ADVANTEST®
ADVANTEST CORPORATION

INSTRUCTION MANUAL

D3185

Pulse Pattern Generator

MANUAL NUMBER OED01 9109

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PREFACE

Related models are as follows:

- D3285 ERROR DETECTOR
- TR4515 SYNTHESIZED SWEEPER

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1. GENERAL INFORMATION

1.1 General

The D3185 high-performance pulse pattern generator generates (in combination with the TR4515 synthesized sweeper) nine stages of the pseudo random (PRBS) pattern from 2^7-1 to 2^{23}-1 and ten stages of the programmable pattern up to 2^{16}(65536)-bit length in the ultra-high frequency band from 1 to 10 GHz.

For the PRBS pattern, a variety of marking rates can be set. The data output and clock output generates the high-quality waveforms with rise/fall times up to 30 ps (20 to 80% of the amplitude) or less jitter.

[FEATURES]

The D3185 pulse pattern generator:

- Provides a memory for storing 16 sets of frequency values for quicker setting of the frequency, in combination with TR4515.
- Has amplitude and offset selections knobs for each of the data and clock outputs.
- Allows the user to insert the motor-drive variable delay line into the clock output, which provides a resolution up to ±400 ps and 1 ps.
- Provides a master slave function to coordinate the patterns with the D3285 error detector for determining the code error rate.
- A standardized GPIB provides the function (OP command) of reading set points.

1.2 Before Using the Equipment

1.2.1 Check of Attachment

Upon receipt of this equipment, run checks thereon as shown below.

① Run visual checks against any and all damages or imperffections.

② Check the quantity and rating of standard attachments to assure their conformance with Table 1-1.

Should there be any flaw, or damage, or missing or insufficient part, contact the nearest dealer or the sales and support offices.

Request to User: When ordering add-on attachments and the like, be good enough to stipulate the model (or stock No.) concerned.

Table 1 - 1 Standard Attachments

No.	Product name	Model	Stock No.	Q'ty
1	Power cable	A01402	DCB-DD2428 x 01	1
2	BNC-BNC cable	MI-09	DCB-FF0392	1
3	SMA-SMA cable	DGM224-00700A	DCB-FF1211 x 01	3
4	GPIB cable	408JE-101	DCB-SS1076 x 02	1
5	Double/triple-pole conversion adapter for power plug	A09034	JCD-AL003E x 03	1
6	K adapter	30-672-0000-890	JCF-BJ001E x 02	4
7	Instruction manual	---	JD3185	1
		---	ED3185	

1.2.2 Operating Environment

(1) Avoid using this unit where it may be exposed to a lot of dust, direct sunlight, or corrosive gases.

(2) Operate this unit at an ambient temperature from 0 to 40°C and a humidity of 40 to 85%.

(3) Be careful in handling this unit so as not to give it any severe mechanical shock.

(4) Keep at least 10 cm space between the back of this unit and a wall or other large object because this unit has a discharge-type cooling fan. Do not block the air intake holes on the top and sides of the unit.

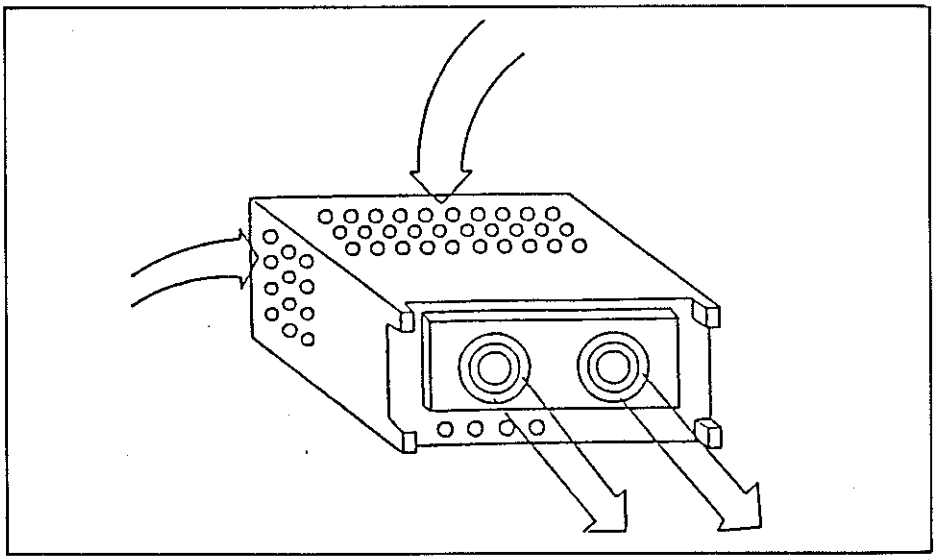


Figure 1 - 1 Ventilation with Cooling Fan

1.2.3 Setting Up the D3185

(1) Supply Voltage

The AC supply voltage for this unit is factory set and its value is displayed near the power cable on the rear panel. This unit must be used within the range of the displayed value and at a frequency of 50 Hz/60 Hz.

(2) Power Cable

The power cable has a three-pin plug whose round pin is to be grounded. Ground this unit before use according to one of the following methods:

① When using a three-pin/two-pin conversion adapter (A09034) attached to the power plug, use the green ground wire out of the conversion adapter to ground this unit.

② When using the power plug without the conversion adapter, simply insert the three pin plug in a three pin receptacle.

③ If it is not possible to ground this unit using the power plug, use the ground terminal on the rear panel of this unit.

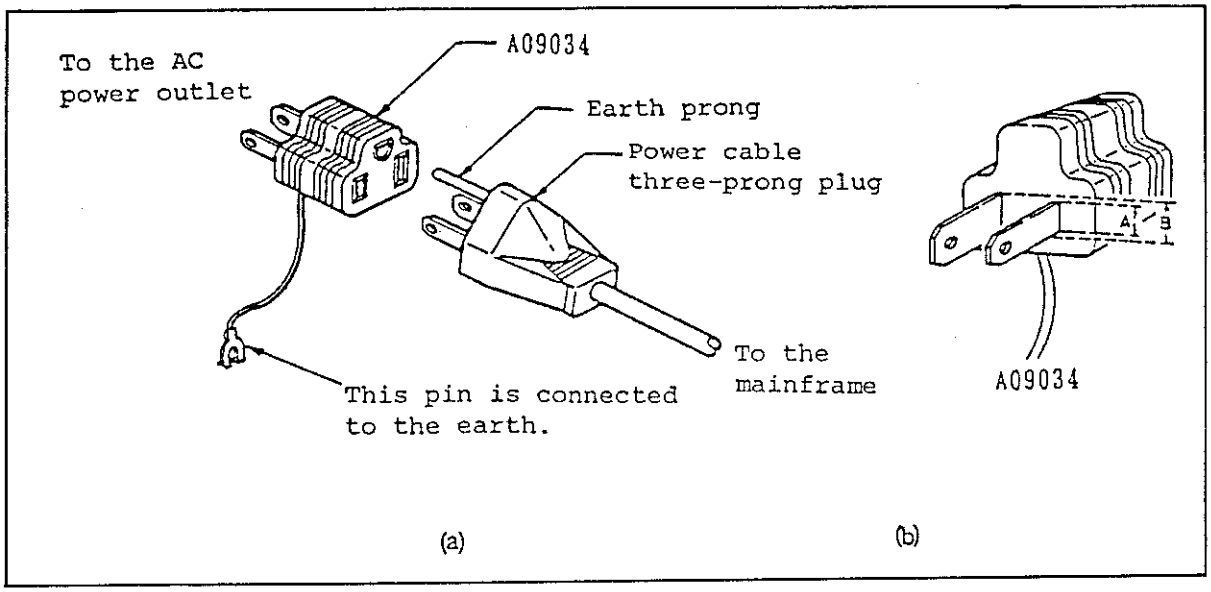


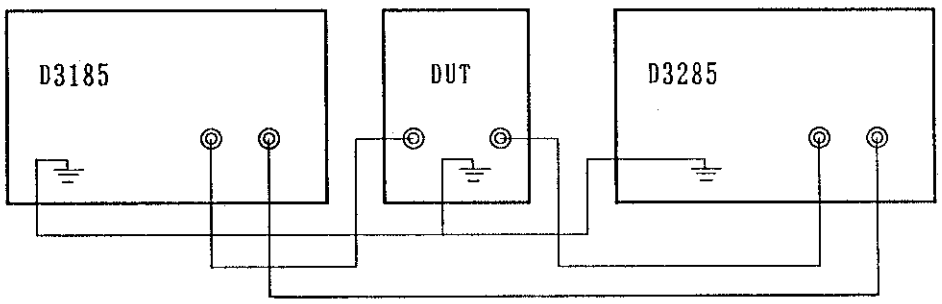
Figure 1 - 2 Power Cable Plug and Adapter

1.2.4 Notes on use

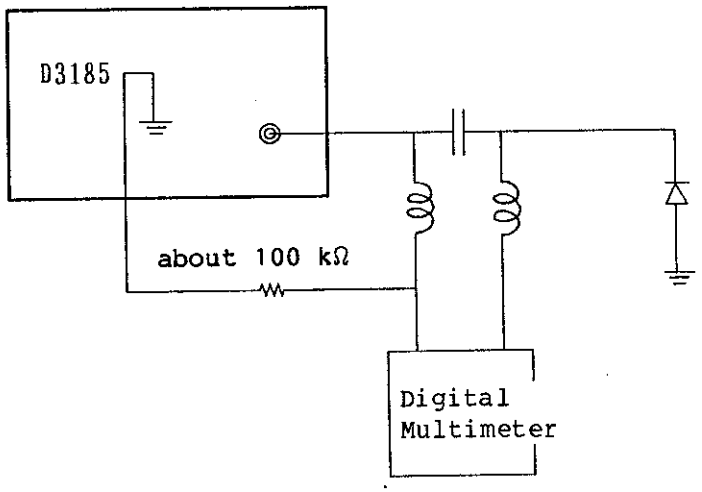
(1) Connect the 50 Ω resistor terminated by earth potential or -2 V as a load for output.

(2) Never input the apply voltage or current into the output.

(3) Since the part for high frequency is the internal circuit connected to the input/output terminal of this device, the static electricity is very weak and is sometimes damaged.



Before connecting the input and output, be sure to connect the GND between the testing device and the device under test.



When floating equipment is connected, be sure to connect the resistor (about 100 kΩ) and the input/output terminal.

1.2.5 NOTES ON STORING, TRANSPORTING, AND CLEANING THE D3185

(1) Notes on Storage

When the D3185 is not used for a long period of time, the unit should be stored in a corrugated cardboard box in a place not exposed to direct sunlight which has low humidity.

This unit must be stored at an ambient temperature and humidity within the ranges from -20 to +60°C and 30 to 85% respectively.

(2) Notes on Transportation

When transporting this unit, use its original packaging. If the packaging has been lost, observe the following instructions:

① Cover the unit with vinyl. (Put a desiccating agent under the vinyl cover to prevent the affects of moisture.)

② Put this unit in a corrugated cardboard box. Then put a cushioning material, 40 mm or more thick, between the unit and the inner wall of the box so as to cover the unit with the cushion.

③ Put the accessories of this unit in the box, add a cushioning material and close the box. Lastly tie up the box with packing rope.

(3) Notes on Cleaning

When cleaning this unit, give attention to the following:

CAUTION

Do not use solvents harmful to plastic or other resins (e.g., organic solvents such as benzene, toluene, and acetone) during maintenance and cleaning.

