CLAS 4000 LOGIC ANALYSIS SYSTEM

68040 MICROPROCESSOR ANALYSIS PACKAGE

USER'S MANUAL

Publication Number 0192-0559-10, Rev. A

BIOMATION

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PREFACE

This manual describes equipment connections and operation of Disassembler Utility software for the BIOMATION Microprocessor Analysis Package (MAP). The MAP is an accessory tool for the Configurable Logic Analysis System 4000(CLAS 4000).

Procedures are included in this manual for connecting MAP hardware components to the CLAS 4000, loading the utility software, and invoking the disassembly operation. These procedures also describe the use of menu-driven display screens to disassemble information recorded by the CLAS 4000.

The MAP user should be familiar with basic operating features of the CLAS 4000 driven by the *Macintosh™ computer which uses windows, icons, and pull-down menus to control system operations. Refer to the CLAS 4000 User's Manual, Publication Number 0192-0225-10, for system operating procedures.

If you require assistance on this product, please call BIOMATION Corporation Customer Service on the toll-free, hot-line number: **(800) 538-9320**; then dial **2** to contact the Marketing Department.

The content in this manual reflects the MAP software level which was valid at the time of publication, but is subject to change without notice.

Copies of this manual and other BIOMATION publications may be obtained from the BIOMATION sales office or distributor serving your locality.

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Chapter 1

INTRODUCTION

OVERVIEW

This manual describes the BIOMATION Microprocessor Analysis Package (MAP). The MAP is a tool that expands the test-debug capability of the Configurable Logic Analysis System 4000 (CLAS 4000). The MAP disassembles captured information to convert executed object code into mnemonic code and display the result on the video screen.

The MAP contains interface hardware and software components to be installed on the CLAS 4000 by the user. Typical MAP hardware is shown in Figure 1-1.

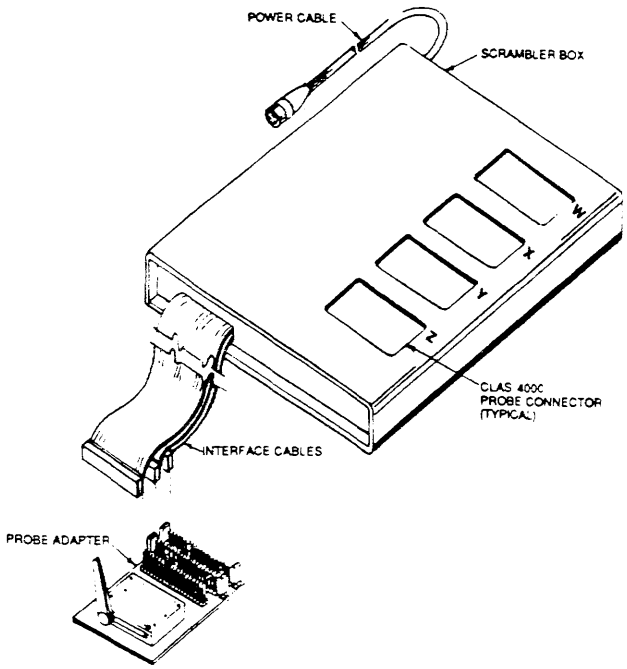


Figure 1-1. Typical MAP Components

Included in this manual is a microprocessor-to-logic analyzer pinout diagram, microprocessor-to-logic analyzer connection data, screen displays of preprogrammed menus, and screen displays of captured data presented in various disassembled formats.

HOW TO USE THIS MANUAL

The content in this manual is organized to present Standard MAP Features in Chapters 1 through 3 and Unique MAP Features in Chapters 4 through 6.

Standard MAP Features

The Standard MAP Features (Chapters 1 through 3) describe common characteristics of the MAP package which are the same for all microprocessor types. The information presented in these chapters is intended to guide the user through the standard operating capabilities of the MAP. If specific information is needed for a particular microprocessor type, refer to information contained in Chapters 4 through 6.

The Standard Features include the following types of information:

- Overview of MAP Hardware and Software Components (Chapter 1)

- Loading and Invoking the Disassembler (Chapter 2)

- Analyzer Setup (Chapter 2)

- Disassembler Operation (Chapter 3)

- Selecting Format Options (Chapter 3)

- Realignment of Data Screen (Chapter 3)

- Configuration Options (Chapter 3)

- Unloading the Disassembler (Chapter 3)

Unique MAP Features

The Unique MAP Features (Chapters 4 through 6) describe microprocessor dependent characteristics of the MAP Package which are different for each microprocessor type. Refer to these chapters for detailed information about connections for MAP components , microprocessor pin assignments, and unique disassembler operations for the microprocessor type.

The Unique Features include the following types of information:

- MAP Components (Chapter 4)

- MAP Specification (Chapter 4)

- Target System Connections (Chapter 5)

- CLAS 4000 Equipment Connections (Chapter 5)

- Variations in Disassembler Operation (Chapter 6)

MAP HARDWARE COMPONENTS

Hardware Interface Requirements

The MAP hardware components consist of the Microprocessor Probe Adapter (which is used to interface target system pins) and MAP Scrambler Box with attached cables (which is used to interface CLAS 4000 probe connections to the microprocessor probe adapter). These components are used to connect pins on the target system microprocessor to assigned analyzer channel inputs on the CLAS 4000. The MAP hardware interface allows the CLAS 4000 to capture data related to bus activity directly from the target microprocessor pin location.

SCSI Port Expansion and MAP Power Module

The MAP Scrambler Box may require input power supplied from the CLAS 4000 chassis. This power interface is provided by the SCSI Port Expansion and MAP Power Module (Product No. A70042).

The SCSI module contains four conditioned +/- 5Volts power output connectors for interfacing the MAP hardware and other accessories. The module also allows multiple SCSI devices to be connected in a daisy-chain network to the CLAS 4000 chassis. The SCSI module is optional equipment and is not included as a component in the MAP package. Contact your local BIOMATION Sales office for additional information on this component. When required for MAP operation, this equipment is described in the Installation Connections section of Chapter 5.

MAP DISASSEMBLER SOFTWARE

The MAP software is a Disassembler Utility supplied on a single, 3.5-inch diskette which contains six types of files as follows:

- Disassembler Setup File (filename ends in Setup)
- Disassembler Program File (filename ends in Disassembler)
- Sample Data File (filename ends in Sample Data)
- Sample Timing File (filename ends in Sample Timing)
- Sample Symbol File (filename ends in Sample Symbols)
- Sample Label File (filename ends in Sample Labels)

Disassembler Setup File

The Disassembler Setup File contains information that is unique to each Disassembler. The setup information identifies the base format and clocking setup conditions for the Disassembler. The format can be *modified* by the user without affecting disassembly processing, but any *deletion* from the base setup parameters will render the disassembler unusable.

Disassembler Program File

The Program File contains all of the Disassembler Specific Macintosh code and resources to initialize the Disassembler Parameters, an About Box, and an optional Disassembler Parameter Box. This file also contains the executable code for disassembly of a specific microprocessor type.

Sample Files

The Sample Files contain examples of recordings that are unique to the CLAS 4000. These files are provided to demonstrate the capabilities and operating features of the Disassembler.

-The Sample Data File contains a recording of state data. The associated setup parameters are included to allow the user to manipulate the recorded information.

-The Sample Timing File contains ALL of the available channels from the probe with pin numbers and timing labels (e.g. "A7 DACK") in place of "Status 7". This is an asynchronous recording intended for timing evaluation only and is not used for disassembly.

-The Sample Label File presents a table which contains at least four labels (e.g. Reset, Begin, Init, and Idle) for the code address group.

- The Sample Symbol File provides status information decoded for microprocessor cycle periods which can be used for pattern definition.

Using the Disassembler

The disassembler evaluates object code recorded from the target system and displays this information in a pseudo-assembly language form. The displayed information conforms to the chip manufacturer's mnemonic code for the microprocessor instruction set.

The displayed information indicates the captured state of external bus activity that occurred at the microprocessor pins. The user can manipulate the disassembled information to accomplish selective review for the various disassembly modes.

The Disassembler evaluates recorded data to identify the processor cycles. It then attempts to identify the program flow to decode the instructions. The Disassembler assumes the first recorded instruction to be valid and all other instructions to be recorded continuously.

If the first recorded information is not the start of an instruction, or if all available information is not recorded due to selective Trace Control, the disassembly may not be entirely accurate. In this case, it is necessary to re-synchronize the Disassembler to obtain the proper display. The procedure for realignment of the display is described in Chapter 3.

Certain microprocessor types contain internal cache and program memory. These features must be disabled to obtain a meaningful display of external microprocessor activity at the assigned pin/channel location. Other types of microprocessors use the external cache which eliminates the need for user intervention to enable and disable these circuit features. When applicable for MAP operation, this information is provided in Chapter 6.

BASIC MAP OPERATING FEATURES

All MAP packages provide the following basic operating capabilities:

- Capture of Address, Data, and Control signals associated with microprocessor program execution, and display cycle-by-cycle or summary by instruction sequences.

- Trigger on combinations of Bus Cycle Types; Input, Output, Memory Read/Write, Instruction Fetch, and Interrupts.

- Display captured information in various listings using manufacturer's software architecture (e.g. generate a listing with non-executed instructions deleted, or generate a listing with read/write status deleted, etc.).

Chapter 2

LOADING AND INVOKING THE DISASSEMBLER

COPYING FILES TO HARD DISK

General

The CLAS 4000 application is driven by software contained in the folder named **CLAS4000Folder.** This folder is installed on the Macintosh hard disk to implement CLAS 4000 operations.

The utility diskette supplied with the MAP components contains the **CLAS4000Folder** with the Setup File, Program File and Sample Files described in Chapter 1. These files are used to control disassembly processing for the CLAS 4000. These files must be copied to the hard disk as described in the Installation procedure which follows.

The contents of the diskette must be placed in the correct directories on the Macintosh before the user can boot the application.

Installation

If this is the first CLAS 4000 utility to be installed (i.e., there is no CLAS4000Folder on the hard disk), copy the entire folder to the root directory of the hard disk. The main CLAS 4000 Application should already be present in this directory.

If the CLAS4000Folder already exists, all of the files must be placed in the **CLAS4000Folder** directory. Also, the **CLAS4000Folder** must be in the root directory to work properly.

If you are a first time user of the CLAS 4000 interfaced to the Macintosh computer, refer to the Macintosh User's manual. This manual describes procedures for copying files to the hard disk and using folders to organize stored information.

LOADING THE DISASSEMBLER

There are several ways to load the Disassembler utility. The first method is to double click the mouse on the **Setup File** in the CLAS4000Folder while in the Macintosh Desktop Window. This action loads the CLAS 4000 Disassembler Setup parameters.

The second method is to **Load** the Disassembler with a setup from the CLAS 4000**File** Menu. This should be used if the current setup is not appropriate for the disassembler. (The channel setup for Address, Data, and Status fields, must be defined in the setup file in the same manner that was shipped with the disassembler; otherwise, the data display information will be garbled.) To accomplish this, simply load the next setup along with that of the disassembler. Running the Analyzer will then produce data in the appropriate format for display.

The third method for loading the Disassembler is used when the setup is already compatible with the Disassembler. The loading occurs by selecting the **Load Utility** menu item under the CLAS4000 empty utility menu icon (see Figure 2-1). This action loads the executable code and inserts the disassembler in the setup.

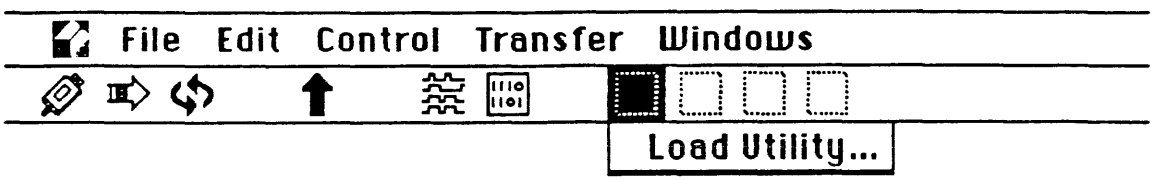


Figure 2-1. Load Utility Menu Icon

The fourth method is used to load the Disassembler from the CLAS 4000 Application which is accomplished as follows:

1. Select **Load** from the **File** menu, then select **Next Setup**.

2. Select **Load** from the **File** menu, then select **Last Setup** with Data (timing labels and transfer).

3. Select **Load Utility** to obtain the Disassembler Files dialog box.

The **Disassembler Files** dialog box (Figure 2-2) appears after selecting the **Load Utility** menu item. This box identifies all of the disassemblers contained in the currently selected folder.

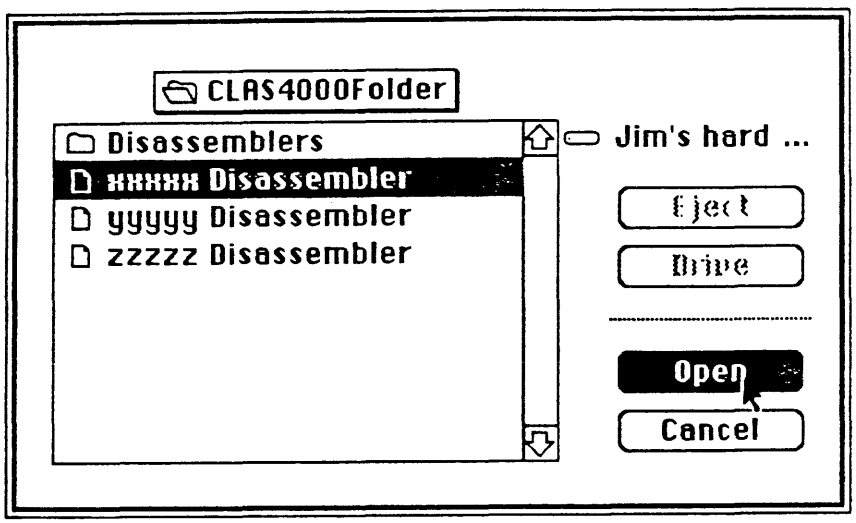


Figure 2-2. Disassembler Files Dialog Box

INVOKING DISASSEMBLY PROCESSING

The Disassembler is loaded and invoked by selecting the Disassembler filename from the Files dialog box and clicking the mouse on **Open,** or double clicking the mouse on the Disassembler filename. The utility is automatically loaded into memory and initialized.

ANALYZER SETUP FOR DISASSEMBLY

Setup Requirements

The CLAS 4000 is setup for disassembly by loading a Disassembler compatible setup into the application. The screens for Channel setup, along with the screens for Clock setup and Trace Control, are initialized with the unique information for the particular Disassembler that was loaded.

These screens can be altered by using the CLAS 4000 standard setup method for each screen. However, accurate disassembly can be assured only when the above screens contain the setup information that was downloaded by the Disassembler. Additional columns of information can be appended to the right side of the Setup screen , but none can be deleted.

Loading Symbols

Symbols are loaded into the Channel Setup Edit Symbol dialog box. The symbols may be either typed or loaded from a file. If they are loaded from a file, the file must be of standard text using the following format:

Symbol String<tab 0X>Hex Value <tab> Care Value <CR>

Where:

Symbol String, Hex Value, and Don't Care Value are ASCII representations of standard Hexadecimal numbers which are no greater than the fields where they will be inserted (i.e.,10, 8, 8 respectively).

The Care Value is optional and if used, must be set to 1 for each 'Care' Bit .

Each line is followed by a Carriage Return <CR> indicating the end of the record.

One symbol is used per line for as many lines as are required to express the complete symbol table.

An example Symbol Table File prepared by the user with standard text in the required format is shown in Figure 2-3.

