ADVANTEST®
ADVANTEST CORPORATION

INSTRUCTION MANUAL

R47252A

PERSONALITY KIT

MANUAL NUMBER OEA00 9006

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Printed in Japan

PREFACE

Note the following description in this manual.

Device	:	Means the R47252A personality kit.
Main unit	:	Means logic analyzer TR4726 (on which the R47252A is installed).
SUT	:	Abbreviation of System Under Test.
68000/68010	:	Motorola's microprocessor µP is an abbreviation of microprocessor.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

1. OVERVIEW

1.1 Outline

The R47252A personality kit for 68000/68010 is plugged in the TR4726 logic analyzer (opt06: Synchronous analysis module is also used) to analyze the state. The following three types of analyzers can be used by combination of the kit and timing analysis module (option).

(1) Timing Only Analyzer

(2) State Analyzer

(3) S & T (state and timing) Analyzer

This manual mainly explains how to operate the state analyzer. For the detail of the TR4726, refer to the TR4726 Logic Analyzer Operation Manual.

1.2 Outline of Product

The R47252A features as follows.

(1) Emulates the queue in the CPU of 68000/68010 by hardware. So, it analyzes easily the execution requiring complicated prefetch.

(2) Uses 68000/68010 mnemonic in addition to values to analyze fetched data, so the rate of state analysis can be improved.

(3) Fetches data by dedicated hardware, and enables the high level analysis by relatively-small probe.

(4) Defines the symbol and code by setting the test condition or analyzing test data. So, the rate of state analysis can be improved.

(5) Supports complicated application owing to several trace window conditions or memory resolution (store function) by setting the trace condition.

(6) Realizes advanced user interface such as disk control regardless of the menu method and disk. This function serves for the energy-saving, standardized, and automatic tests.

(7) The system disk attached to the R47252A offers most of system software. So, the functions and features of the R47252A can be improved when the system disk is revised.

1.3 Requirements Before Using the R47252A

1.3.1 Checking External View and Accessories

On receiving the R47252A, inspect the external view and check whether any cracks or damage has occured during transportation.
Then, check the standard accessories according to Table 1-1 and verify each quantity and specification.
If any cracks or damage is found or if some accessories are missing, contact the sales division or agency nearest your place of business. Address and telephone numbers are listed at the end of this manual.

Table 1 - 1 Standard Accessary List

Item	Model name	Quantity
Personality board		2
Microprocessor probe	TR14725-20	1
64-pin DIP clip cable	A04725-21	1
64-pin DIP plug cable	A04725-22	1
Probe test adapter		1
System software package	P47252-026FJ	1
Blank disk	MF-2DD	1
Disk case		1
Operation manual		1

The blank disk can be purchased separately.
Model name : A09502 (a set of 10 disks)

MEMO

2. PREPARATION FOR TEST AND PREVIOUS KNOWLEDGE

2.1 Outline

When using the R47252A for the first time, be sure to read this chapter. The chapter explains the preparation work for test and the previous knowledge required to operate the R47252A. It is recommended that you should do the above work and operate the R47252A actually according to the chapter.

2.2 Installing the Personality Board

Procedure

① Check that the R47252A is powered off.

② Remove the machine screw (3mm, +) from the upper cover of R47252A, and remove the cover.

③ When the other personality board is installed, remove the board. Marks 1 and 2 are stuck on the slots of the personality board (see Figure 2-1).

④ Insert the personality board whose card ejector is marked by 1 into slot 1.

⑤ Insert the personality board whose card ejector is marked by 2 into slot 2. Connect the 50-pin flat cable to the connector in the center of the board.

⑥ Install the upper cover using machine screw as before.

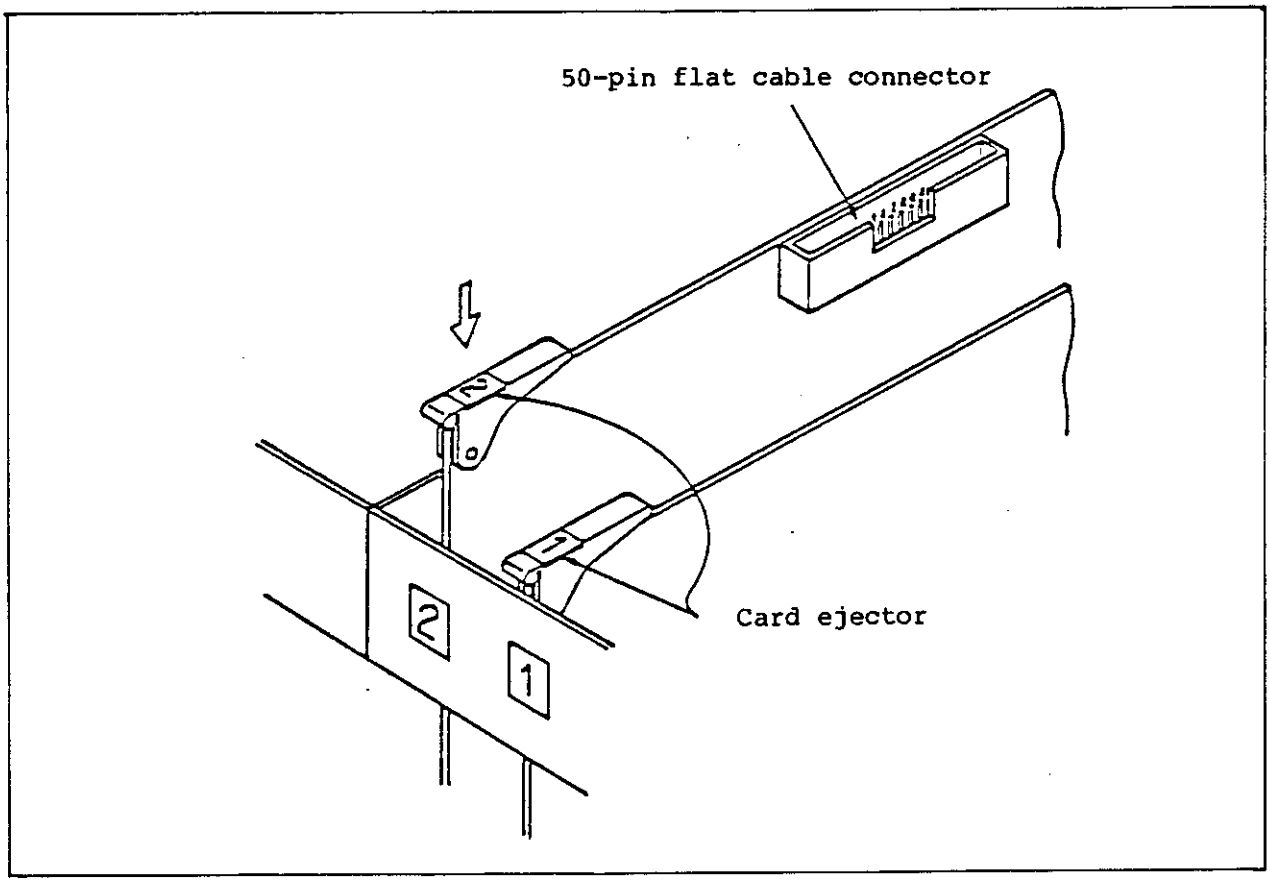


Figure 2 - 1 Mounting the Personality Board

2.3 Connecting the SUT to the Probe

The following explains how to connect the R47252A to the SUT that uses 68000/68010.

2.3.1 Connecting the Microprocessor Probe

The R47252A has the microprocessor probe (TR14725-20) to connect the system under test (SUT) that uses microprocessor 68000 or 68010. This section explains how to connect the probe. Figure 2-2 shows the shape and partial names of the microprocessor probe.

(1) Connecting the Microprocessor Probe to the R47252A

As shown below, the microprocessor probe (TR14725-20) has three probe connectors B, C, and D. Connect these connectors to probe slots B, C, and D on the rear of the R47252A. These connectors are locked by screw.

NOTE

Be sure to power off the R47252A before connecting the microprocessor probe.

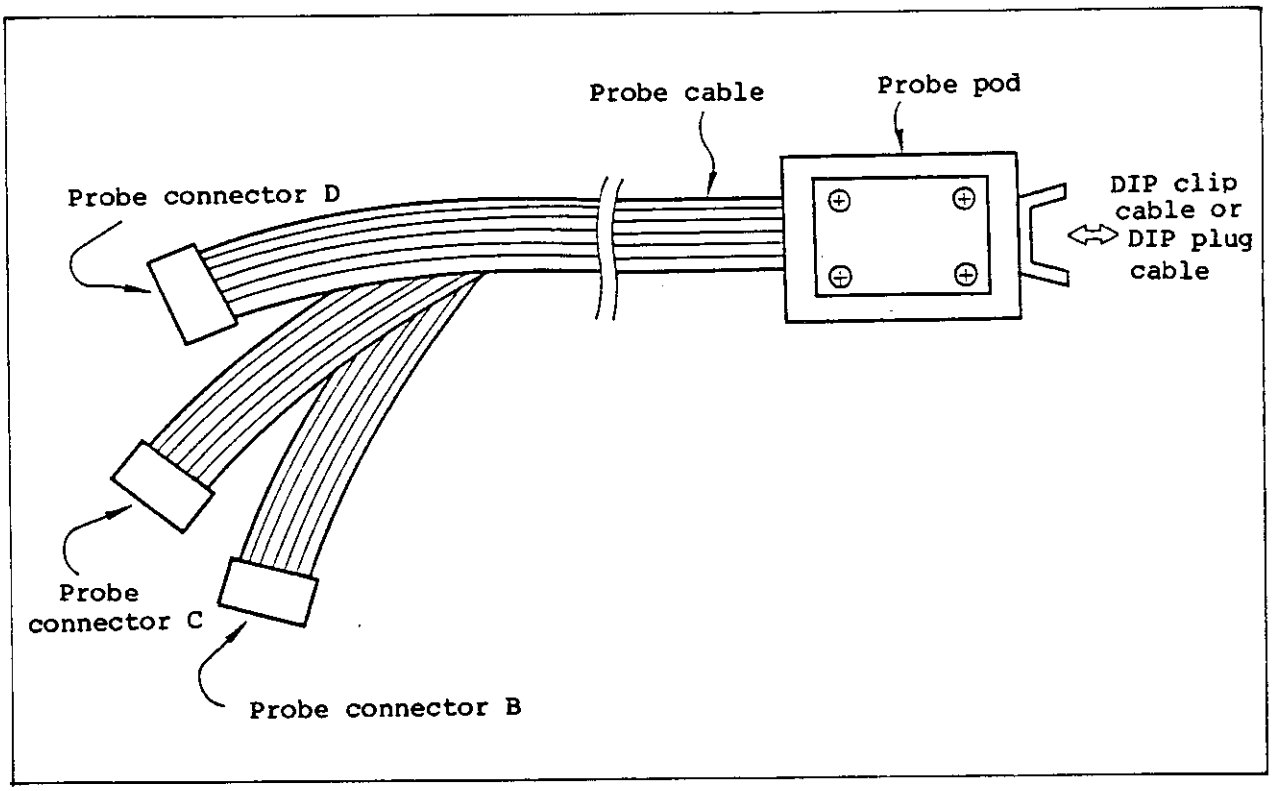


Figure 2 - 2 Shape and Partial Names of Microprocessor Probe

(2) Connecting the Microprocessor probe to the SUT

Connect the SUT to the microprocessor probe through the 68000 or 68010 microprocessor. The following two methods of connecting can be used. The one uses the DIP clip cable (see Figure 2-3). The other uses the DIP plug cable (see Figure 2-4).

Note: When the microprocessor uses the socket, both methods are enabled. When the microprocessor is soldered, only the DIP clip cable can be used. In both cases, connect pin 1 carefully.

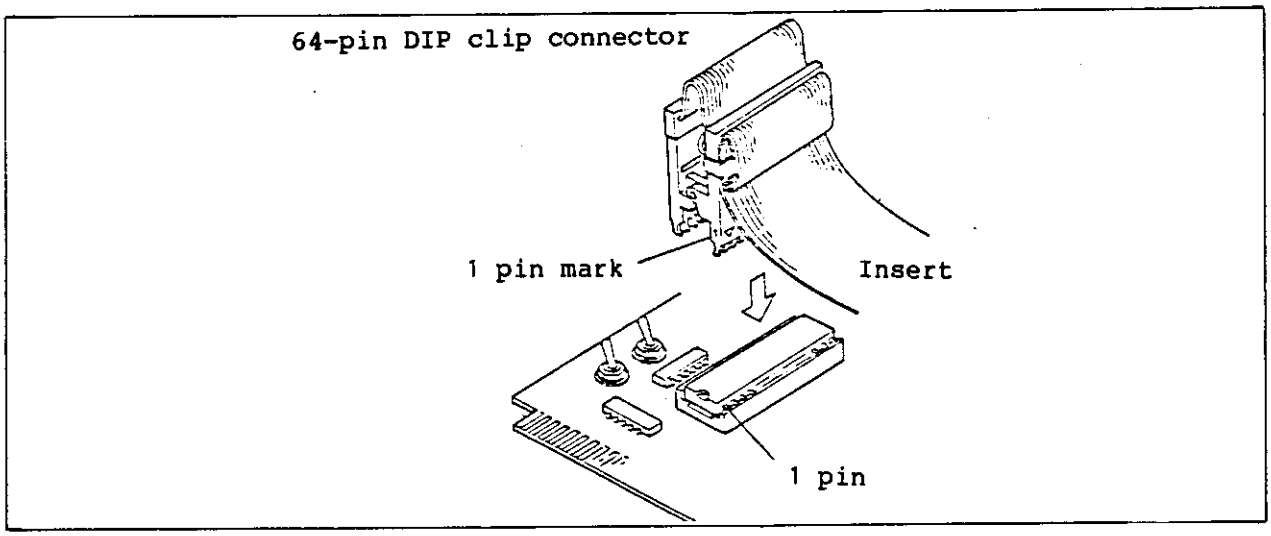


Figure 2 - 3 Using the DIP Clip Cable

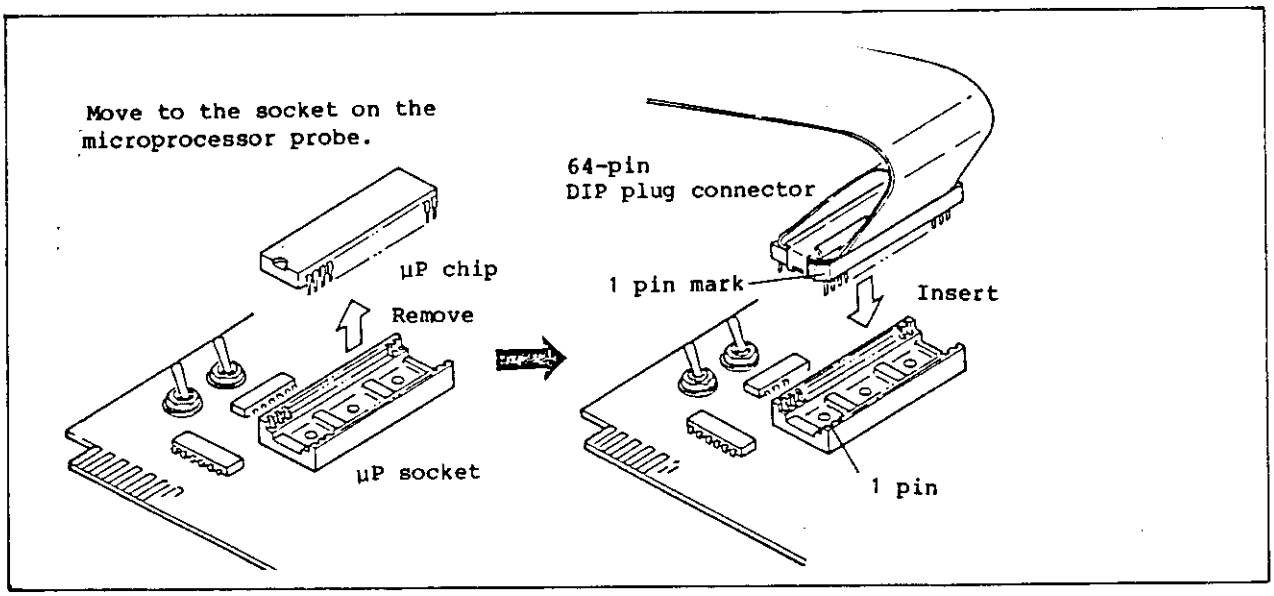


Figure 2 - 4 Using the DIP Plug Cable

3. BASIC TEST OPERATION

3.1 Outline

This chapter explains how to operate the TR4726 logic analyzer for a state analyzer.

3.2 Menu Screen Structure

The control method according to the menu is used in the TR4726 logic analyzer. The screen having more than one reference menu item is called menu screen. Insert the system disk into the floppy disk drive of the TR4726 and start the TR4726, and the menu screen in Figure 3-1 displayed.

