INSTRUCTION MANUAL

LOGIC ANALYZER

MODEL DLG7050

KIKUSUI ELECTRONICS CORPORATION

Power Requirements of this Product

Power requirements of this product have been changed and the relevant sections of the Operation Manual should be revised accordingly.
(Revision should be applied to items indicated by a check mark ☑.)

☐ Input voltage

The input voltage of this product is _____ VAC,
and the voltage range is _____ to _____ VAC. Use the product within this range only.

☐ Input fuse

The rating of this product's input fuse is _____A, _____VAC, and _____.

WARNING

- To avoid electrical shock, always disconnect the AC power cable or turn off the switch on the switchboard before attempting to check or replace the fuse.
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that short circuits the fuse holder may result in fire, electric shock, or irreparable damage.

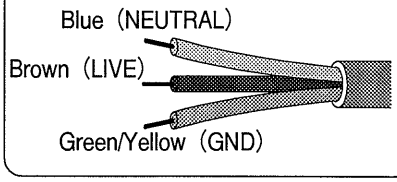
☐ AC power cable

The product is porvided with AC power cables described below. If the cable has no power plug, attach a power plug or crimp-style terminals to the cable in accordance with the wire colors specified in the drawing.

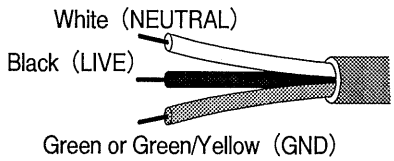
WARNING

- The attachment of a power plug or crimp-style terminals must be carried out by qualified personnel.

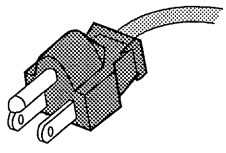
☐ Without a power plug



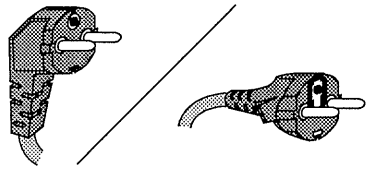
☐ Without a power plug



☐ Plugs for USA



☐ Plugs for Europe



☐ Provided by Kikusui agents

Kikusui agents can provide you with suitable AC power cable.
For further information, contact your Kikusui agent.

☐ Another Cable _____

 Kikusui Part No. Z9-000-027 IB001681

KIKUSUI

TABLE OF CONTENTS

1. GENERAL DESCRIPTION

Kikusui Model DLG7050 Logic Analyzer is capable of three types of data recording and analyses, namely, parallel data analysis, serial data analysis, and GP-IB bus monitor analysis.

Parallel data analysis is capable of 50-MHz 16-channel 1000-data recording, timing display, and state display with codes set as required.

Serial data analysis is capable of 1000-character recording in the unit of character in an asynchronized system or a synchronized system, and is capable of state display.

GP-IB bus monitor analysis is capable of recording the data of the GP-IB data bus, control bus and management bus with the internal clock signal or DAV signal, and is capable of timing display and state display as is the case of parallel data analysis.

The various control parameters for data recording can be set by means of the menu displays. Setting is facilitated by the soft keys which provide particular functions assigned to them.

For parallel recording, trigger words for 18 channels (16 data channels and 2 qualifier channels) can be set. Setting can be made also for trigger filter, trigger event and trigger delay, thereby ensuring positive triggering even for sophisticated logic signals.

For serial recording, 2-consecutive word triggering (including break and parity error) can be made and trigger event and trigger delay setting as in the case of parallel recording can be done.

For GP-IB bus monitor recording, trigger word setting for 16 channels (all signals), and trigger event and trigger delay setting can be made.

For timing display, 0 - F for input channel display and up to six characters for naming of each channel are available. Since a high-resolution CRT is employed, even narrow pulses are clearly discernible.

The DLG7050 has a record memory (MEM A) and a reference memory (MEM B) and data stored in either memory can be displayed. It also has a compare display function (COMP mode) and a search function to search for a specific data pattern.

When in the state display mode, the input state is constantly displayed and monitored and the input state can be monitored without requiring to start recording. (<NOW> display)

A composite video output terminal is provided, permitting to print out hardcopies of displays using a video printer.

2. SPECIFICATIONS

2.1 Parallel Data Recording Section

No. of Input Channels		
Data	16 channels	Probes A and B
Data Qualifier	2 channels	Probe C (Q0 and Q1)
External Clock	1 channel	Probe C (E. CK)
External Clock Qualifier	1 channel	Probe C (CQ)
Input Impedance	Approx. 1 MΩ, 12 pF or less	Exclude probe chip probe lead
Threshold Voltage		
Setting Range	-6.3 V to +6.3 V, in 0.1-V steps	Can be set for each probe
Tolerance	±(1% of set value + 100 mV)	
Input Signal Voltage		
Minimum Sensitivity	Threshold voltage ±0.35 V	
Rated input voltage	±30 V	
Maximum Allowable Input Voltage	±60 V DC	
Sampling Clock		
Internal Clock Period	20 ns - 500 ms, 1-2-5 sequence	
External Clock Period	20 ns (50 MHz) minimum	
External Clock Polarity	+ or -	
Data Setup Time	10 ns	
Data Hold Time	0 ns	
External Clock Qualifier		
Polarity	+ or - or ×	"×" means "not used".
Setup Time	5 ns	With respect to effective edge of external clock

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Hold Time	5 ns	With respect to ineffective edge of external clock
Skew Between Channels	10 ns maximum	
Memory Capacity		
Data Record Length	1000 data	Recorded in MEM A
Reference Data Length	1000 data	Recorded in MEM B (transferred from MEM A)
Input Mode	SAMPLE or LATCH	Can be set for each channel
Minimum Data Pulse Width	5 ns	Recorded in LATCH mode
Trigger		
Word Setting	16 channels + 2 channels	Data + Data qualifier
Filter	ON or OFF	ON is with 3-clock width or more
Polarity	Leading or trailing	
Event	1 - 9999	Number of trigger word detections
Delay	-999 to +9999	Number of clocks from triggering to start of data recording
Start of Trigger Detection	After completion of HOLD OFF	
Repetitive Data Record Control		
Comparison Channels	16 channels, "1" or "×" setting	
Comparison Range	ALL or CUR - REF	
Stop Condition	NONE	Constantly repeated
	MEM A = B, MEM A ≠ B	Stops when condition is met

Display	By timing or state display	
Display Memory	MEM A and MEM B	
Display Modes	NORMAL, COMP, and SEARCH	
Timing Display		
Number and Order of Display Channels	16 channels maximum, can be set as required	Simplified scroll available
Display Polarity	+ or -	
Horizontal Magnification (H-MAG)	×1, ×2, ×5, ×10, ×20, and ×50	
Vertical Magnification (H-MAG)	×1, ×2, and ×4	Automatically set by the number of display channels
State Display		
Polarity	+ or -	Can be set for each channel
Display Codes	BIN, OCT, HEX, and SPC	SPC is by menu setting.
<NOW> Display	The current input state is displayed in the STATE mode.	

2.2 Serial Data Recording Section

No. of Input Channels		
Data	1 channel	Probe C (SER)
External Clock	1 channel	Probe C (E. CK)
Input Impedance	Approx. 1 MΩ, 12 pF or less	Exdude probe chip probe lead
Threshold Voltage		
Setting Range	-6.3 V to +6.3 V, in 0.1-V steps	
Tolerance	±(1% of set value + 100 mV)	
Input Signal Voltage	The same as that of Parallel Data Recording Section	
Input Data Polarity	+ or -	"+" is at HIGH level when Marking.
Transmission Mode	Asynchronized (ASYNC) or synchronized (SYNC) mode	
Transmission Speed	19200 bits/sec max.	
Types of Internal Clock	50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 4800, 9600, or 19200	(bits/sec)
Accuracy of Internal Clock	±0.1%	
Effective Edge of External Clock	+ or -	"+" is for rise up in the center of data bit.
Data Setup Time with Respect to External Clock	3 μs	
Data Hold Time With Respect to External Clock	3 μs	
Memory Capacity	The same as that of Parallel Data Recording Section	
Recording Data	8 data bits, and break, parity error and framing error	

Data Bit Length	5, 6, 7, or 8 bits	Excluding parity bit
Parity Check	ODD, EVEN, or NONE	
Stop Bit Length	Fixed at 1 bit	
Sync Word (when in SYNC mode)	1 or 2 words	
Trigger		
Word Setting	2 consecutive words or 1 word	Word including data, break, and parity error
Event	1 - 9999	
Delay	-999 to +9999	Number of data from triggering to start of data recording
Start of Detection	After establishment of synchronization	
Repetition and Data Record Control		
Comparison Bits	8 data bits, and break and parity error "1" or "x" setting	
Comparison Range and Stop Condition	The same as those of Parallel Data Recording Section	
Data Record End Conditions	1. End of single record 2. End of repetitive data record 3. When error data (parity error or framing error) is received after preceding reception of 64 or more valid data	
Display	State display	
Display Memory	MEM A and MEM B	
Display Modes	NORMAL, COMP, and SEARCH	
Display Codes	BIN, OCT, HEX, and SPC	SPC is with ASC code.

2.3 GP-IB Bus Monitor Data Recording Section

No. of Input Channels	16 channels	DIO1 - DIO8, DAV, NRFD, NDAC, ATN, REN, IFC, EOI, and SRQ
External Clock	1 channel	Connected to DAV
Input Impedance	Approx. 1 MΩ, 12 pF or less	Exclude probe chip probe lead
	DAV: Approx. 500 kΩ, 40 pF or less	When GP-IB terminal card is used
Threshold Voltage	+1.4 V, fixed	(Tolerance 120 mV)
Input Signal Voltage	The same as that of Parallel Data Recoding Section	
Sampling Clock		
Internal Clock	20 ns - 500 ms, 1-2-5 sequence	
External Clock and Polarity	DAV+ or DAV-	
Input Modes	SAMPLE and LATCH	Can be set for each channel
Minimum Data Pulse Width	5 ns	Recording in LATCH mode
Trigger		
Word Setting	16 channels	DIO1 - DIO8, DAV, NRFD, NDAC, ATN, REN, IFC, EOI, and SRQ
Polarity, Event, and Delay	The same as those of Parallel Data Recoding Section	
Repetitive Data Recording	The same as above	
Memory Capacity	The same as above	
Display	By timing or state display	
Display Memory	MEM A and MEM B	
Display Modes	NORM, COMP, and SEARCH	

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Timing Display		
Number and Order of Display Channels	16 channels, fixed order	Simplified scroll available
Display Polarity	The same as that when in recording	
Magnifications	Both horizontal and vertical magnifications are the same as those of the Parallel Data Recording Section	
State Display		
Display Polarity	The same as that when in recording	"1" on bus is LOW level.
Display Code	BIN, HEX, MESSAGE, and ASC	MESSAGE and ASC are with coding of DIO1 - DIO7 and ATN.

2.4 General Specifications

Data Record Memory (MEM A)	16 bits × 1000 data	Used in common for parallel, serial, and GP-IB
Reference Data Memory (MEM B)	16 bits × 1000 data	Used in common for parallel, serial, and GP-IB
Data Write in MEM B	With TRANSFER MEM A → B key	
Output Signal		
Video Output Signal	Approx. 1 Vp-p, 75 Ω (BNC)	Composite
CRT	7 inches, high resolution	
Weight		
Main Unit	Approx. 9.3 kg (20.5 lbs)	
Including Accessories	Approx. 11 kg (24.2 lbs)	
Overall Dimensions	350 W × 200 H × 370 D mm (13.8 W × 7.9 H × 14.6 D in.)	
Dimensions Including Extrusions	400 W × 255 H × 400 D mm (15.7 W × 10.0 H × 15.7 D in.)	
Line Voltage	90 V - 126 V AC 194 V - 253 V AC	Selectable with switch on rear panel
Line Frequency	50/60 Hz	
Power Consumption	Approx. 130 VA	
Ambient Conditions		
Rated Temperature and Humidity	5°C to 35°C (41°F to 95°F), 85% RH	
Maximum Operating Temperature and Humidity	0°C to 40°C (32°F to 104°F), 90% RH	

2.5 Accessories of DLG7050

Item	Model	Q'ty	Remarks
Probe	PR01-DLG	1	Probe A
Probe	PR02-DLG	1	Probe B
Probe	PR03-DLG	1	Probe C
Probe Chips	TP01-DLG (GRAY)	21	With probe cable
Probe Chips	TP02-DLG (BLACK)	7	With probe cable
			Housed in probe case
Fuse	4 A	1	
Fuse	2 A	1	
GP-IB Terminal Card	TC01-DLG	1	
Power Cable		1	
Accessory Bag		1	Set on mainframe
Instruction Manual		1	
Optional			
GP-IB Monitor Adaptor	AP01-DLG		With GP-IB cable 0.5 m

3. GENERAL PRECAUTIONS

3.1 Inspection Upon Delivery

The instrument is shipped from the factory after being fully inspected and tested.

Upon receipt of the instrument, immediately unpack and inspect it for any damage which might have been sustained when in transportation. If any sign of damage is found, immediately notify the bearer and/or the dealer.

3.2 Checking the Line Voltage Setting

The AC line voltage setting of the DLG7050 is selectable between nominal 100-VAC system and 200-VAC system with the AC line voltage selector switch on the rear panel (9 in Figure 4.2.) The "A" position of the switch is for nominal 100 VAC (with voltage tolerance of 90 V - 126 V) and the "B" position is for nominal 200 VAC (with voltage tolerance of 194 V - 253 V).

The AC line frequency should be 50/60 Hz.

When the AC line voltages are changed, the fuses also should be changed accordingly (a 4-ampere fuse for "A" and a 2-ampere fuse for "B").

When the instrument is shipped from the factory, the voltage selector switch is set in the "A" position.

Warning:
- o Before connecting the power cord to an AC line outlet, check that the AC line voltage selector switch on the rear panel is set in the correct position for the AC line voltage.
- o Before changing the switch positions, be sure to disconnect the power cord from the AC line outlet.

3.3 Environments

The DLG7050 employs a number of ICs. Pay attention so that the cooling fan air outlet holes and ventilation holes are not blocked in order that cooling of the ICs and other components is not hampered. Do not operate the DLG7050 in direct sunlight or near a source of heat.

Avoid using the DLG7050 in adverse environments such as dust, corrosive gas, chemicals, and mechanical vibration. Note that such will badly shorten the longevity of the instrument.

The ambient conditions to satisfy the performance specifications of the instrument is 5°C to 35°C (41°F to 95°F), 85% RH.

The DLG7050 has a high speed digital clock generator to provide a timing signal and has a switching type of regulated power supply. The instrument is incorporated with provisions to prevent EMI (electromagnetic interference) that could be caused by these circuits. However, should any device be subjected to EMI caused by the instrument, move such device apart from the instrument and use an isolated power source for the device.

3.4 Setting Methods of Accessories

3.4.1 Connections of Probes and Their Chips

The cable wires used for connections of probes and their chips are classified by colors: white for signals and black for ground.

Receptacles are connected to the wires of the probe chip side and plugs are connected to the wires of the probe side. The GND plugs are larger than the signal plugs.

Each probe bears a label indicating the names of the signals (channels) to be connected.

Insert the cable wires in conformity with the signal names. The cable wires are identified by signal name labels. Channels 0 through F are identified as "0" through "F", the external clock (E CK) as "CK", the external clock qualifier (CQ) as "CQ", and data qualifiers Q0 and Q1 as "Q0" and "Q1", respectively.

For your reference, the relationship between the location of the receptacles shown in Figure 3.1 and the signal names are shown in Table 3.1.

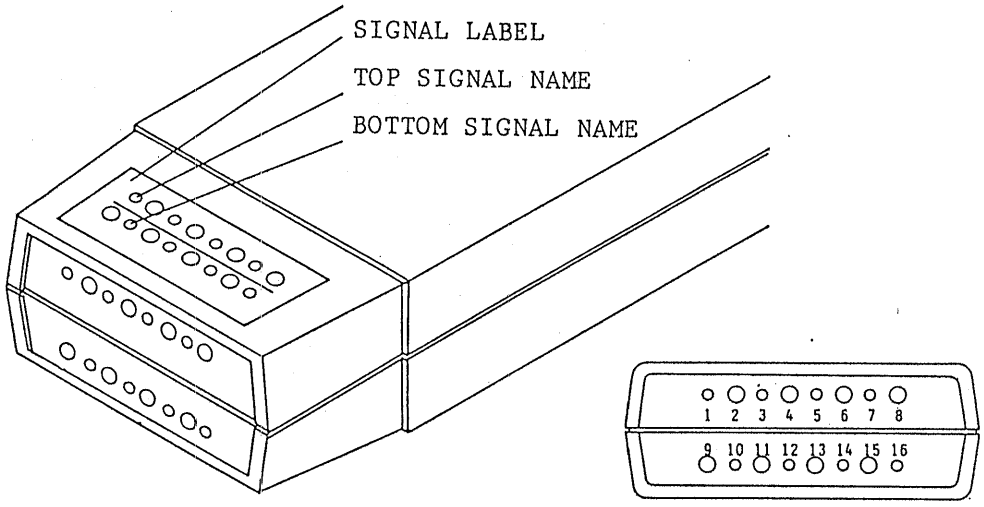


Figure 3.1 Layout of Receptacles for Chennel Connections

Table 3.1 Relationship Between Location of Receptacles and Signal Names

	PR01	PR02	PR03		PR01	PR02	PR03
1	CH0	CH8	Q0	9	GND	GND	(GND)
2	(GND)	(GND)	(GND)	10	CH4	CHC	-
3	CH1	CH9	Q1	11	(GND)	(GND)	(GND)
4	(GND)	(GND)	(GND)	12	CH5	CHD	-
5	CH2	CHA	-	13	(GND)	(GND)	GND-CQ
6	(GND)	(GND)	(GND)	14	CH6	CHE	CQ
7	CH3	CHB	SER	15	(GND)	(GND)	GND-CK
8	GND	GND	GND	16	CH7	CHF	CK

3.4.2 Connections Between Main Unit and Probes

Connect the connectors of PR01-DLG, PR02-DLG and PR03-DLG to the PROBE A, B and C, respectively, of the main unit of DLG7050 as shown in Figure 3.2.

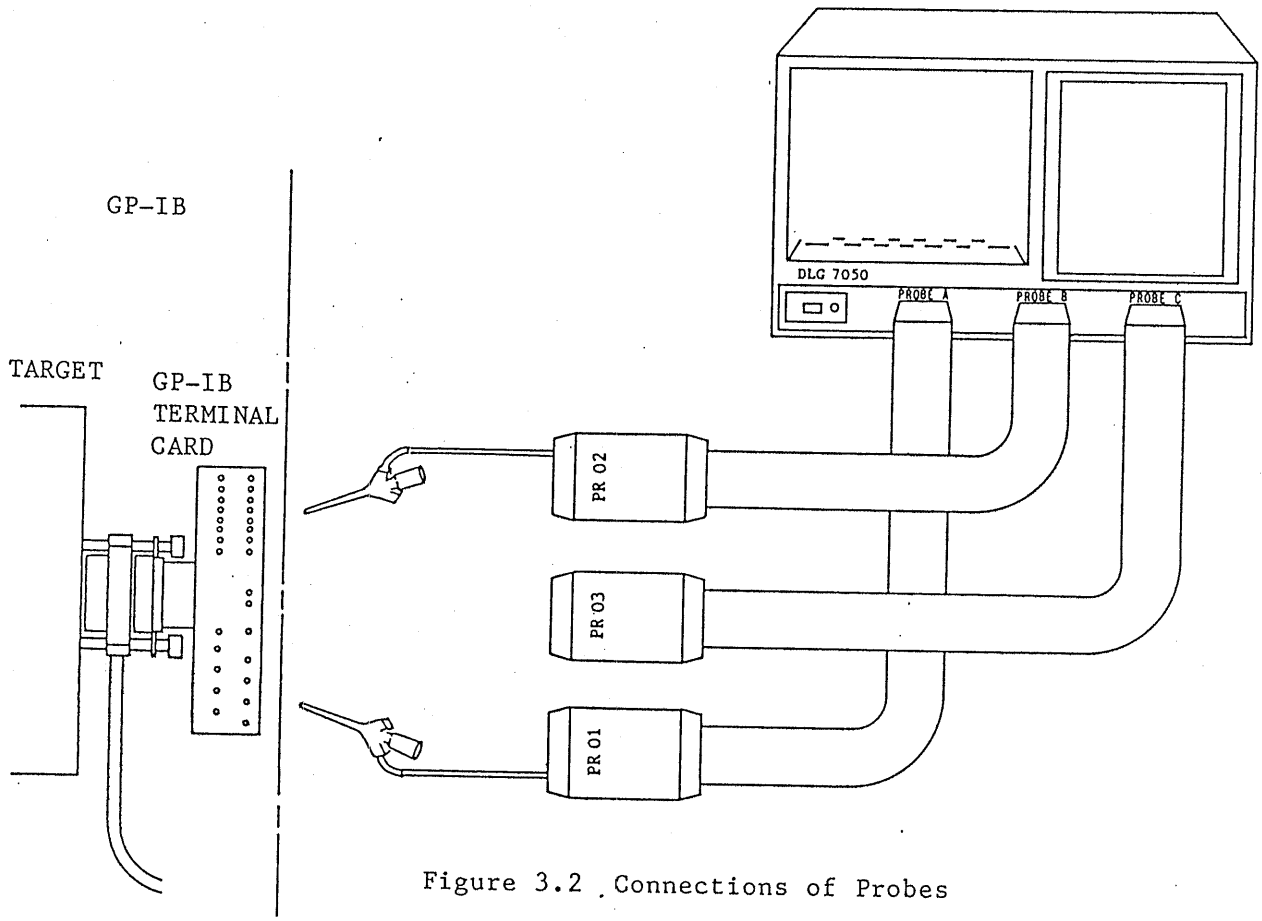


Figure 3.2 Connections of Probes

The GP-IB terminal card (TC01-DLG) bears names of the signals to be connected. When employing the card, connect the probes referring to the signal names.

4. DESCRIPTION OF PANELS

4.1 Description of Front Panel

(1)	POWER Switch and Lamp	Main power switch of the instrument. (Before turning on the switch again after turning it off, allow a period of several seconds or more.)
(2)	PROBE A Connector	Connector for channels 0 - 7
(3)	PROBE B Connector	Connector for channels 8 - F
(4)	PROBE C Connector	Connector for data qualifiers 0 and 1, external clock, external clock qualifier, serial data, and serial external clock.
(5)	Soft Keys (6 keys)	Selectable in conformity with soft key function display.
(6)	Soft Key Function Display	Function display changes in conformity with modes.
(7)	Operation Panel	Refer to Section 5.

Note: Note that the pins of the PROBE connectors (2), (3) and (4) are exposed being loaded with voltages. Pay attention so that they are not shorted with metallic pieces.

