Instructions

Tektronix

92DM916
80960KA, 80960KB & 80960MC
Microprocessor Support

063-1020-00

This document supports 92DM916 software version 1.00 and DAS 9200 system software release 2, version 1.60 and above.

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

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Tektronix, Inc., P.O. Box 1000, Wilsonville, OR 97070–1000

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Section 1: OVERVIEW

PRODUCT DESCRIPTION

The 92DM916 Microprocessor Support product disassembles data from systems based on the Intel 80960KA/KB/MC microprocessor. The 92DM916 product runs on a properly equipped DAS 9200.

This product consists of software on a floppy disk, probing accessories, a socketed 132-pin PGA probe adapter, and this manual. The software includes setup files and a disassembler program.

Also included is a demonstration reference memory. Directions for viewing the reference memory are in Section 3.

Product Warranty

This and other DAS microprocessor/bus support products in the "900" series of 92DM products were developed by third parties to address the needs of specific users, who are now successfully utilizing this support. If the media on which this product is distributed is defective during the warranty period, it will be replaced at no cost. Tektronix does not warrant the functionality of this software against any published document. Assistance in using this application software is available locally through Tektronix' network of Application Engineers. Hardware accessories, if any, are warranted against defects in materials or workmanship for 90 days.

ABOUT THIS MANUAL

This manual contains detailed descriptions of how to do the following:

- install the disassembler software
- view the demonstration reference memory
- configure the acquisition module for 80960KA/KB/MC support
- acquire bus activity
- use the disassembly display to view acquired data
- set up your DAS 9200 to perform timing analysis of the 80960KA/KB/MC bus

Conventions Used in This Manual

In this manual, the following conventions are used:

- the terms disassembler and disassembler software are used interchangeably in reference to the 92DM916 software that disassembles the bus cycles into instruction mnemonics and cycle types
- the terms system under test and SUT are used interchangeably in reference to the microprocessor system under test
- references to the 92A96 Data Acquisition Module include all versions (92A96D, 92A96XD, etc.) of that module unless otherwise noted
- all screen prints used to show Disassembly display capabilities are generic photos of 68010 examples, not data acquired from an 80960KA/KB/MC system
- a signal that is active low has a tilde (~) following its name

Other References

Before using these instructions, you should be familiar with the operation of a DAS 9200 with the data acquisition module you are using. For general instructions on the use of the DAS 9200 and a data acquisition module, refer to both the *DAS 9200 System User's Manual* and the data acquisition module user's manual.

Refer to the Intel i960™ MC Microprocessor Reference Manual for information about the 80960KA/KB/MC microprocessor.

DAS 9200 CONFIGURATION

To use the 80960MC Support package, your DAS 9200 must be equipped with at least one 92A96 (Centurion) Data Acquisition Module with standard probes.

80960KA/KB/MC SYSTEM REQUIREMENTS

Package Types Supported, The 92DM916 microprocessor support package comes with a probe accessory that supports the 80960KA, 80960KB or 80960MC microprocessor in a socketed 132-pin PGA package. You can also connect the probes directly using any convenient means to support other packages or isolated applications.

Section 2: INSTALLING SOFTWARE

You must install the microprocessor support software prior to acquiring bus activity or using the disassembler to view acquired or Reference memory data.

The disassembler software sets up the DAS 9200 to acquire, disassemble, and display data from an 80960KA/KB/MC system. Prior to their use, the application files on the 5 1/4-inch floppy disk must be installed on the DAS 9200 hard disk. You cannot execute the disassembler from the floppy disk.

If you have a prototype version of 80960MC support installed on your system (provided by your local Application Engineer), you should remove it before you install the 92DM916 software. Failure to remove a prototype version before installing the production version will cause later removal of the prototype support to remove files needed by the production support. To check this, look at the HW/SW Version utility menu (you may need to scroll the display if you have many application packages installed). If there is an application called:

"80960MC PROTOTYPE 80960MC Support"

installed, you should remove it using the "Remove Application" operation in the Disk Services menu. If you have already installed the 92DM916 without doing this, simply remove them both and re-install the 92DM916.

To install the software, follow these steps:

1. Power on the DAS 9200 and press the Select Menu key.
2. Select the Disk Services menu in the Utilities column.
3. Press the Return key.
4. Select Install Application in the Operation field.
5. Press F8: EXECUTE OPERATION and follow the on-screen prompts.

If there is inadequate disk free space available on the hard disk, you must use the Remove Application or Delete File function of the Disk Services menu to free up enough disk space to install the software. The approximate space required to install the software is listed on the label of the 92DM916 floppy disk.

After the DAS 9200 successfully copies the application files from the floppy disk to the hard disk, the message **Application installation complete with no errors** appears on your screen.

Remove the floppy disk and store it in a safe place in case you need to reinstall the software.

If you would like to see an example of 80960KA/KB/MC bus activity with mnemonic disassembly, read the next discussion and procedure.

Section 3: VIEWING THE DEMO REFERENCE MEMORY

A reference memory file is provided for you to familiarize yourself with the way the disassembler displays 80960KA/KB/MC cycle types and instruction mnemonics. You can select the reference memory file to see how 80960KA/KB/MC mnemonics are displayed without making any of the connections between the DAS 9200 and the system under test.

The "960MC_DEMO" reference memory file is automatically installed when the disassembler software is installed on the hard disk.

To view the "960MC_DEMO" Refmem, use the following procedure:

1. Press the Select Menu key to return to the Menu Selection overlay.
2. Move the cursor to the Refmem column and select the "960MC_DEMO" file.
3. Move the cursor to the Display column and select Disasm.
4. Press the Return key to view the reference memory.

You can change the format of disassembled data from the Disassembly Format Definition overlay, which you can access through the Disassembly menu. Hardware disassembly is the default format in the Disassembly menu. Examples of the disassembly formats are found under *Display Formats* in Section 6.

If you wish to conserve space on the hard disk, you can delete the "960MC_DEMO" reference memory file. It is presented strictly for viewing and is not necessary to the operation of the disassembler.

Section 4: CONFIGURING THE DAS 9200 FOR 80960KA/KB/MC SUPPORT

The microprocessor support package supplies the disassembler software and data acquisition module setup files used to acquire and display instruction mnemonics. Setup files are supplied for the Channel, Clock, and Trigger menus. Symbol files are supplied for displaying data and to use in the Trigger menu as word recognizer values. A format file is also provided for the Timing menu when performing hardware analysis.

You can select the disassembler and its associated setup files from the module's Configuration menu. Move the cursor to the Software Support field and select 80960MC Support. The microprocessor support software automatically configures the various module menus as soon as you select 80960MC Support.

A detailed description of the 80960MC support setup follows. You can use the Channel, Clock, Trigger and Symbol Editor menus to view the default 80960MC setup files.

CONNECTING THE DAS 9200 TO THE 80960KA/KB/MC SYSTEM

Before acquiring data, you must connect the acquisition module probes to the appropriate signals of the 80960KA/KB/MC system you are testing. This is usually accomplished using s pre-configured appropriate probe adapter. The probe adapter provided with the 92DM916 accepts 92A96 eight-channel data probes and single-channel clock probes directly.

If you do not have a probe adapter that is compatible with your device, package or logic analyzer, or if you are attempting to probe a physically isolated part (soldered in, inadequate clearance, etc.), you can connect the probe channels according to Table 4-1 using the most convenient method available. If you use a 92A96 acquisition module without a 80960KA/KB/MC probe adapter, be sure to select "General Purpose" as the "Probe Interface Type" in the Custom Clock menu.

For 92A96 modules, use the 103-0321-00 132-pin PGA probe adapter (comes standard with the 92DM916). To connect the 92A96 Module clocks and 8-channel probes to the probe adapter, refer to Figure 2-2 and follow this procedure:

- Make sure that the jumper is in the "NORM" (for Disassembly or Synchronous acquisition) position.

- Match the section names and channel numbers on the interface housing to the probe adapter.
- Connect the clocks and 8-channel probes to the appropriate sets of square pins on the probe adapter.
- The signal connectors are located on the color-coded side of each 8-channel probe. The ground connections are located on the opposite side of the probe.