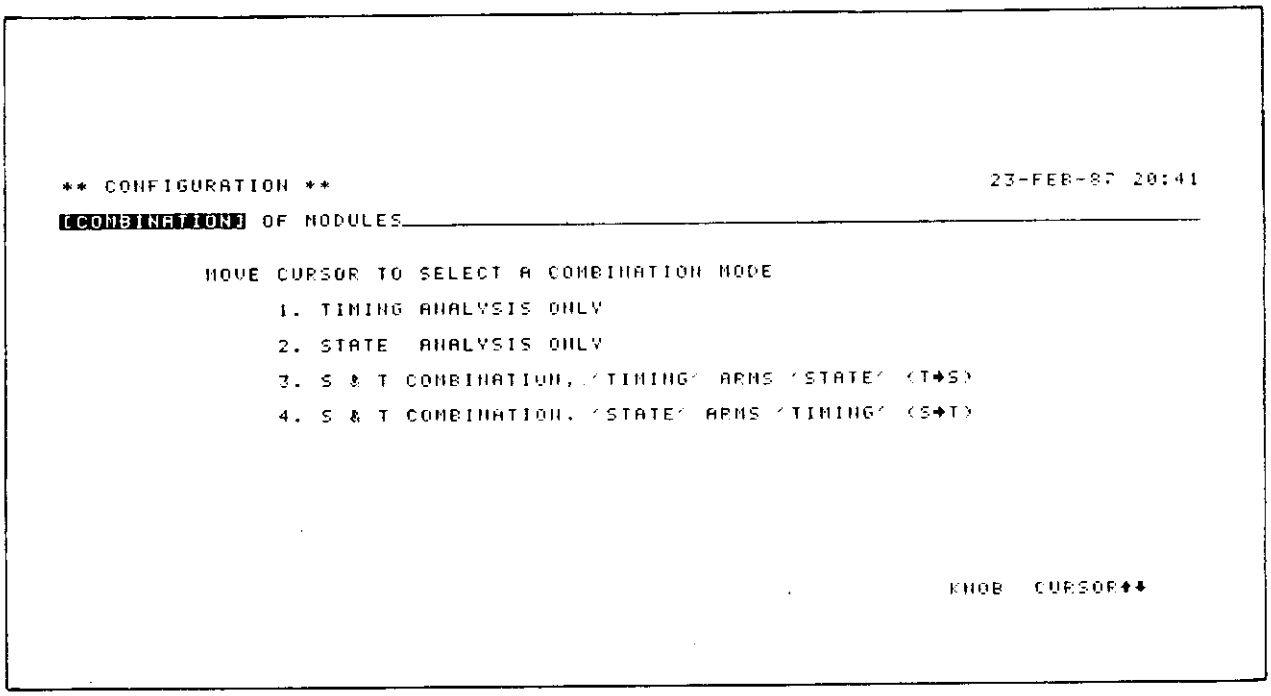


Figure 3 - 1 Start Menu Screen

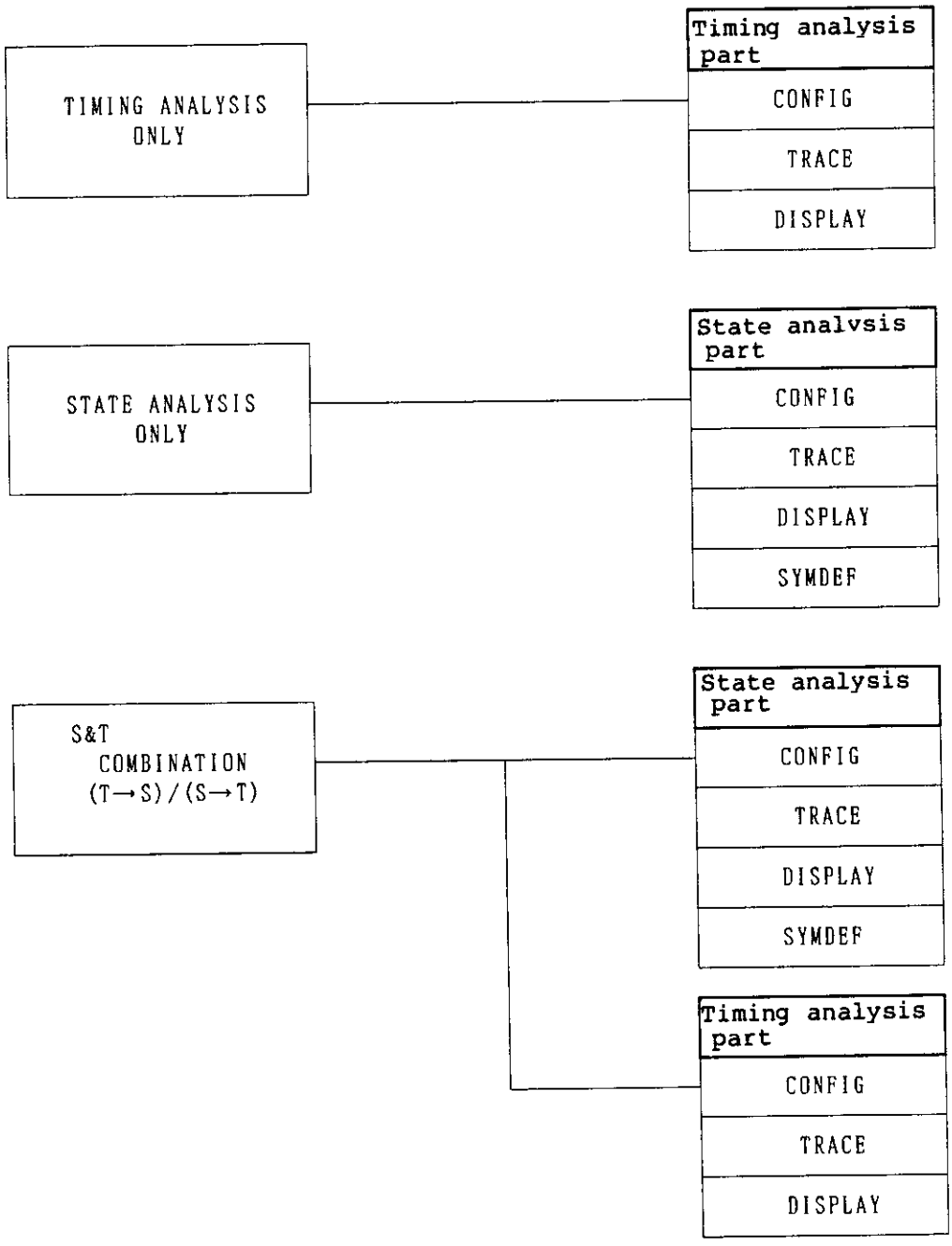
1. TIMING ANALYSIS ONLY: Uses timing analysis part only.

2. STATE ANALYSIS ONLY : Uses state analysis part only.

3. & 4. S & T COMBINATION : Used for a combination analyzer by state analysis and timing analysis functions.

Move the cursor by knob and press the SELECT key, and the SET UP screen is displayed.

The menu screens in modes are configured as follows.



The menu screen of state analysis part in the S & T COMBINATION MODE is changed to that of timing analysis part by [STATE TIMING] .
The menu screen of state analysis part is shown below. The S & T COMBINATION mode is explained in Chapter 4.

3.3 Input Channel Structure (CONFIG function)

3.3.1 CONFIG Menu Screen for 68000/68010

CONFIG determines the structure of input part of TR4726 on which the R47252A is installed. Section 2.3.1 explains how to connect the probe to the SUT. This section explains the CONFIG function.
This function levels the electric signals input from the probe of R47252A, samples, and converts them into logical data that is treated easily. It is explained below.
Figure 3-2 shows the menu screen of state analysis part.

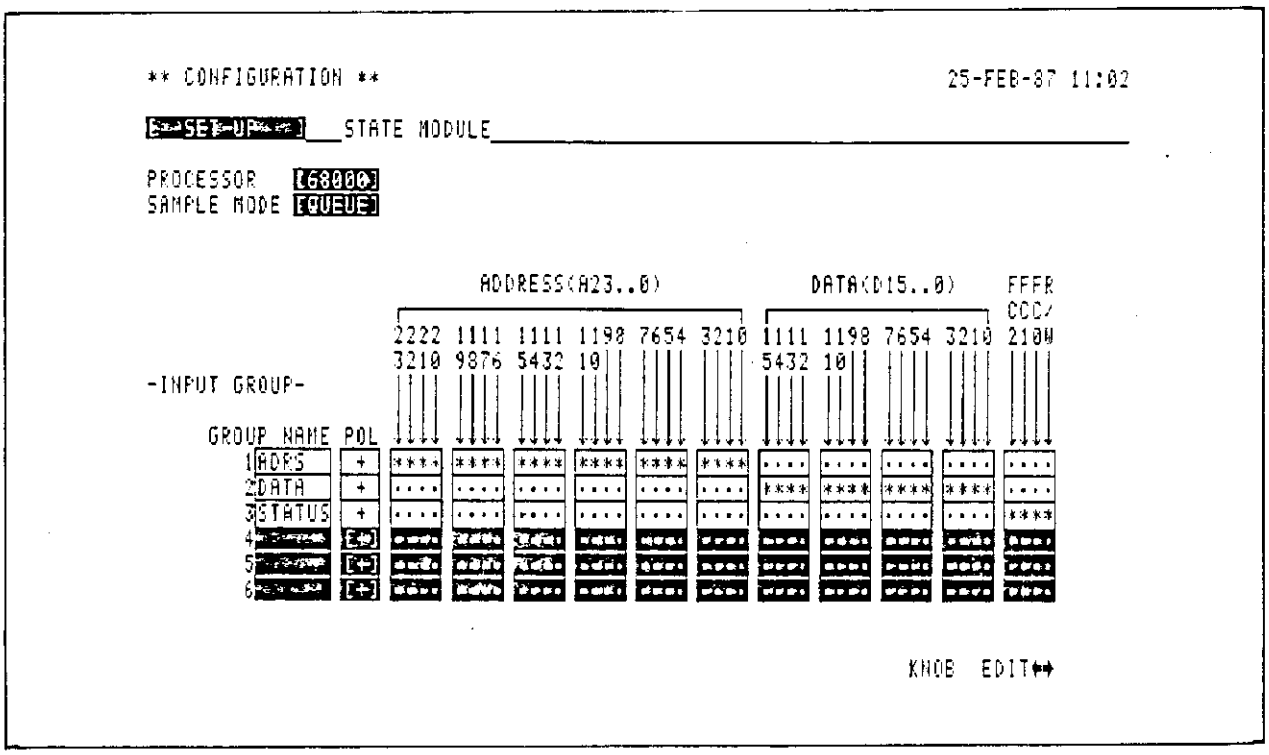


Figure 3 - 2 Menu Screen of State Analysis Part

The symbol with arrow indicates the names of 68000 and 68010 signal pins. The 68000 and 68010 have no signal name A0 (LSB of address bus). Since the odd address is accessed actually, they generates the signal name internally using the UDS and LDS signals to use. The odd address can be used by defining the SYMBOL and CODE, and setting the trace condition.

The following items can be set on the screen (Figure 3-2).
o PROCESSOR : Selects 68000 and 68010.
o SAMPLE MODE : Selects QUEUE sample mode and BUS sample mode.

The QUEUE sample mode synchronizes with the instruction queue in the 68000 or 68010, and fetches data. The non-executable instruction of prefetched instructions does not fetch data, so it is fit to trace software. The BUS sample mode fetches data output to the bus of 68000 or 68010. The mode fetches the non-executable instruction of fetched instructions. It is fit to see the relation to peripheral equipment.

- POL : Specify the polarity + or - to fetch the signal.
- GROUP : The unit treating several input channels together can be defined as an input GROUP (GROUP). To define the GROUP, determine the name of the GROUP by up to six alphanumeric characters. Specify the input channel belonging to the GROUP by inputting an asterisk. Up to six GROUPs can be specified. Three groups ADRS, DATA, and STATUS of them are already defined in the R47252A and cannot be changed by user. The residual three groups can be defined by user. Already-used input channel cannot be duplicated.

3.4 Setting the Trace Condition (TRACE function)

TRACE specifies the test mode, and sets the trace condition that is the center of test condition. The main purpose of the trace condition is to focus the trigger as standard to obtain the data part requiring to analyze the SUT from the flow of large quantity of data input from the input channel.
The R47252A can support complicated data flow by combination of S & T function (trigger arming) and several trace window conditions.

3.4.1 Setting the Trace Condition in the State Analysis Part

Press the TRACE key, and the TRACE menu screen (figure 3-3) is displayed.

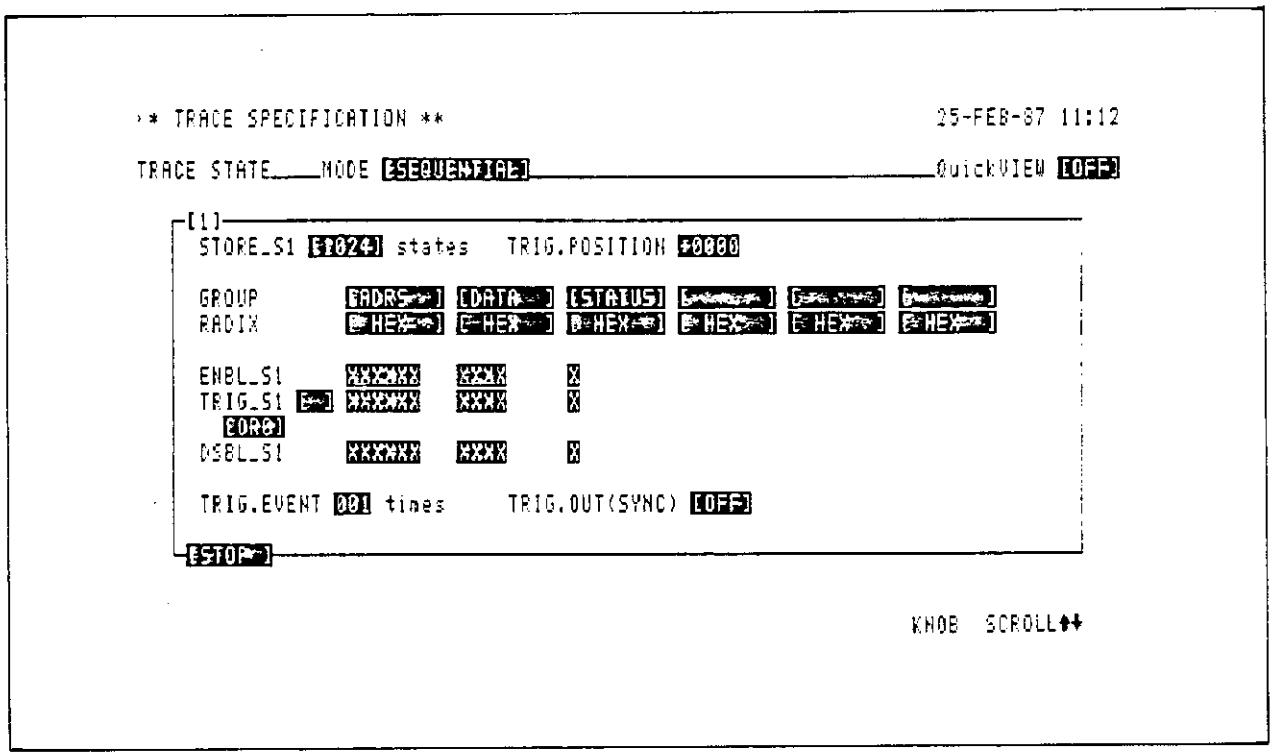


Figure 3 - 3 Initial Menu Screen of TRACE

For the trace mode in the state analysis part, the TRACE TRIG mode and SEQUENTIAL mode can be used. The following shows the initial screen in each mode.

