ADVANTEST®

ADVANTEST CORPORATION

INSTRUCTION MANUAL

R47250A

Personality Kit

MANUAL NUMBER 47250A OEA 706

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1. INTRODUCTION

1.1 HOW TO USE THIS OPERATION MANUAL

The R47250A is a plug-in device mounted on the TR4726 logic analyzer body (opt06: synchronous analysis module used at the same time) for state analysis. By combining with an optional timing analysis module, it can take any of the following three forms:

(1) Timing-only analyzer
(2) State analyzer
(3) S&T (state and timing) analyzer

This operation manual mainly deals with operations of the state analyzer. For the operation of the TR4726 body, refer to TR4726 Logic Analyzer Instruction Manual.

1.2 OUTLINE OF PRODUCT

The R47250A is a plug-in device mounted on the TR4726 logic analyzer body for performing state analysis.

This personality kit, with its general-purpose, versatile functions, can meet the requirements of a given machine including a microcomputer system and minicomputer system.

Main features of this personality kit are as follows:

(1) It has a total of 64 input channels including 48 data input channels and 16 clock input channels. Further, each input channel has a high input impedance of 1 MΩ enabling wide applications.

(2) Sampling clocks can be generated as required freely by combining 4 clock input channels and 12 clock qualifier input channels. Further, the clock input channels can take in a maximum of 500 MHz clocks to generate sampling clocks of a maximum of 20 MHz.

(3) When analysing measurement data or setting measurement conditions, symbols or codes may be used, thus improving the state analysis efficiency.

(4) In setting tracing conditions, the availability of many trace window conditions and a memory division function (storage function) enables complex application requirements to be met.

(5) A sophisticated user interface including a menu system and disk operation is possible without being conscious of the disk enables labor-saving, standardized and automated measurement.

(6) Most of the system software is provided by the system disk attached to the personality kit, and therefore the functions and performance are improved with the new version of the system disk.

1.3 BEFORE STARTING TO USE

1.3.1 Appearance and Component Check

Upon receiving the R47250A, first check the product apperance then check for any damage of flaw that may have been caused during transportation.

Then, with reference to the table below, check the component parts, their quantities and specifications. If any flaw, damage of shortage of a component part is found, please notify your nearest ADVANTEST's representative.

Locations and telephone numbers of branch offices are given at the end of this booklet.

Item	Model	Q'ty	
Personality board		2	
Data acquisition probe A	TR14701-01	1	
Data acquisition probe B	TR14701-02	1	
Data acquisition probe C	TR14701-03	1	
Clock/qualifier probe D	TR14701-04	1	
Probe hook	A04701-01	8	Each set of ten, 80 units in total
Probe test adaptor		1	
System software package		1	
Blank disk	MF-2DD	1	
Disk case		1	
Small item cases		1	
Instruction manual		1	

2. PREPARATIONS FOR MEASUREMENT AND BACKGROUND KNOWLEDGE

2.1 OBJECT OF THIS CHAPTER

Be sure to read this chapter before operating the kit. The chapter explains how preparatory work is to be done for meaurement and gives background knowledge necessary for operation. Proceed with operating steps according to the instructions, and the contents will be understood automatically. Keep the kit at hand while reading this booklet.

2.2 HOW TO MOUNT PERSONALITY BOARD

Mount the personality board according to the steps specified below.

① Check that power is off.
② Take off the plus screw (3 mm) on the upper cover of the body, and remove the upper cover.
③ If another personality board is mounted, take it off. Marks "1" and "2" are attached to the slots of the personality board. (See Figure 2-1)
④ Mount in slot "1" the personality board with a card injector marked with "1".
⑤ In slot "2", mount the personality board with a card injector marked with "2". Then, connect the 50-pin flat cable to the connector at the center of the board.
⑥ Screw the upper cover in position.

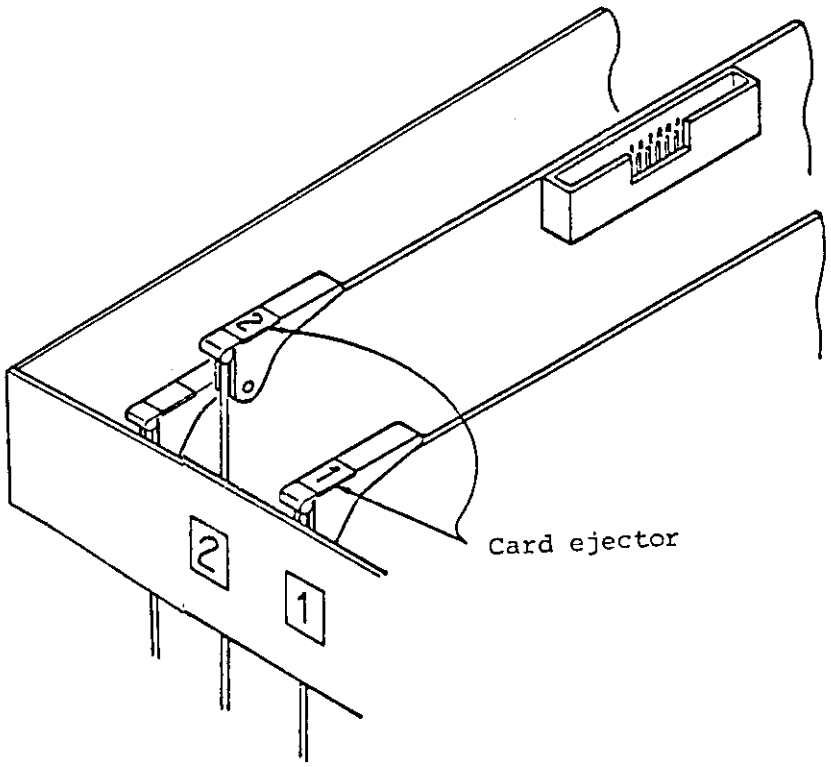


Figure 2-1 How to Mount the Personality Boards

2.3 CONNECTION OF MEASURED SYSTEM AND PROBE

2.3.1 Connection of Probe A/B/C/D

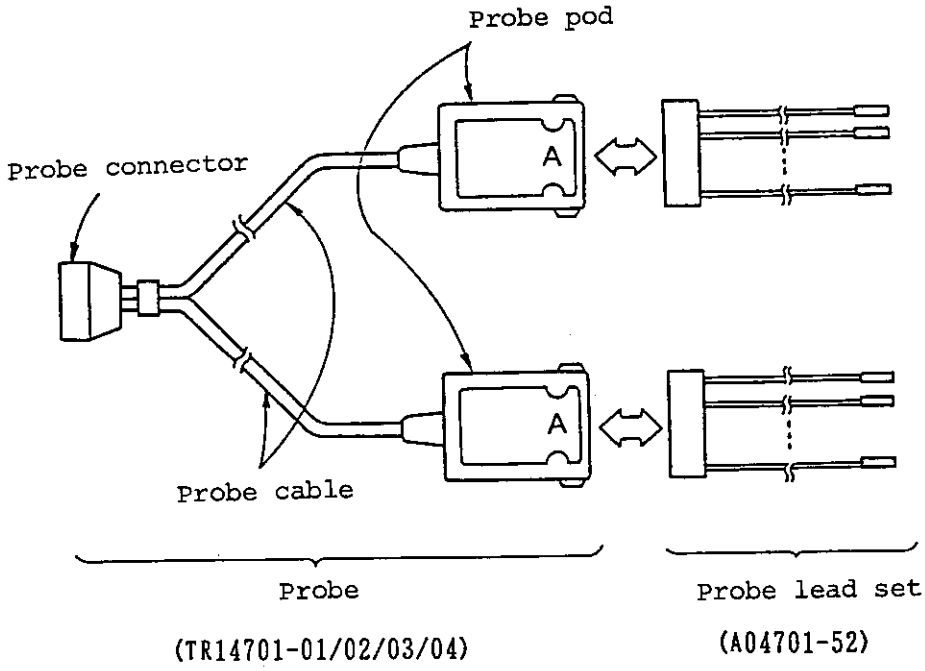
This personality kit has four types of probes for connecting to a system to be measured (system under test, called "SUT").

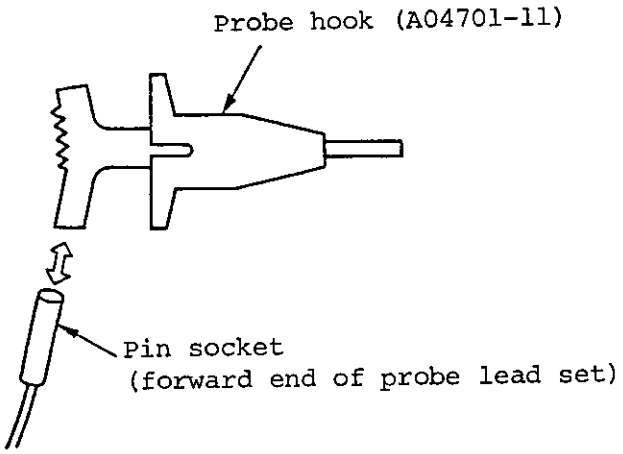
There are the following three types of probes for handling the SUT data signal: data acquisition probe A (TR14701-01: called "data probe A" or simply "probe A"), data acquisition probe B (TR14701-02), and data acquisition probe C (TR14701-03). Each probe can handle data of 16 channels. Probe D handles the SUT data signal (TR14701-04: called "clock probe D" or simply "probe D"). The clock probe D can handle a maximum of 4-channel clock signals and a maximum of 12-channel clock qualifier signals.

This section deals with the physical connection of the probes.

The style of probes A/B/C/D and the names of their parts are shown in Figure 2-2.

This personality kit has a probe lead set with pin socket and a probe hook as standard equipment.





⇔ The arrow indicates removability.

Figure 2-2 Styles and Nomenclature of Probes A/B/C/D

(1) Connection of probes A/B/C/D and body
The probe connector for the probes A/B/C/D has an "up" mark attached as shown in Figure 2-3. Insert into the probe slots at the rear of the body with this mark facing up (as probe A in probe slot A). This connector has a locking function with screw.

CAUTION

Before connecting probes A/B/C/D, be sure to turn off the body power.

(2) Connection of probes A/B/C/D and SUT
SUT is usually connected to the circuit through an attached probe hook. Insert the probe hook into the pin socket at the forward end of the probe lead set.

If there is a pin suitable for the pin socket in the circuit, it may be connected directly with the pin socket. The model and size of the pin socket are shown below.

Maker	Model	Applicable size
AUGAT	LSG-2BG2-1	0.51 mm to 0.76 mm

In addition, probe lead set is available as an accessory, which can be soldered or can connect 8 or 16 channels in a lump using a connector.

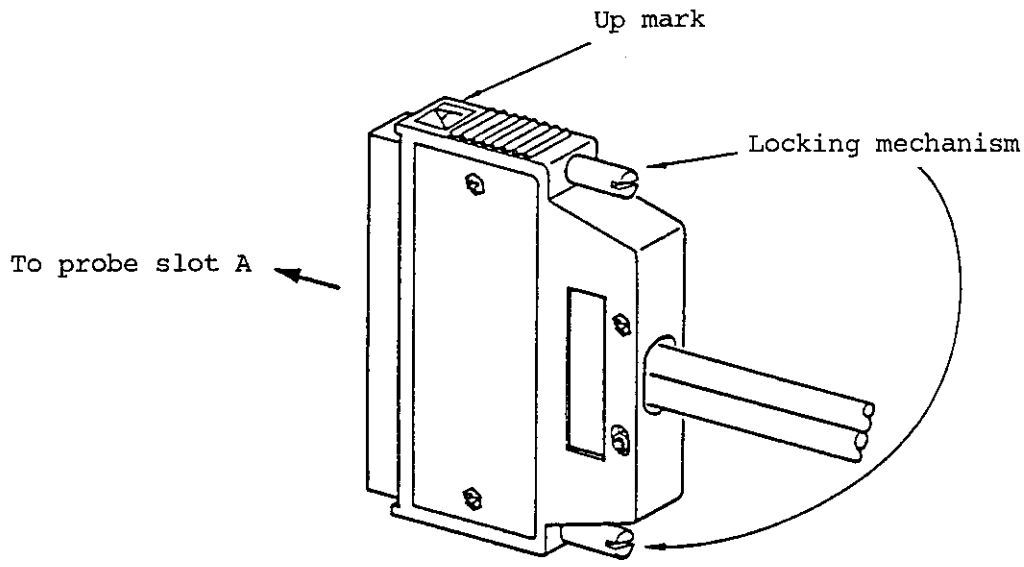


Figure 2-3 Probe Connector Connection (For Probe A: Same Form as Others)

3. BASIC MEASUREMENT OPERATION

3.1 GENERAL

This section explains the basic measurement operation using the TR4726 logic analyzer as a state analyzer.

3.2 CONFIGURATION OF MENU SCREEN

The TR4726 logic analyzer uses an operational method based on the menu system.