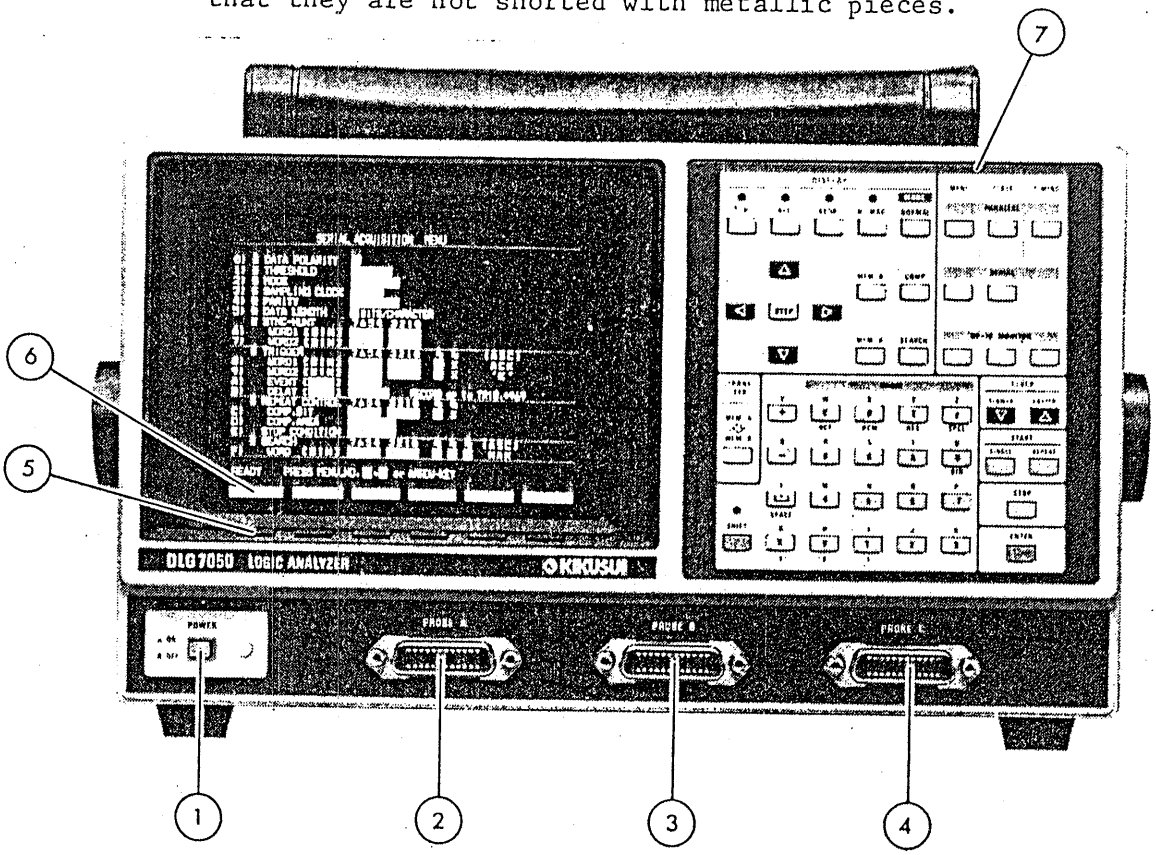


Figure 4.1 Front Panel of DLG7050

4.2 Description of Rear Panel

(8)	Power Cable Connector	
(9)	Line Voltage Selector Switch	A: 90 V - 126 V B: 194 V - 253 V
(10)	Fuse Holder	90 V - 126 V: 4 A 194 V - 253 V: 2 A
(11)	VIDEO OUT Connector	Video signal output connector, BNC
(12)	GND Terminal	
(13)	Power Cable Takeup Hook	
(14)	Accessory Bag	

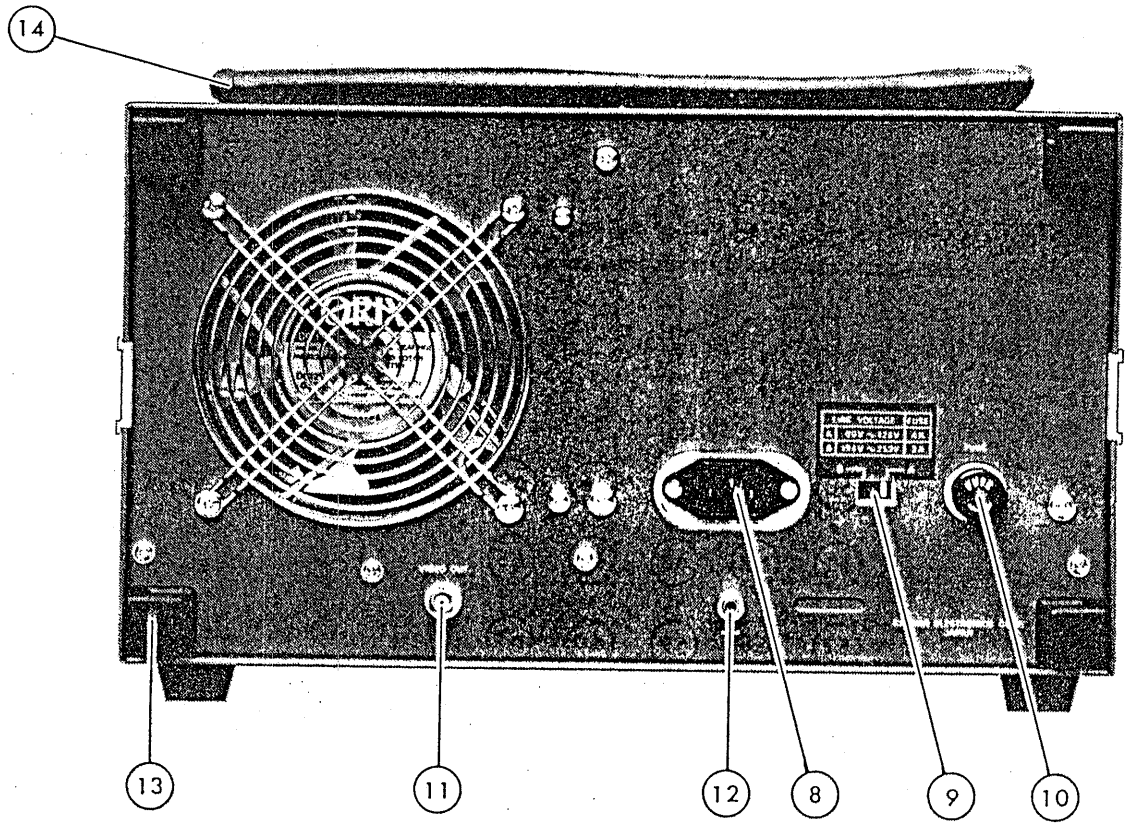
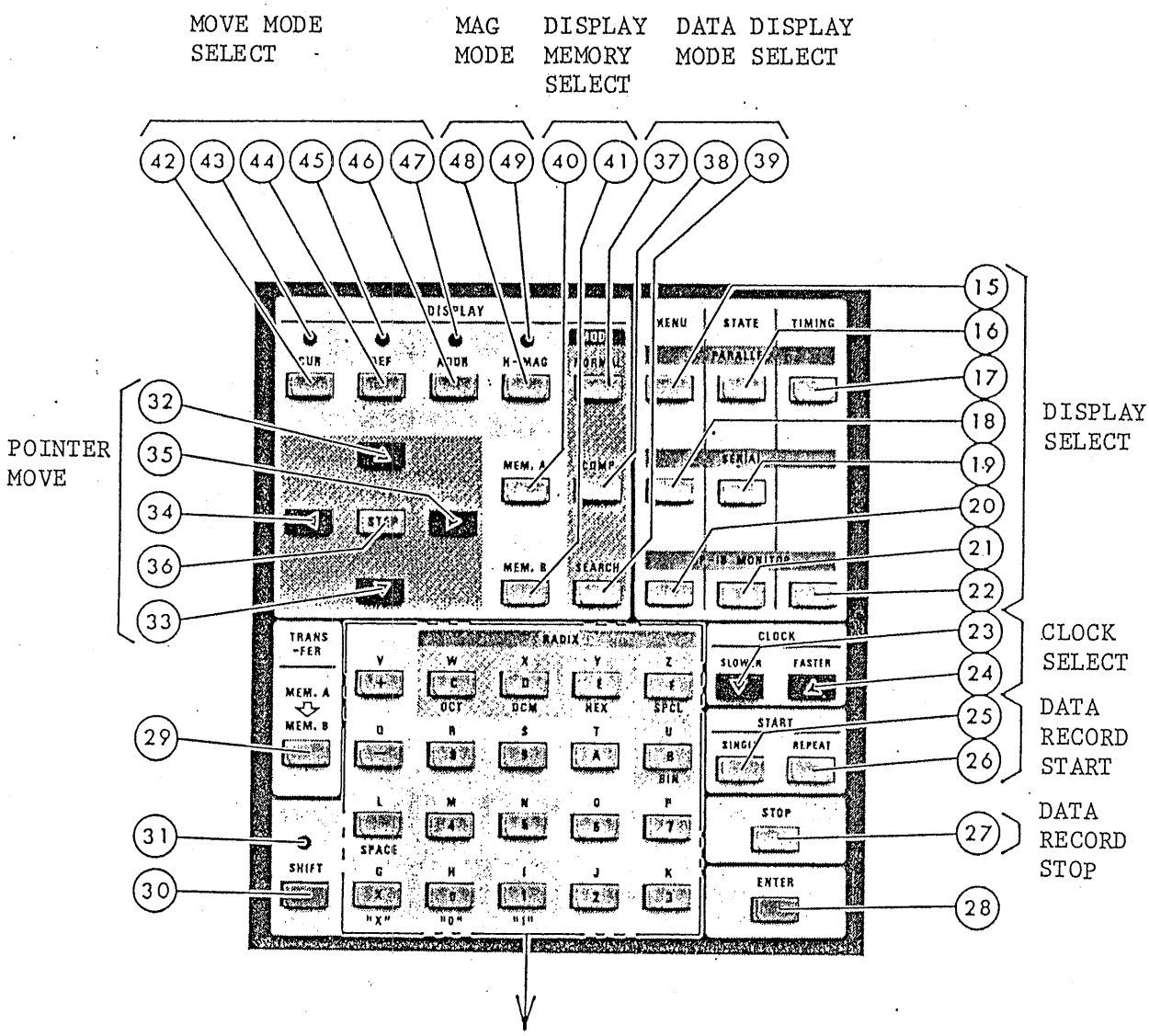


Figure 4.2 Rear Panel of DLG7050

Operation Panel



5. DESCRIPTION OF OPERATION PANEL

5.1 DISPLAY SELECT Keys (15) - (22)

These keys are used to select menu displays or data displays (state displays and timing displays).

(15) PARALLEL MENU Display

As you press this key once, PAGE-1 is displayed; as you press it again, PAGE-2 is displayed. When the key is pressed, the pointer is at the home position.

(16) PARALLEL STATE Display

(17) PARALLEL TIMING Display

(18) SERIAL MENU Display

(19) SERIAL STATE Display

(20) GP-IB BUS MONITOR MENU Display

(21) GP-IB BUS MONITOR STATE Display

(22) GP-IB BUS MONITOR TIMING Display

5.2 DATA RECORD START Keys (25), (26)

(25) START [SINGLE] Key

As you press this key, data is recorded and displayed for a single operation cycle.

(26) START [REPEAT] Key

As you press this key, data is repeatedly recorded and displayed. Repetition operation can be set by means of menu [REPEAT CONTROL]. For details, refer to 10.2 "Repetitive Recording by the REPEAT Function."

5.3 DATA TRANSFER Key [MEM A → MEM B] (29)

(29) [MEM A → MEM B] Key

As you press this key, data (up to 1000 data together with recording parameters) is transferred from data record memory (MEM A) to reference data memory (MEM B). Recording parameters are shown on TIMING displays.

The keys of 5.1, 5.2 and 5.3 are constantly effective except the following cases:

(1) When in data recording

(2) When the set value on MENU display is invalid

(3) When in relative or absolute address move mode (See Section 6.2.7.)

5.4 DATA DISPLAY MODE SELECT Keys ㊲ , ㊳ , ㊴

These keys are used to select data display modes. For details of display modes, refer to Section 6.2 "General Description of TIMING and STATE Displays."

㊲	[NORMAL]	Normal data display. (Ineffective when in MENU display)
㊳	[COMP]	To compare data between [MEM A] and [MEM B]. (Ineffective when in MENU display)
㊴	[SEARCH]	To search for a particular data pattern. When in MENU display, the pointer moves to the item where the SEARCH WORD is set.

5.5 DISPLAY MEMORY SELECT Keys ㊵ , ㊶

These keys are used to select display memory.

㊵	[MEM A]	Data record memory. When power is on, parallel data samples are set. In addresses 740 and further, sample data for state display of GP-IB bus monitor is set.
㊶	[MEM B]	Reference data memory. When power is on, serial data samples are set.

The capacity of each of MEM A and B is 1000 data, with addresses 0 - 999. MEM A and B are used in common for the parallel, serial, and GP-IB modes of operation. Even when the display shown does not conform with the recording mode, the recorded data is not cleared or recording is not disabled.

5.6 MOVE MODE SELECT Keys and Lamps (42) - (47)

These keys and lamps are used to select one of the three modes mentioned below, when in the DATA DISPLAY mode.

(42) [CUR]
(44) [REF] } Mode to move the display pointer for addresses 0 - 999.

(46) [ADDR] Mode to change the head address of display. CUR and REF addresses remain unaltered.

The display pointer can be moved by means of the POINTER MOVE keys described in Section 5.9 or by directly specifying an address with the keys of (54) and further. For details, refer to Section 6.2.7.

5.7 MAG MODE Key (48) and Lamp (49)

(48) [H-MAG] To select horizontal magnification factor when in TIMING display. As this key is pressed, magnification factor changes in the sequence of ×1, ×2, ×5, ×10, ×20, ×50, and then returns to ×1. The lamp (49) illuminates when the magnification factor is other than ×1.

5.8 CLOCK SELECT Keys (23), (24)

These keys are effective for both MENU and DATA displays. When the pointer is at another set item in a MENU display, if one of these keys is pressed for the first time, the pointer will be set to the [SAMPLING CLOCK] item. If the key is pressed again, clock will change as follows:

(23) [SLOWER] Clock is set to that slower by one step.

Examples: 20 ns → 50 ns
2400 bits/s → 1200 bits/s

(24) [FASTER] In the reverse of (23)

The sampling clock loops are set in the following sequences:

Parallel: 20 ns, 50 ns, ... 500 ms, EXT+, EXT-, 20 ns

Serial: 19200 bits/s, 9600 bits/s, ... 50 bits/s, EXT-, EXT+, 19200 bits/s

GP-IB Monitor: 20 ns, 50 ns, ... 500 ms, DAV+, DAV-, 20 ns

5.9 POINTER MOVE Keys (32) - (36)

These keys are used to move the setting pointer on a MENU display. They also are used to move the display pointer on a DATA display. The pointer moves in the direction indicated by each key.

(36) [STEP] When in the MENU display mode, as you press this key, the pointer will move to a point advanced by four points in the same item or to the next item.

When in the DATA display mode, as you press this key, the pointer will move basically by one display.

For the SOFT KEY FUNCTION display, the arrowhead keys are for [→], [←], [↑], [↓].

5.10 SHIFT Key (30) and Lamp (31)

This key is effective when in the MENU display mode. With this key, characters "G" - "Z" can be set in the PARALLEL MENU PAGE-2 [CH LABEL] item.

As you press this key once, the entry keys are set to the SHIFT ON state and become effective for "G" - "Z". The lamp (31) illuminates to indicate the SHIFT ON state.

As you press the key again, the entry keys are set to the SHIFT OFF state and become effective for "0" - "9", "A" - "F", "+", "-", and "SPACE".

When in a MENU item other than the above, if you press a menu item number 0 - F (indicated at the head of each item) (54) - (69) key, the setting pointer will move to the target item.
(with using SHIFT key at the same time)

5.11 RADIX SELECT Keys (65) - (69)

These keys are used to select a radix of [BIN], [OCT], [HEX], [SPC], or [DCM] when in the DATA display mode. Effective keys differ by displays. See Section 6.2.5.

When in the MENU display mode, these keys are used for setting of radix. These keys are effective only when the pointer is set at the RADIX point.

5.12 NUMERAL, CHARACTER & SYMBOL ENTRY Keys (50) - (69)

These keys are used for various settings of MENU.

When in the DATA display mode, if you press the [+] key (50) or [-] key (51), the entry is done in a relative-value movement mode. If you press the [0] - [9] keys (54) - (63), the entry is done in an absolute-value movement mode and the pointer will move to the address specified by the entry. See Section 6.2.7.

5.13 STOP Key (27)

When in the data recording mode, this key functions as a recording stop key. When in the direct or indirect address move mode, this key is used to abort setting.

When delivering the output to a video printer, this key is used to stop blinking of display. Blinking can be resumed by pressing another key.

6. DESCRIPTION OF DISPLAYS AND OPERATION METHOD

6.1 General Description of MENU Display

The MENU display is for setting the conditions of recording or displaying data. The functions of individual items of the MENU display are described in the paragraphs which explain the displays which employ the set values in question.

6.1.1 Setting

Setting can be done by moving the blinking pointer with the POINTER MOVE keys (arrowhead keys) to the point where change is required. The required point alone can be modified, skipping the intermediate points.

For setting, the SOFT keys (5), [0 - F] keys (50) - (69), and [+], [-], [␣] (SPACE) keys can be used.

When one of a multiple number of items is to be selected the required item is indicated in a SOFT KEY FUNCTION display (Figure 6.1 (E)). Press the SOFT key immediately underneath the indication.

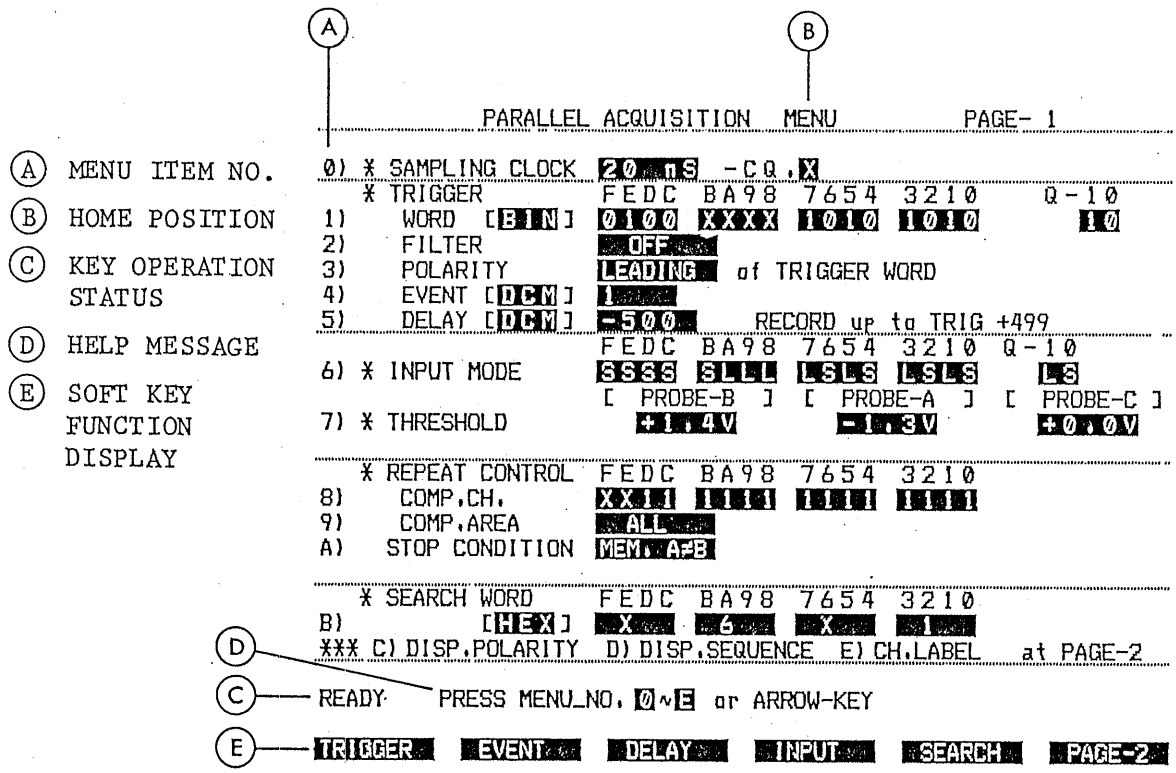


Figure 6.1 Example of MENU Display

6.1.2 To Move the Pointer

The pointer can be moved by means of the POINTER MOVE keys (32) - (35), [STEP] key (36), and [ENTER] key (28). For the procedure to move to the required point in one step, see Section 5.10.

([SHIFT] + [ITEM NO.])

(1) When setting of the item which is currently indicated by the pointer is exceeding the setting limit value or otherwise invalid, the pointer cannot be moved to other item.

(2) The DISPLAY SELECT keys (5) - (22) and the DATA RECORD START keys (25) and (26) are constantly effective so far as the settings of all items are meeting the required conditions.

(3) As you press the [ENTER] key (28), the pointer moves to the setting point at the left hand end of the below item (subsequent item) on the display.

(4) As you press a POINTER MOVE key (arrowhead key) (32) - (36), the pointer will move in the direction indicated by the arrowhead, except the following cases:

a. If you press the [←] key when the pointer is at the left hand end of an item, the pointer moves to the right hand end of the above item (proceeding item).

b. If you press the [→] key when the pointer is at the right hand end of an item, the pointer moves to the left hand end of the below item (subsequent item).

c. For an EVENT or a DELAY item, the pointer is always set starting by the next point of the RADIX. For a SAMPLING CLOCK item, the pointer is always set starting by the left hand end setting point.

d. There are some points where the pointer cannot be set depending on the conditions of setting.

6.1.3 HELP Messages (Figure 6.1 (D))

HELP messages appear at the bottom of the display to facilitate setting.

6.1.4 KEY OPERATION Status (Figure 6.1 (C))

The following meassages appear.

READY	Waits for key entry.
KEY ERR	The key entry is invalid.

DATA ERR	Setting of the item (in relation to other items) does not meet the required conditions.
MAX OVER	The high or low limit is exceeded. Check and correct the setting.
HARD ERR	A hardware failure is found and data recording is disabled.

6.1.5 Automatic Correction of MENU Value Setting

In some cases, invalid settings on the MENU display are automatically corrected so that data can be correctly recorded.

(1) When all items of TRIGGER WORD are set to "×"

Items corrected:	TRIGGER EVENT is corrected to "1". TRIGGER POLARITY is corrected to "LEADING".
Timing of correction:	When leaving the TRIGGER WORD item or when starting data recording. For GP-IB, when leaving the CLOCK item.
Reason for correction:	With the above setting, all input states conform with the TRIGGER WORD and no disparities are caused. Consequently, the EVENT count does not advance, no end of conformity with the TRIGGER WORD is detected, and data recording cannot end.
Messages:	When all items of TRIGGER WORD are set to "×", the following messages will appear.

For the EVENT item:

IN ALL "×" TRIG.WORD!, SET EVENT TO "1"

For the POLARITY item:

IN ALL "×" TRIG.WORD!, SET EVENT TO "1", POLARITY TO "LEADING"

(2) When CLOCK is set to DAV+ or DAV- in the GP-IB MONITOR mode

Items corrected:	TRIGGER FILTER is corrected to "OFF". TRIGGER WORD DAV is corrected to "×". COMP.CH. DAV is corrected to "×".

Timing of correction: The same as that of (1)

Reason for correction: To record DAV with DAV

(3) When in the SERIAL mode

When in the SYNC mode

The BK (break) items of TRIGGER WORD 1, 2 and COMP BIT are automatically corrected to "x".

When in the ASYNC mode

If the BK (break) items of TRIGGER WORD 1 and 2 have been set to "1", all other bits are set to "x".

(4) Messages

When correction of (1) or (2) is done, one of the following messages is displayed.

```
CORRECTED !, EVENT to "1"
CORRECTED !, EVENT to "1" & TRIG,POLARITY to "LEADING"
CORRECTED !, TRIG.,FILTER,POLARITY,EVENT or COMP,CH,[DAV]
```

6.2 General Description of TIMING and STATE Displays

6.2.1 Data Addresses

Each of MEM A and MEM B has 1000 addresses, namely, from address 0 to address 999, to identify locations of 1000 data.