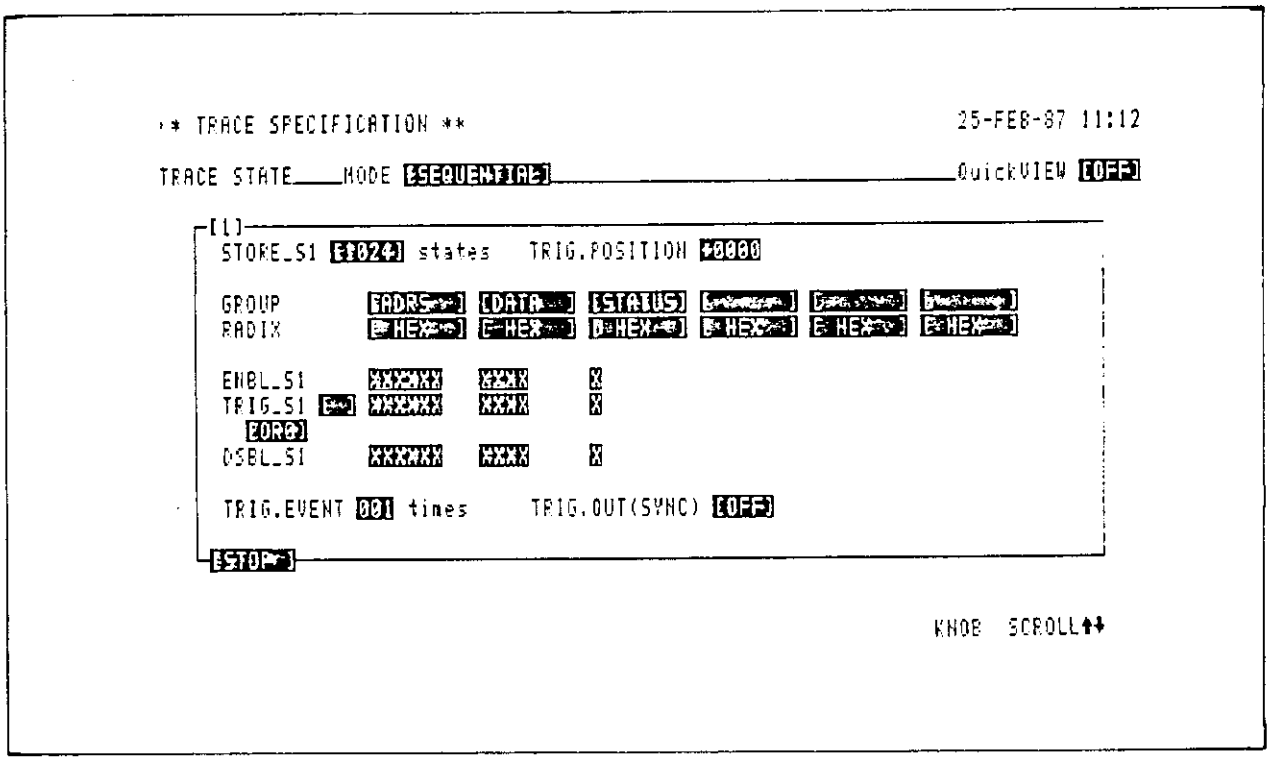


Figure 3 - 4 Initial Screen in the SEQUENTIAL Mode

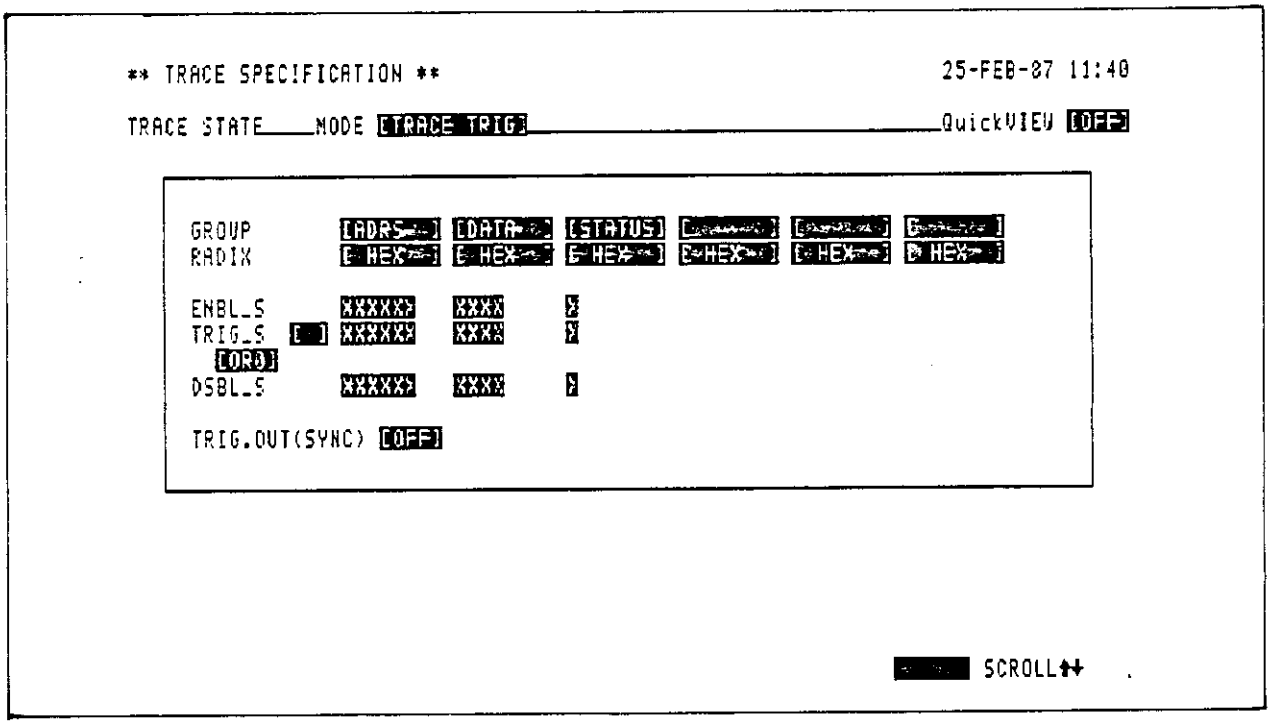


Figure 3 - 5 Initial Screen in TRACE TRIG Mode

MODE_ TRACE TRIG : Only the pattern set by TRIG_S is traced.
MODE_ SEQUENTIAL : Data is obtained by combination of up to four trace window conditions and up to four trace window conjunctions.

The SEQUENTIAL mode can set an independent trigger condition in trace windows, and obtains data under its trigger condition.

(1) Menu for Trace Window Condition

One trace window condition consists of the store condition, trigger condition, and specification of trigger pulse on/off. In description below, n ranges from 1 to 4.

The store condition (STOREn, TRIG POSITION) specifies the size of trace window n and the trigger point.

- STOREn : The quantity of acquisition memory (ACQ_MEM) in the state analysis part is 48 CH. X 1024 states. It can be divided in the direction of depth. As a value, an exponent of 2 (0, 1, to 1024) can be set. If the exponent is 0, data cannot be fetched in memory (the trigger condition is enabled). If it is 1, only the trigger condition is fetched. When several trace windows are used, the store value of trace window 1 must be less than 512. Flexible data can be fetched by combination of the value and trace window conjunction.
- TRIG POSITION : The trigger point in data for trace window n can be set. The range from -3072 to + (store value -1) state (decimal) can be set. When the positive value is set, data prior to the trigger can be acquired. When STOREn is zero, this menu is disabled.

The trigger condition (ENBLn, TRIGn, DSBn, TRIG PASS) specifies the reference point (trigger point) of data fetch. The patterns of ENGLn, TRIGn, DSBLn are ANDed by GROUP pattern and are used for actual patterns. As a RADIX of each GROUP, SYMBOL and CODE in addition to the value (BIN, OCT, HEX) can be used (if possible).
So, an asterisk must be entered to USE on the SYMDEF menu screen.

- TRIGn : Specifies data pattern that is regarded as a trigger.
  All patters that correspond to this pattern are not a trigger. If data satisfies the limit specified by set value for the menu item below, it can be trigger. the NOT trigger can be specified by menu item [ ] on the left of TRIGn. The OR trigger can be specified by menu item [OR0]. When two trigger patterns are set, the earlier-coming pattern is considered as a trigger (OR1). OR2 is an OR trigger for three trigger patterns. OR3 is an OR trigger for four trigger patterns. Up to four trigger patterns can be set in the whole state analysis part.
- ENBLn : It is the previous pattern taht can detect the TRIGn pattern. After data corresponding to the ENBLn pattern appears, only data corresponding to the TRIGn pattern can be the trigger condition.
- DSBLn : It is pre-pattern that disables the TRIGn pattern to be detected. After data corresponding to the DSBLn pattern appears, data corresponding to the TRIGn pattern cannot be the trigger condition (data corresponding to the ENBLn pattern must appear).
- TRIG EVENT : Specifies the trigger pattern repeat number (event). 1 to 256 (decimal) can be set.
  The menu of trigger pulse on/off is as follows.
- TRIG OUT (SYNC) : Specify whether the specific pulse is output when data corresponding to the TRIGn pattern appears to the same BNC connector on the rear panel (not trigger). It is the TTL level and is the 500-ns negative pulse.

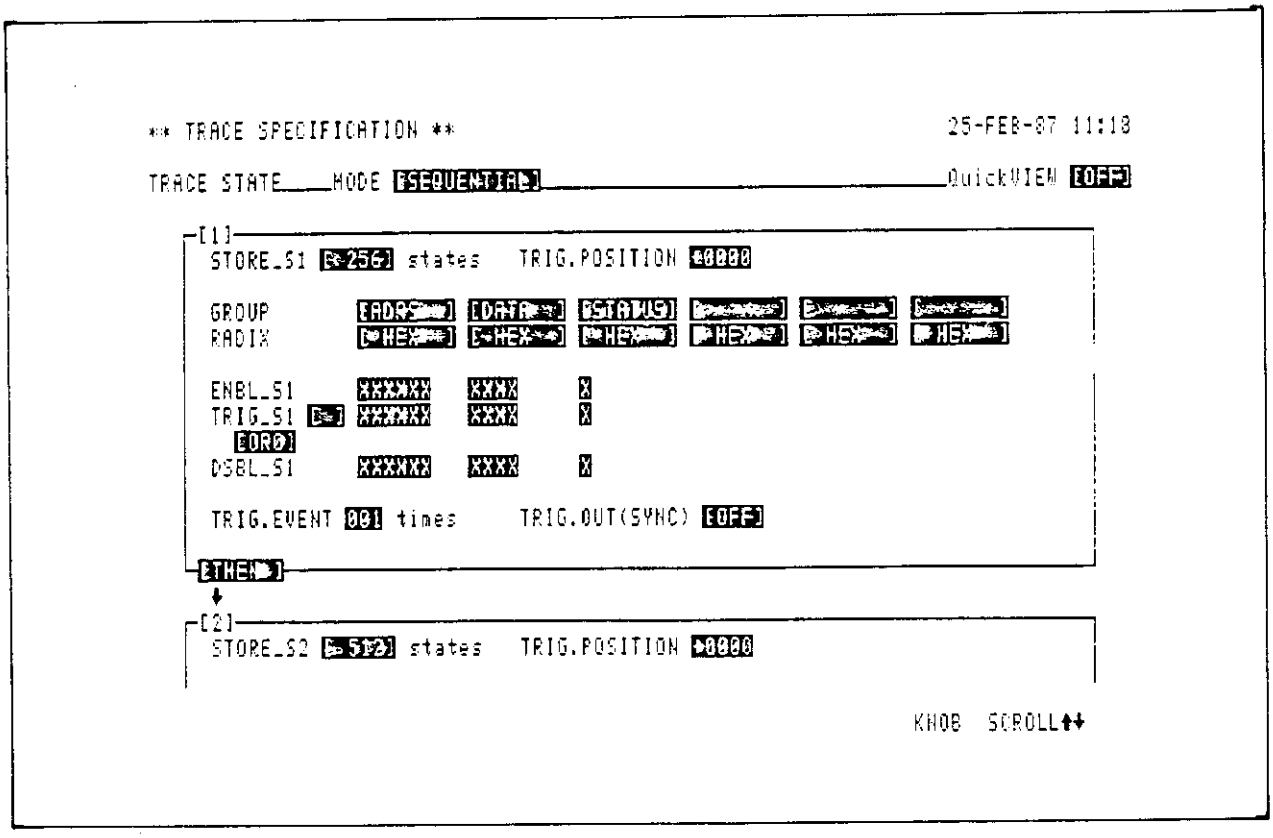


Figure 3 - 6 Trace Window Conduction

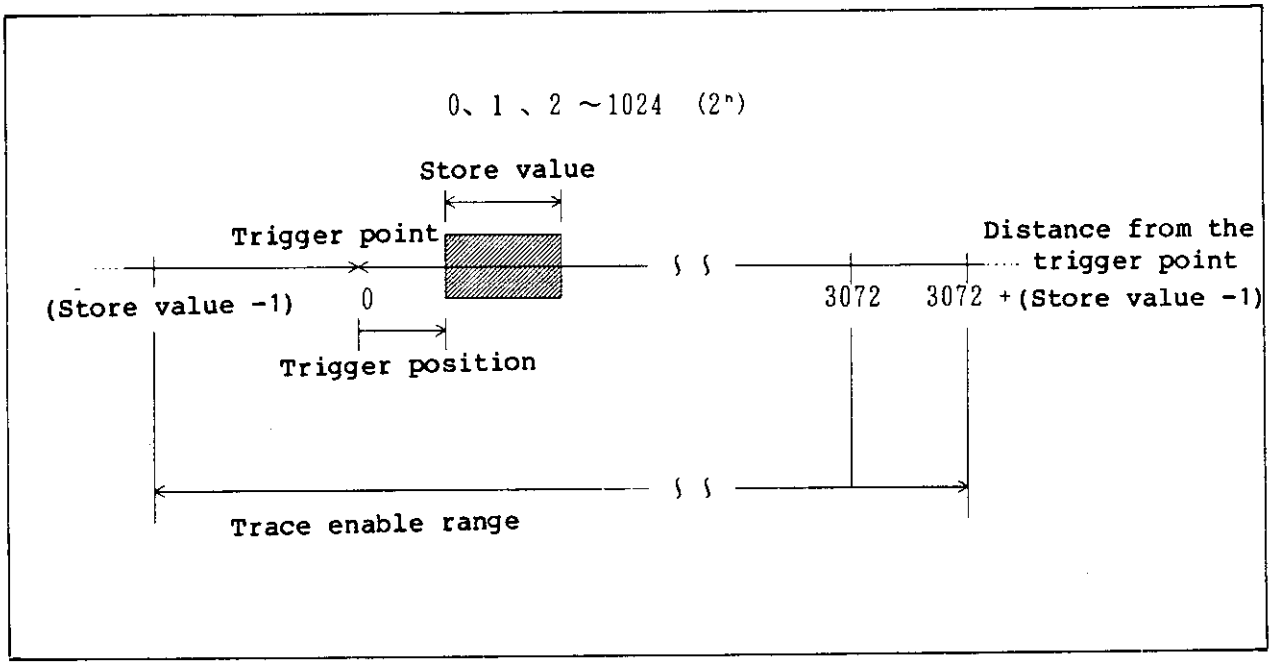


Figure 3 - 7 Store Condition

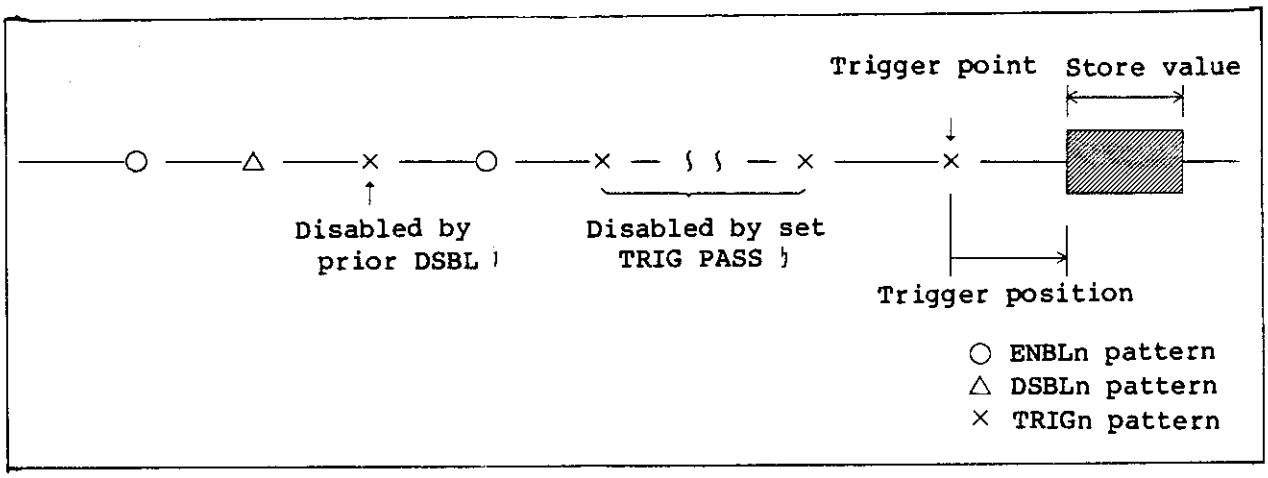


Figure 3 - 8 Trigger Condition

(2) Trace Window Conjunction

Trace window conjunction combines several trace window conditions and can make up the flexible trace condition for complicated data flow. The following four trace window conjunctions can be used (see Figure 3-9).

- STOP : Ends the test. It can be used even if the sum of STOREn is less than 1024 states.
- THEN : Starts the test under the next trace condition after the test is ended under a certain trace window condition. Up to four trace window conditions can be combined.
- AGAIN : Repeats the test under the previous trace window condition until acquisition memory is full.
- TOP : Returns to trace window condition 1 and continues the test.

The above trace window conjunctions can be used together.

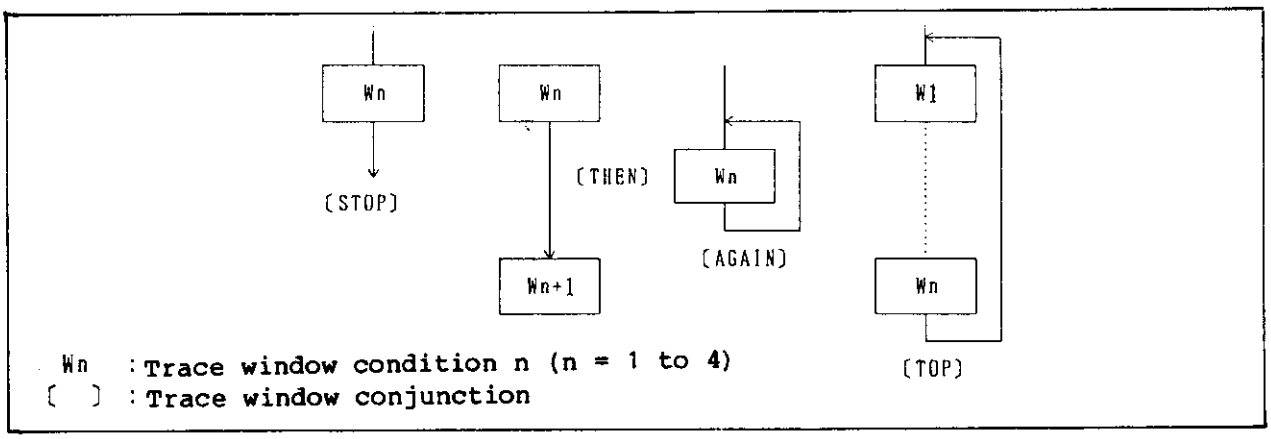


Figure 3 - 9 Function of Trace Window Conjunction

(3) Trace Window Condition and Trace Window Conjunction

The following explains some combinations of the trace window condition and trace condition conjunction (see Figure 3-10 (a) to (f)).

- Figure 3-10 (a) : Shows the currently-set logic analyzer and the initial menu screen. As a store value, other than 1024 can also be obtained.
- Figure 3-10 (b) : Trace window condition 1 is repeated by AGAIN.
- Figure 3-10 (c) : Trace window conditions 1 to 4 are connected by THEN.
- Figure 3-10 (d) : After data is obtained by previous trigger in advance, the succeeding trace window condition is repeated.
- Figure 3-10 (e) : After trace window conditions are set, trace window condition 1 is set again.
- Figure 3-10 (f) : Shows the configuration of sequential trigger to be realized.
  ENBLn and TRIGn (n = 1 to 3) are used for the enable pattern. They are eight-level sequential trigger. Since the trance window condition still has the DSBLn pattern, it can be set more complicatedly.