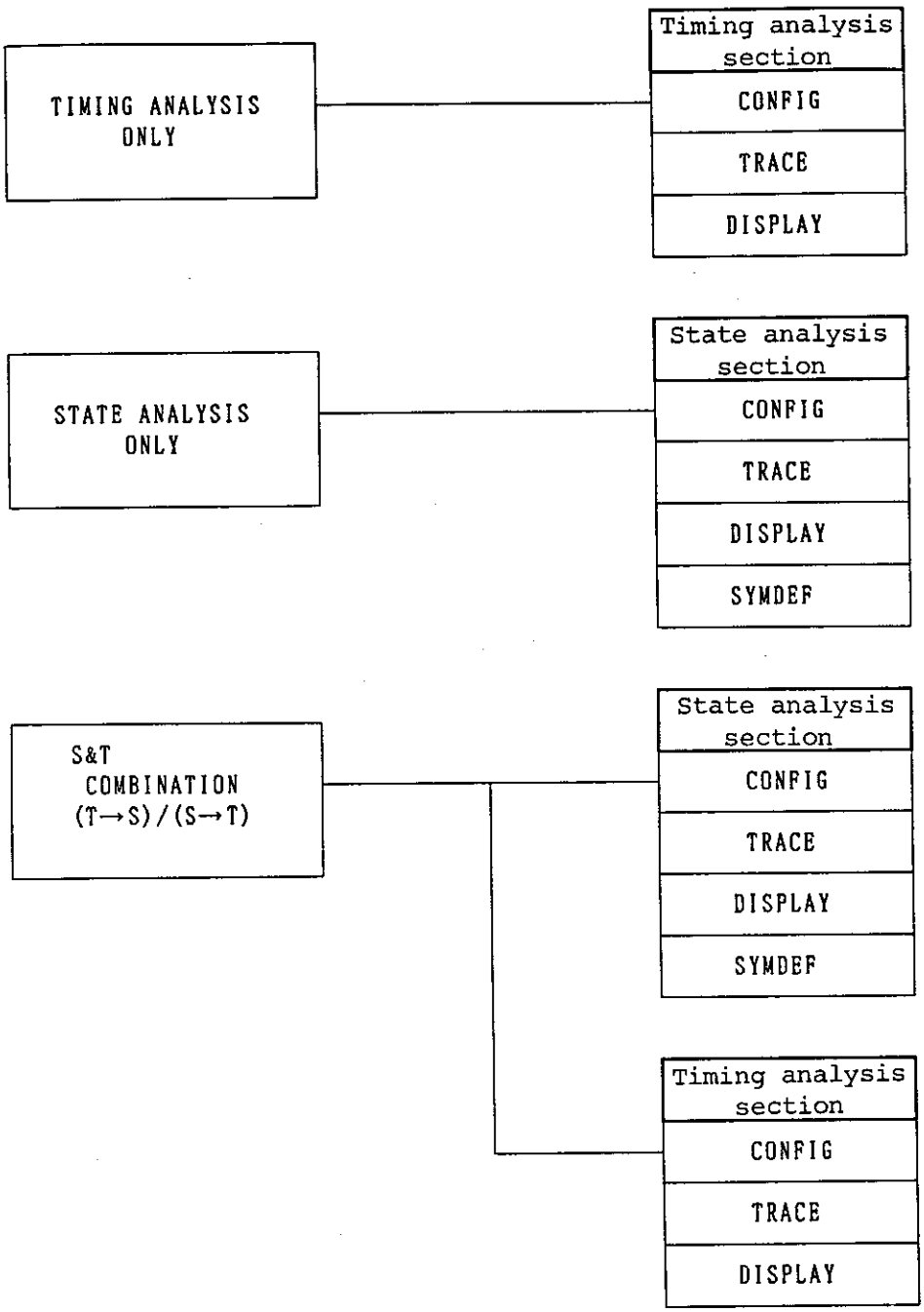
A screen having one or more related menu items is called a menu screen.

Insert the system disk into a floppy disk drive of the TR4726 body, and set up the body. A menu screen as shown in Figure 3-1 is displayed.

(1) TIMING ANALYSIS ONLY: Use the timing analysis section only
(2) START ANALYSIS ONLY : Use the state analysis section only
(3) S&T COMBINATION : Use the state analysis and timing analysis sections together

Select an operating mode by moving the cursor with the knob. Depress the SELECT key, and the SETUP screen is displayed.

The menu screen for each mode is configured as shown below.



The menu screens for state and timing analysis sections in S&T COMBINATION mode can be switched by STATE / TIMING key of the MENU key group.

The menu screen for the state analysis section is described in the next section, and the S&T COMBINATION mode in Section 4.

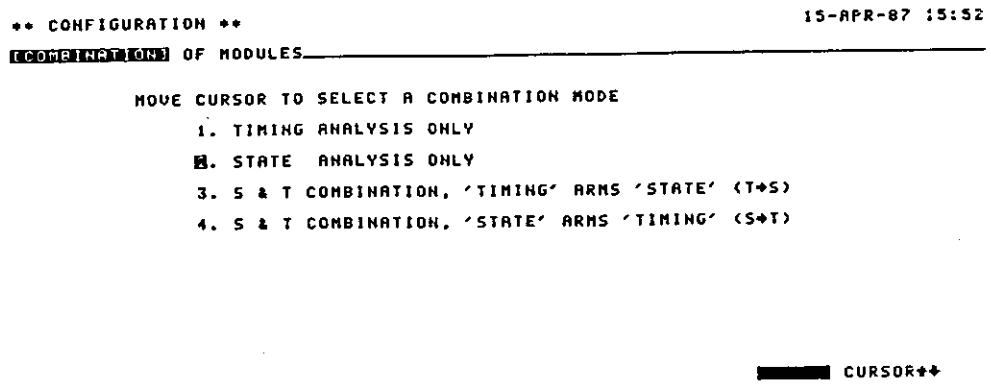


Figure 3-1 Set-up Menu Screen

3.3 CONFIGURATION OF INPUT CHANNELS (CONFIG FUNCTION)

3.3.1 General-purpose CONFIG Menu Screen

In R47250A, the object measured by the state analysis section is not limited; it is adaptable to any digital system as long as it meets specifications.

CONFIG is a function for determining the "configuration" of the input parts of TR4726 on which the present personality kit is mounted.

The physical connection of the probe and the measured system was explained in Section 2.3. This section, however, will outline the CONFIG function for derternining how the level of an electrical signal applied from the probes is changed for sampling and converted into logic data which is easy to handle.

The menu screen of the state analysis section related to this personality kit comprises a section in which data input of a maximum of 48 channels are divided into several parts for group definition (configuration of data input channels), and a section in which sampling clocks are defined by a maximum of 16 channels of external clock input to sample only the required data (configuration of clock input channels).

The group definition screen and the sampling clock definition screen can be scrolled continuously by turning the scroll knob while the knob key is set to SCROLL ↑ ↓ .

(1) Configuration of data input channel
An initial menu screen for data input channel configuration is shown in Figure 3-2. This drawing indicates that the data input signal applied from data probe A/B/C is handled as data of a designated group after a designated threshold. In other words, an electrical signal of 48 channels having physical names of PRB_CF to PRB_CO, PRB_BF to PRB BO and PRB_AF to PRB_AO are converted into data having a logic name (group name).

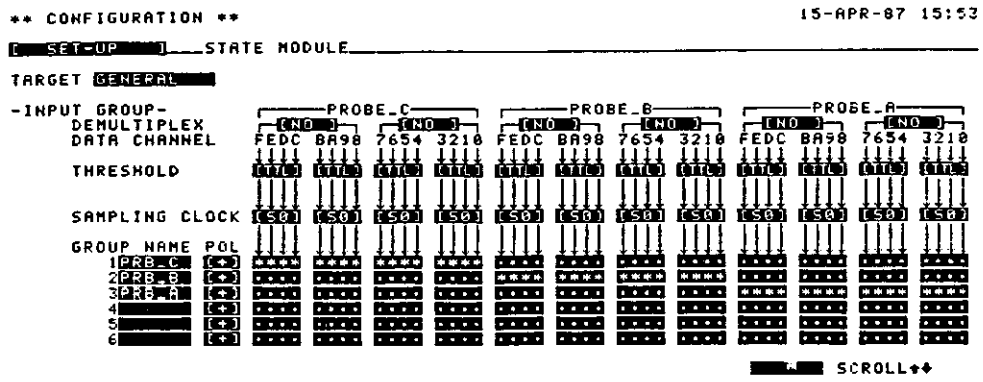


Figure 3-2 Initial Menu Screen of Data Input Channel Configudration

Data that can be set is as folows:

- o TARGET : This menu item relates to the whole configuration of input channels. The object of measurement under the current setting is given in ten or fewer alphanumeric characters. Normally this description is displyed on the right of the center of the uppermost line on the menu screen.
  GENERAL in the initial data indicates a general-purpose personality kit.
- o DEMULTIPLEX: When the data input channel is used in time-division multiplex mode, designate YES, and the data may be separated in PK. Demultiplex may be designated for each probe pod, so that data of four to eight lower channels can be obtained. An example is shown in Figure 3-3. In this example, 16-bit input signal applied from the probe C/D is separated by two sampling clocks, S0 and S1, and changed into data having the group names of ADDRESS and DATA respectively.

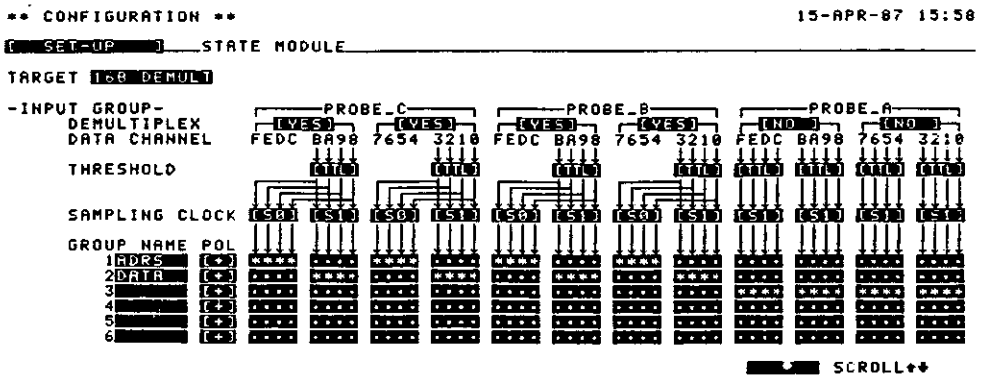


Figure 3-3 Setting Example of Demultiplex

- o THRESHOLD : A threshold voltage is selected from TTL (approximately 1.4 V), ECL (approximately -1.3 V), V1 and V2. V1 and V2 may be set freely in 100 mV steps within the range from -12.7 V to +12.7 V. (In the menu screen of the clock input channel configuration) the threshold voltage may be set each four cahnnels of data input.
- o SAMPLING CLOCK: Selected from a maximum of six sampling clocks, including S0 to S5, created on the menu screen of clock input channel configuration. Invalid clocks are not included for selection.
- o POL : The polarity for handling a signal is designated by "+" or "-".
- o GROUP : A unit for handling several data input channels collectively is defined as a group.
  First a group name is defined with a maximum of six alphanumeric characters. Then, a data input channel under the particular group is designated by applying the mark "*". A maximum of six groups may be designated.
  For initialization, PRB_C, PRB_B and PRB_A are defined as group names corresponding to data probe C, data probe B and data probe A respectively. The groups thus defined are used in other menu screens.

(2) Configuration of clock input channels
An initial menu screen for configuration of the clock input channels is shown in Figure 3-4 (a) and (b). This menu screen is used to prepare a maximum of six sampling clocks (S0 to S5) and a master clock (MK) from a 4-channel clock input (K3 to K0) and 12-channel clock qualifier input (QB to Q0).

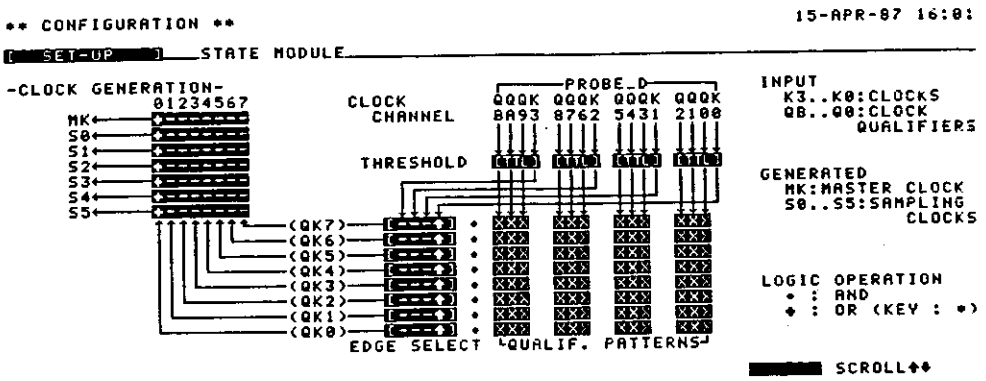


Figure 3-4 (a) Initial Menu Screen of Clock Input Channel Configuration

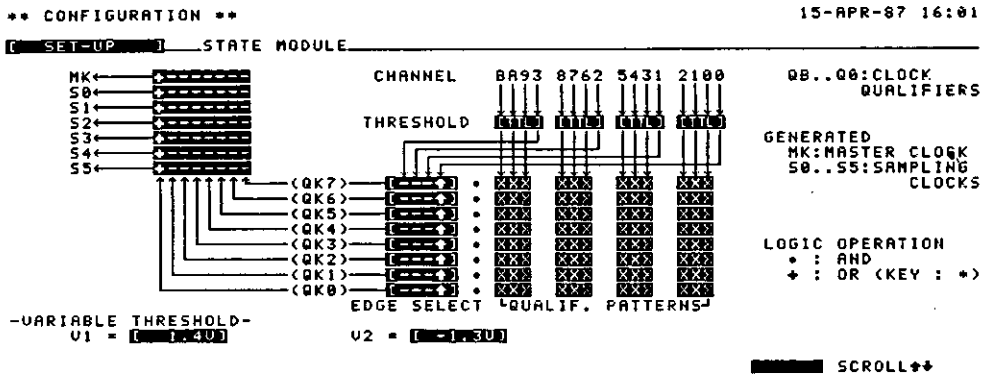


Figure 3-4 (b) Setting Screen of Threshold Voltage

The data that can be set are as follows:

o THRESHOLD : A threshold voltage is selected from TTL (approximately 1.4 V), ECL (approximately -1.3 V), V1 and V2.
V1 and V2 can be set as desired in 100 mV steps in the range from -12.7 V to +12.7 V.
The threshold voltage can be set with a channel of clock input and three channels of clock qualifier input.

o EDGE SELECT : A rise edge or fall edge of a required clock input may be designated out of K3 to K0 as a select edge. ↑ indicates a rise edge, and ↓ , a fall edge.

