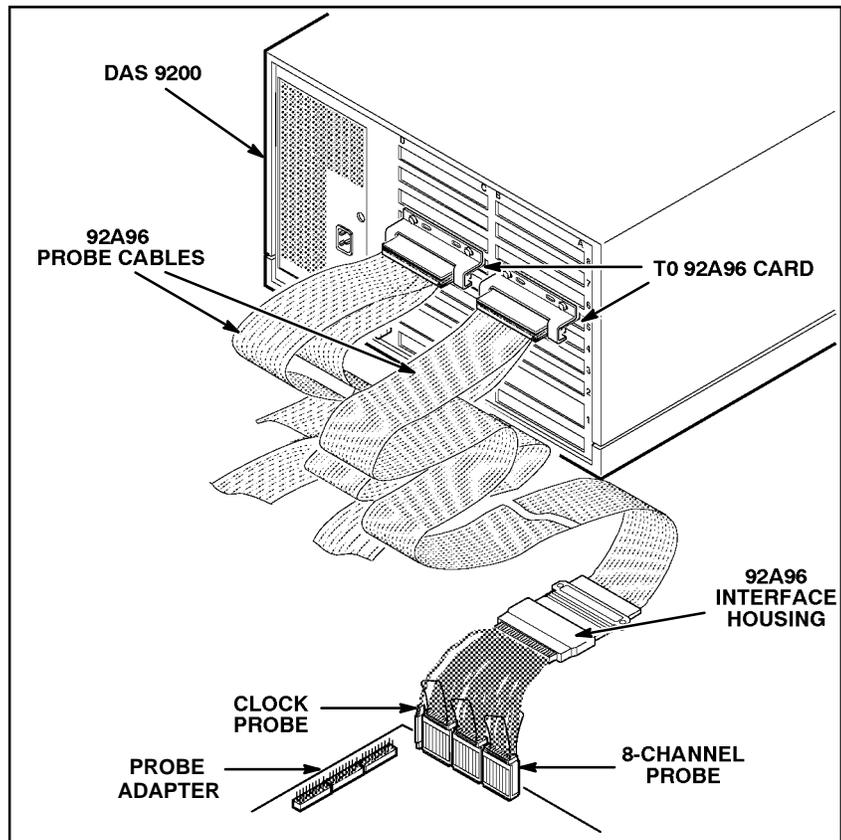
The following servicing safety information is for service technicians. Follow these safety precautions, along with the general precautions outlined in your *92A96 Module User Manual*, while installing or servicing this product.

**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 TMS320C40 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 TMS320C40 microprocessor. The probe adapter connects to the SUT. Signals from the TMS320C40 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 Texas Instruments, Inc. TMS320C40 microprocessor in a 325-pin PGA package.

### **Probe Adapter Circuit Description**

The 92DM921 Probe Adapter Board is a custom design. It connects to a standard 325-pin grid array (PGA) socket for the TMS320C40 microprocessor. There is no active circuitry on the probe adapter board. All microprocessor signals are available on standard connectors for analysis.

## 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 system under test (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	40 MHz
Minimum Setup Time Required	
All Signals	5 ns
Minimum Hold Time Required	
All Signals	0 ns
Signals	<b>DC Load, Specification</b>
H1, H3	3 podlets
ACK~, NMI~, RESET~, ROMEN	2 podlets
All other	1 podlet