To connect the probe adapter to the system under test follow this procedure:

- Power down your 80960KA/KB/MC system and carefully remove the microprocessor. (It is not necessary to power down the DAS 9200.) Be sure to follow standard static precautions while handling either the microprocessor or the probe adapter.
- Carefully plug the probe adapter into the 80960KA/KB/MC socket. Align pin A1 on the probe adapter to pin A1 on the 80960KA/KB/MC system socket.
- Carefully plug the 80960KA/KB/MC microprocessor into the socket. Align pin A1 on the 80960KA/KB/MC to pin A1 of the socket. The clock and 8-channel probes should already be connected before placing the probe adapter in the system.

Notes & Cautions

- Be sure to connect the signal channels to the signal pins and the ground channels to the ground pins on the test clip. If you connect a ground lead to any 80960KA/KB/MC system signal, you can cause the 80960KA/KB/MC microprocessor to malfunction.
- Static-discharge can damage microprocessor devices, the system you are testing and your logic analyzer probes. To prevent static damage, always wear a grounding wrist strap, or similar device, while handling these items.
- Because the 80960KA/KB/MC encodes burst length information on the least significant two bits of the address bus, the Address group replaces these two bits with channels that are connected to ground (always a "0"). This re-mapping of signals causes correct addresses to be displayed, but precludes the use of range recognizers with the Address group for triggering. You can change the Address group in the Channel menu to use the actual signals A0:1&0, which will enable the use of range

recognizers, but disassembly of the acquired data will not be correct. For proper operation of address group range recognizers, specify "00 for the least significant two bits of the lower bound and "11" for the least significant two bits of the upper bound.

Alternate Connections

There are signals on the 80960KA/KB/MC that are not necessary for mnemonic disassembly. Acquisition of these signals may still be useful for hardware timing analysis. The signals that ARE required for disassembly are either signals that convey information required by the disassembly software algorithm or signals that are used to clock or qualify the data being stored.

You can use any of the acquisition channels NOT required for disassembly as general purpose channels to acquire data from other parts of your system. You can not, however change the clocking for these signals. They will be sampled once per bus cycle if Custom clocking is used, or at the same rate as the other channels if an asynchronous timebase is used. Table 4-1 indicates which signals are not required for disassembly.

With 92A96 modules, you can utilize entire unused 8-channel probes or separate the individual channels (podlets) and connect them to other signals in your 80960KA/KB/MC system. You will have to separate the podlets from partially used sections to use them for connections to other signals in your 80960KA/KB/MC system.

Refer to *Disconnecting Clock and 8-Channel Probes* and *Removing and Replacing Podlets* in Appendix C of the 92A96/D/XD Module User's Manual for information on how to disconnect 92A96/D/XD probes and separate podlets from an 8-channel probe.

NOTE

If using a 92A96 module, be sure to connect all podlet ground channels to the ground in the 80960KA/KB/MC system when making any alternate connections.

CHANNEL GROUPS AND ASSIGNMENTS

The 80960KA/KB/MC disassembler relies on the presence of the signals and channel groups defined by the support software for the Address, Data, and Control channel groups. The channel assignments used for 80960MC support are shown in Table 4-1.

Table 4-1 80960KA/KB/MC Channel Assignments

92DM916 Group (Radix)	Group Bit Pos	92A96 Section: Channel	Threshold Voltage, Polarity	960MC Signal Name	132-Pin PGA	164-Pin CQFP
Address (Hex)	31	A3: 7	TTL, +	LAD31	F2	7
	30	A3: 6	TTL, +	LAD30	G1	10
	29	A3: 5	TTL, +	LAD29	F1	9
	28	A3: 4	TTL, +	LAD28	E1	12
	27	A3: 3	TTL, +	LAD27	E3	11
	26	A3: 2	TTL, +	LAD26	E2	14
	25	A3: 1	TTL, +	LAD25	C2	29
	24	A3 0	TTL, +	LAD24	B2	30
	23	A2: 7	TTL, +	LAD23	B1	31
	22	A2: 6	TTL, +	LAD22	B3	33
	21	A2: 5	TTL, +	LAD21	B4	32
	20	A2: 4	TTL, +	LAD20	C6	35
	19	A2: 3	TTL, +	LAD19	A3	34
	18	A2: 2	TTL, +	LAD18	B5	37
	17	A2: 1	TTL, +	LAD17	A4	36
	16	A2: 0	TTL, +	LAD16	A5	38
	15	A1: 7	TTL, +	LAD15	B6	39
	14	A1: 6	TTL, +	LAD14	A6	40
	13	A1: 5	TTL, +	LAD13	C7	41
	12	A1: 4	TTL, +	LAD12	B7	43
	11	A1: 3	TTL, +	LAD11	A7	42
	10	A1: 2	TTL, +	LAD10	B8	45
	9	A1: 1	TTL, +	LAD9	A8	44
	8	A1: 0	TTL, +	LAD8	C8	47
	7	A0: 7	TTL, +	LAD7	A9	46
	6	A0: 6	TTL, +	LAD6	B9	49
	5	A0: 5	TTL, +	LAD5	A10	48
	4	A0: 4	TTL, +	LAD4	A11	50
	3	A0: 3	TTL, +	LAD3	C9	54
	2	A0: 2	TTL, +	LAD2	B10	55
	1	C2: 5	TTL, +	GND		
	0	C2: 4	TTL, +	GND		

‡ Signals not required for disassembly.

Table 4-1 (cont.) 80960KA/KB/MC Channel Assignments

92DM916 Group (Radix)	Group Bit Pos	92A96 Section: Channel	Threshold Voltage, Polarity	960MC Signal Name	132-Pin PGA	164-Pin CQFP
Data (Hex)	31	D3: 7	TTL, +	LAD31	*	*
	30	D3: 6	TTL, +	LAD30	*	*
	29	D3: 5	TTL, +	LAD29	*	*
	28	D3: 4	TTL, +	LAD28	*	*
	27	D3: 3	TTL, +	LAD27	*	*
	26	D3: 2	TTL, +	LAD26	*	*
	25	D3: 1	TTL, +	LAD25	*	*
	24	D3 0	TTL, +	LAD24	*	*
	23	D2: 7	TTL, +	LAD23	*	*
	22	D2: 6	TTL, +	LAD22	*	*
	21	D2: 5	TTL, +	LAD21	*	*
	20	D2: 4	TTL, +	LAD20	*	*
	19	D2: 3	TTL, +	LAD19	*	*
	18	D2: 2	TTL, +	LAD18	*	*
	17	D2: 1	TTL, +	LAD17	*	*
	16	D2: 0	TTL, +	LAD16	*	*
	15	D1: 7	TTL, +	LAD15	*	*
	14	D1: 6	TTL, +	LAD14	*	*
	13	D1: 5	TTL, +	LAD13	*	*
	12	D1: 4	TTL, +	LAD12	*	*
	11	D1: 3	TTL, +	LAD11	*	*
	10	D1: 2	TTL, +	LAD10	*	*
	9	D1: 1	TTL, +	LAD9	*	*
	8	D1: 0	TTL, +	LAD8	*	*
	7	D0: 7	TTL, +	LAD7	*	*
	6	D0: 6	TTL, +	LAD6	*	*
	5	D0: 5	TTL, +	LAD5	*	*
	4	D0: 4	TTL, +	LAD4	*	*
	3	D0: 3	TTL, +	LAD3	*	*
	2	D0: 2	TTL, +	LAD2	*	*
	1	D0: 1	TTL, +	LAD1	*	*
	0	D0: 0	TTL, +	LAD0	*	*

* The LAD31-0 signals can be de-multiplexed internally by the 92A96/D/XD modules. They are designated as connections to the D0-D3 sections in the DAS setup, but no external connection to these channels is necessary.

‡ Signals not required for disassembly.