- o QUALIF. PATTERNS : A 12-bit pattern for designating a valid or invalid select edge may be prepared by the 12-channel clock qualifier input QB to Q0. Each pattern element assumes any of the values X (don't care), 1 and 0. X indicates that "valid" or "invalid" designation is impossible with the qualifier input involved. The validity or invalidity of a select edge may be designated by positive logic for 1 and a negative logic for 0.
- o CLOCK GENERATION : Sampling clocks S0 to S5 may be prepared by using logically ORing qualified clocks QK7 to QK0 which were prepared by clock input and clock qualifier input. The coupling is completed by inputting a given number (from 1 to 8) of marks "+" at positions covered by the qualified clocks used.
  The master clock may be prepared similarly. The master clock is such that data sampled with the sampling clock are collectively applied to the internal data bus of the system. The master clock must be delayed behind or occur at the same time as a given sampling clock.
- o VARIABLE THRESHOLD: V1 and V2, variable threshold voltages, can be set in 100 mV steps in the range from -12.7 V to +12.7 V.

The process of creating clocks by combining menu items as mentioned above is summarized below.

(1) The clock input (K0 to K3), together with a maximum of qualifier patterns (QP0 to QP7) prepared by the clock qualifier input (Q0 to Q8), is applied to AND gate to prepare a maximum of eight qualified clocks (QK0 to QK7).

$$QK0 = K\ell\uparrow\downarrow \cdot QP0$$
$$\vdots$$
$$QK7 = Km\uparrow\downarrow \cdot QP7 \quad (\ell, m \ldots\ldots = 0 \text{ to } 3)$$

Where the arrows indicate clock edge selection, and "·" the AND logic.

(2) A maximum of eight qualified clocks in (1) are applied to OR gate to prepare a maximum of six sampling clocks (S0 to S5).

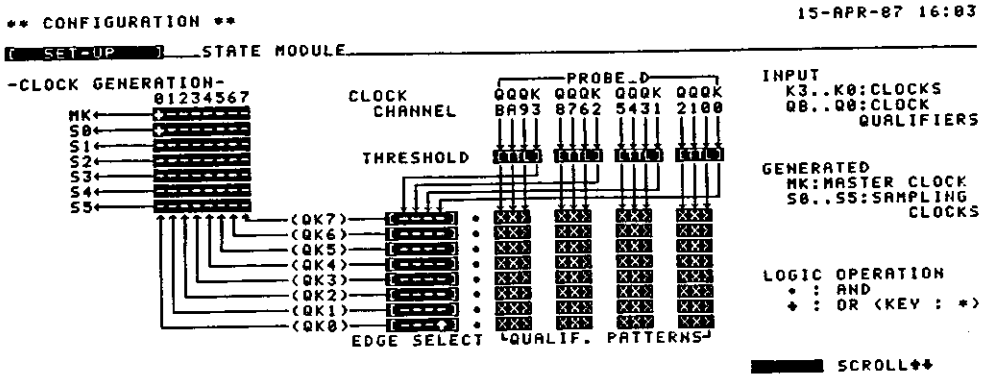
$$S0 = QKa + QKb + \ldots\ldots\ldots + QKc$$
$$\vdots$$
$$S5 = QKd + Qke + \ldots\ldots\ldots + QKf$$
$$(a, b, c, d, e, f, \ldots\ldots = 0 \text{ to } 7)$$

Where "+" indicated the OR logic.

(3) The master clock (MK) is obtained similarly.

MK = QKx + QKy + ... QKz
(x, y, z, ... = 0 to 7)

Examples of clock generation are shown in Figures 3-5 to 3-9.



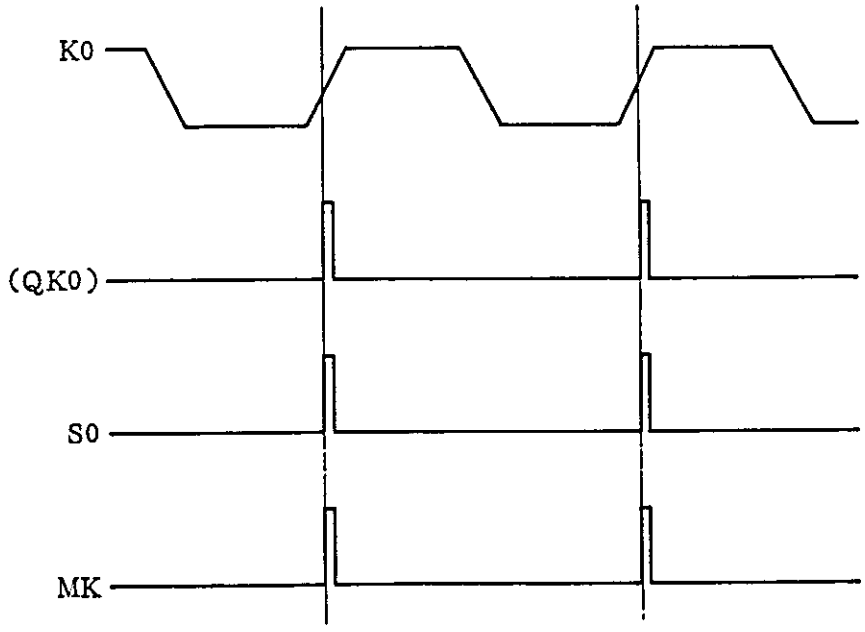
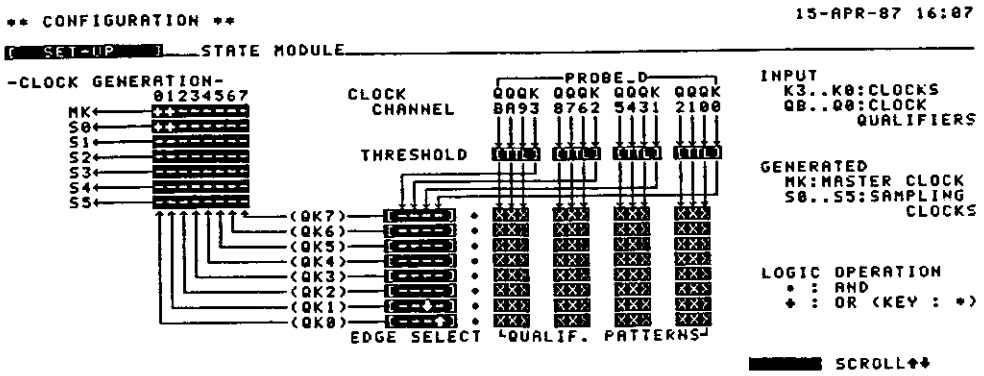


Figure 3-5 Example of Data Sampling at All Leading Edges of a Single Clock (Applied from K0)



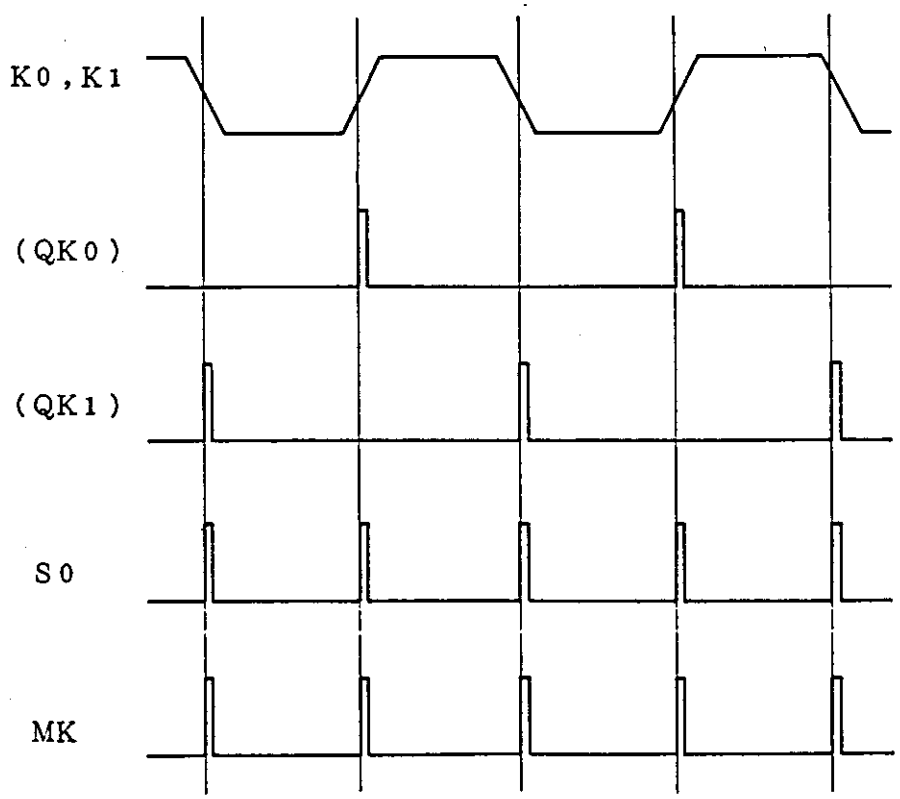
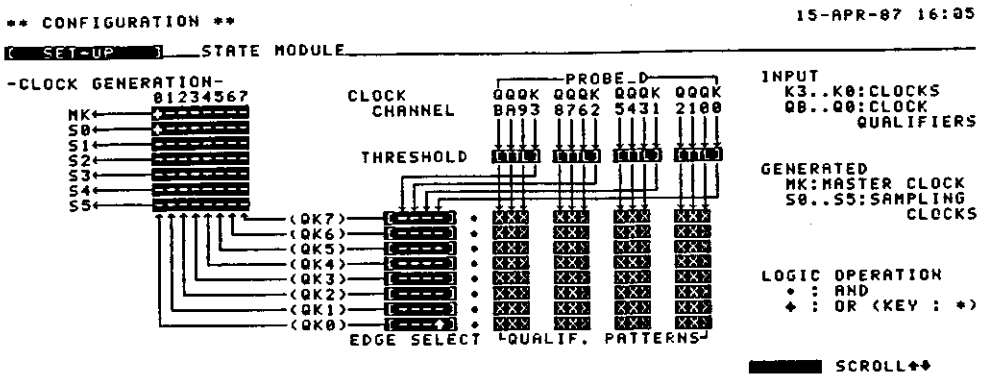


Figure 3-6 Example of Data Input Sampling at All Leading and Trailing Edges of a Single Clock (the Same Clock applied from K0 and K1)



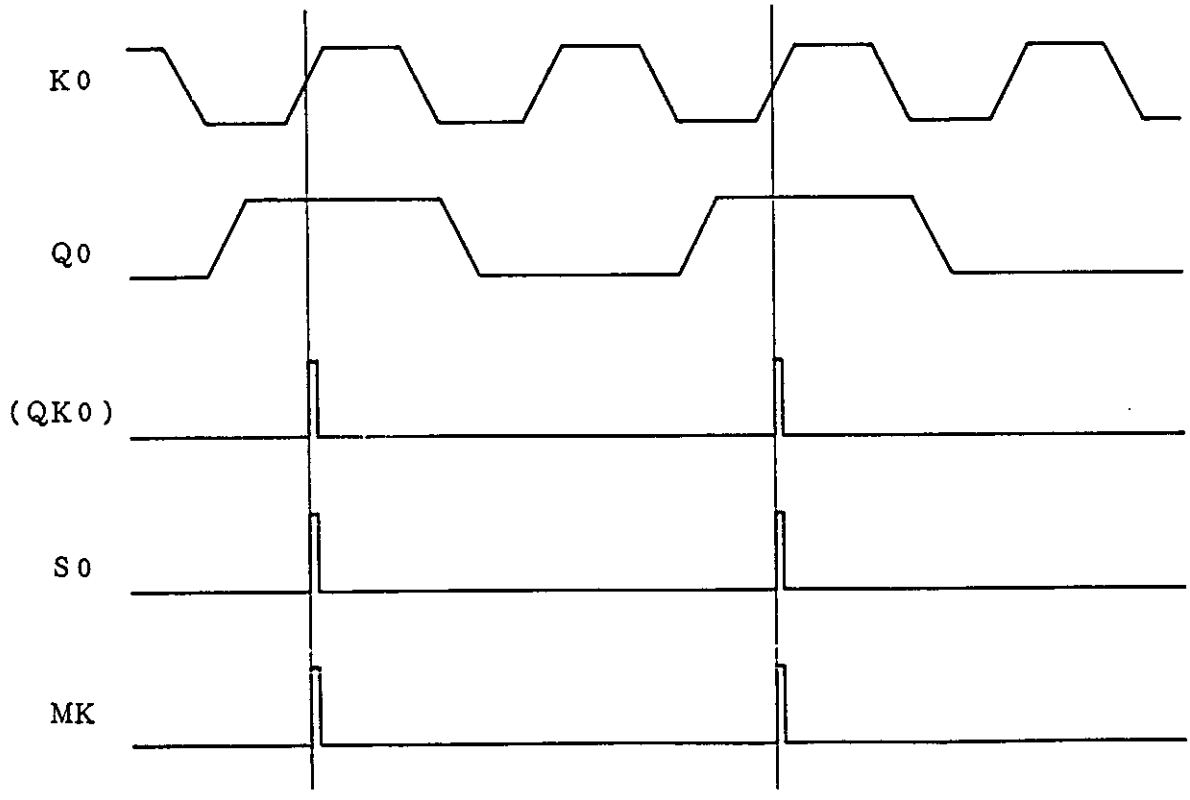
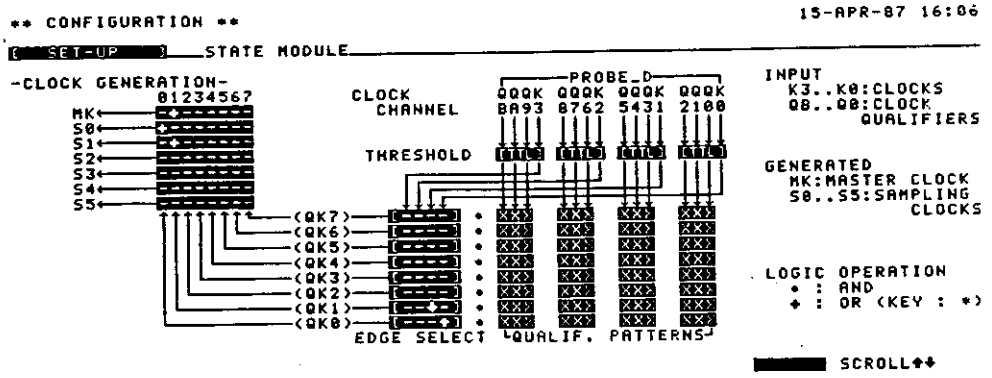