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

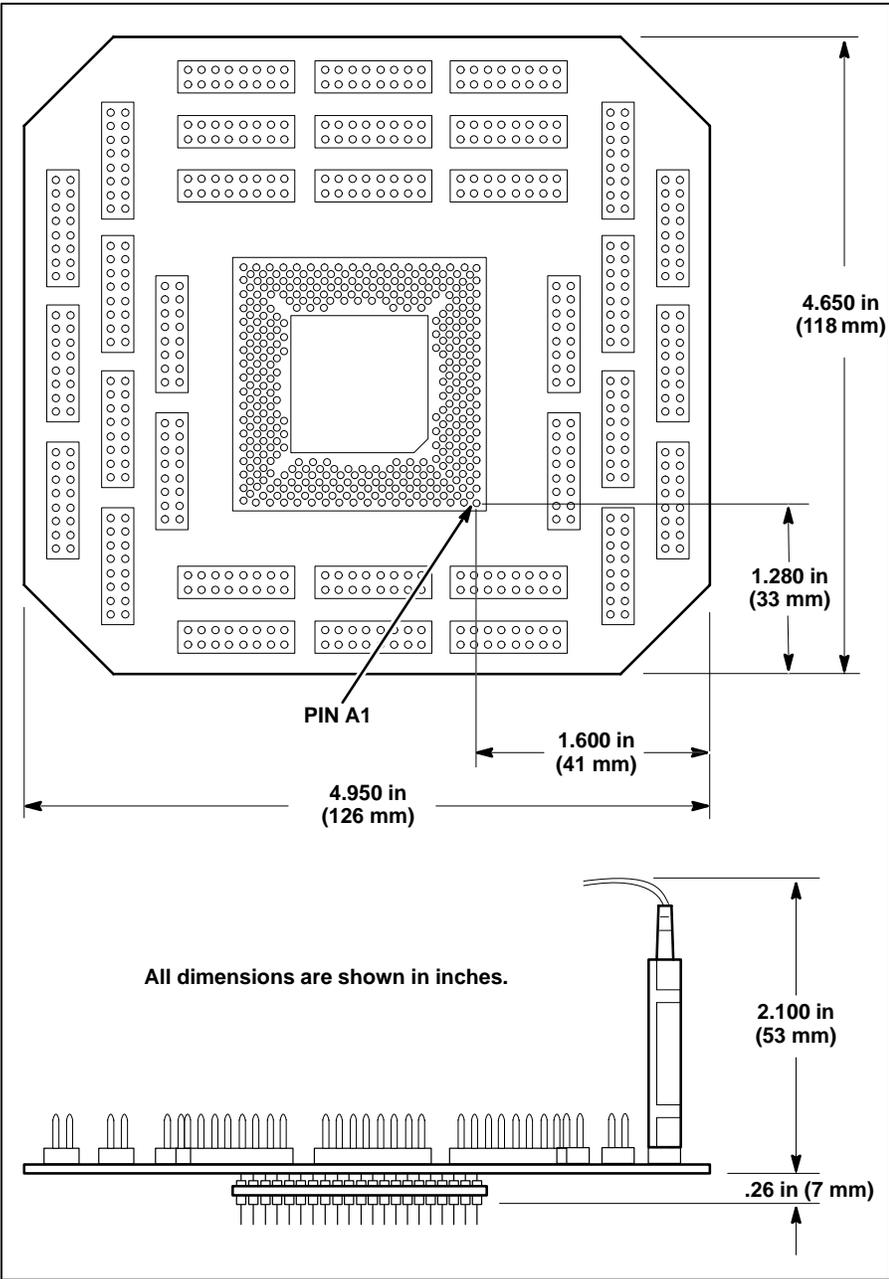


Figure C-2. Minimum clearance of the probe adapter.

**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 TMS320C40 thermal considerations. Forced air cooling may be required across the CPU.

† Tested to Tektronix standard 062-2847-00 class 5.

## Channel Assignments

Prefixes to indicate various TMS320C40 bus connections are printed on the probe adapter. A G\_ prefix indicates Global bus connections, an L\_ prefix indicates Local bus connections, and a C\_ prefix indicates Communications Port bus connections.

The Communications Ports Bus will not be disassembled.

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).