Table 4-1 (cont.) 80960KA/KB/MC Channel Assignments

92DM916 Group (Radix)	Group Bit Pos	92A96 Section: Channel	Threshold Voltage, Polarity	960MC Signal Name	132-Pin PGA	164-Pin CQFP
Control	4	C3: 7	TTL, +	RESET	B13	57
(Sym)	3	C2: 7	TTL, +	LOCK~	H3	160
	2	C3: 3	TTL, +	INTA~	C12	58
	1	C2: 3	TTL, +	HOLDA	D3	16
	0	C2: 6	TTL, +	W/R~	H1	8
BurstLen	3	A0: 1	TTL, +	BLEN(LAD)1	A12	51
(Bin)	0	A0: 0	TTL, +	BLEN(LAD)0	B12	56
DataSize	3	C3: 5	TTL, +	BE3~	K1	2
(Bin)	2	C3: 4	TTL, +	BE2~	J2	163
	1	C3: 1	TTL, +	BE1~	G3	4
	0	C3: 0	TTL, +	BE0~	H2	1
Intr	2	C1: 7	TTL, +	‡INTR	A13	53
(Bin)	1	C1: 6	TTL, +	‡INT1	C13	59
	0	C3: 6	TTL, +	‡IAC~	C14	75
Misc	9	C3: 2	TTL, +	CLK2	B11	52
(Off)		CLK: 3				
	8	C1: 0	TTL, +	‡HOLD	C1	27
	7	C1: 5	TTL, +	‡CACHE	F3	5
	6	C1: 4	TTL, +	‡FAILURE~	K2	161
	5	C2: 2	TTL, +	READY~	G2	3
	4	C1: 1	TTL, +	‡BADAC~	C3	28
	3	C2: 0	TTL, +	ALE~	D1	13
	2	C1: 3	TTL, +	‡ADS~	D2	15
	1	C2: 1	TTL, +	DEN~	L1	162
	0	C1: 0	TTL, +	‡DT/R~	J2	6
Aux	4	C0: 7	TTL, +			
(Off)	6	C0: 6	TTL, +			
	5	C0: 5	TTL, +			
	4	C0: 4	TTL, +			
	3	C0: 3	TTL, +			
	2	C0: 2	TTL, +			
	1	C0: 1	TTL, +			
	0	C0: 0	TTL, +			
GND	*			GND	A2, B14	18, 20
	*			GND	C5, C11	23, 25
	*			GND	J3, E13	60, 62
	*			GND	K3, L12	64, 66
	*			GND	M3, M4	87, 103
	*			GND	N1, M10	119, 125
	*			GND	P13	153, 158
	*			GND		164

* Not in a group.

‡ Signals not required for disassembly.

WHAT SETUP PARAMETERS YOU CAN CHANGE

You can change part of the module setup without affecting disassembly. You can change the trigger program in the Trigger menu and the display radix for any channel group in the Channel menu.

You cannot change the channel grouping, names, threshold voltage or polarity of the Address, Data, or Control groups and expect the disassembler to function properly. You can, however, change the signal names of any individual channels in the channel setup without disturbing disassembly

You can change the 80960KA/KB/MC signal connections, the channel grouping, and group name for the channels not required for mnemonic disassembly. Refer to Table 4-1 to identify the channels not required for disassembly. Refer also to the discussion on *Alternate Connections* in this section for a description of how to make connections to other signals in your 80960KA/KB/MC system.

SYMBOL TABLES

You can use symbol tables to display channel group information symbolically in the State and Disassembly menus and to specify trigger word values symbolically.

The 92DM916 contains a symbol table file for the Control group. The file name is 960MC_Ctrl. This symbol table assigns symbolic names to combinations of signal values within the Control group. Refer to Section 6 for a description of how to display the Address group symbolically.

Table 4-2 shows the name, bit pattern, and meaning for the symbols in the file 960MC_Ctrl, the Control group symbol table.

Table 4-2 Control Group Symbol Table (960MC_Ctrl)

Symbol	Control Group Value RESET LOCK~ INTA~ HOLDA W/R~	Meaning
RESET	1 X X X X	A hardware reset
READ*	0 1 1 0 0	A read from memory
WRITE	0 1 1 0 1	A write to memory
"LOCKED READ"	0 0 1 0 0	A locked read cycle
"LOCKED WRITE"	0 0 1 0 1	A locked write cycle
"DMA READ"	0 X 1 1 0	A DMA read from memory
"DMA WRITE"	0 X 1 1 1	A DMA write to memory
"INT ACK CYCLE"	0 X 0 X 0	Acknowledgement that an interrupt has been received

* The control signal patterns for both READ and FETCH cycles are identical. They are discerned in the "Mnemonic" field in the disassembly display by a complex algorithm. If the Control group is displayed in Symbolic radix, using this Table, all READ and FETCH Cycles will be displayed as READ cycles.

Section 5: ACQUIRING BUS ACTIVITY

This section describes how to acquire data for viewing in the Disassembly menu.

After you install the microprocessor support software, make all the connections between the DAS 9200 and the system under test, and select the 80960MC Support, you are ready to define a trigger program (or use the default) and acquire data.

CLOCKING

When you selected 80960MC Support in the module Configuration menu, a custom clocking setup was loaded and became the default selection in the Clock menu.

This Custom clocking setup programs the CSM (Clocking State Machine) in the acquisition module to acquire valid 80960KA/KB/MC bus cycles synchronously.

You may choose to use the Internal or External clocking modes to acquire data for State or Timing analysis, but disassembly of the data acquired in these modes will not be correct.

Probe Interface Type. When Custom clocking is selected in the clock menu, an optional selection is offered in the Clock menu which allows you to select the appropriate preset clocking for the "Probe Interface Type" you are using to connect to your 80960MC system: the first, labeled "Probe Adapter", is for clocking data using the PGA probe adapter supplied with the 92DM916 (103-0321-00); the other, labeled "General Purpose", is for use when the 92A96 leadsets are connected directly to your system, such as when probing a device in a different package or in a system that can not accomodate the PGA probe adapter. The default is "Probe Adapter". You can change the clocking mode by changing the "Probe Interface Type" option field in the Clock menu.

DMA Cycles. When Custom clocking is selected in the clock menu, another optional selection is offered in the Clock menu which allows you to select one of two modes for acquiring 80960KA/KB/MC data: to include DMA cycles or to exclude DMA cycles. The default is to exclude DMA cycles. You can change the clocking mode by changing the DMA Cycles option field in the Clock menu.

How Data Is Acquired

This section tells how the acquisition module acquires 80960KA/KB/MC signals.

Custom Clocking

When Custom clocking is used with the 80960KA/KB/MC, there are three sample points, described as follows:

Sample point 1 - The clocking state machine detects the rising edge of CLK2 when ALE~ is low as the start of the bus transaction. it samples the Address information on the next rising edge of CLK2. During burst transfers, the address information is held for the remainder of the burst (not re-sampled or updated for each cycle).

Sample point 2 - Two rising edges of CLK2 later (after address is sampled) the BE~ signals are sampled. During a burst sequence, the BE~ information for the next cycle's data word is sampled two rising edges of CLK2 after the current cycle's data word is sampled.

Sample point 3 - Two rising edges of CLK2 after sample point 1, the READY~ signal is tested. If it is low, then the data and control lines are sampled and the acquisition of this bus cycle is completed (this would be the same time as sample point 2). If the READY~ is not low then READY~ will be tested again 2 rising edges of CLK2 later. If it is then low, the data and control lines are sampled and the acquisition of the bus cycle is completed. If not, the READY~ line will be tested again every second rising edge of CLK2 until it is asserted.

After all signals are sampled, they are sent to the trigger machine and acquisition memory as a master sample (one complete data acquisition record). Table 5-1 shows the sample points for 80960KA/KB/MC signals

Table 5-1 80960KA/KB/MC Sample Points

Sample Point	Signals Acquired
1	Address(31-0)
2	BE(3-0)~, DEN~, ALE~
3	Data (31-0), all other control signals* and timestamp
* including Aux	

DMA Cycles

If HOLDA is active, then the 80960KA/KB/MC microprocessor has given up the bus to another device.

The design of your 80960KA/KB/MC system affects what data will be logged in during DMA cycles. The DAS 9200 only samples signals at the 80960KA/KB/MC pins. To properly log in bus activity, any buffers between the 80960KA/KB/MC and the alternate bus driver must be enabled and pointed towards the 80960KA/KB/MC. Possible 80960KA/KB/MC hardware and clocking interactions are as follows:

- If the alternate device drives the same address, data and control lines as the 80960KA/KB/MC and the 80960KA/KB/MC sees these signals, alternate bus activity is logged in just like normal bus cycles.
- If none of the control lines are driven or if the 80960KA/KB/MC cannot see them (because they are buffered), the DAS 9200 will not capture any DMA cycles.
- If some of the 80960KA/KB/MC control signals are visible, but not all the address or data lines, the DAS 9200 may acquire DMA cycles without valid Address or Data..