Figure 3-7 Example of Data Input Sampling at Rising Edges of a Single Clock (Applied from K0) Validated by Clock Qualifier (Applied from Q0, Positive Logic)



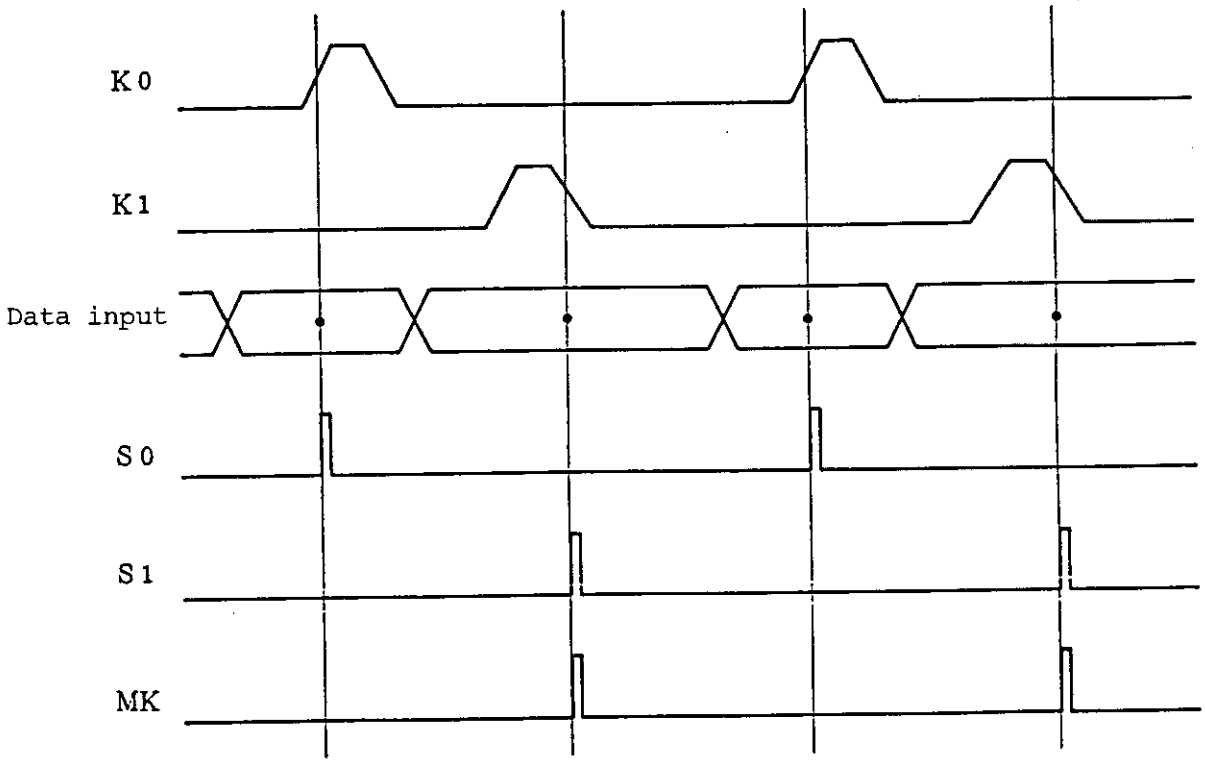
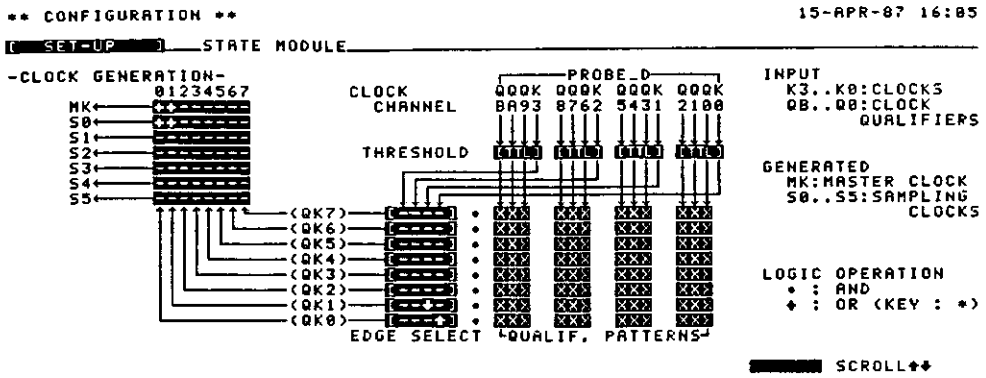


Figure 3-8 Example of Sampling Data Input Used for Time-division Multiplexing with Two Clocks (Applied from K0 and K1) (For details on demultiplex, see Figure 3-2)



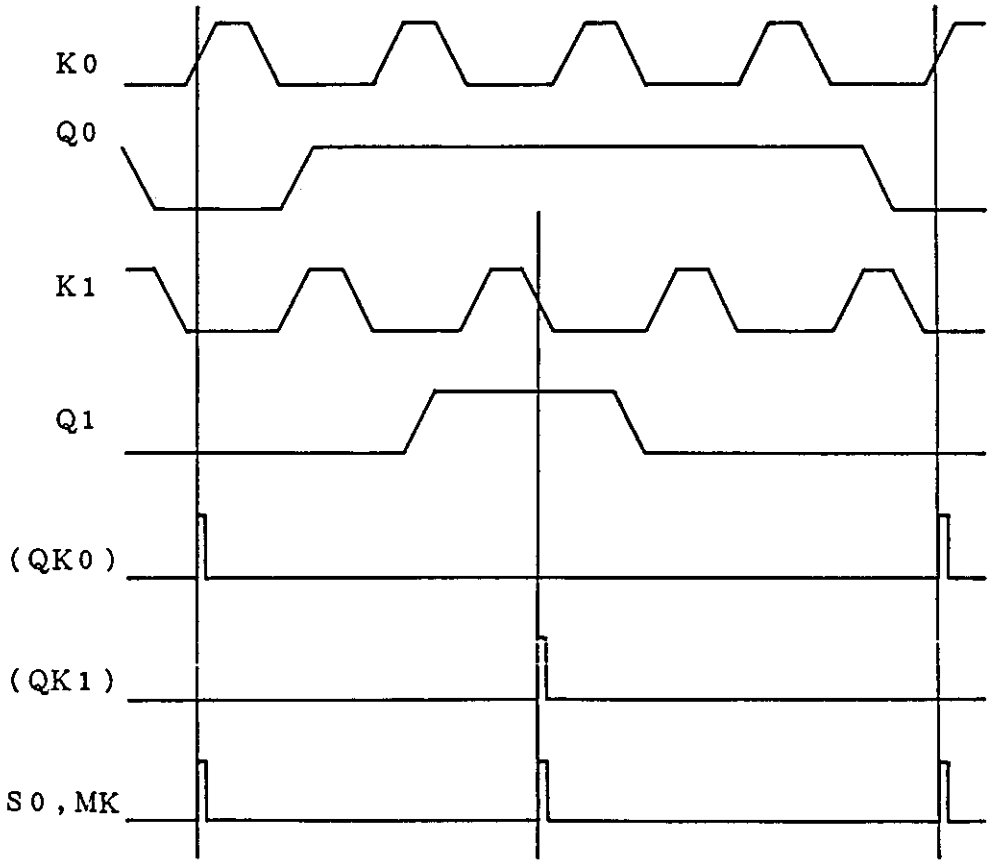


Figure 3-9 Example of Data Input Sampling With Both of the Clocks Qualified Separately

3.4 SETTING OF TRACING CONDITIONS (TRACE FUNCTION)

TRACE is a function for designating a measurement mode and setting tracing conditions which provide the nucleus of the measurement conditions.

The main object of setting the tracing conditions is to determine the reference trigger for obtaining limited data required for operation analysis of the measured system (SUT) from the large volume of data from input channels.

In this kit, complete data flow is handled by the S&T function (trigger arming) and by the function for combining a plurality of trace window conditions (state analysis section).

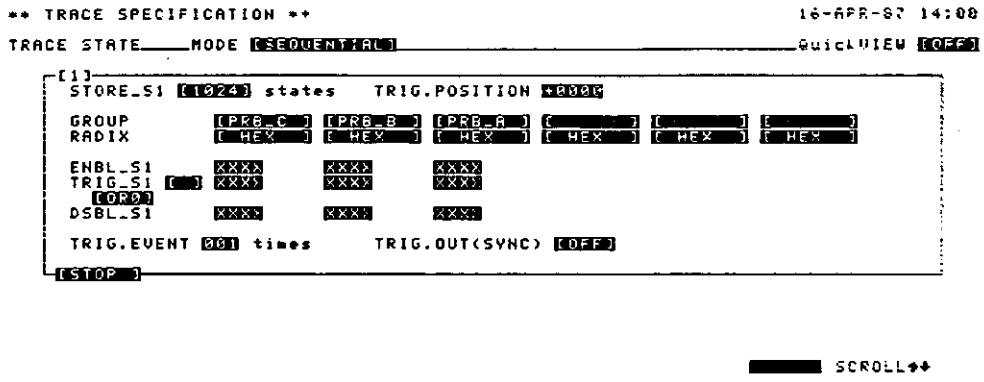


Figure 3-10 Initial Menu Screen of TRACE
(Figure 3-11 Initial Screen of SEQUENTIAL Mode)

3.4.1 Setting of tracing conditions at state analysis section

Depress the TRACE key, and the TRACE menu screen is displayed. The trace mode for the state analysis section is TRACE TRIG mode or SEQUENTIAL mode.

MODE_ TRACE TRIG : Only the pattern set by TRIG_S is traced.
MODE_ SEQUENTIAL: Data is obtained by combining a maximum of four trace window conditions and a maximum of four trace window conjunctions.

In SEQUENTIAL mode, independent trigger conditions can be set for respective trace windows, and data is obtained on the basis of the trigger conditions involved.

Figures 3-10 and 3-12 show initial screens for each mode.

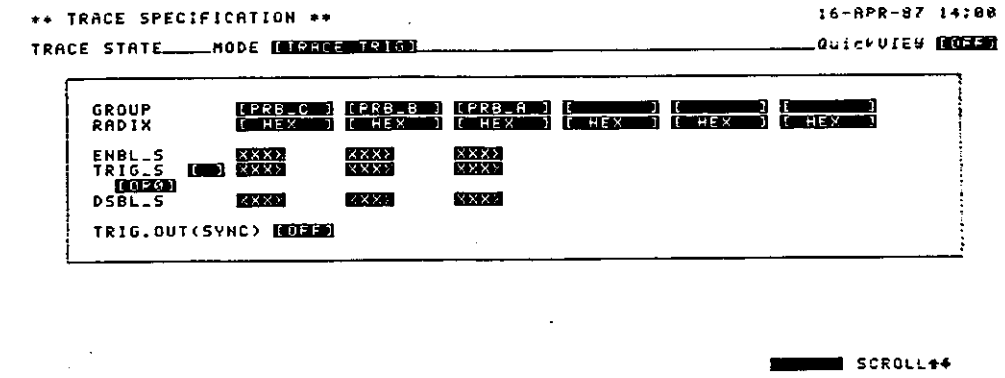


Figure 3-12 Initial Screen in TRACE TRIG Mode

(1) Menu item for trace window conditions
Each trace window condition is composed of store condition, a trigger condition, and an on-off designation of the trigger pulse. In the description that follows, n is assumed to take the value of 1 to 4. The store condition (STOREn, TRIG POSITION) is for designating the magnitude of the trace window n and its positional relationship with a trigger point.

- o STOREn : The acquisition (ACQ_MEM) of the state analysis section, which amounts to 48 ch. x 1024 states, may be used divided along the depth. Squares of 2 (0, 1, 2 to 1024) may be set. Data cannot be taken into the acquisition memory at 0, although the trigger conditions are valid. At 1, only the trigger can be taken. If a plurality of trace windows is used, all the store values of trace windows must be set to less than 512. Versatile data introduction is possible by combining with trace window conjunctions.
- o TRIG POSITION: The relative position of the trigger point in the data of trace window n can be set. The setting is possible in the range from -3072 to + (store value -1) state (decimal number). If a positive value is set, it indicates that data before the trigger can be acquired. If STOREn = 0, this menu item is invalid.

The trigger conditions (ENBLn, TRIGn, DSBLn, TRIG PASS) are for designating the reference (trigger) point of data acquistion. Each of the patterns ENBLn, TRIGn and DSBLn is used as an actual pattern after a group pattern is passed through an AND gate. As a RADIX of each group, symbols and codes, and numerals other than (BIN, OCT, HEX) may be used. For this purpose, mark * must be entered into the USE of SYMDEF menu screen in advance.

- o TRIGn : This pattern must have data making up a trigger. Actually, all data that coincides with this pattern cannot become a trigger, but only data that has met all restrictions of settings of the following menu items: The NOT trigger may be designated by menu item [ ] to the extreme left of TRIGn. The negation of the designated pattern for the NOT trigger is considered a trigger pattern.
  The OR trigger may be designated by the menu item of [OR0]. For OR1, one of the two trigger patterns, whichever appears first, is deemed as a trigger. OR2 is capable of an OR trigger of three trigger patterns, and OR3 is capable of four trigger patterns. A maximum of four trigger patterns may be set for the whole state analysis section.
- o ENBLn : An advance pattern for enabling TRIGn pattern detection. Only data which coincides with the TRIGn pattern after appearance of data coinciding with the ENBLn pattern can become a trigger.
- o DSBLn : An advance pattern that disabling the detection of TRIGn pattern. After the appearance of data that coincides with the DSBLn pattern data, if any, that coincides with the TRIGn pattern cannot become a trigger. (The appearance of data that coincides with the ENBLn pattern is required.)
- o TRIG EVENT: The number of repetitions of the trigger pattern (event) is designated. A number in the range from 1 to 256 (decimal number) can be set.