**Table C-3**  
**92DM921 Address Group Channel Assignments**

Bit Order	92A96 Channel	TMS320C40 Signal Names	
		Global Bus (Channel Name*)	Local Bus
MSB	A3:7	AE~	LAE~
	A3:6	A30	LA30
	A3:5	A29	LA29
	A3:4	A28	LA28
	A3:3	A27	LA27
	A3:2	A26	LA26
	A3:1	A25	LA25
	A3:0	A24	LA24
	A2:7	A23	LA23
	A2:6	A22	LA22
	A2:5	A21	LA21
	A2:4	A20	LA20
	A2:3	A19	LA19
	A2:2	A18	LA18
	A2:1	A17	LA17
	A2:0	A16	LA16
	A1:7	A15	LA15
	A1:6	A14	LA14
	A1:5	A13	LA13
	A1:4	A12	LA12
	A1:3	A11	LA11
	A1:2	A10	LA10
	A1:1	A9	LA9
	A1:0	A8	LA8
	A0:7	A7	LA7
	A0:6	A6	LA6
	A0:5	A5	LA5
	A0:4	A4	LA4
	A0:3	A3	LA3
	A0:2	A2	LA2
	A0:1	A1	LA1
	LSB	A0:0	A0

All signals required for disassembly.

\*The 92A96 channel name only appears in the Trigger menu and Timing display.

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

**Table C-4**  
**92DM921 Data Group Channel Assignments**

Bit Order	92A96 Channel	TMS320C40 Signal Names		
		Global Bus (Channel Name*)	Local Bus	Communications Ports Bus
MSB	D3:7	D31	LD31	C3D7
	D3:6	D30	LD30	C3D6
	D3:5	D29	LD29	C3D5
	D3:4	D28	LD28	C3D4
	D3:3	D27	LD27	C3D3
	D3:2	D26	LD26	C3D2
	D3:1	D25	LD25	C3D1
	D3:0	D24	LD24	C3D0
	D2:7	D23	LD23	C4D7
	D2:6	D22	LD22	C4D6
	D2:5	D21	LD21	C4D5
	D2:4	D20	LD20	C4D4
	D2:3	D19	LD19	C4D3
	D2:2	D18	LD18	C4D2
	D2:1	D17	LD17	C4D1
	D2:0	D16	LD16	C4D0
	D1:7	D15	LD15	C2D7
	D1:6	D14	LD14	C2D6
	D1:5	D13	LD13	C2D5
	D1:4	D12	LD12	C2D4
	D1:3	D11	LD11	C2D3
	D1:2	D10	LD10	C2D2
	D1:1	D9	LD9	C2D1
	D1:0	D8	LD8	C2D0
	D0:7	D7	LD7	C1D7
	D0:6	D6	LD6	C1D6
	D0:5	D5	LD5	C1D5
	D0:4	D4	LD4	C1D4
	D0:3	D3	LD3	C1D3
	D0:2	D2	LD2	C1D2
	D0:1	D1	LD1	C1D1
	LSB	D0:0	D0	LD0

All signals required for disassembly.

\*The 92A96 channel name only appears in the Trigger menu and Timing display.

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

**Table C-5**  
**92DM921 Control Group Channel Assignments**

Bit Order	92A96 Channel	Channel Name*	TMS320C40 Signal Names		
			Global Bus	Local Bus	Communications Ports Bus
MSB	C3:7	Ctrl_3	STAT3	LSTAT3	CREG3~
	C3:6	Ctrl_2	STAT2	LSTAT2	CACK3~
	C3:5	Ctrl_1	STAT1	LSTAT1	CSTRB3~
LSB	C3:4	Ctrl_0	STAT0	LSTAT0	CRDY3~

All signals required for disassembly.

\*The 92A96 channel name only appears in the Trigger menu and Timing display.

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

**Table C-6**  
**92DM921 Misc Group Channel Assignments**

Bit Order	92A96 Channel	TMS320C40 Signal Names	
		Global Bus (Channel Name*)	Communications Ports Bus
MSB	C3:2	NMI~‡	CACK2~
	C3:1	IACK~‡	CSTRB2~
LSB	C3:0	RESET~‡	CRDY2~

~This signal is asserted low.

\*The 92A96 channel name only appears in the Trigger menu and Timing display.

‡These signals are required for disassembly.

