



THERMAL ARRAYCORDER

WR7700

MANUAL NO. WR7700-OP-UM-151

LOGIC AMPLIFIER
DC/AC POWER SUPPLY UNIT
GPIB INTERFACE
1/10 ATTENUATOR
Z-FOLD PAPER UNIT

USER'S MANUAL



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LOGIC AMPLIFIER

1. LOGIC AMPLIFIER

1.1 Specifications

Number of inputs 16 channels, in 4 groups of 4: A, B, C, and D

Input levels (1) 0 to +24 V (max)
Threshold level: +1.4 or +2.5 V
(Switchable for each group of four channels individually)

(2) Contact input
H: Open input terminal (50 kΩ min)
L: Short input terminal to GND terminal (1 kΩ max)

Note

Threshold level is set to +1.4 V.

Input configuration One-side grounded (ground level is common to all channels)

Sampling speed (1) At direct Y-T: Varies according to chart speed

Chart Speed	100 mm/s	50	20	10	5	2	1	50 mm/min	20	10	5	50	50
Sampling Speed	2.5 ms	2.5 ms	5.0 ms	5.0 ms	10.0 ms	25.0 ms	50.0 ms	60 ms	150 ms	300 ms	600 ms	1.5 s	3 s

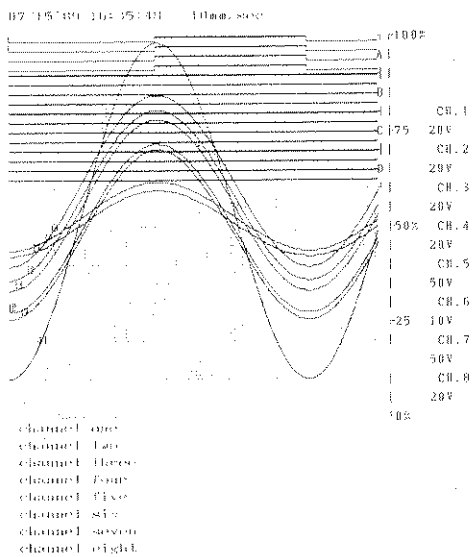
(2) At memory Y-T: Depends on memory sampling interval

Trigger setting 16-channel pattern trigger
H, L, X (Don't care) selected from menu screen

Print On/Off Set for groups of four channels in menu screen
(Four settings: A, AB, ABC, and ABCD)

Recording formats

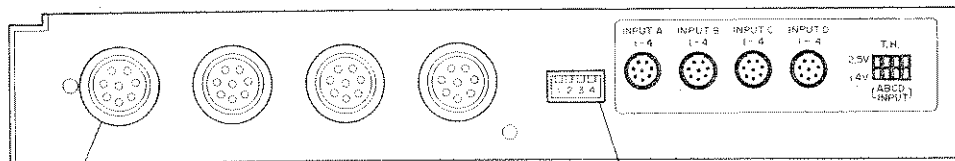
Recording format and logic signal recording position for 20 mm×8.



(1) For the 160 mm×1 and other formats also, the recording is made in the same position as for 20 mm×8.

(2) When recording analog signals simultaneously, analog signals will be overlaid in the same position as for 20 mm×8.

1.2 Input Section Panel Names and Functions



① Logic Signal Input Connectors

② Threshold Level Setting Switches

① Logic Signal Input Connectors

There are four input connectors A, B, C, and D, and each one accepts signals from four channels. Connect the accessory logic input cables here. These connectors are also used to connect a logic probe (CM-105, CM-106), which is sold separately.

② Threshold Level Setting Switches

These DIP switches are used to set the threshold levels for the input signals. Threshold levels can be set separately for each of the four inputs A to D. When pushed up, the threshold level is set to +2.5 V, and when pushed down, +1.4 V. Set the threshold level to +1.4 V when using a logic probe (CM-105, CM-106).

1.3 Menu Settings

When using the logic amplifier, the PLOT and TRIG menus in each mode of the main unit undergo certain changes. Only the changes are described here, and this section should be read in conjunction with Section 2.4.2 PLOT Menu Setting of the Instruction Manual for the main unit when making menu settings.

1.3.1 Print On/Off Setting

The print on/off status is set in the PLOT menu. When the PLOT key in the function key group is pressed, the menu in Fig. 1-1 appears on the LCD screen.

Use the down key to move the cursor to the desired position (Fig. 1-2).

The print on/off status can be selected from the following five settings.

1. OFF: None of the logic signals are recorded.
2. ABCD: All signals of groups A to D are recorded.
3. ABC: Signals of groups A to C are recorded.
4. AB: Signals of groups A and B are recorded.
5. A: Only the signals of group A are recorded.

Make settings for the other parameters in the PLOT menu by referring to the main unit Instruction Manual.

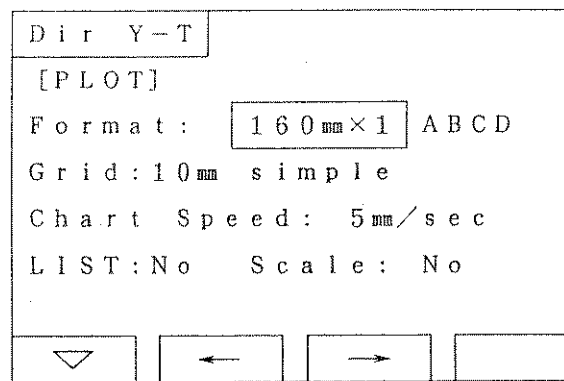


Fig. 1-1

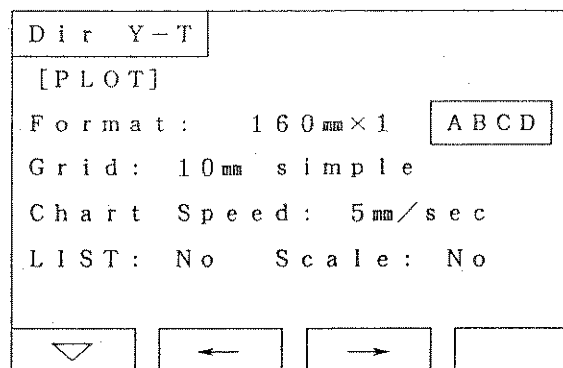


Fig. 1-2

1.3.2 Trigger Setting

The trigger is set in the TRIG menu.

When the TRIG key in the function key group is pressed, the menu in Fig. 1-2 appears on the LCD screen.

When setting the Trig. Memory as the trigger function in the direct Y-T mode, analog waveform signals are stored in signal memory, but logic signals are not stored in memory.

Thus, output of recordings does not include any logic signal recordings.

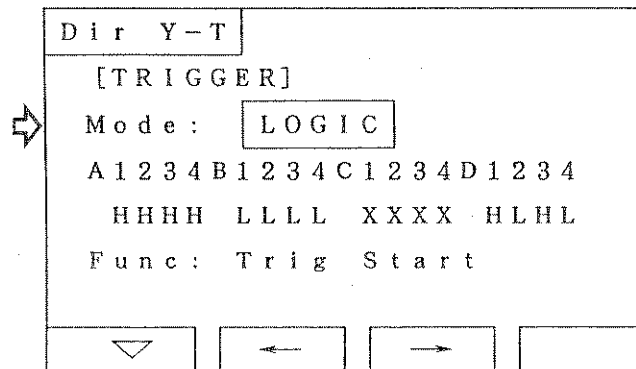


Fig. 1-3

① Trigger Mode Setting

Set the trigger mode to LOGIC (Fig. 1-3).

② Trigger Pattern Setting

Set the trigger pattern to the desired pattern (Fig. 1-4).

The trigger pattern is formed by combining any of the following three settings.

H: High level

L: Low level

X: Don't Care

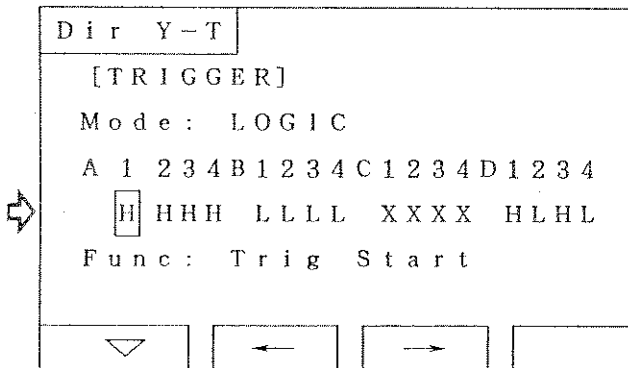


Fig. 1-4

Refer to the main unit Instruction Manual Section 2.4.3 TRIG Menu Setting, for procedures for making the settings for the other parameters in the other TRIG menu. It is not possible to combine Ch 1 to 4 (8) analog waveform triggers and logic triggers.

1.4 Using the Memory Card

When the main unit includes the logic option, and the MU256C Data-Storage Memory Card is used, the following cautions must be observed when saving data stored in memory to the memory card or loading data into memory from the memory card.

① Setting Type of Data Saved to (or Loaded from) Memory Card

When the INIT key of the function key group is pressed, the LCD screen changes to that shown in Fig. 1-5.

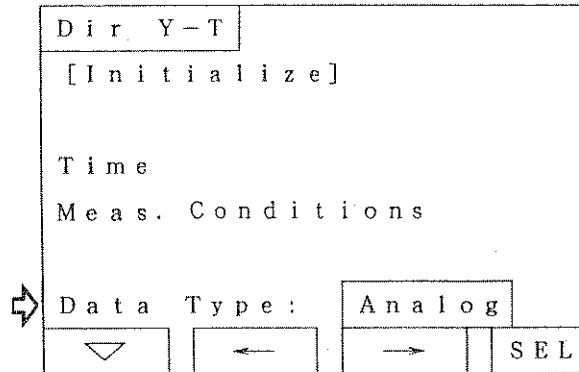


Fig. 1-5

Align the cursor to Data Type, and select the data type. The relation between the data types and data that can be saved to (or loaded from) the memory card is given in the following table.

Data Type	Data that can be Saved (Loaded) to Memory Card
Analog	Only analog waveform data stored in main memory can be saved. Two banks of measurement data, Data-1 and Data-2, are stored.
A. and L.	Analog waveform data stored in main memory and logic signal data can be saved.