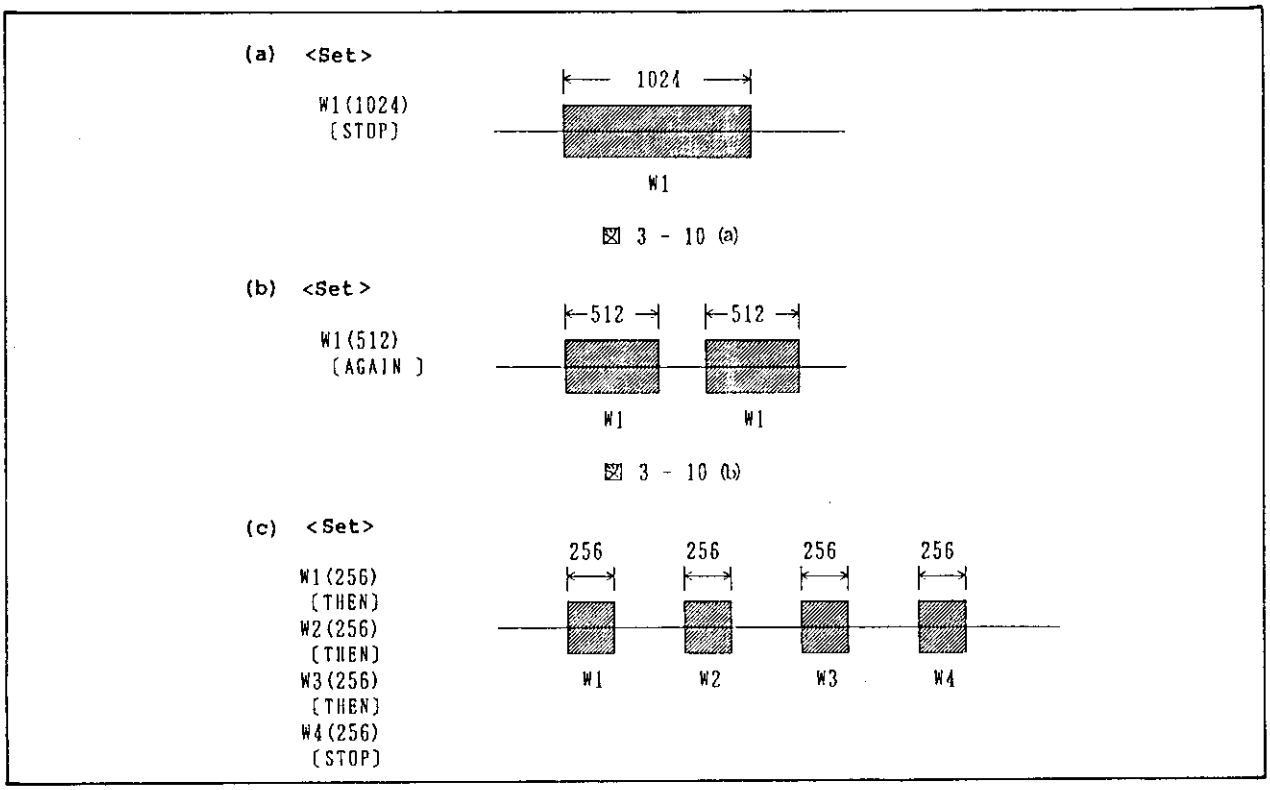


Figure 3 - 10 Combinations of Window Condition and Trace Window Conjunction

(d) <Set>

W1(512)
〔THEN〕
W2(256)
〔AGAIN 〕

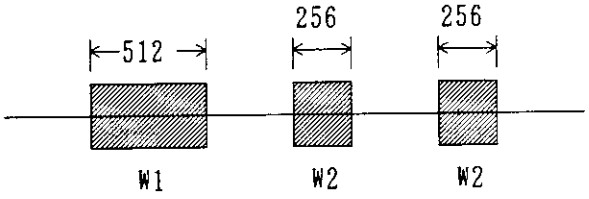


図 3 - 10 (d)

(e) <Set>

W1(256)
〔THEN〕
W2(256)
〔TOP 〕

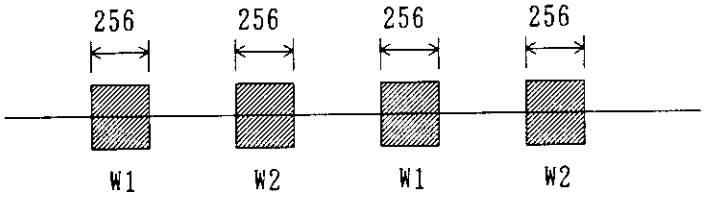


図 3 - 10 (e)

(f) <Set>

W1(0)
〔THEN〕
W2(0)
〔THEN〕
W3(0)
〔THEN〕
W4(1024)
〔STOP〕

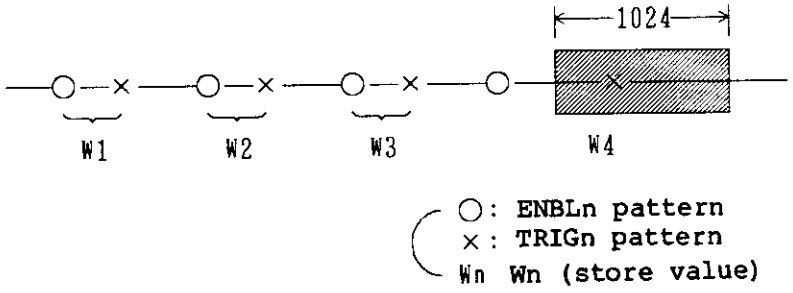


Figure 3 - 10 Combinations of Window Condition and Trace Window Conjunction (cont'd)

3.5 Displaying Acquisition Data in State Analysis Part (DISPLAY function)

DISPLAY displays data fetched in acquisition memory in several formats to analyze.

3.5.1 Menu Item and Display Format

Figures 3-11 and 3-12 show examples of acquisition data to be displayed.
Figure 3-11 shows the example of acquisition data to be displayed in the TRACE TRIG mode.
Figure 3-12 shows the example of acquisition data to be displayed in the SEQUENTIAL mode.

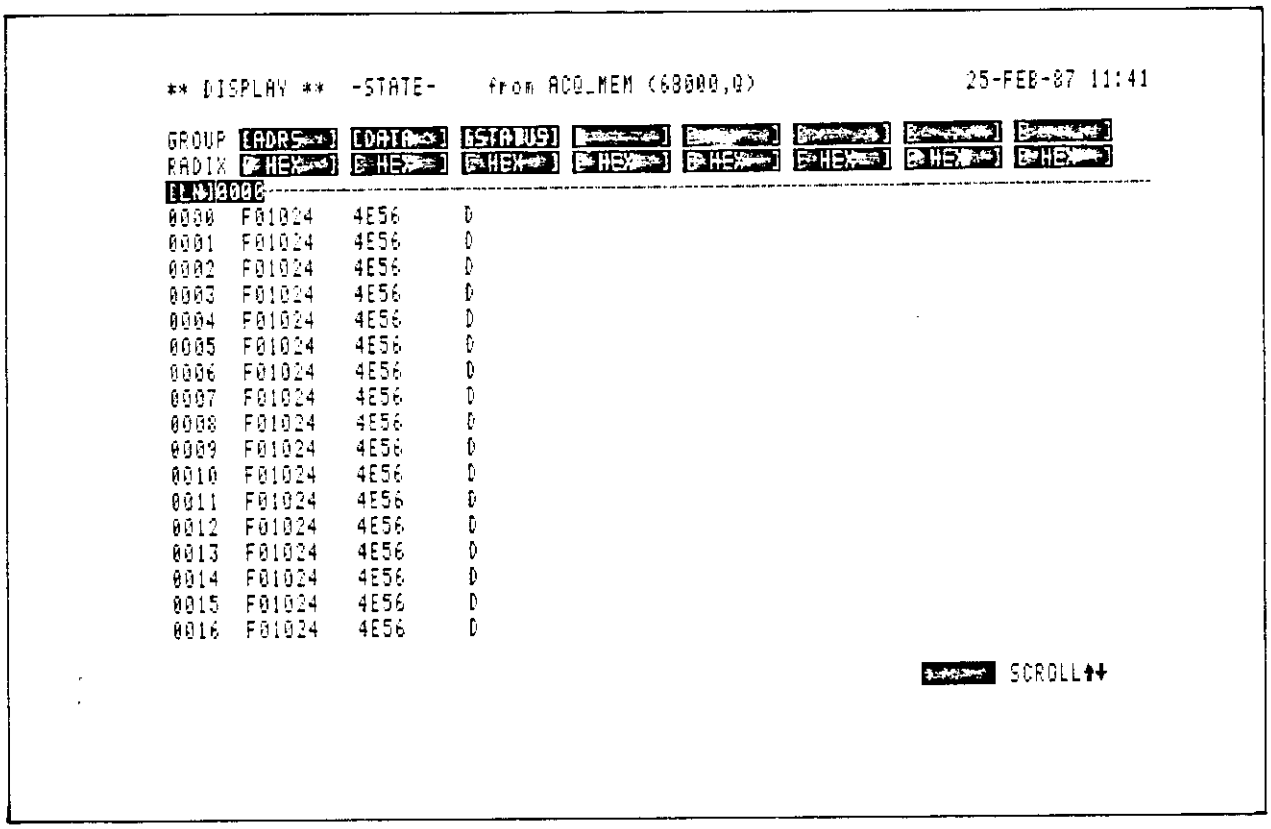


Figure 3 - 11 Example of Test Data to be Displayed

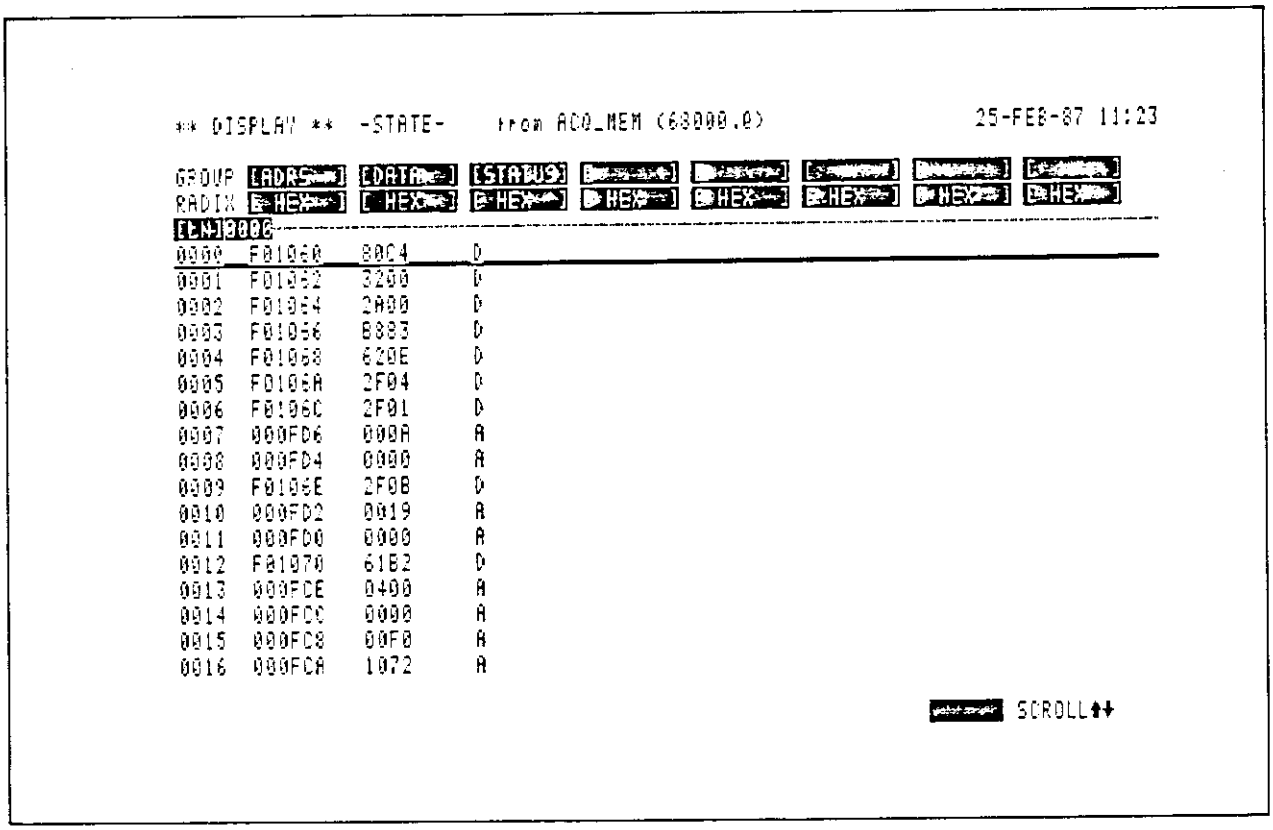


Figure 3 - 12 Example of Test Data to be Displayed: SEQUENTIAL Mode

The underline displayed by halftone in the SEQUENTIAL mode indicates the trigger mark. When acquisition memory is divided using several trace window conditions, the memory division boundary mark and trigger mark are not displayed as shown in Figure 3-13. When the memory division boundary mark overlaps the trigger mark, the trigger mark is displayed normally (when only the trigger overlaps, halftone is displayed). The following explains set menu items and the result.

- GROUP : GROUP has up to eight menu items. When the SELECT key is pressed to select GROUP defined on the CONFIG menu screen, the arbitrary order can be displayed. Data in the same GROUP can be overlapped for display in different places. When the blank is specified, no data for the specified GROUP can be displayed. The width of GROUP to be displayed is changed greatly by defined channel number and RADIX. When a combination of GROUP and RADIX exceeds the width displayed on the CRT, it is not allowable.

- RADIX : A radix to display data for specified GROUP is set in this menu item. One of BIN (binary), OCT (octal), DEC (decimal), HEX (hexadecimal), ASCII (7- or 8-ch GROUP only), MNEM (data for PK only), SYMBOL (see Item 3.6.3), and CODE (only the group less than 8-ch; see Item 3.6.4) can be set.
- Line No. : When a decimal number is entered to this menu item by ENTRY key, data for line No. of the number is displayed. For a default, an input prompt appears in the hundreds digit. It can be moved to the other digit by ← and → .

Data scroll is explained below. Displayed data can be scrolled up and down at optional speed by scroll knob (turning the knob clockwise allows the data to move up). When the PAGE ↑ and ↓ keys are pressed, the page scrolls up and down every displayed 10 lines.

```
** DISPLAY **  -STATE-    From ACQ_MEM (68000.0)          25-FEB-87 11:24

GROUP [ADRS   ] [DATA   ] [STATUS ] [       ] [       ] [       ] [       ] [       ]
RADIX [ HEX   ] [ HEX   ] [ HEX   ] [ HEX   ] [ HEX   ] [ HEX   ] [ HEX   ] [ HEX   ]
[LN]0000
0000  F01060   80C4     D
0001  F01062   3200     D
0002  F01064   2A00     D
0003  F01066   8383     D
0004  F01068   620E     D
0005  F0106A   2F04     D
0006  F0106C   2F01     D
0007  000FD6   000A     A
0008  000FD4   0000     A
0009  F0106E   2F08     D
0010  000FD2   0019     A
0011  000FD0   0000     A
0012  F01070   61B2     D
0013  000FCE   0400     A
0014  000FCC   0090     A
0015  000FC8   00F0     A
0016  F01060   80C4     D

                                                    [       ] SCROLL↕↕
```

Figure 3 - 13 Example of Test Data to be Displayed when Memory is Divided (STORE = 16, AGAIN)

To analyze the state smoothly using DISPLAY function, some display states are enabled.
Figure 3-14 shows the example of test data to be displayed.

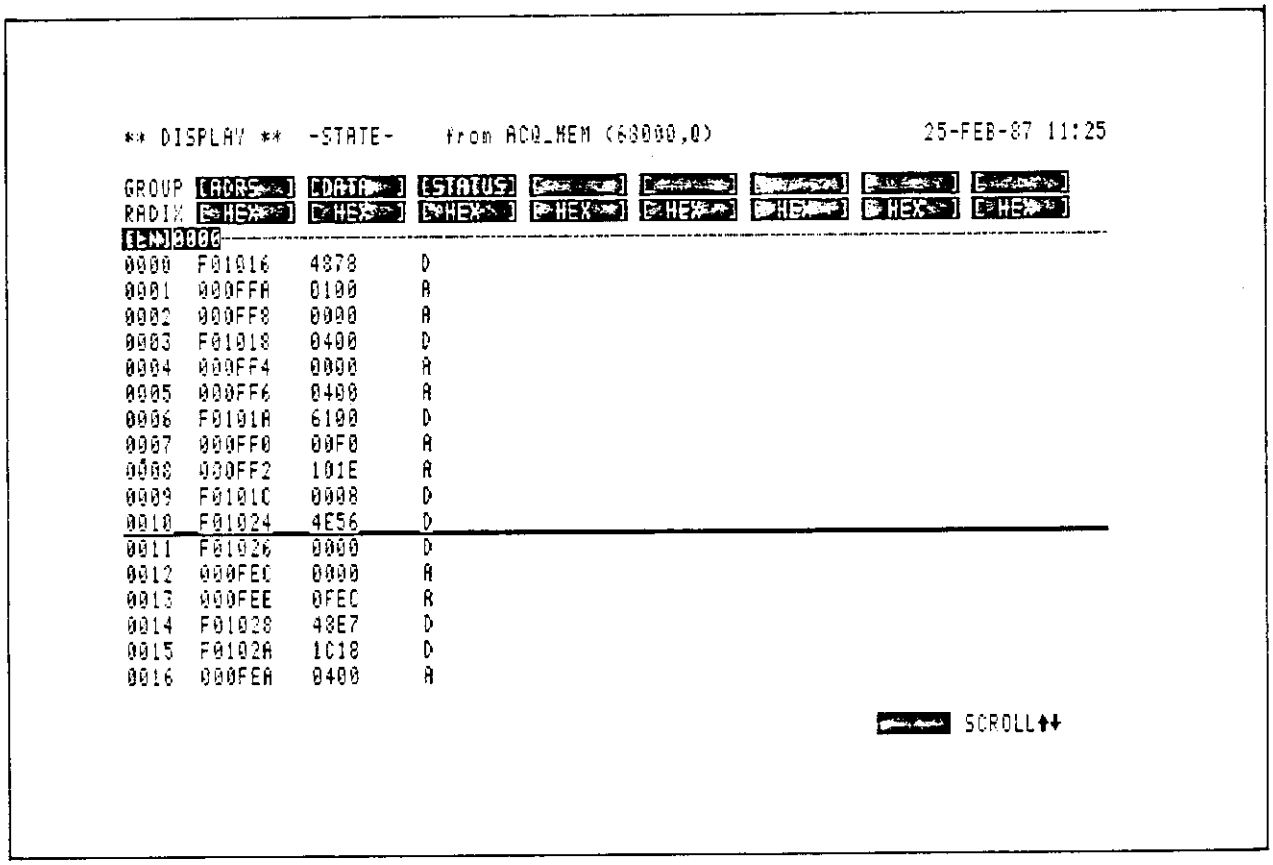


Figure 3 - 14 Example of Test Data to be Displayed

(1) Display in the QUEUE Sample Mode

Figure 3-15 shows the example of data fetched in the QUEUE sample mode by mnemonic.