2. DESCRIPTION OF PANEL

This chapter describes the front and rear panels.

2.1 Front Panel

The front panel consists of the three blocks as shown in Figure 2-1.

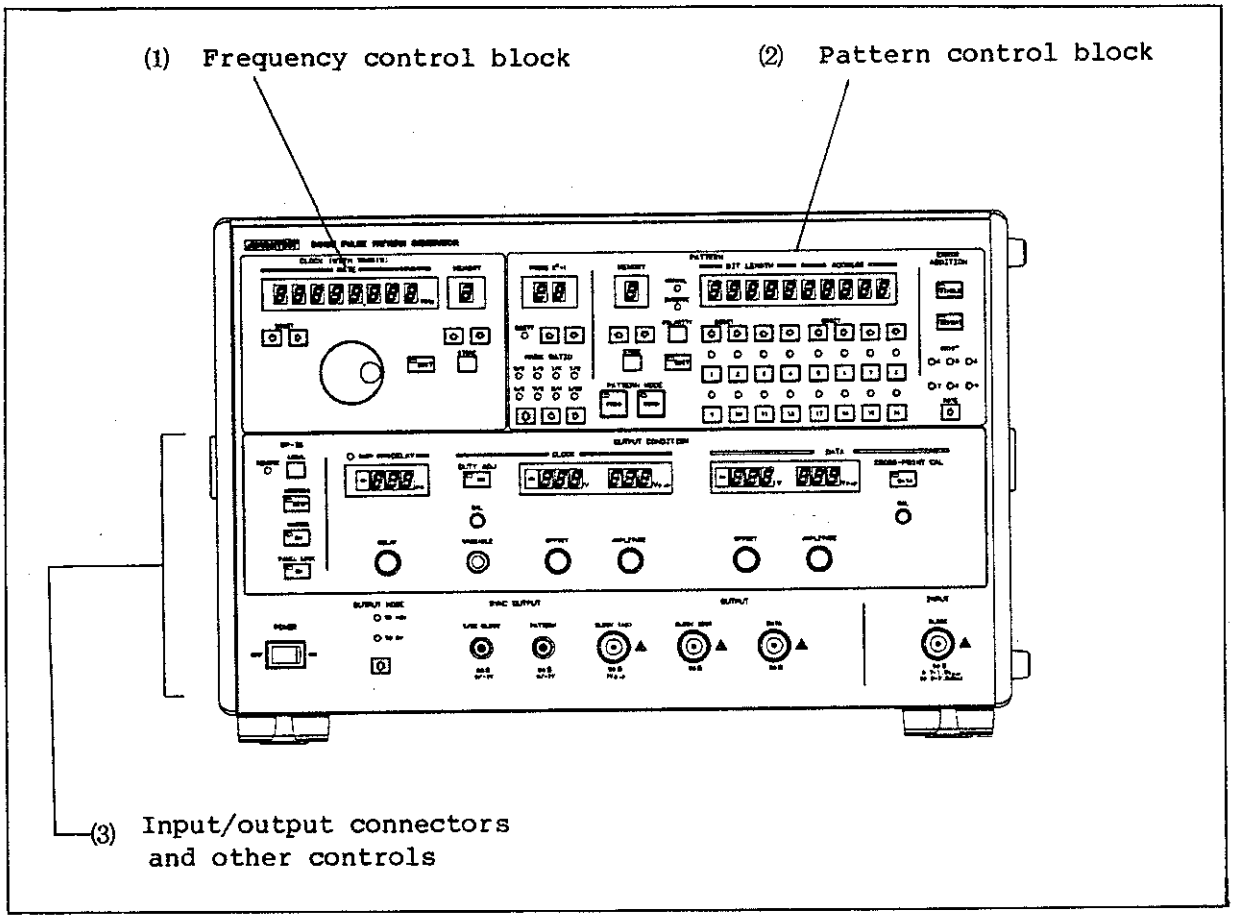


Figure 2 - 1 Front Panel

(1) Frequency Control Block (in combination with TR4515)

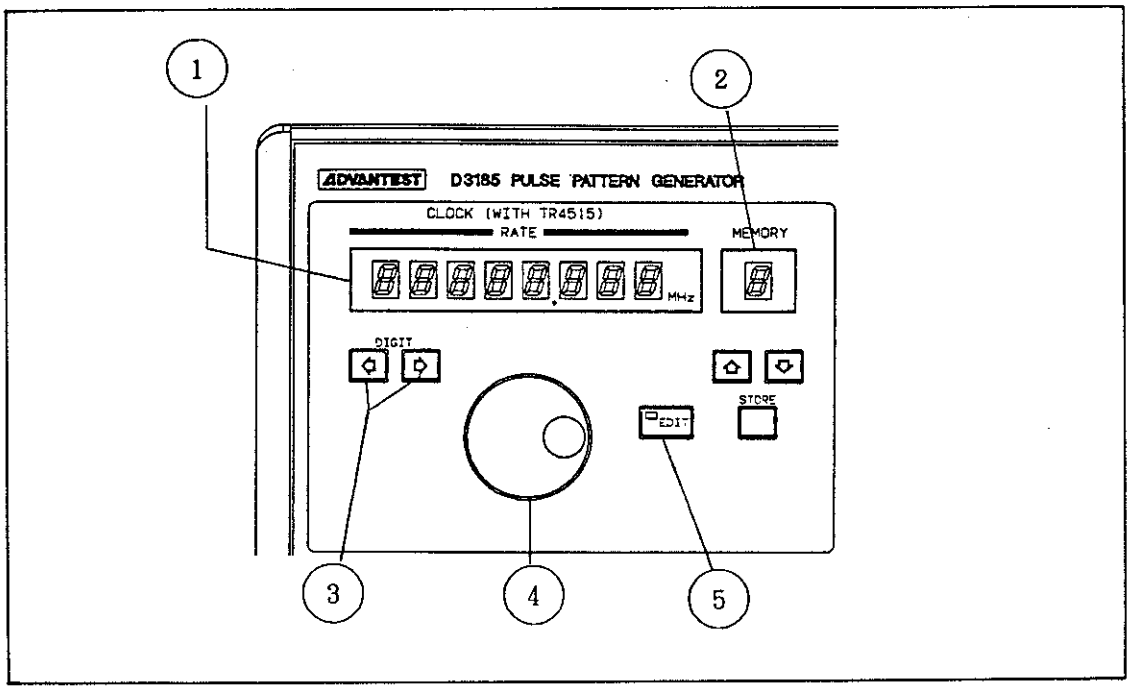


Figure 2 - 2 Frequency Control Block

① Frequency indicator (RATE)

Indicates the value of the currently set clock frequency in MHz. The value is shown in eight digits with a decimal point fixed on the fourth digit. The resolution is 1 kHz. The displayed frequency range is from 1000 MHz to 10000 MHz.

② Memory operating section (for frequency value storage)

Stores up to sixteen frequency values set by the frequency setting knob. The MEMORY indicator displays an alphanumeric character from 0 to F which is handled as the file number of a particular frequency value stored in memory.

③ DIGIT key

Selects the digit in a frequency value to be set by the knob.
These keys can work only while the EDIT key is on. A selected digit tobe set is accompanied by a left-superscript pointer turned on.

④ Frequency setting knob

When this knob is turned counterclockwise and clockwise it increments and decrements the digit which has a lighting pointer on the frequency indicator.

⑤ EDIT key

Used to change the current frequency value in real time or to update stored values using the knob.

(2) PATTERN Control Block

⑥ PRBS stage count selector section

Selects one of nine types of PRBS pattern stages: 7, 9, 10, 11, 15, -15, 17, 20, and 23.

⑦ Memory operating section (for word pattern storage)

Stores up to ten word patterns which have been created.

⑧ Pattern polarity selector section

Determines the logic of a data pattern to be output from the DATA OUTPUT connector.

⑨ DIGIT key

Selects the digit to be set for a bit length.

⑩ BIT LENGTH indicator

Displays the bit length of a pattern which is being created when the EDIT key is on. The indicator displays the bit length of a stored pattern when the EDIT key is off. This indicator is cleared while the PRBS key is on.

⑪ Bit length setting key

Sets the digit with a lighting pointer on the BIT LENGTH indicator.

⑫ DIGIT key

Selects the digit to be set for an address number.

⑬ ADDRESS number indicator

Displays the address number of the 16-bit pattern which is being monitored with a pattern indicator.

⑭ Address number setting key

Used to set address numbers.

⑮ CCITT LED

Lights up when a PRBS pattern which conforms to the standard specification is selected with the PRBS stage count selector section and the mark ratio selecting section.

⑯ MARK RATIO selecting section

Selects any one of eight types of mark ratios.

⑰ PRBS key

Changes the output pattern setting to the pseudo-random mode.

⑱ WORD key

Changes the output pattern setting to the word mode.

⑲ EDIT key

Turn off this key to use a stored pattern. Turn on this key to change the contents of stored patterns or output patterns created in real time.

⑳ Pattern indicators and pattern setting keys

Pattern setting keys from [1] to [16] are available only when the EDIT key is on.
When the PRBS key is on, the outputs of CLOCK DC and DATA can be changed to the AC mode with the [14] and [16] keys.

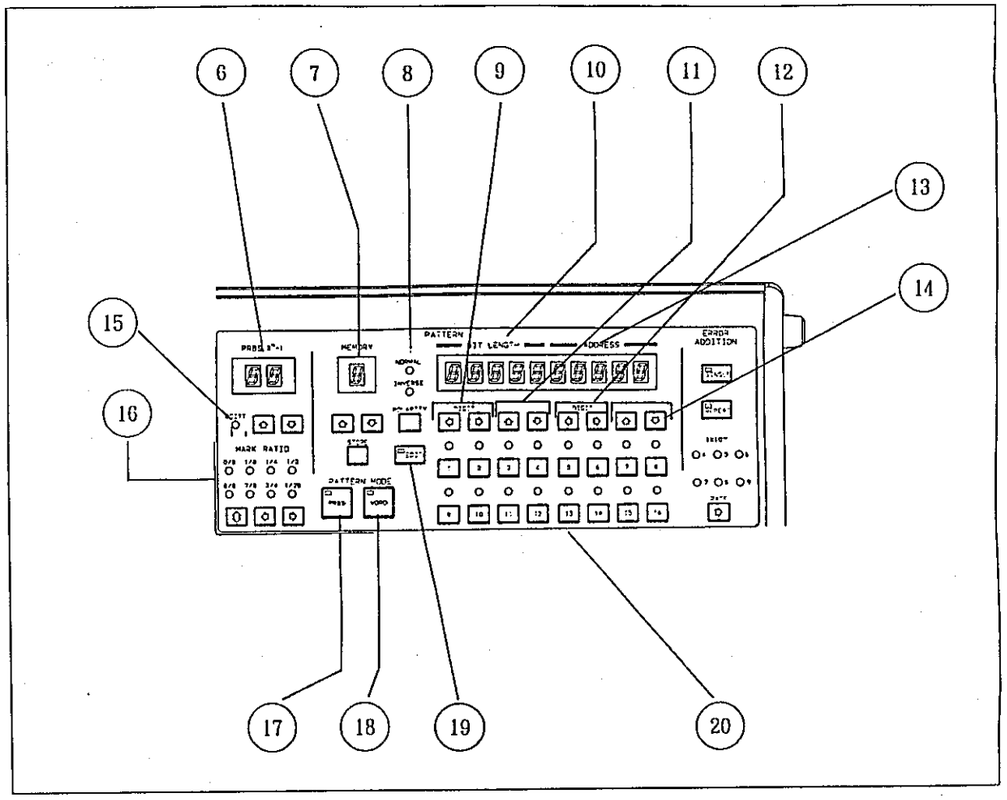


Figure 2 - 3 Pattern Control Block

(3) Input/Output Connectors and Other Controls

㉑ POWER switch

Turns on or off the power supply of this unit.