92A96 Probe Adapters

The probe adapter for the 92A96 module (103-0321-00) has some circuitry that latches control signals to improve data reliability under extreme conditions. These latches are enabled whenever the jumper on the probe adapter is in the "Norm" (for "Disassembly" or Synchronous acquisition) position. These latches are disabled whenever the jumper is in the "Time" (for "Timing" or Asynchronous acquisition) position. Disabling the latches allows the 92A96 module to perform actual bus timing measurements by placing the latches in a transparent mode.

When Custom clocking is used, the Clock menu offers a selection for "Probe Interface Type". The default selection "Probe Adapter" should be used whenever the 103-0321-00 probe adapter is used (with the jumper in the "Norm" position) with the 92A96. This compensates for the effect of the latches.

TRIGGERING

All the Trigger menu selections currently available for your data acquisition module are still valid for disassembly. Refer to your module user's manual for a list and description of the selections.

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 DAS 9200 module, or to the Trig In/Out SMB connector on the module. You should refer to your *DAS 9200 System User's Manual* for an in-depth description of defining and using signals and to specific module user's manual for a description of using the Trig In/Out SMB connector.

ACQUIRING DATA

After you have selected 80960MC Support in the module Configuration menu, connected the probes, and specified the desired trigger condition, you can press F1: START to begin the acquisition. After satisfying the trigger program and filling acquisition memory, the DAS 9200 displays data in the display menu used last. The default display menu is State. You may need to press F1: STOP if the stop conditions are not met. You can change the display menu from the Menu Selection overlay (press the Select Menu key).

If the trigger is not located immediately, the DAS 9200 displays the Module Monitor menu showing the progress of the acquisition. Refer to the following list of error messages and possible solutions.

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.

Slow Clock

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

1. The microprocessor system is powered on and running. Be sure the system is not halted.
2. The appropriate Software Support is selected in the acquisition module Configuration menu.
3. Custom is selected in the Clock menu.
4. The clock and data probe connections are correct (clock, section names, and channel numbers match), are properly oriented (GND connects to ground), and are fully engaged.
5. The connections between the interface housings and 92A96 probe cables have matched color labels, matched slot numbers, and are properly keyed.

6. The connections between the 92A96 probe cables and probe connectors have matched color labels, matched slot numbers, and are properly keyed.
7. The orientation pin on the microprocessor in the probe adapter is correct.
8. The orientation pin on the test clip in the target system is correct.
9. No bent or missing pins on the microprocessor or test clip.

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. The solution in this case is to wait for the other modules to fill their memory. 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 microprocessor system or data 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 doesn't occur. Check for the following:

1. The microprocessor system is powered on and running. Be sure the system is not halted.
2. The trigger conditions are 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.

Section 6: DISPLAYING DISASSEMBLED DATA

THE DISASSEMBLY DISPLAY MENU

The DAS 9200 displays disassembled data in the Disassembly menu. This menu shows the disassembled instruction mnemonics, operands and addresses, and bus cycle mnemonics for non-instruction fetches.

You can display the disassembled data in different formats. You can select the display format and tailor it for your specific needs using the Disassembly Format Definition overlay. Detailed information on this overlay is provided later in this section. Figure 6-1 shows an example of a Disassembly menu (A 68010 microprocessor in Hardware Display Format is used as an example).

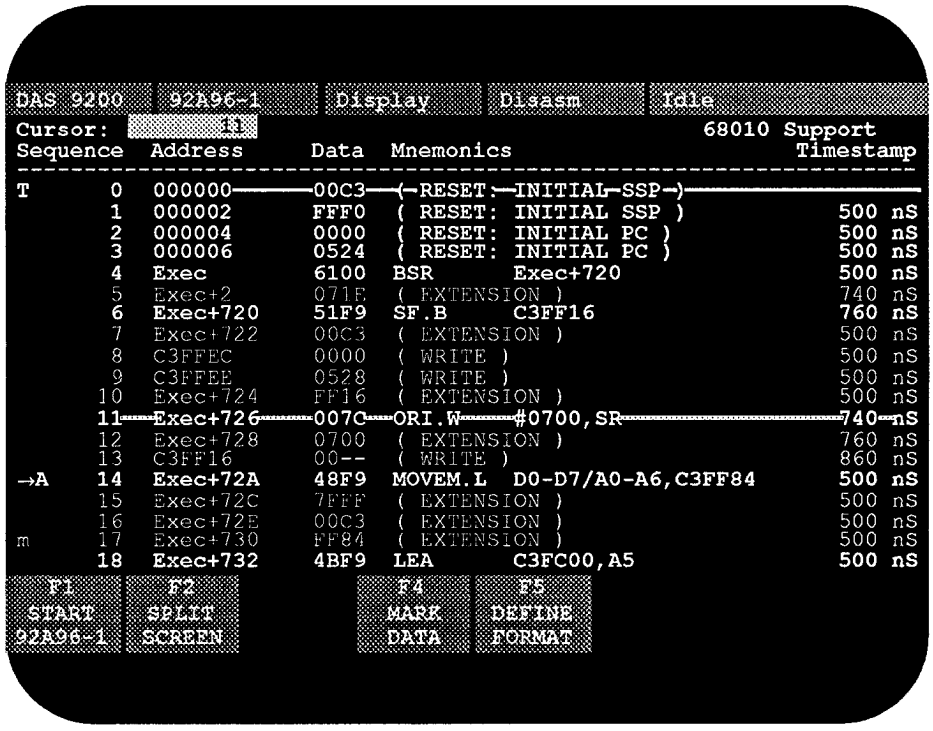

Figure 6-1 Disassembly menu (68010 Hardware format)

Keep in mind the following characteristics of the Disassembly menu when viewing disassembled data:

- all numeric values are shown unsigned (non-negative numbers) except for some relative timestamp values
- all numeric values are justified from the least significant bit

- the timestamp value is always displayed as a decimal value
- the timestamp for all the modules in a cluster is shown only in a single column position
- the only radix selections for Mnemonics are ASCII or Off
- the Symbol radix is only useful when a valid symbol table is available for that group

Disassembly Display Columns

No matter which display format you decide to use, the Disassembly menu displays the following columns of information by default:

- **Sequence Column.** The sequence column shows the sequence number of the data displayed on that line. The cursor field in the upper-left area of the menu displays the sequence number of the current cursor location.

  The first characters on the left edge of the Sequence Column are used for special labels that indicate when the module triggered (displayed as a "T"), which samples have been marked with user marks (displayed as a single letter "A"-"M" indicating which mark or a "Δ" for the Delta mark) or which sequences have had their disassembly altered by marking opcodes (displayed as a lower-case "m"). This display column cannot be disabled, re-positioned or altered

- **Address and Data Group Columns.** The address and data group columns show values for both the address and data bus at each sequence. You can change the position of the Address and Data groups, or change their radix to Hexadecimal, Octal, Binary, Decimal, ASCII (displays ASCII character equivalent of each byte of group value), symbolic or "off" (not displayed at all). To display the Address group symbolically, refer to *Displaying the Address Group Symbolically* in this section.

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

- **Instruction Mnemonics Group Column.** The instruction mnemonics column shows the disassembled 80960KA/KB/MC cycles and instructions. You can change the position of the this group, or change its radix to either ASCII (displays mnemonics) or "off" (not displayed at all).

  The disassembler displays all numeric operands as

hexadecimal values. Register numbers are in decimal. When you select the Symbol radix for the Address group, the calculated effective addresses are displayed symbolically.

If the addressing mode is IP-with-displacement (instruction pointer plus displacement), the disassembler software calculates the effective address before displaying it (instead of displaying the displacement).

- **Timestamp Column.** The timestamp column shows the timestamp value, when you choose to display the timestamp values. You can use the Timestamp field of the Disassembly Format Definition overlay to select Absolute, Relative, Delta, or Off.

  An Absolute timestamp shows the amount of time elapsed from the time the module (or cluster of modules) was started and each subsequent sample. A Relative timestamp shows the amount of time elapsed between samples. A Delta timestamp shows the amount of time elapsed between which ever data sample you mark with the delta mark and all other samples. (To place a delta mark on a sample, use F4: MARK DATA from the Disassembly menu.)

  Cycles are assigned the value of the timestamp counter at the end of the bus cycle. Because the timestamp counter changes in fixed increments (10 ns for 92A96 modules), timestamps for data acquired from an 80960KA/KB/MC system with a clock rate that is not an even multiple of the module's timestamp timebase (10 ns) will be slightly skewed. For example, data acquired with a 92A96 from an microprocessor system with a clock rate of 30 MHz (33 ns) would be assigned a relative timestamp either of 30 or 40 ns. This skewing is not cumulative.