6.2.2 Display Select

Displays can be selected with the DISPLAY SELECT keys (16), (17), (19), (21) and (22). By pressing these keys, the "NORMAL" DISPLAY mode and the "CUR" MOVE mode can be selected, and the SCROLL mode of the TIMING display can be released.

The display which appears on the CRT differs by display mode, display memory, display radix, and horizontal magnification.

Select the MOVE mode and adjust the display pointer and display head address as required.

6.2.3 Display Modes

There are three display modes as follows:

(1) NORMAL: This mode is for normal data display.

(2) COMP: This mode is for comparison of data of MEM A with that of MEM B.

On the TIMING display, data of MEM B is shown immediately below that of MEM A.

On the STATE display, data of MEM A is compared with that of MEM B for corresponding addresses and, if they differ, the display polarity is inverted.

Depending on the type of display, data of both MEM A and B appear on the same display or that of either MEM A or B alone appears. See Section 6.2.4.

(3) SEARCH: This mode is to search for a data pattern set on the MENU display. When a corresponding data is found, its address is set in the "CUR" or "REF".

There are two types of SEARCH modes. One is to search starting by address 0 and the other starting by the current address in the MOVE mode. For details, see Section 6.2.8.

On the STATE display, an asterisk appears at the head of address indication of coincident data.

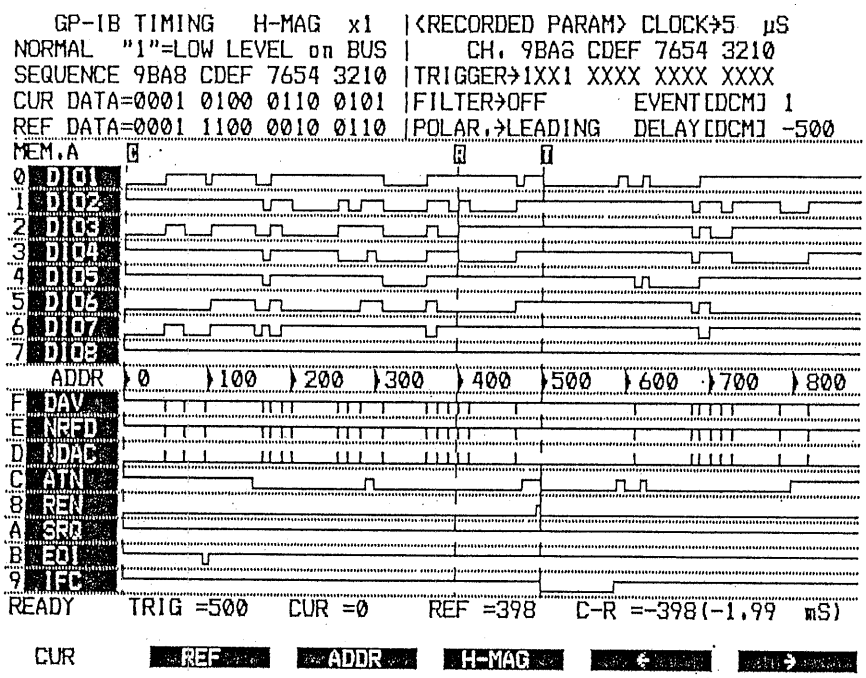


Figure 6.2 An Example of TIMING Display

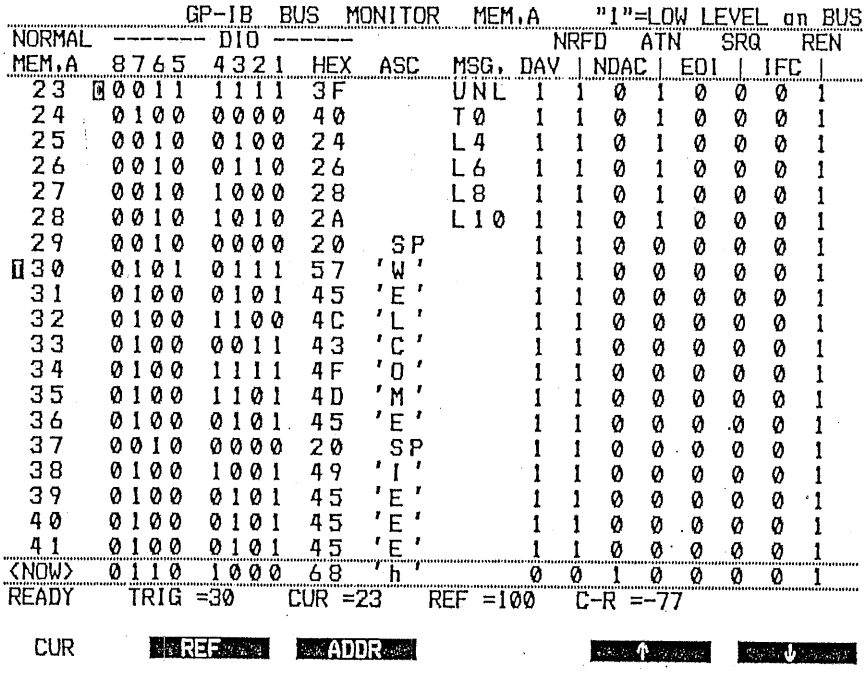


Figure 6.3 An Example of STATE Display

6.2.4 Display Memory Select

Data of either MEM A or B can be displayed. Since data is recorded into MEM A, data which is used for reference should be transferred to MEM B by means of the [TRANSFER MEM A → MEM B] key (29).

When in the COMP display mode, data of both MEM A and B are displayed except the following in which cases data of either MEM A or B is displayed.

(1) PARALLEL STATE [SPC] RADIX

(2) SERIAL STATE [SPC] RADIX

(3) GP-IB BUS MONITOR STATE

6.2.5 Display Radix Select

When in the TIMING display mode, the display radix of parameters for recording is selected and the display unit word for trigger event or trigger delay is specified. The [SPC] is inhibited. The [BIN] is for judgement for individual items.

When in the STATE display mode, the data display radix is selected. The [DCM] is inhibited. If the [SPC] is selected when in the SERIAL or GP-IB mode, 200 data are shown in one display in ASC code.

When in the PARALLEL STATE [SPC] mode, the order of channels to be displayed is determined depending on the MENU [DISPLAY SEQUENCE] setting. Also, the channels are classified into groups and the display radix is determined depending on the number of channels of each group. See Section 7.4.2.

6.2.6 Horizontal Magnification

When in the TIMING display mode, horizontal magnification can be effected by pressing the [H-MAG] key (48). Priority is in the order of CUR, REF and ADDR. The center of magnification, as a general rule, is as follows:

(1) When the CUR is displayed, magnification is done with the CUR as the center of magnification.

(2) When the CUR is not displayed but the REF is displayed, magnification is done with the REF as the center of magnification.

(3) When neither CUR nor REF is displayed, magnification is done with respect to the ADDR (the head address of the display) unaltered.

6.2.7 MOVE Mode (CUR, REF, and ADDR)

On the DATA display, the CUR and REF pointers can be shown on the display. On the display, C and R appear on the inverted background.

Since it is unable to show 1000 data in one display, the start address is indicated. To indicate this, the ADDR pointer (or head address pointer) is used.

To move these pointers, proceed as follows: Select the required one of the pointers by means of the MOVE MODE SELECT keys (42), (44) and (46), or the SOFT keys. The indicator lamp of the selected mode will illuminate and the SOFT KEY FUNCTION lamp will blink. (When a DISPLAY SELECT key is pressed, the CUR pointer will be selected.) By pressing the POINTER MOVE keys, move the pointer in the DIRECT or INDIRECT ADDRESS MOVE mode.

When the ADDR is moved, the values of CUR and REF remain unaltered. When the CUR or REF is moved off the display, the ADDR is automatically corrected so that the CUR or REF is shown within the display.

As you press one of the POINTER MOVE keys, the pointer moves in the corresponding direction. If you press the [STEP] key, the pointer moves basically by one frame (for the page function) in the direction of the POINTER MOVE key pressed immediately before pressing the [STEP] key. If in the SEARCH mode, however, the pointer moves as mentioned in the above and then the search function is performed and the result is displayed. (See Section 6.2.8.)

When in the TIMING display mode, the functions of the [Δ] key (32) and [∇] key (33) differ from the above. (They are used for the scroll function. See Sections 7.3.9 and 9.2.1.)

DIRECT ADDRESS MOVE Mode: [NUMERIC KEYS] and [ENTER]

When in the DATA display mode, the CUR, REF or ADDR pointer specified in the MOVE mode can be moved to the required point by pressing the NUMERIC keys ([0] - [9]) as required and the ENTER key. For example, if you press the [2], [3], [9] and [ENTER] keys when in the CUR MOVE mode, the CUR pointer will move to address 239.

INDIRECT ADDRESS MOVE Mode: [+] or [-], [NUMERIC KEYS], and [ENTER]

This mode is selected as you press the [+] or [-] key. For example, if you press the [+], [2], [3], [4] and [ENTER] keys when the REF pointer is at address 569 in the REF MOVE mode, the REF pointer will move to address (569 + 234) = 803.

If the result exceeds the limit value, the MAX value is set.

When in the DIRECT or INDIRECT ADDRESS MOVE mode, as you press the initial key, the entered value appears at the bottom of the display. After this display has appeared, the DISPLAY SELECT keys and DATA RECORD START keys remain idle until the [STOP] key is pressed.

If you press the [STOP] key without pressing the [ENTER] key, the value attempted to be entered is aborted and the preceding value remains effective.

6.2.8 SEARCH Mode

This mode is to search for data which conforms with the SEARCH WORD set by the MENU. The displayed data is of either MEM A or MEM B.

There are two ways of search. One is to start search by address 0 and the other is by the address where the pointer (CUR or REF) exists currently.

(1) Starting search by address 0

Search starts by address 0 if one of the following actions is taken when in the SEARCH mode.

① The [SEARCH] key is pressed to change into the SEARCH mode.

② The [MEM A] or [MEM B] key is pressed when in the SEARCH mode. (See Note 1.)

③ The [TRANSFER MEM A → MEM B] key is pressed when data of MEM B is being displayed in the SEARCH mode.

When the above has occurred, the following values are set:

CUR:	Address where data conformed for the 1st time	(999 if no data conform)
REF:	Address where data conformed for the 2nd time	(999 if no data conform)
NEXT:	Address where data conformed for the 3rd time	(Shown at bottom of display)
TOTAL:	The number of addresses where data conformed within addresses 0 - 999	(Shown at bottom of display)

(2) Starting search by the current pointer address

If the SEARCH mode has already been effected, search starts by the address where the pointer exists currently.

If in the CUR or REF mode, the pointer is moved as described in Section 6.2.7 and then search starts.

When data which conforms is found, its address is set to the pointer by the MOVE mode. The next coincident address is set to the NEXT pointer.

If in the ADDR MOVE mode, the pointer moves as described in Section 6.2.7 and the head address of display is altered. No search is done and the addresses of the CUR and REF pointers remain unaltered.

(3) For actual examples, refer to Section 14.7 "SEARCH".

Note 1: The three types only of displays described in Section 6.2.4.

6.2.9 To Display the Head Address of Effective Data

When data recording is stopped by pressing the [STOP] key or when an effective input which conforms with the TRIGGER WORD is detected immediately after starting with the DELAY set at a negative value, data recorded starting by address 0 of the data record memory may be ineffective. (See Sections 10.5 and 10.8.) When such ineffective data is suspected, the head address of the effective data can be displayed for confirmation with the following procedure:

① Set all channels (bits) of the SEARCH WORD to "x". (The instrument is initialized to this state when its power is turned on.)

② With the TIMING or STATE display shown on the CRT, press the [SEARCH] key to select the SEARCH mode. The CUR pointer will be set at the head address of the effective data.

③ Press the [NORMAL] key to return to the NORMAL mode.

6.3 Display Control, and Pointer Setting Release and Modification

This section covers the parameters which are affected when displays are changed.

6.3.1 MOVE Parameters

CUR, REF — The locations of these pointers remain unaltered even when displays are changed by means of the DISPLAY SELECT keys ⑮ - ㉑, unless the POINTER MOVE procedure is correctly done.

ADDR — The location of the pointer remains unaltered unless the POINTER MOVE procedure is correctly done. However, if the value is for an address further than address 999 due to the difference of the number of data shown in one display, modification is done.

6.3.2 Display Modes

NORM
COMP — When a display is selected by means of the DISPLAY SELECT keys ⑮ - ㉑, the display mode is set to "NORMAL".

SEARCH — If data recording is started when in the SEARCH mode, it is modified to the NORMAL mode.

If the [MEM A] or [MEM B] key is pressed when data of both MEM A and MEM B are displayed in the COMP mode, the display is modified to the NORMAL display of MEM A or MEM B.

6.3.3 Display Memory Units

MEM A
MEM B — Memory unit setting remains unaltered even when displays are changed by means of the DISPLAY SELECT keys ⑮ - ㉑.

However, if displays are changed when data of both MEM A and MEM B are being displayed in the COMP mode, the new display is in the NORMAL mode and consequently the MEM A is set.

If data recording is started when data of MEM B is being displayed, memory setting is modified to MEM A.

6.3.4 Display Radix

Basically, the display radix is not affected even when displays are changed by means of the DISPLAY SELECT keys (15) - (21). However, since DCM is not available for the STATE displays, it is modified to BIN if a STATE display is selected. Also, since SPC is not available for a TIMING displays, it is modified to DCM or BIN.

The GP-IB STATE display is with BIN and HEX used indiscriminately. Within the instrument, BIN is used throughout for all of BIN, OCT and HEX.

6.4 <NOW> Display (Real Time Input State Display)

When in the PARALLEL or GP-IB STATE display mode, the <NOW> display is used to indicate the current state of the input. This, however, is not applicable when in the SPC RADIX mode or GP-IB SEARCH mode.

The THRESHOLD is with a value set by MENU.

The input level is sampled at fixed time intervals (several tens milliseconds) and is state-displayed with the radix being indicated. However, the signals of smaller duty ratios are not displayed.

When in data recording, the data being recorded into MEM A is monitored. The <NOW> display does not change in response to input change if the external clock is halted when in recording with the external clock.

7. DISPLAYS AND OPERATION METHOD OF PARALLEL DATA SECTION

7.1 PARALLEL MENU (PAGE-1)

7.1.1 Effective Keys

The following keys are constantly effective so far as they meet the setting conditions of respective items. They are inhibited if they do not meet the conditions.

DISPLAY SELECT keys (15) - (22)

CLOCK SELECT keys (23), (24)

DATA RECORD START keys (25), (26)

DATA TRANSFER key (29)

[ENTER] key (28)

POINTER MOVE keys (32) - (36) (The [←] and [→] keys are constantly effective so far as they are within the item.)

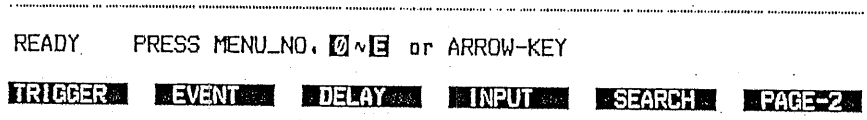
[SHIFT] key (31) (Used in conjunction with numeric keys [0] - [F] to specify item number)

[SEARCH] key (39) (To move for item search)

SOFT keys (For respective functions)

7.1.2 Home Position

The pointer can be moved to the item whose data is required to be changed, by using the POINTER MOVE keys, SOFT keys and by entering the item number.



Effective keys: [0] - [F] (Item number)

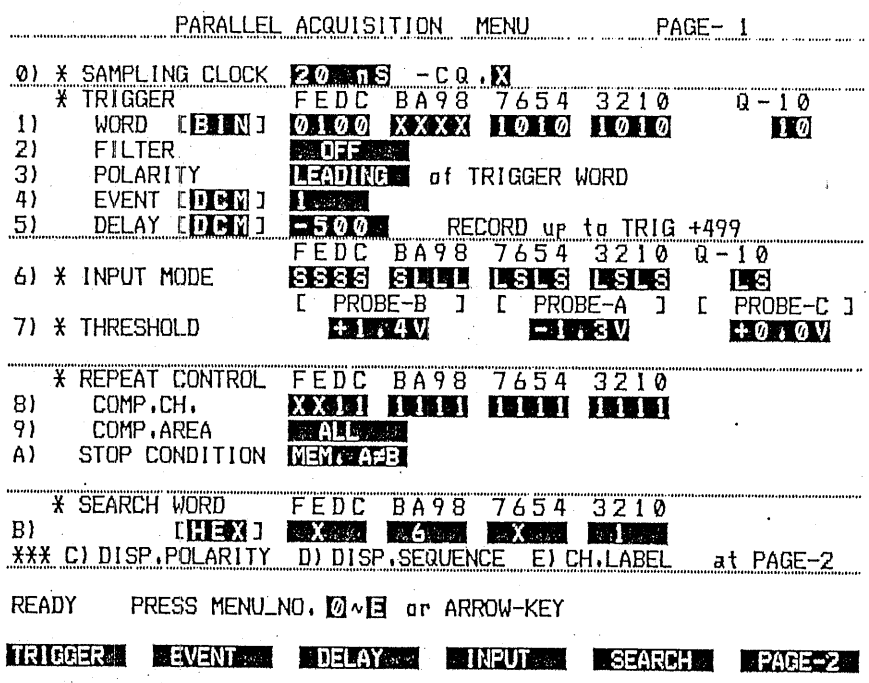
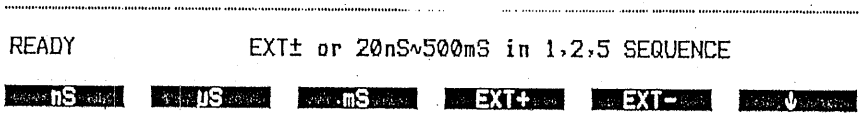


Figure 7.1 An Example of PARALLEL MENU (PAGE 1) Display

7.1.3 0) SAMPLING CLOCK



Effective keys: [1], [2], [5], [0], [+] (EXT+), [-] (EXT-)

Setting can be done either by entering the required value with the NUMERIC keys or by selecting the required value with the [FASTER] and [SLOWER] keys and selecting a unit with the SOFT keys.

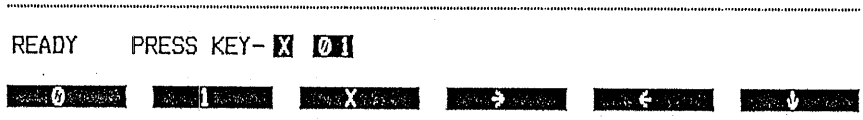
Only when an external clock (EXT+ or EXT-) is selected, the pointer can be moved to the "-CQ" (external clock qualifier) of the right hand item.

Effective keys: [+], [-], [×]

For this type of setting, refer to Section 11.2 "MENU Setting of External Clock and Its Qualifier."

7.1.4 1) TRIGGER WORD

A trigger word is used to set a reference data pattern to start recording of data. For the details of this item, refer to Section 10.7.1. For the description in the case of that all bits of the trigger word are set to "×", refer to Section 6.1.5.



Effective keys: [×], [0], [1] - [F] (Differs by point)

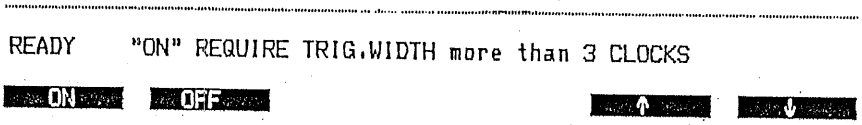
To change the radix setting, move the pointer to the RADIX position by means of the [←] key.

Effective keys: [B] (BIN), [C] (OCT), [E] (HEX)

Term "Q-" of the trigger word denotes the data qualifier input of channel 1 or 0. Although this input is not recorded, it is used for combination of trigger word. It is used also as an external trigger.

7.1.5 2) TRIGGER FILTER

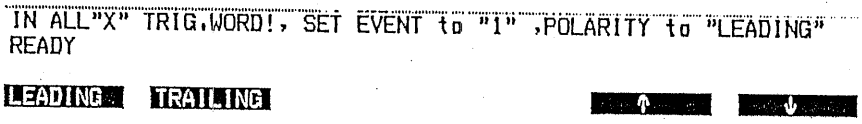
Refer to Section 10.7.1.



Effective keys: None (Use the SOFT keys.)

7.1.6 3) TRIGGER POLARITY

Refer to Section 10.7.1.

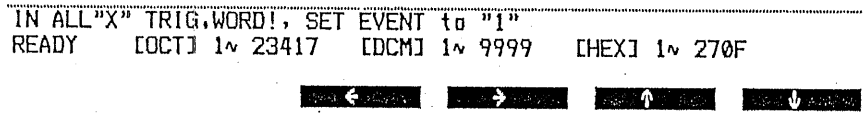


Effective keys: None (Use the SOFT keys.)

84.10.26

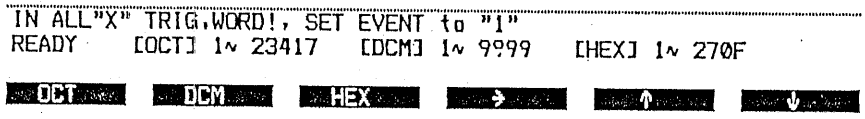
7.1.7 4) TRIGGER EVENT

Refer to Section 10.7.1. If all bits of the trigger word are set to "x", refer to Section 6.1.5.



Effective keys: [0] - [7], [0] - [9], [0] - [F] (Depends on the set radix)

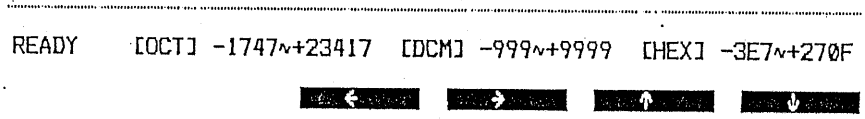
To change radix, move the pointer to the left hand end.



Effective keys: [C] (OCT), [D] (DCM), [E] (HEX)

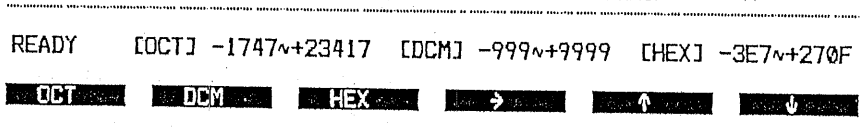
7.1.8 5) TRIGGER DELAY

This item is used to set a relationship between the triggering point and the record start point. Refer to Section 10.7.1.



Effective keys: [+], [-] and [0] - [7], [0] - [9], [0] - [F] (Depends on the set radix)

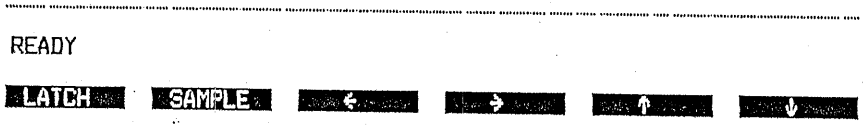
To change radix, move the pointer to the left hand end.



Effective keys: [C] (OCT), [D] (DCM), [E] (HEX)

7.1.9 6) INPUT MODE

Refer to Section 10.7.2.