㉒ CLOCK INPUT connector

Inputs external clock signals.

㉓ 1/32 CLOCK OUTPUT connector

Outputs 1/32 divided signals from the clock in use.

㉔ PATTERN SYNC OUTPUT connector

Outputs signals synchronized with the patterns output from the DATA OUTPUT connector.

㉕ CLOCK OUTPUT (AC) connector

Outputs the clock in use after AC coupling.

㉖ CLOCK OUTPUT (DC) connector

Outputs the clock in use after DC coupling.

㉗ DATA OUTPUT connector

Outputs the set pattern in NRZ (non-return to zero).

㉘ Output level selecting section

Selects the output level of the DATA output and the CLOCK DC output.

㉙ DATA output AMPLITUDE setting section

Includes the indicator and the control knob for the DATA output amplitude.

㉚ DATA output OFFSET setting section

Includes the indicator and the control knob for the offset value of the DATA output.

㉛ CLOCK DC output AMPLITUDE setting section

Equivalent to ㉙ .

㉜ CLOCK DC output OFFSET setting section

Equivalent to ㉚ .

㉝ DUTY factor adjuster

Sets the duty factor of the CLOCK DC output.

㉞ DELAY setting section

Sets the time difference between the DATA output and the CLOCK output (for both AC and DC).

㉟ ERROR ADDITION setting section

Sets addition of 1×10^{-4} to 1×10^{-9} and SINGLE error.

㊱ GPIB setting section

Includes the REMOTE LED which is on with the GPIB in the remote state and the LOCAL key which returns the GPIB to the local state.

㊲ ADDRESS display key

Allows the ⑬ ADDRESS number indicator to display the address of the GPIB.

㊳ MASTER CONTROL key

Interlocks the setting of the pattern control block of the D3285 (error detector) with that of this unit (the D3185).

㊴ PANEL LOCK key

Invalidates all the settings and set numerals.

㊵ Cross Point calibrating section

Calibrates the cross point of the DATA output.

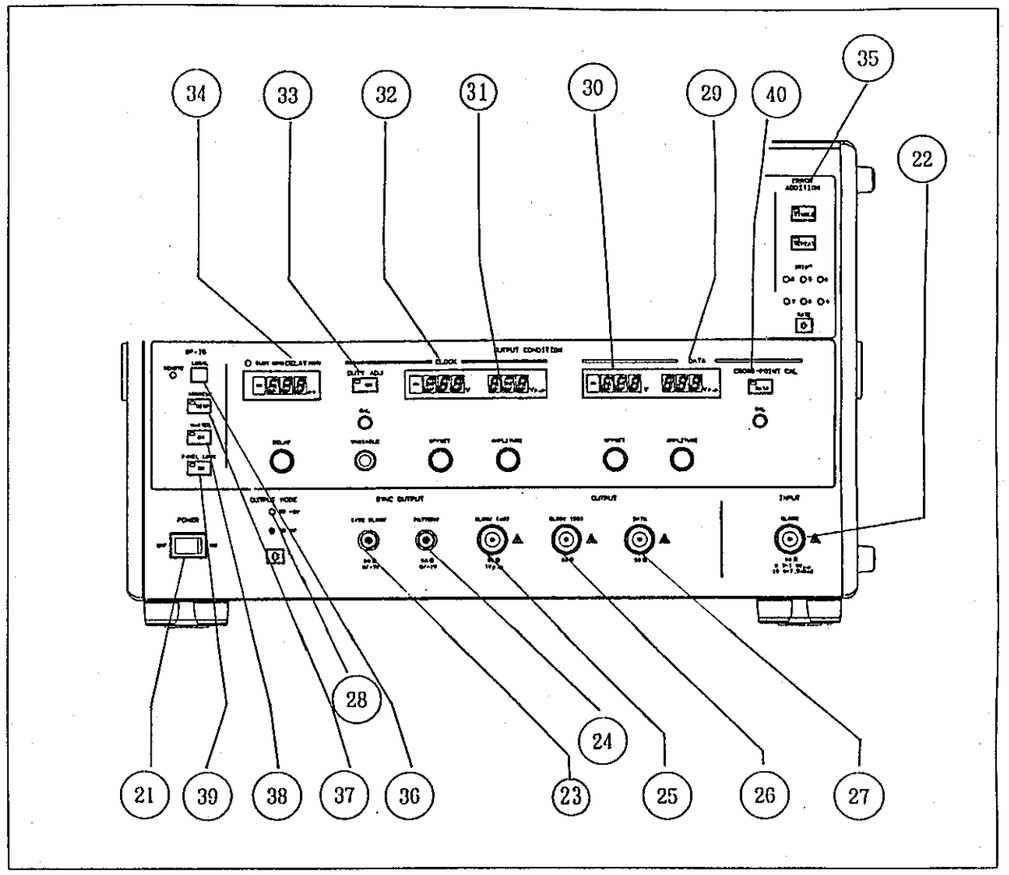


Figure 2 - 4 I/O Connectors and Other Controls

2.2 Rear Panel

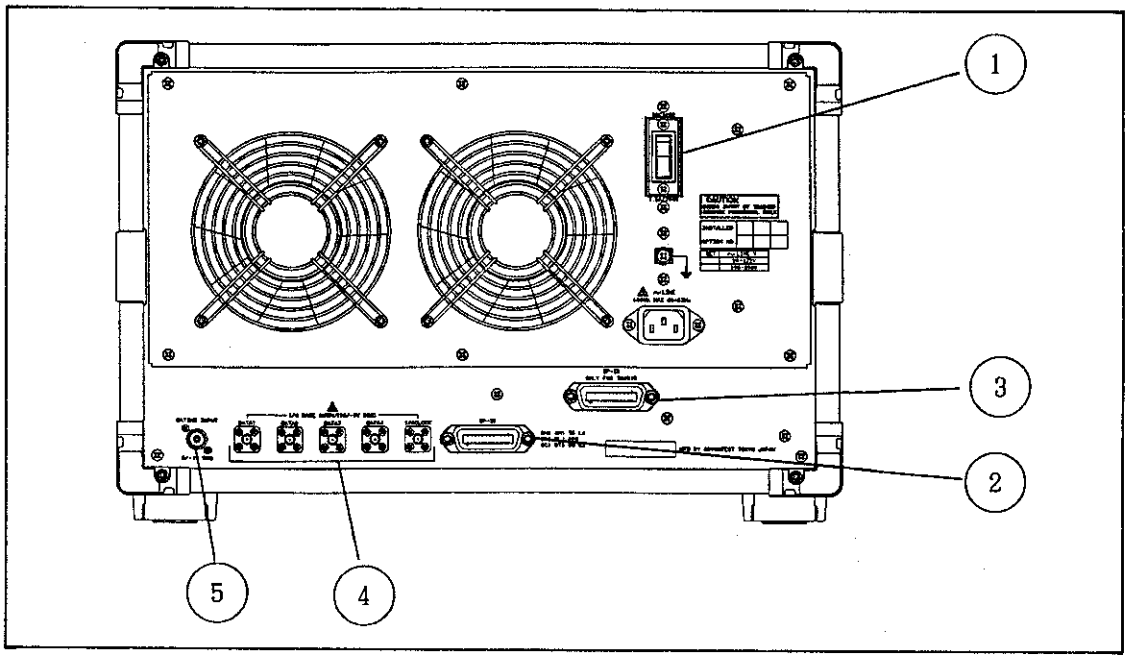


Figure 2 - 5 Rear Panel

① BREAKER

Turns off the power when an overcurrent flows through the AC line.

② GPIB connector

Used for GPIB control or master/ slave control.

③ GPIB connector for TR4515

Transmits the clock frequency set for TR4515 by D3185.

④ 1/4 RATE OUTPUT

1/4 RATE OUTPUT of the DATA output and the CLOCK output. Ground the unit with 50 ohms. The phase of each output is as follows at left side. (Figure 2-6)

⑤ GATING INPUT

Inhibits DATA output as follows at right side. The input impedance is about 50 ohm. (Figure 2-7)

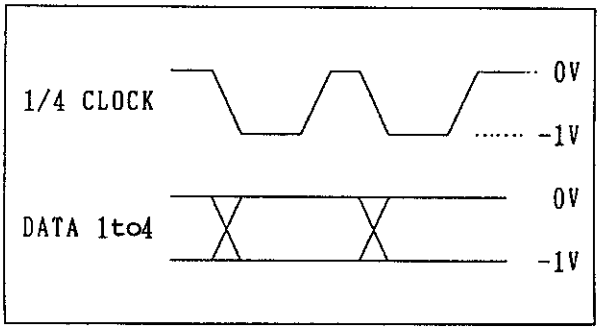


Figure 2 - 6 1/4 Rate Output

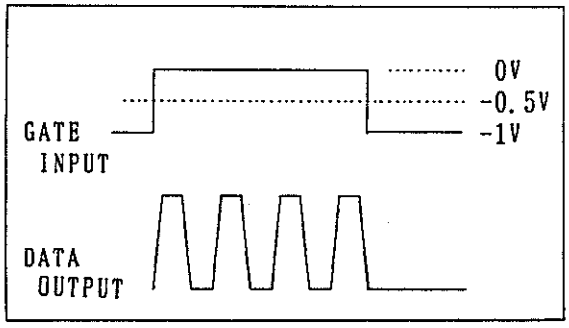


Figure 2 - 7 Gating Input

MEMO

3. OPERATION METHOD

3.1 Turning on the Power

First check that the POWER switch on the front panel is off and the breaker on the rear panel is on (with the · side pressed). Then connect the power plug to the power receptacle. Avoid turning on and off the breaker frequently as a substitute for the POWER switch.

Lastly turn on the POWER switch to connect power to the D3185.

3.2 Operation of Each Part

This section describes the operation method of each part of the front panel. See Figures 2-1, 2-2, 2-3, and 2-4 when required.

(1) Frequency Control Block

The components are explained in the order of the numbering in Figure 2-2 as follows:

① Frequency Indicator (RATE)

This indicator displays the frequency value of the TR4515 as it is currently set.
(Note that D3185 nust be connected to TR4515 with the GPIB cable.)
The value in MHz units is shown in eight digits with a decimal point fixed on the fourth digit. The resolution is 1 kHz and the displayable frequency range is from 1000 MHz to 10000 MHz.

This indicator may display the frequency value which is currently set on the knob in real time or it may display a stored frequency value.

② Memory Operating Section (For Frequency Value Storage)

This section allows the storing of up to sixteen frequency values which are set with the frequency setting knob.
The MEMORY indicator displays an alphanumeric character from 0 to F which is handled as the file number (memory number) of a particular frequency value stored in memory. Keys [⟨⟩] and [⟨⟩] cause the memory number, which is displayed on the MEMORY indicator, to increase and decrease respectively.