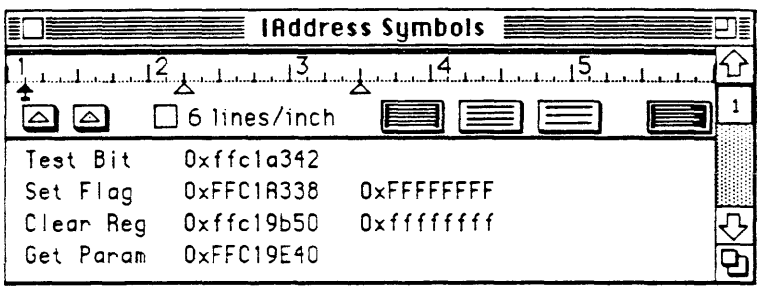


Figure 2-3. Example Symbol Table File

Symbols may be used for either the Address Field or Status Field. Sample files for each symbol type are included on the diskette that is supplied with the system.

Address Symbols (Figure 2-4) are used to add labels to Disassembler displays as described in Chapter 3.

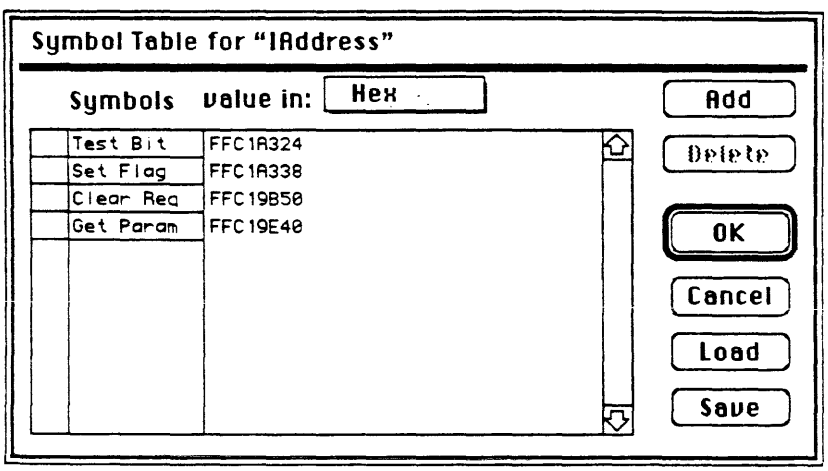


Figure 2-4. Symbol Table for Address

Status Symbols may be used to define Trace Control Patterns relative to microprocessor bus cycle types. To use this feature, the Symbol Table is either entered or loaded in the Channel Setup Symbol Edit Mode for the desired recording (i.e., Next, Last, or Reference). The selection of Next is normally used.

The desired symbol can then be selected in the Trace Control Pattern Definition window by double clicking the mouse on the Status Pattern or using the Edit button to obtain the Symbol Selection Table shown in Figure 2-5.

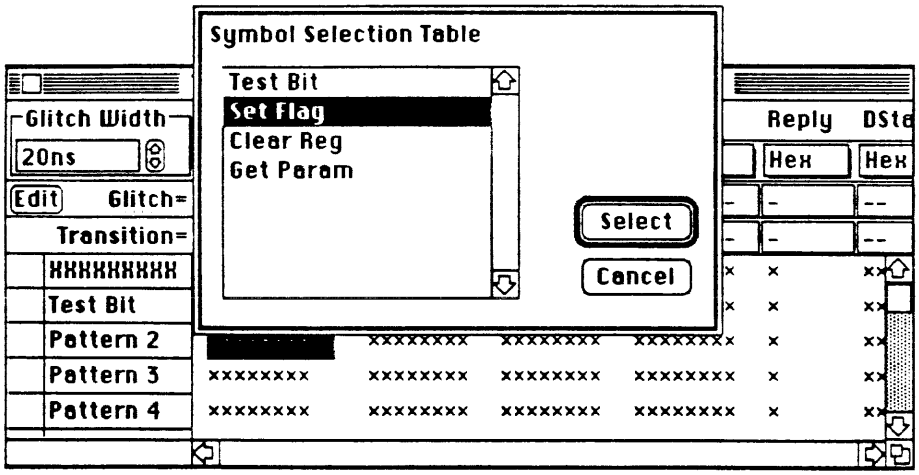


Figure 2-5. Symbol Selection Table

Chapter 3

DISASSEMBLER OPERATION

DISASSEMBLING THE DATA

After loading is completed, the empty utility icon is replaced with the Disassembler menu icon (Figure 3-1) and its associated menu selections.

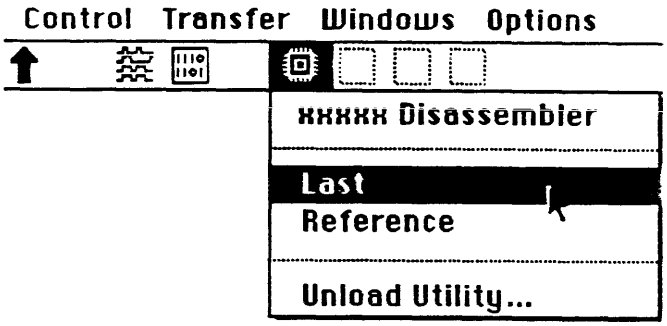
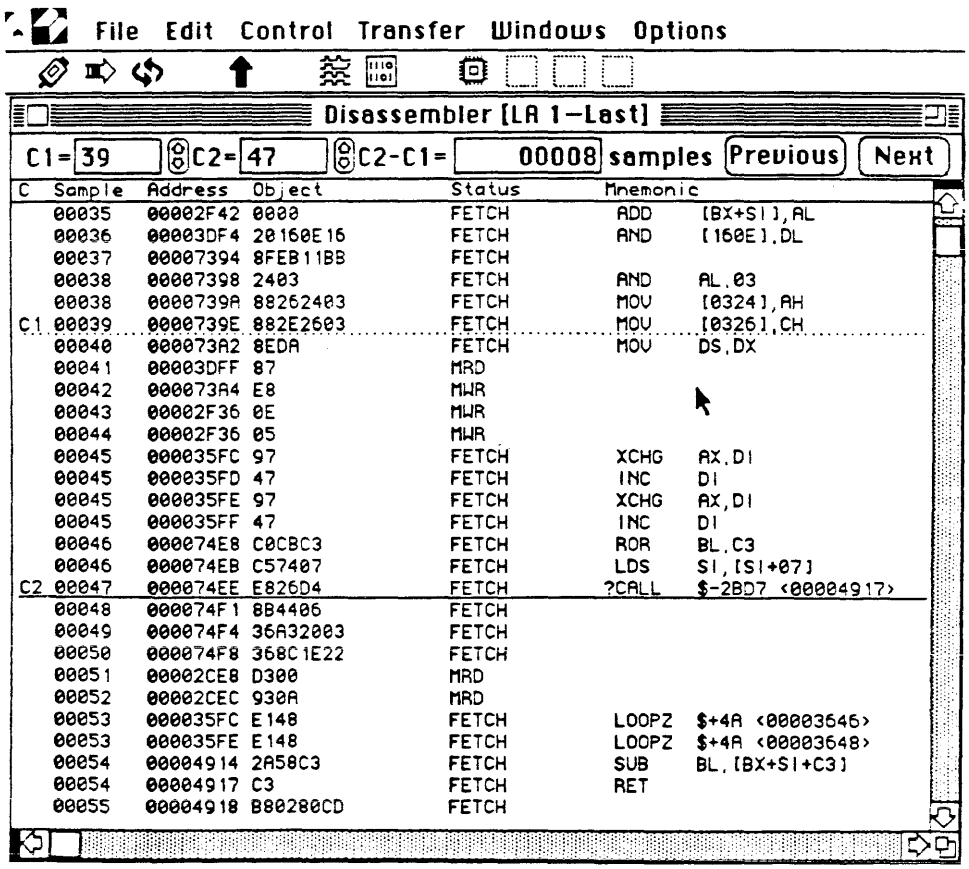


Figure 3-1. Disassembler Menu Icon for Last Data Recorded

The Disassembler Display Window (Figure 3-2) presents typical disassembled information. The display window is entered by selecting either the **LAST** or the **REFERENCE** item from the Disassembler menu. This selection determines what data is to be disassembled. Selecting the Title Choice from the Disassembler Menu displays the revision level of the Disassembler software.



C	Sample	Address	Object	Status	Mnemonic	
	00035	00002F42	0000	FETCH	ADD	[BX+SI],AL
	00036	00003DF4	20160E16	FETCH	AND	[160E],DL
	00037	00007394	8FEB11BB	FETCH		
	00038	00007398	2403	FETCH	AND	AL,03
	00038	0000739A	88262403	FETCH	MOV	[0324],AH
C1	00039	0000739E	882E2603	FETCH	MOV	[0326],CH
	00040	000073A2	8ED8	FETCH	MOV	DS,DX
	00041	00003DFF	87	MRD		
	00042	000073A4	E8	MWR		
	00043	00002F36	0E	MWR		
	00044	00002F36	05	MWR		
	00045	000035FC	97	FETCH	XCHG	AX,DI
	00045	000035FD	47	FETCH	INC	DI
	00045	000035FE	97	FETCH	XCHG	AX,DI
	00045	000035FF	47	FETCH	INC	DI
	00046	000074E8	C0CBC3	FETCH	ROR	BL,C3
	00046	000074EB	C57407	FETCH	LDS	SI,[SI+07]
C2	00047	000074EE	E826D4	FETCH	?CALL	$-2BD7 <00004917>
	00048	000074F1	8B4406	FETCH		
	00049	000074F4	36A32003	FETCH		
	00050	000074F8	368C1E22	FETCH		
	00051	00002CE8	D300	MRD		
	00052	00002CEC	930A	MRD		
	00053	000035FC	E148	FETCH	LOOPZ	$+4A <00003646>
	00053	000035FE	E148	FETCH	LOOPZ	$+4A <00003648>
	00054	00004914	2A58C3	FETCH	SUB	BL,[BX+SI+C3]
	00054	00004917	C3	FETCH	RET	
	00055	00004918	B80280CD	FETCH		

Figure 3-2. Typical Disassembler Display Window

Disassembly Processing

When the Disassembler Display Window is entered for the first time, the contents area of the window is empty and a pause occurs for completion of disassembly processing before the window is filled with disassembled data. During this time, a Status Box will indicate progress of the disassembly.

If the user wishes to abort the disassembly, hold down the **Apple** key and type a **period**. The disassembler will present disrupted data on the screen.

A spinning cursor is displayed to the user while the disassembler is busy decoding the data for display. The spinning cursor is also displayed if a new recording is taken while viewing the current disassembly display. The old contents of the screen will remain visible until the screen is updated with the new decoded data. To avoid having disassembly processing occur when it is not needed, the user can simply close the disassembler window.

If it is suspected that noise causes errors to occur in a data recording, increase or decrease the threshold voltages beyond the noise levels to remove the disturbance.

The disassembler also disassembles data on the screen when a message is received that the format patterns have been changed. This condition would occur after the user loads another symbol table into the Channel Setup Symbol definition screen, or when a pattern is edited from the list. It precedes the disassembly by downloading the symbol table.

The disassembler columns may be moved by clicking the mouse on the column heading and shifting in the desired direction. However, the disassembler columns can not be reordered; otherwise, this window operates in the same manner as the state display. The display pane splitters operate in the same manner, as well as the cursors, the markers, and most of the menu commands.

Using Disassembler Options Menu

When the Disassembler Display Window is entered, the **Options** menu item (Figure 3-3) is added to the menu bar. The **Options** menu contains choices for selections that are used to manipulate the Disassembler Display Window as described in subsequent paragraphs.

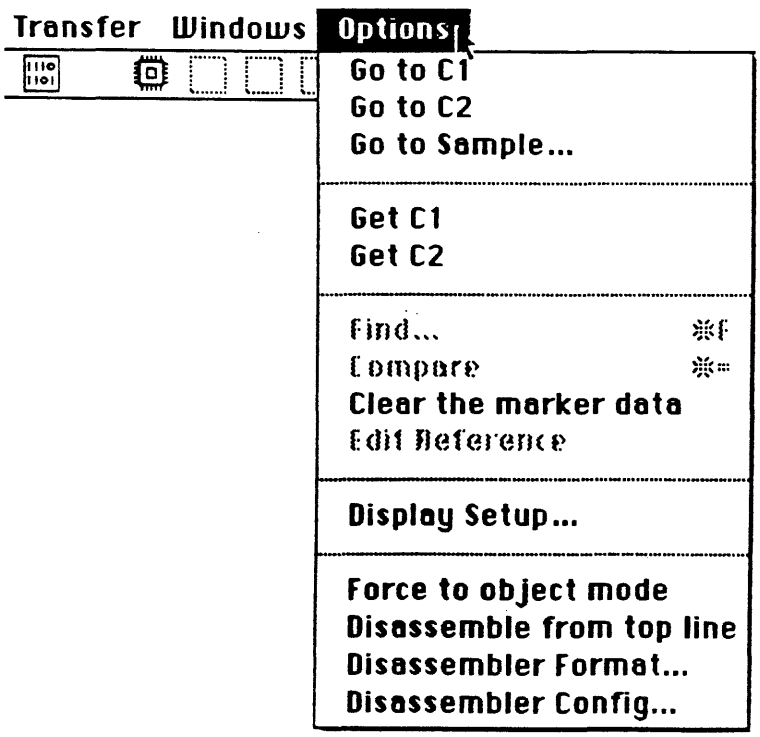


Figure 3-3. Disassembler Options Menu

Some of the Options Menu commands that are available in the State Window display are not available in the Disassembler Window display and vice-versa as described below.

The following commands are available in the Disassembler Window but not in the State Window:

Force to Object Mode
Disassemble from Top Line
Disassembler Format
Disassembler Configuration (when required by the specific disassembler)

The following commands are available in the State Window but not in the Disassembler Window:

Find*
Compare*
Edit Reference

***NOTE:** Despite the fact that Find and Compare commands are not available in the Disassembler Window, the results are displayed in the Disassembler Window whenever they are used in the State Window.

The user can change the displayed area of the Disassembler Window by using the **Go to...** cursor menu items. The display window can also be manipulated either by using the scroll bars or by dragging the cursor. If the display window has been manipulated by the scroll bar, and the user wishes to return to the area in the recording where either cursor is located, choose the **Go to C1** or **Go to C2** menu item to accomplish this action.

Go to Sample Number Dialog Box

The **Go to Sample...** menu selection allows the user to view the display contents beginning with the sample number selected. After selecting the **Go to Sample...** item, a dialog box (Figure 3-4) appears so that the user may select the specific sample number.

NOTE: The function for this selection is independent from the cursor movement. It merely changes the display to show the information beginning from the selected sample number. The cursors remain in their original positions.

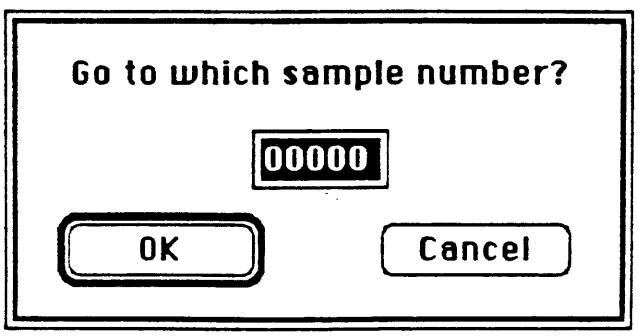


Figure 3-4. Go to Sample Number Dialog Box

The **Get C1** or **Get C2** menu items position the cursor to the top of the currently displayed area.

NOTE: Entering the sample number for the squares labeled **C1=** or **C2=** is another method for repositioning the cursor locations in memory. The **Clear the marker data** command simply clears any search, compare, or marker information that was previously defined by the user.

The **Disassembler Format. . .** command allows the user to define his preferences on such things as font size, the choice to display step (level) data, and time stamp information. This command works exactly the same for both the State and Disassembler Windows.

The **Force to object mode** command re-displays the current data in object format, with the smallest instruction per line. This is useful when the data has a break in sequence, or when the recording did not start on an instruction boundary.

The **Disassemble from top line** command re-disassembles data from the top display line. This is used in conjunction with the **Force to object mode** command to re-synchronize the Disassembler's internal instruction counter with the data flow.