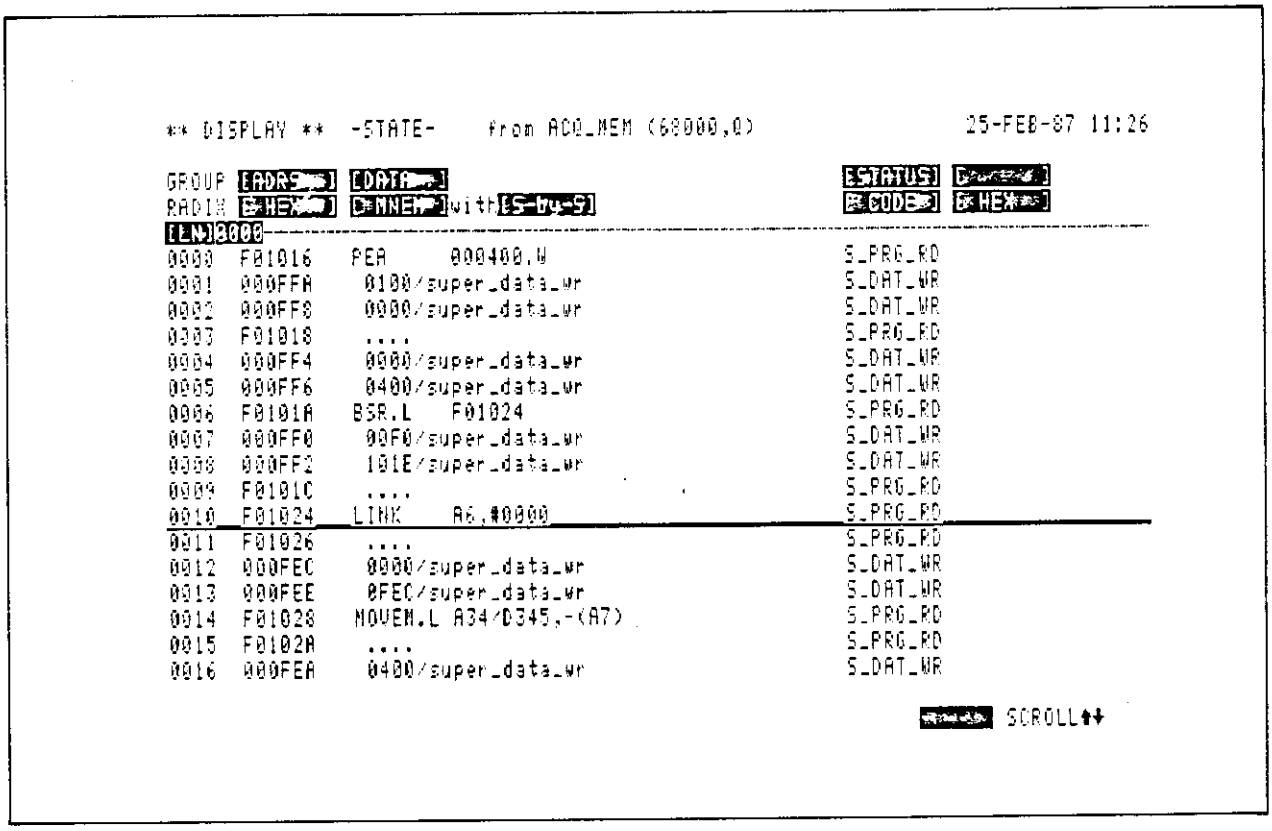


Figure 3 - 15 Example of S-by-S to be Displayed in QUEUE Sample Mode

Since the 68000/68010 prefetches the instruction, the bus is not used in sequence to fetch and execute the instruction. One instruction is fetched, the other instruction is sometimes not be executed. In the QUEUE sampling mode, data is sampled by synchronizing the internal queue of 68000/68010, the instruction is fetched and executed. Such sequential display is done, so it is useful for debugging.
Part "....." in [DATA] displayed by mnemonic is a part of instruction code. It indicates that the previous mnemonic (or operand) contains the data. A period is hexadecimal one-digit data.

As shown above, the method of displaying data fetched by R47252A is called S-by-S (State-by-State) display mode. The other mode eliminates "....." that is unnecessary to analyze data and enables highly-dense display. This mode is called PACKED display mode. Figure 3-16 shows the PACKED display mode with the same data as in Figure 3-15.

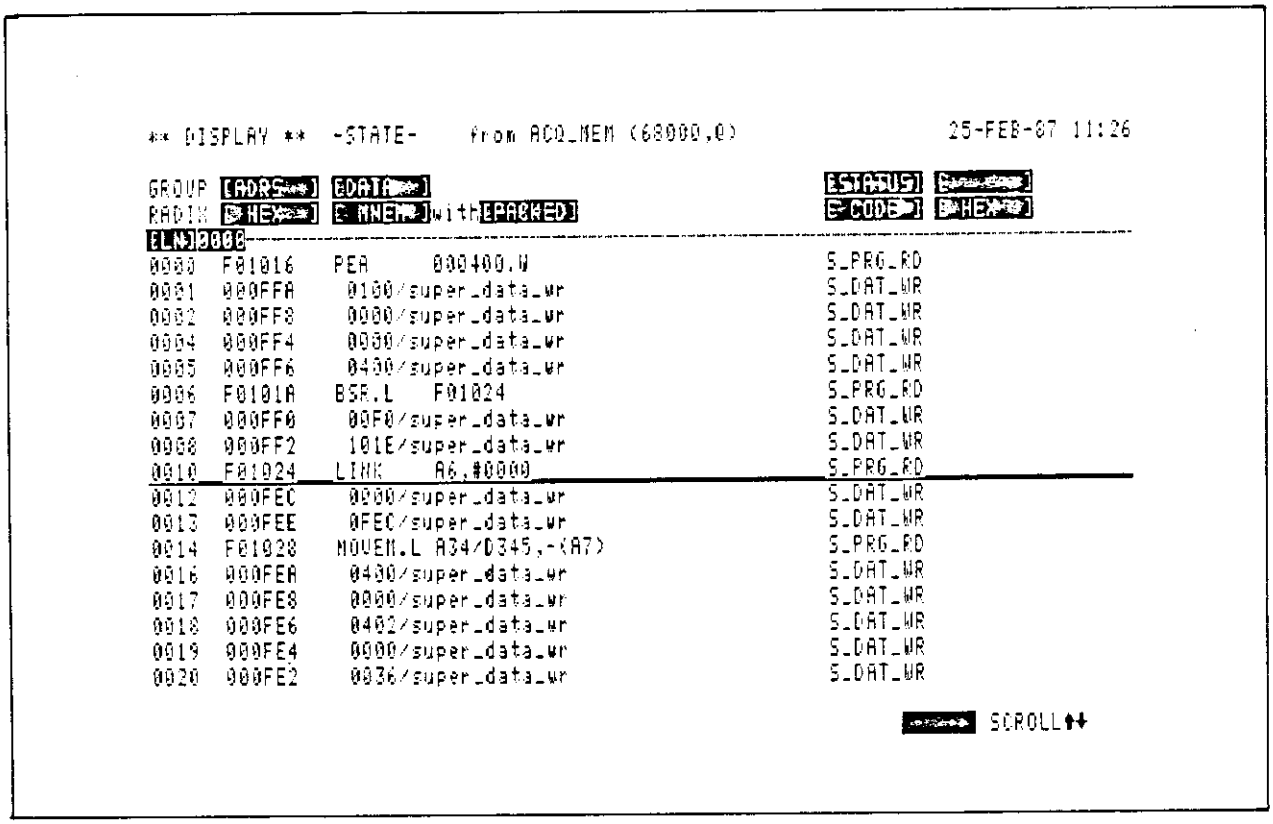


Figure 3 - 16 Example of PACKED to be Displayed in QUEUE Sample Mode

(2) Displaying BUS Sample Mode

Figure 3-17 shows the example of data fetched in the BUS sample mode by mnemonic. Such data has been tested under the same trace condition as in Figures 3-14 and 3-15 (only setting CONFIG is different). In the BUS sample mode, the 68000/68010 microprocessor fetches data to access the bus. The previous instruction prefetches the next instruction in the 68000/68010 microprocessor, so the instruction code on the bus and the operation of operated bus after execution of the code are not continuous.
The part "." in data displayed by mnemonic is a part of an instruction code and indicates that it is included in the previous mnemonic (and operand). "." indicates the hexadecimal one digit.

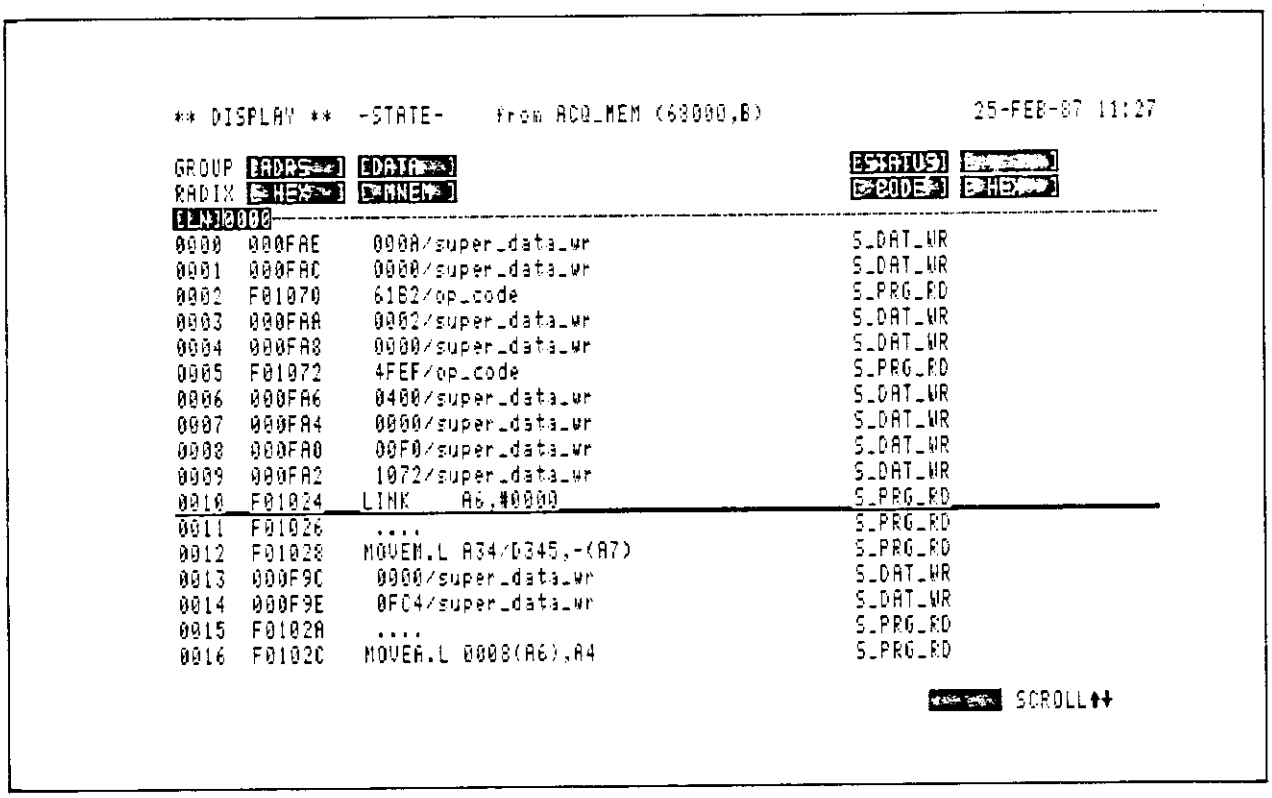


Figure 3 - 17 Example of Data to be Displayed in BUS Sample Mode

3.5.2 68000/68010 Reverse Assembly Format

(1) For mnemonic of operation code, the Motorola's 68000/68010 standard assembler format is used (reference: M68000 Microprocessor User's Manual REV 4.00, 1984).

(2) All values that appear in the operand are represented by hexadecimal, so the symbol indicating the base of values is not used.

(3) To the operation code that can treat the different operand in size, one of B (byte), W (word), or L (long word) is added. If the operation code is the same as above, the symbol specifying the size is not added to the code requiring CCR, SR, or USP as a operand.

(4) S (short) and L (long) is added to Bcc, BRA, and BSR of branch instructions according to the displacement size.

(5) # is added to immediate data. If the size of data is three or four bits, it is displayed by one digit of hexadecimal. If it is eight bits, it is displayed by two digits of hexadecimal. If it is 16 bits, it is displayed by four digits of hexadecimal. If it is 32 bits, it is displayed by eight digits of fixed length.

(6) If the displacement other than the branch instruction is eight bits, it is two digits of hexadecimal. If it is 16 bits, it is displayed by four digits of fixed length.

(7) The operand (8- or 16-bit displacement) of branch instruction (Bcc, BRA, BSR, and DBcc) is converted into the 24-bit absolute address regardless of the size, and is displayed by six digits of hexadecimal.

(8) When the jump instruction (JMP, JSR) and memory operand are specified by absolute address, the absolute address (16 or 32 bits) used for an execution address is changed to 24-bit absolute address. To indicate the size of each address, "_W" (word) and "_L" (long word) are added.

Example:

```
JMP hhhhhh_W (h is one digit of hexadecimal)
JSR hhhhhh_L
```

(9) When the GROUP (ADRS) is displayed by SYMBOL, the operand address is displayed by SYMBOL if possible.
The display format is as follows.
SYMBOL name + hhhhhh (h is one digit of hexadecimal)
SYMBOL name - hhhhhh

(10) The register list is displayed by MOVE instruction as follows. The address register (starting with A) and data register (starting with D) are displayed in order. They are separated by "/". When more than register Nos. are continuous, the first and last Nos. are displayed. They are separated by "-".

(11) The name of stack pointer (SP, USP, SSP) is used only when the instruction is specified explicitly.

(12) The ILLEGAL instruction ($4AFC_H$) is used for a formal operation code. It an undefined instruction and unmounted instruction are found, hhhh/illegal is displayed.

3.6 Defining SYMBOL and CODE (SYMDEF function)

The R47252A (state analysis part) can use the user-defined SYMBOL name and CODE name in addition to values or fixed code to set the trace condition (TRACE function) or display and analyze test data (DISPLAY function). SYMBOL can be applied to the arbitrary channel number to the GROUP, giving one SYMBOL name to the string of certain values (or one value). The rate of debugging can be improved by using the label name, variable name, and step name to development a program. CODE can be applied to the GROUP which is less than 8-channel, giving one CODE name to one value. The code table can be created easily.

3.6.1 SYMDEF Menu Screen

Press the SYMDEF , and the menu screen of SYMDEF is displayed (see Figure 3-18). The menu screen of SYMDEF depends on the number of defined GROUPs, and consists of up to 12 partial menu screens which are shown in Figure 3-19. Set data displayed once on the CRT defines 16 SYMBOLs (or CODEs) or less which are on the one partial screen of them. Data defining one SYMBOL or CODE is represented by one line of related several menu items. This line is called a menu item line. The line number for menu item line is variable. For easy-to-see display, only one line is displayed inversely.
When the menu screen contains 17 lines or more, the whole partial menu screen can be displayed by scroll knob or PAGE ↑ and ↓ .
Using the scroll allows you to access to a proper part on the partial menu screen at proper speed. Using the PAGE ↑ and ↓ allows you to feed the page every 10 lines of menu item line. The scroll mark [↑ or ↓] at the bottom of the CRT screen can judge that part of partial menu screen is not displayed on the CRT. When displaying the partial menu screen that is different from the currently-displayed screen, change the menu item of GROUP (select from defined GROUP name) and TYPE (select from SYMBOL and CODE).
Fixed R47252A has no partial menu screen corresponding to the GROUP name, DATA (for SYMBOL and CODE).