② Cautions When Saving or Loading Data

- (1) When analog waveform data is saved together with logic signal data to a memory card in which two banks of analog waveform data are already stored, all of the previously saved analog waveform data in both banks is erased.
- (2) An error message is displayed and data load not executed in the following cases.
 - (a) When the data type is set to Analog and an attempt is made to load data from a memory card in which

both analog waveform data and logic signal data have been saved.

- (b) When the data type is set to A. and L. and an attempt is made to load data from a memory card onto which analog waveform data only has been saved.

Reset the data type in the INIT menu and then load the data.

DC/AC POWER SUPPLY UNIT

Table 3-3

Bus Signal Lines		Description																								
DIO	<table border="0"> <tr> <td>1 (</td> <td>Data Input</td> <td>1)</td> </tr> <tr> <td>2 (</td> <td>Output</td> <td>2)</td> </tr> <tr> <td>3 (</td> <td>"</td> <td>3)</td> </tr> <tr> <td>4 (</td> <td>"</td> <td>4)</td> </tr> <tr> <td>5 (</td> <td>"</td> <td>5)</td> </tr> <tr> <td>6 (</td> <td>"</td> <td>6)</td> </tr> <tr> <td>7 (</td> <td>"</td> <td>7)</td> </tr> <tr> <td>8 (</td> <td>"</td> <td>8)</td> </tr> </table>	1 (Data Input	1)	2 (Output	2)	3 ("	3)	4 ("	4)	5 ("	5)	6 ("	6)	7 ("	7)	8 ("	8)	Used for transfer of data and commands
1 (Data Input	1)																								
2 (Output	2)																								
3 ("	3)																								
4 ("	4)																								
5 ("	5)																								
6 ("	6)																								
7 ("	7)																								
8 ("	8)																								
DAV (Data Valid)		Indicates data validity																								
NFRD (Not Ready for Data)		Ready for reception signal																								
NDAC (Data Not Accepted)		Reception complete signal																								
ATN (Attention)		Indicates whether DIO data is an address or a command																								
IFC (Interface Clear)		Initializes the interface																								
EOI (End or Identify)		Indicates the last byte of data																								

3.1.4 GPIB Interface Settings

The interface conditions are set by means of DIP switches and menus.

(a) DIP Switch Settings

The DIP switches to the side of the GPIB connector are used to set the GPIB address and the operating mode.

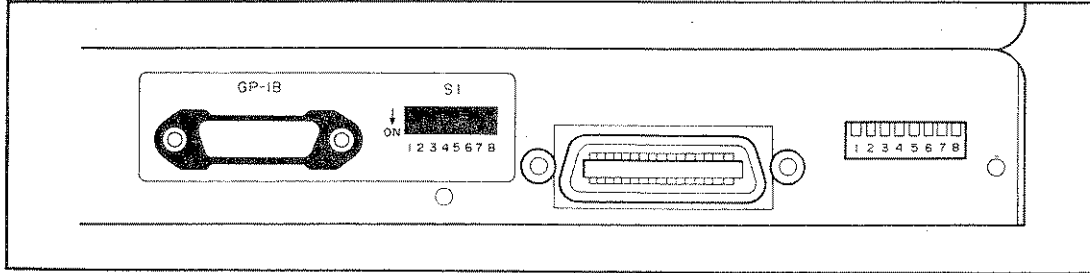


Fig. 3-5

- S1 is set as follows. Note that the 1 state is indicated as OPEN and the 0 state is indicated as ↓ ON.

No.	Description	
8	LSB	Device Address
7		
6		
5		
4		
3	1: Talk only	0: Normal
2	1: Normal	0: EOI enabled
1	Always set to 1	

① Device Address

Note that the address setting of 31 in which positions 4 through 8 are all set to 1 is not possible.

② Talk Only

If the third position of the DIP switch is set to 1, the talk-only mode is enabled and the address setting of positions 4 to 8 is ignored.

③ To enable EOI, set position 2 to 0.

(b) External Interface Settings

This setting is made by means of a menu used to select the type of external interface.

Press the INIT key of the function keys to display the menu shown in Fig. 3-6.

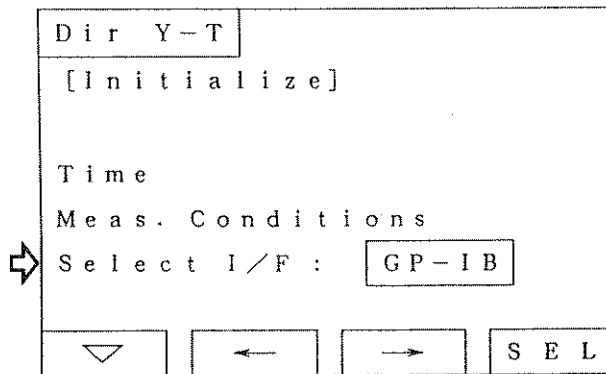


Fig. 3-6

Move the cursor to the I/F Select item and select the GPIB interface.

3.2 Data Transfer

3.2.1 Data Transfer Types

To an external computer using a built-in GPIB interface.

- Main front panel or menu setting conditions
- Amplifier setting conditions
- Memory data captured in the memory mode

3.2.2 Basic Transfer Protocols

(a) Signal Cable Connections

For the GPIB, a commercially available IEEE-488 (24-pin conductor) cable is used to make connections between the WR7700 and the computer.

(b) Interface Settings

For the GPIB, the settings are made by switches and by menus.

(c) Loading the Transfer Program

A transfer program for the particular computer to be used is generated and loaded.

(d) WR7700 Measurement Condition Settings

The WR7700 is placed in the measurement condition, and a data capture is tried to enable operating panel and menu settings to be made.

(e) WR7700 Measurement Start and Stop

In general, the measurement is started and then the STOP key is pressed to stop the measurement after verifying that data has been captured.

(f) Running the Computer Program

The computer program is run to start the WR7700 measurement and data transfer sequence.

3.2.3 Commands

The control and transfer commands used in generating the program for the WR7700 are shown in the interface command table (Section 3.3).

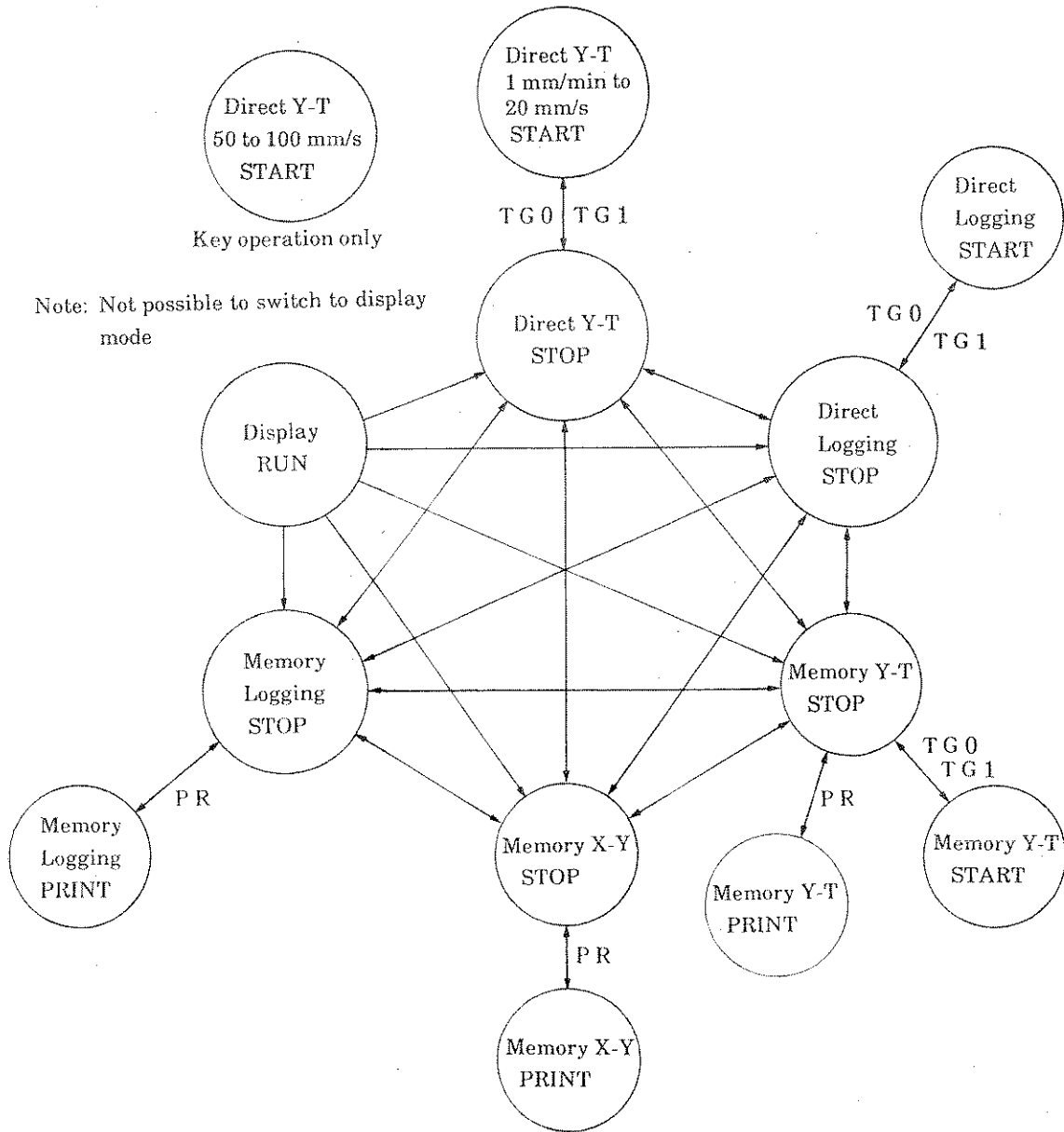
3.2.4 Transfer Data Format

Main front panel and menu setting conditions, and amplifier setting conditions are transferred as ASCII character codes. Memory data captured in the memory mode is transferred as binary data.