The last two commands are designed to be used together. When synchronization is lost, the user should **Force data to object mode**, move down to a probable opcode location, and then return to normal disassembly mode using the **Disassemble from top line** command. The Disassembler is setup to allow the user to do this as many times as needed.

SELECTING THE DISASSEMBLER FORMAT

The **Disassembler Format** menu presents the Disassembler Specific Format Dialog Box (Figure 3-5). This dialog box allows the user to choose the desired Disassembly and Display modes. The mode shown in Figure 3-5 is used to display disassembly results.

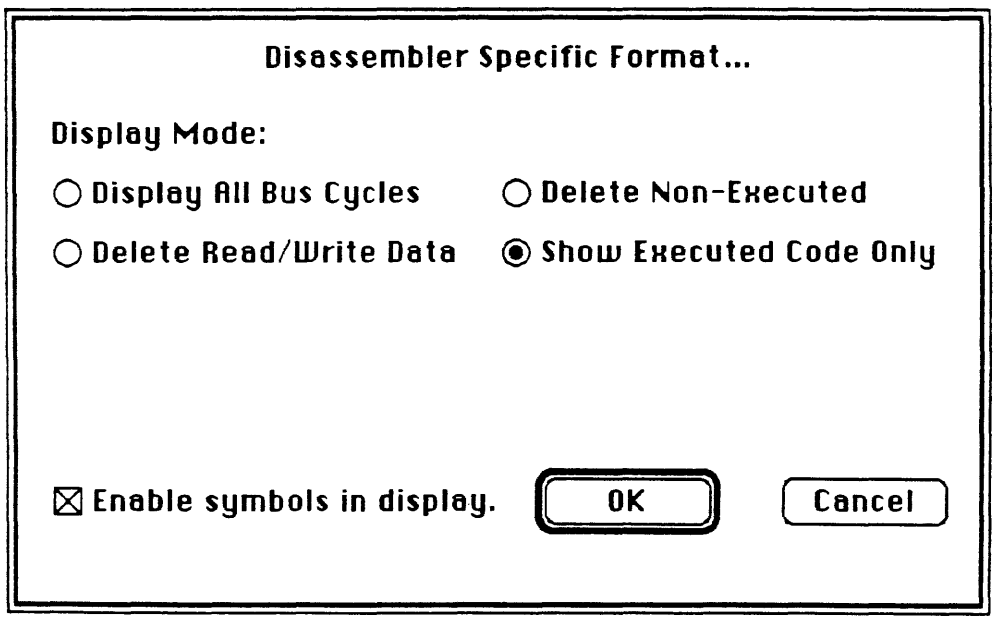


Figure 3-5. Disassembler Specific Format Dialog Box

Click the mouse on the assigned button to select a choice for Disassembler Display Mode. The display modes are filters that specify what portion of the disassembled data is displayed. Typical display modes are as follows:

Display All Bus Cycles
Delete Non-Executed Instructions
Delete Read/Write Data
Show Executed Code Only (removes both non-executed instructions and read/write data)

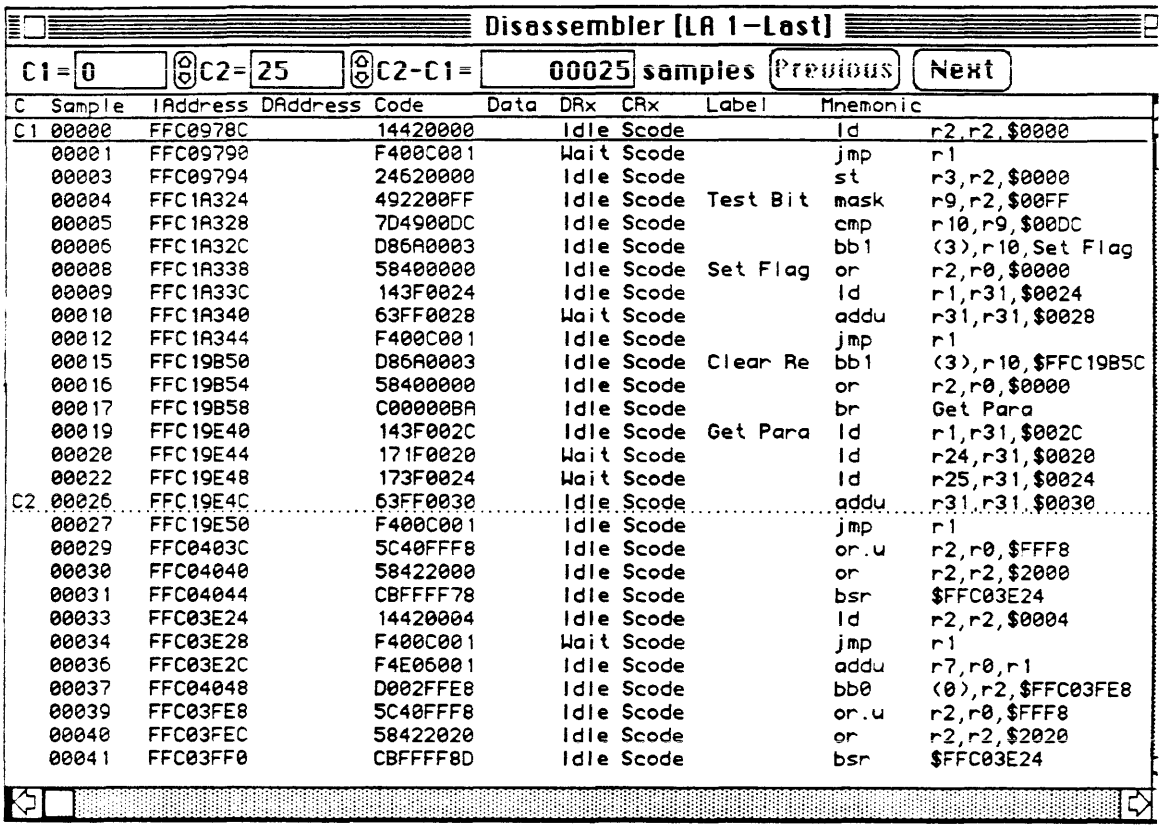
ENABLE SYMBOLS

Upon selecting the option for **Enable symbols in display**, a column is inserted in the disassembler Display Window between the Status and Mnemonic column that is titled Labels.

The first column (Address) must be in Symbol Display Mode and a Symbol Table must be loaded.

The symbol is inserted at locations where an address matches a symbol from the Symbol Table or when a decoded instruction references a specific Address (see Figure 3-6).

NOTE: A Sample Address Symbol Table is included on the diskette supplied with the system.



C	Sample	IAddress	DAddress	Code	Data	DRx	CRx	Label	Mnemonic	
C1	00000	FFC0978C		14420000		Idle	Scode		ld	r2,r2,$0000
	00001	FFC09790		F400C001		Wait	Scode		jmp	r1
	00003	FFC09794		24620000		Idle	Scode		st	r3,r2,$0000
	00004	FFC1A324		492200FF		Idle	Scode	Test Bit	mask	r9,r2,$00FF
	00005	FFC1A328		7D4900DC		Idle	Scode		cmp	r10,r9,$00DC
	00006	FFC1A32C		D86A0003		Idle	Scode		bb1	(3),r10,Set Flag
	00008	FFC1A338		58400000		Idle	Scode	Set Flag	or	r2,r0,$0000
	00009	FFC1A33C		143F0024		Idle	Scode		ld	r1,r31,$0024
	00010	FFC1A340		63FF0028		Wait	Scode		addu	r31,r31,$0028
	00012	FFC1A344		F400C001		Idle	Scode		jmp	r1
	00015	FFC19B50		D86A0003		Idle	Scode	Clear Re	bb1	(3),r10,$FFC19B5C
	00016	FFC19B54		58400000		Idle	Scode		or	r2,r0,$0000
	00017	FFC19B58		C00000BA		Idle	Scode		br	Get Para
	00019	FFC19E40		143F002C		Idle	Scode	Get Para	ld	r1,r31,$002C
	00020	FFC19E44		171F0020		Wait	Scode		ld	r24,r31,$0020
	00022	FFC19E48		173F0024		Wait	Scode		ld	r25,r31,$0024
C2	00026	FFC19E4C		63FF0030		Idle	Scode		addu	r31,r31,$0030
	00027	FFC19E50		F400C001		Idle	Scode		jmp	r1
	00029	FFC0403C		5C40FFF8		Idle	Scode		or.u	r2,r0,$FFF8
	00030	FFC04040		58422000		Idle	Scode		or	r2,r2,$2000
	00031	FFC04044		CBFFFF78		Idle	Scode		bsr	$FFC03E24
	00033	FFC03E24		14420004		Idle	Scode		ld	r2,r2,$0004
	00034	FFC03E28		F400C001		Wait	Scode		jmp	r1
	00036	FFC03E2C		F4E06001		Idle	Scode		addu	r7,r0,r1
	00037	FFC04048		D002FFE8		Idle	Scode		bb0	(0),r2,$FFC03FE8
	00039	FFC03FE8		5C40FFF8		Idle	Scode		or.u	r2,r0,$FFF8
	00040	FFC03FEC		58422020		Idle	Scode		or	r2,r2,$2020
	00041	FFC03FF0		CBFFFF8D		Idle	Scode		bsr	$FFC03E24

Figure 3-6. Symbol Column Insertion in Data Display Window

SELECTING DISASSEMBLER CONFIGURATION

The **Disassembler Config...** menu selection is available when the current disassembler has parameters that will not fit into the choices available above. These conditions are defined inside the disassembler resource file, and will vary from one disassembler to another.

Typically, this menu is used to specify operating modes of the target microprocessor or to provide the value of internal registers which cannot be determined from recorded data. This information is described in Chapter 6 when required for a specific Disassembler.

UNLOADING THE DISASSEMBLER

The Disassembler is unloaded by clicking the mouse on the **Unload Utility** menu item on the icon menu bar (See Figure 3-1). This action will cause the Disassembler to unload. The Setup information is purged from the CLAS 4000 and the Utility icon becomes grayed to indicate the utility is inactive. If a setup containing a disassembler is loaded on top of another disassembler, the old one is automatically unloaded.

Chapter 4

68040 MAP SPECIFICATIONS

PHYSICAL DIMENSIONS AND WEIGHT

Size

Scrambler Box:	1.6 inches (4.0 cm) height 8.4 inches (21.3 cm) width 9.0 inches (22.9 cm) length
Probe Adapter:	0.93 inches (2.38 cm) height 2.06 inches (5.24 cm) width 5.37 inches (13.65 cm) length
Weight	2 lb., 8 oz. (1.1 kg) with Probe Adapter and attached cables
Temperature	32-122 deg.F (0-50 Deg C) noncondensing

ELECTRICAL CHARACTERISTICS

Loading (Signal Inputs)

Input Impedance:	Probe load for all signals is 1 megohm shunted by 8pf. Maximum current for signals is +/- 5uA

Loading (Ground/Reference Input)

Input Resistance:	Less than 1 ohm referenced to target system ground and approximately 18K ohms referenced to logic analyzer ground
Ground Difference Immunity:	+/- 0.25 Volt maximum between logic analyzer ground and target system ground

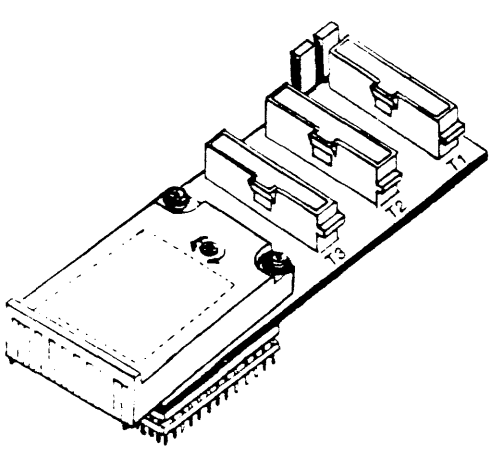
Map Power Input

Supplied from CLAS 4000	Requires SCSI Port Expansion and MAP Power Option to provide -5 Volts DC

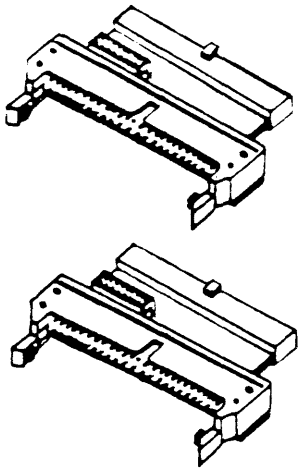
MAP COMPONENTS

The 68040 Microprocessor Analysis Package (Product No. A70044) consists of the following components which are shown in Figure 4-1:

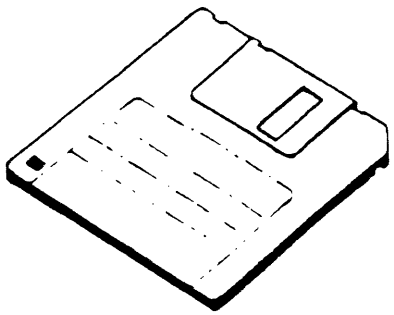
- 68040 Scrambler Box (with attached signal cables and power cord)
- Probe Adapter Assembly
- Two Clock Probe Interface Adapters
- One 68040 Disassembler Diskette
- Users Manual



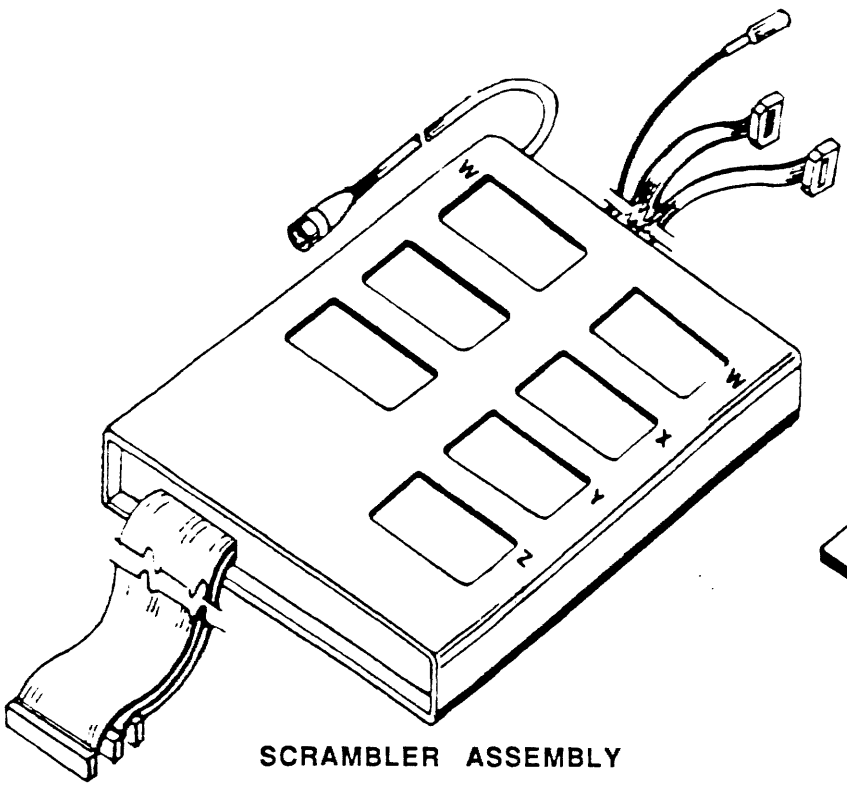
PROBE ADAPTER
P/N 0192-0510-20



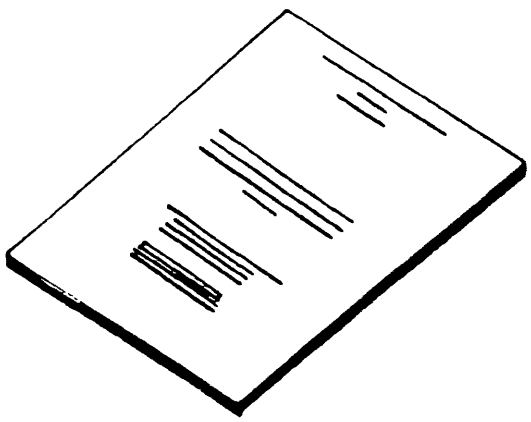
CLOCK PROBE INTERFACE ADAPTER
P/N 0192-1055-10



SOFTWARE DISKETTE
P/N 0192-0560-10



SCRAMBLER ASSEMBLY



USER'S MANUAL
P/N 0192-0559-10

Figure 4-1. 68040 MAP Components

68040 MICROPROCESSOR PIN ASSIGNMENTS

Pin assignments for the 68040 microprocessor are shown in Figure 4-2.