Disassembler Error Messages

These error messages will appear in the Disassembly menu when there are problems with disassembling the acquired data.

"No valid data"

The acquisition module has been stopped without acquiring valid data, check the following:

1. The stop key was pressed while the acquisition was not acquiring due to a "Slow Clock", "Waiting for Trigger", "Waiting for Stop" or "Waiting for Stop-Store" condition.; if so, correct the condition (see *Module Error Messages* in Section 5).

2. The Disassembler menu was invoked on a Reference Memory that did not contain any valid data. If so, delete the Reference Memory and acquire valid data .

"Select Software Support Package in Configuration Menu"

The system has attempted to invoke a disassembler that is not present in the system. This can be caused by the following:

1. You attempted to view an refmem with the Disassembly display, but the appropriate disassembler is not present on the system; if so, install the disassembler and try again or view the data in another display.
2. The Disassembler file for the support package being used (80960MC, etc.) has been damaged; to check, run the Verify Software procedure in the H/W S/W Version menu.

"Channel Groups Have Been Changed"

The system has invoked a disassembler that is expecting channel groups that are different from the ones found in the setup of the current module or Refmem containing the data you are attempting to display. The number of channel groups, names of channel groups or width (number of channels included) of the groups expected by the disassembler have been changed. Refer to the information in Section 4 regarding *What Setup Parameters You Can Change*. This can be caused by the following:

1. If you are viewing acquisition data directly from the module, you can restore the default 80960MC channel setup using the "Default Grouping" function Key in the Channel Menu. You will then have to re-acquire the data with the new setup to affect the disassembler.
2. If you are viewing acquisition data from a Reference Memory, you can not change the channel setup at all. You will have to either view the data in the State display or re-acquire the data with the acquisition module (using an acceptable channel setup) and save a new Reference Memory.

Disassembler Error Window

Under some error conditions, a window will appear listing messages inside it that originate internal to the disassembler itself. These generally occur only if the Disassembler encounters data patterns it is not capable of parsing. This could be because the data acquired is corrupt and incapable of being parsed, or because of functional errors in the Disassembler . Check for possible problems listed below under *Incorrect Data*.

If there are more messages than can be displayed in the window, use the Return key to page to the other messages. When you want to close the message window, press the Esc key (escape). The system will display the error(s) it encounters and the action it took in the message window, then recover and either display the data it parsed successfully, or re-invoke the display process.

Other Disassembler Problems

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

Incorrect Data

If the data acquired is obviously incorrect, check the following:

1. The appropriate Software Support is selected in the acquisition module Configuration menu.
2. Custom is selected in the Clock menu.
3. The clock and data probe connections are correct (clock, section names, and channel numbers match), are properly oriented (GND connects to ground), and are fully engaged.
4. The connections between the interface housings and 92A96 probe cables have matched color labels, matched slot numbers, and are properly keyed.
5. The connections between the 92A96 probe cables and probe connectors have matched color labels, matched slot numbers, and are properly keyed.
6. The orientation pin on the microprocessor test clip is correct.
7. No bent or missing pins on the microprocessor or on either of the probe adapter or test clip sockets.
8. The jumper on the probe adapter (92A96 applications only) should be in the .

Other Suggestions

If the previous suggestions don't fix the problem with acquiring disassembled bus cycles or instruction mnemonics, try the following:

1. Reload the module setup by selecting General Purpose Support, then the appropriate Software Support (80960MC Support) in the acquisition module Configuration menu to restore the DAS 9200 to known state.

If the DAS 9200 still is not acquiring data after trying these suggestions, there may be a problem with the target microprocessor system. Try performing timing analysis with your DAS 9200 system to ensure that the microprocessor signals are valid at the time the probe adapter samples them. Refer to Section 7, *Timing Analysis*.

DISPLAY FORMATS

The 80960KA/KB/MC disassembler software provides four formats for displaying disassembled data:

- Hardware format shows all acquired cycle types and instruction mnemonics in the order they occurred
- Software format suppresses all opcode extensions and flushed cycles and displays a menu that looks similar to an assembly language program listing
- Control Flow format only displays the instructions that change the control flow of the microprocessor
- Subroutine format only displays subroutine calls, exceptions, and returns

You can further define how the data is displayed within the four formats by selecting various display options with the Disassembly Format Definition overlay.

The following discussions describe the four display formats.

Hardware Display Format

In the Hardware format, all bus cycles are shown in the order that they occurred. Instruction mnemonics are displayed on Fetch cycles and cycle-type information is displayed for all other cycles. Invalid data bytes are represented by dashes. Figure 6-1 (at the beginning of this section) shows an example of a Disassembly menu in Hardware display format (a 68010 microprocessor is used as an example).

Software Display Format

In the Software format, only opcode fetches are displayed. All other cycle types are suppressed. Figure 6-2 shows an example of a Disassembly menu in Software display format (a 68010 microprocessor is used as an example).

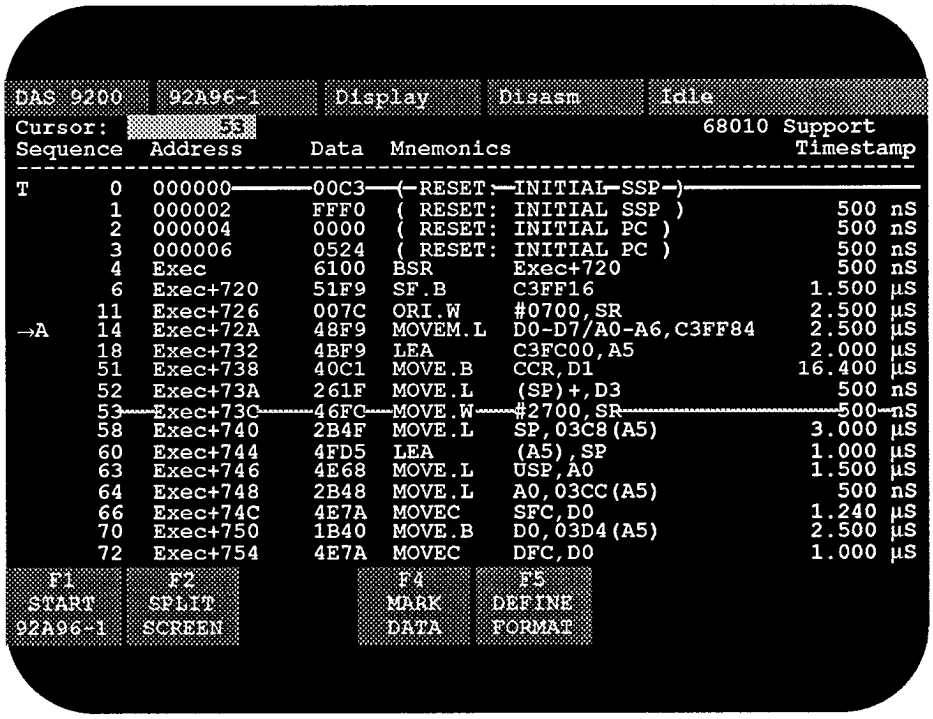

Figure 6-2 Disassembly menu (68010 Software format)

Control Flow Display Format

In the Control Flow format, only instructions that change the control flow are displayed. This generally includes all unconditional CALL, RETURN, JUMP and BRANCH instructions and conditional variations of the same instructions, but only if the condition is true and the control flow change takes place. Instructions that do not actually change the control flow are not displayed, such as conditional branches that are not taken. Figure 6-3 shows an example of a Disassembly menu in Control Flow display format (a 68010 microprocessor is used as an example).