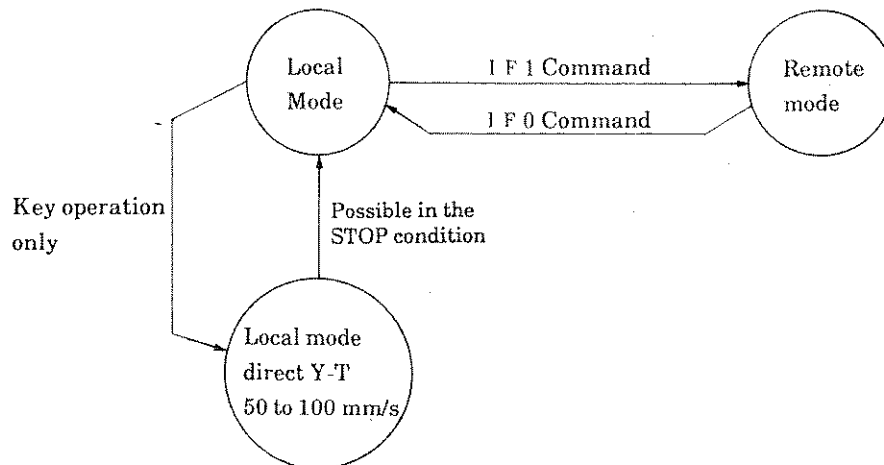
3.2.5 Data Transfer Precautions

- ① The GPIB interface cannot be used at chart speeds of 50 mm/s or faster in the direct Y-T mode. If an attempt is made under these conditions to send a command from the computer, the computer will halt during data transmission, and this must be cleared by cancelling the GPIB function by, for example, issuing a BREAK command one time.
- ② When the remote command IF1 is received, if the WR7700 can be placed in the remote mode, Y CR LF (59₁₆ OD₁₆ OA₁₆) is output and the recorder switches to the remote mode. If it is not possible to switch to the remote mode (e.g., at a chart speed of 50 mm/s or faster in the direct Y-T mode), N CR LF (4E₁₆ OD₁₆ OA₁₆) is output and the recorder remains in the local mode. In this case, the CF command should be used to set the chart speed to 20 mm/s or slower.
- ③ When a valid GPIB command is received, the WR7700 executes the GPIB command as it simultaneously goes into the remote mode.
- ④ Since during direct logging recording, the WR7700 outputs data to the GPIB in the same format as for recording data, data must be received in this format at the computer.
- ⑤ In the TRIG. WAIT condition, if a GPIB command is received, the STOP condition is entered and the command is executed.

Mode Switching by Means of the MD Command



Remote/Local Switching by Means of the IF Commands



3.3 WR7700 Interface Command Table (1)

Command	Format	Contents of n and m, and applications	Output Data Format
INITIAL	IN (T)	WR7700 Initialization	
MODE SET	MDn (T)	n = 0: Direct Y-T 1: Direct log 2: Memory Y-T 3: Memory X-Y 4: Memory log	
RECORD START	TG0 (T)	WR7700 Start recording	
RECORD STOP	TG1 (T)	WR7700 Stop recording	
FORM FEED	FF ll (T)	Chart paper feed form feed (page feed)	
LIST OUT	LI (T)	List output	
OUTPUT STATUS	OS (T)	Read Status Data	Format 4
OUTPUT REPORT	ORn (T)	n = 1: Read operating panel setting conditions n = 2: Read 1 of amplifier setting conditions n = 3: Read 2 of amplifier setting conditions	Format 5 Format 2 Format 3
OUTPUT IDENTITY	OI (T)	Read model name data	Format 8
DATE SETTING	DSmmddyy (T)	mmddyy: mm = month dd = day yy = year	
TIME SETTING	TShhmmss (T)	hhmmss: hh = hour mm = minute ss = second	
ERROR CLEAR	EC (T)	Clears the error flag read by the OS command	
PRINT OUT	PR (T)	Printout	
LOCAL-REMOTE	IFn (T)	n = 0: Local n = 1: Remote	Format 6

WR7700 Interface Command Table (2)

Command	Format	Contents of n and m, and applications	Output Data Format
PRINT LABEL	LBnABC...(T)	n: Channel No. for printing (1-8) ABC...: ASCII character string of up to 18 characters	
CHART SPEED SETTING	CFsst(T)	ss=00: 1 mm/min ss=01: 2 mm/min ss=02: 5 mm/min ss=03: 10 mm/min ss=04: 20 mm/min ss=05: 25 mm/min ss=06: 50 mm/min ss=07: 1 mm/s ss=08: 2 mm/s ss=09: 5 mm/s ss=10: 10 mm/s ss=11: 20 mm/s ss=12: 25 mm/s Note: 50 mm/s and 100 mm/s chart speeds cannot be specified.	
SAMPLING INTERVAL TIME	Sinn(T)	nn = 00: 8 μ s nn = 02: 20 μ s nn = 04: 100 μ s nn = 06: 500 μ s nn = 08: 2 ms nn = 10: 10 ms nn = 12: 50 ms nn = 14: 200 ms nn = 01: 10 μ s nn = 03: 50 μ s nn = 05: 200 μ s nn = 07: 1 ms nn = 09: 5 ms nn = 11: 20 ms nn = 13: 100 ms	
TRIGGER SOURCE	TUn(T)	n = 0: Manual n = 1: External n = 2: A n = 5: Window in n = 3: A or B n = 4: A and B n = 6: Window out	
TRIGGER CHANNEL	TCn(T)	n: Trigger A channel (1 to 4) (8) m: Trigger B channel (1 to 8)	

WR7700 Interface Command Table (3)

Command	Format	Contents of n and m, and applications	Output Data Format
TRIGGER LEVEL	TLnℓℓ(T)	ℓℓ: Level (00 to 100) n = 0: A trigger n = 1: B trigger	
TRIGGER SLOPE	TPnp(T)	p = 0: Rising edge p = 1: Falling edge n = 0: A trigger n = 1: B trigger	
PRINT FORMAT	PFabcd(T)	a = 0: No DATE printing a = 1: Print DATE b = 0: No TIME printing b = 1: Print TIME c = 0: No SPEED printing c = 1: Print SPEED d = 0: No TIME SCALE printing d = 1: Print TIME SCALE	
LABEL PRINT START	LP(T)	Start label printing	
PRINT TEXT	TXnnABC... (T)	nn: Line number for printing (01-40, must be 2 digits) ABC: ASCII character string of up to 40 characters	
TEXT PRINT START	XP(T)	Start text printing	
TRIGGER ACTION	TAn(T)	n = 0: Single n = 1: Repeated	
MEMORY BLOCK	MBn(T)	n = 0 8 K - 1 n = 1 8 K - 2 n = 2 16 K - 1	

WR7700 Interface Command Table (4)

Command	Format	Contents of n and m, and applications	Output Data Format
MEMORY VOLUME	MVn (T)	n = 0: 100% n = 1: 50% n = 2: 25% n = 3: 12.5%	
MEMORY OUTPUT AREA	MOsee (T)	s: Memory output starting % (0 to 9) s × 10% ee: Memory output ending % (01 to 10) ee × 10%	
SCALING FACTOR	SCn (T)	n = 0: 1/8 n = 4: 2 n = 1: 1/4 n = 5: 4 n = 2: 1/2 n = 6: 8 n = 3: 1/1	
TRIGGER DELAY RATE	DRS ℓ ℓ (T)	s: Polarity (+ or -) ℓ ℓ : ℓ ℓ × 10% (ℓ ℓ = 00 to 10)	
TRIGGER FUNCTION 1	TF1n (T)	n = 0: Trigger start n = 1: Trigger stop n = 2: Trigger start & stop	n = 3: Trigger memory n = 4: Trigger Zoom
TRIGGER FUNCTION 2	TF2n (T)	n = 0: Time mode 1 = 1: Length mode	
RECORDING TIME	RTmmss (T)	mmss: mm minutes ss seconds	
RECORDING LENGTH	RLℓ ℓ ℓ ℓ (T)	ℓ ℓ ℓ ℓ : ℓ ℓ ℓ ℓ mm (0000 to 9999)	
RECORD FORMAT	RFnm (T)	n = 0: No scale printing m = 0: No list printing n = 1: Scale printing m = 1: List printing	

WR7700 Interface Command Table (5)

Command	Format	Contents of n and m, and applications	Output Data Format
Y-T FORMAT	YTn (T)	<p>4-ch model</p> <p>n = 0: 160 mm × 1</p> <p>n = 1: 80 mm × 2</p> <p>n = 2: 40 mm × 4</p> <p>n = 3: 100 mm × 1</p> <p>n = 4: 50 mm × 2</p> <p>8-ch model</p> <p>n = 0: 160 mm × 1</p> <p>n = 1: 80 mm × 2</p> <p>n = 2: 40 mm × 4</p> <p>n = 3: 20 mm × 8</p> <p>n = 4: 100 mm × 1</p> <p>n = 5: 50 mm × 2</p>	
GRID TYPE	GRnm (T)	<p>n = 0: 10 mm × 10 mm</p> <p>n = 1: 5 mm × 10 mm</p> <p>n = 2: 4 mm × 10 mm</p> <p>n = 3: 10 div × 10 mm</p> <p>n = 4: None</p> <p>m = 0: Simple grid</p> <p>m = 1: Fine grid</p>	
X-Y FORMAT	XYx1y1 (T)	<p>x1: X-axis channel (1 to 8)</p> <p>y1: Y-axis channel (1 to 8)</p>	
BINARY DATA	BD ℓ (T)	ℓ: Read channel specification (1 to 8)	Format 1
OUTPUT INTERVAL	OTn (T)	<p>n = 0: 1 s</p> <p>n = 1: 10 s</p> <p>n = 2: 1 min</p> <p>n = 3: 10 min</p>	
RANGE SETTING	PAnrvif (T)	<p>n: Setting channel (1 to 8)</p> <p>r: Range</p> <p>r = 0 100 mV</p> <p>r = 1 200 mV</p> <p>r = 2 500 mV</p> <p>r = 3 1 V</p> <p>r = 4 2 V</p> <p>r = 5 5 V</p> <p>r = 6 10 V</p> <p>r = 7 20 V</p> <p>r = 8 50 V</p> <p>r = 9 100 V</p> <p>v: Vernier</p> <p>v = 0 Vernier OFF</p> <p>v = 1 Vernier ON</p> <p>i: Input</p> <p>i = 0 OFF</p> <p>i = 1 AC</p> <p>i = 2 DC</p> <p>i = 3 GND</p> <p>i = 4 CAL.</p> <p>f: Filter</p> <p>f = 0 OFF</p> <p>f = 1 5 Hz</p> <p>f = 2 500 Hz</p> <p>f = 3 5 kHz</p>	

WR7700 (Interface Command Table)

Command	Format	Contents of n and m, and applications	Output Data Format
OPTION TRIGGER SETTING	T ⁿ h ¹ b ² m ¹ m ² h ³ h ⁴ m ³ m ⁴ (T)	n = 1: off n = 2: start n = 3: repeat h ¹ h ² m ¹ m ² : h ¹ h ² hours m ¹ m ² minutes h ³ h ⁴ m ³ m ⁴ : h ³ h ⁴ hours m ³ m ⁴ minutes	
TRIGGER ZOOM SETTING	TZnm (T)	n = 0: Factor × 2 n = 1: Factor × 4 n = 2: Factor × 8 m: Zoom channel	

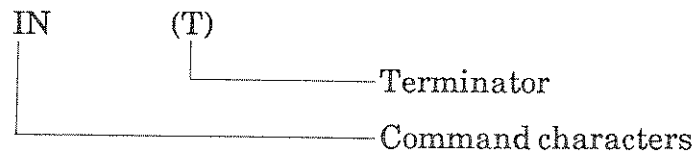
3.4 Detailed Command Descriptions

When performing data transfer with the WR7700, 38 commands are used. These are described below in detail.