The menu items for on/off designation of trigger pulse are as follows:

- o TRIG OUT (SYNC): When data coinciding with the TRIGn pattern comes to the BNC connector with the same name as the back panel (that may not be a trigger), whether a predetermined pulse is to be produced (on/off) is set.
  A negative pulse 50 ns wide is involved at TTL level.

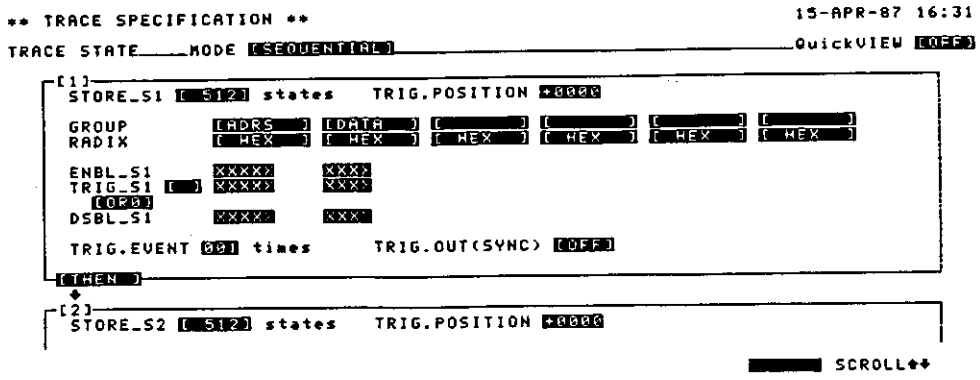


Figure 3-13 Trace Window Conditions

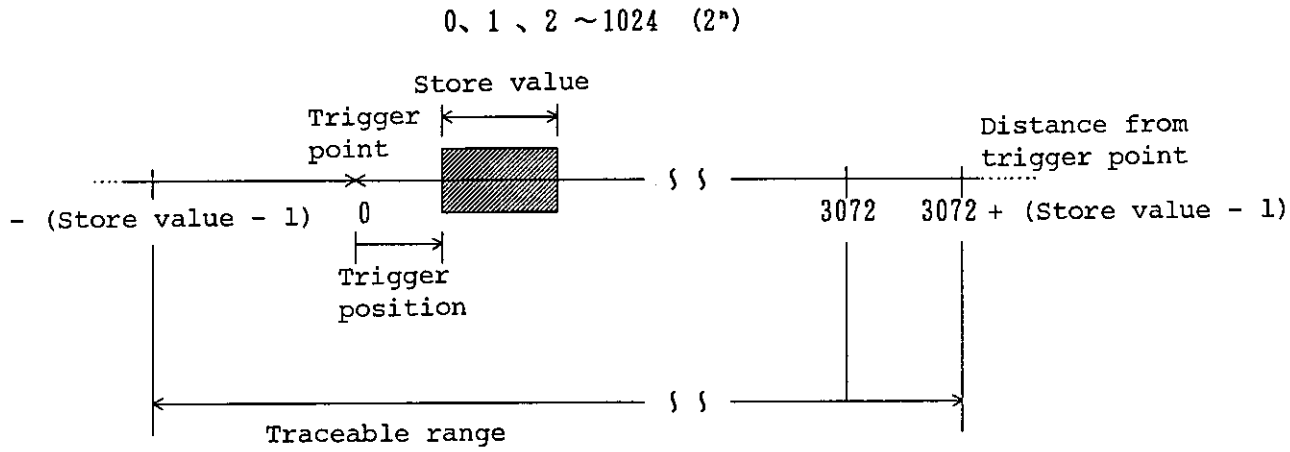


Figure 3-14 Store Conditions

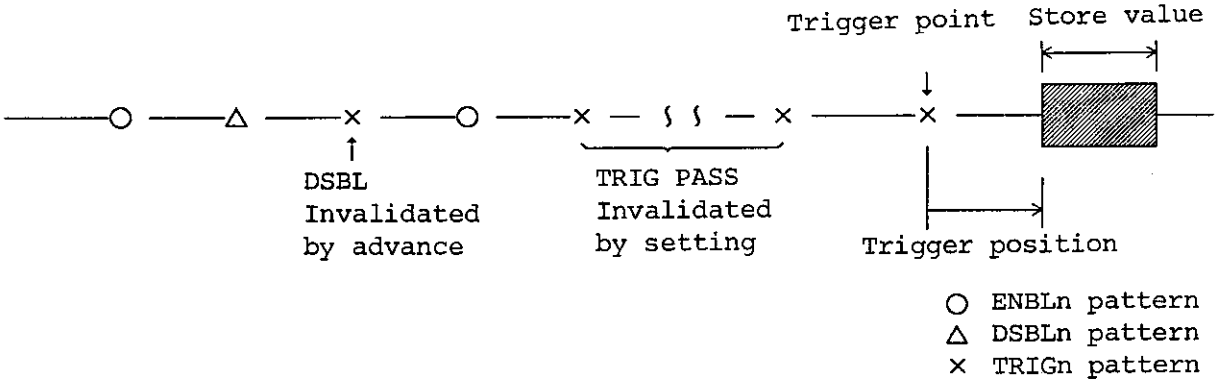
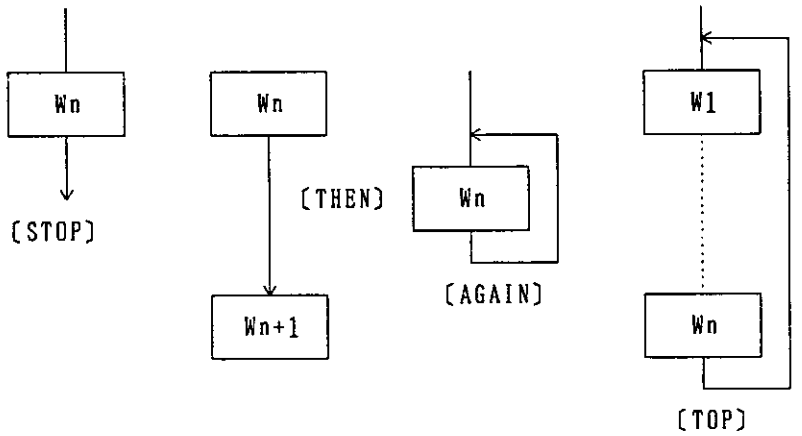


Figure 3-15 Trigger Conditions

(2) Trace window conjunction
The trace window conjunction connects a plurality of trace window conditions to configure versatile tracing conditions that are able to meet the complex data flow.
There are four types of trace window conjunctions as shown below (See Figure 3-16).

- o STOP : Ends measurement. Usable even if the total value of STOREn is less than 1024 states.
- o THEN : After execution of the measurement based on a given trace window condition, the execution of a measurement based on the next tracing window condition is started. A maximum of four trace window conditions may be connected by THEN.
- o AGAIN: The execution of measurements based on the immediately-preceding trace window conditions is repeated until the acquisition memory is filled up.
- o TOP : Measurement is continued by returning to the trace window condition 1.

These four trace window conjunctions may be mixed.



Wn : Trace window condition n
(n = 1 to 4)
〔 〕: Trace window conjunction

Figure 3-16 Function of Trace Window Conjunctions

(3) Trace window conditions and trace window conjunctions
Some examples of combinations of trace window conditions and trace window conjunctions will be described. (See Figures 3-17 (a) to (f).)

- o Figure 3-17 (a) shows the conventional setting of a logic analyzer. The initial menu screen involves this setting. A value other than 1024 may take a store value.
- o Figure 3-17 (b) shows when the trace window condition 1 is repeated at AGAIN.
- o Figure 3-17 (c) shows when the trace window conditions 1 to 4 are connected by THEN.
- o Figure 3-17 (d) shows that after data is taken by a given trigger in advance, the succeeding trace window conditions are repeated.
- o Figure 3-17 (e) shows when the process is returned to the trace window condition 1 after completion.
- o Figure 3-17 (f) shows a configuration for realizing a sequential trigger. Both ENBLn and TRIGn (n: 1 to 3) are both used as an enable pattern. In this case, an 8-level sequantial trigger is involved, and a more complex setting is possible as the trace window conditions still contain DSBLn.

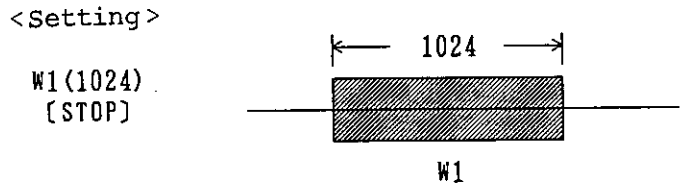


Figure 3-17 (a)

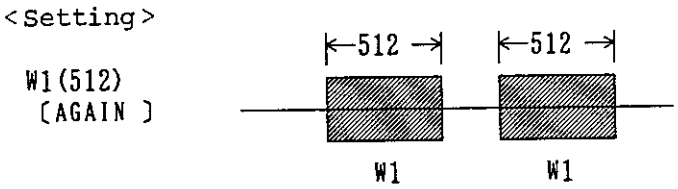


Figure 3-17 (b)

<Setting>

W1(256)
〔THEN〕
W2(256)
〔THEN〕
W3(256)
〔THEN〕
W4(256)
〔STOP〕

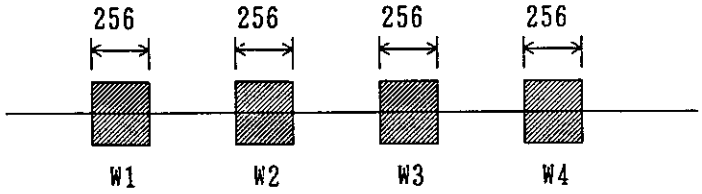


Figure 3-17 (c)

<Setting>

W1(512)
〔THEN〕
W2(256)
〔AGAIN 〕

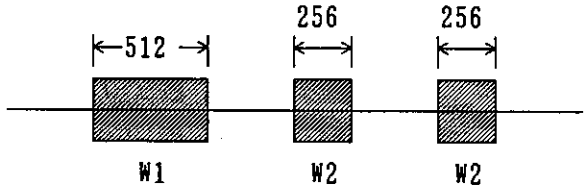


Figure 3-17 (d)

<Setting>

W1(256)
〔THEN〕
W2(256)
〔TOP 〕

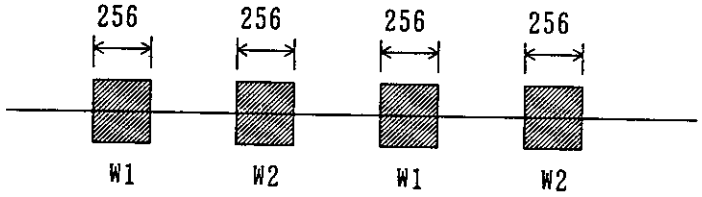


Figure 3-17 (e)

<Setting>

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

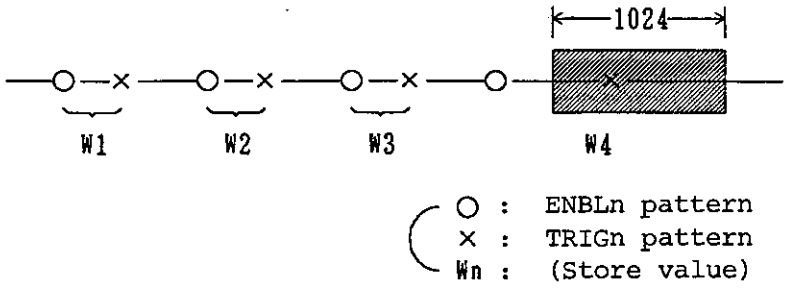


Figure 3-17 (f)

Figure 3-17 Example of Combination of Trace Window Conditions and Trace Window Conjunctions

3.5 DISPLAY OF ACQUISITION DATA AT STATE ANALYSIS SECTION (DISPLAY FUNCTION)

DISPLAY is a function for analyzing the data introduced into the acquisition memory by display in various formats.

3.5.1 Menu Items and Display Format

Examples of display of acquisition data are shown in Figures 3-18 and 3-19. Figure 3-18 shows an example of display data in SEQUENCITAL mode. The underline of halftone in SEQUENTIAL mode indicates a trigger mark. If the acquisition memory is divided by using a plurality of trace window conditions, a memory division boundary mark and a trigger mark are displayed as shown in Figure 3-19.

When the trigger mark is superimposed with the memory division boundary mark, a normally-displayed trigger mark is indicated. (A halftone display if trigger only). The following are settings of menu items and their effect:

- o GROUP : A maximum of eight menu items for GROUP are available. They can be displayed in a desired sequence by selecting the group defined on the CONFIG menu screen by a SELECT key. Data of the same group may be displayed in duplex form at different places. Also, by selecting a blank, data of a particular group will not be displayed. The display width of group depends to a large measure on the number of channels and RADIX. A group that exceeds the display width of the CRT display cannot be combined with RADIX.
- o RADIX : A radix for displaying data of a designated group is set by using this menu item. BIN (binary number), OCT (octal number), DEC (decimal number), HEX (hexadecimal number), and ASCII (only for group of 7 or 8 channel) or a symbol code is set.
- o Line number: Enter a decimal number by using ENTRY key for this menu item. Then, data of the line number of the particular numeral is displayed first. In case of a default, an input prompt occurs at the order of 100, but the position may be changed by using keys ⊟ ⊟.

The following explains the data scroll operation.

Data on display may be scrolled at any desired speed vertically by the scroll knob. (Turn the knob clockwise, and the data moves up.)

PAGE ⊡, ⊡ keys are used for scrolling pages vertically for each ten display lines.