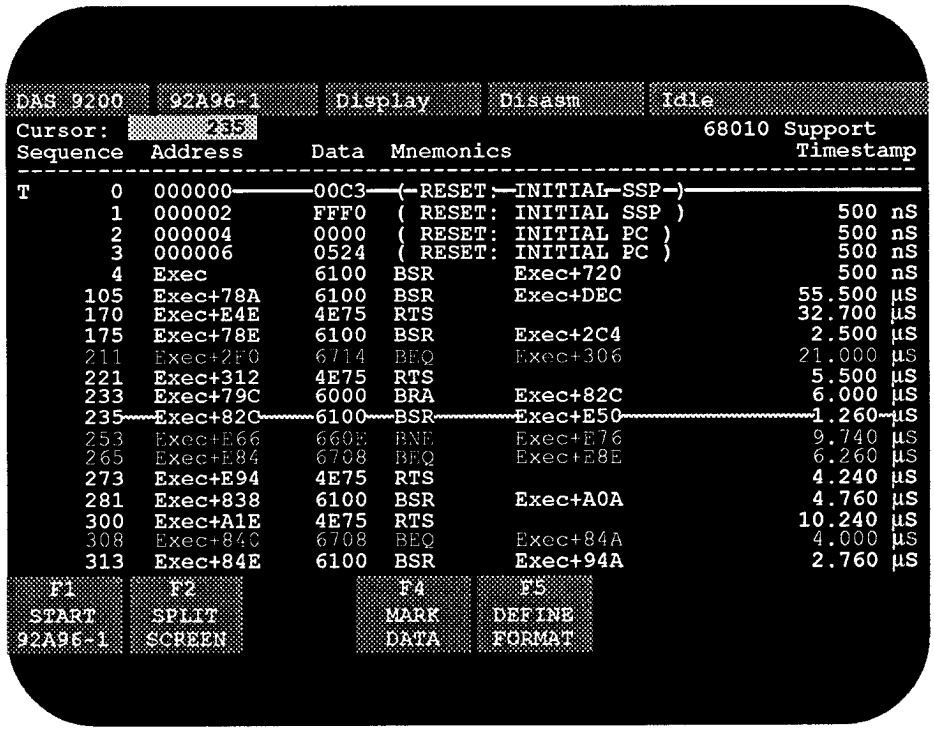

Figure 6-3 Disassembly menu (68010 Control Flow format)

80960KA/KB/MC instructions unconditionally shown in Control Flow Format disassembly are as follows:

CALL	B	BX
CALLS	BAL	FMARK
CALLX	BALX	RET
SENDSERV	RESUMPRCS	

80960KA/KB/MC instructions shown in Control Flow Format disassembly based on a conditional test are as follows:

BBC	CMPIBGE	FAULTE
BBS	CMPIBL	FAULTG
BE	CMPIBLE	FAULTGE
BG	CMPIBNE	FAULTL
BGE	CMPIBNO	FAULTLE
BL	CMPIBO	FAULTNE
BLE	CMPOBE	FAULTNO
BNE	CMPOBG	FAULTO
BNO	CMPOBGE	MARK
BO	CMPOBL	RECEIVE
CMPIBE	CMPOBLE	WAIT
CMPIBG	CMPOBNE	

Subroutine Display Format

The Subroutine format displays subroutine calls and returns only. The displayed subroutine calls and returns include interrupts/traps and returns from interrupts/traps. Conditional calls and returns that are not taken are not displayed.

80960KA/KB/MC instructions shown in Subroutine Format disassembly are as follows:

CALL	CALLX	BALX
CALLS	BAL	RET
SENDSERV	RESUMPRCS	RECEIVE
WAIT		

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 specific needs. To access this overlay, press F5: DEFINE FORMAT from the Disassembly menu.

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 or gaps
- continue disassembly across gaps in the acquisition
- change the order in which the channel groups are displayed in the Disassembly menu
- change the radix for each group

- choose which symbol table to use for each group where symbol is the selected radix

Figure 6-4 shows the Disassembly Format Definition overlay.

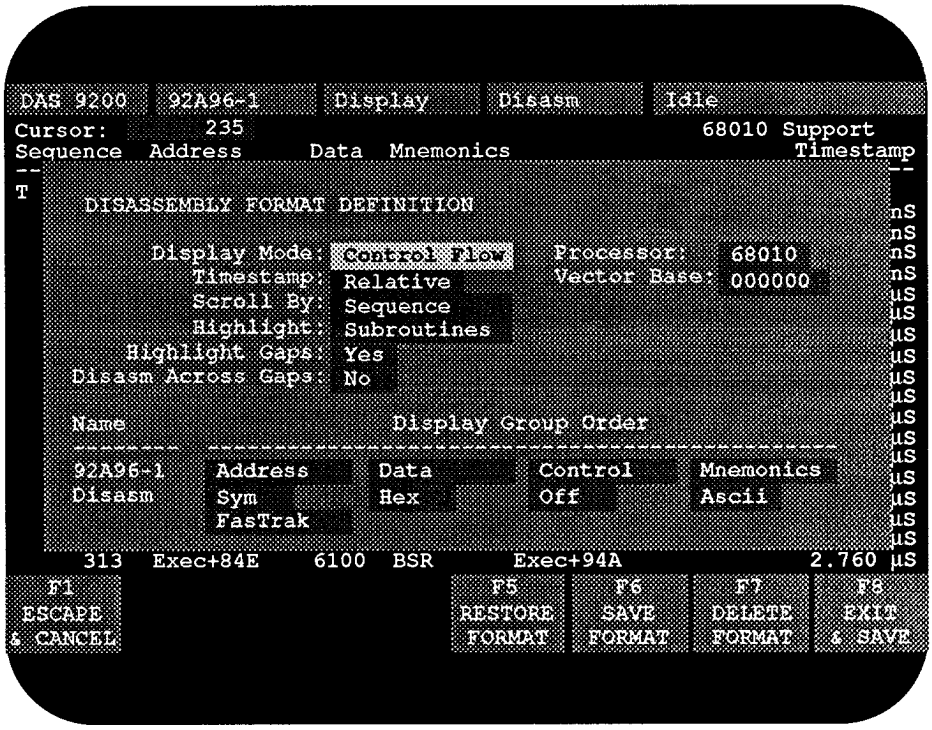

Figure 6-4 Disassembly Format Definition overlay (68010)

- **Display Mode.** You can display the disassembled cycle types or instruction mnemonics in Hardware, Software, Control Flow, or Subroutine modes.
- **Timestamp.** You can display the timestamp as an Absolute, Relative, or Delta value. You can also set the timestamp display to Off. Refer to the description of timestamp column earlier in this section for definitions of these selections.
- **Scroll By.** You can scroll by Sequence, Instructions, Control Flow, or Subroutines.
- **Highlight.** You can highlight All, Instructions, Control Flow, or Subroutines. Only the selected type of samples are shown as white text with a black background with highlighting on. All other samples are shown as gray text with a black background.
- **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 displayed group values.

- **Disasm Across Gaps.** You can choose to continue or to discontinue to disassemble instructions across gaps. Disassembling instructions across gaps causes the disassembler to align the last address or data sample before the gap with the address or data sample immediately following the gap. Disassembled data will be invalid if these samples do not logically match.
- **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. All the groups to the right of the inserted group are moved over one column position to the right.
- **Group Radix.** You can select the radix in which each group displays. The radix selections for most groups are Binary, Octal, Hexadecimal, Symbol, Decimal, ASCII and Off. The only selections for Mnemonics are ASCII or Off. You should only select the Symbol radix when a symbol table is available for that group. The timestamp value always displays in decimal.
- **Symbol Table.** You can specify a symbol table to use for each group where symbol 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. Use the cursor keys to select the desired format to restore and press the Open/Close or Return key. One choice, named "Default", is always present in the list of selections to restore, and always returns all format overlay selections to their default values.

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.

BUS CYCLE TYPES DISPLAYED BY THE DISASSEMBLER

The Disassembly display places bus cycle labels in the mnemonics column, if displayed, for any bus cycle that is not an opcode fetch (opcode fetch cycles, if executed, are labeled with instruction mnemonics, instead). These cycles generally follow the same cycle names and meanings as those indicated as bus cycle symbols in Table 4-2.

Since the disassembler is able to consider other groups and data samples in its determination of bus cycle types, there may be some cycles labeled in disassembly with labels that can not be reproduced with a symbol table.

DISPLAYING THE ADDRESS GROUP SYMBOLICALLY

The Address group can be displayed as symbol values similar to the way the Control, Intr, and Misc groups can be displayed as symbol values. You can use the Symbol Editor menu to create symbol tables to assign symbols to specific addresses or various address ranges; then use the Channel menu to change the default radix of the Address group to Sym and assign to it the symbol table. Refer to your *DAS 9200 System User's Manual* for a description of how to create or edit symbol tables.