Additional information, including cross references for microprocessor machine code and instructions may be obtained by consulting the following reference manuals issued by *Motorola™ Incorporated:

MC68040 Microprocessor User's Manual, Publication Number MC68040UM/AD

MC68040 Designer's Handbook, Publication Number MC68040DH/AD

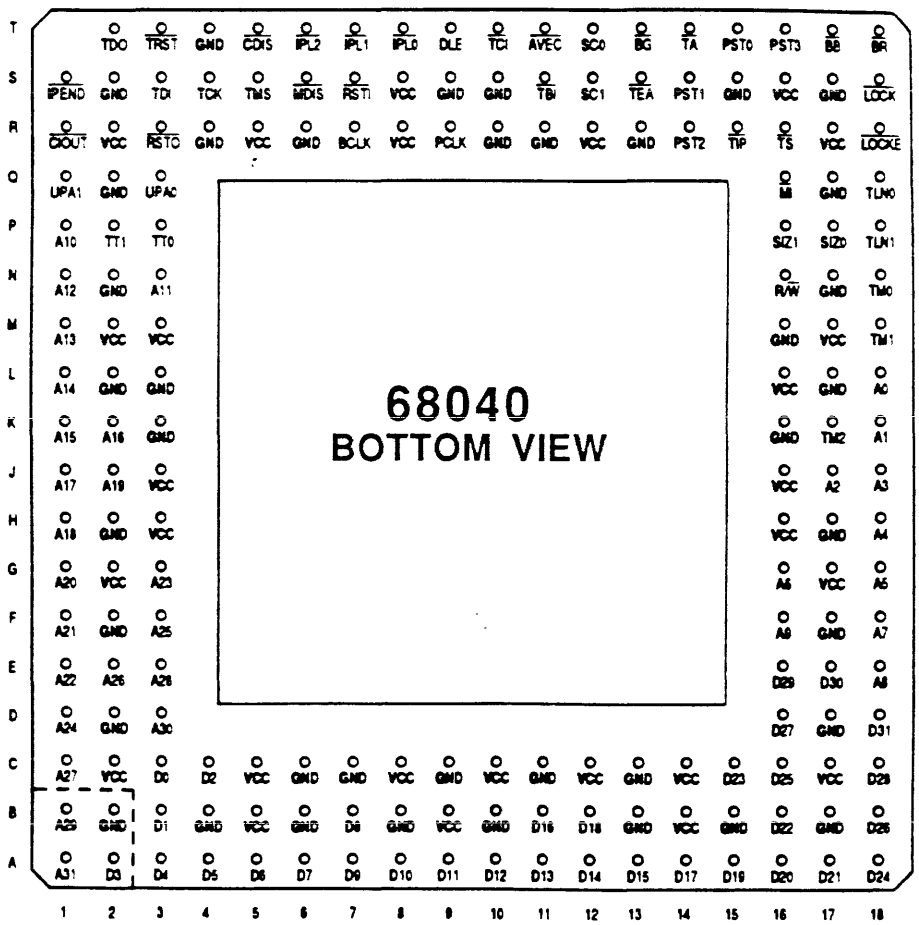


Figure 4-2 68040 Microprocessor Pin Assignments

*Motorola is a trademark of Motorola Inc.

Chapter 5

INSTALLATION

SCRAMBLER BOX TO TARGET SYSTEM CONNECTIONS

The 68040 microprocessor chip must be removed from the target system and the Probe Adapter is installed in its place. The microprocessor chip is then inserted into the probe adapter via the Zero Insertion Force (ZIF) socket. The Probe Adapter is connected to the Scrambler Box with three attached cables as shown in Figure 5-1. The Probe Adapter contains two jumper connections (W1and W2) which are described in Chapter 6. See description of Cache and MMU jumpers.

Procedure

Use the following procedure to connect Scrambler Box to the target system:

1. Remove the 68040 microprocessor chip from target system socket and install the base of probe adapter into the target system socket. Observe the location of Pin A1 on probe adapter which must mate with Pin A1 on the target system socket for correct alignment of pins.

2. Install the microprocessor chip on probe adapter via the ZIF socket. Ensure pin locations on the microprocessor chip are aligned with corresponding pins on the probe adapter .

3. Connect three flat signal cables from scrambler box to probe adapter connectors T1, T2, and T3.

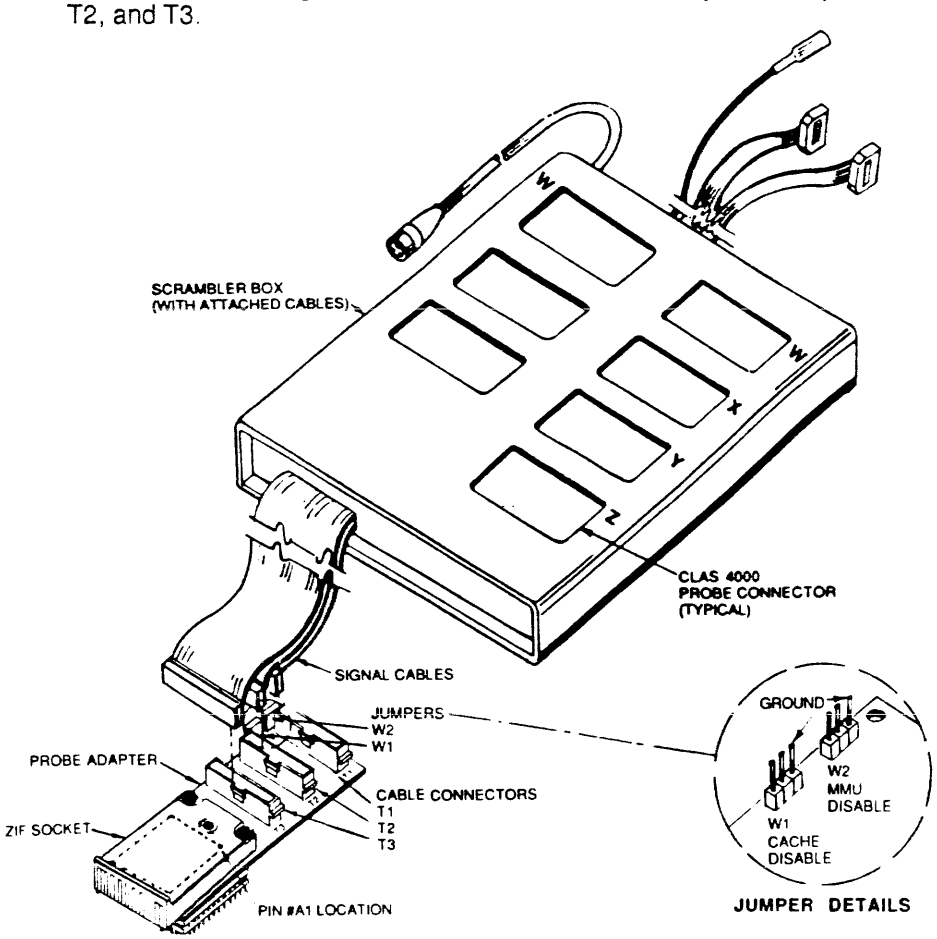


Figure 5-1. Scrambler Box to Probe Adapter Connections

SCRAMBLER BOX TO CLAS 4000 CONNECTIONS

The two Clock Probe Interface Adapters supplied with the MAP package must be installed on the CLAS 4000 Z Channel connectors at Data Boards A and B. These adapters are used to connect the Scrambler Box clock interface cable to the Z connector as shown in Figure 5-2.

The two Clock Interface Cables attached to the Scrambler Box contain 16-pin connectors which plug into mating connectors on the Clock Probe Adapters. The 100 MHz coaxial cable on the Scrambler Box attaches to a jack on the CLAS 4000 Control Board Panel.

Probe connectors on top of the Scrambler Box are labeled W, X, Y, and Z to identify the location for a corresponding analyzer probe.

The 68040 MAP Scrambler Box receives -5 Volt power input from the CLAS 4000. The power is supplied from the SCSI Port Expansion and MAP Power Module (Product No. A70042). This option must be installed on the CLAS 4000 chassis to power the MAP Scrambler Box.

Procedure

Use the following procedure to connect the CLAS 4000 to the Scrambler Box:

1. Ensure AC power is off at CLAS 4000 prior to connecting the Scrambler Box.

2. Remove analyzer probe cables from Z Channel locations on Data Boards A and B. Install a Clock Probe Adapter at each of the Z Channel connectors.

3. Connect the two clock input signal cables and coaxial cable from Scrambler Box to CLAS 4000 as follows:

   a) Locate the clock interface cable which is labeled POWER/GROUND THRESHOLD. Connect this cable to Clock Probe Adapter at Data Board A.

NOTE: This cable supplies signals that control the synchronization of clock signals and must be connected to Clock Probe Adapter at Data Board A.

   b) Connect the other clock input cable to Clock Probe Adapter at Data Board B.

   c) Connect the 100 MHz coaxial cable to one of the CLK OUT jacks on CLAS 4000 Control Panel.

4. Connect the Scrambler Box power cord to one of the 5-Volt SCSI connectors at lower front panel of CLAS 4000 chassis.

5. Remove flying leads and grabbers from analyzer probe connectors (if attached) and connect five probes, W, X, Y, Z, and W to corresponding Scrambler Box connectors as follows:

   a) Connect W and X probes from Data Board A to corresponding W and X probe locations on right side of Scrambler Box (see orientation in Figure 5-2).

   b) Connect Y probe from Data Board A to Yprobe location on right side of Scrambler Box.

   c) Connect Z probe from clock probe adapter at Data Board A to Z probe location on right side of Scrambler Box.

   d) Connect W probe from Data Board B to W probe location on left side of Scrambler Box.

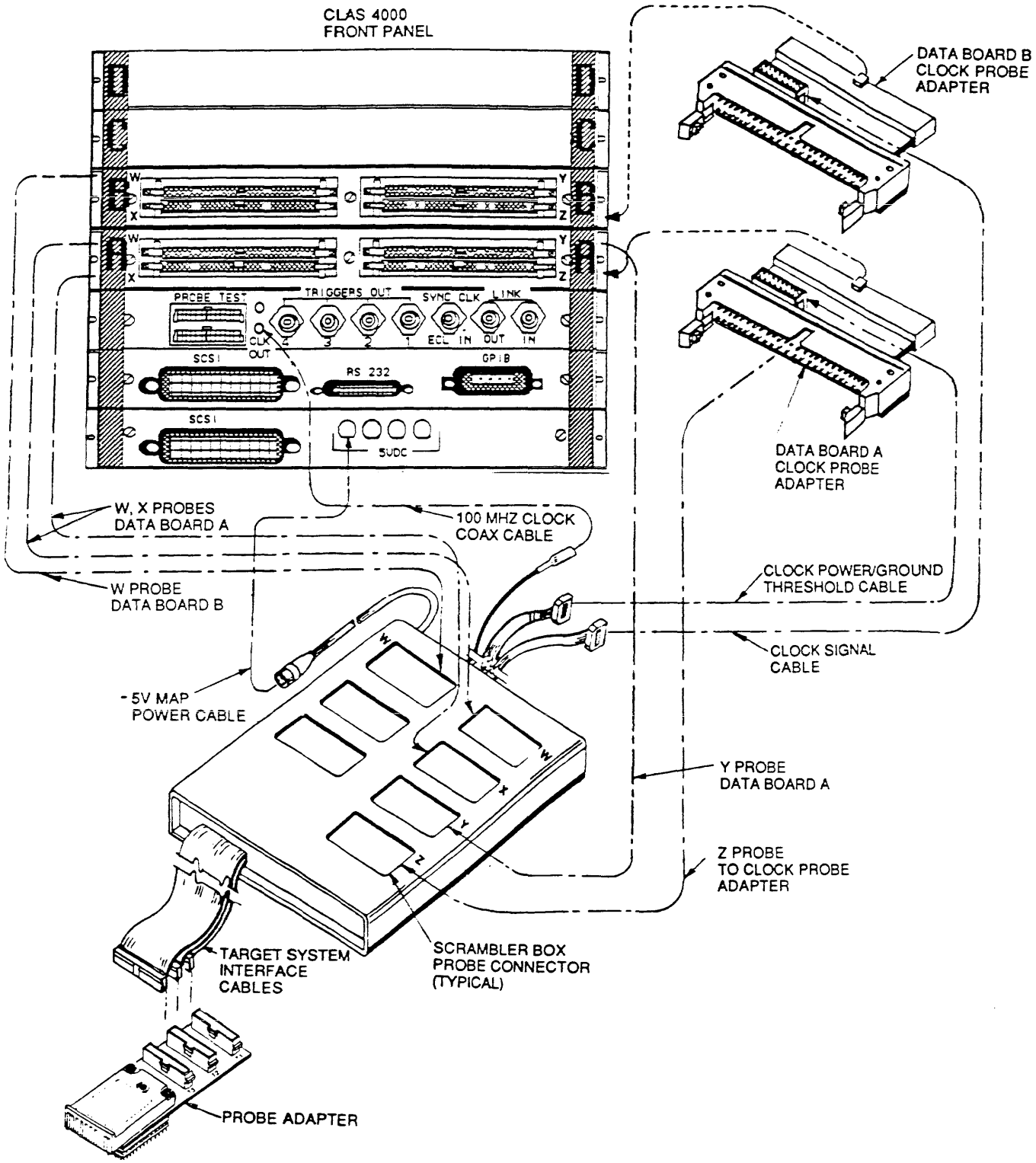


Figure 5-2. Scrambler Box to CLAS 4000 Connections

MICROPROCESSOR PINOUTS TO LOGIC ANALYZER

Signals for 32 Address Lines, 32 Data lines, and 48 Status and Control Lines (112 total lines) are transferred from the 68040 target microprocessor in the system under test to the Scrambler Box. These signals are also transferred from the Scrambler Box to the assigned Analyzer Channel in the CLAS 4000.

The wire list in Table 5-1 identifies the assigned Signal Name/Function for each 68040 pin, the Target Head pin connections, the MAP Scrambler Board pin connections, and the corresponding Logic Analyzer channel connections.

The wire list in Table 5-2 describes clock signal connections between the Scrambler Board, Sync Adapter Board, and the corresponding Logic Analyzer channel.

Schematic diagrams for circuit connections are provided in Chapter 6.

The following conventions are used in this Tables 5-1 and 5-2:

- The asterisk (*) character following a signal name indicates active-low logic level.
- The abbreviation NC indicates no connection.
- The abbreviation GND indicates ground.