To set a higher memory number, press the key [⟨⟩] once. Holding down the key increments the memory number in succession. To set a lower memory number, press the [⟨⟩] key once.

Press the [⟨⟩] key or the [⟨⟩] key when the EDIT key (⑤ described later) is off, the frequency indicator (① above) displays the stored frequency value corresponding to the displayed memory number.

To store a new frequency value, press the STORE key after checking that the EDIT key is turned on. Then the frequency value being displayed on the frequency indicator is stored in memory with the memory number which is being displayed on the MEMORY indicator.

③ DIGIT Key

The DIGIT keys are used to select the digit of a frequency value to be set by the knob.

These keys work only while the EDIT key is on.

A selected digit to be set is accompanied by a left-superscript pointer on.
To move the pointer to the left by one digit, press the ⊡ key once.
To move it to the right by one digit, press the ⊡ key once.

④ Frequency Setting Knob

Turn this knob counterclockwise to increase the digit with the lighting pointer on the frequency indicator. At this time, a carry digit is transferred to the higher-order digit position. Turn this knob clockwise to decrease the numeral. Then a borrow digit is transferred to the higher-order digit.

This knob is of the constant-speed response type and has a limit in the speed at which a frequency value can be set or changed.

To set or change a frequency value, move the pointer to the higher digit position.

⑤ EDIT Key

Turn on this key to change the current frequency value in real time or update stored values using the knob (④). This key must be off when a stored value is used.

(2) PATTERN Control Block

The components are explained in the order of the numbering in Figure 2-3 as follows:

⑥ PRBS Stage Count Selector Section

The PRBS stage count is indicated with a two-digit and 7-segment LED display. The nine stages of PRBS are: 7, 9, 10, 11, 15, -15, 17, 20, and 23. Stage -15 is differ from 15 in the generating polynomial (Refer to Table 3-1).
The ⊡ key increments the stage count, while the ⊡ key decrements it.

⑦ Memory Operating Section (For Word Pattern Storage)

This section is used to store up to ten word patterns which have been created. The MEMORY indicator displays numeric characters from 0 to 9 and alphabetic characters A and b. 0 to 9 can be both called and stored. The A and b are to be called only. The A stores 1023-bit length of the 10B1C-rule patterns. The b stores the all-zero pattern.

Press keys ⊡ and ⊡ to increment and decrement respectively the number which is displayed on the MEMORY indicator.

To increment or decrement the currently displayed number by one, press the corresponding key once. Holding down the key increments or decrements the number in succession.

Press the [⟨⟩] key or the [⟨⟩] key when the EDIT key (⑲) is off, the stored patterns are output according to the displayed memory numbers.

To store a new pattern, press the STORE key after checking that the EDIT key is on. Then the pattern being created is stored in memory with the memory number currently displayed on the MEMORY indicator.

⑧ Pattern Polarity Selector Section

This section is used to determine the logic of a data pattern to be output from the DATA OUTPUT connector (㉗). To select either of them, press the POLARITY key.

The NORMAL and INVERSE LEDs display the reverse of each other in their respective indicating logic.

The stored pattern is output in its original form when NORMAL polarity is selected. When INVERSE polarity is selected, on the other hand, the inverted pattern is output. Note that the contents of the pattern is monitored with the corresponding pattern indicator (⑳) at that time.

⑨ DIGIT Key

The DIGIT keys are used to select the digit to be set when setting a bit length.
The digit to be set is identified by its superscript pointer.
Pressing keys [⟩] and [⟨] cause the pointer to move to the right digits and left digits, respectively.

⑩ BIT LENGTH Indicator

This indicator displays the bit length of a pattern being created. Press the [⟨⟩] key or the [⟨⟩] key when the EDIT key is on. The indicator displays the bit length of a stored pattern when the key is off.
This indicator is cleared while the PRBS key (⑰) is on.

The bit length is expressed in up to five digits. Bits 1 through 1024 are counted sequentially while bits 1024 through 65536 are counted in 64 bit steps.

⑪ Bit Length Setting Key

The bit length setting keys are used to set the digit with a lighting pointer on the BIT LENGTH indicator (⑩).
When the [⟨⟩] key is pressed, the numeral is incremented and a carry digit is transferred to the higher-order digit position. When the [⟨⟩] key is pressed, the numeral is decremented and a borrow digit is transferred to the higher-order digit position.

⑫ DIGIT Key

The DIGIT keys are used to select the digit to be set when setting an address number.
The digit to be set is identified with its superscript pointer.
Pressing keys ▷ and ◁ cause the pointer to move to the right digits and left digits, respectively.

⑬ ADDRESS Number Indicator

This indicator displays the address number of the 16-bit pattern which is being monitored with the pattern indicator (⑳). The address number indicator functions even with the PRBS key (⑰) on, allowing the contents of the PRBS pattern to be checked.

⑭ Address Number Setting Key

The address number setting keys are used to set address numbers.
Pressing keys ∧ and ∨ cause the digit with a superscript pointer displayed in the address number indicator to be incremented and decremented, respectively. In each case, a carry or borrow digit is transferred to the higher digit position.

The setting range is step 1 from 0 to 4095. Note that this range does not apply to the case when the PRBS pattern is being monitored, and up to 524287 can be set.

⑮ CCITT LED

This LED is on when the PRBS pattern selected with ⑥ and ⑯ conforms to the standard specification.
The LED goes on for each of the 7, 9, 11, 15, 20, and 23 stages.
(Note that the LED goes on for each of the 15 and 23 stages with a mark ratio of 1/2B.)
Table 3-1 shows the on/off state of the CCITT LED with the generating polynomial for each PRBS pattern stage.

⑯ MARK RATIO Selecting Section

This section is used to select any one of eight types of mark ratios: 0/8, 1/8, 1/4, 1/2, 8/8, 7/8, 3/4, and 1/2B.
The ↕ key selects one of vertically paired LEDs in turn when the key is pressed. The ▷ key selects one of the horizontally arranged LEDs in a clockwise direction. The ◁ key selects it in a counterclockwise direction.

⑰ PRBS Key

This key is used to change the output pattern setting to the pseudo-random mode.

⑱ WORD Key

This key is used to change the output pattern setting to the word mode.

⑲ EDIT Key

Turn off this key to use the stored pattern.
Turn on this key to change the contents of stored patterns or output created patterns in real time.

⑳ Pattern Indicators and Pattern Setting Keys

Pattern setting keys from [1] to [16] are available only when the EDIT key is on.
The set pattern is monitored using the LED (pattern indicator) above the corresponding key. The lighting pattern indicator LED represents logic 1 (high level).

When the bit length is 17 or more, set the pattern after updating the address number.

When a stored pattern or a PRBS pattern is used, the contents of the pattern used is monitored with the corresponding LED.

When the [14] and [16] keys are controlled in the PRBS pattern, the outputs of CLOCK DC and DATA can be changed to the AC mode.
They are terminated at 50 ohms through the capacitor (about 1 μF) in the AC mode.

(3) Input/Output Connectors and Other Controls

The components are explained in the order of the numbering in Figure 2-4 as follows:

㉑ POWER Switch

This switch turns on and off the power supply of this unit.
If power isn't available to the unit when this switch is on, check if the breaker on the rear panel is off.

㉒ CLOCK INPUT Connector

This connector inputs external clock signals to this unit.
The input impedance is approx. 50 ohm (when connected directly to the GND). Enter the sine wave of 0.7 to 1.5 Vp-p amplitude.

㉓ 1/32 CLOCK OUTPUT Connector

This connector outputs 1/32 divided signals from the clock being used.
This connector is used when measuring PRBS eye patterns with a sampling oscilloscope.
The output impedance is 50 ohm with the level of 0 V/-1 V.

㉔ PATTERN SYNC OUTPUT Connector

This connector outputs the signal synchronized with the pattern output from the DATA OUTPUT connector (㉗).
The signal changes its phase by 16 bits whenever the address number displayed on the address number indicator (⑬) changes.

㉕ CLOCK OUTPUT (AC) Connector

This connector is the AC-coupled output of the clock in use.
The output has an impedance of about 50 ohm and an amplitude of 1 Vp-p ±30%, showing a sinusoidal waveform. The duty factor is fixed.

㉖ CLOCK OUTPUT (DC) Connector

This connector is the DC-coupled output of the clock in use.
The offset, amplitude and the duty factor can be varied by using their respective setting sections ㉜ , ㉛ , and ㉝ . The output impedance is about 50 ohm.

㉗ DATA OUTPUT Connector

This connector outputs the set pattern in NRZ.
The offset, amplitude are variable by using ㉚ and ㉙ , respectively. The output impedance is about 50 ohm.

The change point of the data almost matches the last transition point of the CLOCK (DC) of ㉖ .

㉘ Output Mode Selecting Section

This section is used to select the output level of the DATA output of ㉗ and the CLOCK DC output of ㉖ .
When the ECL TO -2 V is selected, 50 ohm termination to -2 V results in the waveform of the ECL level (high level of about -0.8 V to low level of about -1.6 V).
In the case, the offset and the amlplitude can be variable at ±200 mV.

When VARIABLE is selected, a 50 ohm termination to the GND results in the output variable in its offset and amplitude.
To select the output level, use the ⇳ key.

㉙ DATA Output AMPLITUDE Setting Section

This section contains the indicator and the control knob for the DATA output amplitude.
Turning the control knob clockwise and counterclockwise causes the amplitude value to decrease and increase, respectively.
The setting range is from 0.5 to 2 Vp-p (when ECL mode is 0.6 to 1 Vp-p) and the resolution is 10 mV.

(30) DATA Output OFFSET Setting Section

This section contains the indicator and the control knob for the offset value of the DATA output.
Turning the control knob clockwise and counterclockwise causes the offset value to decrease and increase, respectively.
The setting range is from -2.00 to +2.00 V (when ECL mode is -1.00 V to -0.60 V) and the resolution is 10 mV.
The offset is applied based on the high level of the output waveform.

(31) CLOCK DC Output AMPLITUDE Setting Section

Equivalent to (29) .

(32) CLOCK DC Output OFFSET Setting Section

Equivalent to (30) .

(33) DUTY Factor Adjuster

This adjuster is used to set the duty factor of the CLOCK DC output. The control knob can change the duty factor when the DUTY ADJ key is on. Once the duty factor is set to 50% with the CAL knob, the VARIABLE knob can modulates the variable by ±5% or more.
When the DUTY ADJ key is off, the duty factor is fixed to about 50%.

(34) DELAY Setting Section

This section contains the knob to set the time difference between the DATA output and the CLOCK output (for both AC and DC). The D3185 uses the motor-driven delay line of the trombone type to provide the time difference. The setting range is from -400 ps to +400 ps (for the time difference of CLOCK output from DATA output) with a resolution 1 ps. The motor starts driving about 0.2 seconds after turning the knob. The BUSY LED is on while the motor is on.

When the variation in the absolute value exceeds the tolerance, the unit enters the self-calibration routine and displays the word "CAL". This routine is terminated within 12 seconds. During the execution of this routine, any key setting on the panel is rejected.

(35) ERROR ADDITION Setting Section

This section is used to set addition of 1×10^{-4} to 1×10^{-9} and a SINGLE error.
When the REPEAT key is ON, errors occur at the set error rate. When pressing the SINGLE key, the REPEAT key becomes OFF and an error occurs. After then, whenever pressing the SINGLE key, an error occurs.