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

**Table C-7**  
**92DM921 BusCtl Group Channel Assignments**

Bit Order	92A96 Channel	TMS320C40 Signal Names		
		Global Bus (Channel Name*)	Local Bus	Communications Ports Bus
MSB	C2:3	STRB1~ ‡	LSTRB1~ ‡	CREQ1~
	C2:2	STRB0~ ‡	LSTRB0~ ‡	CACK1~
	C2:1	RDY1~ ‡	LRDY1~ ‡	CSTRB1~
	C2:0	RDY0~ ‡	LRDY0~ ‡	CRDY1~
	C2:7	PAGE1 †	LPAGE1 †	CREQ4~
	C2:6	PAGE0 †	LPAGE0 †	CACK4~
	C2:5	CE1~ †	LCE1~ †	CSTRB4~
	C2:4	CE0~ †	LCE0~ †	CRDY4~
LSB	C3:3	LOCK~ †	LLOCK~ †	CREQ2~

~This signal is asserted low.

\*The 92A96 channel name only appears in the Trigger menu and Timing display.

‡This signal is required in the indicated bit position for disassembly.

†This signal is not required for disassembly.

Table C-8 shows the 92A96 section and channel assignments for the BusCtl1 group channels and the microprocessor signal to which each channel connects, starting with the most significant bit (MSB).

**Table C-8**  
**92DM921 BusCtl1 Group Channel Assignments**

Bit Order	92A96 Channel	TMS320C40 Signal Names	
		Global Bus (Channel Name*)	Local Bus
MSB	A3:7	AE~	LAE~
	C1:3	DE~	LDE~
	C1:2	R/W1~	LR/W1~
LSB	C1:1	R/W0~	LR/W0~

~This signal is asserted low.

\*The 92A96 channel name only appears in the Trigger menu and Timing display.

All signals are required for disassembly.

There are six communication ports on the TMS320C40 microprocessor. The probe adapter contains six groups of square pins that you can use to connect to the data signals of each communication port.

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

**Table C-9**  
**92DM921 COMMxD Group Channel Assignments**

Bit Order	92A96 Channel	92A96 Channel Name *
MSB	C0:7	CxD_7
	C0:6	CxD_6
	C0:5	CxD_5
	C0:4	CxD_4
	C0:3	CxD_3
	C0:2	CxD_2
	C0:1	CxD_1
LSB	C0:0	CxD_0

\*The 92A96 channel name only appears in the Trigger menu and Timing display.

You can use the C0 probe to connect to any one of the six groups of communication port data signals. Table C-10 shows the TMS320C40 port number, the square pin group to which you connect the C0 probe, and the TMS320C40 signal name.

**Table C-10**  
**92DM921 Probe Adapter Port Connections**

Port Number	Square Pin Group Label	TMS320C40 Signal Name
5	G_C0:7-0	C5D7-C5D0
4	C_D2:7-0	C4D7-C4D0
3	C_D3:7-0	C3D7-C3D0
2	C_D1:7-0	C2D7-C2D0
1	C_D0:7-0	C1D7-C1D0
0	L_C0:7-0	C0D7-C0D0

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

**Table C-11**  
**92DM921 CxCTRL Group Channel Assignments**

Bit Order	92A96 Channel	92A96 Channel Name*	TMS320C40 Signal Names	
			Global Bus	Local Bus
MSB	C1:7	CREQx~	CREQ5~‡	CREQ0~
	C1:6	CACKx~	CACK5~‡	CACK0~
	C1:5	CSTRBx~	CSTRB5~‡	CSTRB0~
LSB	C1:4	CRDYx~	CRDY5~‡	CRDY0~

~This signal is asserted low.

\*The 92A96 channel name only appears in the Trigger menu and Timing display.

X is a port number 0 or 5.

‡ These signals are required for disassembly.