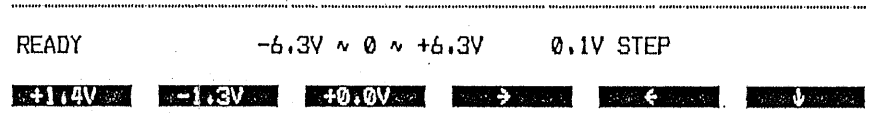
Effective keys: None (Use the SOFT keys.)

On the display, "L" stands for LATCH and "S" for SAMPLE.

7.1.10 7) THRESHOLD (Threshold Voltage)

Refer to Section 10.7.3.

The signal of probe C includes an external clock and its qualifier input, and data qualifier inputs 1 and 0.



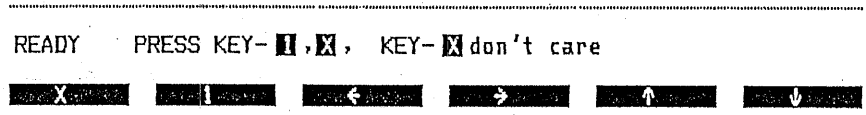
Effective keys: [+], [-], [0] - [9]

Special keys: [A], [B], [C], [D] and [E] keys are used to set data for function test.

* REPEAT CONTROL (Record and Control of Repetitive Data)

7.1.11 8) COMP CH (Compare channels)

Refer to Section 10.2.



Effective keys: [×], [1]

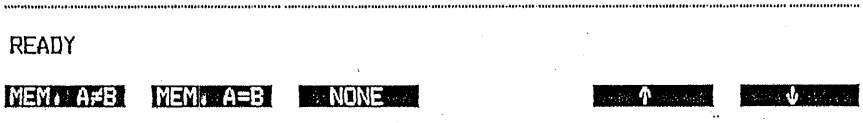
7.1.12 9) COMP AREA (Compare areas)

Refer to Section 10.2.

Effective keys: None (Use the SOFT keys.)

7.1.13 A) STOP CONDITION

Refer to Section 10.2.



Effective keys: None (Use the SOFT keys.)

7.1.14 B) SEARCH WORD

This item is used to set a data pattern for search. Refer to Section 6.2.8.

```
READY    PRESS KEY- X 0123456789ABCDEF
 0        1        X        →        ←        ↓
```

Effective keys: [×], [0] - [F] (Depends on the set radix and indicated by message)

Setting should be done with the polarity that has been used for data recording.

To change radix, move the pointer to the left hand end.

```
READY
 BIN      OCT      HEX      →        ↑        ↓
```

Effective keys: [B] (BIN), [C] (OCT), [E] (HEX)

7.2 PARALLEL MENU (PAGE-2)

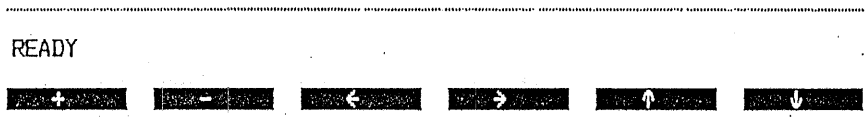
This display is for control of the parallel data displays. If you press the [PARALLEL MENU] key (15) when the pointer is at the home position, the display is changed to that of the PARALLEL MENU (PAGE-1).

```
                PARALLEL ACQUISITION  MENU          PAGE- 2

   * DISPLAY     FEDC BA98 7654 3210
C)   POLARITY    ++++ ++++ ++++ ++++
D)   SEQUENCE    FEDC BA98 7654 3210
E) * PROBE CHANNEL LABEL      ( for TIMING DISPLAY only)
          CH.0-012345
          CH.1-6789AB
          CH.2-CDEF+-
          CH.3-
          CH.4-GHIJKL
          CH.5-MNOPQR
          CH.6-STUVWX
          CH.7-YZ
          CH.8-KIKU-
          CH.9-   SUI
          CH.A-ELEC-
          CH.B- TRON-
          CH.C-   ICS
          CH.D- CORP
          CH.E-DLG
          CH.F- 7050

READY    PRESS MENU_NO. 0~E or ARROW-KEY

POLARITY  SEQUENCE  LABEL  PAGE-1
```

Figure 7.2 An Example of PARALLEL MENU (PAGE-1) Display

7.2.1 C) DISPLAY POLARITY

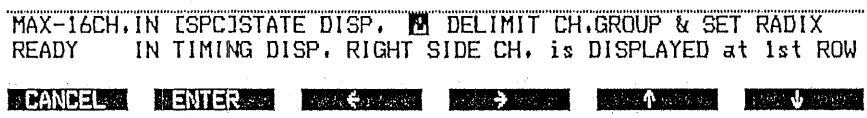
This item is used to select either the polarity is to be inverted or not when displaying the data which has been stored in MEM A or MEM B. This item is used in common for both STATE display and TIMING display.



Effective keys: [+], [-]

7.2.2 D) DISPLAY SEQUENCE

Refer to Sections 7.3.2 (TIMING display) and 7.4.2 (STATE display).

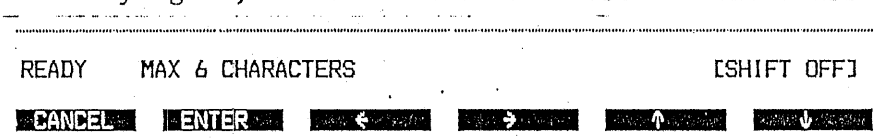


Effective keys: [ ] (SPACE), [0] - [F]

As you press the [CANCEL] key (SOFT key), the setting is cleared and all data is replaced by spaces. This item is used in common for the [SPC] RADIX of the STATE display and for the TIMING display.

7.2.3 E) PROBE CHANNEL LABEL

This item is used to provide a label for each of the channels. Up to six characters can be used for each label. As you press the [SHIFT] key once, it is locked and the SHIFT ON state is maintained. As you press the key again, it is unlocked and reset to the SHIFT OFF state.



Effective keys: [SHIFT], [0] - [F], [+], [-], [ ] (SPACE), [×]

When in the SHIFT ON state, the [0] - [F], [+], [-], [ ] and [×] keys are used as "G" - "Z" keys.

If you press the [CANCEL] key (SOFT key), the data of the corresponding set line is cleared by being replaced by spaces.

If you press the [ENTER] key, the pointer moves to the head of the next line. If the pointer is at this item, it cannot be moved by pressing the [SHIFT] key and entering an item number.

7.3 PARALLEL TIMING

7.3.1 Contents of Display

① SOFT KEY Display

One of the [CUR], [REF] and [ADDR] pointers is in the MOVE mode and is blinking. One of the operation panel lamps ㊸, ㊺ and ㊻ illuminates to indicate the MOVE mode.

② STATUS Display

1) Key status

2) Address of TRIG in memory

A slash symbol (/) if no TRIG is recorded in memory or if the TRIG addresses are different when data of both MEM A and MEM B are displayed in parallel in the COMP mode.

3) Locations (addresses) of and difference between CUR and REF. Time-equivalent value of internal sample clock if such is used when recording data.

③ Parameters Used When Recording the Data Being Displayed

Radixes of EVENT and DELAY can be specified.

④ Horizontal Magnification Factor

A magnification factor can be selected with the [H-MAG] key. Indicator lamp ㊾ illuminates when the selected magnification factor is other than ×1.

⑤ Display Mode

⑥ Display Sequence

The displayed channel numbers are shown from left to right in the order that they are shown from bottom to top in the display.

Note: When in the SEARCH mode, the order of ⑤ and ⑥ may be inverted. This occurs when all terms of the SEARCH WORD of the undisplayed channel are set to "×". If the undisplayed channel has even a single "1" or "0", ⑤ is shown in line 2 and ⑥ in line 3, with ⑤ indicating the SEARCH WORD setting in the sequence of F - 0.

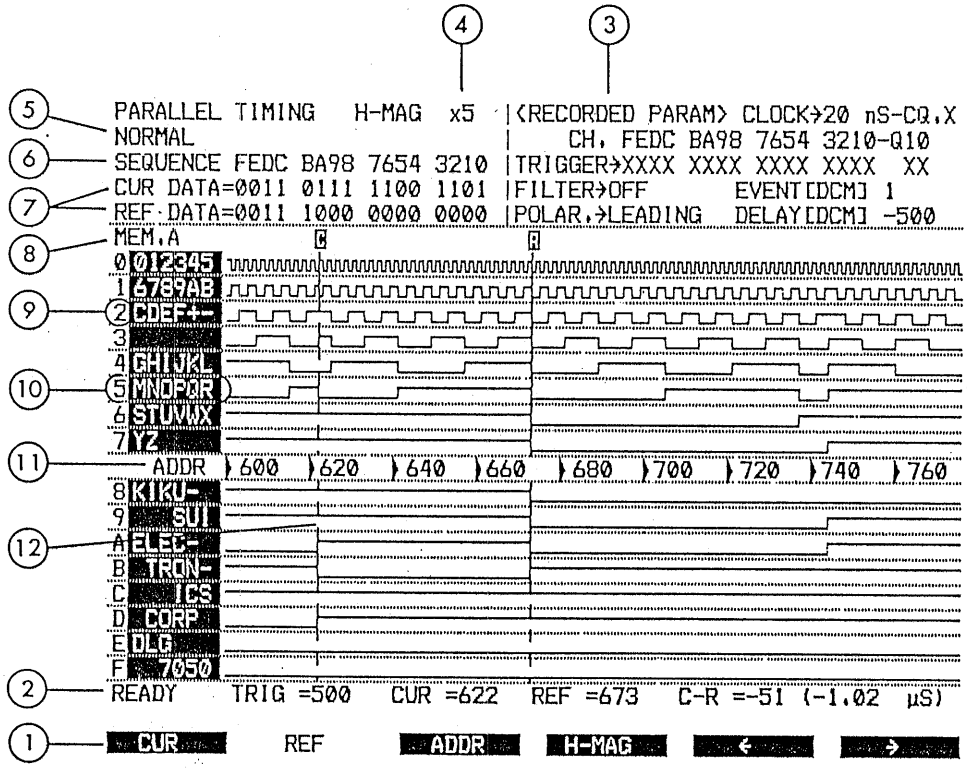


Figure 7.3 An Example of PARALLEL TIMING Display

⑦ CUR Data and REF Data

These items show the data of the addresses indicated by the CUR and REF pointers. The high level is represented by 1 and the low level by 0.

⑧ Display Memory

⑨ Display Channel No.

Display channel No. of MEM A is displayed with the normal video and that of MEM B with the inverted video.

⑩ Channel Label

When power of the instrument is turned on, the channel number only is set in this item. Label setting can be done with the MENU.

⑪ Data Address Display

⑫ Data

For the display sequence, refer to Section 7.3.2.

The display polarity is inverted (inverted between high level

and low level) for the channel which is specified to be "-" by the DISPLAY POLARITY of PARALLEL MENU PAGE-2.

7.3.2 Display Sequence, Number of Channels, and Vertical Magnification

(1) As you press the PARALLEL TIMING key (17), data is displayed in the order as set in the DISPLAY SEQUENCE item of PARALLEL MENU PAGE-2. The channel corresponding to that at the right hand end of the item is displayed at the top and that at the left hand end is displayed at the bottom. The spaces are ignored.

(2) When in the COMP mode, data of MEM A is displayed at the top and that of MEM B at the bottom, starting by the channel set at the right hand end. Thus, if more than nine channels are set, the channels set at the left hand end are not displayed. In this case, data of such channels can be displayed in the SCROLL mode.

(3) To display channels in the SCROLL mode, use the [Δ] and [∇] keys. If you press the [Δ] key when in the state of (1), the uppermost channel disappears. If you press the [∇] key, the lowermost channel disappears.

(4) When in the COMP mode, to view the data of a channel which is set in the DISPLAY SEQUENCE item but not displayed, scroll the display by pressing the [Δ] key. The channels which are not set cannot be viewed in the SCROLL mode. The original state is restored as you press the TIMING display key.

(5) The number of display channels is 16 - 1. The vertical magnification factor is automatically set with respect to the number of display channels as follows:

16 - 9 channels: ×1

8 - 5 channels: ×2

4 - 1 channels: ×4

For examples of magnifications, see Figures 14.10 and 14.11.

7.3.3 Examples of Displays in Different Modes

Figure 7.4 shows a display in the TIMING COMP mode. On this display the timing difference can be clearly seen as the data of MEM A and that of MEM B are displayed in parallel. The order of the displayed channels is such that the right hand end channel of the DISPLAY SEQUENCE setting appears at the top and orderly toward the bottom. Up to eight channels can be displayed. If 9 or more channels are set, the channels can be viewed in the SCROLL mode by using the [Δ] and [∇] keys.

Figure 7.5 shows a display in the TIMING SEARCH mode. Since all of the 16 channels are displayed, the DISPLAY SEQUENCE is indicated in line 2 and the SEARCH DATA setting, CUR ADDRESS DATA and REF ADDRESS DATA are shown in the subsequent lines.

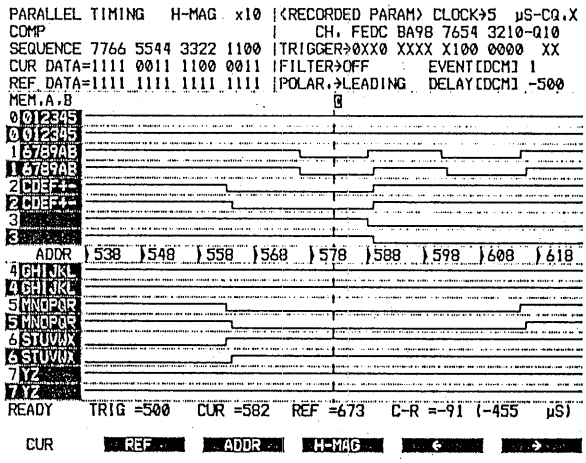


Figure 7.4 An Example of PARALLEL TIMING COMP Mode Display

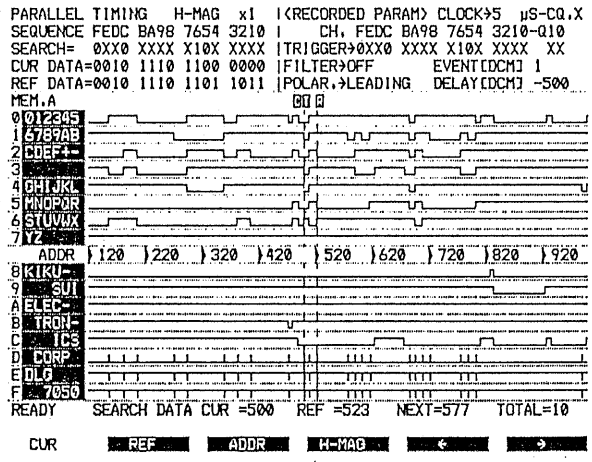


Figure 7.5 An Example of PARALLEL TIMING SEARCH Mode Display

7.4 Parallel State

7.4.1 Contents of Display

①	SOFT KEY Display:	The CUR, REF, or ADDR pointer is in the MOVE mode and blinks.
②	STATUS Display:	The same as that of PARALLEL TIMING, Section 7.3.1.
③	<NOW> Display:	The input state is displayed.
④	Display Mode:	NORMAL, COMP, or SEARCH mode
⑤	Display Radix:	The unit of display (BIN, OCT, HEX, or SPC)
⑥	Display Memory:	MEM A, MEM B, or both MEM A and B in the COMP mode
⑦	Data Address:	Data address 0 - 999
⑧	Data:	Display polarity is as selected by Item C) "DISPLAY POLARITY" of PARALLEL MENU PAGE-2.

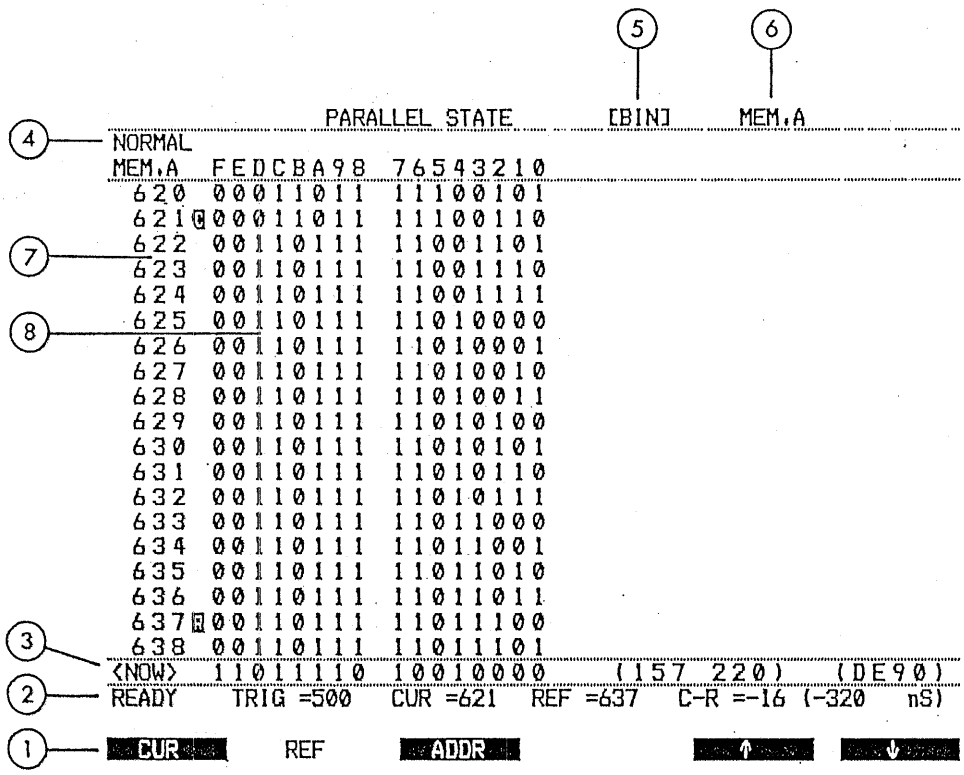


Figure 7.6 An Example of PARALLEL STATE Display

7.4.2 Examples of Displays in Different Modes

(1) Display Radix

When in the BIN, OCT or HEX system, the channels are denoted with channel F as MSB and channel 0 as LSB. A specific system is used in the case of the SPC.

(2) Figure 7.7 shows an example of display in the PARALLEL STATE COMP mode, with the BIN radix. Data of MEM A is compared with that of the same address of MEM B and, if disparity of data is found, the data and its address are displayed with the inverted display polarity.

(3) Figure 7.8 shows an example of display in the PARALLEL STATE SEARCH mode. Data which conforms with the SEARCH word is searched for and the coincident data is indicated with an asterisk and its address is displayed being inverted. The total number of the coincident data items within addresses 0 to 999 is displayed in the TOTAL item.

PARALLEL STATE [BIN] MEM.A,B

COMP	MEM.A FEDCBA98 76543210	MEM.B FEDCBA98 76543210
10	00000000 01101000	00000000 11010001
11	00000000 01101001	00000000 11010110
12	00000000 11010011	00000000 11010011
13	00000000 11010100	00000000 11010100
14	00000000 11010101	00000000 11010101
15	00000000 11010110	00000000 11010110
16	00000000 11010111	00000000 11010111
17	00000000 11011000	00000000 11011000
18	00000000 11011001	00000000 11011001
19	00000000 11011010	00000000 11011010
20	00000000 11011011	00000000 11011011
21	00000000 11011100	00001000 11011100
22	00000000 11011101	00000000 11011101
23	00000000 11011110	00000000 11011110
24	00000000 11011111	00000000 11011111
25	00000000 11100000	00000000 11100000
26	00000000 11100001	00000000 11100001
27	00000000 11100010	00000000 11100010
28	00000000 11100011	00000000 11100011
<NOW>	11011110 10010011	(157 223) (DE93)

READY TRIG =/ CUR =13 REF =25 C-R =-12

CUR REF ADDR ↑ ↓

Figure 7.7 An Example of PARALLEL STATE COMP Mode Display

PARALLEL STATE [HEX] MEM.A

SEARCH XXXX 0110 XXXX 0001

MEM.A	MEM.A	MEM.A	MEM.A
*263 0631	287 0644	306 0657	325 066A
269 0632	288 0645	307 0658	326 066B
270 0633	289 0646	308 0659	327 066C
271 0634	290 0647	309 065A	328 066D
272 0635	291 0648	310 065B	329 066E
273 0636	292 0649	311 065C	330 066F
274 0637	293 064A	312 065D	331 0670
275 0638	294 064B	313 065E	*332 0671
276 0639	295 064C	314 065F	333 0672
277 063A	296 064D	315 0660	334 0673
278 063B	297 064E	*316 0661	335 0674
279 063C	298 064F	317 0662	336 0675
280 063D	299 0650	318 0663	337 0676
281 063E	*300 0651	319 0664	338 0677
282 063F	301 0652	320 0665	339 0678
283 0640	302 0653	321 0666	340 0679
*284 0641	303 0654	322 0667	341 067A
285 0642	304 0655	323 0668	342 067B
286 0643	305 0656	324 0669	343 067C

<NOW> DEDF (11011110 11011111) (157 337)

READY SEARCH DATA CUR =268 REF =284 NEXT=300 TOTAL=7

CUR REF ADDR ↑ ↓

Figure 7.8 An Example of PARALLEL STATE SEARCH Mode Display

(4) PARALLEL STATE SPC Display

The sequence of display channels and display radix depends on the DISPLAY SEQUENCE setting of Item D) DISPLAY SEQUENCE of PARALLEL MENU PAGE-2.

Setting can be made for up to 16 channels. Within this number, the same channel can be used twice or more.

Channels can be classified into groups by providing spaces between them. The display radix for a group is automatically determined depending on the number of channels set in the group. In each group, the leftmost channel is denoted as MSB. See Table 7.1.

Table 7.1 [SPC] Display Radix

No. of channels	Radix	No. of channels	Radix
1	BIN, 1 column	8	ASC, 1 character (MSB is ignored.)
2, 3	OCT, 1 column	9 - 12	HEX, 3 columns
4	HEX, 1 column	13 - 16	HEX, 4 columns
5, 6, 7	ASC, 1 character		

Figure 7.9 shows an example of MENU setting. Figure 7.10 shows an example of data display based on the setting.

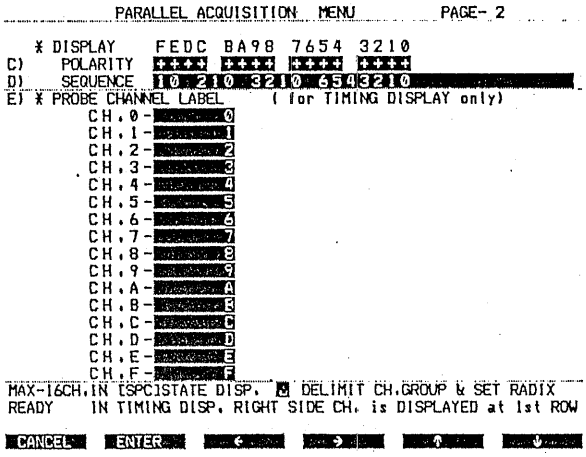


Figure 7.9

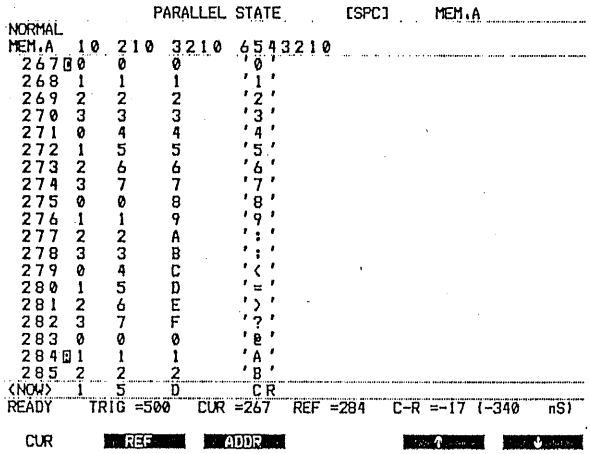


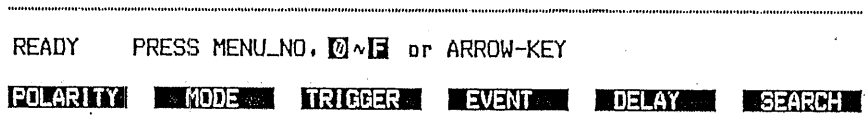
Figure 7.10

8. DISPLAYS AND OPERATION METHOD OF SERIAL DATA SECTION

8.1 SERIAL MENU

8.1.1 Home Position

The pointer can be moved to the item whose data is required to be changed, by using the POINTER MOVE keys, SOFT keys and by entering the item number.