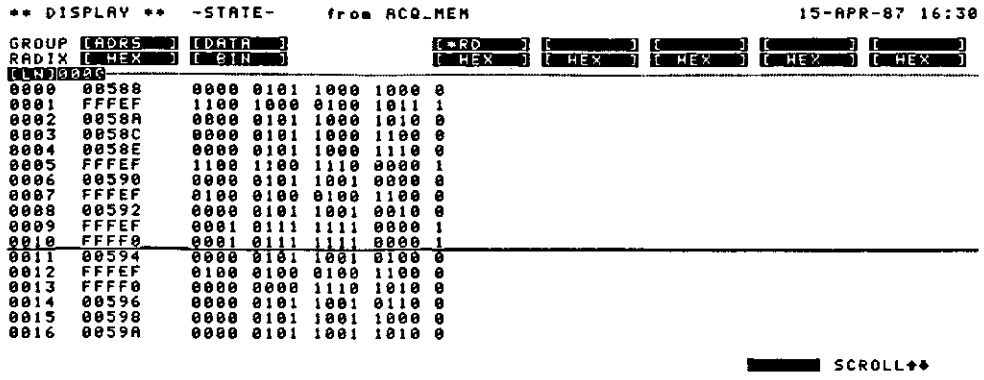


Figure 3-18 Example of Measurement of Data Display SEQUENTIAL Mode

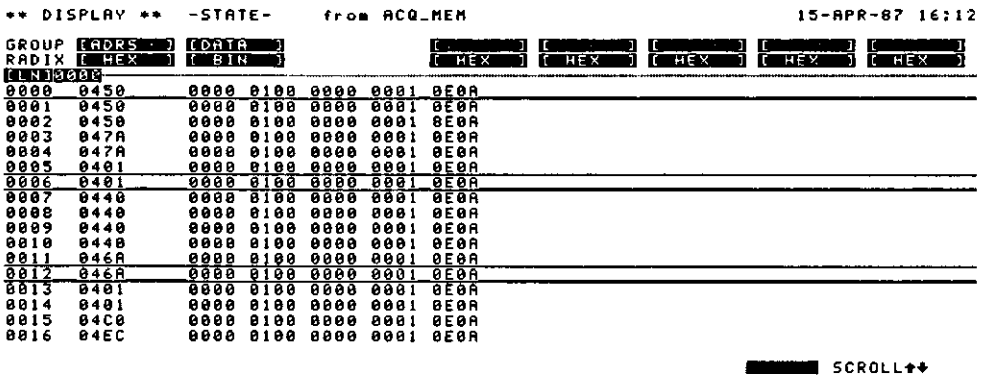


Figure 3-19 Display Example with Memory Used in Divisions (STORE = 16, AGAIN)

3.6 DEFINITION OF SYMBOLS AND CODES (SYMDEF FUNCTION)

This kit (state analysis section) may be used with not only numerals and fixed codes but also symbols and code names defined by the user to set the tracing conditions (TRACE function) and display and analyse measurement data (DISPLAY function). SYMDEF is the function for this definition.

SYMBOL, which is applicable to a group of a given number of channels, attaches a symbol name to a certain range of a numeral train (or a single numeral). The debugging efficiency is improved by using this function in correspondence with the label, variable and procedure names in program development.

CODE attaches a code name to a numeral and is applicable to a group of 8 or less channels. It facilitates preparation of a code table or the like.

3.6.1 SYMDEF Menu Screen

Depress [SYMDEF] key, and the menu screen of SYMDEF is displayed. (See Figure 3-20).

The SYMDEF menu screen, depending on the number of groups defined, is configured into a maximum of 12 partial menus as shown in Figure 3-21.

The setting data displayed at one time on the CRT display are definition data of 16 or fewer symbols or codes located in one of the partial menus. The definition data of a single symbol or code is composed of a plurality of related items concentrated in a line, and is called a menu item line. The number of menu item lines is variable; only one of the lines is displayed inversely to facilitate viewing.

In the case of the partial menu screen having 17 or more lines of menu items, the whole partial menu screen can be viewed by using a scroll knob or PAGE [↑], [↓] keys.

The scroll knob permits smooth access to a desired part of the partial menu screen at the desired rate. By using PAGE [↑], [↓] keys, however, the page may be turned every ten lines of menu items. The part of the partial menu screen that is not displayed on the CRT display is determined by the lowest scroll mark (↑ ↓).

When a partial menu screen different from the one being displayed is to be displayed, the menu items of GROUP (selected from defined group names) and TYPE (selected from symbols and codes) are changed.

For a personality kit with a fixed object, there is no partial menu screen available which corresponds to the group name "DATA" (for both symbol and code).

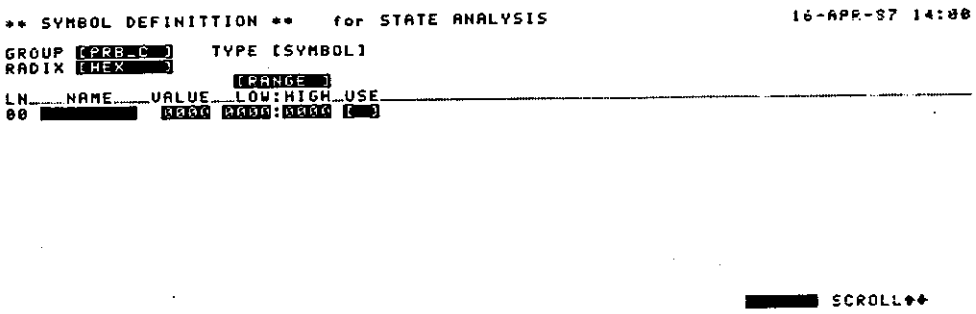


Figure 3-20 Initial Menu Screen of SYMDEF

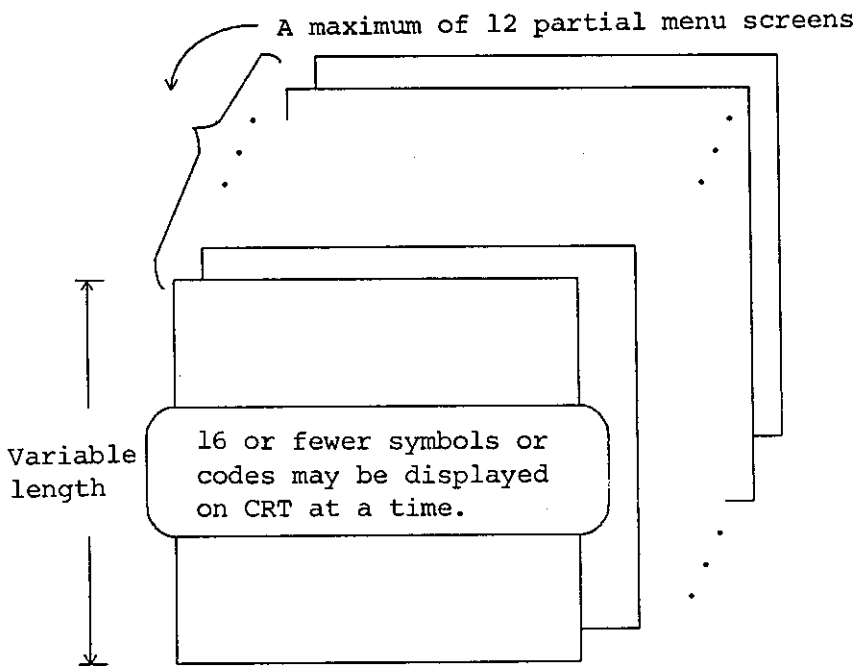


Figure 3-21 Configuration of SYMDEF Menu Screen

3.6.2 Definition of Symbols

Under the initial condition of the SYMDEF menu screen, the group name defined first, that is the partial menu screen of SYMBOL is displayed as shown in Figure 3-20. As a first step, the group name for which the symbol is to be defined in the group menu items is selected. Then, the input prompt is brought to the menu item line and entered in each menu item in the manner shown below.

- o NAME : Eight or fewer alphanumeric characters are entered as a symbol name. The advancing space is valid. (The reduction effect is obtained at DISPLAY.)
- o VALUE: The reference value of SYMBOL is entered.
- o LOW : The minimum value of the numeral column is entered. If the menu item just above is RANGE, an absolute value is entered; if it is OFFSET, a relative value from VALUE is entered.
- o HIGH : A maximum value of a numeral column is entered. If the menu item just above is RANGE, an absolute value is entered; if it is OFFSET, a relative value from VALUE is entered.
- o USE : On the TRACE menu screen, a symbol is used by using the SELECT key, and therefore only a limited number of symbols can be used. If the mark * is designated with this menu item, the symbol can then be used on the TRACE menu screen. On the DISPLAY menu screen, all defined symbols can be used regardless of the designation.

Figure 3-22 shows the use of symbols. If the object is the N-channel group, the particular group takes the value of 0 to 2^{N-1}. By the setting of VALUE, HIGH and LOW, the range in which reference to symbols can be done in a particular numeral space is designated. Other than that LOW must always be smaller than HIGH, there is no restriction between VALUE, LOW and HIGH.

Figure 3-22 (a) shows when VALUE = LOW; this is considered the most common setting. Names of procedure, function, subroutine and variable are used as a symbol name, and their range is designated by VALUE, LOW and HIGH. On the TRACE and DISPLAY menu screens, a numeral may be referenced by a symbol name plus n (offset).

Figure 3-22 (b) shows when VALUE = HIGH, which is applicable to stack, etc. On the TRACE and DISPLAY menu screens, a numeral may be referenced by a symbol name minus n (offset).

Figure 3-22 (c) shows when VALUE is located between LOW and HIGH, and is applicable to the stack frame, etc. On the TRACE and DISPLAY menu screen, a numeral may be referenced by a symbol name minus n or by symbol name plus n.

Figure 3-22 (d) shows when VALUE is not located between LOW and HIGH; this is a modification of Figure 3-21 (a).

Though not shown, a case where VALUE = LOW = HIGH is also possible. Then, all that is required is to set a value to VALUE.

When adding or deleting a menu item line, use ↓, INSERT and DELETE keys. For prepare a new menu item line, use key ↓. Set the input prompt to the lowest line, and depress key ↓. A new menu item line is then added immediately after the menu item line containing the input prompt, so that the input prompt moves to a new menu item line.

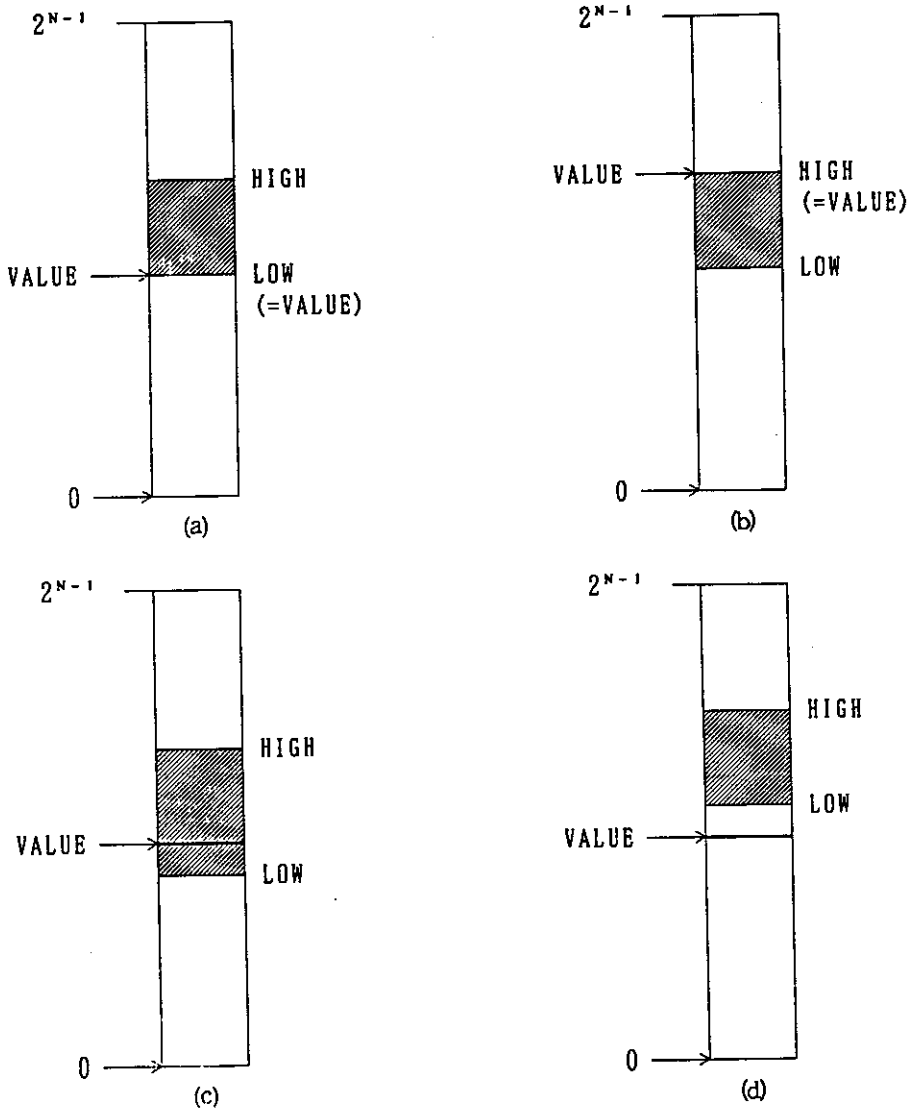


Figure 3-22 An Application of SYMBOL

Depress the [INSERT] key, and a new menu item line is added immediately before the menu item line containing the input prompt, then the input prompt moves to the particular line.

Depress the [DELETE] key, and the menu item line containing the input prompt is deleted. If there is only one menu item line with an input prompt, its content is cleared.

Values with different symbols (VALUE, LOW to HIGH) are not allowed to be duplexed.

The maximum definable number of symbols is 100 per group, or a total of 200 for all groups. Among them, the number usable on the TRACE menu screen is a maximum of 50 per group.