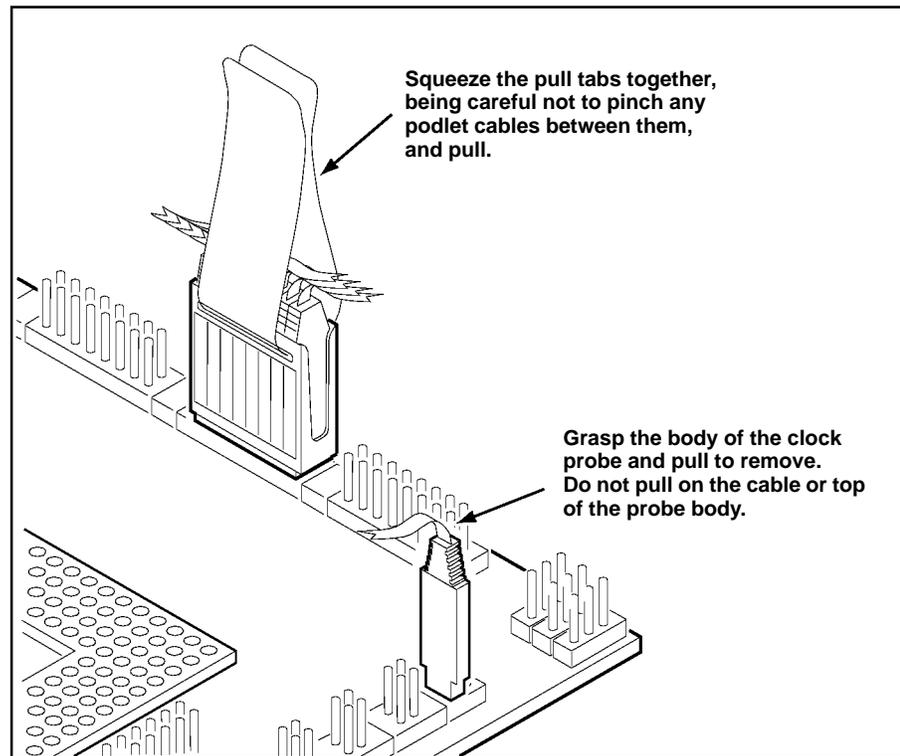
Table C-12 shows the 92A96 section and the channel assignments for the clock channels (not part of any group) and the microprocessor signal to which each channel connects. These channels are not stored with DAS 9200 acquisition data; they must be double-probed if they are to be stored in the new acquisition.

**Table C-12**  
**92DM921 Clock Channel Assignments**

92A96 Channel	TMS320C40 Signal Name
CLK0	H1
CLK1	H3
CLK2	no connection
CLK3	no connection

## 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 TMS320C40 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 TMS320C40 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.

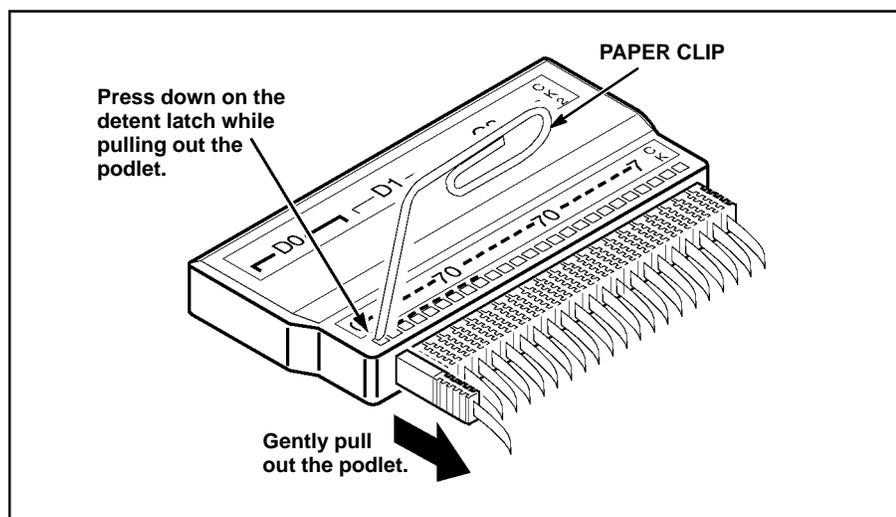


Figure C-4. Removing a clock or probe podlet from the interface housing.