Effective keys: [0] - [F] (item number)

8.1.2 0) DATA POLARITY (Input Data Polarity)

The "+" state is for the HIGH level when Marking is applied to the input terminal and the "-" state is for the HIGH level when Spacing is applied to the input terminal.

Effective keys: [+], [-]

For relative description, refer to Section 12.2.

8.1.3 1) THRESHOLD (Threshold Voltage)

The operation of the SOFT keys and the messages displayed are identical with those of Section 7.1.10.

8.1.4 2) MODE (SYNC Mode)

```
READY

 SYNC    ASYNC                                    ↑       ↓
```

Effective keys: None (Use the SOFT keys.)

[SYNC] Mode: For external clock only

[ASYNC] Mode: For both internal clock and external clock

8.1.5 3) SAMPLING CLOCK (To Select Clock (Transmission Speed))

[ASYNC] Mode:

```
READY   PRESS EXT±  or 1st & 2nd DIGITS of INTERNAL CLOCK

 EXT+    EXT-     ←       →       ↑       ↓
```

Effective keys: [0] - [9], [+] (EXT+), [-] (EXT-)

```
                    SERIAL ACQUISITION  MENU

0) * DATA POLARITY    +
1) * THRESHOLD        +1.4V
2) * MODE             SYNC
3) * SAMPLING CLOCK   EXT+
4) * PARITY           EVEN
5) * DATA LENGTH      8 BITS/CHARACTER
   * SYNC-HUNT        7654  3210
6)   WORD1 [BIN]      0001  0110
7)   WORD2 [BIN]      0001  0110
   * TRIGGER          7654  3210   PE  PK     (ASC)
8)   WORD1 [BIN]      X000  0110    X   X       ACK
9)   WORD2 [BIN]      X100  1011    X   X       'K'
A)   EVENT [DCM]      1
B)   DELAY [DCM]      -30          RECORD up to TRIG +969
   * REPEAT CONTROL   7654  3210   PE  PK
C)   COMP.BIT         X111  1111    X   X
D)   COMP.AREA        ALL
E)  STOP CONDITION    MEM A=B
   * SEARCH           7654  3210   PE  PK  PE  (ASC)
F)   WORD  [BIN]      X001  0101    X   X   X   NAK

READY   PRESS MENU_NO. 0~F or ARROW-KEY

POLARITY  MODE  TRIGGER  EVENT  DELAY  SEARCH
```

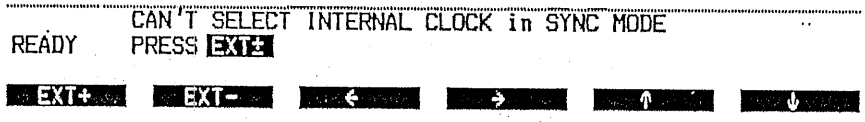
Figure 8.1 An Example of SERIAL MENU Display

For the internal clock, enter only two effective columns with the keys. No entry is needed for the 3rd and further columns.

The loop of the values set by the [FAST] key is as follows; that set by the [SLOW] key is in the reverse of the following:

50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200 BITS/SEC, EXT+, EXT-, (50)

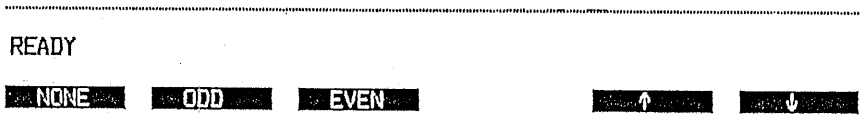
[SYNC] Mode



Effective keys: [+] (EXT+), [-] (EXT-)

The polarity of the external clock in the case of [EXT+] is such that the level changes from LOW to HIGH at the center of data bits. In the case of [EXT-], the polarity changes to the reverse direction. In either case, the period is with a relationship of one-to-one with respect to the bit rate.

8.1.6 4) PARITY



Effective keys: None (Use the SOFT keys.)

8.1.7 5) DATA LENGTH (Data Bit Length/Word)

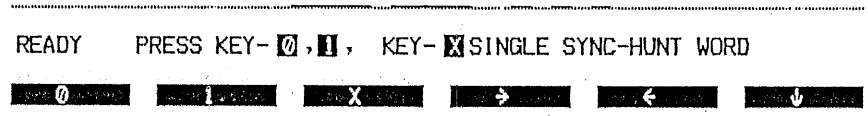
Effective keys: [5] - [8]

When the DATA LENGTH is set, the display of Items 8) and 9) "TRIGGER WORD" and Item C) "COMP BIT" changes and all of the ineffective bits are displayed as spaces. The ineffective bits are judged as "x".

8.1.8 6) SYNC-HUNT WORD 1

Effective keys: [0], [1]

8.1.9 7) SYNC-HUNT WORD 2



Effective keys: [0], [1], [×]

Items 6) and 7) can be displayed and set only when in the SYNC mode. The setting is for a code for establishment of synchronization. When in the SYNC mode, data recording does not start until the above data stream is detected.

Two words can be specified for the DATA WORD. When using only a single word for SYNC-HUNT, set WORD 2 using the [×] key. (The set words are not used after synchronization is established and have no relation with data recording thereafter.)

8.1.10 8) TRIGGER WORD 1, 9) TRIGGER WORD 2

Effective keys: [0], [1], [×]

Triggering can be effected with two consecutive words. When using only a single word for triggering, set "×" to all terms of WORD 2. When in the ASYNC mode, triggering can be effected also by break (BK).

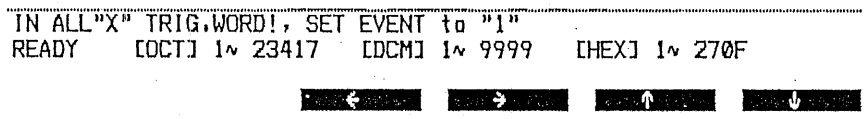
When setting a TRIGGER WORD, an (ASC) display appears following the set data. This is for changing the set data provided that any of the following conditions is met.

(1) When all of B7 - B0 are set to "1" or "0" and none of them is set to "×".

(2) When B7 alone is set to "×" and all of B6 - B0 are set to "1" or "0".

If the break (BK) bit is set to "1", the "brk" display is effected. Of the TRIGGER WORD, B7, B6 and B5 are automatically set to "x" depending on the data bit length and consequently these bits are not displayed.

8.1.11 A) TRIGGER EVENT



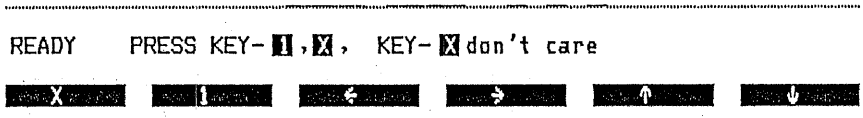
The setting method is identical with that of Section 7.1.7. Consecutive TRIGGER WORDS 1 and 2 are taken to be one event. For description, refer to Section 10.7.1.

8.1.12 B) TRIGGER DELAY

This item is identical with that of Section 7.1.8. For description, refer to Section 10.7.1.

* REPEAT CONTROL

8.1.13 C) COMP BIT (Compare Bits)



8.1.14 D) COMP AREA (Compare Areas)

8.1.15 E) STOP CONDITION (Condition for Stop)

For description, refer to Section 10.2. For the effective keys, refer to Sections 7.1.11, 7.1.12 and 7.1.13.

8.1.16 F) SEARCH WORD (Search Data Pattern Setting)

Effective keys: [0], [1], [×]

For description, refer to Section 6.2.8. An (ASC) display appears following the set data. The setting method is identical with that described in Section 8.1.10. If the break (BK) bit is set to "1", other bits are automatically set to "×".

8.2 SERIAL STATE

8.2.1 Contents of Display

①	SOFT KEY Display:	The CUR, REF, or ADDR pointer is in the MOVE mode and blinks.
②	STATE Display:	Identical with that of PARALLEL TIMING, except that no time-equivalent value of CUR - REF is displayed. Refer to Section 7.3.1.
③	Display Mode:	NORMAL, COMP, or SEARCH mode
④	Display Radix:	BIN, OCT, HEX, or SPC
⑤	Display Memory:	MEM A, MEM B, or both MEM A and B in the COMP mode
⑥	Data Address:	Data address 0 - 999
⑦	Data:	"PE" stands for parity error, "FE" for framing error, and "brk" for break. The bits which are not recorded depending on the data length are set to "0". In the case of ASC display, bit 7 is ignored and bits 6 - 0 are converted. When the display radix is set to SPC, an ASC display is done and 200 data are shown in one display.

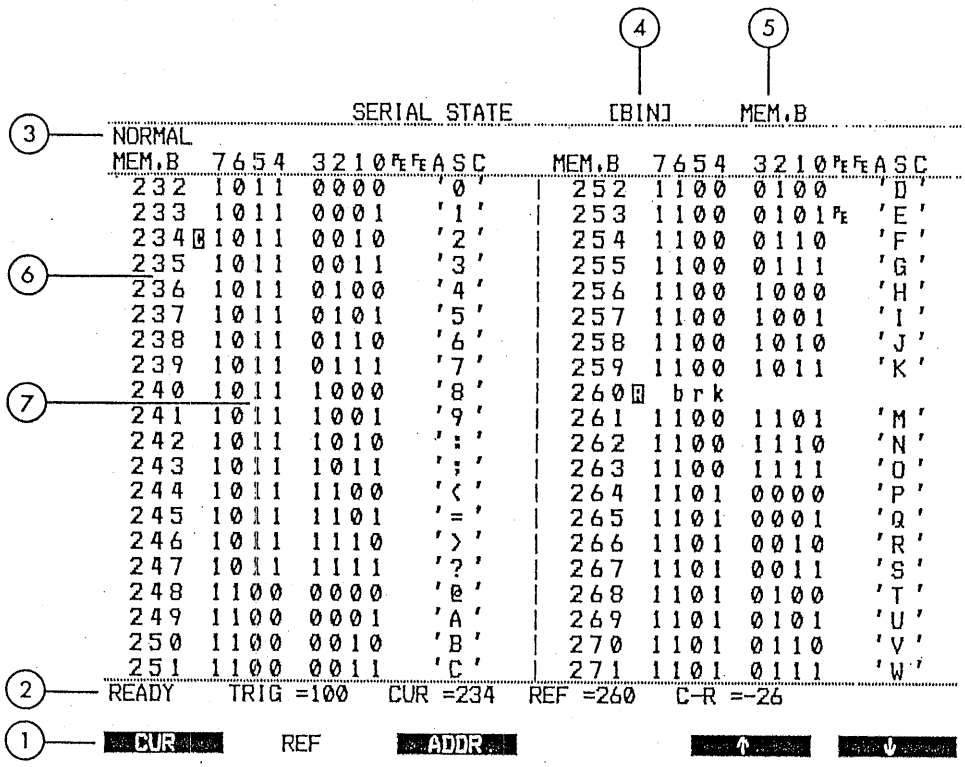


Figure 8.2 An Example of SERIAL STATE Display

8.2.2 Examples of Displays in Different Modes

As in the case of the PARALLEL STATE, when in the COMP display mode, data of MEM A is compared with that of the same address of MEM B and, if they do not conform, the data and address are displayed being inverted. (See Figure 8.3.)

When in the SEARCH display mode, the coincident data is indicated with an asterisk and the address is displayed being inverted. (See Figure 8.4.)

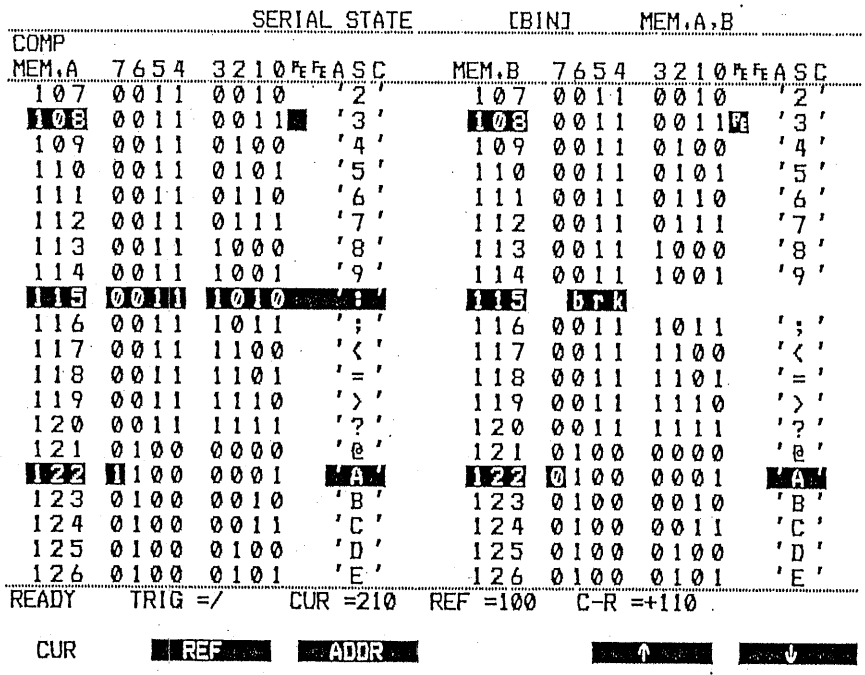


Figure 8.3 An Example of SERIAL STATE COMP Mode Display

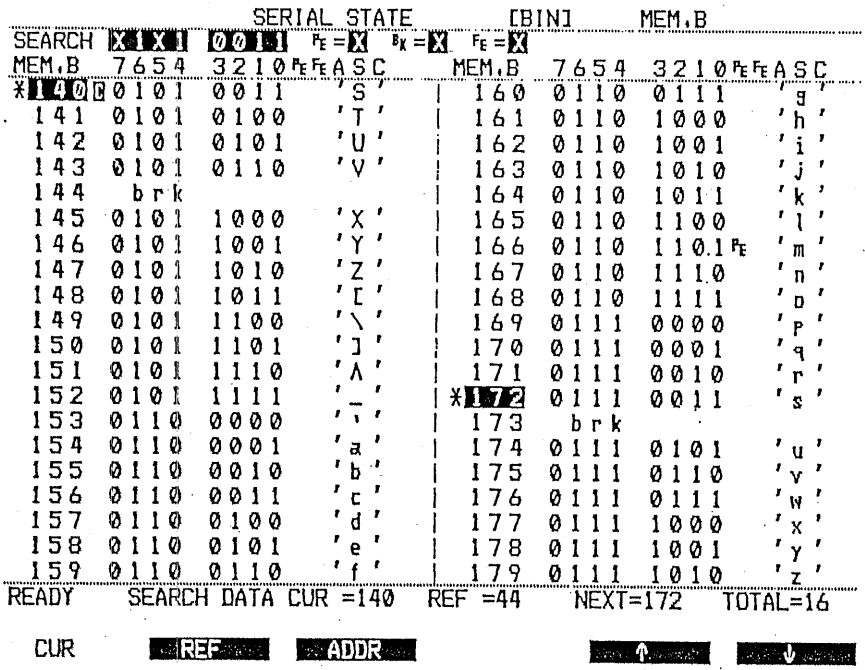


Figure 8.4 An Example of SERIAL STATE SEARCH Mode Display

9. DISPLAYS AND OPERATIN METHOD OF GP-IB MONITOR DATA SECTION

9.1 GP-IB Bus Monitor Menu

9.1.1 Differences from Parallel Menu

(1) SAMPLING CLOCK

No clock qualifier is provided. External clock is limited to DAV signal (DAV+ or DAV-).

(2) THRESHOLD

Fixed at +1.4 V.

(3) DISPLAY POLARITY

Fixed. The LOW level on the bus is represented by "1".

(4) DISPLAY SEQUENCE

Fixed.

(5) PROBE CHANNEL LABEL

Fixed. To set automatically the name of signal on the bus.

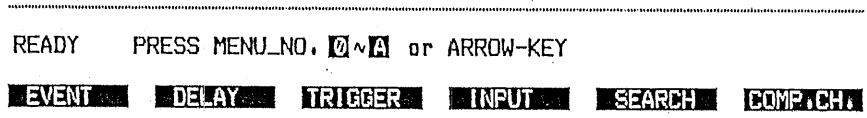
(6) Others

When SAMPLING CLOCK is set to DAV+ or DAV-, setting of some items is limited. Refer to Section 6.1.5 "Automatic Correction of MENU Value Setting."

```
                GP-IB BUS MONITOR MENU    "1"=LOW LEVEL on BUS

0) * SAMPLING CLOCK  DAV+
   * TRIGGER
1)    FILTER         OFF
2)    POLARITY       LEADING  of TRIGGER WORD
3)    EVENT [DCM]    1
4)    DELAY [DCM]    -30                    NRFD  ATN   SRQ   REN
   * TRIGGER         8765 4321   DAV | NDAC | EOI | IFC |
5)    WORD [BIN]     X0 1 1  1 1 1   X  X  X  1  X  X  X  1
6) * INPUT MODE      SSSS SSSS   S  S  S  S  S  S  S  S
   * SEARCH          | | | | | | | |  |  |  |  |  |  |  |
7)    WORD [BIN]     00 1X XXXX  X  X  X  1  X  X  X  X
   * REPEAT CONTROL  | | | | | | | |  |  |  |  |  |  |  |
8)    COMP.CH.       1 1 1 1 1 1 1 1  X  1  1  1  1  1  1  1
9)    COMP.AREA      ALL
A)    STOP CONDITION MEM. A=B
MESSAGE CODING TABLE     ( ATN=1  DIO8=X don't care)
  GTL-X000 0001   SDC-X000 0100   PPC-X000 0101   GET-X000 1000
  TCT-X000 1001   LLO-X001 0001   DCL-X001 0100   PPU-X001 0101
  SPE-X001 1000   SPD-X001 1001   UNL-X011 1111   UNT-X101 1111
  LAG-X010 0000 ~ X011 1110       TAG-X100 0000 ~ X101 1110

READY    "1"=LOW LEVEL on BUS

   0        1        X        →        ←        ↓
```

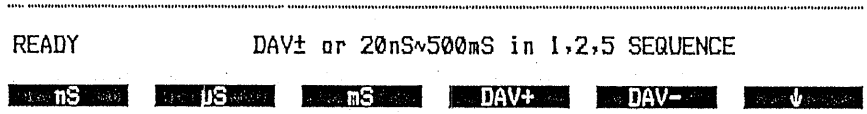
Figure 9.1 An Example of GP-IB MENU Display

9.1.2 Home Position



Effective keys: [0] - [A]

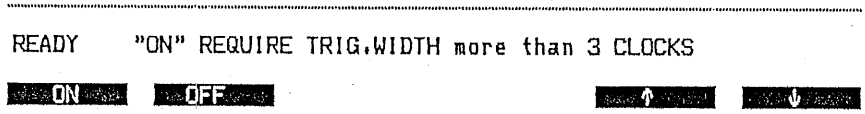
9.1.3 0) SAMPLING CLOCK



Effective keys: [+] (DAV+), [-] (DAV-), [1], [2], [5], [0]

For description, refer to Section 13.3 "Setting of Sampling Clock."

9.1.4 1) TRIGGER FILTER



Effective keys: None (Use the SOFT keys.)

For description, refer to Section 10.7.1. If the sampling clock is set to [DAV+] or [DAV-], the trigger filter is automatically corrected to "OFF" by the time of starting the data recording at the latest. See Section 6.1.5.

9.1.5 2) TRIGGER POLARITY

For description, refer to Section 10.7.1. The effective keys are identical with those of Section 7.1.6.

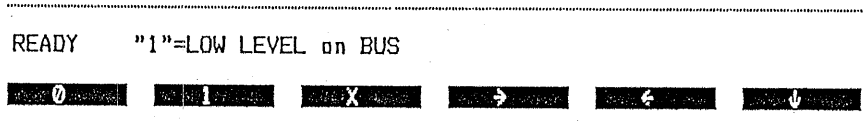
9.1.6 3) TRIGGER EVENT

For description, refer to Section 10.7.1. The effective keys are identical with those of Section 7.1.7.

9.1.7 4) TRIGGER DELAY

For description, refer to Section 10.7.1. The effective keys are identical with those of Section 7.1.8.

9.1.8 5) TRIGGER WORD



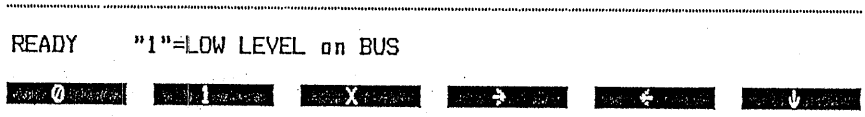
Effective keys: [0], [1], [×]

If SAMPLING CLOCK is set to DAV+ or DAV-, the [DAV] item of TRIGGER WORD is automatically corrected to "×" and the setting cannot be changed. (Refer to Section 6.1.5.) For other description, refer to 10.7.1.

9.1.9 6) INPUT MODE

For description, refer to Section 10.7.1. The effective keys are identical with those of Section 7.1.9.

9.1.10 7) SEARCH WORD (Search Data Pattern Setting)

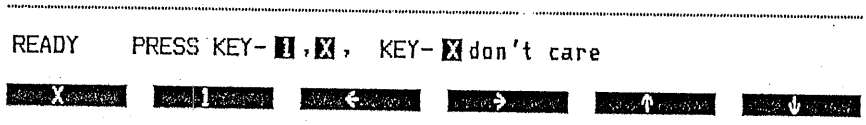


Effective keys: [0], [1], [×]

For description, refer to Section 6.2.8. "1" represents the LOW level on the bus and "0" the HIGH level.

* REPEAT CONTROL

9.1.11 8) COMP CH (Compare Channels)



Effective keys: [1], [×]

This function is effective when SAMPLING CLOCK is set to DAV+ or DAV-. The [DAV] item of COMP CH is automatically corrected to "×" and cannot be set to "1" (refer to Section 6.1.5). For other description, refer to Section 10.2.

9.1.12 9) COMP AREA (Compare Areas)

For description, refer to Section 10.2. The effective keys are identical with those of Section 7.1.12.

9.1.13 A) STOP CONDITION

For description, refer to Section 10.2. The effective keys are identical with those of Section 7.1.13.

9.2 GP-IB BUS MONITOR Timing

9.2.1 Difference from PARALLEL Timing, and Description

The display polarity, display sequence, and channel labels are fixed. The number of displayed channels cannot be changed unless the scroll function ([▽] and [△] keys) is used. When in the COMP mode, DIO8 - DIO1 are displayed initially. Observe the control lines by means of scroll.

9.3 GP-IB BUS MONITOR State

9.3.1 Difference from PARALLEL State, and Description

DIO1 - DIO7 are used for ASC representation and message code representation, and code conversion is done referring to whether the ATN signal is 0 or 1.