3.4.1 IN (Initialize) Command

This command places the WR7700 in the same condition as when power is first applied.

① Format



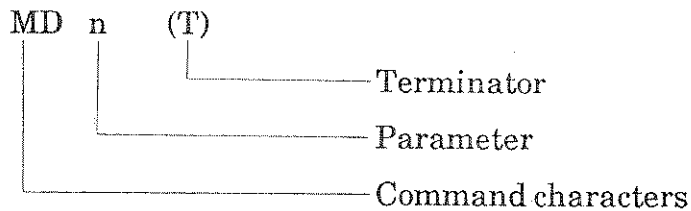
② Terminator: CR/LF

③ Valid conditions: Valid in either the START or the STOP condition.

3.4.2 MD (Mode Setting) Command

This command is used to set the WR7700 operating mode.

① Format



② Parameter

- n=0: Sets the WR7700 to the direct Y-T mode.
- n=1: Sets the WR7700 to the direct mode.
- n=2: Sets the WR7700 to the memory Y-T mode.
- n=3: Sets the WR7700 to the memory X-Y mode.
- n=4: Sets the WR7700 to the memory logging mode.

③ Terminator: CR/LF

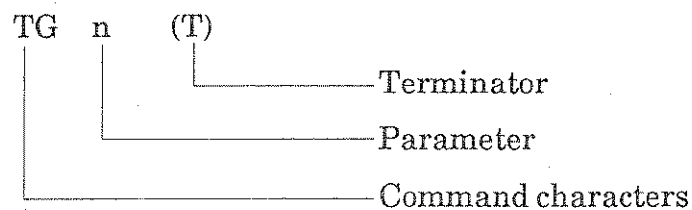
④ Valid conditions: Valid in the addressable mode.

Valid in the STOP condition.

3.4.3 TG (Trigger) Command

This command is used in place of the START and STOP keys.

① Format



② Parameter

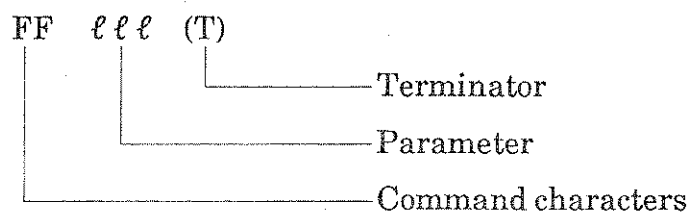
n=0: Sets the WR7700 to the START condition.

n=1: Sets the WR7700 to the STOP condition.

③ Terminator: CR/LF

3.4.4 FF (Form Feed) Command

① Format



② Parameter

l l l (mm) amount of paper feed (000 to 999)

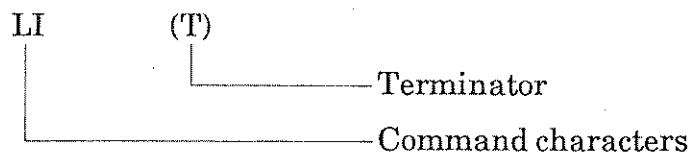
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.5 LI (List Output) Command

This command is used to create a list output of setting conditions on the chart paper.

① Format



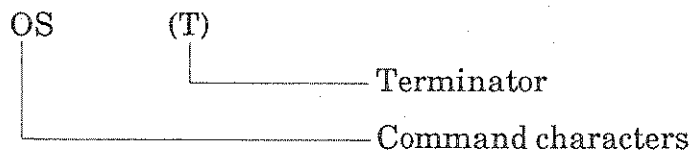
② Terminator: CR/LF

③ Valid conditions: Valid in the STOP condition.

3.4.6 OS (Output Status) Command

This command is used to read the output status signals. When this command is received, the internal conditions of the WR7700 are output as the status.

① Format



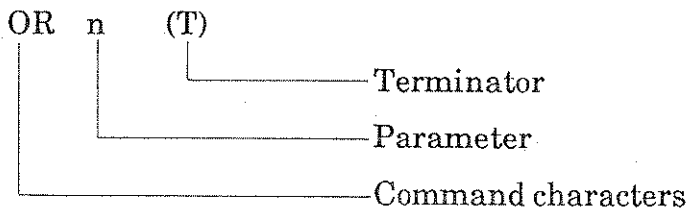
② Terminator: CR/LF

③ Refer to Output Data Format 4 for the data contents

3.4.7 OR (Output Report) Command

This command is used to read part of a menu or amplifier setting conditions.

① Format



② Parameter

n = 1: Outputs the menu setting conditions.

n = 2: Outputs amplifier conditions 1.

n = 3: Outputs amplifier conditions 2.

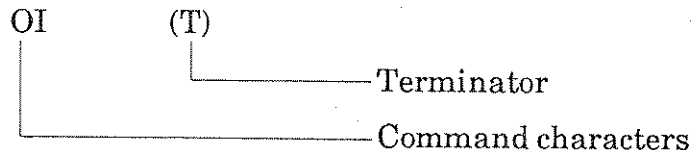
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.8 OI (Output Identity) Command

This command is used to cause the WR7700 to output "WR7700 CR/LF."

① Format



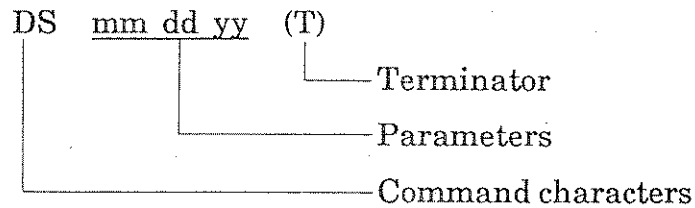
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.9 DS (Date Setting) Command

This command is used to set the date for the internal clock of the WR7700.

① Format



② Parameters

mm: month (01 to 12)

dd: day (01 to 31)

yy: year (00 to 99)

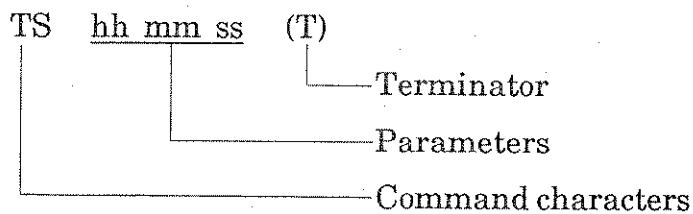
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.10 TS (Time Setting) Command

This command is used to set the time for the internal clock of the WR7700.

① Format



② Parameters

hh: hour (00 to 23)

mm: minute (00 to 59)

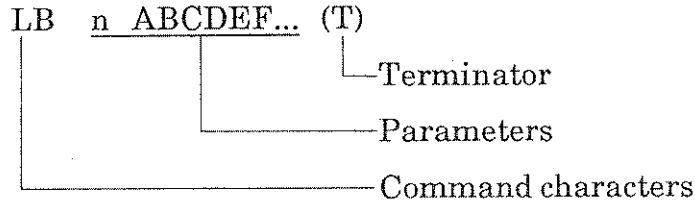
ss: second (00 to 59)

③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.14 LB (Label Print) Command

① Format



② Parameters

n: Channel number for printing (1 to 8)

ABCDEF: ASCII string of up to 18 characters

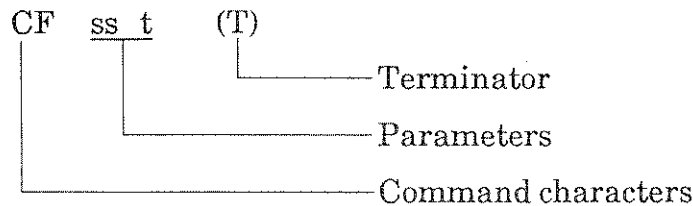
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.3.4.15

3.4.15 CF (Chart Feed Speed Setting) Command

This command is used to set the chart feed speed.

① Format



② Parameters

ss=00 1 mm/min

ss=01 2 mm/min

ss=02 5 mm/min

ss=03 10 mm/min

ss=04 20 mm/min

ss=05 25 mm/min

ss=06 50 mm/min

ss=07 1 mm/s

ss=08 2 mm/s

ss=09 5 mm/s

ss=10 10 mm/s

ss=11 20 mm/s

ss=12 25 mm/s

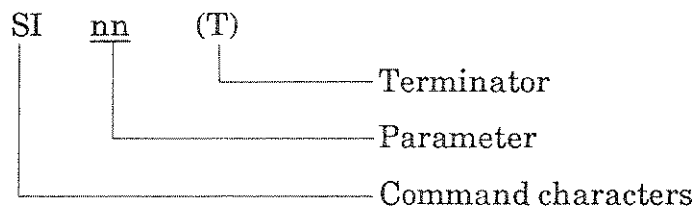
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.16 SI (Sampling Interval Time Setting) Command

This command is used to set the interval time for sampling analog signals in the memory mode.