Table 5-1. 68040 MICROPROCESSOR-TO-LOGIC ANALYZER WIRING CONNECTIONS

	A	B	C	D	E	F
1	SIGNAL	PGA PIN	CONN.	PROBE	CHANNEL#	DATA BD#
2						
3	A0	L18	T1-26	J01-03	CH00	1
4	A1	K18	T1-30	J01-05	CH01	1
5	A2	J17	T2-05	J01-07	CH02	1
6	A3	J18	T1-34	J01-09	CH03	1
7	A4	H18	T2-37	J01-11	CH04	1
8	A5	G18	T1-38	J01-13	CH05	1
9	A6	G16	T2-39	J01-15	CH06	1
10	A7	F18	T1-42	J01-17	CH07	1
11	A8	E18	T1-44	J01-19	CH08	1
12	A9	F16	T2-33	J01-21	CH09	1
13	A10	P1	T3-11	J01-23	CH10	1
14	A11	N3	T3-16	J01-25	CH11	1
15	A12	N1	T3-15	J02-03	CH12	1
16	A13	M1	T3-17	J02-05	CH13	1
17	A14	L1	T3-19	J02-07	CH14	1
18	A15	K1	T3-23	J02-09	CH15	1
19	A16	K2	T3-21	J02-11	CH16	1
20	A17	J1	T3-27	J02-13	CH17	1
21	A18	H1	T3-31	J02-15	CH18	1
22	A19	J2	T3-25	J02-17	CH19	1
23	A20	G1	T3-29	J02-19	CH20	1
24	A21	F1	T3-35	J02-21	CH21	1
25	A22	E1	T3-33	J02-23	CH22	1
26	A23	G3	T3-36	J02-25	CH23	1
27	A24	D1	T3-37	J03-03	CH24	1
28	A25	F3	T3-34	J03-05	CH25	1
29	A26	E2	T3-39	J03-07	CH26	1
30	A27	C1	T3-43	J03-09	CH27	1
31	A28	E3	T3-32	J03-11	CH28	1
32	A29	B1	T3-41	J03-13	CH29	1
33	A30	D3	T3-30	J03-15	CH30	1
34	A31	A1	T3-44	J03-17	CH31	1
35	D0	C3	T3-28	J05-03	CH48	1
36	D1	B3	T3-26	J05-05	CH49	1
37	D2	C4	T3-40	J05-07	CH50	1
38	D3	A2	T3-42	J05-09	CH51	1
39	D4	A3	T2-42	J05-11	CH52	1
40	D5	A4	T3-38	J05-13	CH53	1
41	D6	A5	T3-10	J05-15	CH54	1
42	D7	A6	T2-28	J05-17	CH55	1
43	D8	B7	T2-32	J05-19	CH56	1
44	D9	A7	T2-26	J05-21	CH57	1
45	D10	A8	T2-30	J05-23	CH58	1
46	D11	A9	T2-36	J05-25	CH59	1
47	D12	A10	T2-34	J06-03	CH60	1
48	D13	A11	T2-40	J06-05	CH61	1
49	D14	A12	T1-31	J06-07	CH62	1
50	D15	A13	T1-29	J06-09	CH63	1

Table 5-1 (Cont'd.)

	A	B	C	D	E	F
51	SIGNAL	PGA PIN	CONN.	PROBE	CHANNEL#	DATA DB#
52						
53	D16	B11	T2-38	J06-11	CH64	1
54	D17	A14	T1-35	J06-13	CH65	1
55	D18	B12	T2-44	J06-15	CH66	1
56	D19	A15	T1-33	J06-17	CH67	1
57	D20	A16	T1-39	J06-19	CH68	1
58	D21	A17	T1-27	J06-21	CH69	1
59	D22	B16	T1-43	J06-23	CH70	1
60	D23	C15	T1-37	J06-25	CH71	1
61	D24	A18	T2-27	J07-03	CH72	1
62	D25	C16	T1-41	J07-05	CH73	1
63	D26	B18	T2-25	J07-07	CH74	1
64	D27	D16	T1-05	J07-09	CH75	1
65	D28	C18	T2-31	J07-11	CH76	1
66	D29	E16	T2-35	J07-13	CH77	1
67	D30	E17	T2-41	J07-15	CH78	1
68	D31	D18	T2-29	J07-17	CH79	1
69	AVEC*	T11	T2-10	J03-21	CH33	1
70	BB*	T17	T2-21	J03-23	CH34	1
71	BCLK	R7	T1-12	J10-17	CH19	2
72	BCLK	R7	T1-12	P04-01	CH90	1 & 2
73	BG*	T13	T1-25	J03-25	CH35	1
74	BR*	T18	T1-24	J04-03	CH36	1
75	CDIS*	T5, W1-2	T2-02	J09-03	CH00	2
76	CIOUT*	R1	T3-05	J09-05	CH01	2
77	DLE	T9	T2-16	J10-19	CH20	2
78	DLE	T9	T2-16	P04-02	CH91	1 & 2
79	IPEND*	S1	T1-16	J08-13	CH89	1
80	IPLO*	T8	T2-20	J07-19	CH80	1
81	IPL1*	T7	T1-20	J07-21	CH81	1
82	IPL2*	T6	T2-08	J07-23	CH82	1
83	LOCK*	S18	T2-17	J09-13	CH05	2
84	LOCKE*	R18	T2-43	J09-15	CH06	2
85	MI	Q16	T1-07	J09-19	CH08	2
86	MDIS*	S6, W2-2	T2-01	J09-17	CH07	2
87	PCLK	R9	T2-18	J04-09	CH39	1
88	PST3	T16	T2-23	J04-11	CH40	1
89	PST2	R14	T1-15	J04-13	CH41	1
90	PST1	S14	T1-19	J04-15	CH42	1
91	PST0	T15	T1-03	J04-17	CH43	1
92	R/W*	N16	T2-11	J03-19	CH32	1
93	RST1*	S7	T2-24	J04-19	CH44	1
94	RST0*	R3	T3-22	J04-21	CH45	1
95	SC1	S12	T1-23	J09-21	CH09	2
96	SC0	T12	T1-06	J09-23	CH10	2
97	TA*	T14	T1-17	J10-21	CH21	2
98	TA*	T14	T1-17	P04-03	CH92	1 & 2
99	TBI*	S11	T2-04	J09-07	CH02	2
100	TCI*	T10	T2-14	J09-09	CH03	2

Table 5-1 (Cont'd.)

	A	B	C	D	E	F
101	SIGNAL	PGA PIN	CONN.	PROBE	CHANNEL#	DATA BD#
102						
103	TEA*	S13	T1-21	J09-11	CH04	2
104	TIP*	R15	T1-11	J07-25	CH83	1
105	TLN1	P18	T2-47	J08-03	CH84	1
106	TLN0	Q18	T1-10	J08-05	CH85	1
107	TM2	K17	T2-07	J08-07	CH86	1
108	TM1	M18	T2-09	J08-09	CH87	1
109	TM0	N18	T1-22	J08-11	CH88	1
110	SIZ1	P16	T2-13	J04-05	CH37	1
111	SIZ0	P17	T1-14	J04-07	CH38	1
112	TS*	R16	T1-09	J10-23	CH22	2
113	TS*	R16	T1-09	P04-04	CH93	1 & 2
114	TT1	P2	T3-13	J04-23	CH46	1
115	TT0	P3	T3-18	J04-25	CH47	1
116	TCK	S4	T2-06	J09-25	CH11	2
117	TDI	S3	T3-24	J10-03	CH12	2
118	TDO	T2	T3-06	J10-05	CH13	2
119	TMS	S5	T3-14	J10-07	CH14	2
120	TRST*	T3	T3-08	J10-09	CH15	2
121	UPA1	Q1	T3-09	J10-11	CH16	2
122	UPA0	Q3	T3-20	J10-13	CH17	2
123	MstrClk	(From Sync.	Adaptor	Board)	CH94	1 & 2
124	VCC(PLL)	S8	T2-22	J10-15	CH18	2
125	GND(PLL)	S9	T2-15	P4-07		
126	GND(PLL)	R6	T1-31	P4-08		
127	GND(PLL)	R10	T2-19	P4-23		
128	GND(IN)	C6	T2-50	P4-24		
129	GND(IN)	T4	W1-3	P4-25		
130	GND(OUT)	B2	T2-48	P4-26		
131	GND(OUT)	B17	T3-46			
132	GND(OUT)	D2	T3-50			
133	GND(OUT)	D17	T3-48			
134	GND(OUT)	F17	T3-49			
135	GND(OUT)	H2	T3-47			
136	GND(OUT)	L2	T3-45			
137	GND(OUT)	L17	T2-49			
138	GND(OUT)	N17	T2-12			
139	GND(OUT)	Q2	T1-01			
140	GND(OUT)	Q17	T2-45			
141	GND(OUT)	S2	T3-01			
142	GND(OUT)	S15	T1-18			
143	GND(OUT)	S17	T1-08			
144	GND	W1-3	W2-3			
145	GND	W2-3	T1-02			

Table 5-2. SYNC ADAPTER BOARD WIRING CONNECTIONS

	A	B	C	D	E	F	G	H	I
1	Signals	P4 Scr. bd.	Hybird-in	Hybird-out	P2-Adaptor-in	P2-Adaptor-out	J4/J5/J6/J7	LA-CHNL	Power/Clock
2									
3	BCLK	1	U10-2	U10-28/BCLK	22	21	14	90	
4				U10-29/BCLK*	24	23	13		
5	DLE	2	U10-4	U10-26/DLE	18	17	12	91	
6				U10-27/DLE*	20	19	11		
7	TA*	3	U10-6	U10-24/TA*	14	13	10	92	
8				U10-25/TA	16	15	9		
9	TS*	4	U10-8	U10-22/TS*	12	11	8	93	
10				U10-21/TS	10	9	7		
11	MCLK					7	6	94	
12	MCLK*					5	5		
13	Target GND	7 & 8		U10-10					
14	-5.2 V		U10-23		25 & 26		J4-16		P1-2
15	GND	23,24,25,26	U10-11		27 & 28		J4-15		P1-1
16	+5V				29 & 30				P1-3
17	100 MHz								J8-1
18									
19									
20									
21									

Chapter 6

SPECIAL OPERATING FEATURES

GENERAL

This chapter describes special operating features for the 68040 MAP Disassembler as related to unique characteristics of the 68040 microprocessor.

Some of the microprocessor characteristics are associated with the Addressing Scheme, Instruction Cycles, Branch Operations, and Status Conditions. These characteristics require special consideration by the user when encountered by the disassembler. Example screens are provided for Setup and Data Display windows.

CACHE AND MMU DISABLE JUMPERS

The Probe Adapter contains two jumper connections, W1and W2 (Figure 5-1) which are used to enable or disable the 68040 internal Cache Memory and MMU functions (see schematic diagram, Figure 6-13).

When one side of the jumper is grounded, the Cache or MMU function is disabled and disassembly information is available for Cache and MMU internal cycle operations.

NOTE:*The device under test should provide a pullup load to enable the Cache and MMU functions. The jumper must not be connected directly to Vcc.*

When the jumper is not connected to ground, the Cache or MMU function is enabled. Partial disassembly information is available for these operations, because only CPU external cycles are sampled. The jumpers are used as follows, to control Cache and MMU functions:

JUMPER	SIGNAL	NAME	FUNCTION
W1	CDIS*	Cache Disable	Disables the on-chip Caches to assist emulator support
W2	MDIS*	MMU Disable	Disables translation of Addresses by the MMU

DATA SCREEN INFORMATION

The data display window for the 68040 Disassembler presents column fields which contain data for Sample Number, Address, Object, Status, Label (if enabled), Mnemonic and Comments.

Data Read/Write and Program Read cycles are displayed as they are physically recorded. For example, if the 68040 reads a word (16 bits) that was aligned on an odd address, the disassembler displays two lines of 8 bits each, corresponding to the two memory cycles required by the 68040 to read the data.

The 68040 Disassembler assumes that the first program read in recorded data is the beginning of an instruction. It attempts to disassemble the data from that point. If the decoded instruction alignment is not correct, the user can choose the starting point of the disassembler by using the "Disassembler Options Menu" as described in Chapter 3.

The 68040 microprocessor uses an instruction to disable the cache. Also, if the cache is disabled, the 68040 MAP software sequentially disassembles each instruction executed by the processor. Otherwise, the instructions executed are not disassembled sequentially.

The 68040 uses a pre-fetch queue of 32 bytes. The disassembler does not decode program-read samples that are fetched but not executed.

When there is new data for the disassembler to decode, a spinning cursor is displayed while the disassembler is busy decoding the data for display.

68040 RECORDING CONSIDERATIONS

The following considerations are applicable for 68040 MAP recordings:

- The handling of pre-fetched, but not executed instructions may not be correct in all cases.

- Recording occurs only when the CPU is acting as the Bus Master.

Sample Number Field

The Sample Number Field of the disassembler display shows the number for the Sample data displayed on that line.

Status Field

The Status Field of the disassembler display contains various messages which are described in the Motorola MC68040 Microprocessor User's Manual. (See Tables 5-2 and 5-4.) Typical messages are as follows:

"AltFn Code0",	"AltFn Code3",	"AltFn Code4",	AltFn Code7",
"MI6"	"Int Ack Level",	"Breakpnt Ack",	

Address Field

The Address Field of the disassembler display is a calculated value, versus a direct display of recorded addresses. The value may not always be the same as the recorded address for the Instruction or Data involved.

An example of when this will occur is when the 68040 executes two consecutive single-word instructions. If the 68040 is operating in 32-bit mode, both instructions will be read at the same address. Instead of displaying two consecutive instructions with the same address, the disassembler adds an offset of 2 to the second instruction for display purposes.

Addressing Mode

When instructions with relative addressing modes are encountered by the disassembler, the relative value is adjusted to be relative to the beginning of the instruction. If the relative address is a direct value, the absolute destination value is displayed in Angle Brackets (< >) next to the relative value.

Branch Instructions

The disassembler attempts to determine if conditional branch instructions execute the branch or fall through by examining the recorded data for a break in the sequential addressing that would indicate a jump was taken. If the new address matches that of the instruction target, the branch was assumed to have been taken, and intervening instructions are not decoded.

When a conditional branch target is exactly the length of the 68040 instruction pipeline, this algorithm is unsuccessful, and assumes that the intervening instructions were executed regardless of the actual results of the branch instruction.

Unconditional calls and jumps are verified in the same manner as unconditional branches, except that intervening instructions are *Never* decoded. If an unconditional branch target does not match the new recorded address , the branch instruction is marked with a Question Mark (?).

Comment Field

The following comments are presented in the Comment Field of the disassembler display. These comments occur whenever the Address matches the Vector Base Register plus the Offset. The Offset value is calculated as described in the Motorola MC68040 Microprocessor User's manual. (See Table 9-1).

"@@ Unexecuted", indicates this Instruction is assumed to be unexecuted.
"@@ Guess Not Taken", indicates this branch is assumed as not taken.
"@@ Reset Vector", indicates Exception Vector was reset to 0.
"@@ User Trap", indicates the Address of this instruction belongs to trap handler routines.

Additional comments, as follows, may be present:

"Reset SP", "Reset PC", "Access Fault", "Address Error",
"Illegal Instruction", "Divide by Zero", "CHK, CHK2 Instruction", "FTRAPcc, TRAPV Instr",
"Privilege Violation", "Trace", "Unimplemented A-Line Opcode", "Unimplemented F-Line Opcode",
"Format Error", "Uninitialized Interrupt",

"Spurious Interrupt", "Level 1 Int Auto Vector", "Level 2 Int Auto Vector",
"Level 3 Int Auto Vector", "Level 4 Int Auto Vector", "Level 5 Int Auto Vector",
"Level 6 Int Auto Vector", "Level 7 Int Auto Vector",

"Trap #0", "Trap #1", "Trap #2", "Trap #3", "Trap #4", "Trap #5",
"Trap #6", "Trap #7", "Trap #8", "Trap #9", "Trap #10", "Trap #11",
"Trap #12", "Trap #13", "Trap #14", "Trap #15",

"FP branch or Set or Unordered Cond", "FP Inexact Result", "FP Divide by Zero",
"FP Underflow", "FP Operand Error", "FP Signaling NAN",
"FP Unimplemented Data",

CYCLE STATUS MESSAGES

Cycle Status messages displayed for Data Read/Write cycles and Program Read/Write cycles are as follows:

STATUS MESSAGE	STATUS	DESCRIPTION
N User DWr	000000xx	Normal user data Cache push write access
N User DRd	000001xx	Normal user data Cache push read access
N Sup DWr	001010xx	Normal supervisor data write access
N Sup DRd	001011xx	Normal supervisor data read access
N Sup PRd	001101xx	Normal supervisor code read access
N Sup PWr	001100xx	Normal supervisor code write access
N User PWr	000100xx	Normal user code write access
N User PRd	000101xx	Normal user code read access
Move 16	01xxxxxx	Move 16
Don't care	xxxxxxxx	Don't care

CLOCKING CONSIDERATIONS

The MstrClk signal at CH#94 is generated on the Sync Adaptor Board inside the MAP box. For more details, refer to Schematic Diagram (Figure 6-11). The Master Clk is created by ANDing the MstrClk signal at CH#94 and the BClk ~ signal together. See Channel Set up Display Window, Figure 6-2.