When in the SPC radix mode, data are converted into ASC or message codes and 200 data are shown on one display.

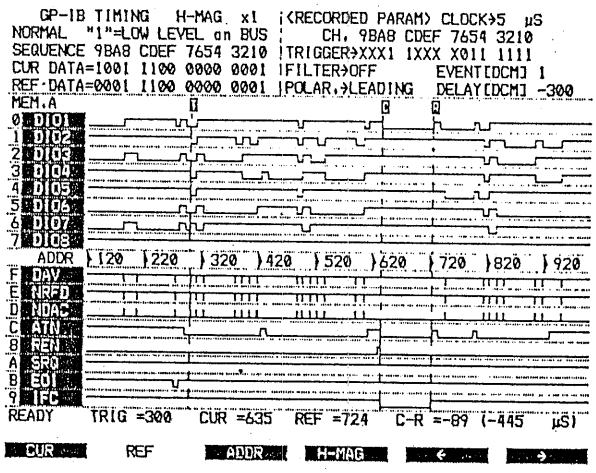


Figure 9.2 An Example of GP-IB TIMING Display

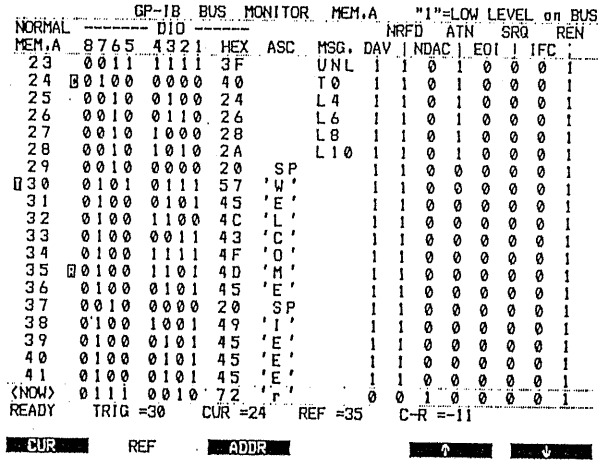


Figure 9.3 An Example of GP-IB STATE Display

10. GENERAL DESCRIPTION OF DATA RECORDING METHOD

10.1 Types and Start of Data Recording

(1) Data recording starts as you press the START [SINGLE] or [REPEAT] key. The [SINGLE] key is for a single cycle of data recording and the [REPEAT] key is for repetitive recording as set on the menu.

(2) The type of data recording depends on the type of data displayed on the CRT. That is to say, regardless of whether the MENU, STATE or TIMING display, the PARALLEL data recording is done if a PARALLEL display is being shown on the CRT, the SERIAL data recording if a SERIAL display is being shown, or the GP-IB BUS MONITOR data recording if a GP-IB BUS MONITOR display is being shown.

(3) When starting data recording with a MENU display, pay attention to the following:

1 No data recording starts unless the set conditions are valid.

2 When in the PARALLEL or GP-IB mode, the recorded data is shown as a TIMING display. When in the SERIAL mode, the recorded data is shown as a STATE display.

(4) For all of the PARALLEL, SERIAL and GP-IB modes, data is recorded in MEM A since no individual memories are provided.

(5) When starting data recording, part of menu setting may be automatically corrected. Refer to Section 6.1.5.

(6) If the corresponding probe is not connected to the instrument, data recording does not start and a message is displayed. The probes which are checked are as follows:

① SERIAL: Probe C

② PARALLEL or GP-IB: Probe C if the instrument is set for operation with external clock, or probes for which TRIGGER WORD other than "x" is set.

Message: PROBE-A is NOT CONNECTED

10.2 Repetitive Data Recording by the REPEAT Function

(1) New data is recorded in MEM A.

(2) After recording is over, data is displayed as per Section 10.3.

(3) Data of MEM A is compared with that of the same address of MEM B and decision is made on whether data is to be recorded again or the recording operation is to be terminated.

(4) For the above purpose, the reference data should be recorded in MEM B by recording the data once in the START [SINGLE] mode and then transferring it by employing the function of the [TRANSFER MEM A → MEM B] key. (This procedure is not required in the case of STOP CONDITION "NONE".)

(5) The repetition control items can be set with the REPEAT CONTROL items of the MENU display, such as COMP CH (BIT), COMP AREA, and STOP CONDITION.

(6) COMP (Compare)

Data of MEM A is compared with that of the same address of MEM B, either for addresses 0 - 999 (AREA "ALL") only for the channel (bit) for which "1" is set with the COMP CH (BIT) or for the addresses from the CUR address to the REF address (AREA "CUR - REF"). When COMP AREA is set for "CUR - REF", before starting comparison, the CUR and REF should be set at addresses as required by the user by employing the STATE or TIMING display.

(7) STOP CONDITION

When "NONE" is specified, repetitive data recording and display are continued indefinitely. To stop them, press the [STOP] key.

When "MEM A ≠ B" is specified, data recording ends if MEM A does not conform with MEM B. If they conform, data recording is repeated.

When "MEM A = B" is specified, data recording is done in the reverse of the above.

(8) Notes for Repetitive Data Recording

When PARALLEL or GP-IB data recording is done on the internal clock, cycling error of one cycle will result. In order to avoid this, for comparison and repetition, use an external clock which is synchronized with the data. (Use the DAV signal for the GP-IB data.)

10.3 Displays

(1) When data recording is started with a STATE or TIMING display, correction is done as mentioned in (2) and data is shown on the same display.

When data recording is started with a MENU display, SERIAL data is shown on a STATE display and PARALLEL or GP-IB data is shown on a TIMING display.

(2) The following mode corrections are automatically done:

Display mode:	SEARCH mode is corrected to NORMAL mode.
Display memory select:	MEM B is corrected to MEM A.
Display radix:	Inhibited radix is corrected to BIN.

If the final address of display exceeds 999 as the result of the above corrections, "ADDR" is corrected so that the final address becomes 999.

(3) The following items remain unaltered:

CUR, REF, and H-MAG

(4) Due to the above, if there is a display which is required to be shown when in repetitive data recording, such displays should be specified in the NORMAL or COMP mode of STATE or TIMING display before starting data recording. Data being recorded can be shown for the set "ADDR" and with the set H-MAG.

10.4 Data Recording and Status Display

10.4.1 Data Recording Operation

As you press the START [SINGLE] or [REPEAT] key to start data recording, the following message will appear. The top section of the display will not vary until the recorded data appears.

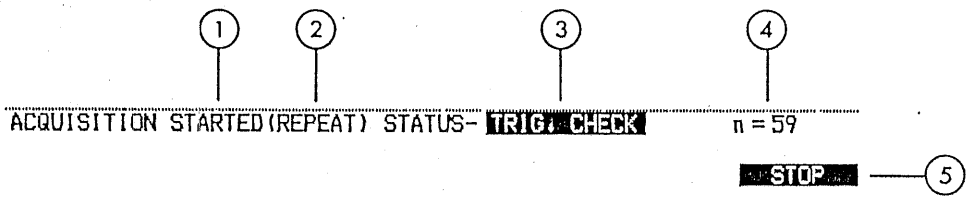


Figure 10.1 Data Recording Status Display

① "STARTED" is displayed when in data recording; "STOP" is displayed when the recording sequence is over.

② This term is displayed when the START [REPEAT] key is pressed.

③ This term indicates the advancing status of data recording. The term may not be visible depending on the advancing speed of data recording. For details, refer to Section 10.4.2.

④ This term indicates the number of the data recoding cycles. The number can be set for a range of 1 - 9999. If this range is exceeded, the number starts by 1 again.

⑤ This term indicates the SOFT KEY function. When in data recording, the [STOP] key alone is effective.

10.4.2 Data Recording Advancing Status

(1) NO CLOCK: This status is such that the sampling clock is set for an external clock but no effective clock is received after starting data recording. (EXT+ or EXT- for PARALLEL data recording, or DAV+ or DAV- for GP-IB data recording)

(2) NO DATA: This status is such that the [STOP] key is pressed when in the status of (1), that synchronization is not established for SERIAL data, or that not a single word of data is recorded yet.

(3) HOLD OFF: This status is for recording of PARALLEL data only. Although data is recorded even when in this status, no trigger word detection is done. For details, refer to Section 10.9.

(4) TRIG CHECK: This state is such that triggers are checked referring to the TRIGGER WORD, FILTER and POLARITY settings and the number of events is counted. When in the SERIAL mode, consecutive TRIGGER WORDS 1 and 2 are checked.

(5) EVENT COUNT: This status is for the SERIAL mode only and indicates that consecutive TRIGGER WORDS 1 and 2 have been received once at least and the next conbination of TRIGGER WORDS 1 and 2 are being checked.

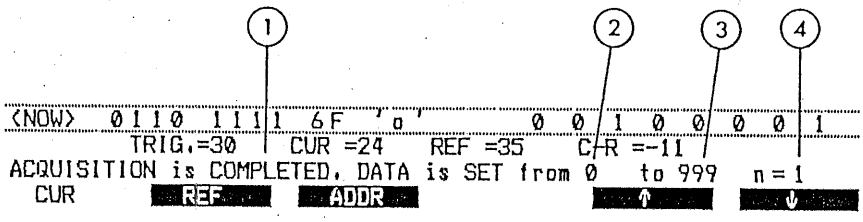
(6) DELAY COUNT: This status is such that counting of events is over and counting for delay is being done.

(7) DATA CHECK: This status is such that one sequence of data recording is completed and data display and repeat control are being checked. In this case, ① of Figure 10.1 "Data Recording Status Display" indicates "STOP".

(8) STOP SW ON: Indicates that the [STOP] key is pressed.

10.4.3 Messages Displayed When Data Recording is Over

The following message is displayed when [SINGLE] data recording is completed or when the repeat control conditions for [REPEAT] data recording are met. The message remains displayed until another key is pressed.



If you press the [STOP] key when in the NO DATA status, the following message is displayed.

ACQUISITION is TERMINATED,NO DATA is RECORDED n=1

① When the [STOP] key is pressed or when data recording is terminated by error, this term indicates "TERMINATED".

② This term indicates the head address of the effective data stored in MEM A. When data recording in the PARALLEL mode is successfully completed, this term indicates address 0.

③ This term indicates the final address of the effective data stored in MEM A. When data recording is successfully completed, this term indicates address 999. When the [STOP] key is pressed or when data recording is terminated by an error, this term indicates address 989. (Refer to Section 10.5.)

④ This term indicates the corresponding one (at which the corresponding data of MEM A is recorded) of the repetitive data recording cycles.

10.5 Recording Termination by [STOP] Key, and Ineffective Data

Data recording can be terminated at any time by pressing the [STOP] key. Termination of data recording before completion differs from ending of data recording by completion in the following points:

(1) When in repetitive data recording of PARALLEL or GP-IB mode, if the [STOP] key is pressed when in the 2nd or further recording cycle, the data of the current recording cycle is discarded and that of the preceding recording cycle is stored. Thus, data which is identical with that stored when in successful completion of data recording is displayed.

(2) When in other cases than the above, 10 data of addresses 990 to 999 of MEM A are regarded to be ineffective in order to discriminate from the case that recording is successfully completed.

The latest data is stored at address 989 and elder data are stored toward address 0 for the amount of data. Therefore, when the number of stored data is less than 990, the data of the addresses from address 0 for the number representing the remainder of 990 minus the number of the actually recorded data is regarded to be ineffective.

10.6 Other Types of Recording Termination

(1) When in serial data recording, recording stops if a parity error or a framing error is detected after recording 64 or more normal data without any errors.

(2) When in circuit failure, recording stops and a message is displayed.

10.7 Menu Setting Items and Data Recording

10.7.1 Trigger

The trigger dictates the reference point for recording. The section to be recorded is selectable with the delay function.

In the description hereafter, when an input data has met all conditions, the term "TRIG" is used to denote the data.

(1) TRIGGER WORD

When in the PARALLEL or GP-IB mode, the TRIGGER WORD specifies combination of 16 channels of data to be recorded with a single clock. When in the SERIAL mode, the TRIGGER WORD specifies combination of states of the data section, break, parity error, and status.

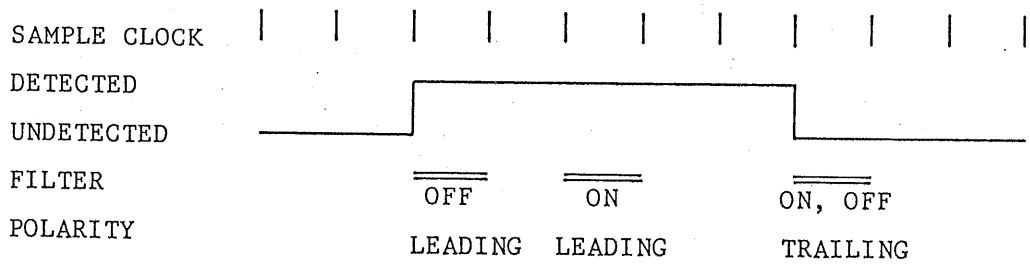
For example, if triggering is effected when channel 0 is LOW and channel 1 is HIGH, channel 0 is set to "0", channel 1 is set to "1", and other channels are set to "×".

(2) TRIGGER FILTER

Even when the input has conformed with the TRIGGER WORD, it is judged to be a trigger not immediately but after it has remained in the conformed state for a certain duration. When in the TRIGGER FILTER is set to "OFF", the duration is 1 clock period (1 data period). When the TRIGGER FILTER is set to "ON", the duration is 3 clock periods or more.

(3) TRIGGER POLARITY

This term is to select whether triggering is to be effected at the instant a TRIGGERING WORD is detected or at the instant the detected TRIGGER WORD has become undetected. (The former is referred to as "LEADING" triggering and the latter as "TRAILING" triggering.)



(4) EVENT

This term is to specify a particular order-number one for effecting triggering among the trigger words which meet the conditions of (1), (2) and (3) above. If this term is set to "1" for example, triggering is effected by the 1st trigger word (the 1st trigger word is used as "TRIG").

(5) DELAY

- The DELAY sets a starting point with respect to the "TRIG" for recording of 1000 data. If the DELAY is set at "+", data after the "TRIG" are recorded; if it is set at "-", data before the "TRIG" also are recorded.
- If the DELAY is set at "0", 1000 data which follows the "TRIG" are recorded. In this case the "TRIG" is at address 0 of the memory.
- If the DELAY is set at "+100", 1000 data starting by the data 100 clocks after the "TRIG" and ending by the data 1099 clocks after the "TRIG" are recorded. The "TRIG" is not located on the memory.
- If the DELAY is set at "-100", data starting by the data 100 clocks before the "TRIG" and ending by the data 899 clocks after the "TRIG" are recorded. The "TRIG" is at address 100 on the memory. Data before the "TRIG", however, may not be recorded if the operation mode is without the "HOLD OFF" function (refer to Section 10.8).

10.7.2 SAMPLE and LATCH Input Modes

When in the PARALLEL or GP-IB BUS MONITOR recording, the input channels can be set for respective modes.

SAMPLE Input Mode

When in this mode, the input is sampled by the effective edge of the sampling clock. Therefore, the status of data except during the period from setup time to hold time is not recorded.

LATCH Input Mode

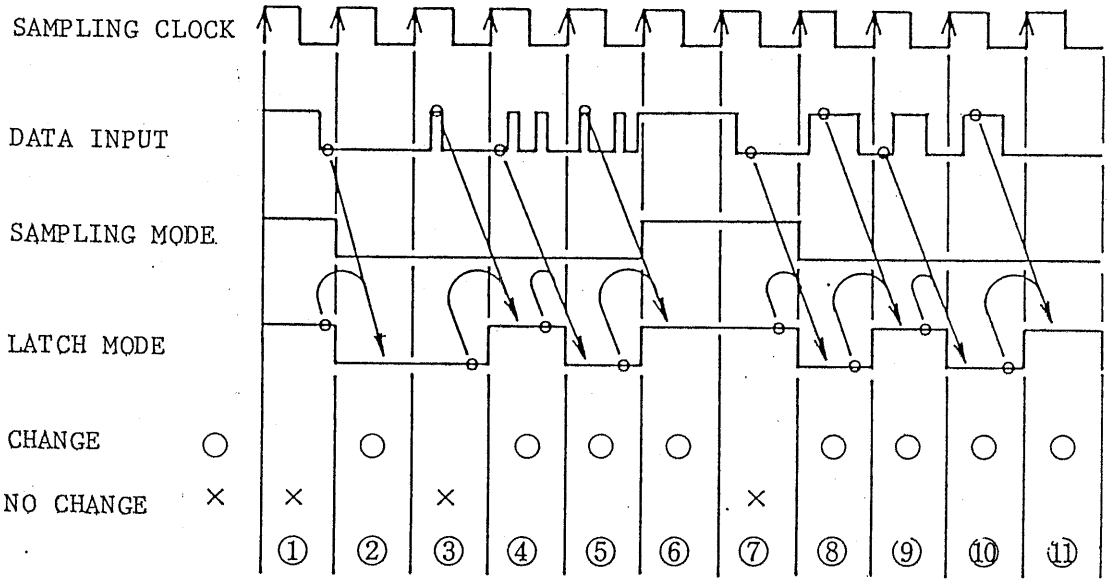
When in this mode, the input is sampled by the sampling clock period. If there is input data which does not conform with data which was recorded one period ago, data which is in the reverse of the previously recorded data is recorded.

Due to the above, even a pulse (5 ns or over) which is shorter than the sampling clock period is recorded being extended into one period.

Even when there are two or more input changes in one period, the initial change alone is effective.

This mode is suitable for recording of a signal whose pulse width is shorter but whose period is longer as compared with the sampling clock.

Example



Description of LATCH Mode Referring to Illustration

At ①, ③ and ⑦, the output does not change as the input does not differ from the output of the preceding period.

At ②, ④, ⑤, ⑥, and ⑧ - ⑪, the output is inverted as the input differs from the output of the preceding period.

Data which changes with the period the same with that of the clock as in the cases of ⑨ - ⑪ is recorded with a period of double of the clock.

Even data of narrow width as in the cases of ③, ④ and ⑤ is recorded being extended to data of one clock length.

10.7.3 Threshold Voltage and Hysteresis

For PARALLEL data recording, the threshold voltage can be set for each probe for a range of 0 to ±6.3 V in 0.1-V steps.

For SERIAL data recording also, the threshold voltage can be set for the same range. It can be set in common for both data input and external clock. For GP-IB data recording, the threshold voltage is fixed at +1.4 V.

The input voltage is judged with reference to the above voltage. However, since histeresis is involved, recording cannot be successfully done unless the following amplitude is provided:

Amplitude exceeding the threshold voltage by 0.35 V or more in the positive or negative polarity

10.8 HOLD OFF Period and Ineffective Data

Causes of Ineffective Data

Data recording is done with reference to the "TRIG". If the DELAY is set at a "-" value, data which existed before the "TRIG" also is recorded.

If the "TRIG" is detected immediately after starting data recording, data which existed before the "TRIG" is not recorded. The missing amount of data is regarded to be ineffective data.

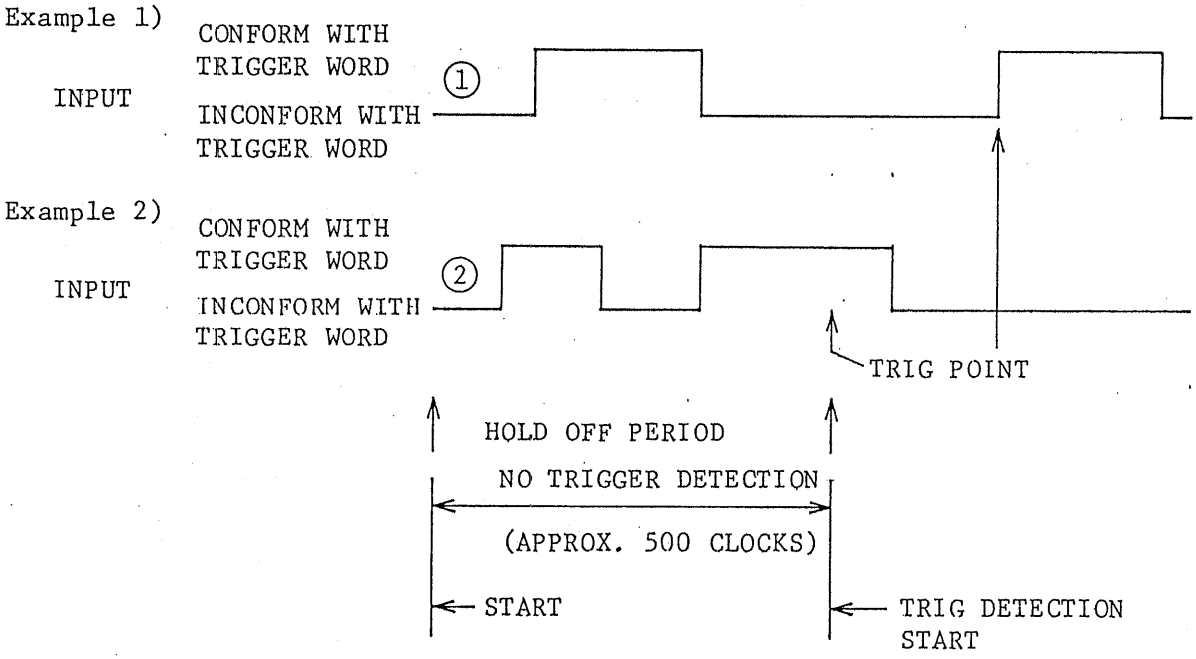
For PARALLEL data recording, in order to avoid leaving the above type of ineffective data in the memory, a HOLD OFF period is provided.

During the HOLD OFF period, no detection of the "TRIG" is done and new data is written in the memory. Detection of the "TRIG" starts only after such state is attained that, at the instant the "TRIG" is detected, the data which existed before the "TRIG" as set by the DELAY can be acquired.

Due to the above, when in PARALLEL data recording, it is possible that data which is identical with the trigger is recorded before the "TRIG". Therefore, when the EVENT is set at "1" and the POLARITY at "LEADING", if there is input data which conforms with the TRIGGER WORD extending to the end point of the HOLD OFF period, the "TRIG" is at the end point of the "TRIG" and, consequently, the "TRIG" may be set at a point which is not the rise up portion of the signal. Examples are given in the following.