An example of symbol definition is shown in Figure 3-23 (a), (b). Exactly the same definition is indicated by RANGE in Figure 3-23 (a), and by OFFSET in Figure 3-23 (b).

```
** SYMBOL DEFINITTION **    for STATE ANALYSIS                15-APR-87 16:27

GROUP [ADRS    ]    TYPE [SYMBOL]
RADIX [HEX     ]
                          [RANGE ]
LN   NAME     VALUE    LOW:HIGH    USE
00 MAIN       F1000 F1000:F2000 [*]
01 SUB.01     F5000 F5000:F8000 [ ]
02 [        ] 00000 00000:0A40H [ ]

                                                          SCROLL**
```

Figure 3-23 (a) Example of Symbol Definition (Displayed by RANGE)

```
** SYMBOL DEFINITTION **    for STATE ANALYSIS                15-APR-87 16:28

GROUP [ADRS    ]    TYPE [SYMBOL]
RADIX [HEX     ]
                          [OFFSET]
LN   NAME     VALUE     LOW:HIGH    USE
00 MAIN       F1000 +00000:+01000 [*]
01 SUB.01     F5000 +00000:+03000 [ ]
02            00000 +00000:+00000 [ ]

                                                          SCROLL**
```

Figure 3-23 (b) Example of Symbol Definition (Displayed by OFFSET)

3.6.3 Definition of Codes

A code may be defined for a group of less than 8 channels by the same method of operation as for a symbol. A code has a code name corresponding to a numeral, and is analogous to the ASCII code in image. (ASCII code may be used on the DISPLAY menu screen.) Both symbol and code can be defined for the same group.

(In this case, they are handled as different partial menu screens.) To define a code, the group name involved is selected first, then TYPE is encoded.

The following entry is made to each menu item on the menu item line:

- o NAME : Eight or fewer alphanumeric characters are entered as a code name. The advancing space is valid. (The reduction effect is obtained at DISPLAY.)
- o VALUE: The value of code is entered.
- o USE : Whether to use on the TRACE menu screen is entered. (Usable is the mark * is entered.)

The code is usable for defining the code table; it is not always necessary, however, to define all numerals.

A maximum of 256 codes can be defined per group (2^8 for the 8-channel group), or a total of 512 for all groups. Of these, the maximum number usable on the TRACE menu screen is 50 per group.

An example of code definition is shown in Figure 3-24.

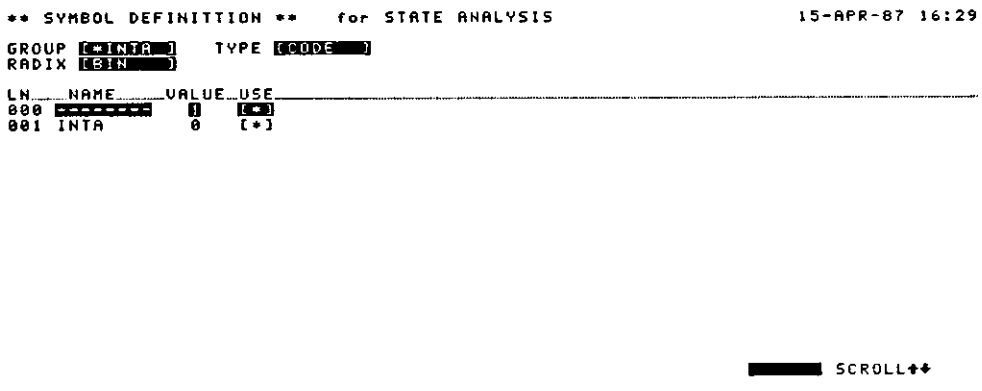


Figure 3-24 Example of Code Definition

4. OPERATION AS S&T COMBINATION ANALYZER

4.1 GENERAL

This section exaplains the device's operation as a combination analyzer with state and timing functions combined.

4.2 MEASUREMENT OPERATION

If the S&T COMBINATION mode is selected on the COMBINATION OF MODULE screen of Figure 3-1, the state analysis section and the timing analysis section are energized at the same time.

By arming the trigger, the timing analysis section and the state analysis section can be corresponded to each other.

A trace screen and an execution status in (T → S) and (S → T) modes are shown in Figures 4-1 and 4-2 respectively.

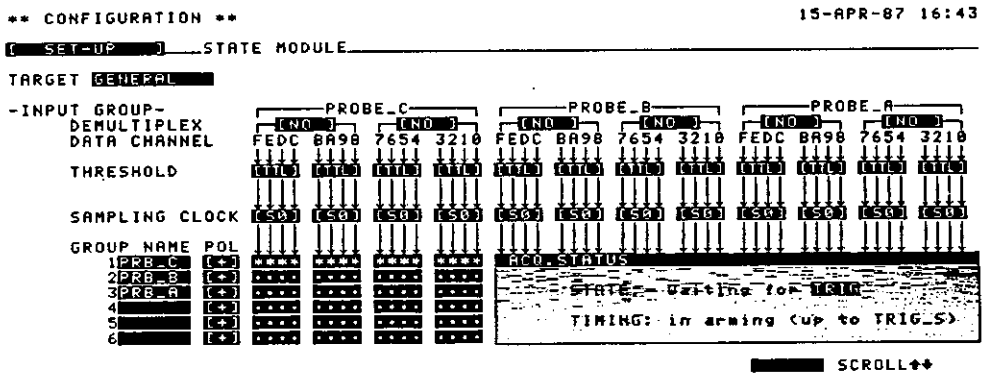


Figure 4-1 Screen and Execution Status in TRACE S&T (T → S) Mode

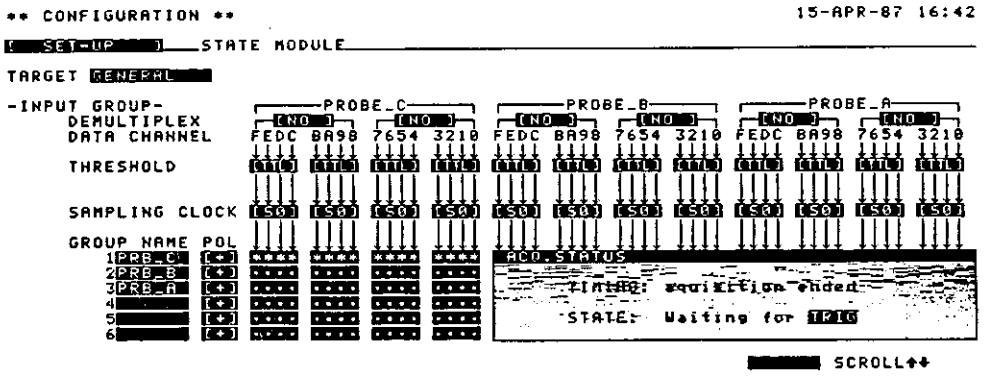


Figure 4-2 Screen and Execution Status in TRACE S&T (S → T) Mode

(1) Status of state analysis section: "STATE" is followed by the following message. The underlined part is displayed in normal blinking.

o in arming (up to TRIG _T) ... Indicates that the state analysis section (or a specified trace window condition) is in arming. In arming, ENBLn, TRIGn or DSBLn are not detected. By using TRIG_T of the timing analysis section, arming is cancelled (disarmed).

- o waiting for ENBLn ... This is displayed when the arrival of data having a ENBLn pattern is waited for. This display also occurs when the clock does not arrive from the SUT microprocessor.
- o waiting for TRIGn ... Displayed when the arrival of data having TRIGn is waited for.
- o in delaying (STOREn) ... Displayed when a trigger is detected, but the data taken fails to meet the number set in STOREn.
- o Acquisition ended ... Displayed when the measurement has been executed.

(2) Status of timing analysis section: The following message appears after "TIMING:". The underlined part is displayed in normal blinking.

- o in arming (up to TRIGn) ... Indicates an arming status. In an arming status, ENBL_T or TRIG_L is not detected. Arming is cancelled by TRIGn of the state analysis section.
- o waiting for ENBL_T ... Displayed when waiting for data having a ENBL_T pattern.
- o waiting for TRIG_T ... Displayed when the arrival of data having a TRIG_T pattern is waited for.
- o in delaying ... Displayed when a trigger has been detected but the data taken fails to meet the size of the acquisition memory. (only when a low-speed clock is selected)
- o acquisition ended ... Displayed when the measurement execution has ended.

After all measurements have ended, the DISPLAY menu screen of the state analysis section is automatically displayed in TRACE STATE and TRACE S&T (S → T), as well as the DISPLAY menu screen of the timing analysis section in TRACE S&T (T → S) and TRACE TIMING.

If a key other than MENU key group and [STOP] is depressed during measurement, "ignored!" is displayed.

If a MENU key group key is depressed, the measurement is forcibly suspended, and "aborted!" is displayed, followed by the designated menu screen.

If [STOP] is depressed, measurement is also suspended forcibly.

Note, for other than where "acquisition ended" is displayed, incorrect data is displayed.

The menu screen of the state analysis section and the menu screen of the timing analysis section can be switched by STATE / TIMING of the MENU key group.

4.3 RELATIONS BETWEEN STATE ANALYSIS SECTION AND TIMING ANALYSIS SECTION

(1) S&T (S → T) mode
In TRACE S&T (S → T) mode, set TRIGn in (TRIGn) disarms TRIG_T. (The default value is TRIG1).

"disarm" means the cancellation of the arming status. In the arming status, no trigger is detected. The process of measurement execution in S&T (S → T) mode is shown in Figure 4-3. In this drawing, details (such as ENBL) of trigger conditions are not shown.

Figure 4-3 shows when trigger conditions are set for both state and timing analysis sections. Until TRIGNn (n = 1 to 4), which is designated in advance, is detected in the state analysis section, the timing analysis section is in the arming status. After the arming status is cancelled, the trigger conditions of the timing analysis section become valid.

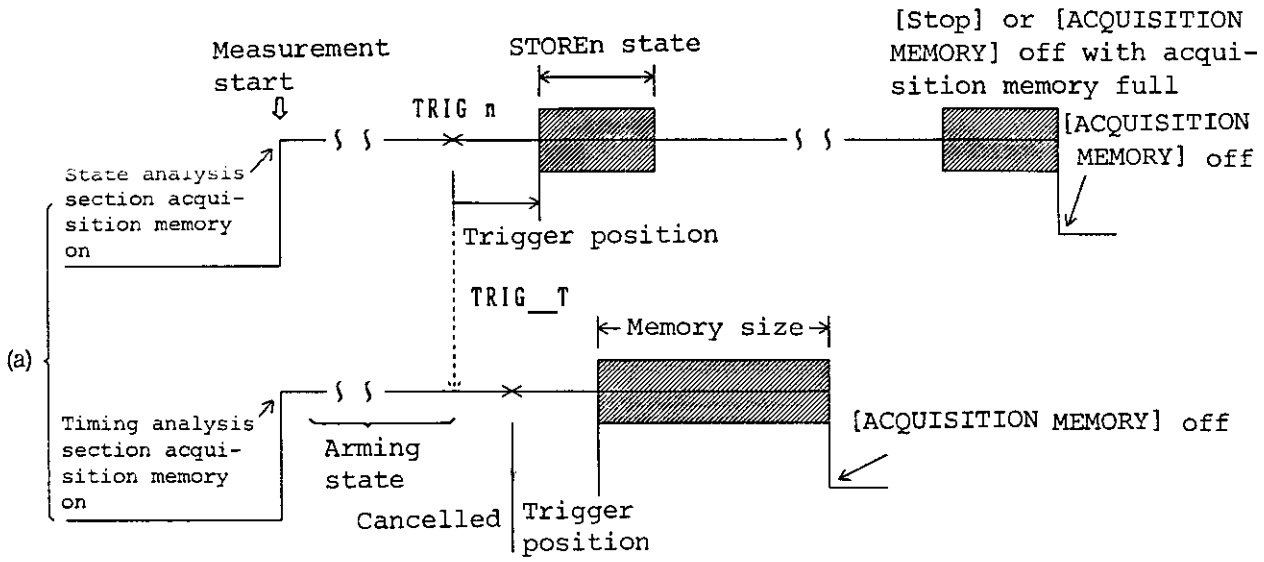


Figure 4-3 Execution of Measurement in TRACE S&T (S → T) Mode

(2) S&T (T → S) mode
In the S&T (T → S) mode, set TRIGn in TRIG_T disarms (TRIGn) (The default value is TRIG1).

The process of measurement execution in S&T (T → S) mode is shown in Figure 4-4. In this drawing, details of trigger conditions are not shown.

Figure 4-4 shows when trigger conditions are set for both the state and timing analysis section. Until TRIG_T is detected at the timing analysis section, the trace window conditions n of the state analysis section is in the arming state. Trace window conditions earlier than the trace window conditions n are executed normally.