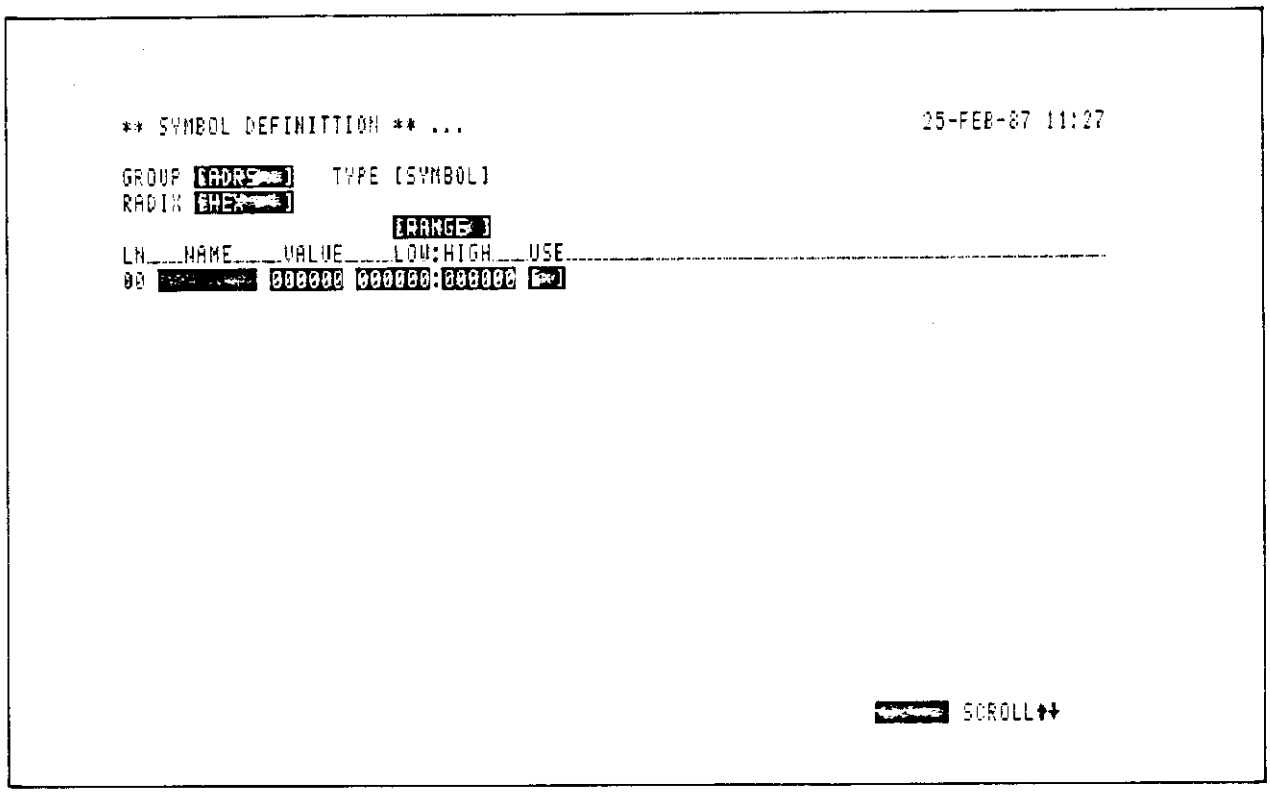


Figure 3 - 18 Initial Menu Screen of SYMDEF

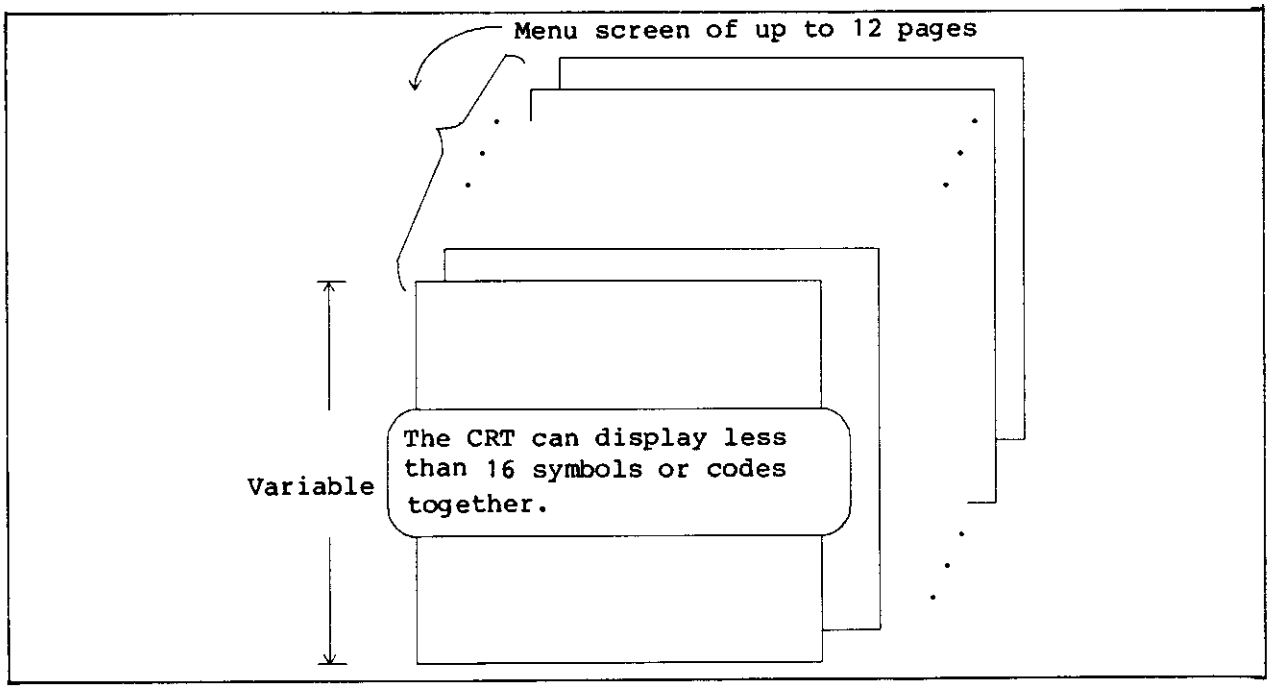


Figure 3 - 19 SYMDEF Menu Screen

3.6.2 CODE Cable for 68000/68010

The R47252A already defines the CODE table to the GROUP (STATUS) (see Figure 3-20).
Abbreviations used in this section are as follows.
U : User state
S : Supervisor state
DAT : Data area
PRG : Program area

```
** SYMBOL DEFINITTION **                                  03-FEB-87 11:31

GROUP [STATUS]    TYPE [CODE   ]
RADIX [HEX     ]

LN     NAME        VALUE  USE
000  U_DAT_WR      2      [*]
001  U_DAT_RD      3      [*]
002  U_PRG_WR      4      [*]
003  U_PRG_RD      5      [*]
004  S_DAT_WR      A      [*]
005  S_DAT_RD      B      [*]
006  S_PRG_WR      C      [*]
007  S_PRG_RD      D      [*]
008  INTA          F      [*]

     pre-defined for 68000/68010 microprocessor
     unchangeable

                                                  SCROLL↑↓
```

Figure 3 - 20 Defined CODE Table (status of 68000/68010)

3.6.3 Defining SYMBOL

On the initial menu screen of SYMDEF, the partial menu screen of SYMBOL is displayed by first-defined GROUP name (Figure 3-18). On the menu items of GROUP, select the GROUP name to define SYMBOL. Issue an input prompt to the menu item line, and input the data to menu lines as follows.

- NAME : Enter eight alphanumeric characters or less as the SYMBOL name. The previous space is enabled (the effect of scroll down can be obtained).
- VALUE : Enter the reference value of SYMBOL.
- LOW : Enter the minimum of numeric string. If the just above menu item is RANGE, enter the absolute value. If it is OFFSET, enter the relative value from VALUE.
- HIGH : Enter the maximum of numeric string. If the just above menu item is RANGE, enter the absolute value. If it is OFFSET, enter the relative value from VALUE.
- USE : The SELECT key is pressed to use SYMBOL on the menu screen of TRACE, so the number of usable SYMBOLs is limited. When an asterisk is specified in this menu items, the SYMBOL can be used on the TRACE screen. Regardless of this specification, all SYMBOLs can be used on the menu screen of DISPLAY.

Figure 3-21 shows the example of SYMBOL to be applied. If SYMBOL is applied to the N-channel GROUP, the value of GROUP is 0 to 2^{N-1}. When VALUE, HIGH, and LOW are set, the range of SYMBOL that can be referred in their values. Except that LOW < HIGH and the duplication of value is not allowed, there is no limit among VALUE, HIGH, and LOW.

Figure 3-21 (a) : It is considered to be the most general setting of VALUE = LOW. The procedure name, function name, and sub-routine name are used for a SYMBOL name. These names are specified by VALUE, HIGH, and LOW. On the menu screens of TRACE and DISPLAY, the value can be referred in the form of SYMBOL name + n (offset).

Figure 3-21 (b) : It can be applied to the stack if VALUE = HIGH. On the menu screen of TRACE and DISPLAY, the value can be referred in the form of SYMBOL name - n (offset).

Figure 3-21 (c) : It can be applied to the stack frame if VALUE ranges from LOW to HIGH. On the menu screen of TRACE and DISPLAY, the value can be referred in the form of SYMBOL name + n or SYMBOL - n.

Figure 3-21 (d) : It is a transformation of Figure 3-20 (a) if VALUE does not range from LOW to HIGH.

Otherwise, SYMBOL is enabled if VALUE = LOW = HIGH.
In this case, only the value of VALUE is set.

When adding or deleting the menu item line, use the ↓, INSERT, and DELETE. To create the menu item line newly, use the ↓. Set the input prompt to the bottom line and press the ↓.
A new menu item line is added directly after the menu item line on which the input prompt is, then the prompt moves to the new menu item line.

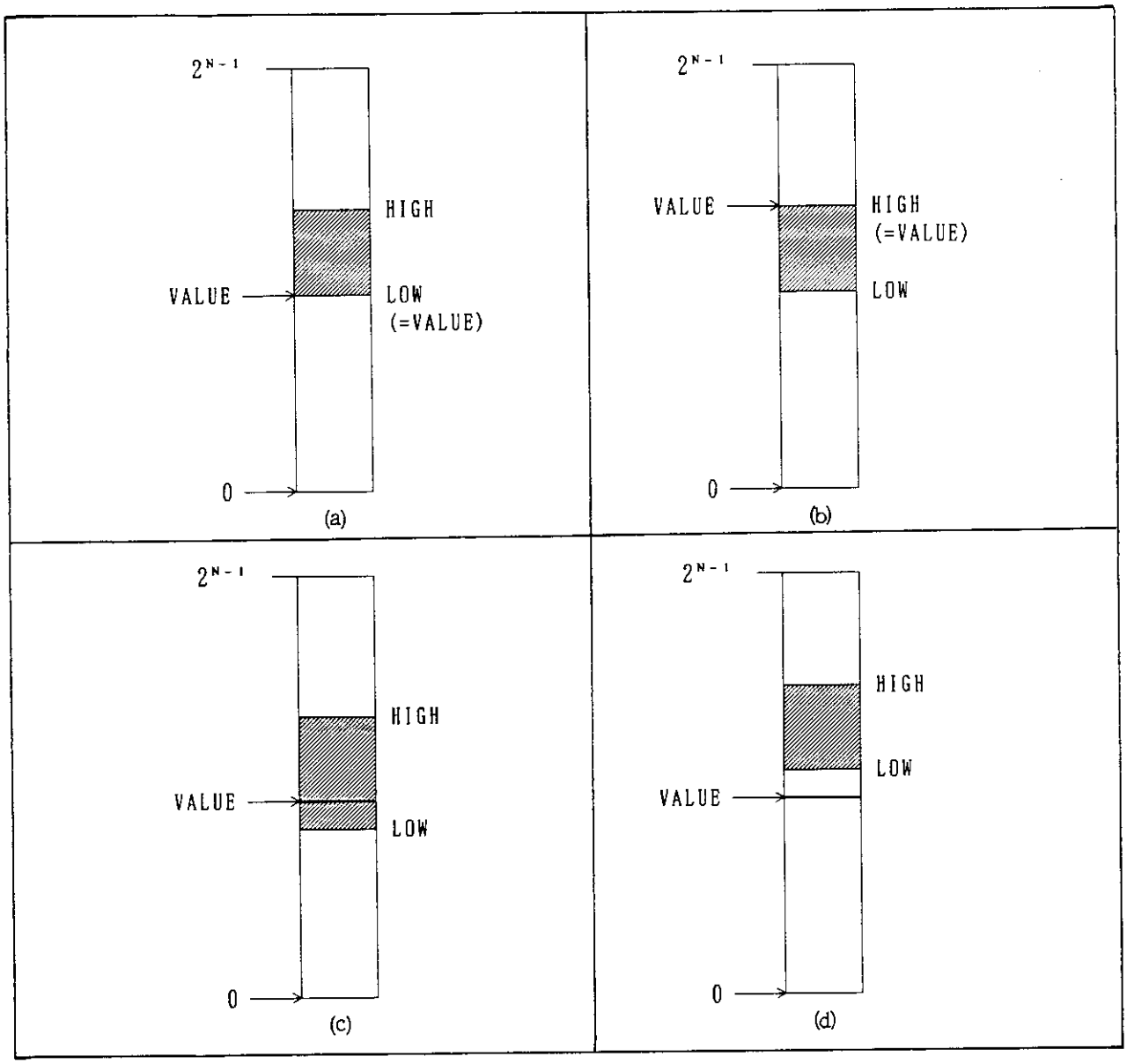


Figure 3 - 21 Example of SYMBOL to be Applied

Press the INSERT [ ] , and a new item line is added directly before the menu item line on which the input prompt is.

Press the DELETE [ ] , and the menu item line with an input prompt is deleted. If the menu item line consists of one line and it has an input prompt, its content is cleared. Duplication between different SYMBOL values (VALUE, LOW to HIGH) is not allowable.
The number of values that the SYMBOL can define is up to 100 per GROUP. The maximum every GROUPs is up to 200. Up to 50 of the value can be used per GROUP on the menu screen of TRACE. Figures 4-14 (a) and (b) shows the examples of SYMBOL to be applied. The same definition is shown by RANGE in Figure 3-22 (b) and is shown by OFFSET in Figure 3-22 (b).

```
** SYMBOL DEFINITTION ** ...                                  25-FEB-87 11:31

GROUP [ADRS--]   TYPE [SYMBOL]
RADIX [HEX--]
                          [RANGE ]
LN___NAME____VALUE____LOW:HIGH___USE_____________________________________
00 TIMER    FC98C0 FC98C0:FCA490 [*]
01  TIMESUB 090780 FC4020:FC41D0 [*]
02 SCHEDULE FC5FC0 FC5FC0:FC6B40 [ ]
03 [------] [000000] [000000:000000] [ ]

                                                        [------] SCROLL↑↓
```

Figure 3 - 22 (a) Example of SYMBOL to be Applied (displayed by RANGE)

```
** SYMBOL DEFINITTION ** ...                                  25-FEB-87 11:31

GROUP [ADRS--]   TYPE [SYMBOL]
RADIX [HEX--]
                          [OFFSET]
LN___NAME____VALUE____LOW:HIGH___USE_____________________________________
00 [TIMER-] [FC98C0] [+000000:+000B0C] [*]
01  TIMESUB 090780 +F338A0:+F33A50 [*]
02 SCHEDULE FC5FC0 +000000:+000B80 [ ]
03          000000 +000000:+000000 [ ]

                                                        [------] SCROLL↑↓
```

Figure 3 - 22 (b) Example of SYMBOL to be Applied (displayed by OFFSET)

3.6.4 Defining CODE

CODE can be defined to the eight-channel GROUP or less in the same way as in SYMBOL. CODE is to define one CODE name to one value, and is like the ASCII code as an image (the ASCII code can be used on the menu screen of DISPLAY). SYMBOL and CODE can be defined to the same GROUP (they are treated as different partial menu screen in this case). To define the CODE, select the GROUP name and determine TYPE as a CODE. Enter the following data to menu items on the menu item line.

- NAME : Enter eight alphanumeric characters or less as a CODE name. The previous space is enabled (the effect of scroll down is enabled in DISPLAY).
- VALUE : Enter the value of CODE.
- USE : Determine whether it is used on the menu screen of TRACE (when an asterisk is specified, it can be used).

The CODE is used to define the code table, but it need not define all values. The number of values that the CODE can define is up to 256 per GROUP (2^8 for eight-channel GROUP). The total of values is 512 every GROUPs. Up to 50 values per GROUP of them can be used on the menu screen of TRACE. Figure 3-23 shows the example of CODE to be defined. For R47252A, defined CODE is enabled to GROUP "STATUS".

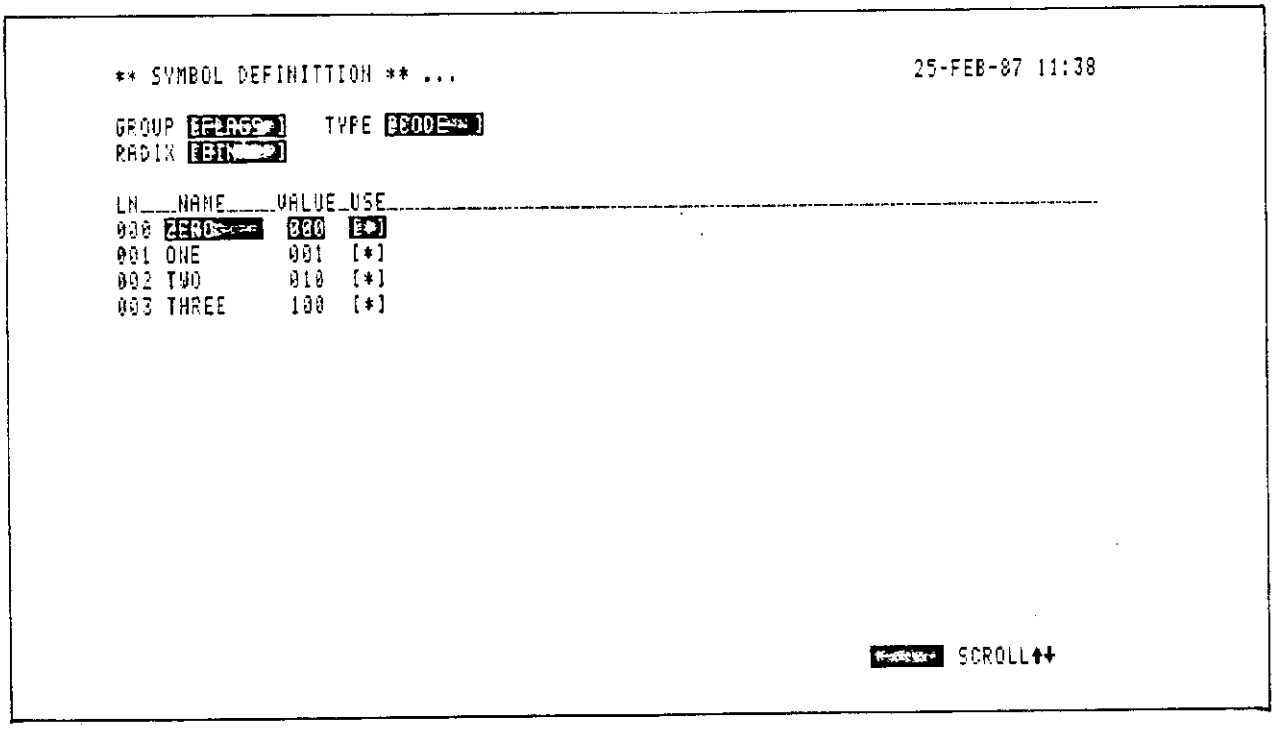


Figure 3 - 23 Example of CODE to be Defined

MEMO

4. HOW TO OPERATE AS S & T COMBINATION ANALYZER

4.1 Outline

This chapter explains how to operate the R47252A as a combination analyzer by combination of state and timing functions.