Example A: HOLD OFF is provided

When DELAY = -500, EVENT = 1, POLARITY = "LEADING", FILTER = "OFF"



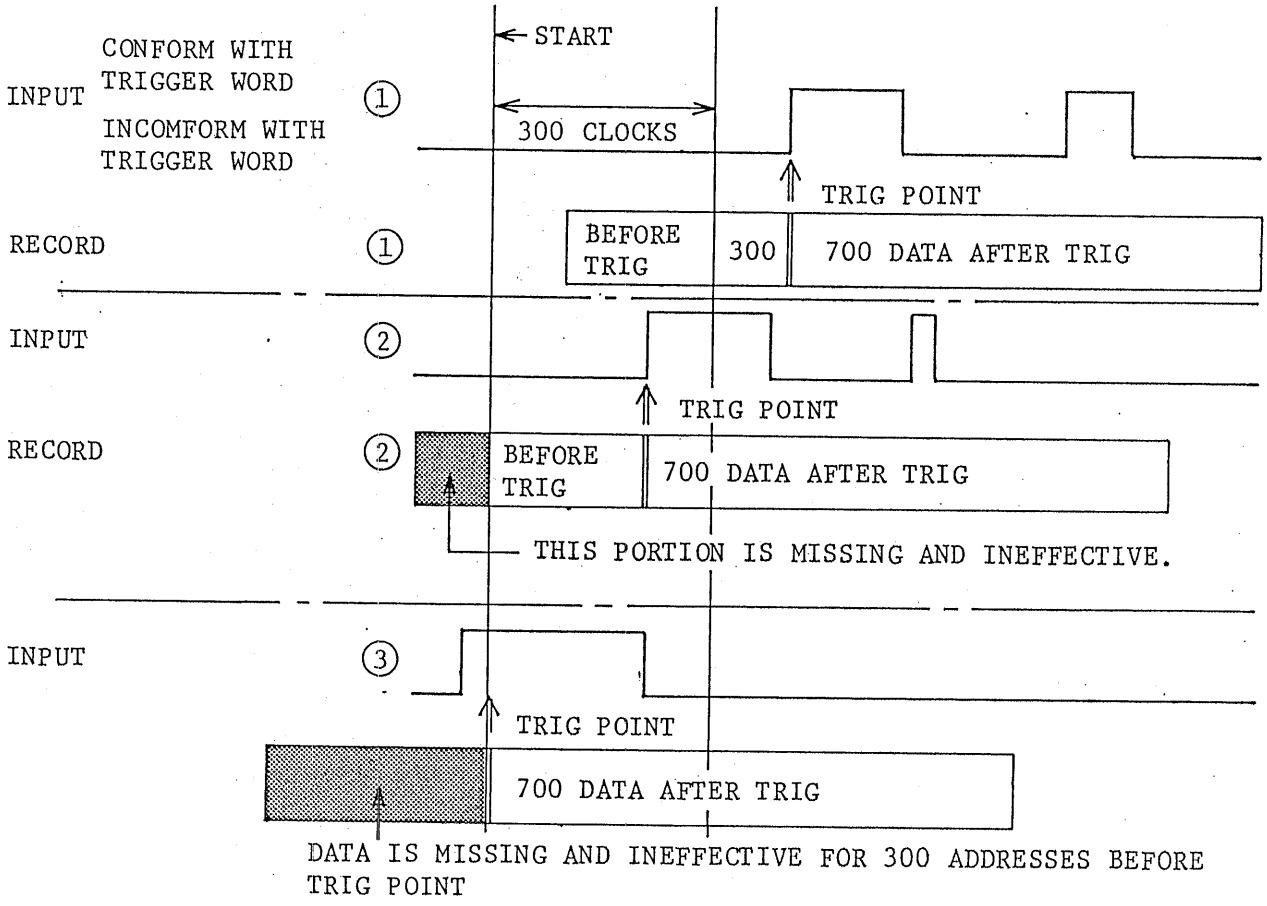
In the case of ①, triggering is effected when the input has conformed with the trigger word after the HOLD OFF period is over.

In the case of ②, as the input conforms with the trigger word immediately after the HOLD OFF period, triggering is effected at a point which actually is not a "LEADING" point. To effect triggering securely at the same point, the EVENT should be set at "2" or over or the POLARITY should be set at "TRAILING".

Example B: No HOLD OFF is provided (SERIAL or GP-IB)

(Recording of ineffective data may result.)

When DELAY = -300, FILTER = "OFF", POLARITY = "LEADING"



11. PARALLEL DATA RECORDING PROCEDURE

11.1 Recording Procedure

(1) Correct or set the required items on the MENU display. The sampling clock can be corrected on any display.

(2) Connect the probes to the instrument mainframe.

(3) Connect the probe chips to the measuring points.

(4) Connect the GND (0 V) lines as follows: Connect to the points as close to the measuring points as possible. Connect at least one GND line for each of the probes. When an external clock and an external clock qualifier are used, connect a GND line for each of them.

(5) Press the START [SINGLE] or [REPEAT] key.

11.2 Comments for MENU Setting of External Clock and Its Qualifier

(1) The external clock qualifier is effective only when the sampling clock is set to the external clock [EXT+] or [EXT-].

(2) When an external clock and its qualifier are used for the sampling clock, a logical product (AND) operation is done between the two signals and the change points where both signals change to the effective level are used as clock points.

For both effective level and ineffective level of the logical product, a width of 9 ns or more and a period of 20 ns or more are required.

External clock

EXT+: HIGH level is effective.

EXT-: LOW level is effective.

External clock qualifier

×: Constantly at effective level (Qualifier input is ignored.)

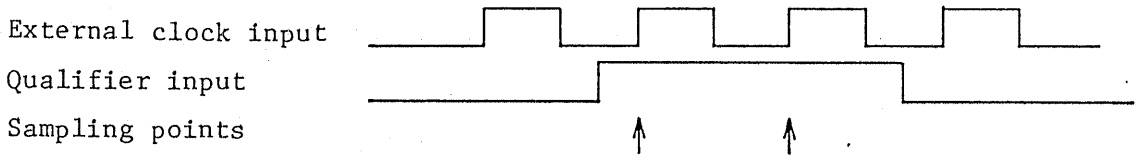
+: HIGH level is effective.

-: LOW level is effective.

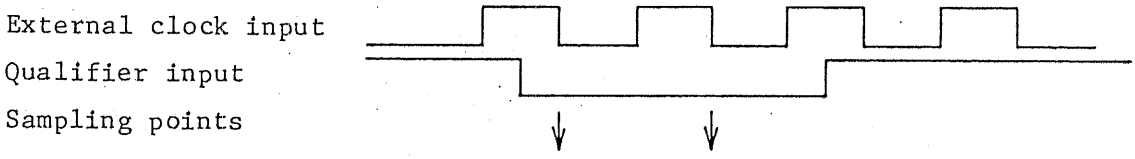
(3) The external clock qualifier can be used also as an external clock enable/disable input or as a second external clock input.

Examples are shown in the following:

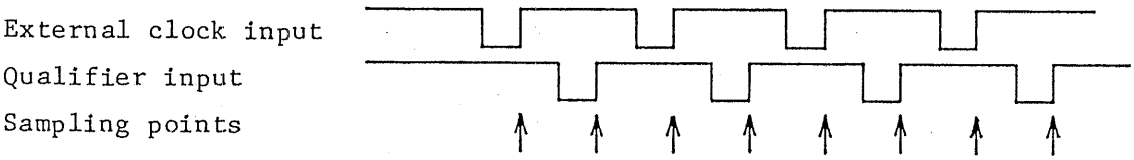
Example 1: EXT+, CQ+ (CQ: External clock qualifier)



Example 2: EXT-, CQ-



Example 3: EXT+, CQ+



When the ineffective levels of the two inputs do not conform as in the above example, both inputs are used as clock signals.

Identification of Input Terminals

The external clock input is identified with the "E. CK" mark on probe C. The external clock qualifier input is identified with the "CQ" mark on probe C.

12. SERIAL DATA RECORDING PROCEDURE

12.1 Recording Procedure

(1) Correct or set the required items on the MENU display.

(2) Make connections, noting the following: Connect data to the channel which is identified as "SER" on probe C. Connect the external clock to the channel which is identified as "E. CK" on probe C. Be sure to connect the GND lines.

(3) Press the START [SINGLE] or [REPEAT] key.

12.2 Polarity

Data polarity is "+" for the HIGH level when in Marking and "-" for the HIGH level when in Spacing. External clock polarity is "+" for the change from LOW to HIGH in the center of data bit and "-" for the change from HIGH to LOW.

12.3 Data Recording Start Conditions

Recording of data is executed when the following events are detected.

(1) When in ASYNC mode:

Detection of the start bit after detecting a mark status once after starting

(2) When in SYNC mode:

Detection of the SYNCH-HUNT WORD stream as described in Sections 6) and 7) of SERIAL MENU

When in the ASYNC mode, if data recording is attempted in the state that data transmission has already been started for the data input, a "space" of the data bit may be erroneously taken for the start bit and data recording may start incorrectly.

12.4 Establishment of Synchronization

(1) Synchronization is established by start bit detection in the ASYNC mode. Detection of the effective start bit after completion of one frame is constantly done.

(2) Synchronization is established with the function of Section 12.3 after starting.

(3) When in repetitive data recording with the START [REPEAT] key: Synchronization establishment function takes place only for the 1st data recording; for the 2nd and further data recording, the established synchronization of the 1st data recording is maintained.

(4) When in the repetitive data recording mode, data recording is not executed during the periods recorded data are being displayed. Therefore, as described in (3) above, search for the SYNC-HUNT WORD is done only when in the 1st data recording in the SYNC mode. When in the repetitive data recording mode, if data transmission is paused once and resumed again by SYNC-HUNT WORD, synchronization will be lost and meaningless data (incorrect data) may be recorded. For correct recording, data should start by the SYNC-HUNT WORD and the synchronized state must be maintained.

12.5 Automatic Correction of MENU Setting

Refer to Section 6.1.9.

12.6 Detection of TRIGGER WORD

(1) If "1" is set for the "BK" (break) of TRIGGER WORD, triggering is effected when "Spacing" continued for a period of 2 frames or more in the ASYNC mode.

(2) In other cases, triggering is effected when conformity of data patterns with combination of data and parity error is detected.

(3) Triggering is effected when TRIGGER WORD 1 is detected and the next data has conformed with TRIGGER WORD 2.

To effect triggering with a single word, set all bits of TRIGGER WORD 2 to "×".

13. GP-IB BUS MONITOR DATA RECORDING PROCEDURE

13.1 General Precautions

(1) The DLG7050 has neither source handsake nor acceptor handsake function. It has monitor function only.

(2) The DLG7050 has no bus terminator. The input impedance is approximately 1 MΩ. When connecting lines, pay attention to reflection.

(3) The DAV signal should be entered in parallel with the external clock input and data input channel F.

13.2 Connection

(1) There are following types of methods for connection between the GP-IB bus and the DLG7050.

(a) Connection by employing probe and GP-IB Terminal Card TC01-DLG (supplied as an accesory).

(b) Connection by employing GP-IB Bus Monitor Adaptor AP01-DLG (optional). Connection can be readily accomplished in this method.

(2) To use the GP-IB Bus Monitor Adaptor, refer to its instruction manual.

(3) To use the Terminal Card, pay attention to the following:

(a) Securely fix the Terminal Card to the target connector with screws.

(b) The channels to be connected are identified on the Terminal Card, with signal names printed on one side and channel names on the other side. The GND pins are identified with the white lines leading from the channel names.

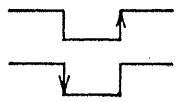
Connection can be done by clipping using the probe chips or by removing the probe chips and inserting the probe cable wires directly into the card pins.

Be sure to connect all of "E. CK" channels and channel 16. Connect at least one GND line for each probe. Be sure to connect the GND line of "E. CK" (DAV) to the specified pin. (Refer to Section 3.4.)

13.3 Setting of Sampling Clock

The available types of sampling clocks are internal clock (identical with that of the PARALLEL mode), DAV+ and DAV-.

DAV+ is with the edge going toward non-active.
DAV- is with the edge going toward active.



Data or message which is accompanied by 3-wire handsake can be recorded with the DAV as a clock. The IFC or other signal which is not accompanied by handshake cannot be recorded with the DAV as a clock. Recording should be made by employing the internal clock or by specifying the latch input mode and employing the next DAV clock for simultaneous recording. Change of signal can be confirmed.

13.4 Automatic Correction of MENU Setting

Refer to Section 6.1.5.

13.5 Starting Record

To start recording, press the START [SINGLE] or [REPEAT] key.

14. EXAMPLES OF OPERATING PROCEDURES

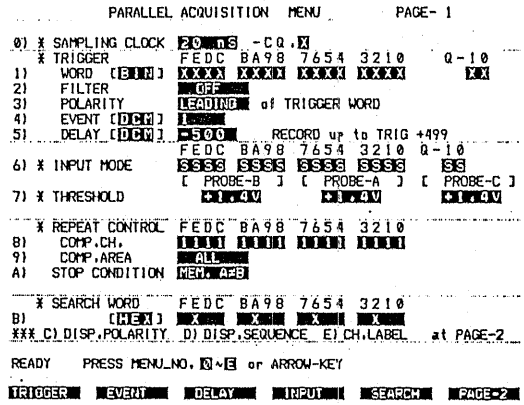


Figure 14.1 PARALLEL MENU PAGE-1 Display

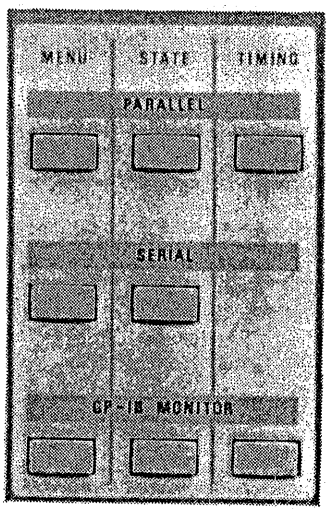


Figure 14.2 DISPLAY SELECT Keys

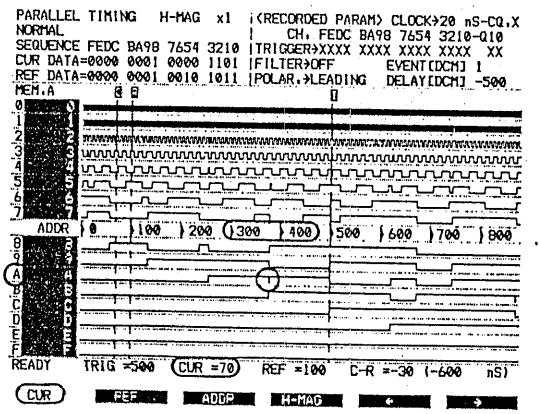


Figure 14.3 TIMING Display

14.1 Turning On Power

As you turn on the POWER switch on the front panel of the instrument, the instrument performs self-diagnosis of its internal circuits and then shows the PARALLEL MENU PAGE-1 display as shown in Figure 14.1. If this display is not shown, it means that a failure is found in the self-diagnosis. (Refer to Section 17 "Self-diagnosis Functions.")

When the POWER switch is turned on, sample data for PARALLEL TIMING display is set in the data record memory (MEM A) and data for GP-IB STATE display is set at addresses 740 and further, and data for SERIAL STATE display is set in the reference data memory (MEM B). Description hereunder is made referring to the above sample data.

14.2 Selecting a Display

Select the required display with the DISPLAY SELECT keys. (See Figure 14.2.)

Press the PARALLEL TIMING key. A TIMING display as shown in Figure 14.3 will appear on the CRT.

(NORMAL mode, MEM A, H-MAG ×1, CUR move)

14.3 CUR Move, Direct Address Move Mode

The SOFT KEY function indication "CUR" at the bottom of the display blinks to indicate that the CUR pointer can be moved. Also indicated are that the CUR pointer is at address 70 and that the distance between CUR and REF is 20 ns × 30 = 600 ns time equivalent. The pointer can be moved rightward with the [→] key and leftward with the [←] key.

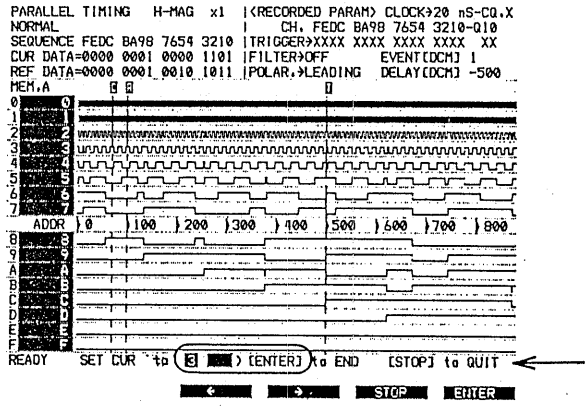


Figure 14.4

Look at channel A on the display. There is a glitch near address 400. Let's magnify this section. To do this, move the CUR pointer to this section and then horizontally magnify the display.

Referring to the central address of the display, the address of the glitch is assumed to be 380. To move the cursor to this address, enter the address directly from the keyboard by pressing the [2], [8], [0], and [ENTER] keys.

As you press the [3] key, the display will change into that shown in Figure 14.4, which is of the direct address move mode. As you press the [ENTER] key, the CUR pointer will be set at address 380 and the display will become as shown in Figure 14.5. As the CUR pointer is slightly shifted, move it to the address of the glitch by pressing the [←] key.

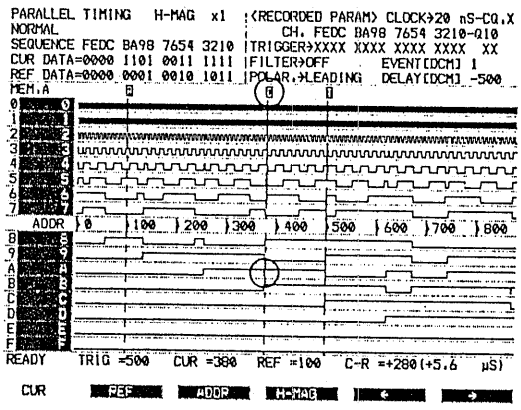


Figure 14.5

14.4 Horizontal Magnification

Select a horizontal magnification factor by pressing the [H-MAG] key. As you press the key, the display is magnified in the sequence of ×2, ×5, ×10, ×20 and ×50, with the address of the CUR pointer as the center of magnification. (See Figure 14.6.)

14.5 Setting of Display Sequence

The display shows sixteen channels of channel 0 to channel F, sequentially. This sequence is as set by the [DISPLAY SEQUENCE] item. The sequence can be changed as described in this section.

Press the [PARALLEL MENU], ([PARALLEL MENU]), and [D] keys, confirming that display is changed. The [D] key is for the item number of [DISPLAY SEQUENCE]. The pointer blinks. (See Figure 14.7)

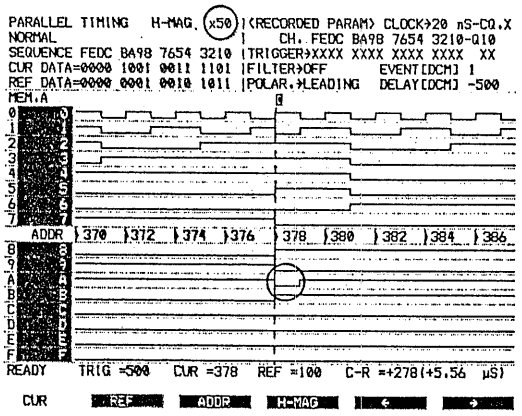


Figure 14.6

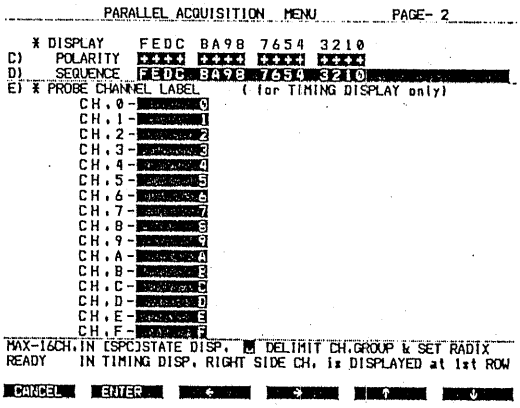


Figure 14.7

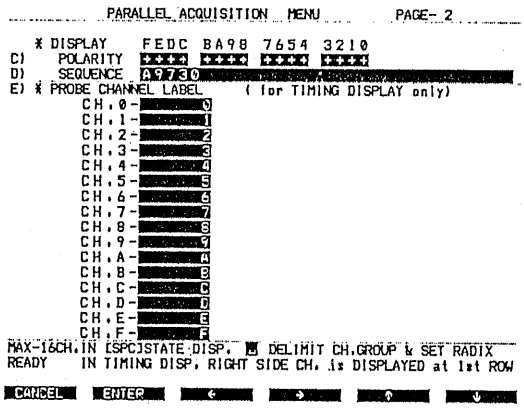


Figure 14.8

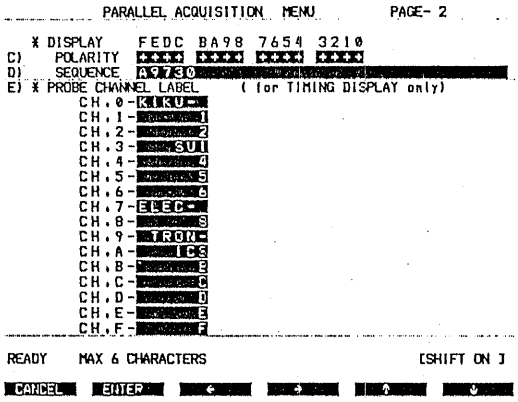


Figure 14.9

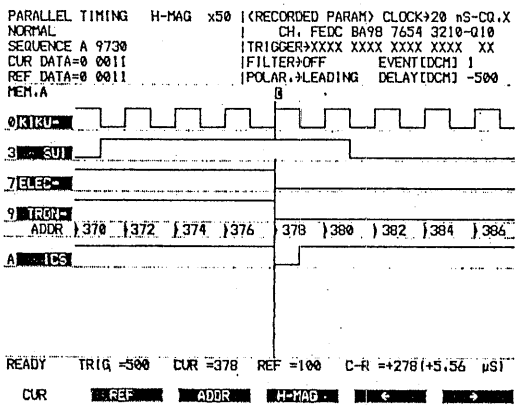


Figure 14.10

Press the [CANCEL] key to clear the entire data display.

Assume that we want to view channels 0, 3, 7, 9, and A on the CRT. Press the [A], [9], [7], [3], and [0] keys. (See Figure 14.8.)

If required, provide labels for channels 0, 3, 7, 9, and A. To do this, move the pointer to the label item of channel 0 with the POINTER MOVE keys, clear one line by pressing the [CANCEL] key, and then enter an appropriate label. Use "G - Z" in the SHIFT ON state by pressing the [SHIFT] key. To return to the SHIFT OFF state, press the [SHIFT] key again.

After the setting is over (Figure 14.9), press the [PARALLEL TIMING] key.

The display (Figure 14.10) will be with five channels of 0, 3, 7, 9, and A in the due sequence, with vertical magnification as the number of channels is reduced to five. The horizontal magnification and the CUR pointer remain unaltered. The display is in the NORMAL, MEM A, and CUR MOVE modes.