① Format



② Parameter

nn=00:	8 μ s
nn=01:	10 μ s
nn=02:	20 μ s
nn=03:	50 μ s
nn=04:	100 μ s
nn=05:	200 μ s
nn=06:	500 μ s
nn=07:	1 ms
nn=08:	2 ms
nn=09:	5 ms
nn=10:	10 ms
nn=11:	20 ms
nn=12:	50 ms
nn=13:	100 ms
nn=14:	200 ms

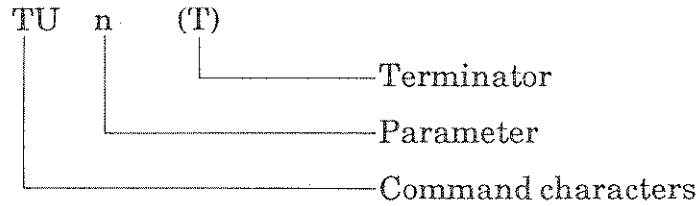
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.17 TU (Trigger Source) Command

This command is used to set the source for the trigger used in the memory mode.

① Format



② Parameter

- n=0: Manual triggering
- n=1: External triggering
- n=2: A
- n=3: A or B
- n=4: A and B
- n=5: Window In
- n=6: Window Out

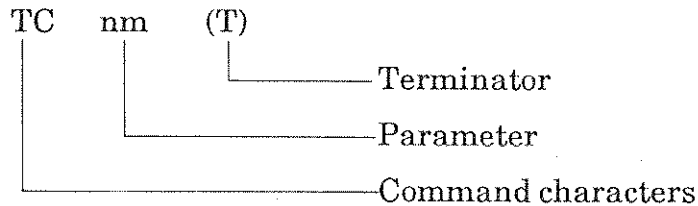
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.18 TC (Trigger Channel Setting) Command

This command is used to set the channel from which the trigger is to be taken for the memory mode.

① Format



② Parameters

- n: Trigger A channel
- m: Trigger B channel

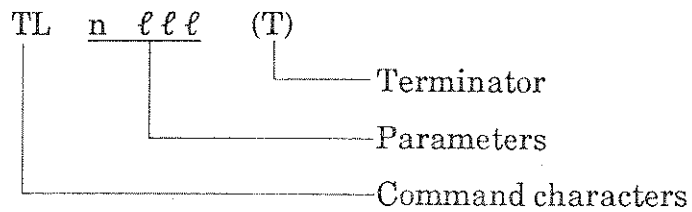
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.19 TL (Trigger Level Setting) Command

This command is used to set the trigger level for the memory mode.

① Format



② Parameters

n = 0: A trigger

n = 1: B trigger

lll: Level (000 to 100)

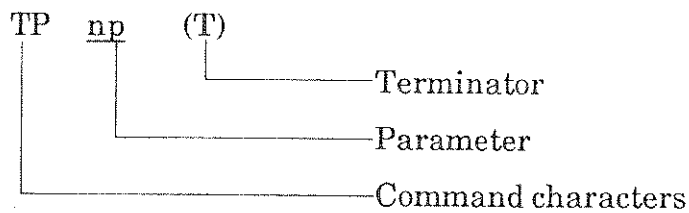
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.20 TP (Trigger Slope Setting) Command

This command is used to set the trigger slope for the memory mode.

① Format



② Parameters

n=0: A trigger

n=1: B trigger

p=0: Rising edge

p=1: Falling edge

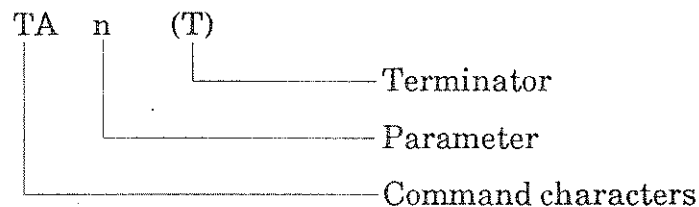
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.21 TA (Trigger Action) Command

This command establishes whether or not in the remote mode after a recording is completed return is made to the trigger weight condition.

① Format



② Parameter

n=0: Single

n=1: Repeated

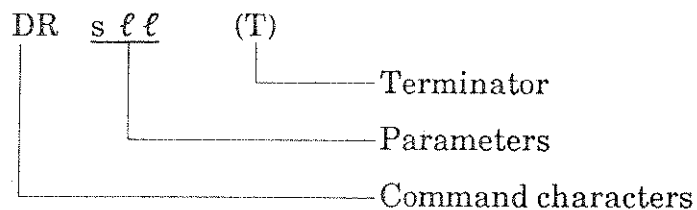
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.22 DR (Trigger Delay Rate) Command

This command sets actual data capture time offset with respect to the trigger signal in the memory mode in terms of a percentage of the memory size.

① Format



② Parameters

s = +: Post triggering

s = -: Pre-triggering

ℓ ℓ: Offset amount $\ell \ell \times 10\%$ (00 to 10)

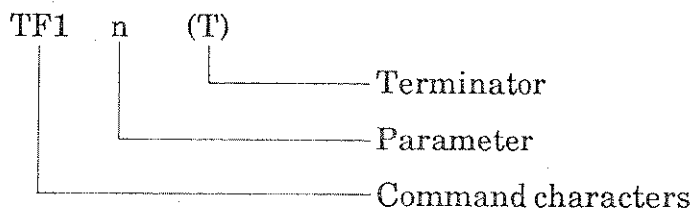
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.23 TF1 (Trigger Function 1) Command

This command sets the trigger function for the direct mode.

① Format



② Parameter

- n=0: Trigger start
- n=1: Trigger stop
- n=2: Trigger start and stop
- n=3: Trigger memory
- n=4: Trigger zoom

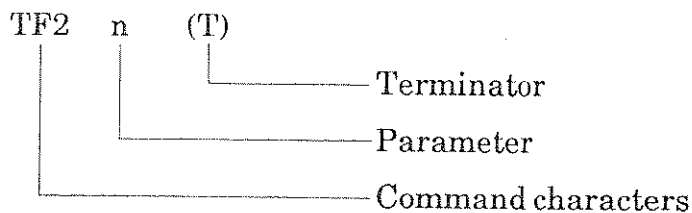
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.24 TF2 (Trigger Function 2) Command

This command is used to specify the recording time and recording length when the trigger start and stop are set using the TF1 command.

① Format



② Parameter

- n=0: Time mode (recording time specification)
- n=1: Length mode (recording length specification)

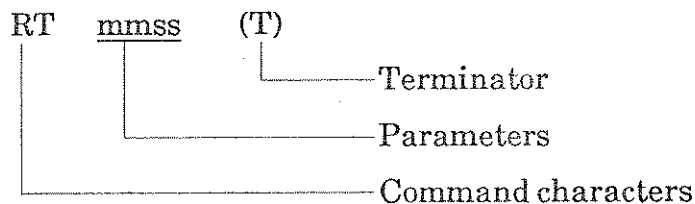
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.25 RT (Recording Time Setting) Command

This command is used to set the recording time when the direct mode trigger function 1 is used to set the trigger start and stop and the trigger function 2 is set to the time mode.

① Format



② Parameters

mmss: mm minutes ss seconds (mm = 00 to 59)
(ss = 00 to 59)

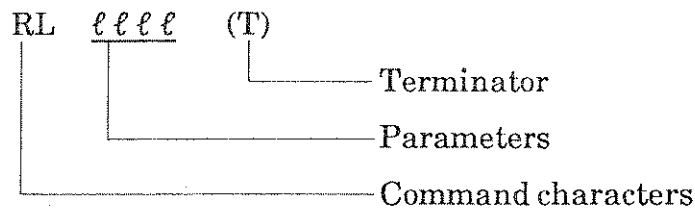
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.26 RL (Recording Length Setting) Command

This command is used to set the recording length when the direct mode trigger function 1 is trigger start and stop and the trigger function 2 is the length mode.

① Format



② Parameter

llll: llll (mm) (0000 to 9999)

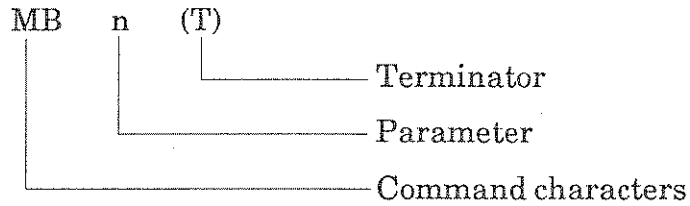
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.27 MB (Memory Block) Command

This command is used to specify the memory block used in the memory mode.

① Format



② Parameter

n=0:	8K-1	8 Kwords No.1 block
n=1:	8K-2	8 Kwords No.2 block
n=2:	16K-1	16 Kwords No.1 block

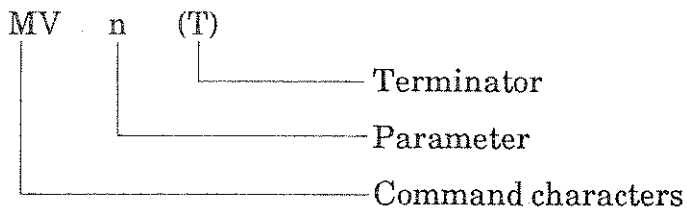
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.28 MV (Memory Volume) Command

This command is used to set the memory volume (capacity) for the memory mode.

① Format



② Parameter

n=0:	100%
n=1:	50%
n=2:	25%
n=3:	12.5%

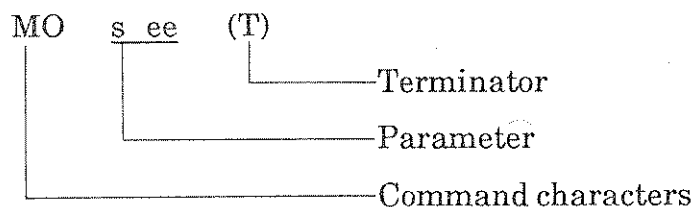
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.29 MO (Memory Output Area) Command

This command is used to set the memory volume (capacity) for the memory mode.

① Format



② Parameter

s: Memory output starting % $s \times 10\%$ (0 to 9)

ee: Memory output ending % $ee \times 10\%$ (0 to 10)

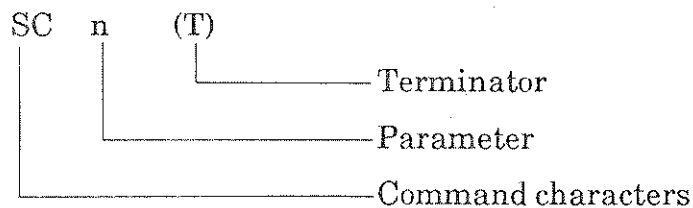
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.30 SC (Scaling Factor) Command

This command is used to set the memory recording output time-axis scaling for the memory mode.