You can also change the radix of the Address group to Sym in the Disassembly menu Format Definition overlay. Figure 6-1 shows the Address group displayed symbolically (using a 68010 microprocessor acquisition example).

If the Address group radix is symbolic, address symbols in the symbol table selected are also applied to all effective addresses calculated in the mnemonics field of the disassembly display.

You do not have to re-create a new table each time you re-locate the code in your system as long as the addresses don't change relative to each other; you only need to redefine the base address for the symbol table.

You can use the Symbol Editor to set the base address of the symbol table to the base address of the corresponding code module or data structure in your system.

SCROLLING DATA IN THE DISASSEMBLY DISPLAY

Basic Cursor Movement

There are many ways to move the cursor in the displayed data using the Cursor field. Data can be scrolled using the Cursor Up/Down keys, the Page-Up/Page-Down keys,and the Joy-Disc, or you can go directly to any location via the Cursor field.

The Cursor Keys

The cursor keys, located at the base of the directional keypad, allow you to scroll up or down through data in increments specified in the Scroll By field in the Format Definition Overlay. This field can be set to scroll by sequence #, by instruction, by control flow change, or by subroutine calls/returns. See the description of Control Flow and Subroutine display formats in Section 6 for a list of the instructions that apply to these choices.

By holding the shift key down and using the cursor keys, you can scroll the display by half-screen increments.

The Page-Up and Page-Down Keys

You can also scroll the display by full-screen increments using the unlabeled keys above (Page-Up) and below (Page-Down) the right arrow key on the directional keypad.

The Joy-Disc

The Joy-Disk, located at the top right-hand corner of the keyboard, allows you to scroll up or down through data by the same increments as the cursor keys. Shifted Joy-Disk functions work similarly.

If the formatted data is wider than the display screen (an arrow will appear in a white field indicating more data off to the side) the Joy-Disk can be used to scroll the display columns horizontally.

The Cursor Field

To quickly move through disassembled data, you can make direct entries in the Cursor field at the top left of the Disassembly Display. These entries allow you to move directly to any sequence or user mark in memory, or the trigger location, or just scroll ahead or backwards by any number of sequences you desire. Table 6-1 summarizes the different Data Cursor movements supported by the Cursor field.

Table 6-1 Cursor Field Operations

Key Entry	Data Cursor Action
<n> <CR>	go to sequence location "n"
"+"<n> <CR>	scroll forward by "n" sequences
"-"<n> <CR>	scroll backward by "n" sequences
"+" <CR>	scroll forward by "n"* sequences
"-" <CR>	scroll backward by "n"* sequences
"0" <CR>	go to beginning of acquisition memory
"$" <CR>	go to end of acquisition memory
"^" <CR>	go to delta mark (if one exists)
"T" or "t" <CR>	go to trigger location (or Sequence 0 if none exists)
"A" through "M" <CR>	go to corresponding user mark (if it exists)
* uses most recently specified value for "n"	

Moving the Cursor to Suppressed Sequences

When displaying data in Software, Control Flow, or Subroutine formats, some sequence location numbers will be suppressed. You can still enter a specific sequence location number that has been suppressed. The cursor moves to the sequence nearest the suppressed sequence that can be displayed. If there is a large block of suppressed sequences near the desired sequence, there is a noticeable delay while the system searches for a sequence that can be displayed.

MARKING CYCLES

You can mark a data sample to easily identify data samples, to move quickly to a data sample, to manually correct a disassembled bus cycle, or to calculate delta timestamp measurements. You can mark a data sample with an A through M, a delta mark (Δ), or the correct bus cycle using the F4: MARK DATA feature of the Disassembly menu. An "m" is placed next to any sample that has had the bus cycle manually changed with an opcode mark.

An Undo Mark selection is also available for opcode marks. You can use both data and opcode marks on a data sample.

Marking Cycles as Instructions/Non-instructions

Although the disassembler generally disassembles bus cycles correctly, there are situations where disassembly is incorrect. Basically a 80960KA/KB/MC does not have control signals which deterministically distinguish the following four types of cycles: Opcode Fetches, Opcode Extension Reads, Flushed Opcode Fetches, and 32-bit Data Reads. Since all these cycles have identical control signal patterns the disassembler attempts to

infer which of these types it is and label it accordingly. Occasionally the disassembler is unable to reach the correct conclusion and will label a cycle incorrectly.

This is most likely to occur at the beginning of an acquisition when the disassembler is not acquiring enough 80960KA/KB/MC information to accurately disassemble the bus cycles. After a few samples are acquired, however, enough information is present to enable the disassembler to begin correctly disassembling the bus cycles. Similar situations can also occur after a reset, at the end of an acquisition, when using storage qualification in the Trigger menu, when the 80960KA/KB/MC is running in its cache, or after a conditional branch or return instruction. In some cases, bus behavior following exceptions and conditional branches can cause similar errors.

To manually correct invalid disassembly, you can use the F4: MARK DATA key to change an erroneously disassembled bus cycle. You can mark a cycle with a disassembled mnemonic, a "READ", "FLUSH" or "READ_EXT" cycle as one of three different cycles. Table 6-2 shows the selections and their functions when used to correct the invalid disassembly. The disassembler will not let you change other cycles.

Table 6-2 Opcode Mark Selections for Reads/Extensions

Opcode Mark	Function
Opcode	This cycle is the prefetch of an opcode that was executed. The actual cycle label displayed will be the mnemonic of the instruction.
Read Extension	This cycle is a prefetch of an opcode extension word
Flush	This cycle is the prefetch of an opcode that was flushed
Data Read	This cycle is a 32-bit memory read
Undo Mark	Removes the opcode mark from the sample on which the cursor is currently positioned

NOTE:

Incorrectly marking a cycle can cause the disassembler to report error messages in the error message window. Use "Undo Mark" to restore.

To correct a bus cycle, follow these steps:

1. Place the cursor on the data sample you want to change in the Disassembly menu.
2. Press F4: MARK DATA and select a bus cycle type.

   When you press F4: MARK DATA, a list of selections appears. The list can change from sample to sample to reflect logical opcode or data mark selections for that

individual sample. Unlike data marks that can only be used once, opcode marks can be used as often as necessary.

If the data sample already has an opcode mark on it, then the selection list appears with the cursor on that mark. To remove the opcode mark from the sample on which the cursor is positioned in the Disassembly menu, select Undo Mark.

3. Press the Return key.

The data sample will reflect the corrected bus cycle and other samples may be affected according to the correction. An "m" is placed at the beginning of the data sample that has had the disassembled bus cycle manually changed.

Marking Data Samples with User Marks

Marks can be used to make data samples easy to identify, and to quickly move the cursor to a marked sample. A special mark, the delta mark (Δ), is also used to calculate delta timestamp values.

The available marks are A through M and Δ. When you mark a data sample, that mark is attached to the acquired data. The mark will show with the data sample in all other display menus until you change it. If you are viewing the data in a split-screen display, such as when performing a search, the mark is attached only to the window in which it is placed and will not be carried over to the other window.

A small arrow appears at the beginning of the line of the marked data sample to make the mark more visible. The arrow disappears when both a data mark and an opcode mark are placed on the same sample.

To place a mark on a data sample, follow these steps:

1. Place the cursor on the data sample you want to mark in the Disassembly menu.
2. Press F4: MARK DATA and select a mark.

   When you press F4: MARK DATA, a list of selections appears. If you select a mark that has already been used, the previously marked sample will be unmarked and the current sample will be labeled with that mark when you close the selection list. Each mark can only be used on one data sample.
3. Press the Return key.

You can remove all the data marks in the Disassembly menu by using the State menu. To remove all data marks, follow these steps:

1. Press the Select Menu key to return to the Menu Selection overlay.
2. Select the State menu and press the Return key.
3. Press F5: DEFINE FORMAT.
4. Press F2: REMOVE MARKS and press the Return key. All the data marks will disappear.
5. Press the Select Menu key to return to the Menu Selection overlay.
6. Select the Disassembly menu and press the Return key. No data marks appear in the Disassembly menu; they have all been removed.

You can use the Δ mark to make delta timestamp measurements. After placing a Δ mark on a data sample, you can select the Delta selection in the Timestamp field of the Disassembly Format Definition overlay. When you press F8: EXIT & SAVE, the Disassembly menu samples will show the amount of time elapsed between the data sample with the Δ and each previous and subsequent sample.