4.2 Test

When the S & T COMBINATION mode is selected on the COMBINATION OF MODULE screen in Figure 3-1, the state analysis part and timing analysis part can be operated simultaneously. When both analysis parts arms the trigger, the timing analysis part can be corresponded to the state analysis part. Figures 4-1 and 4-2 shows the trace screen and status to be executed in the (T→S) and (S→T) modes.

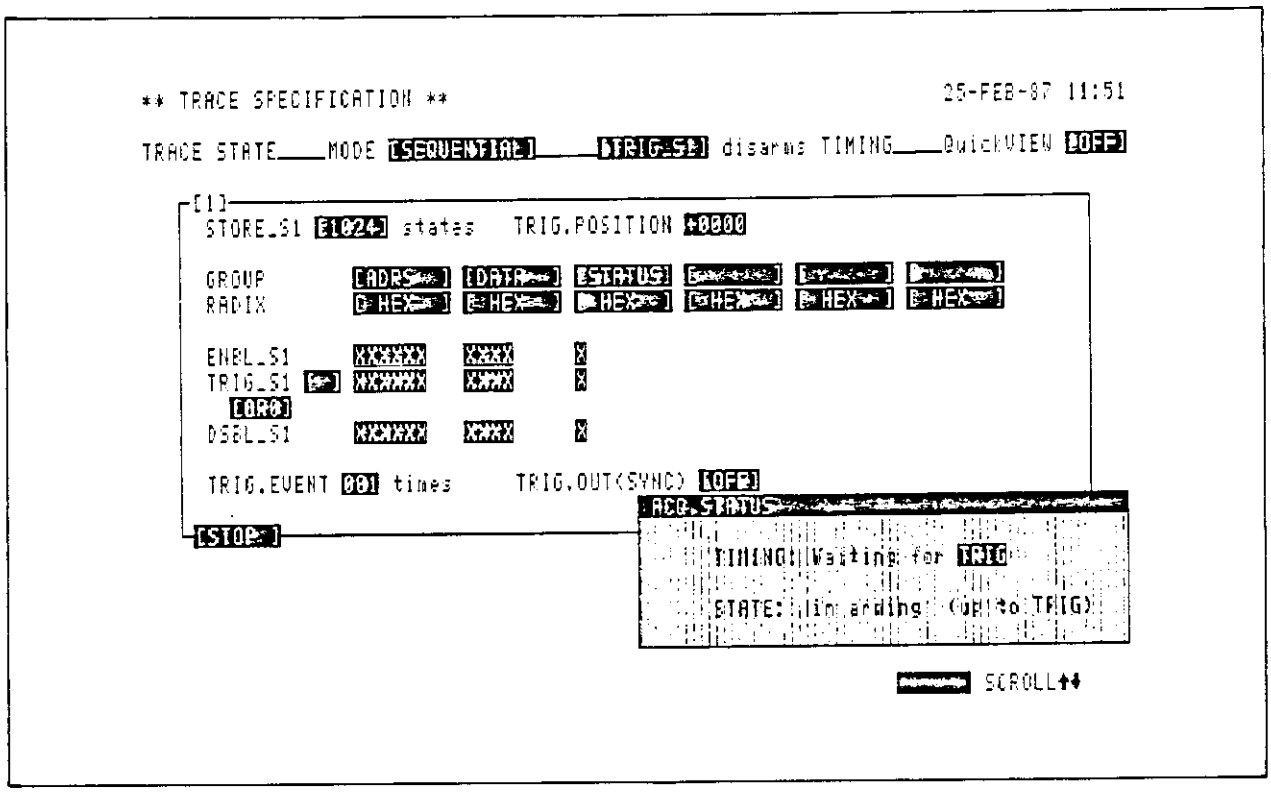


Figure 4 - 1 Screen and Status to be Executed in TRACE S & T (T→S) Mode

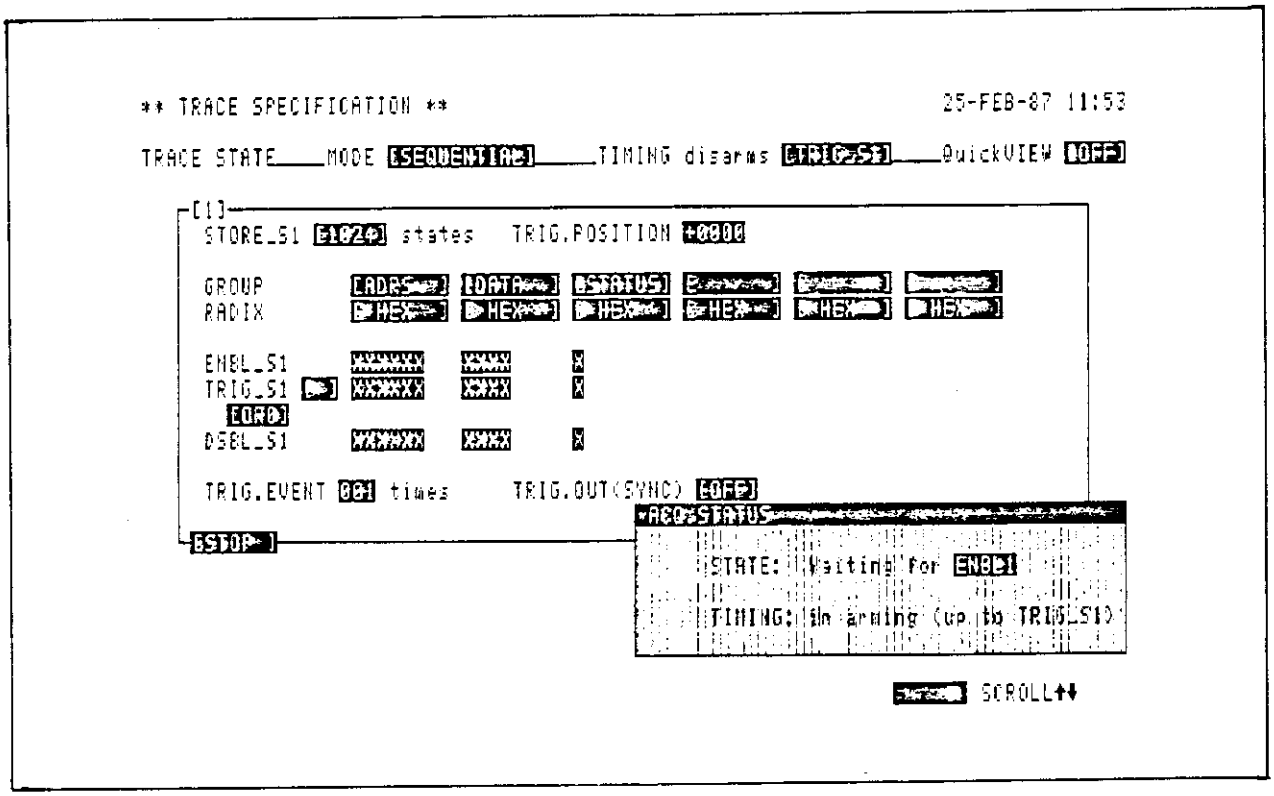


Figure 4 - 2 Screen and Status to be Executed in TRACE S & T (S→T) Mode

(1) Status of State Analysis Part

The following messages are displayed after "STATE".
The underline is displayed by normal blink.

- in arming (up to TRIG T)
  : This message indicates that the state analysis part (or the specific trace window condition) is arming.
  Under the arming state, ENBLn, TRIGn, and DSBLn are not detected. Arming is released by TRIG_T in the timing analysis part.
- waiting for ENBLn
  : This message is displayed while the state analysis part waits for data with ENBLn pattern. Under the arming state, ENBLn, TRIGn, and DSBLn are detected. The message is also displayed when the clock does not come from the microprocessor of SUT.
- waiting for TRIGn
  : This message is displayed when the state analysis part waits for data with TRIGn pattern.
- in delaying (STOREn)
  : This message is displayed when the trigger is detected and fetched data does not satisfy the number set to STOREn.

- acquisition ended
  : This message is displayed when the state analysis part ends the test.

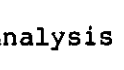
(2) Status of Timing Analysis Part

The following messages are displayed after "TIMING".
The underline is displayed by normal blink.

- in arming (up to TRIGn)
  : This message indicates that the timing analysis part is arming. Under the arming state, ENBL_T and TRIG_T are not detected.

Arming is released by TRIGn in the state analysis part.

- waiting for ENBL_T
  : This message is displayed when the timing analysis part waits for data with ENBL_T pattern.
- waiting for TRIG_T
  : This message is displayed when the timing analysis part waits for data with TRIG_T pattern.
- in delaying
  : This message is displayed when the trigger is detected and fetched data does not satisfies the size of acquisition memory (only when the low-speed clock is detected).
- acquisition ended
  : This message is displayed when the timing analysis part ends the test.

After all tests are ended, the DISPLAY menu screen of the state analysis part is automatically displayed in the TRACE STATE and TRACE S & T (S→T) modes. The DISPLAY menu screen of the timing analysis part is automatically displayed in the TRACE STATE and TRACE S & T (T→S) modes. When the key other than MENU key group and [STOP] is pressed during test, "ignored!" is displayed and entered key is ignored.
When the key in the MENU key group is pressed, the test is interrupted forcibly and "aborted!" is displayed. The screen is changed to specified menu screen.
When the [STOP] is pressed, the test is aborted similarly. Except message, "acquisition ended!" displayed in both cases, correct data is not displayed. The menu screen of state analysis part is changed to that of timing analysis part by 

.

4.3 Relation Between State Analysis Part and Timing Analysis Part

(1) For S & T (S→T) Mode

The TRACE S & T (S→T) mode sets TRIGn in [TRIGn] disarms TRIG_T (a default is TRIG1). "disarm" is to release the arming state. Under the arming state, no trigger is detected. Figure 4-3 shows the test process in the S & T (S→T) mode. In the figure, the detail of trigger condition (ENBL) is omitted. In Figure 4-3, the trigger condition is set together with the state analysis part and timing analysis part. The timing analysis part is in the arming state until previously-specified TRIGn (n = 1 to 4) is detected in the state analysis part. After the arming state is released, the trigger condition in the timing analysis part is enabled.

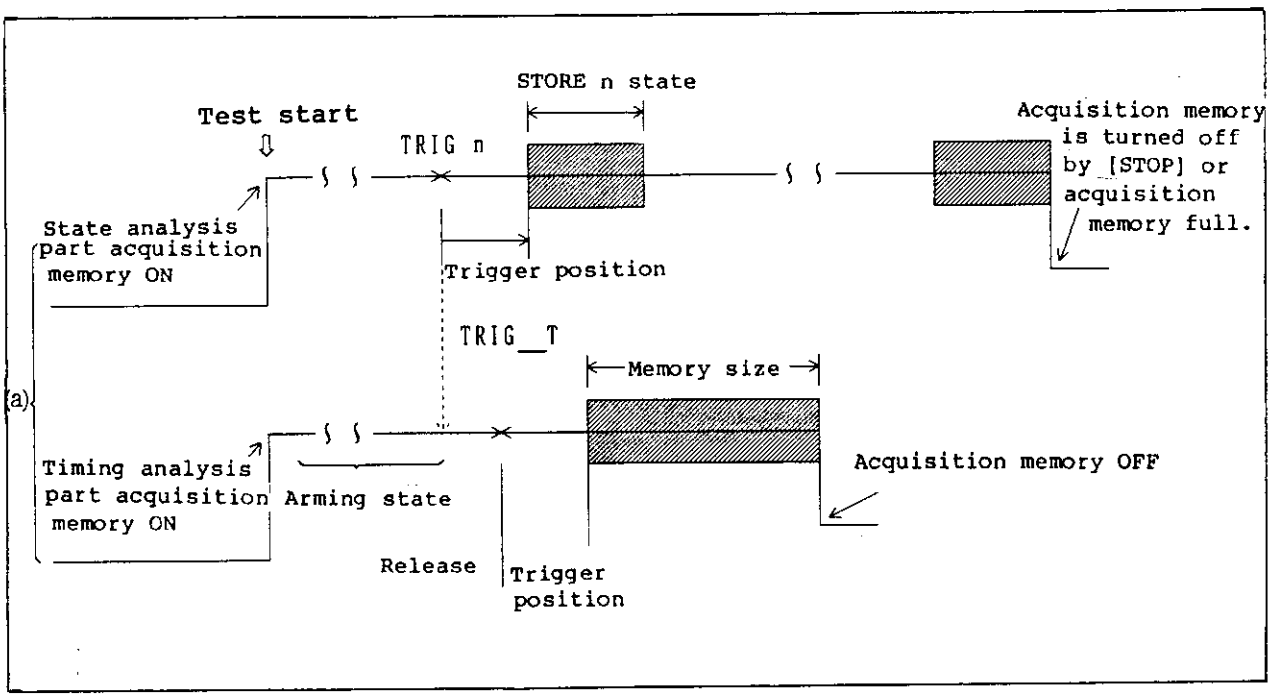


Figure 4 - 3 Test Process in TRACE S & T (S→T) Mode

(2) For S & T (T→S) Mode

The S & T (T→S) mode sets TRIGn in TRIG_T disarms [TRIG n] (a default is TRIG1). Figure 4-4 shows the test process in the S & T (T→S) mode. In the figure, the detail of trigger condition is omitted. In Figure 4-4, the trigger condition is set together with the state analysis part and timing analysis part. The trace window condition n in the state analysis part is under the arming state until TRIG_T is detected in the timing analysis part. The trace window condition earlier than trace window condition n is always executed.

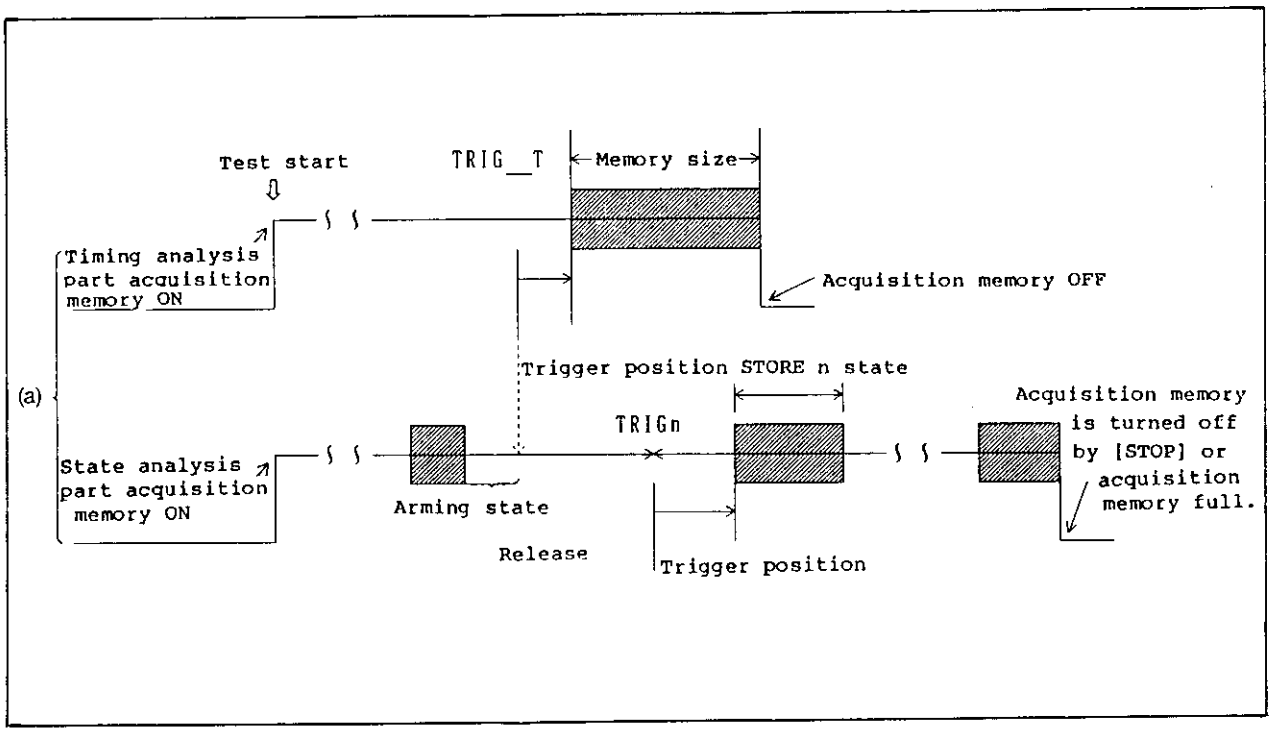
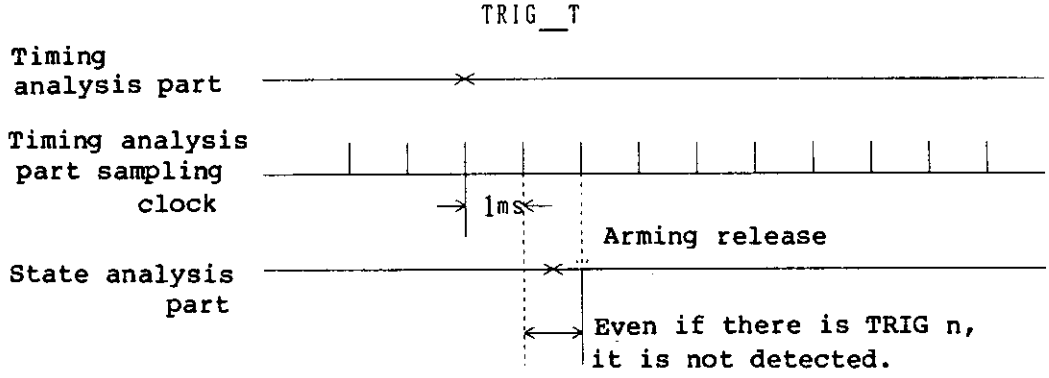


Figure 4 - 4 Test Process in TRACE S & T (T→S) Mode

NOTE

The R47252A judges whether data latched once by sampling clock is the trigger. After the trigger pattern is generated actually, note that the R47252A delays by up to one sampling clock to recognize it as a trigger. In the TRACE S & T (T→S) mode, operate the timing analysis part at slower sampling clock than the speed of the μP to be tested by state analysis part. When data fetched by (for example, 1-ms) state analysis part is tested, the operation of the μP cannot be tested correctly if the actual TRIG_T generation point does not correspond to the arming release point to the state analysis part. Be sure to set the sampling clock to the clock rate of the state analysis part or equivalent. The sampling clock of the state analysis part is always equivalent to the instruction cycle of the μP.