DISASSEMBLER CONFIGURATION

The Trap Register (TBR) in MC68040 is a 32-bit value that contains the upper 20 bits of all Exception Vector Addresses. The 68040 MAP Disassembler allows the user to specify the value that is currently being used by the MC68040 microprocessor to allow accurate tagging of Exception Execution.

To change from the Default Exception Vector of 0, click the mouse on the Disassembler Configuration Menu entry under the Options Menu while a disassembler window is active. The Disassembler Configuration Dialog Box (Figure 6-1) is displayed. Enter the most significant 20 bits of the desired Exception Vector. Note that the lower 12 bits are always zero, as indicated by the three zero digits located to the right of the 5-digit numerical entry field. The Exception Vector is entered in Hexadecimal notation.

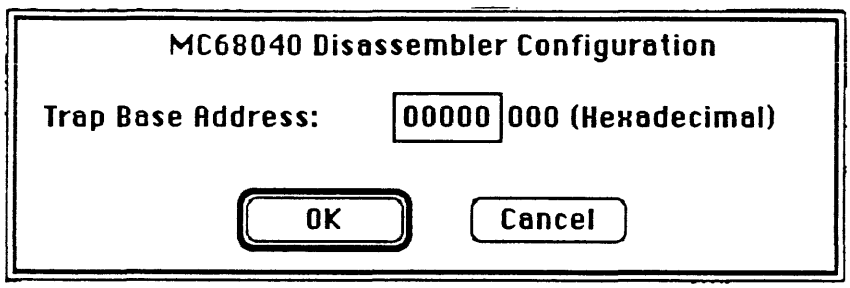
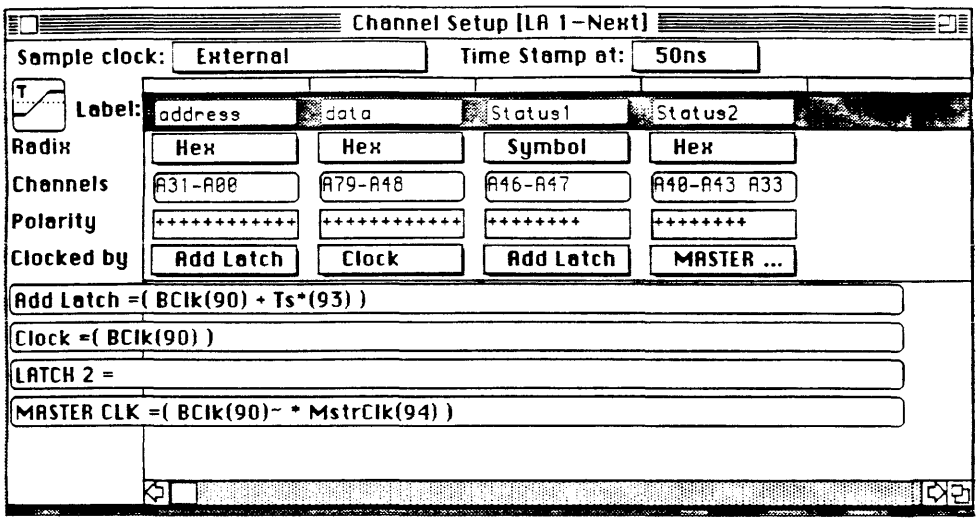


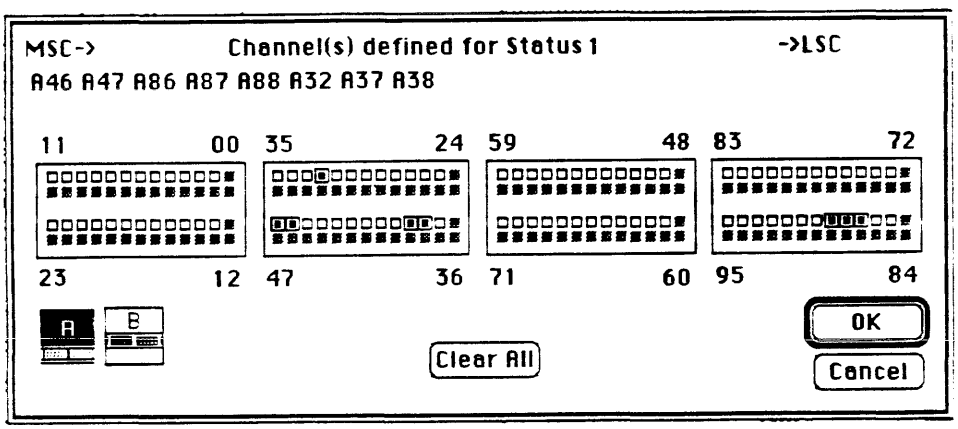
Figure 6-1. 68040 Disassembler Configuration Dialog Box

EXAMPLE SETUP DISPLAY WINDOWS

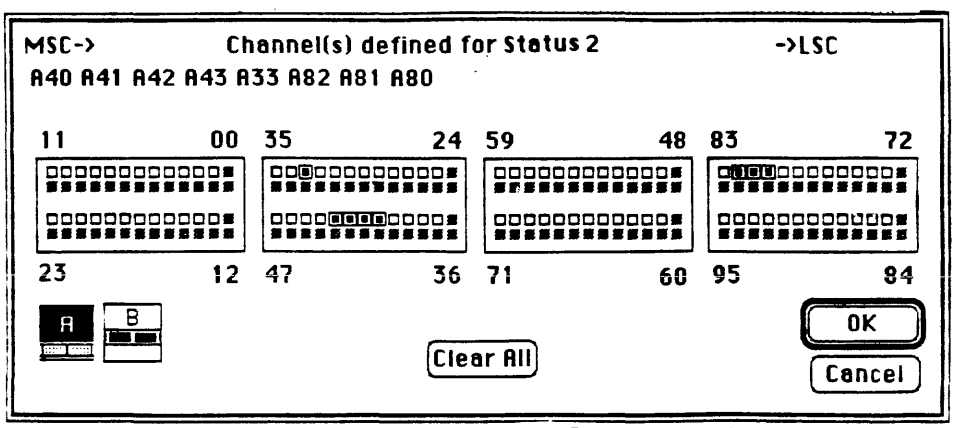
Example displays for Channel Setup, Clock Setup, and Trace Setup are presented below.



View A. Channel Selections



View B. Channel Assigned for Status 1 Label



View C. Channels Assigned for Status 2 Label

Figure 6-2. Channel Setup, Display Window

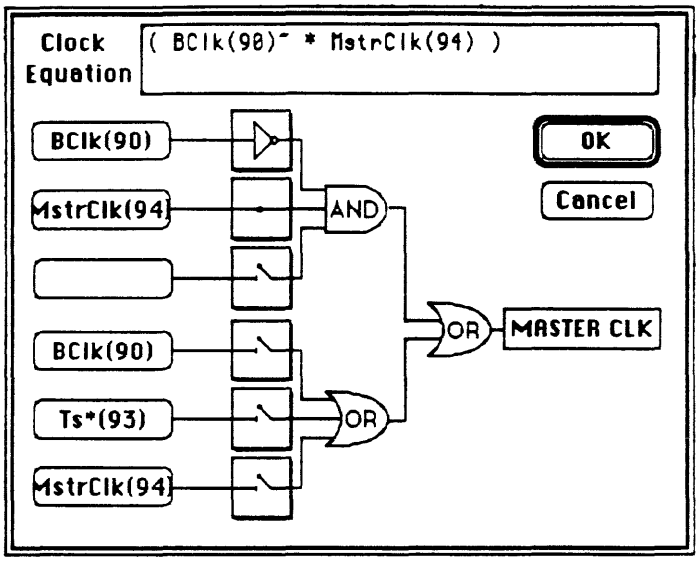


Figure 6-3. Clock Setup, Display Window

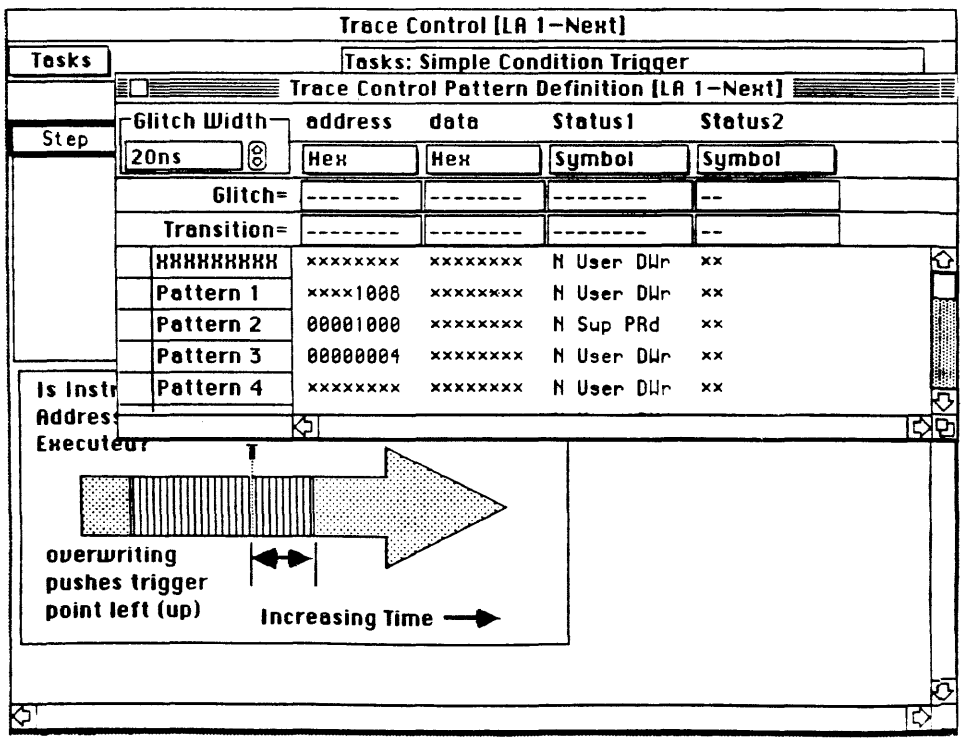


Figure 6-4. Trace Setup, Pattern Definition Display Window

EXAMPLE DATA DISPLAY WINDOWS

Example displays are presented for All Cycles, Delete Non-Executed Instructions, Delete Read/Write Data, and Executed Instructions Only.