If this key is pressed again when the REPEAT key is set to ON, the REPEAT key is set to OFF and occurrence of the error stops.

㊱ GPIB Setting Section

When the GPIB is in the remote state, the REMOTE LED is on.
To release the GPIB from the remote state, press the LOCAL key.

㊲ ADDRESS Display Key

This key is used to display the address of the GPIB on the ADDRESS number indicator of ⑬. The setting range is from 0 to 30.

㊳ MASTER CONTROL Key

This key interlocks the setting of the pattern control block of the error detector (D3285) with that of this unit (the D3185).

Note: In this case, do not connect a device other than the D3285 to the GPIB connector.

㊴ PANEL LOCK Key

This key invalidates all the key settings and numerical settings. Note that this does not apply to settings with the POWER switch, LOCAL key, DUTY ADJ knob, the CROSS-POINT CAL knob and this PANEL LOCK key.

㊵ CROSS POINT Calibrating Section

If the DATA key is on, the CROSS POINT knob can set the cross point to 50%.

Table 3 - 1 PRBS Pattern Generating Polynomials

$2^N - 1$	Generating polynomial	Governing specification	Applicable mark ratio	CCITT LED	
N = 7	$X^7 + X^6 + 1$	CCITT V.29	1/2	On	
9	$X^9 + X^5 + 1$	CCITT V.52	1/2	On	
10	$X^{10} + X^7 + 1$			Off	
11	$X^{11} + X^9 + 1$	CCITT O.152	1/2	On	
15	$X^{15} + X^{14} + 1$	CCITT O.151	1/2B	On	*
15	$X^{15} + X^1 + 1$			Off	*
17	$X^{17} + X^{14} + 1$			Off	
20	$X^{20} + X^3 + 1$	CCITT V.57	1/2	On	
23	$X^{23} + X^{18} + 1$	CCITT O.151 1	1/2B	On	

*: For $2^{15}-1$, if the generating polynomial of $X^{15} + X^1 + 1$ is selected, the PRBS stage count selector section is "-15" as described in item ⑥.

4. SYSTEM OPERATION

This chapter explains how to execute the error tests by connecting D3285, unit which has undergone test (UUT) or device which has undergone test (DUT) to the pulse pattern generator.

4.1 D3185 Setting

4.1.1 Setting the Clock Source and the Frequency

The D3185 requires an external clock source. Feed external clock of sinusoidal wave with amplitude of 0.7 to 1.5 V_{p-p} to the Input Clock connector.

In case the TR4515 (when connected to the dedicated GPIB bus) is used as the clock source, you can set the frequency with the frequency setting dial on the D3185 panel or with the frequency memory operation.

CAUTION

When the clock frequency value has been modified in a wide range, do not forget to switch the pattern mode WORD and PRBS. Unless this operation is done, correct pattern may not be obtained in the data output.

4.1.2 Setting the Data Output

Set the data output level in accordance with the UUT or DUT input conditions.

(1) If the UUT or DUT data input terminator voltage is 0V (See Fig. 4-1.)

Specify the output level by pressing the LEVEL key so that the VARIABLE TO 0V lamp on the front panel will light. Since the data output offset (high level) and the amplitude are variable in this case, specify the offset and amplitude values with the data OFFSET and AMPLITUDE knobs, respectively. As the CLOCK (DC) output terminal condition is also 0V, the offset and the amplitude are also variable.

(2) If the UUT or DUT data input terminator voltage is -2V and at ECL level (See Fig. 4-2.)

Specify the output level by pressing the LEVEL keky so that the ECL TO -2V lamp on the front panel will light. In this case, the data output offset (high level) is set to about -0.8V and the amplitude is set to about $0.8V_{p-p}$ (variable). The CLOCK (DC) output terminal condition is also -2V, the offset is set to about -0.8V and the amplitude about $0.8V_{p-p}$ (variable).

(3) If the UUT or DUT data input is connected to AC (See Fig. 4-3.)

In this case, set the DATA output to AC mode. The output level and the offset values have no relations, and only the amplitude can be specified.

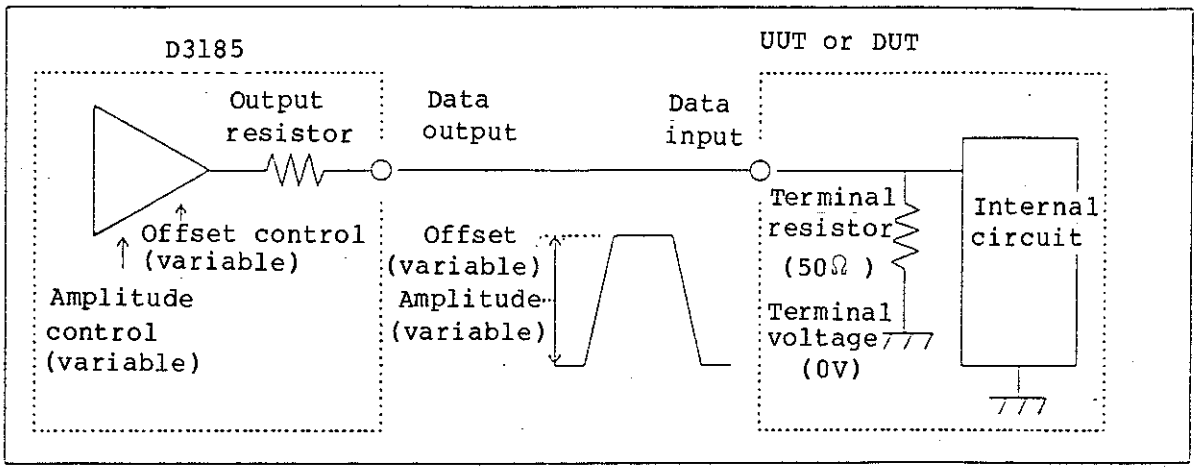


Fig. 4-1 With Data Output Used and 0V Termination

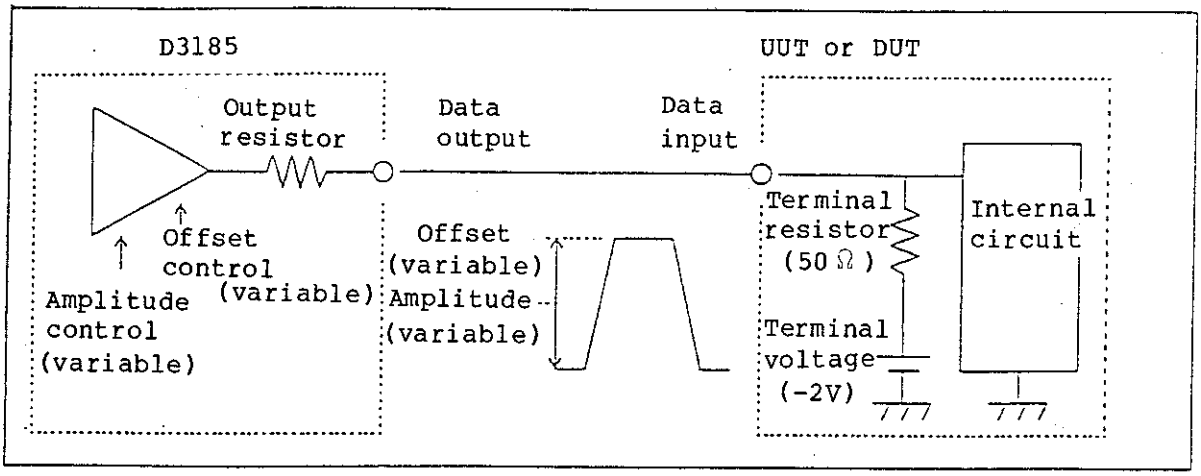


Fig. 4-2 With Data Output Used, -2V Termination and ECL Level

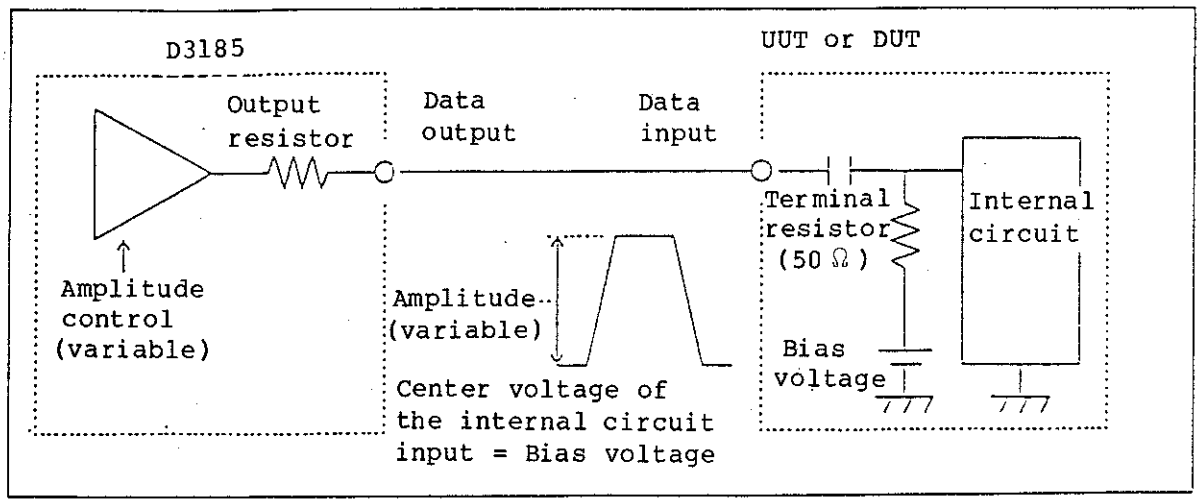


Fig. 4-3 With Data Output in AC mode and AC-connected Termination

4.1.3 Setting the Clock Output

In case the UUT or DUT requires clock, set the clock output level in accordance with the UUT or DUT input conditions.

(1) Setting the Offset when the UUT or DUT clock input is DC-connected

In this case, CLOCK (DC) output is to be used. However, the CLOCK (DC) output cannot be used if the terminal voltage of the UUT or DUT clock input is different from that of the data input.

(a) If the terminal voltage of the UUT or DUT clock input is 0V (See Fig. 4-4.)

Specify the output level by pressing the LEVEL key sot that the VARIABLE TO 0V lamp on the front panel will light. Since the CLOCK (DC) output offset (high level) and the amplitude are variable in this case, set the offset and amplitude values with the CLOCK OFFSET and AMPLITUDE knobs, respectively. At the same time, the data output terminal condition is also 0V; the offset and the amplitude are variable.

(b) If the UUT or DUT clock input is with terminal voltage -2V and at the ECL level (See Fig. 4-5.)

Specify the output level by pressing the LEVEL key so that the ECL TO -2V lamp on the front panel will light. In this case, the CLOCK (DC) output offset (high level) is set to about -0.8V and the amplitude is set to about $0.8V_{p-p}$ (variable). At the same time, the data output is set to terminal condition -2V, offset about -0.8V and amplitude about $0.8V_{p-p}$ (variable).

(2) If the UUT or DUT Clock Input is AC-connected (See Fig. 4-6.)

In this case, set the CLOCK (DC) output to AC mode. The values of the output level and the offset have no relation, and the only the amplitude will be variable.

(3) If the UUT or DUT Clock Input is AC-connected (See Fig. 4-7.) or DC-connected but the Amplitude Center Voltage is to be Equal to the Terminal Voltage (See Fig. 4-8.)