① Format



② Parameter

n=0: 1/8 n=1: 1/4

n=2: 1/2 n=3: 1/1

n=4: 2 n=5: 4

n=6: 8

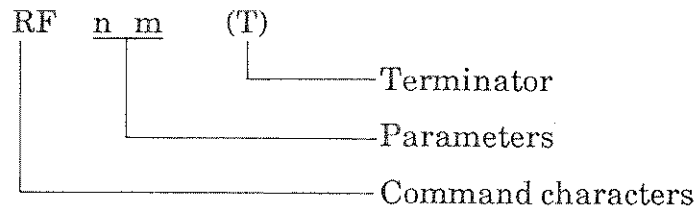
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.31 RF (Record Format) Command

This command is used to select scale printing for waveform recording and enable and disable the menu list.

① Format



② Parameters

n=0: No scale print

n=1: Scale print

m=0: No menu list printout

m=1: Menu list printout

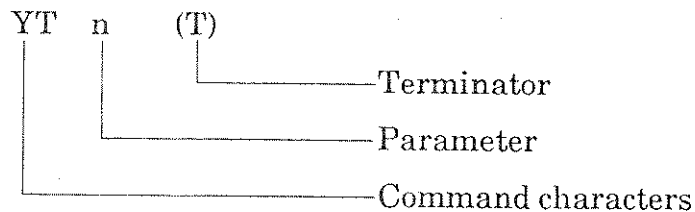
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.32 YT (Y-T Format) Command

This command is used to select the Y-T recording width as single, double, or wide.

① Format



② Parameter

4-ch model

n=0: 160 mm×1

n=1: 80 mm×2

n=2: 40 mm×4

n=3: 100 mm×1

n=4: 50 mm×2

8-ch model

n=0: 160 mm×1

n=1: 80 mm×2

n=2: 40 mm×4

n=3: 20 mm×8

n=4: 100 mm×1

n=5: 50 mm×2

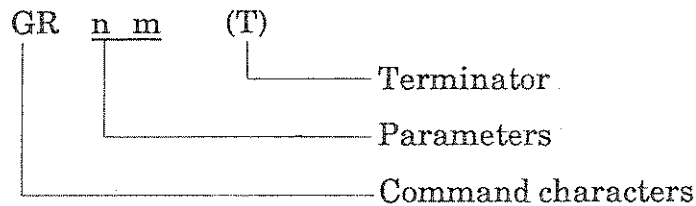
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.33 GR (Grid Type) Command

This command is used to set the type of grid and existence or non-existence of fine grid marks for the Y-T recording mode.

① Format



② Parameters

n=0: 10 mm × 10 mm

n=1: 5 mm × 10 mm

n=2: 4 mm × 10 mm

n=3: 10 div × 10 mm

n=4: None

m=0: Single grid

m=1: Fine grid

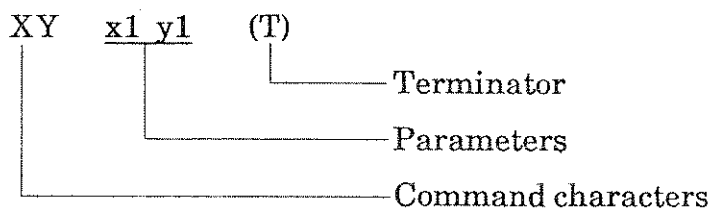
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.34 XY (X-Y Format) Command

This command is used to set the correspondence of channels to various axes in the X-Y format.

① Format



② Parameters

x1: Upper X-axis channel number (1 to 8)

y1: Upper y1-axis channel number (1 to 8)

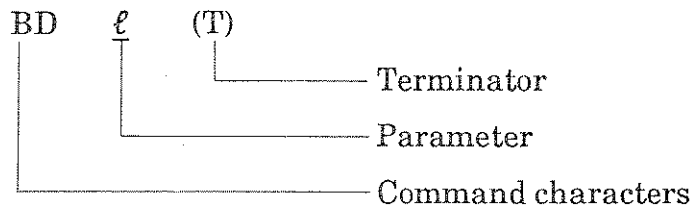
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.35 BD (Output Binary Data) Command

This command is used to read out data stored in memory in binary format.

① Format



② Parameters

ℓ: Channel number (1 to 8)

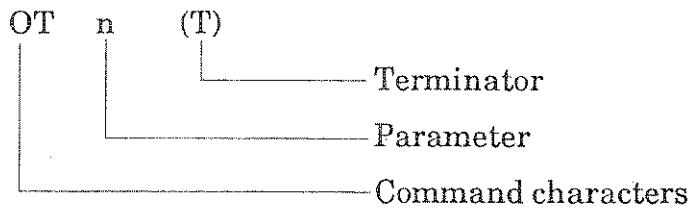
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.36 OT (Output Interval Setting) Command

This command is used to set the recording interval for the direct logging mode.

① Format



② Parameter

n=0:	1 s	n=1:	10 s
n=2:	1 min	n=3:	10 min

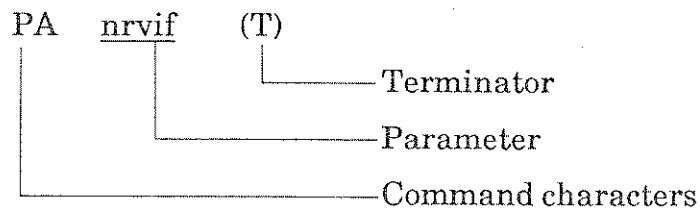
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.37 PA (Preamp Setting) Command

This command is used to make preamplifier settings.

① Format



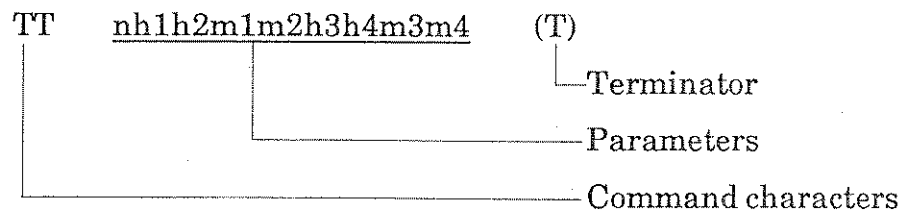
② Parameter

n=:	Set channel (1 to 8)
r=0:	100 mV range
r=1:	200 mV range
r=2:	500 mV range
r=3:	1 V range
r=4:	2 V range
r=5:	5 V range
r=6:	10 V range
r=7:	20 V range
r=8:	50 V range
r=9:	100 V range
v=0:	Calibrated (Vernier off)
v=1:	Vernier on
i=0:	OFF
i=1:	AC
i=2:	DC
i=3:	GND
i=4:	CAL.
f=0:	Filter – OFF
f=1:	Filter – 5 Hz
f=2:	Filter – 500 Hz
f=3:	Filter – 5 kHz

3.4.38 TT (Option Trigger Setting) Command

This command is used to make option trigger mode and time settings.

① Format



② Parameters

n=0: Off

n=1: Start

n=2: Stop

n=3: Repeat

h1h2m1m2: h1h2 hours m1m2 minutes (start)

h3h4m3m4: h3h4 hours m3m4 minutes (stop)

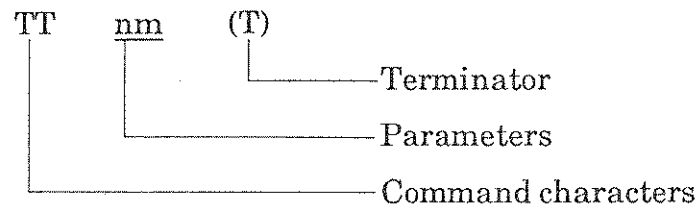
③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

3.4.39 TZ (Trigger Zoom Setting) Command

This command is used to make trigger zoom factor and zoom channel settings.

① Format



② Parameters

n=0: Factor ×2

n=1: Factor ×4

n=2: Factor ×8

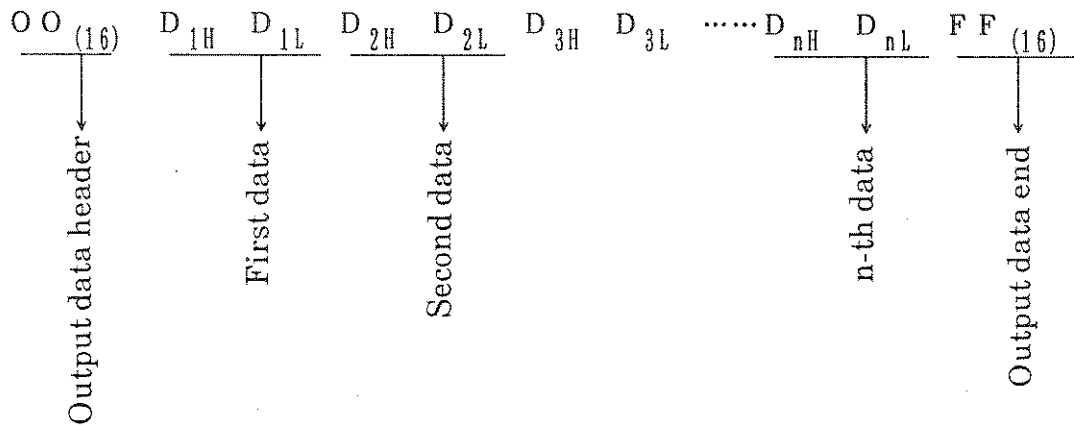
n=3: Zoom channel (1 to 8)

③ Terminator: CR/LF

④ Valid conditions: Valid in the STOP condition.