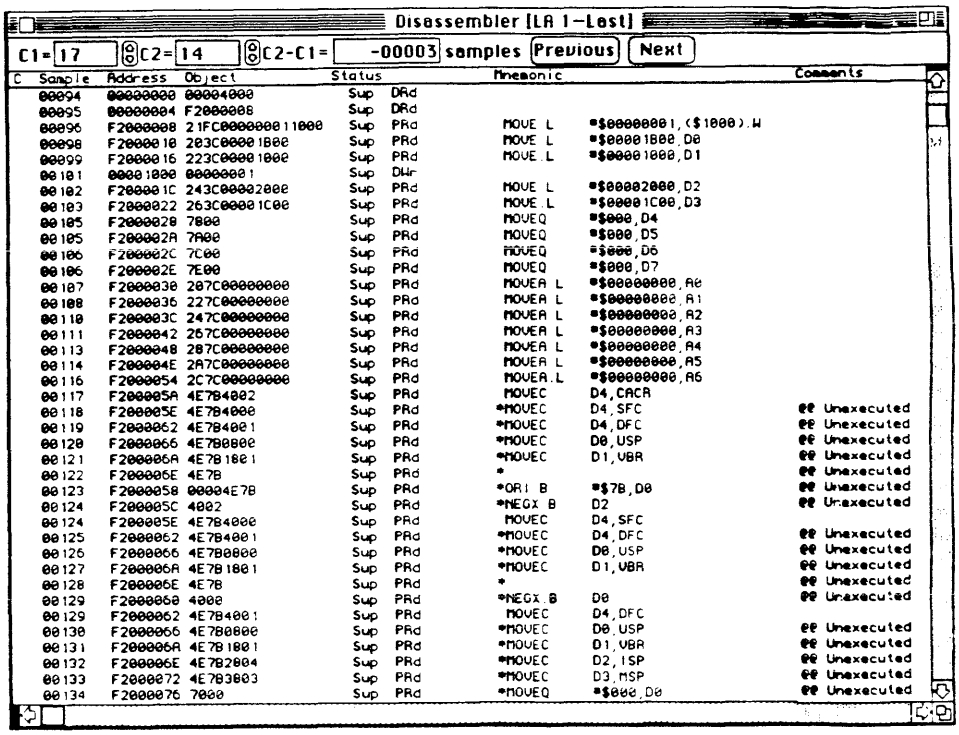


Figure 6-5. All Cycles, Display Window

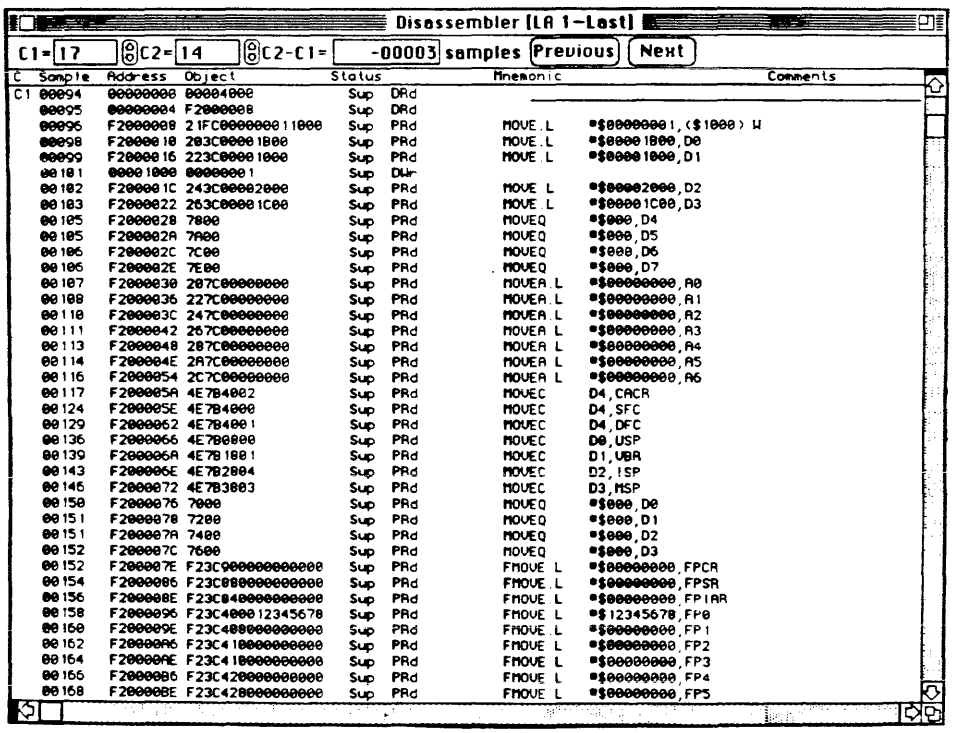
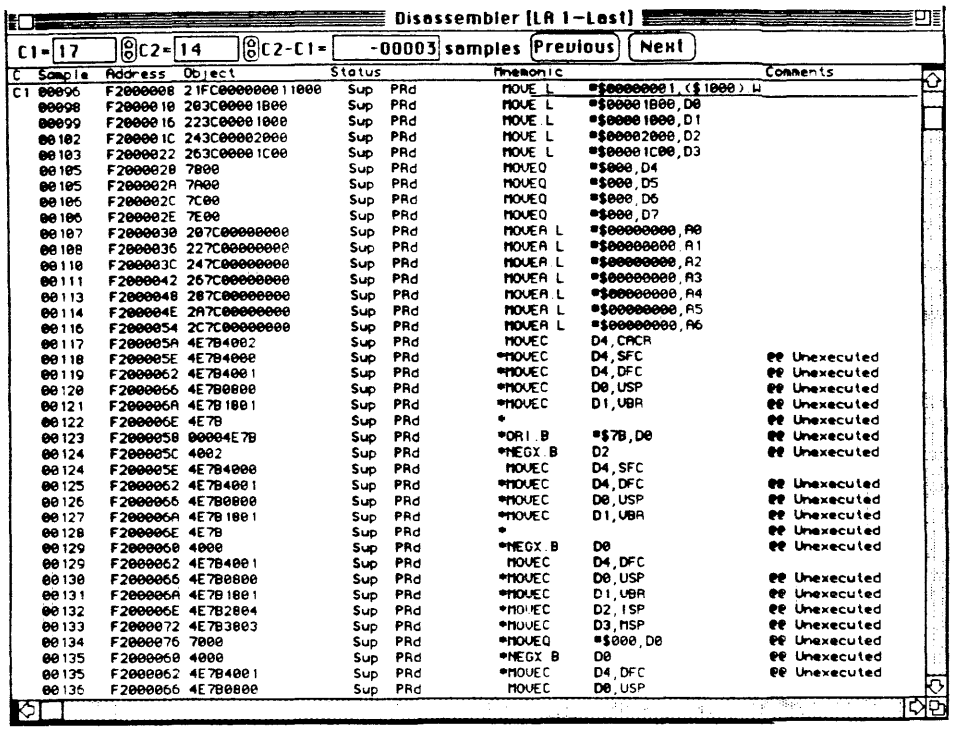
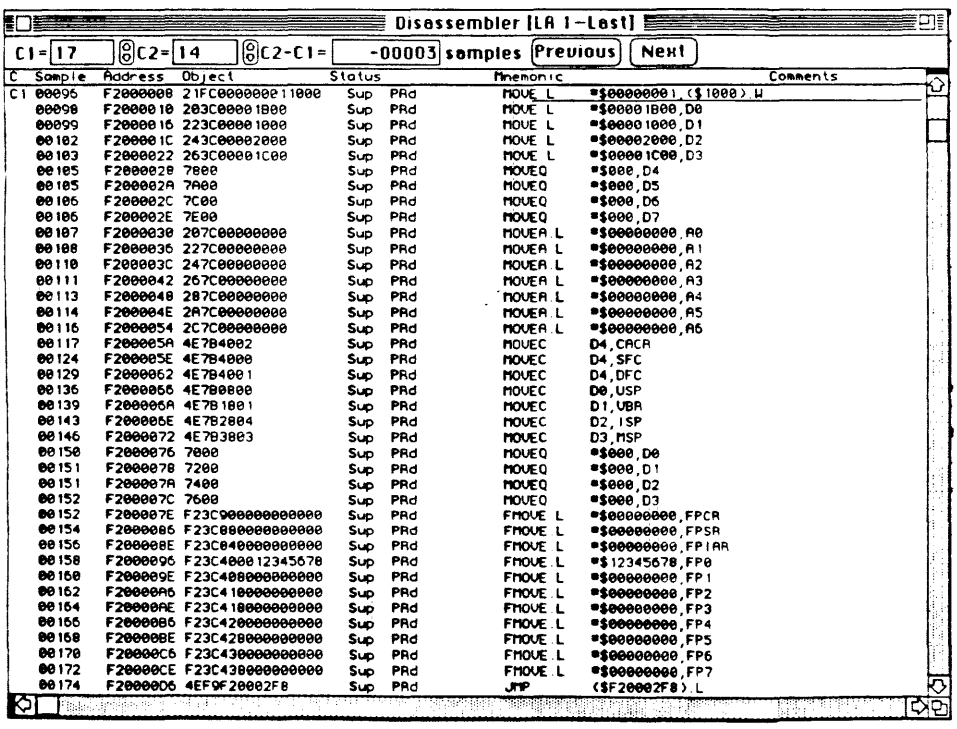


Figure 6-6. Delete Non-Executed Instructions, Display Window



C	Sample	Address	Object	Status		Mnemonic		Comments
C1	00096	F2000008	21FC00000001 1000	Sup	PRd	MOVE.L	#$00000001,($1000).W	
	00098	F2000010	203C00001B00	Sup	PRd	MOVE.L	#$00001B00,D0	
	00099	F2000016	223C00001000	Sup	PRd	MOVE.L	#$00001000,D1	
	00102	F200001C	243C00002000	Sup	PRd	MOVE.L	#$00002000,D2	
	00103	F2000022	263C00001C00	Sup	PRd	MOVE.L	#$00001C00,D3	
	00105	F2000028	7800	Sup	PRd	MOVEQ	#$000,D4	
	00105	F200002A	7A00	Sup	PRd	MOVEQ	#$000,D5	
	00106	F200002C	7C00	Sup	PRd	MOVEQ	#$000,D6	
	00106	F200002E	7E00	Sup	PRd	MOVEQ	#$000,D7	
	00107	F2000030	207C00000000	Sup	PRd	MOVEA.L	#$00000000,A0	
	00108	F2000036	227C00000000	Sup	PRd	MOVEA.L	#$00000000,A1	
	00110	F200003C	247C00000000	Sup	PRd	MOVEA.L	#$00000000,A2	
	00111	F2000042	267C00000000	Sup	PRd	MOVEA.L	#$00000000,A3	
	00113	F2000048	287C00000000	Sup	PRd	MOVEA.L	#$00000000,A4	
	00114	F200004E	2A7C00000000	Sup	PRd	MOVEA.L	#$00000000,A5	
	00116	F2000054	2C7C00000000	Sup	PRd	MOVEA.L	#$00000000,A6	
	00117	F200005A	4E7B4002	Sup	PRd	MOVEC	D4,CACR	
	00118	F200005E	4E7B4000	Sup	PRd	*MOVEC	D4,SFC	** Unexecuted
	00119	F2000062	4E7B4001	Sup	PRd	*MOVEC	D4,DFC	** Unexecuted
	00120	F2000066	4E7B0800	Sup	PRd	*MOVEC	D0,USP	** Unexecuted
	00121	F200006A	4E7B1801	Sup	PRd	*MOVEC	D1,VBR	** Unexecuted
	00122	F200006E	4E7B	Sup	PRd	*		** Unexecuted
	00123	F2000058	00004E7B	Sup	PRd	*ORI.B	#$7B,D0	** Unexecuted
	00124	F200005C	4002	Sup	PRd	*NEGX.B	D2	** Unexecuted
	00124	F200005E	4E7B4000	Sup	PRd	MOVEC	D4,SFC	
	00125	F2000062	4E7B4001	Sup	PRd	*MOVEC	D4,DFC	** Unexecuted
	00126	F2000066	4E7B0800	Sup	PRd	*MOVEC	D0,USP	** Unexecuted
	00127	F200006A	4E7B1801	Sup	PRd	*MOVEC	D1,VBR	** Unexecuted
	00128	F200006E	4E7B	Sup	PRd	*		** Unexecuted
	00129	F2000060	4000	Sup	PRd	*NEGX.B	D0	** Unexecuted
	00129	F2000062	4E7B4001	Sup	PRd	MOVEC	D4,DFC	
	00130	F2000066	4E7B0800	Sup	PRd	*MOVEC	D0,USP	** Unexecuted
	00131	F200006A	4E7B1801	Sup	PRd	*MOVEC	D1,VBR	** Unexecuted
	00132	F200006E	4E7B2804	Sup	PRd	*MOVEC	D2,ISP	** Unexecuted
	00133	F2000072	4E7B3803	Sup	PRd	*MOVEC	D3,MSP	** Unexecuted
	00134	F2000076	7000	Sup	PRd	*MOVEQ	#$000,D0	** Unexecuted
	00135	F2000060	4000	Sup	PRd	*NEGX.B	D0	** Unexecuted
	00135	F2000062	4E7B4001	Sup	PRd	*MOVEC	D4,DFC	** Unexecuted
	00136	F2000066	4E7B0800	Sup	PRd	MOVEC	D0,USP	

Figure 6-7. Delete Read/Write Data, Display Window



C	Sample	Address	Object	Status		Mnemonic		Comments
C1	00096	F2000008	21FC00000001 1000	Sup	PRd	MOVE.L	#$00000001,($1000).W	
	00098	F2000010	203C00001B00	Sup	PRd	MOVE.L	#$00001B00,D0	
	00099	F2000016	223C00001000	Sup	PRd	MOVE.L	#$00001000,D1	
	00102	F200001C	243C00002000	Sup	PRd	MOVE.L	#$00002000,D2	
	00103	F2000022	263C00001C00	Sup	PRd	MOVE.L	#$00001C00,D3	
	00105	F2000028	7800	Sup	PRd	MOVEQ	#$000,D4	
	00105	F200002A	7A00	Sup	PRd	MOVEQ	#$000,D5	
	00106	F200002C	7C00	Sup	PRd	MOVEQ	#$000,D6	
	00106	F200002E	7E00	Sup	PRd	MOVEQ	#$000,D7	
	00107	F2000030	207C00000000	Sup	PRd	MOVEA.L	#$00000000,A0	
	00108	F2000036	227C00000000	Sup	PRd	MOVEA.L	#$00000000,A1	
	00110	F200003C	247C00000000	Sup	PRd	MOVEA.L	#$00000000,A2	
	00111	F2000042	267C00000000	Sup	PRd	MOVEA.L	#$00000000,A3	
	00113	F2000048	287C00000000	Sup	PRd	MOVEA.L	#$00000000,A4	
	00114	F200004E	2A7C00000000	Sup	PRd	MOVEA.L	#$00000000,A5	
	00116	F2000054	2C7C00000000	Sup	PRd	MOVEA.L	#$00000000,A6	
	00117	F200005A	4E7B4002	Sup	PRd	MOVEC	D4,CACR	
	00124	F200005E	4E7B4000	Sup	PRd	MOVEC	D4,SFC	
	00129	F2000062	4E7B4001	Sup	PRd	MOVEC	D4,DFC	
	00136	F2000066	4E7B0800	Sup	PRd	MOVEC	D0,USP	
	00139	F200006A	4E7B1801	Sup	PRd	MOVEC	D1,VBR	
	00143	F200006E	4E7B2804	Sup	PRd	MOVEC	D2,ISP	
	00146	F2000072	4E7B3803	Sup	PRd	MOVEC	D3,MSP	
	00150	F2000076	7000	Sup	PRd	MOVEQ	#$000,D0	
	00151	F2000078	7200	Sup	PRd	MOVEQ	#$000,D1	
	00151	F200007A	7400	Sup	PRd	MOVEQ	#$000,D2	
	00152	F200007C	7600	Sup	PRd	MOVEQ	#$000,D3	
	00152	F200007E	F23C9000000000000	Sup	PRd	FMOVE.L	#$00000000,FPCR	
	00154	F2000086	F23C8800000000000	Sup	PRd	FMOVE.L	#$00000000,FPSR	
	00156	F200008E	F23C8400000000000	Sup	PRd	FMOVE.L	#$00000000,FPIAR	
	00158	F2000096	F23C4000123456 78	Sup	PRd	FMOVE.L	#$12345678,FP0	
	00160	F200009E	F23C4080000000000	Sup	PRd	FMOVE.L	#$00000000,FP1	
	00162	F20000A6	F23C4100000000000	Sup	PRd	FMOVE.L	#$00000000,FP2	
	00164	F20000AE	F23C4180000000000	Sup	PRd	FMOVE.L	#$00000000,FP3	
	00166	F20000B6	F23C4200000000000	Sup	PRd	FMOVE.L	#$00000000,FP4	
	00168	F20000BE	F23C4280000000000	Sup	PRd	FMOVE.L	#$00000000,FP5	
	00170	F20000C6	F23C4300000000000	Sup	PRd	FMOVE.L	#$00000000,FP6	
	00172	F20000CE	F23C4380000000000	Sup	PRd	FMOVE.L	#$00000000,FP7	
	00174	F20000D6	4EF9F20002F8	Sup	PRd	JMP	($F20002F8).L	

Figure 6-8. Executed Instructions Only, Display Window

REVISIONS							
ZONE	REV.	ECO#	DESCRIPTION	DRWN	CHKD	APVD	DATE
	50	6519	NEW RELEASE	H. SH	H. SH	H. SH	9/90

T1-26	A00	J01-03	
T1-30	A01	J01-05	
T2-05	A02	J01-07	
T1-34	A03	J01-09	
T2-37	A04	J01-11	
T1-38	A05	J01-13	
T2-39	A06	J01-15	
T1-42	A07	J01-17	
T1-44	A08	J01-19	
T2-33	A09	J01-21	
T3-11	A10	J01-23	
T3-16	A11	J01-25	
T3-15	A12	J02-03	
T3-17	A13	J02-05	
T3-19	A14	J02-07	
T3-23	A15	J02-09	
T3-21	A16	J02-11	
T3-27	A17	J02-13	
T3-31	A18	J02-15	
T3-25	A19	J02-17	
T3-29	A20	J02-19	
T3-35	A21	J02-21	
T3-33	A22	J02-23	
T3-36	A23	J02-25	
T3-37	A24	J03-03	
T3-34	A25	J03-05	
T3-39	A26	J03-07	
T3-43	A27	J03-09	
T3-32	A28	J03-11	
T3-41	A29	J03-13	
T3-30	A30	J03-15	
T3-44	A31	J03-17	

T3-28	D00	J05-03	
T3-26	D01	J05-05	
T3-40	D02	J05-07	
T3-42	D03	J05-09	
T2-42	D04	J05-11	
T3-38	D05	J05-13	
T3-10	D06	J05-15	
T2-28	D07	J05-17	
T2-32	D08	J05-19	
T2-26	D09	J05-21	
T2-30	D10	J05-23	
T2-36	D11	J05-25	
T2-34	D12	J06-03	
T2-40	D13	J06-05	
T1-31	D14	J06-07	
T1-29	D15	J06-09	
T2-38	D16	J06-11	
T1-35	D17	J06-13	
T2-44	D18	J06-15	
T1-33	D19	J06-17	
T1-39	D20	J06-19	
T1-27	D21	J06-21	
T1-43	D22	J06-23	
T1-37	D23	J06-25	
T2-27	D24	J07-03	
T1-41	D25	J07-05	
T2-25	D26	J07-07	
T1-05	D27	J07-09	
T2-31	D28	J07-11	
T2-35	D29	J07-13	
T2-41	D30	J07-15	
T2-29	D31	J07-17	

T2-10	AVEC*	J03-21	
T2-21	BB*	J03-23	
T1-25	BG*	J03-25	
T1-24	BR*	J04-03	
T2-02	CDIS*	J09-03	
T3-05	CIOUT*	J09-05	
T1-16	IPEND*	J08-13	
T2-20	IPL0*	J07-19	
T1-28	IPL1*	J07-21	
T2-08	IPL2*	J07-23	
T2-17	LOCK*	J09-13	
T2-43	LOCKE*	J09-15	
T1-07	MI	J09-19	
T2-01	MDIS	J09-17	
T2-18	PCLK	J04-09	
T2-23	PST3	J04-11	
T1-15	PST2	J04-13	
T1-19	PST1	J04-15	
T1-03	PST0	J04-17	
T2-11	R/W*	J03-19	
T2-24	RST1*	J04-19	
T3-22	RST0*	J04-21	

T1-23	SC1	J09-21	
T1-06	SC0	J09-23	
T2-04	TBI*	J09-07	
T2-14	TCI*	J09-09	
T1-21	TEA*	J09-11	
T1-11	TIP*	J07-25	
T2-47	TLN1	J08-03	
T1-10	TLN0	J08-05	
T2-07	TM2	J08-07	
T2-09	TM1	J08-09	
T1-22	TM0	J08-11	
T2-13	SIZ1	J04-05	
T1-14	SIZ0	J04-07	
T3-13	TT1	J04-23	
T3-18	TT0	J04-25	
T2-26	TCK	J09-25	
T3-24	TDI	J10-03	
T3-06	TDO	J10-05	
T3-14	TMS	J10-07	
T3-08	TRST*	J10-09	
T3-09	UPA1	J10-11	
T3-20	UPA0	J10-13	
T2-22	VCC	J10-15	

T1-12	BCLK	CH90	J10-17
			P04-01
T2-16	DLE	CH91	J10-19
			P04-02
T1-17	TA*	CH92	J10-21
			P04-03
T1-09	TS*	CH93	J10-23
			P04-04

MASTER CLOCK IS GENERATED IN ADAPTER BD. THROUGH CH94.