5. OPERATION CHECK

5.1 Testing the Microprocessor Probe

The R47252A uses the multiple-pin connector or cable for test, so a trouble such as contact error sometimes occurs. To avoid such error, the signal system can be checked easily.

① Install attached probe test adapter on the probe test connector on the rear panel of the TR4726.

② Connect the microprocessor probe to the probe test adapter to use the DIP plug cable or through the DIP IC package to use the DIP clip cable (see Figure 5-1).

③ Display the menu screen of CONFIG, set [COMBINATION].
Move the cursor by knob, and select STATE ANALYSIS ONLY. Press the SELECT key, change the screen to [SET UP] screen, and press the DEFAULT □ .

④ Change the screen to the menu screen of TRACE, and press the DEFAULT □ .

⑤ Press the [RUN] , and start to check.

⑥ If the screen is the same as Figure 5-2, the normal operation of the R47252A can be checked.

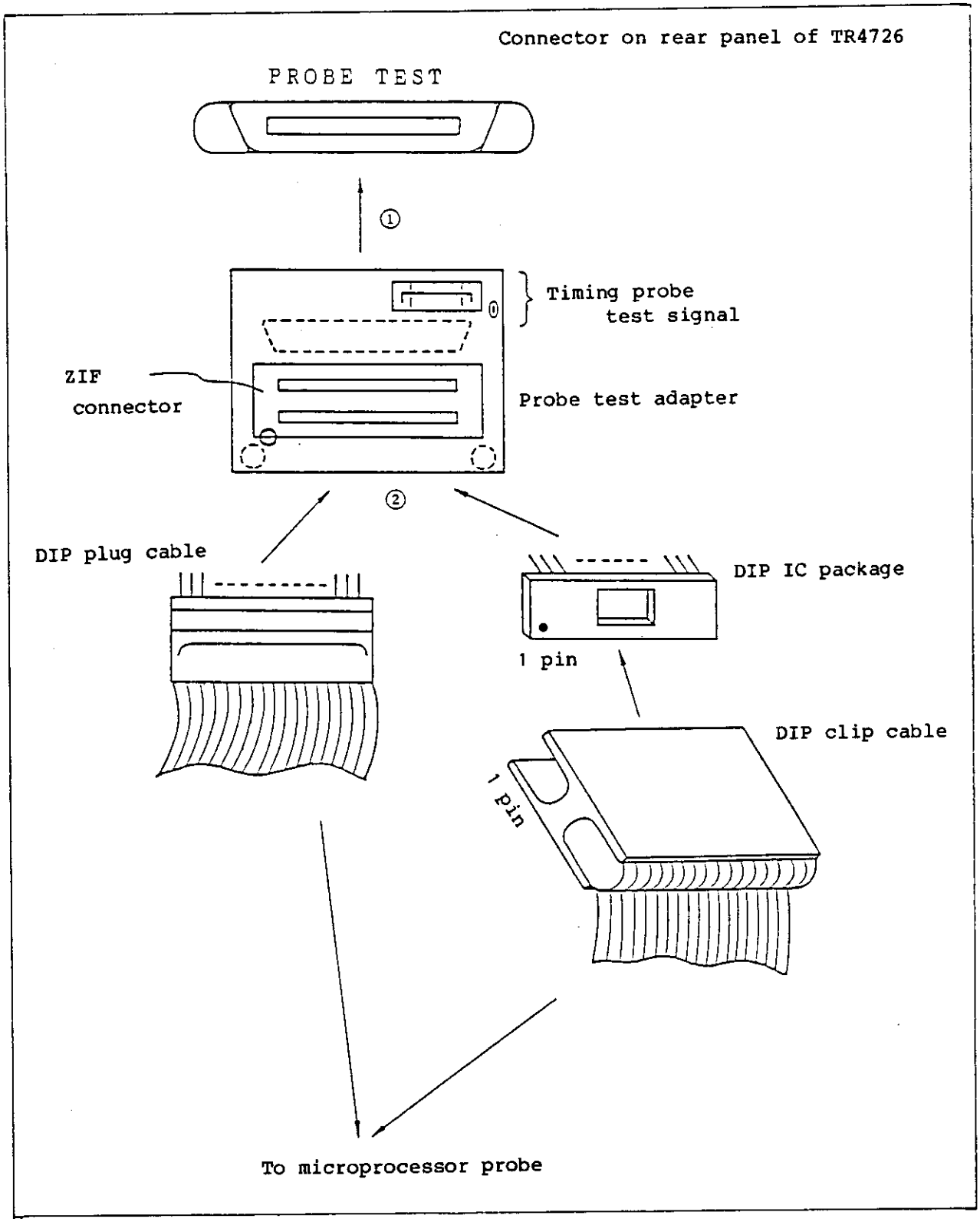


Figure 5 - 1 Connection for Probe Test

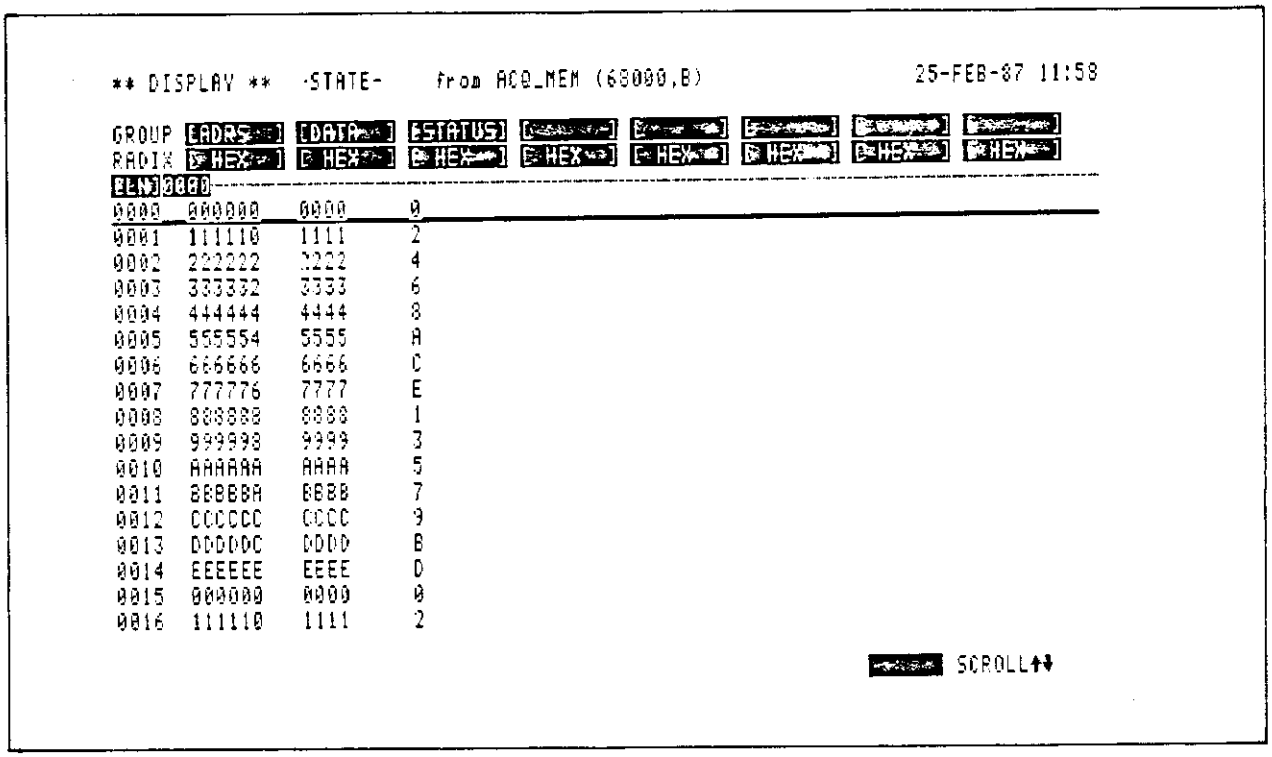


Figure 5 - 2 Result of Microprocessor Probe Test

MEMO

6. NOTES ON STORAGE AND TRANSPORTATION OF R47252A

6.1 Storing the R47252A

The range of temperatures under which the R47252A is stored is -10℃ to +60℃. When the R47252A is not used for a long term, it must be stored in dry place without direct sunlight (the board is inserted into the conductive case attached). Please note that the range of temperatures under which the floppy disk is +10℃ to 60℃.

6.2 Transportation for R47252A

To transport the R47252A, use firstly-delivered packing material. If packing material is already lost, pack the R47252A as follows.

Procedure

① Cover the R47252A with vinyl.

② Use the cardboard case whose width is 5 mm or more, and set cushioning material more than 50 mm inside to fix the R47252A.

③ After covering the R47252A, insert accessories, re-insert cushioning material, close the cardboard, and fix the board by packing string.

7. SPECIFICATION

7.1 Input Specification

Applicable microprocessor
: Motorola's MC68000L, MC68000CL, MC68000AL, MC68000G, MC68000CG (4/6/8/10/12.5 MHz), MC68010L, MC68010CL, MC68010G (8/10/12.5 MHz)
Tomson's EF68000C, EF68000 CV (16 MHz) and equivalent

Microprocessor clock frequency
: As specified in system under test (SUT).

Input current
: -200 µA max. (low level)
20 µA max. (high level)

Microprocessor status display
: Displayed by LED on the microprocessor probe.
CLK, RESET, INTR, DTACK/VPA, BEEP/HALT, and BR/BGACK

Personality kit operation mode
: 1. Bus sample mode ; Fetches data on 68000/68010 bus.
2. Queue sample mode; Fetches data on the bus at timing synchronized with the internal queue of 68000/68010.

Logical polarity
: + or -

Input group : Defined by collecting data enter channel.

Input group name
: Six alphanumeric characters or less

Input group number
: Up to six groups. Three groups are already defined (ADRS, DATA, and STATUS).

7.2 Display Specification

Display data source
: Acquisition memory, reference memory, file

Display item
: Up to eight items

Input group display order
: The input group can be displayed at proper order by selecting the enter group name.
The same input group can be duplicated. The specific input group displayed can be erased.

Display system
: Bus sample mode is displayed.
The S-by-S is displayed in the queue sample mode and the PACKED is displayed.
A state is displayed by one of binary, octal, decimal, hexadecimal, symbol, code, ASCII code, or 68000/68010 mnemonic (only data).

Transfer between memory
: Display data is transferred to reference memory. Data for reference memory is displayed. Data for acquisition memory is displayed.

Data scroll : Vertical scroll is enabled by scroll knob. The vertical scroll per page is enabled by page scroll key.

Special display
: Trigger is displayed for trigger. The memory division boundary is displayed between trace windows.

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(3) You may not reverse engineer, de-compile, or disassemble, all or any part of, the SOFTWARE.

Liability

Advantest shall have no liability (1) for any PRODUCT failures, which may arise out of any misuse (misuse is deemed to be use of the SOFTWARE for purposes other than it's intended use) of the SOFTWARE. (2) For any dispute between you and any third party for any reason whatsoever including, but not limited to, infringement of intellectual property rights.

LIMITED WARRANTY

1. Unless otherwise specifically agreed by Seller and Purchaser in writing, Advantest will warrant to the Purchaser that during the Warranty Period this Product (other than consumables included in the Product) will be free from defects in material and workmanship and shall conform to the specifications set forth in this Operation Manual.

2. The warranty period for the Product (the "Warranty Period") will be a period of one year commencing on the delivery date of the Product.

3. If the Product is found to be defective during the Warranty Period, Advantest will, at its option and in its sole and absolute discretion, either (a) repair the defective Product or part or component thereof or (b) replace the defective Product or part or component thereof, in either case at Advantest's sole cost and expense.

4. This limited warranty will not apply to defects or damage to the Product or any part or component thereof resulting from any of the following:

   (a) any modifications, maintenance or repairs other than modifications, maintenance or repairs (i) performed by Advantest or (ii) specifically recommended or authorized by Advantest and performed in accordance with Advantest 's instructions;

   (b) any improper or inadequate handling, carriage or storage of the Product by the Purchaser or any third party (other than Advantest or its agents);

   (c) use of the Product under operating conditions or environments different than those specified in the Operation Manual or recommended by Advantest, including, without limitation, (i) instances where the Product has been subjected to physical stress or electrical voltage exceeding the permissible range and (ii) instances where the corrosion of electrical circuits or other deterioration was accelerated by exposure to corrosive gases or dusty environments;

   (d) use of the Product in connection with software, interfaces, products or parts other than software, interfaces, products or parts supplied or recommended by Advantest;

   (e) incorporation in the Product of any parts or components (i) provided by Purchaser or (ii) provided by a third party at the request or direction of Purchaser or due to specifications or designs supplied by Purchaser (including, without limitation, any degradation in performance of such parts or components);

   (f) Advantest's incorporation or use of any specifications or designs supplied by Purchaser;

   (g) the occurrence of an event of force majeure, including, without limitation, fire, explosion, geological change, storm, flood, earthquake, tidal wave, lightning or act of war; or

   (h) any negligent act or omission of the Purchaser or any third party other than Advantest.

5. **EXCEPT TO THE EXTENT EXPRESSLY PROVIDED HEREIN, ADVANTEST HEREBY EXPRESSLY DISCLAIMS, AND THE PURCHASER HEREBY WAIVES, ALL WARRANTIES, WHETHER EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, (A) ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND (B) ANY WARRANTY OR REPRESENTATION AS TO THE VALIDITY, SCOPE, EFFECTIVENESS OR USEFULNESS OF ANY TECHNOLOGY OR ANY INVENTION.**

6. **THE REMEDY SET FORTH HEREIN SHALL BE THE SOLE AND EXCLUSIVE REMEDY OF THE PURCHASER FOR BREACH OF WARRANTY WITH RESPECT TO THE PRODUCT.**

7. **ADVANTEST WILL NOT HAVE ANY LIABILITY TO THE PURCHASER FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, INCLUDING, WITHOUT LIMITATION, LOSS OF ANTICIPATED PROFITS OR REVENUES, IN ANY AND ALL CIRCUMSTANCES, EVEN IF ADVANTEST HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES AND WHETHER ARISING OUT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE. TORT (INCLUDING, WITHOUT LIMITATION, NEGLIGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE.**

8. **OTHER THAN THE REMEDY FOR THE BREACH OF WARRANTY SET FORTH HEREIN, ADVANTEST SHALL NOT BE LIABLE FOR, AND HEREBY DISCLAIMS TO THE FULLEST EXTENT PERMITTED BY LAW ANY LIABILITY FOR, DAMAGES FOR PRODUCT FAILURE OR DEFECT, WHETHER ARISING OUT OF BREACH OF CONTRACT, TORT (INCLUDING, WITHOUT LIMITATION, NEGLEGENCE), STRICT LIABILITY, INDEMNITY, CONTRIBUTION OR OTHERWISE.**

CUSTOMER SERVICE DESCRIPTION

In order to maintain safe and trouble-free operation of the Product and to prevent the incurrence of unnecessary costs and expenses, Advantest recommends a regular preventive maintenance program under its maintenance agreement.

Advantest's maintenance agreement provides the Purchaser on-site and off-site maintenance, parts, maintenance machinery, regular inspections, and telephone support and will last a maximum of ten years from the date the delivery of the Product. For specific details of the services provided under the maintenance agreement, please contact the nearest Advantest office listed at the end of this Operation Manual or Advantest 's sales representatives.

Some of the components and parts of this Product have a limited operating life (such as, electrical and mechanical parts, fan motors, unit power supply, etc.). Accordingly, these components and parts will have to be replaced on a periodic basis. If the operating life of a component or part has expired and such component or part has not been replaced, there is a possibility that the Product will not perform properly. Additionally, if the operating life of a component or part has expired and continued use of such component or part damages the Product, the Product may not be repairable. Please contact the nearest Advantest office listed at the end of this Operation Manual or Advantest's sales representatives to determine the operating life of a specific component or part, as the operating life may vary depending on various factors such as operating condition and usage environment.

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