In this case, the CLOCK (DC) output is to be used. The values of the output level,the offset, and the amplitude have no relations. The CLOCK (AC) output is AC-connected and the amplitude is about $1V_{p-p}$. If smaller amplitude is required, use an external attenuator.

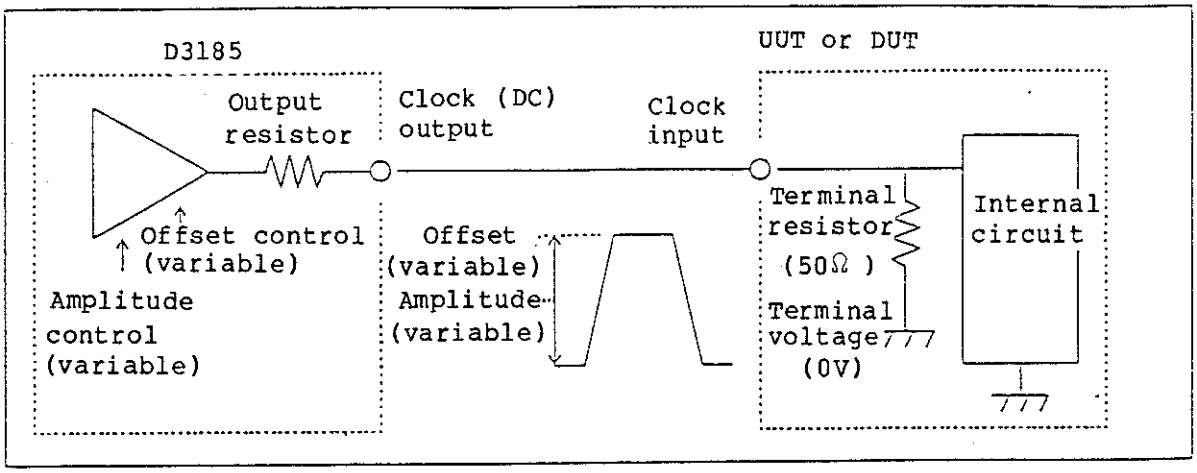


Fig. 4-4 With Clock (DC) Output used and 0V Terminal

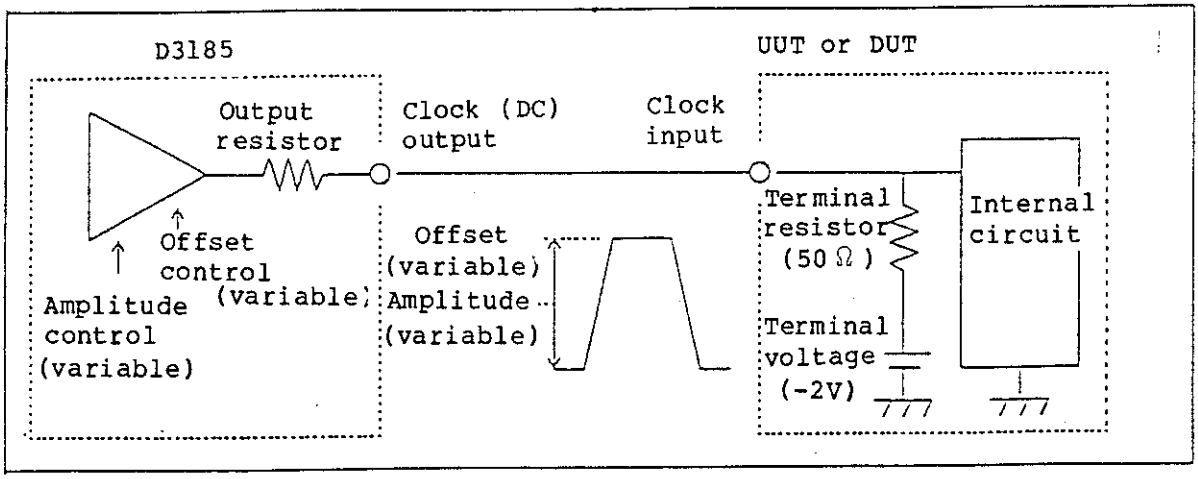


Fig. 4-5 With Clock (DC) Output used, -2V Terminal and ECL level

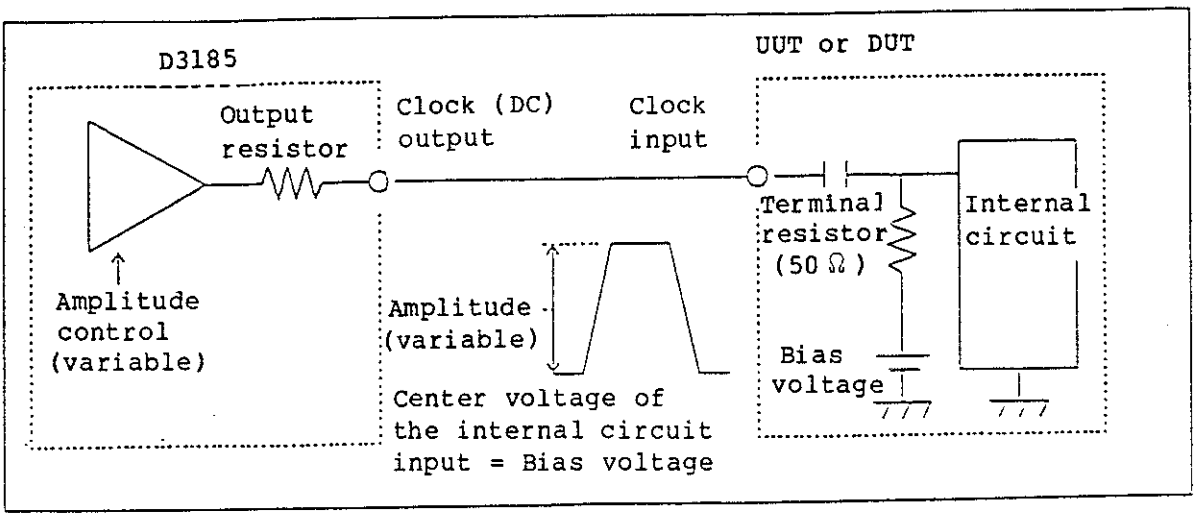


Fig. 4-6 With Clock (DC) Output used in AC mode and AC-connected Terminal

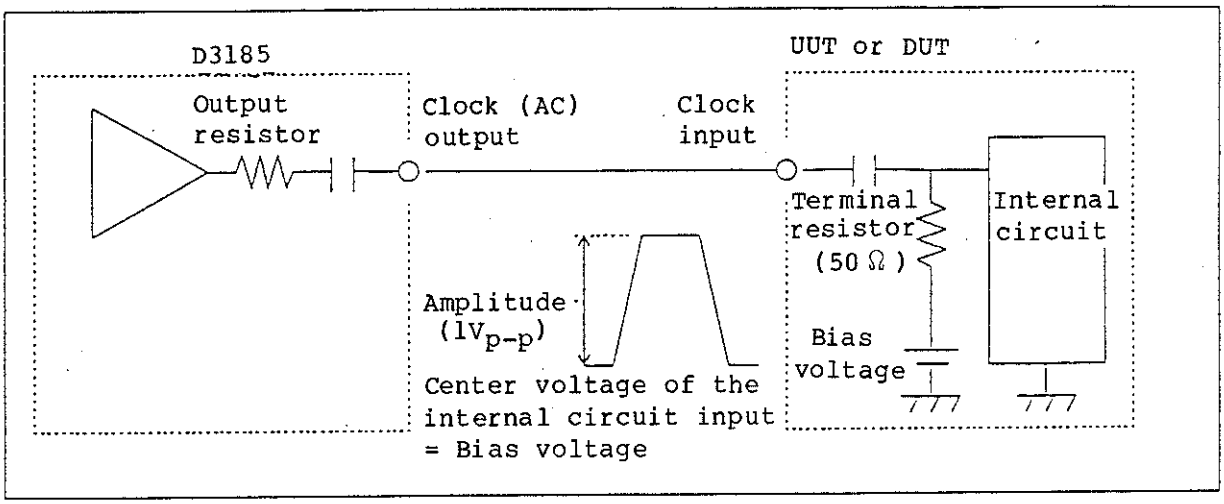


Fig. 4-7 With Clock (AC) Output used and AC-connected Terminal

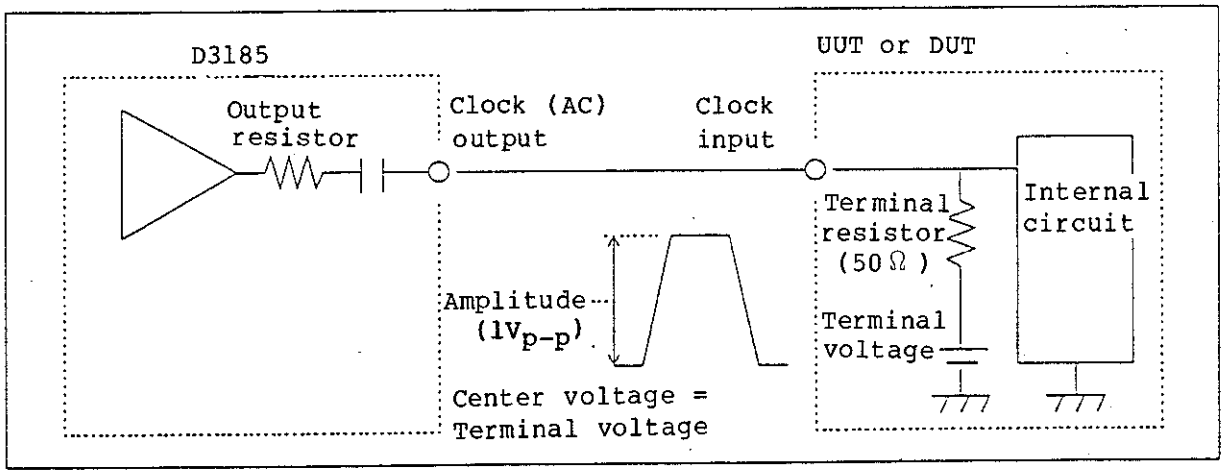


Fig. 4-8 With Clock (AC) Output used and DC-connected Terminal

4.1.4 Setting the Pattern

Set the pattern mode to WORD or PRBS.

If WORD is specified, call a pattern which has been created from the pattern memory or set the bit length and logic (0,1) for each bit.

If PRBS is specified, set the pattern length 2^N -1 and the mark factor.

In case of manual setting through panel key operation, it is recommended to use the Master-Slave function so that the pattern setting in the D3285 is interlocked with the D3185. To use this function, connect the D3185 to the D3285 with the GPIB cable, and set the Master key on the D3185 front panel and the Slave key on the D3285 front panel to ON position.

CAUTION

1. When using the Master-Slave function, do not connect any other device to the GPIB connector between the D3185 and the D3285.

2. When performing remote control with the GPIB controller, do not forget to set the Master key and the Slave key to OFF position.

4.2 D3285 Setting

4.2.1 Setting the Data Input

(1) Set the data input terminal voltage in accordance with the UUT or DUT output conditions.

If the TO 0V lamp of the TERMINATOR DATA on the front panel is lit, the terminator is 0V. If the TO -2V lamp is lit, the terminator is -2V. This setting is switched alternately every time the DATA key is pressed.