Output Formats

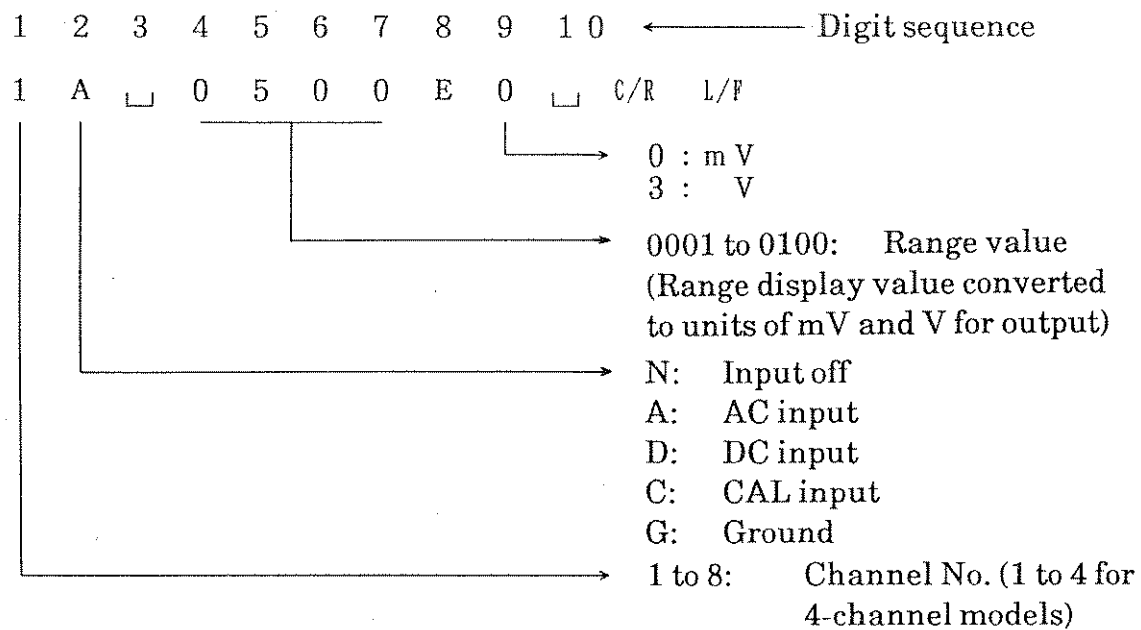
Format 1 (Binary Data)



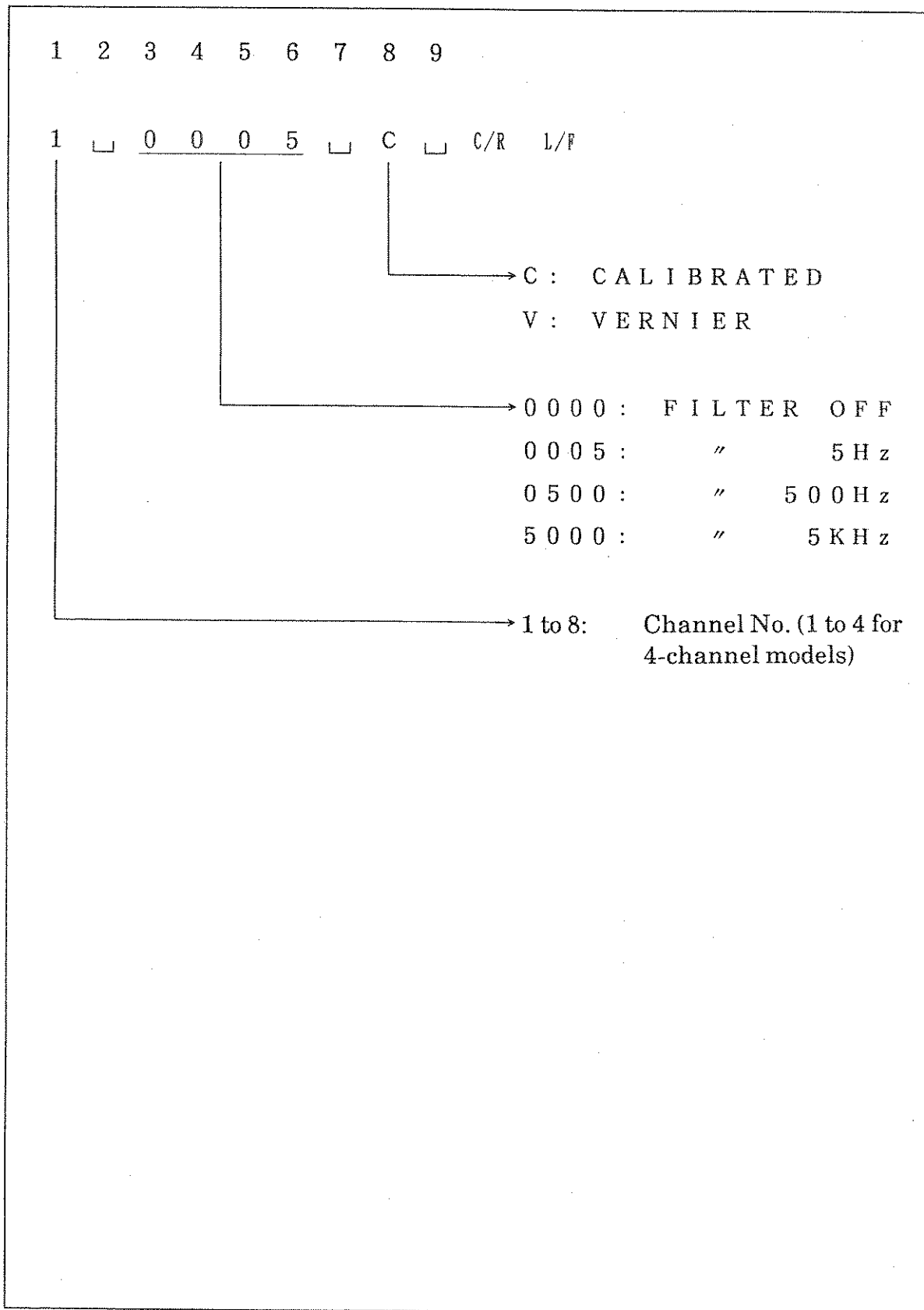
- D_{nH} is the upper byte of data (10_{16} to 00_{16} to $7F_{16}$)
 D_{nL} is the lower byte of data (00_{16} to FF_{16})
- $D_{nH}D_{nL}$ value examples:

1001	+100% or greater (overscale)
1000	+100%
0FFF	
0800	+50%
0000	0%
7FFF	Below 0% (underscale)

Format 2 (Amplifier Setting Conditions 1)



Format 3 (Amplifier Setting Conditions 2)



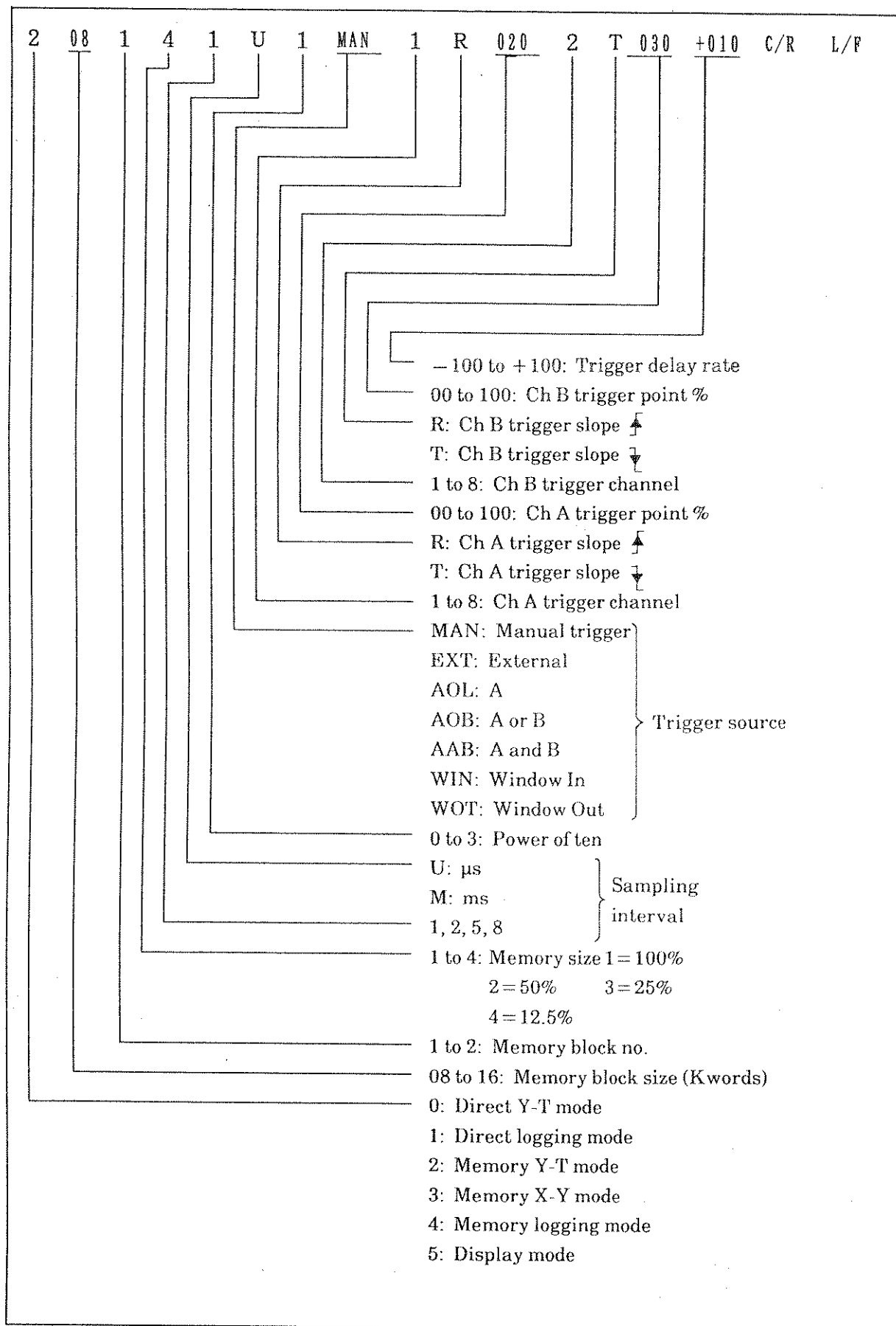
Format 4 (Status Signals)

1 2 3 4 5 6
 □ □ □ □ 3 2 C/R L/F

→ 0 ~ 2 5 5 : Status key decimal value

On bit	Value	Meaning	Name
1	1	0=LOCAL 1=REMOTE	Local/Remote
2	2	0=Direct Y-T	Recording Mode
3	4	2=Direct logging	
4	8	4=Memory Y-T 6=Memory XY 8=Memory logging 10=Display	
5	16	Bit set to on during measurement or during chart paper feed.	Record
6	32	Bit set to on when either of the following conditions occurs.	Error
		<ul style="list-style-type: none"> ● Interface error ● Command error 	
7	64	Set to on for the PAPER END condition.	Paper End
8	128		