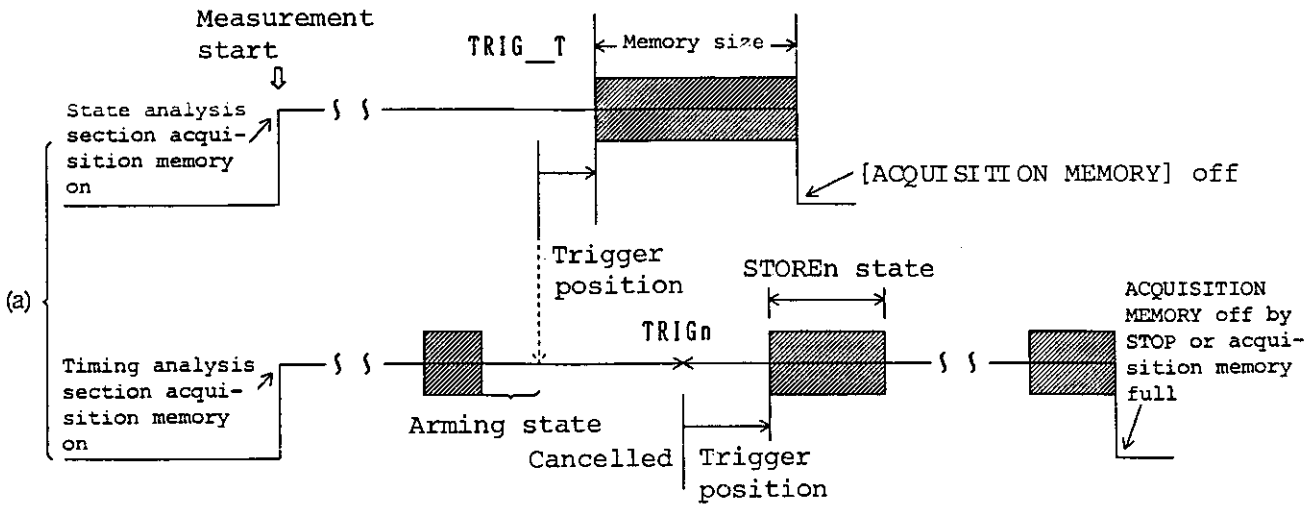


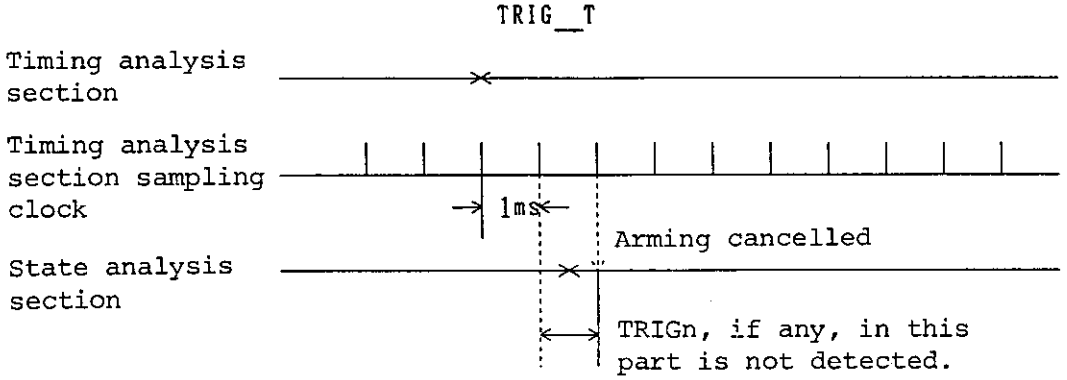
Figure 4-4 Process of Measurement Execution in TRACE S&T (T → S) Mode

CAUTIONS

This kit makes a decision as to whether the data once latched by a sampling clock is triggered. As a result, note that there is a delay of a maximum of one sampling clock from when an actual trigger pattern is to when recognition by the kit triggered.

In the TRACE S&T (T → S) mode, if the timing analysis section is energized by a sampling clock more slowly, when compared with the operating speed of μP (say, 1 ms) (this speed is the object of measurement of the state analysis section to observe the data taken by that section), then, such a delay, if any, between actual point of generation of TRIG_T and the cancellation of arming of the state analysis section will enable the μP operation to be grasped correctly. In such a case, always set the clock rate at least at the same level as the clock rate of the state analysis section.

The sampling clock of the state analysis section usually corresponds to the instruction cycle of μP.



5. OPERATION CHECK

5.1 TEST OF PROBE A/B/C/D

This personality kit takes in an input signal by probes. Due to many input channels, these probes may develop a contact failure depending on how they are handled. In such a trouble, a built-in function works as a probe operation check. If there is trouble with the data taken in, perform a test in the following steps:

(1) If POWER is ON, turn it OFF, and take off probes A/B/C/D.

(2) Load the system software.

(3) Turn to CONFIG menu screen (COMBINATION).
Then, move the cursor by knob to select STATE ANALYSIS ONLY. Depress UTILITY [ ] , and select the PROBE TEST moving the cursor with a knob. Then, depress [RUN], and the program of PROBE TEST is loaded from the system disk, then the display in Figure 5-1 is obtained.

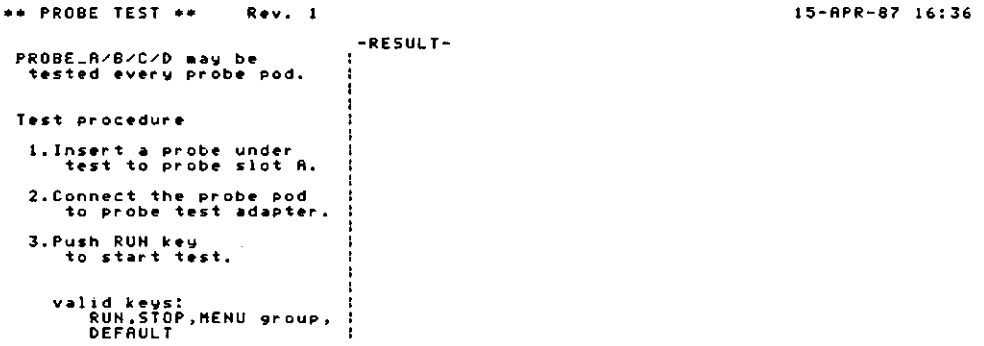


Figure 5-1 Selection of PROBE TEST

(4) Mount the attached probe test adaptor on the PROBE TEST connector on the TR4726 back panel.

(5) Connect the probe to be tested to the probe slot A on the back panel as shown in Figure 5-2. Probes A/B/C/D have two probe pods of 8 channels. Connect one of the pods to the probe lead set from the probe test adaptor.

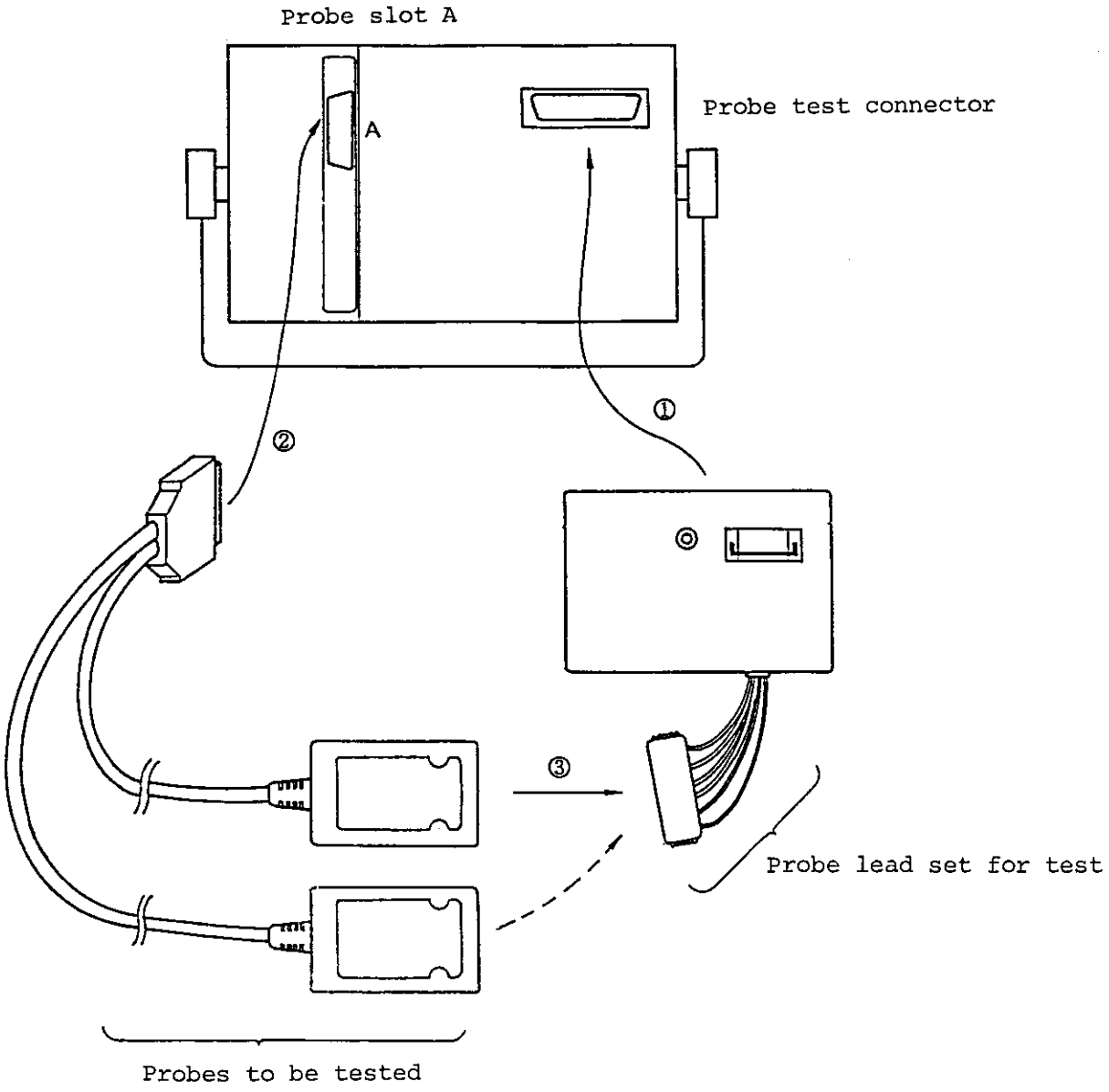


Figure 5-2 Connection for Probe Test

(6) Depress [RUN], and the test is started, the result of the test is displayed for each eight channels. (See Figure 5-3)

PASS indicates that the channel involved is normal, and FAIL that it is in trouble. The name of the channel on display corresponds to the name on the probe name plate.

Depress [RUN] repeatedly, permitting repeated tests on the same probe pod.

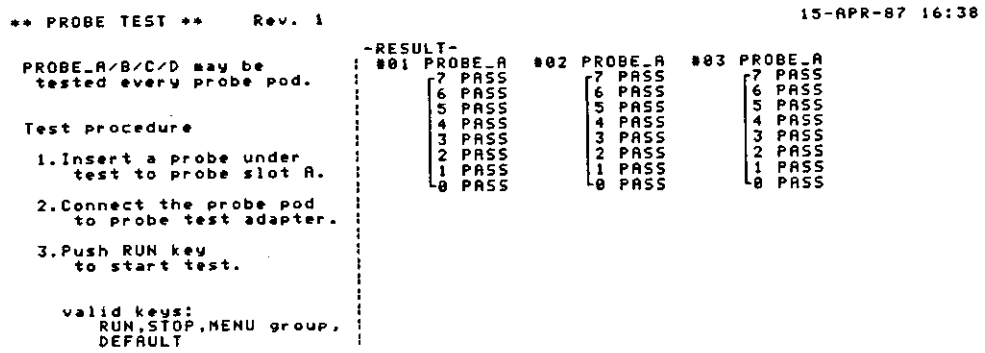


Figure 5-3 Result of Probe Test

(7) When performing a test on another probe pod, reconnect the probe lead set, and depress [RUN].

(8) In testing other probes, start from (1) again.

6. INSTRUCTIONS FOR STORING AND TRANSPORTING THE KIT

6.1 STORAGE

Keep the kit (including components) in an environment of -10°C to +60°C. If the kit is left unused for a long time, store it in the attached personality kit case in a dry place not exposed to direct sunlight. (Be sure to keep the board in the attached conductive case.)

Take care that the floppy disk is kept in a temperature of -10°C to +60°C. (It should be stored in a case separate from the personality kit.)

6.2 TRANSPORTATION

When transporting the kit, use packaging materials delivered by us initially. If the packaging material is lost, be sure to take the steps specified below.

(1) Wrap the kit in a vinyl sheet or the like.

(2) Insert the kit in a corrugated board box 5 mm or more in thickness, with a buffer 50 mm or thicker laid inside.

(3) After the kit is wrapped by the buffer, put the accessories, and then additional buffer. Close the corrugated board box, and securely bind the box by using packaging strings.

7. PERFORMANCE SPECIFICATIONS

7.1 R47250A PERFORMANCE SPECIFICATIONS

Input specifications

Number of input channels	:	64 ch (48 for data input, 4 for clock input, and 12 for clock qualifer input)
Input impedance	:	Approx. 1 M ohm/8 pF or less
Input sensitivity	:	200 mV_{p-p} or less
Threshold voltage	:	TTL (Approx. 1.4 V), ECL (Approx. -1.3 V), V1 or V2 (-12.7 V to +12.7 V, in 100 mV steps)
Sharing of threshold voltage	:	Data input is shared for each four channels and clock input for each channel plus qualifier input for each three channels
Operating input voltage range	:	±10 V around threshold voltage
Breakdown input voltage	:	±50 V
Data input channel set-up time	:	15 ns min
Data input channel hold time	:	0 ns min
Clock input frequency	:	50 MHz max.
Sampling clock	:	6 types (S0 to S5)
Sampling clock frequency	:	20 MHz max.
Sampling clock generation system:		

(1) The clock input (K0 to K3) and a maximum of eight qualifier patterns (QP0 to QP7) generated by the clock qualifier input (Q0 to Q8) are applied to an AND gate to create a maximum of eight qualified clocks (QK0 to QK7).

$QK0 = K\ell\square \cdot QP0$

⋮

$QK7 = Km\square \cdot QP7$ (ℓ, m = 0 to 3)
(where $\square$ indicates clock edge selection, and "·" AND logic)

(2) A maximum of eight qualified clocks mentioned in (1) are applied through an OR gate to produce a maximum of six sampling clocks.

$S0 = QKa + QKb + ... + QKc$

⋮

$S5 = QKd + QKe + ... + QKf$ (a, b to f ..... = 0 to 7)
(where "+" indicates OR logic)

(3) The master clock (MK) is obtained in a similar way.

$MK = QKx + QKy + ... + QKz$ (x, y, z = 0 to 7)

Demultiplex	:	The least significant 4 ch of the probe pods for data input can be sampled with different sampling clocks.

Logic polarity	:	+ or -
Input group	:	Defined by a set of data input channels
Input group name	:	Six or fewer alphanumeric characters
Number of input groups	:	A maximum of six

Display specifications

Display data source	:	Acquisition memory, reference memory, file
Display items	:	A maximum of eight
Sequence of input group display	:	Displayable in the desired sequence by selection of input group names. Double display of the same input group is possible. A specific input group display can be erased.
Display format	:	State display by binary, octal, decimal, hexadecimal, symbol, code, or ASCII code
Inter-memory transfer operation	:	Transfer of display data to reference memory. Data of reference memory displayed. The data of acquisition memory displayed.
Data scroll	:	Vertical scroll possible by scroll knob. Page-by-page vertical scroll possible by page scroll key
Special display	:	Trigger by Trigger display. Memory division boundary displayed between trace windows

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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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