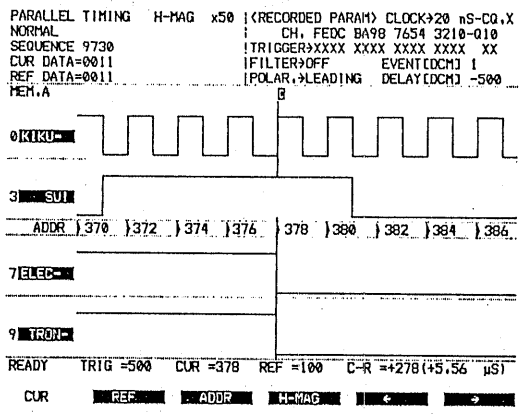


Figure 14.11

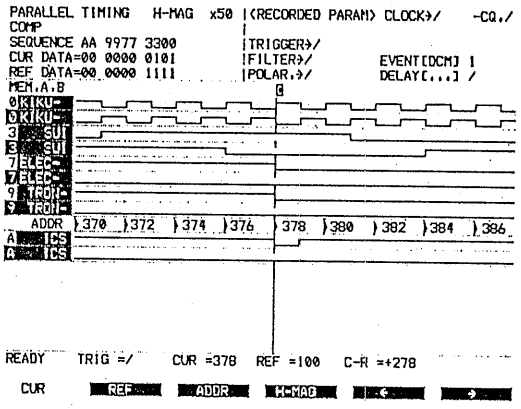


Figure 14.12

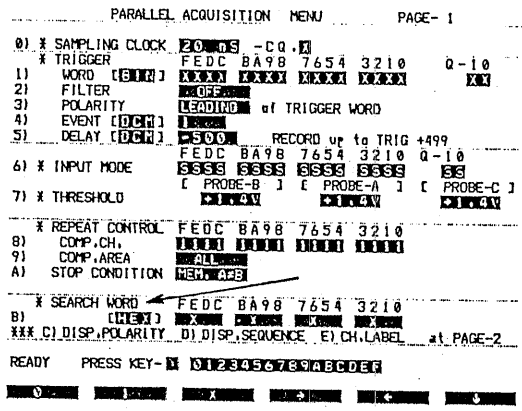


Figure 14.13

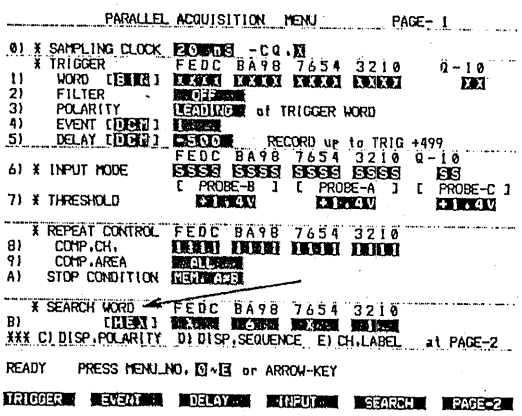


Figure 14.14

14.6 Scroll

Within the setting by the DISPLAY SEQUENCE, the number of displayed channels can be reduced. If you press the [Δ] key when the display of Figure 14.10 is shown on the CRT, the uppermost channel disappears and overall data display scrolls upward. If you press the [∇] key, the display scrolls in the reverse of the above.

The SEQUENCE, CUR DATA, and REF DATA items also vary in conformity with scroll. (Figure 14.11)

As you press the [PARALLEL TIMING] key, scroll is reset and the display returns to the channels as set by the DISPLAY SEQUENCE.

If you press the [COMP] mode key, data of MEM A and that of MEM B are displayed in parallel as shown in Figure 14.12.

14.7 Search

This mode is used to find out how many data patterns which are identical with the required data pattern are there in the recorded data and to find out their locations.

First, the required data pattern should be set. Use the test data which is displayed when the POWER switch is turned on.

Press slowly the [PARALLEL MENU] key and then the [SEARCH] key, confirming that the display changes accordingly. (You may press the item number [B] key instead of the [SEARCH] key.)

Assume that we should search for a pattern of "xxxx 0110 xxxx 0001" which is the SEARCH WORD shown in Figure 14.13.

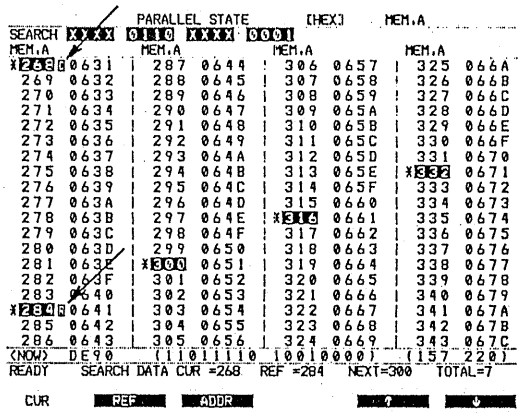


Figure 14.15

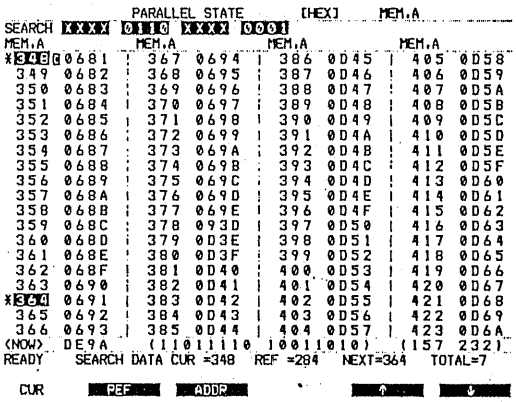


Figure 14.16

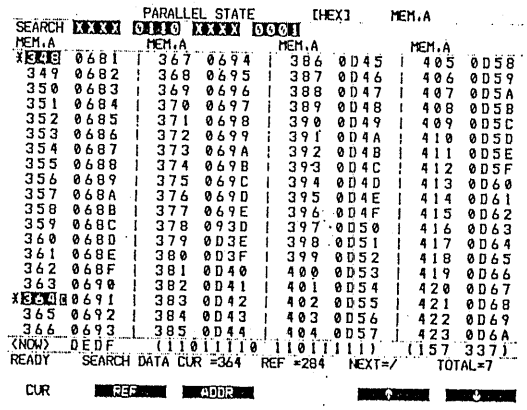


Figure 14.17

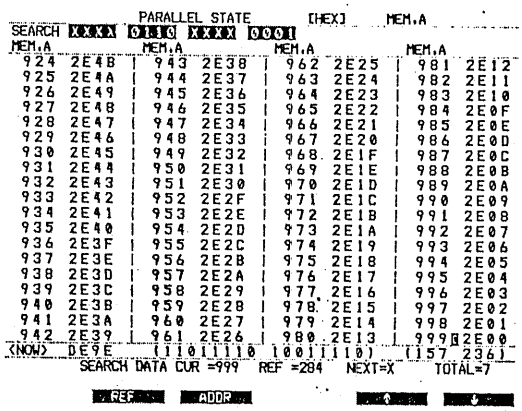


Figure 14.18

Press the [×], [6], [×], and [1] keys in the due order. (See Figure 14.14.) Press slowly the [PARALLEL STATE] key, ([MEM A] key), and [HEX] key, confirming that the display changes accordingly.

Next, press the [SEARCH] key to set to the SEARCH mode. The MOVE mode is set to that of CUR and data is searched from address 0 to address 999.

The initial one (identical pattern) is at address 268 (C: CUR), the second one is at address 284 (R: REF), the third one is at address 300 (NEXT), and so forth, at seven addresses in total. (See Figure 14.15.)

As you press the [↓] key, the C (CUR) moves sequentially from address 284 to addresses 300, 316 and 332, and, as it moves to address 348, the displays are changed. (See Figure 14.16.)

As you press the [↓] key further, the C moves to address 364 and a message "NEXT = /" will appear as shown in Figure 14.17 to indicate that there are no more data of identical pattern.

If you press the key still further, a message "NEXT = ×" will be displayed as shown in Figure 14.18 to indicate that search was unsuccessful, and the CUR pointer will be set at address 999.

As you press the [↑] key, search is done backward in the sequence of from address 364 to addresses 348, 332, 316, 300, 284, and 268. In this case, the display is different from that shown in Figure 14.15.

As you press the [↑] key, the CUR pointer is set at address 0 and a message "NEXT = X" appears. Press the [↓] twice more (identical with

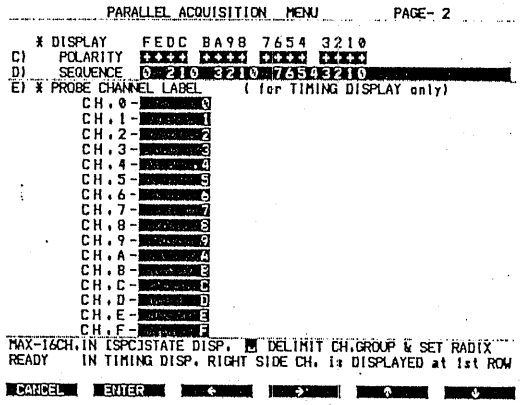


Figure 14.19

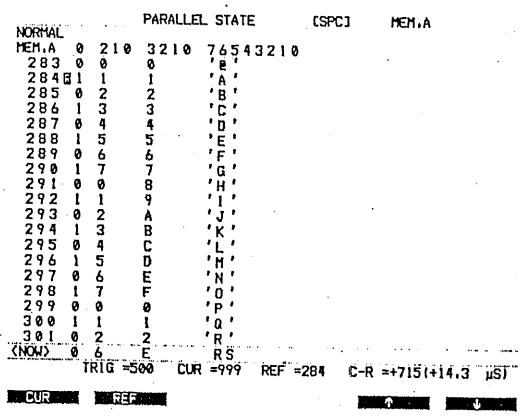


Figure 14.20

that the [↓] key is pressed once when in the display of Figure 14.15) so that the CUR pointer moves to address 284.

Next, press the [STEP] key so that search will start by one page before, that is, by address 284 + 19 × 4 = 360. Set the CUR pointer at address 364.

If you press the [SEARCH] mode key, search starts always by address 0.

14.8 PARALLEL STATE SPC Display

The above description was for the case of [HEX] display. The [SPC] display described here is to show specific channels in a specific sequence.

First, to specify the display sequence, press the [PARALLEL MENU] key and [D] key confirming that the display changes accordingly.

After confirming that the pointer has moved to the DISPLAY SEQUENCE item, press the [CANCEL] key and then press the keys as follows:

[0], [.], [2], [1], [0], [.],
[3], [2], [1], [0], [.], [7]
[6] [5] [4] [3] [2] [1] [0]

See Figure 14.19.

Press the [PARALLEL STATE], ([MEM A]), and [SPC] keys, confirming that the display changes accordingly. To specify the head address of the display, press the [ADDR], [2], [8], [3], and [ENTER] keys.

In this example, the display is divided into four blocks. Of these channels, channel 0 is with BIN, channels 2, 1 and 0 are with OCT, channels 3, 2, 1 and 0 with HEX, and channels 7 - 0 with ASC. See Figure 14.20.

14.9 PARALLEL Data Recording

As you press the POWER switch, the PARALLEL MENU is automatically set, and as you press the [START SINGLE] or [START REPEAT] key, 16 channels of TTL level inputs are recorded and displayed on the 20-ns internal clock.

With the above setting, however, it is unable to start recording of the input waveforms at free timing as required. At least the sampling clock and trigger word should be corrected and set. To set the TRIGGER WORD, press the [PARALLEL MENU] key to show the MENU display, move the blinking pointer to the point to be corrected by means of the POINTER MOVE keys, and then proceed as follows:

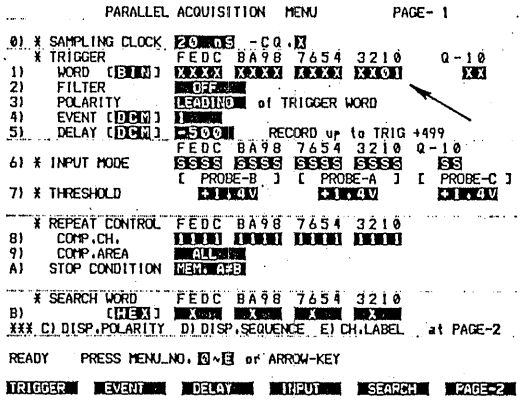


Figure 14.21

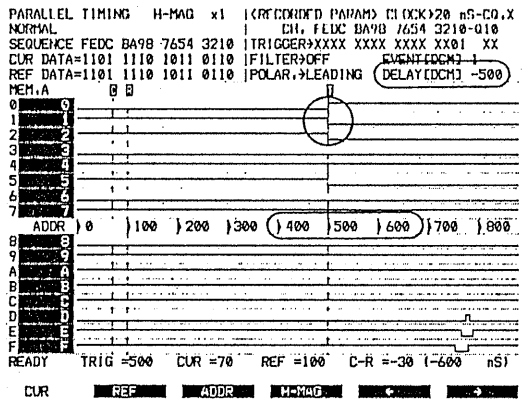


Figure 14.22

(1) If the waveform at the instant the channel has become the LOW level is to be measured, set at "0".

(2) If the waveform at the instant the channel has become the HIGH level is to be measured, set at "1".

(3) For the channels for which either channel will do and for the channels which are not used, set at "x".

(4) Data qualifier input channels 0 and 1 should be used when there are 16 channels of data to be measured and a triggering condition is required in addition or when an external triggering is required. These channels are used for combination of triggering conditions; they cannot be used for recording.

(5) Triggering can be effected by the above combination. As you press the [START] key when the MENU display is shown, the recorded data is shown on a TIMING display. If the H-MAG, CUR, REF, and/or ADDR have been modified by the preceding TIMING display, such modified values are used.

(6) Assume that, on the MENU display immediately following the turning on of the POWER switch, the [START] key is pressed with TRIGGER WORD channel 0 set at "1", TRIGGER WORD channel 1 at "0", and other channels at "×". In this case, 500 data before triggering and other 500 data after triggering (with DELAY at -500) are recorded and shown on a TIMING display, with channel 0 referenced to the HIGH level and channel 1 referenced to the LOW level.

The sampling clock can be changed even on the TIMING display, by means of the [FASTER] and [SLOWER] keys. In this case, however, the CLOCK indication at upper right on the display does not change. This indication is for the clock on which the data has been recorded. The clock which has been changed is indicated at the bottom of the display only for a certain period after the key is pressed.

If more of data before triggering is needed to be measured, set the DELAY value to a larger negative value, such as -800. With this setting, 800 data before triggering and 200 data after triggering will be recorded.

If more of data after triggering is needed to be measured, set the DELAY value to a smaller negative value, such as -100. With this setting, 100 data before triggering and 900 data after triggering will be recorded.

If you set the DELAY at a positive value, recording starts when the clocks for the set value has elapsed after triggering.

When the period for combination of the TRIGGER WORD conditions is long as compared with the clock period and the waveform to be measured is apt to fall out of the combination period, set the TRIGGER POLARITY to the "TRAILING".

When there is a combination which is identical with the TRIGGER WORD for one clock length as in the case of transient, for the input for which triggering is to be effected, set the TRIGGER FILTER to "ON" if the combination is to be maintained for a longer period.

When triggering is to be effected with a combination with the n-th trigger word, set the EVENT at the required number.

To record a pulse whose duration is shorter than the clock period, set the input mode of the channel to "LATCH" (L).

15. HARDCOPY WITH VIDEO PRINTER

The DLG7050 has a composite video signal output terminal (BNC). For connecting the terminal to a video printer, refer to the following specifications:

(1)	Impedance:	Approx. 75Ω
(2)	Signal Level:	Approx. 1 Vp-p
(3)	Polarity:	Positive
(4)	Horizontal Frequency:	15.7 kHz
(5)	Vertical Frequency:	50.5 kHz
(6)	Effective Display Scanning Lines:	260 lines (non-interlacing)

If a blinking display is printed out with a video printer, unprinted sections may result. To stop blinking, press the [STOP] key. Blinking resumes as you press another key.

16. OPERATING PRINCIPLE

16.1 Block Diagram

A block diagram of the DLG7050 is shown in Figure 16.1. The DLG7050 is comprised of one main unit and three probes. Overall instrument operation is controlled by the microprocessor (CPU). The functions of individual blocks are as follows:

(1) A1: CPU

This board has peripheral circuits for the CPU. It generates a clock signal which is used for operation of the CRT, CPU and other circuits. The MEM A and B are assigned to the RAM of this board. This board reads the settings of the operation panel and SOFT keys.

(2) A2: CRT

This board has the circuit for displaying on the raster scan CRT the data which has been stored in the DISPLAY RAM. It also generates a video output signal.

(3) A6: CLOCK & THRESHOLD

This board has an internal clock generator and a frequency divider to provide a timing signal for A7. It also generates a threshold voltage with its D/A converter for probes A, B and C.

(4) A7: PARALLEL AQUISITION

This board has a high speed data recording circuit including probe interface circuits. With respect to the parameters written by the CPU, this board writes the PARALLEL and GP-IB data into the high speed RAM and sends the data to the RAM of CPU.

(5) A8: MOTHER

This is a bus board for the CPU. The board has a terminator.

(6) A9: KEY & A10: SOFT KEY

These boards have keys in X-Y matrixes.

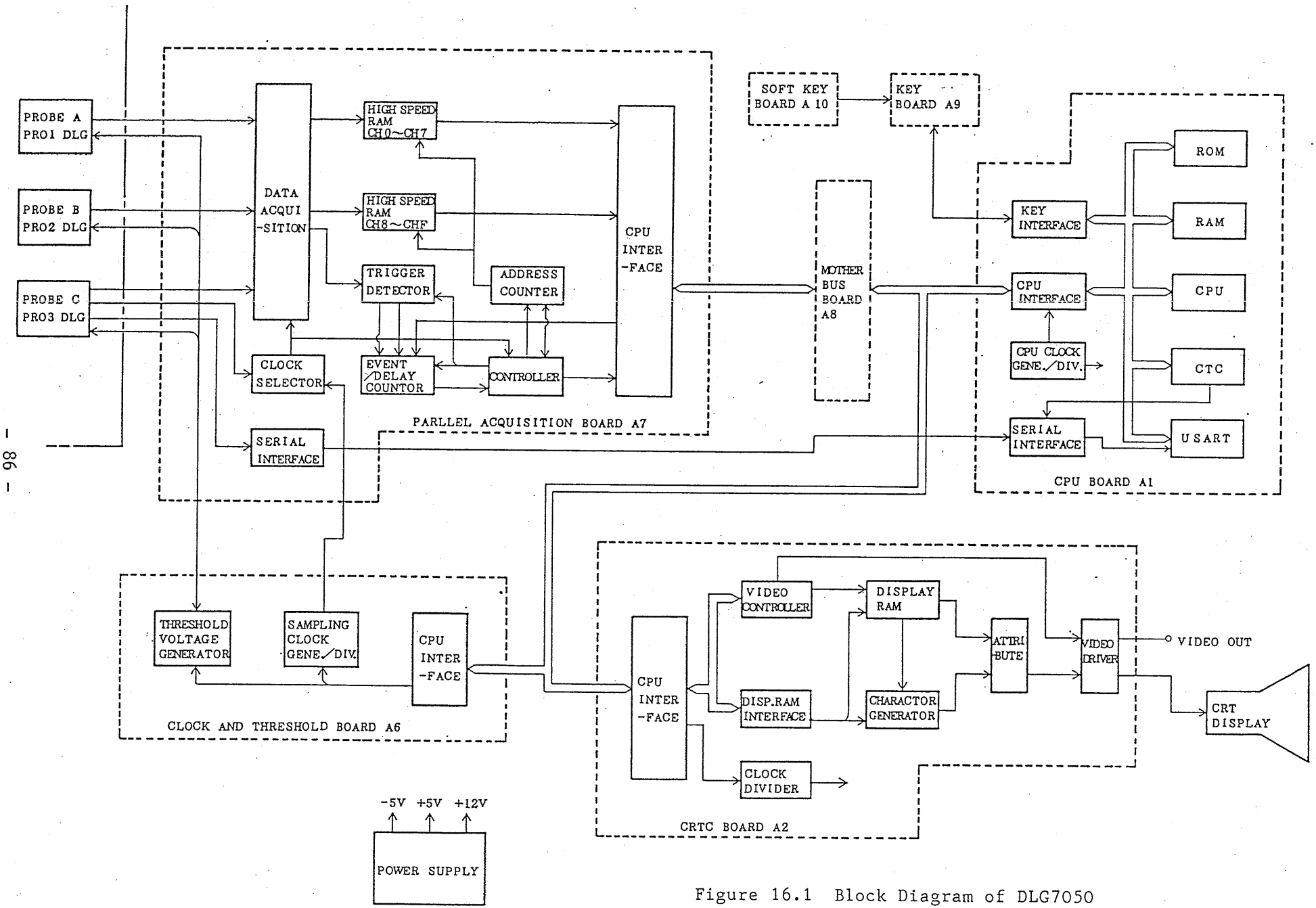


Figure 16.1 Block Diagram of DLG7050

16.2 Principle of Recording Mode

16.2.1 PARALLEL and GP-IB Data Recording

The signal to be measured is fed via the probe, discriminated by the threshold voltage, converted into a digital signal, and then fed to the main unit.

At the PARALLEL AQUISITION section, the input signal is sampled on the required clock in the required input mode, and stored in the high speed memory and, at the same time, it is checked for conformity with the TRIGGER WORD at the trigger detector section.

The conformity output signal is subjected to trigger polarity check and filter check, and then fed to the event counter. When the preset number of events are counted, the DELAY counter trips to generate a data record end signal.

The data stored in the high speed memory is transferred once to the RAM (MEM A) of the CPU board and then displayed on the CRT.

16.2.2 SERIAL Data Recording

The serial data also is digitized in the probe, fed to the main unit, fed via the AQUISITION board to the CPU for polarity processing, and then fed to the USART.

On the other hand, the clock is selected between internal clock and external clock, and then fed to the USART.

With the USART, the bit-synchronized and series/parallel converted data and status are stored in MEM A and, at the same time, compared with the TRIGGER WORD for event count and delay count.

The data stored in MEM A are re-arranged for the normal order and then displayed on the CRT.

16.3 Principle of Display Mode

The data stored in MEM A and B are subjected to display formatting for the type of display, display mode, display memory, head address of display, display radix, and horizontal magnification (H-MAG). Then, the data is code-converted as required and written in the display RAM. Such attributes as inverted display and blinking also are written at the same time.

The display control circuit generates a sync signal to drive the constant raster scan type CRT. It also reads data from the display RAM and feeds it to the charactor generator and attribute circuit.

The charactor converts the input signal into an intensity control signal. The signal is modulated by the attribute circuit and then fed, together with the sync signal, to the CRT.

17. SELF-DIAGNOSIS FUNCTIONS

The DLG7050 performs its self-diagnostic functions each time the POWER switch is turned on. The tested items are as follows:

(1) CRC test of program ROM

(2) Read/write test of RAM

(3) OFF test of key switches

(4) PARALLEL data recording test (excluding the probes)

(5) SERIAL data recording test (turn back)

If a failure is found in the tests of (1) - (3), the DLG7050 cannot be used.

When a failure is found in the test of (4) or (5), the DLG7050 can be operated by pressing the [ENTER] key. However, it cannot be operated in the mode in which the failure has been found.

If display is possible when a failure is found, an error number is shown. (Convey this information to your Kikusui dealer when ordering him to repair the instrument.)

Part of self-diagnoses are executed even when in data recording. If a failure is detected, a message is shown. In this case, however, no error numbers are shown.

Appended Table 1: Probes, Recording Channels and Recorded Signals

Probe	Input Channel	PARALLEL Record Connection Signal	GP-IB Record Connection Signal	IEEE 488 Connector Pin No.		Serial Record Connect Signal
				Signal	GND	
A	CH0	CH.0	DIO1	1	#24	
PRO1-DLG	CH1	CH.1	DIO2	2	#24	
	CH2	CH.2	DIO3	3	#24	
	CH3	CH.3	DIO4	4	#24	
	CH4	CH.4	DIO5	13	#24	--
	CH5	CH.5	DIO6	14	#24	
	CH6	CH.6	DIO7	15	#24	
	CH7	CH.7	DIO8	16	#24	
	GND	GND	GND			
B	CH8	CH.8	REN	17		
PRO2-DLG	CH9	CH.9	IFC	9	21	
	CHA	CH.A	SRQ	10	22	
	CHB	CH.B	EOI	5		
	CHC	CH.C	ATN	11	23	
	CHD	CH.D	NDAC	8	20	
	CHE	CH.E	NRFD	7	19	
	CHF	CH.F	DAV	6	18	
	GND	GND	GND			
C	Q0	DATA QUALIFIER CH.0	--	--	--	--
PRO3-DLG	Q1	DATA QUALIFIER CH.1	--	--	--	--
	SER	--	--	--	--	DATA
	CQ	EXT.CLOCK QUALIFIER	--	--	--	--
	E.CK	EXT.CLOCK	DAV	6	18	EXT.CLOCK
	GND	GND	GND			GND

Operation Panel