To quickly move from one data mark to another, enter the mark for the new location in the Cursor field of the Disassembly menu. Enter an ^ in the Cursor field to move the cursor to a Δ mark.

SEARCHING THROUGH DATA

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

1. Press F2: SPLIT DISPLAY to use the Split-Screen overlay.
2. Select the Disassembly menu for one half of the split-screen display and the State menu for the other half.
3. Press F5: SPLIT HORIZ to split the screen into two horizontal displays.
4. Press F2: LOCK CURSORS. A selection list appears.
5. Select **lock cursors at the same sequence**.
6. Press the Return key.
7. Press F8: EXIT & SAVE to display the menus in a split screen.

8. If the active menu is the Disassembly menu, press F3: SWITCH WINDOW to make the State menu active. The active menu is the one with the yellow cursor and Cursor field.
9. Press F6: DEFINE SEARCH to use the Search function of the State menu to search for the desired sequence.

Refer to the description of the State Search Definition overlay in your module user's 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.

PRINTING DATA

To print disassembled data, select the desired display format with the Format Definition Overlay and then access the Disassembly Print overlay, by pressing the Shift and Print keys at the same time from the Disassembly menu. Figure 6-5 shows the Disassembly Print overlay.

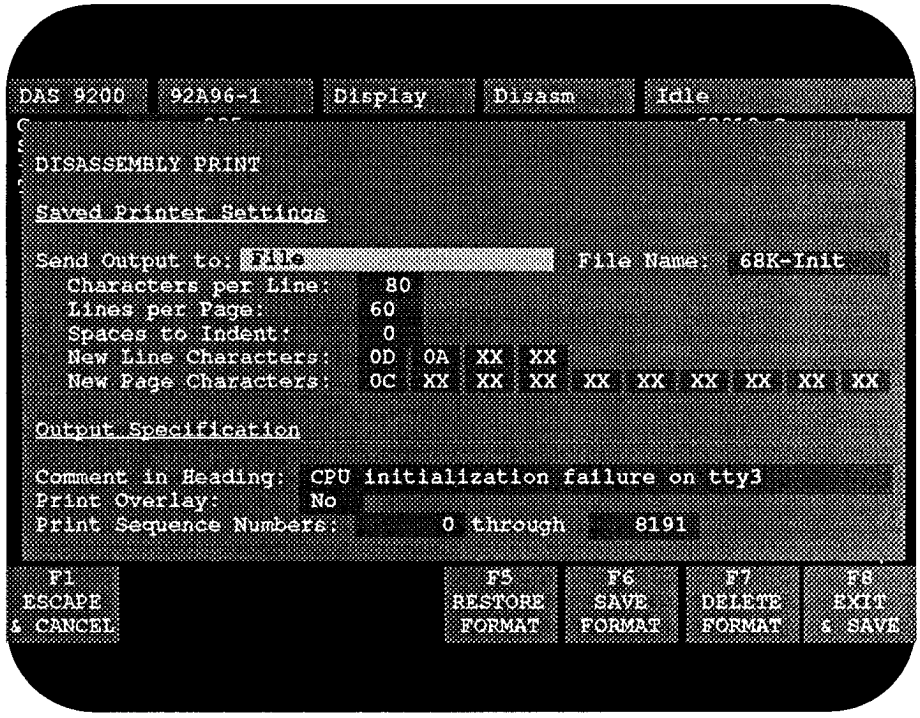

Figure 6-5 Disassembly Print overlay

You can choose one of two destinations for the disassembled data: the RS-232 Auxiliary Port, or a file stored on the hard disk. The data is formatted the same in both cases. Appendix C in the

DAS 9200 System User's Manual contains information on connecting the RS-232 Auxiliary Port to a printer.

If the Send Output To field is set for a file, you need to name the file (the default name is Output). The file is stored in the Print Output directory. This file can be renamed, deleted, copied to a floppy disk, and so on from the Disk Services menu.

If the Send Output To field is set for the RS-232 Auxiliary port, the printer attached to this port receives the data for printing. To set the rate of transmission (baud rate) for the Auxiliary port, select the Communications menu and set the baud rate to match the data rate of your printer.

The parameters you can define in the Disassembly Print overlay are as follows:

- characters per line
- lines per page
- spaces to indent
- new line characters
- new page characters
- comment for page headings
- beginning and ending sequence numbers

If you are using a single module, printed data looks similar to the data displayed on a DAS 9200 terminal screen.

If the width of the data exceeds the width of the specified line length (maximum 300 characters), greater than symbols (>) are printed to indicate that the data continues past the edge of the page. If you define more characters per line than can fit on a page, the data will either print on the next line or run off the edge of the page, depending on the type of printer being used.

To print the display screen, make the appropriate selections for the Saved Printer Settings (top of the Disassembly Print overlay) and the output specification, and press F5: PRINT. During printing, you can abort the printing sequence at any time by pressing F5: STOP PRINT.

NOTE

The DAS 9200 does not detect printer errors and will not give any error or warning messages if the print sequence cannot be completed.

For information on printer cable connections, refer to Appendix C in your DAS 9200 User's Manual.

Section 7: TIMING ANALYSIS

You may need to perform timing analysis on your 80960KA/KB/MC system prior to, during, and after attempting to integrate your software with the 80960KA/KB/MC 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, and you can see signal activity that would otherwise go undetected.

To acquire and display timing data, you need to change the clocking selection, acquire data, and view it in the Timing menu. A predefined Timing Format Definition overlay file (with bus forms) called 960MC_96 can be used to view 80960KA/KB/MC timing data. A description of this file and how to use it can be found later in this section.

With the probes connected according to Table 4-1, the data acquisition module acquires data from some signals that are not necessary for mnemonic disassembly. Some of these signals are useful for hardware analysis.

If you are not interested in acquiring data from these signals, you can disconnect them from the probe adapter and reconnect the channels (podlets) to other system signals more useful to you. Refer to *Alternate Connections* in Section 4 for information on which channels you can use to make alternate connections between the DAS 9200 and the system under test. If you are using a 92A96 module, refer to *Disconnecting Clock and 8-Channel Probes* and *Removing and Replacing Podlets* in the *92A96/D/XD Module User's Manual* for information on disconnecting probes and separating the individual podlets from an 8-channel probe.

NOTE

Power down the 80960KA/KB/MC system before making alternate connections. Power on the 80960KA/KB/MC system after all connections are made. It is not necessary to power down the DAS 9200.

CLOCKING

The default clocking mode is Custom when 80960MC Support is selected in the module Configuration menu. Custom clocking only stores one data sample for each bus transaction, which can

take one or more clock pulses. This clocking selection is generally unproductive for timing analysis.

To sample the data asynchronously, select Internal clock in the Clock menu.

Internal Clocking

When you select Internal as the clocking mode, the data acquisition 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 80960KA/KB/MC signals are transitioning as expected, or to measure timing relationship between signals.

With 92A96 modules, 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's Manual* for information on sampling data at speeds faster than 100 MHz.

92A96 Probe Adapters

The probe adapters for the 92A96 modules (103-0321-00) have some circuitry that latches control signals to improve data reliability under extreme conditions. For timing measurements, these latches should be disabled placing the jumper in the "Time" (for "Timing" or Asynchronous acquisition) position. Disabling the latches allows the 92A96 module to perform actual bus timing measurements by placing the latches in a transparent mode.

Timing Menu

In the Timing menu, every channel is shown as an individual waveform, or as part of a bus form, or as both.

Predefined timing format files for the 80960KA/KB/MC are available for you to use when displaying data in the timing format. The 960MC_96 file was installed on the DAS 9200 with the disassembler software.

This timing format places the system clock as the first displayed channel followed by other important control signals. Address and data group signals are shown as bus forms containing bus values instead of as individual timing waveforms.

To select a predefined timing format file, follow these steps:

1. Press the Select Menu key to return to the Menu Selection overlay.
2. Select the Timing menu in the Display column.
3. Press the Return key.
4. Press F5: DEFINE FORMAT.
5. Press F5: RESTORE FORMAT.
6. Select the desired file and press the Return key. A message tells you the format file is selected.
7. Press F8: EXIT & SAVE to return to the Timing menu.

PRINTING DATA

To print out timing data, you can use the Timing Print overlay. To access either print overlay, press the Shift and Print keys at the same time from the State or Timing menu. Refer to your module user's manual for a complete description of these overlays.