## 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.

### CAUTION

*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.

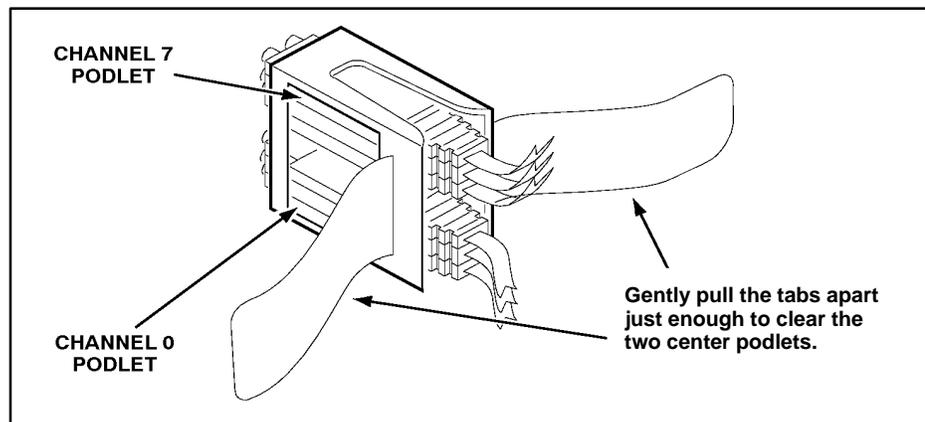


Figure C-5. Ganging together the 8-channel probe podlets.

## 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-13 shows the color code and channel number of each podlet for an 8-channel probe.

**Table C-13**  
**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

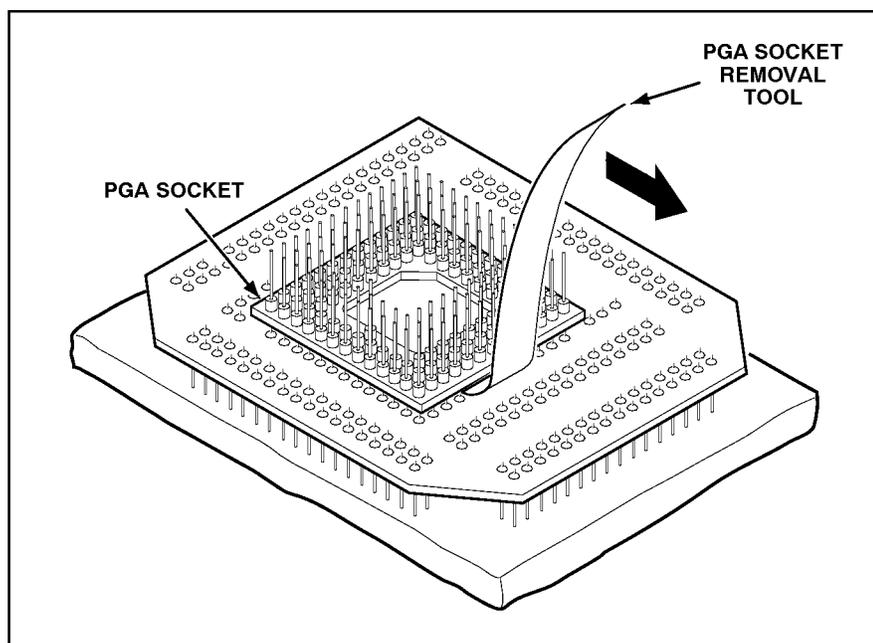
The probe adapter board contains sockets designed to protect the probe adapter, and to make it easy to insert and remove the microprocessor. The socket on top of the probe adapter board is soldered and cannot be removed. The protective socket on the bottom of the probe adapter board can be removed.

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.

## **Service Information**

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