SIGNALS: BCLK, DLE, PCLK, R/W*, TA*, TS*
NEED TO HAVE PARALLEL GND LINES.

P04-07
P04-08
P04-23
P04-24
P04-25
P04-26

CONN. J01-J10: ALL EVEN PINS ARE CONNECTED TO GND.

T2-15
T1-13
T2-19
T2-50
T2-48
T3-46
T3-50
T3-48
T3-49
T3-47
T3-45
T2-49

T1-01
T2-45
T3-01
T1-18
T1-08
T1-02

GND

Figure 6-9.
68040 MAP Scrambler Board
Schematic Diagram
Page 6-9

BIOMATION

TITLE		
68040 SCRAMBLER BOARD SCHEMATIC		
MODEL	PART NUMBER	REV
CLAS 4000	0192-0506	50
	SHEET 1 OF 1	

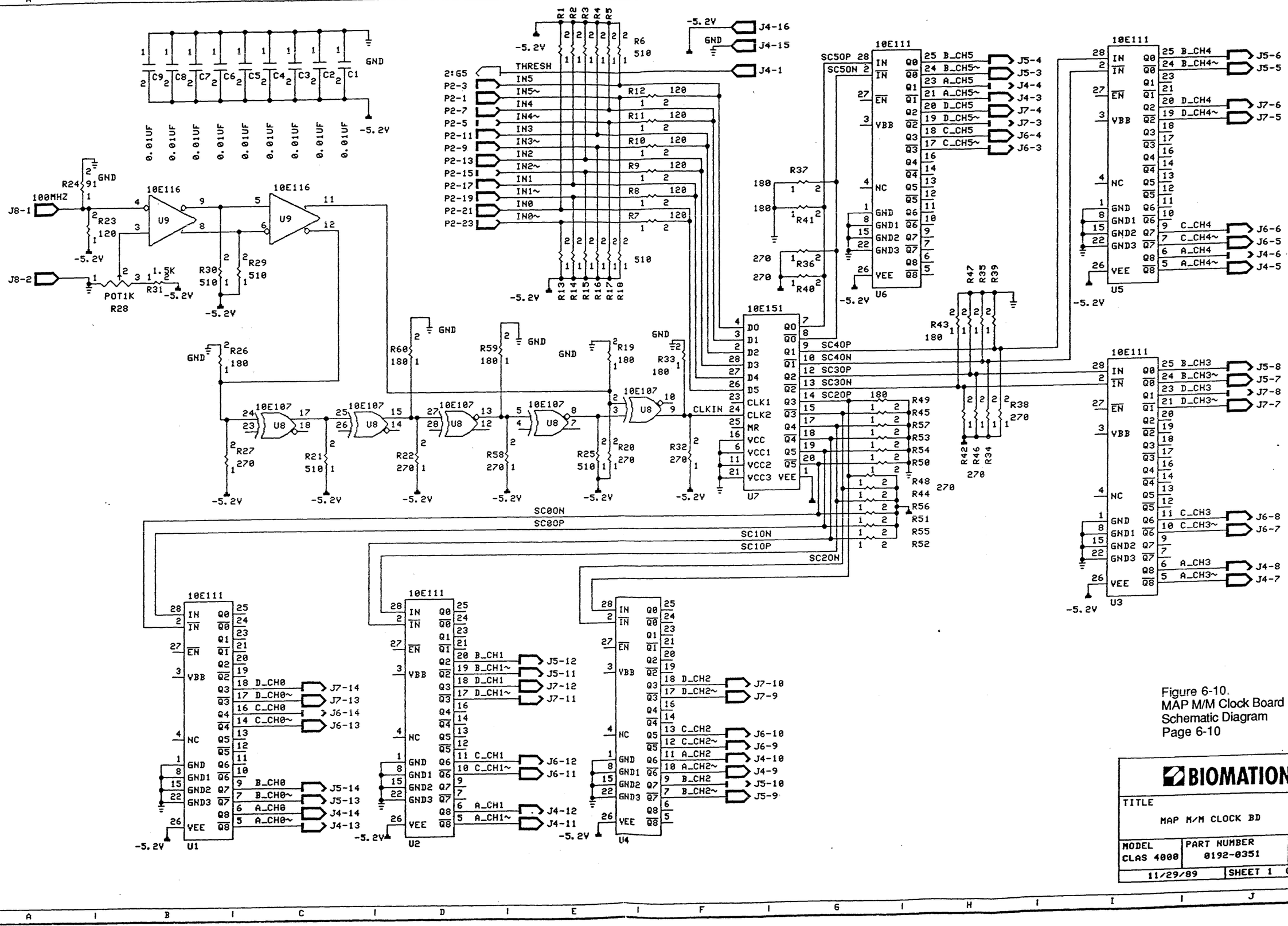
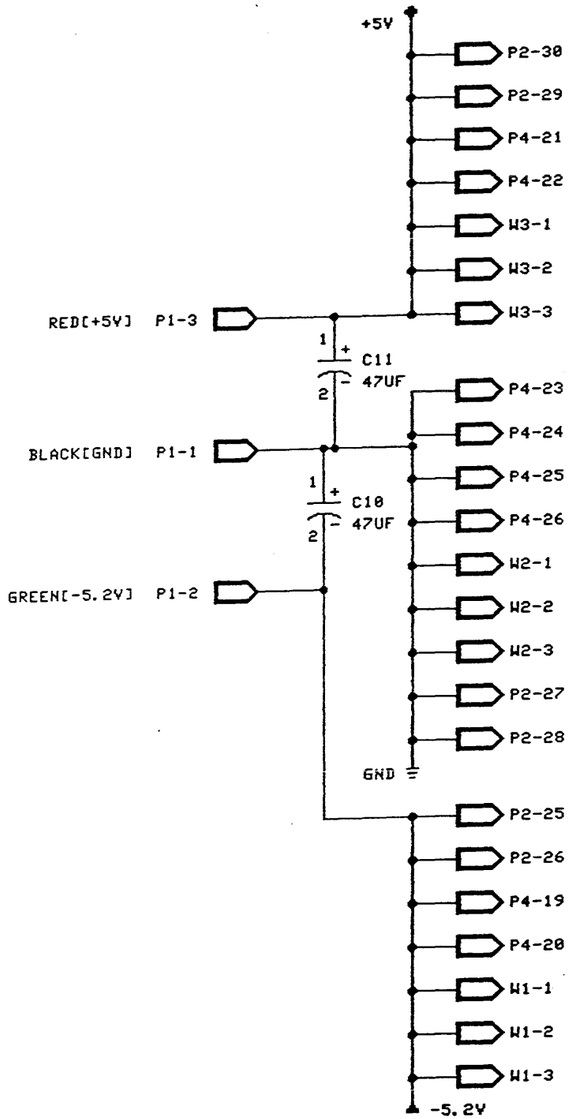
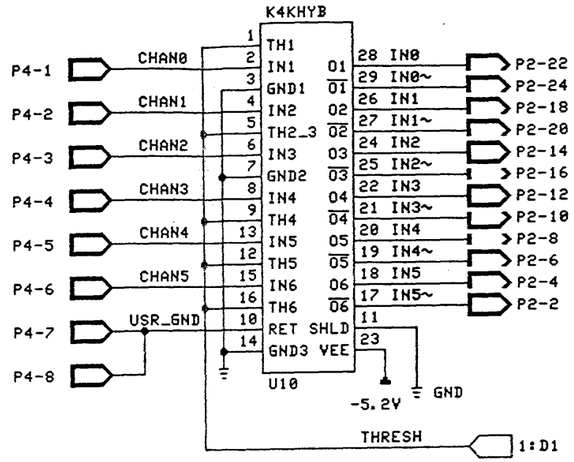


Figure 6-10.
MAP M/M Clock Board
Schematic Diagram
Page 6-10

BIOMATION		
TITLE: MAP M/M CLOCK BD		
MODEL: CLAS 4000	PART NUMBER: 0192-0351	REV: 50
11/29/89	SHEET 1 OF 2	





MAP M/M Clock Board
Schematic Diagram
Page 6-11

BIOMATION		
MODEL CLAS 4000	DWG. NO. 0192-0351-10	REV 50
	SHEET 2 OF 2	

REVISIONS							
ZONE	REV.	ECO#	DESCRIPTION	DRWN	CHKD	APVD	DAT
	50	6519	NEW RELEASE	H. SH	H. SH	H. SH	9/9

P2-24 BCLK* P2-23
P2-22 BCLK P2-21
P2-20 DLE* P2-19
P2-18 DLE P2-17
P2-14 TA
P2-16 TA*
P2-13
P2-15
P2-12 TS P2-11
P2-10 TS* P2-09
P2-26
P2-25
P2-28
P2-27
GND
-5.2V
-2V
MCLK P2-07
CH94
MCLK* P2-05

U1 10H131 (S2, D2, R2, CE2, (CLK); Q2, Q2)
U2 10H104
U3 10H103
R1 100
R2 100
R3 100
R4 51
R5 100
R6 51
R7 51
R8 51
R9 51
R10 51
R11 51
R13 51
R14 51
R_SPR1 51
R_SPR2 100
D1 D2 D3 D4 1N4001
C1 47UF
C2 .01
C3 .01
C4 47UF
C5 .01

** NEED TO BE 6" LONG.

10H104 SPARE1 (A1, A2, B1, B2, C1, C2, D1, D2; Aout, Bout, Cout, Dout)

VDS2110 SPARE2 (IN, OUT, GND1, GND2, GND3, GND4)

Figure 6-11.
68040 MAP Sync Adapter Board
Schematic Diagram
Page 6-12

BIOMATION

TITLE		
MC68040 SYNC ADAPTOR BOARD		
MODEL CLAS 4000	PART NUMBER 0192-0621	REV 50
	SHEET 1 OF 1	

REVISIONS							
ZONE	REV.	ECO#	DESCRIPTION	DRWN	CHKD	APVD	DATE
	50	6519	NEW RELEASE	H. SH	H. SH	H. SH	9/90

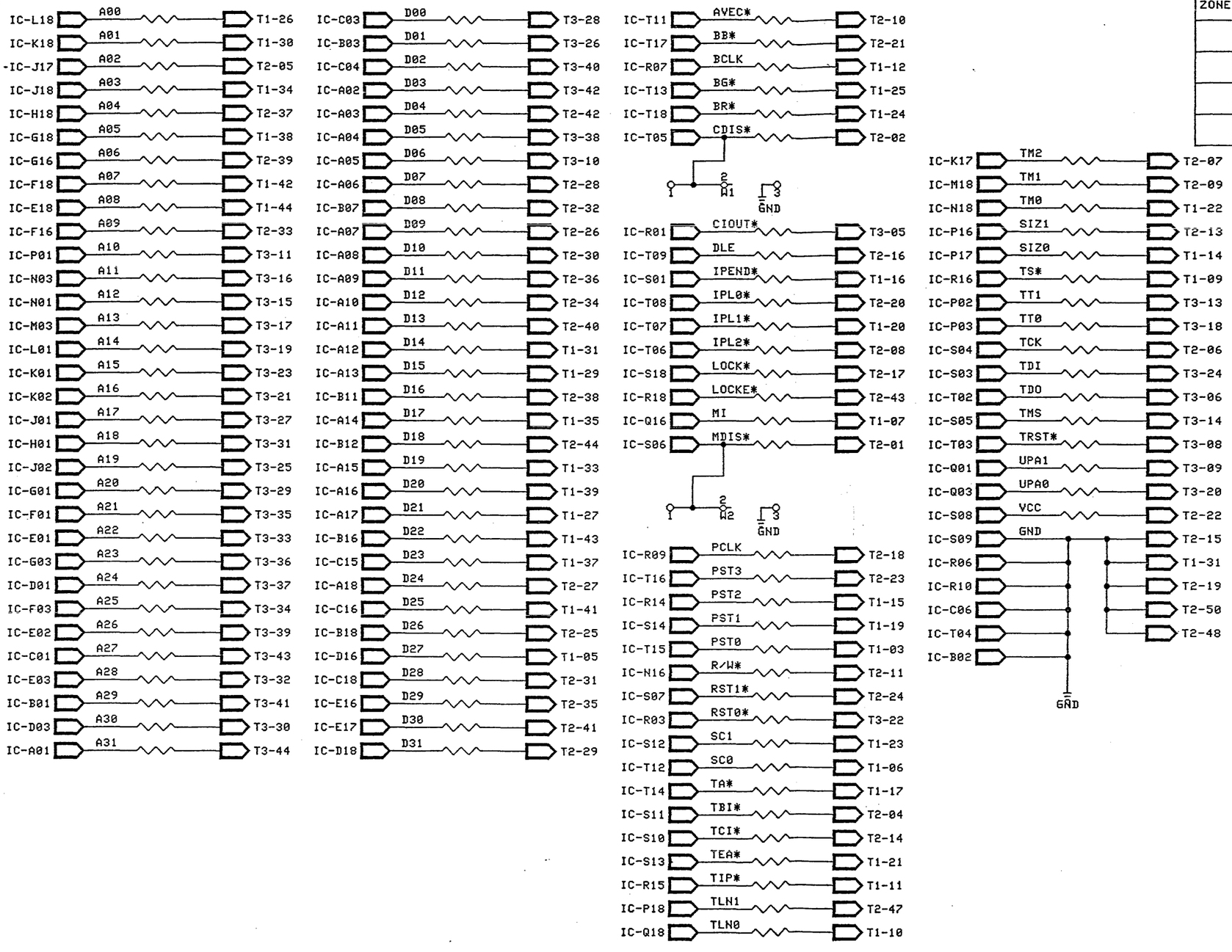


Figure 6-12.
68040 MAP Probe Board
Schematic Diagram
Page 6-13

BIOMATION

TITLE		
MC68040 PROBE BOARD SCHEMATIC		
MODEL	PART NUMBER	REV
CALS 4000	0192-0460	50
	SHEET 1 OF 1	

Warranty/Registration

BIOMATION

BIOMATION CORPORATION
19050 Pruneridge Avenue, Cupertino, CA 95014
Phone (800) 538-9320; FAX (408) 988-1647

Please return this card to BIOMATION within five days.

Did the packaging of this equipment exhibit any outward signs of physical damage? ..... YES ☐ ☐ NO

Did this equipment arrive intact, without missing parts, loose parts or cable damage? ..... YES ☐ ☐ NO

Did the equipment operate on power-up? ..... YES ☐ ☐ NO

Did you attain adequate system performance? ..... YES ☐ ☐ NO

Were any electrical adjustments required? ..... YES ☐ ☐ NO

If you required assistance, was a local BIOMATION representative contacted? ..... YES ☐ ☐ NO

Comments _____

User Name _____ Title _____ Department _____ M/S _____

Company _____ Phone _____

Address _____ City _____ State _____ Zip _____

Model or Description _____ Serial or Part No. _____ Date Received _____

Reader Comments

BIOMATION

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Phone (800) 538-9321; FAX (408) 988-1647

The manual's completeness, accuracy, organization, usability, and reliability: _____

_____

_____

Did you find errors in this manual? _____ How can this manual be improved? _____

_____

_____

_____

Additional comments: _____

_____

_____

Name _____ Department _____ Date _____

Company _____ Manual or Part No. _____

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