Format 5 (Major Menu Setting Conditions)



Format 6 (IF1 Command Response Output)

1			
Y	C/R	L/F	

→ Y: Remote mode enabled
 N: Remote mode disabled

Format 7 (Direct Logging Mode Output Data)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
			0	1	/	0	1		8	9		0	1	:	0	0	:	
			Month			Day			Year			Hour			Minute			
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
0	0					7	3	.	8					7	2	.	4	
Second						c h 1 (%)								c h 2 (%)				
38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
			7	4	.	1					7	6	.	2				
			c h 3 (%)								c h 4 (%)							
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
7	2	.	1					6	3	.	4					7	2	.
c h 5 (%)								c h 6 (%)								c h 7 (%)		
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
0					6	3	.	5										
					c h 8 (%)													
95	96	97	98	99	100	101	102	103	104	105								
											C/R	L/F						

Format 8 (Model Name Data Readout)

1	2	3	4	5	6	7													
W	R	-	7	7	0	0	C/R	L/F											

1/10 ATTENUATOR

4. 1/10 ATTENUATOR

4.1 Specifications

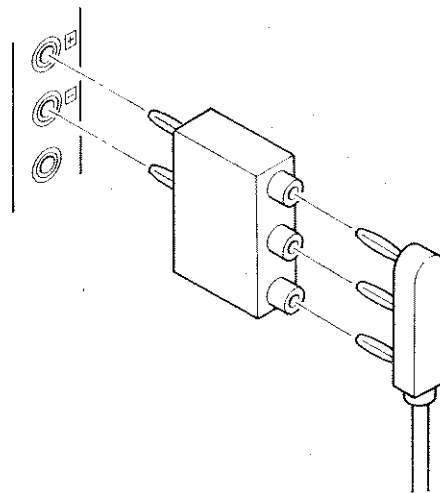
Division ratios	$\times 1$, $\times 1/10$ ($\pm 0.5\%$), switchable
Allowable input voltage	Between + and - pins: 500 V (DC + AC peak) Between - and G pins: 250 V
Input resistance	For $\times 1$: 1 M Ω (when connected to WR7700) For $\times 1/10$: 10 M Ω (when connected to WR7700)
Connected to WR7700	For $\times 1$: 0.1 to 100 V at full scale of WR7700 measurement range For $\times 1/10$: 1 to 100 V at full scale of WR7700 measurement range

4.2 Functions

This is a $\times 1$ and $\times 1/10$ switchable voltage divider. High voltages can be measured by connecting it to the input terminal of the WR7700.

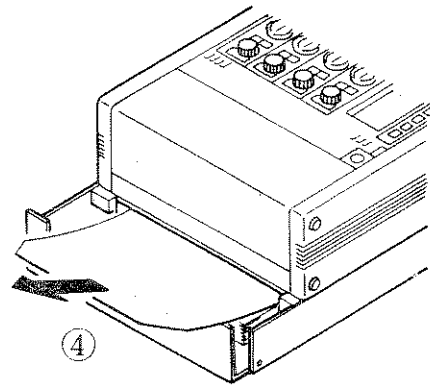
4.3 Connection

Connect between the input signal cable and the WR7700 input terminal as shown in the illustration below.



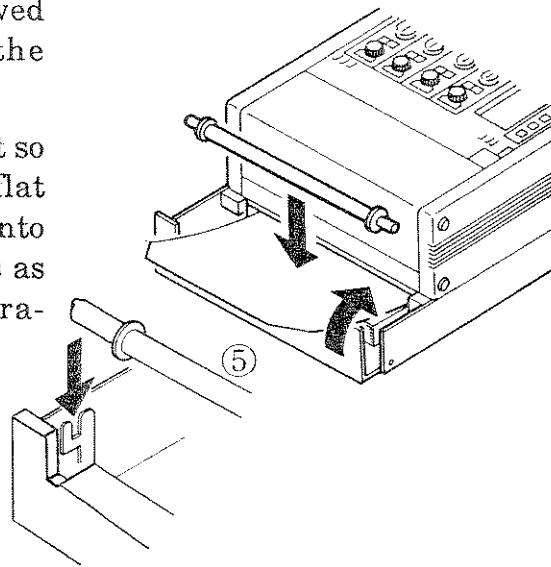
Z-FOLD PAPER UNIT

- ④ Pull out the front edge of the top of the paper in the Z-Fold Paper Unit.

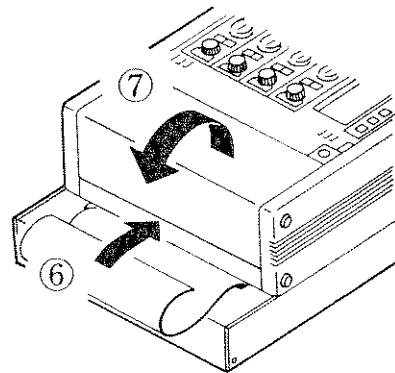


- ⑤ Place the guide shaft removed in step ② above over the paper, and close the door.

- Mount the guide shaft so that the protruding flat parts at both end fit into the U-shaped grooves as shown in the illustration.



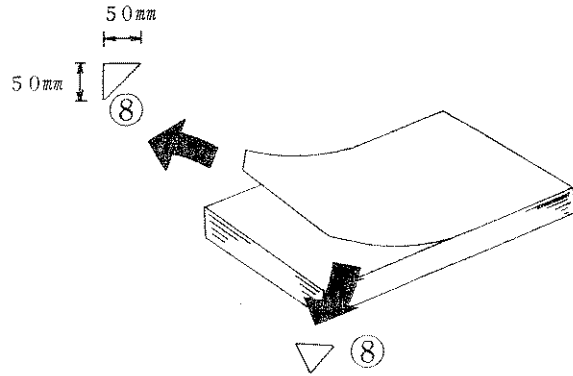
- ⑥ Feed the front edge of the paper into the gap under the recording panel on the main unit.



- ⑦ Open the recording panel.

- ⑧ Cut off the corners of the front end of the recording paper.

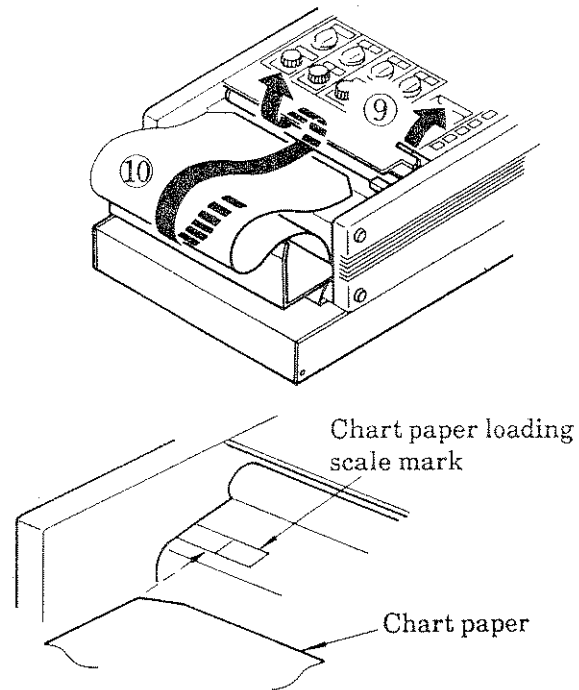
- These cuts do not have to be made on new recording paper.



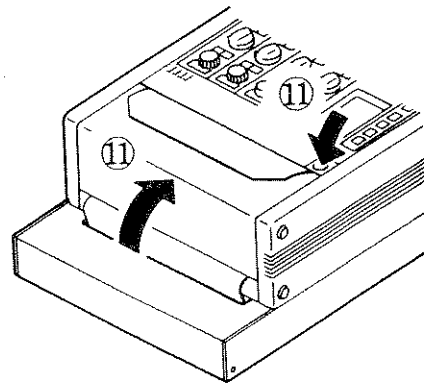
- ⑨ Raise the paper loading lever.

- ⑩ Feed the front end of the recording paper under the recording drum. This can be done easily if a sufficient length of paper is pulled out first before inserting it.

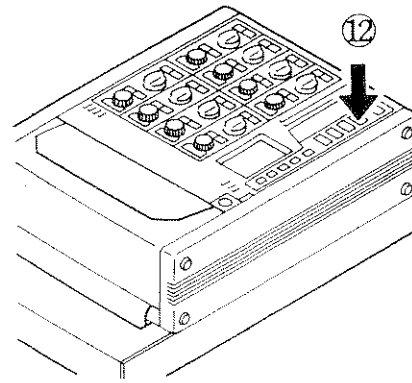
Determine the insertion position of the recording paper by aligning it with the recording paper setting scale.



- ⑪ Release the paper loading lever, and close the recording panel.



- ⑫ Before starting recording, apply power to the main unit and press the FEED switch to feed about 30 cm of paper.



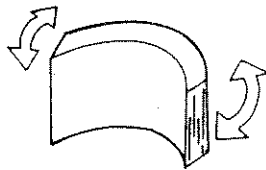
Note

This step is only necessary when recording paper is first mounted, it does not have to be performed when restarting operations with the paper already mounted.

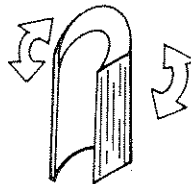
Notes

1. If the recording paper is inserted with the wrong surface facing upwards, recording cannot be performed. If this happens, turn it around, and follow the steps in the above procedure from step ③ to reset the paper.
2. If the main unit is not mounted correctly on the Z-Fold Paper Unit, the recording paper may twist to the right or left or be skewed to one side.
3. Attachment of the paper guide shaft (step ⑤) can be made from either the right or the left side, but it is extremely important that the protruding flat parts at both ends fit into the U-shaped grooves.
4. Use the procedure below to ruffle the recording paper immediately after removing it from its packaging. Repeat this procedure two or three times to make absolutely sure that the edges of the paper do not stick together.

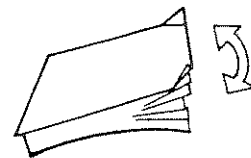
1)



2)



3)



4)