(2) Set the data input threshold level in accordance with the UUT or DUT output voltage.

Set the THRESHOLD LEVEL voltage on the front panel approximately at the center value of the UUT or DUT output voltage by turning the knob. The range of setting varies depending on the data input terminal voltage.

4.2.2 Setting the Clock Input

Three types of clock input source are available. Set the clock input terminal voltage in accordance with the clock source output conditions.

(1) When using the UUT or DUT Clock Output

Set the clock input terminal voltage in accordance with the UUT or DUT output conditions.

If the TO 0V lamp of the TERMINATOR CLOCK on the front panel is lit, the terminator is 0V. If the TO -2V lamp is lit, the terminator is -2V. This setting is switched alternately every time the CLOCK key is pressed.

In case the UUT or DUT clock output is AC-connected, the D3285 clock input terminal voltage can be set either to 0V or -2V.

(2) When using the D3185 Clock (DC) Output

If the D3185 output level is set to VARIABLE TO 0V, the D3285 clock input is to be eliminated at 0V; and if set to ECL TO -2V, the D3285 clock input is to be terminated at -2V.

If the TO 0V lamp of the TERMINATOR CLOCK on the front panel is lit, the terminator is 0V; and if the TO -2V lamp is lit, the terminator is -2V. This setting is switched alternately every time the CLOCK key is pressed.

(3) When using the D3185 Clock (AC) Output

In this case, the D3285 clock input terminal voltage can be set either to 0V or -2V.

4.2.3 Setting the Pattern

The D3285 pattern setting is executed in the same way as the D3185 pattern setting.

To use the Master-Slave function so that the D3285 pattern setting is interlocked with the D3185, connect the D3185 to the D3285 with the GPIB cable, and set the Master key on the D3185 front panel and the Slave key on the D3285 front panel to ON position.

CAUTION

When using the Master-Slave function, do no connect any other device to the GPIB cable between the D3185 and the D3285.
When performing remote control with the CPIB controller, do not forget to set the Master key and Slave key to OFF position.

4.2.4 Setting the Data Input Polarity

Set the INPUT POLARITY on the front panel depending whether the data polarity is reversed or not in the relationships between the input and the output of the UUT or DUT.

Press the INPUT POLARITY key so that the INVERS lamp will light if reversed; and the NORMAL lamp will light if not reversed.

4.3 Signal Line Connection

An example of signal line connection is given in Fig. 4-9.

When connecting the clock input and output signal lines, pay attention whether the UUT or DUT clock input/output is used and also on the voltage level as well as the terminator type.

CAUTION

To prevent device damage, make the following preparations before starting to connect signal lines.

(1) Collect the ground terminals of all the devices at one place and connect them to the earth.

(2) The operator must wear a earth band or the equivalent not to be charged with static electricity.

(3) The static electricity between the conductors of the coaxial cables to be used for signal connection should be discharged beforehand.

(4) The device output voltage levels and terminal voltages should be set strictly.

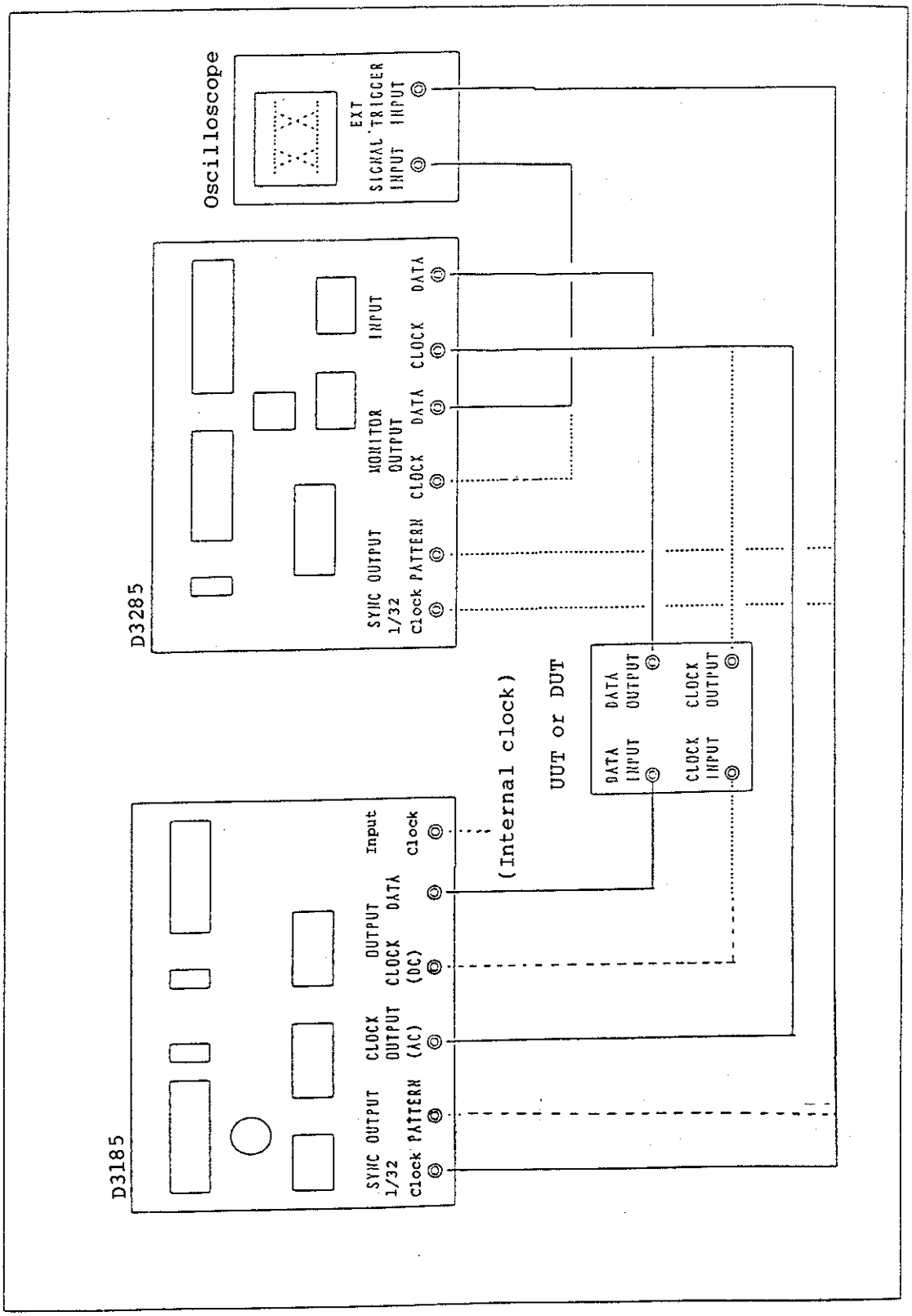


Fig. 4-9 Signal Line Connection

MEMO

5. GENERAL-PURPOSE INTERFACE BUS (GPIB)

5.1 Introduction

The general-purpose interface bus (GPIB) is the interface system which connects the tester to the controller and/or the peripheral devices using a simple cable (bus line).

The GPIB is an easy-to-use interface system with higher expandability compared to other systems. In addition, it provides electrical, mechanical and functional compatibility with other manufacturers' products. Therefore, the GPIB can make up not only a simple system but an automatic instrumentation system using the single bus cable.

In the GPIB system, it is necessary to set the address of each component connected to the bus line. Each component may play one or more roles of the controller, talker and listener.

During operation of the system, only one talker can transmit data on the bus line while the listeners receive the data.

The controller specifies the addresses of the talker and the listeners. It transfers data from the talker to the listeners and sets the measuring conditions from itself (or the talker) to the listeners.

For data transfer among components of the system, eight data lines of the parallel/serial bit type are used for asynchronous two-way transmission. The asynchronous system allows high-speed and low-speed compound devices to be connected arbitrarily.

A collection of data (messages) sent and received among devices includes measurement data, measuring conditions (programs) and commands. The ASCII code is mainly used.

Beside the above mentioned eight data lines, the system includes three handshaking lines to control asynchronous data transfer among devices and five control lines to control the information flow on the bus.

- The following signals are used for the handshaking lines.

DAV (Data Valid)	:	Signal to indicate the data valid state
NRFD (Not Ready For Data)	:	Signal to indicate the data reception enabled state
NDAC (Not Data Accepted)	:	Signal to indicate the reception completion state

- The following signals are used for the control lines:

  ATN (Attention) : This signal identifies whether the signal on the data line is an address, command or other information.

  IFC (Interface Clear): Signal to clear the interface

  EOI (End or Identify): Signal to be used on the termination of information transfer

  SRQ (Service Request): Signal to cause an arbitrary device to present a request for services from the controller

  REN (Remote Enable) : Signal to be used for remote control of a remote-programmable device

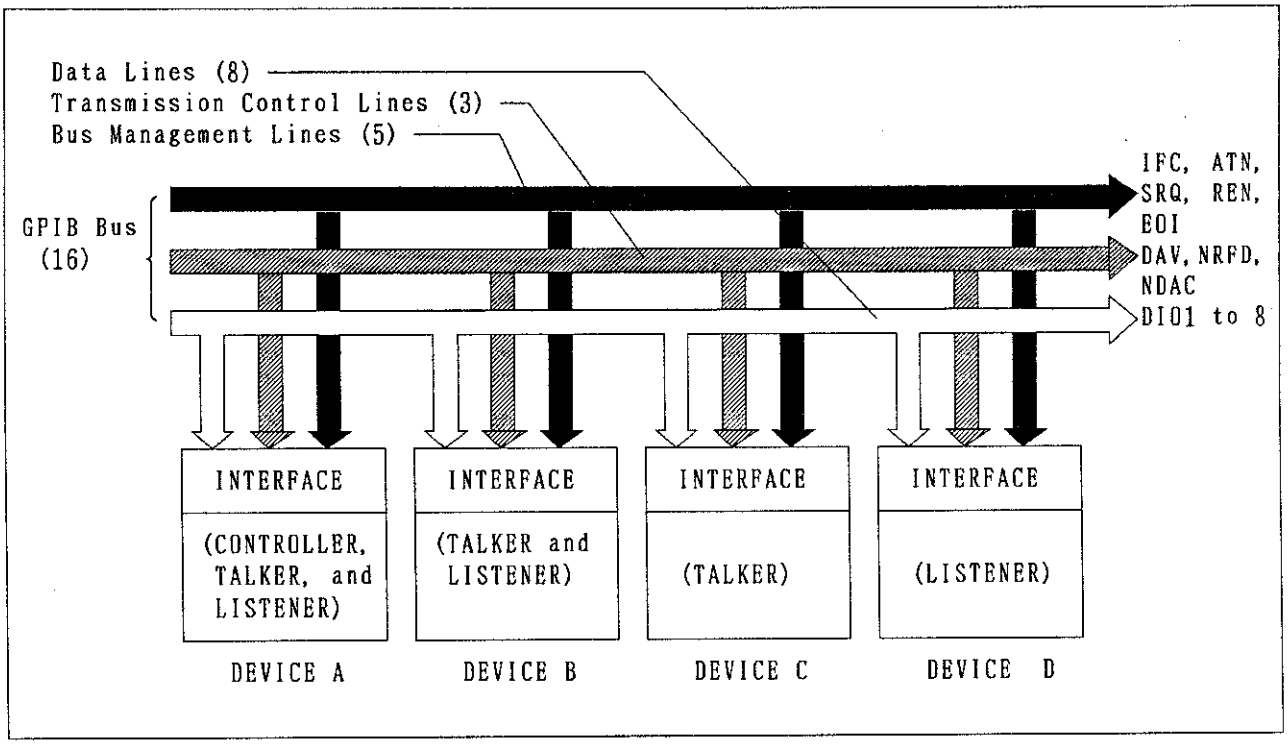


Figure 5 - 1 Outline of GPIB

5.2 Performance

5.2.1 GPIB Specifications

Governing specification: IEEE standard 488-1978

Available code : ASCII code and binary codes

Signal level : "High" state + 2.4 V or more
"Low" state + 0.4 V or less

Termination of signal conductors
: 16 bus lines are terminated as follows:

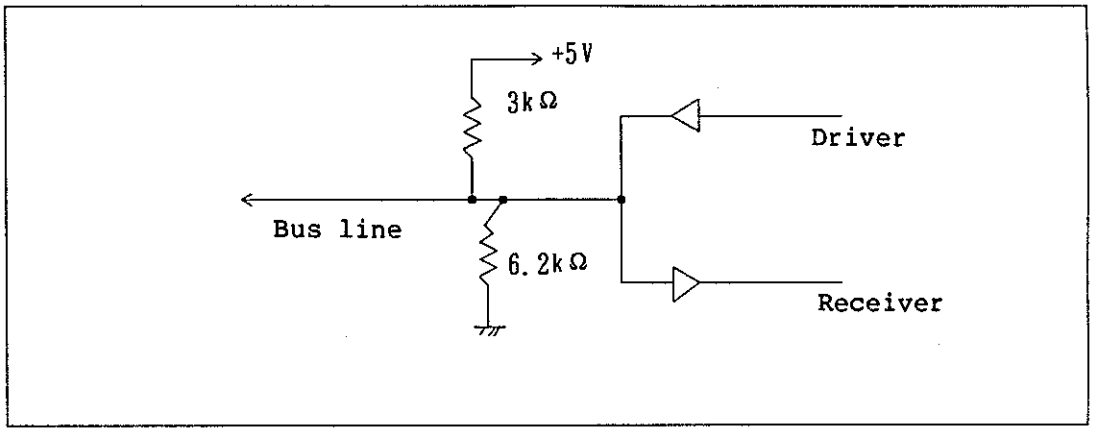


Figure 5 - 2 Termination of Signal Conductors

Driver specifications : Open collector system

"Low" state output voltage : +0.4 V or less, 48 mA
"High" state output voltage: +2.4 V or more, -5.2 mA

Receiver specifications: "Low" state at +0.6 V or less
"High" state at +2.0 V or more

Bus cable length : The length of each bus cable must not exceed: (the number of devices connected to the bus) x 2 m or 20 m in total.

Addressing : The address selection switch on the front panel allows
32 types of talk/listen addresses to be selected.

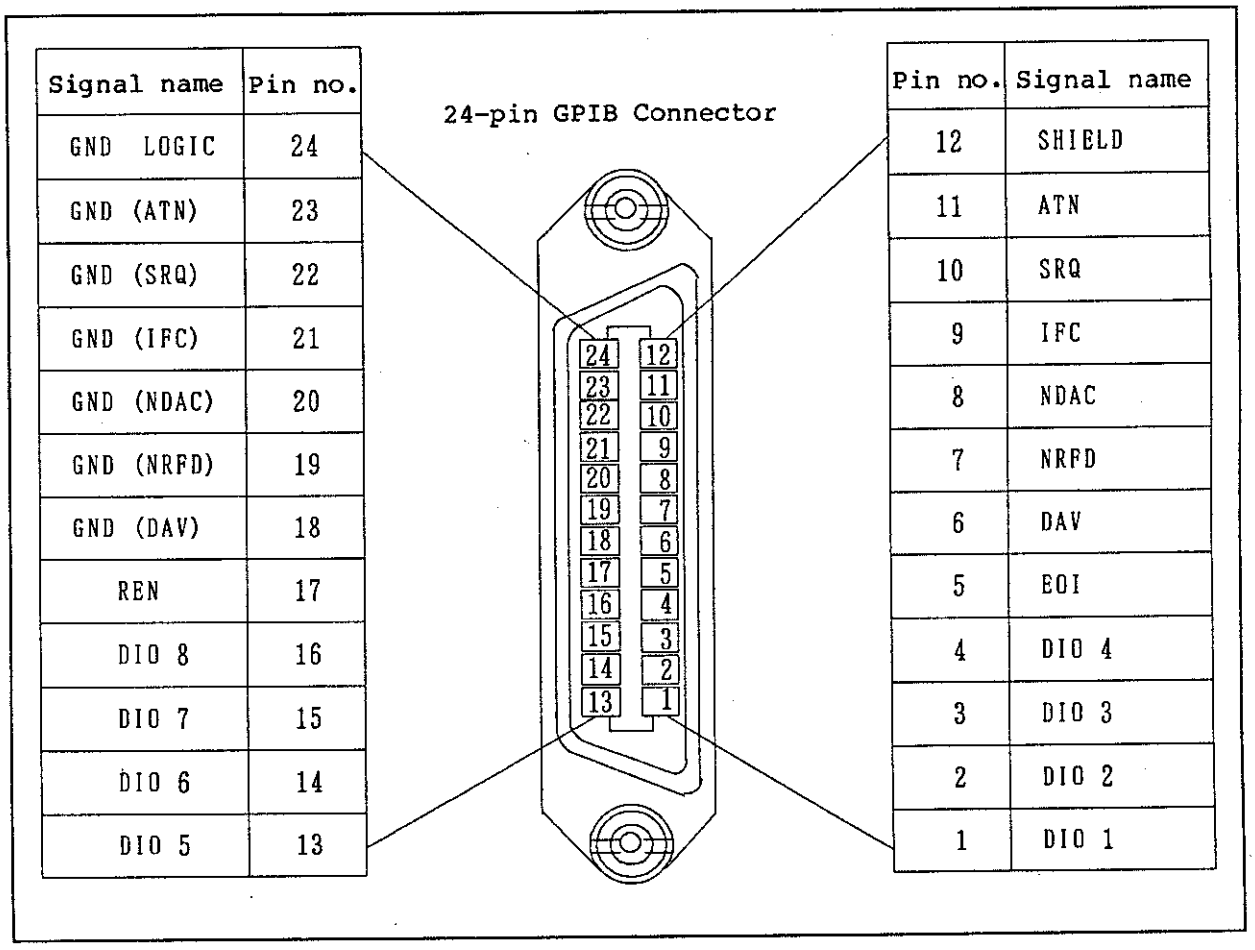
Connector : 24-pin GPIB connector, 57-20240-D35
(Equivalent to the product manufactured by Anphenol)

5.2.2 Interface Functions

Table 5-1 shows interface functions below:

Table 5 - 1 Interface Functions

Code	Functions and description
SH1	Source handshake function
AH1	Accepter handshake function
T5	Basic talker function, Serial poll function, Talk only mode, Listener-specified talker cancel function
L4	Basic listener function, Talker-specified listener cancel function
SR1	Service request function
RL1	Remote function n
PP0	No parallel poll function
DC1	Device clear function (SDC and DCL commands are available.)
DT0	No device trigger function
C0	No controller function
E2	Use of three-state bus driver



Signal name	Pin no.
GND LOGIC	24
GND (ATN)	23
GND (SRQ)	22
GND (IFC)	21
GND (NDAC)	20
GND (NRFD)	19
GND (DAV)	18
REN	17
DIO 8	16
DIO 7	15
DIO 6	14
DIO 5	13

Pin no.	Signal name
12	SHIELD
11	ATN
10	SRQ
9	IFC
8	NDAC
7	NRFD
6	DAV
5	EOI
4	DIO 4
3	DIO 3
2	DIO 2
1	DIO 1

Figure 5 - 3 Pin Assignment of GPIB Connector

5.3 Notes on Using the GPIB

This section explains the notes on using the GPIB.

(1) Connecting or Removing Cables

Turn off all devices to which cables are to be connected or removed. In this case, all ground cables must be connected mutually (grounded). For D3185, the GPIB address is set to 8 at the factory.

(2) GPIB Connector for TR4515

D3185 provides a dedicated connector for the control of TR4515. Do not connect a device other than TR4515 to this connector. For TR4515, the GPIB address should be set to 20.

(3) Master Operation

If a device other than D3285 error detector is connected when the MASTER switch on the front panel is set to ON, this unit may operate abnormally and display an error message on the front panel. In such a case, set the MASTER switch to OFF. If the MASTER switch is set to OFF via the GPIB, issue an instruction that sets the IFC line to the lower level.

(4) ATN Interrupt Caused During Message Transfer

If an ATN request is issued while transferring a message between devices, the ATN is given priority and the preceding state is canceled.

5.4 Setting a Device Address

The device address of this unit is displayed on the address number indicator in the pattern setting block. To cahnge the device address, operate the [<] or [>] key under the indicator. The setting range is 0 to 30.

5.5 List Format

This section explains the program codes that the GPIB controller use for remote control.

5.5.1 Basic Format

Usually, ASCII codes are used. However, binary codes may be used for word pattern setting.

When ASCII codes are used, commas are used as string delimiters but they may be omitted unless specified otherwise.

Example: "WORD, CR1234.56" ⟶ "WORDCR1234.56"

When ASCII codes are used, the following record delimiters are used. EOI stands for "End Or Identify" (single wire signal). ASCII codes of CR and LF are 13 and 10 respectively.

a. CR, LF[+EOI]
   EOI may be written together with LF.

b. LF[+EOI]
   EOI may be written together.

c. CR+EOI
   EOI may be written together with CR.

d. EOI
   EOI is written together with the last byte of the program code.

When binary codes are used, only the single wire signal (EOI) may be used as a record delimiter.

The total length of program codes that this unit can receive at a time is 128 characters or less (string delimiters are included but record delimiters are not included) except when a word pattern is set.

If it is longer than 128 characters or any invalid code is included, a syntax error occurs. In this case, records are discarded up to the next record delimiter.

5.5.2 GPIB Function Code

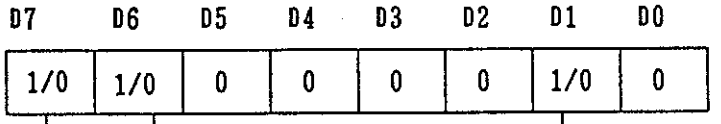
Code	Content
Z	Initialization of each parameter. (Initialization of the panel state)
C	Initialization for GPIB

5.5.3 Codes Related to Service Request (SRQ)

Code	Content
S0	Transmission of SRQ
S1	No transmission of SRQ

When the "S0" mode is specified, the service request is transmitted to the controller on the occurrence of a SYNTAX error. The status byte is transmitted when the SPE command is received at the time of serial polling from the controller.

5.5.4 Configuration of Status Byte



0 (Correct code): Indicates no SYNTAX error

1 (Incorrect code): Indicates a SYNTAX error.

RQS bit: The same value of the D1 bit

Busy bit: L is set in the delay mode or during word memory rewriting. In other cases, 0 is set. This bit does not generate a SRQ.

5.5.5 Remote Code

Table 5-2 shows the D3185 remote code below:

Table 5 - 2 Remote Code

Function name	Code	Contents
MEMORY (CLOCK)		(Clock rate memory number)
MEMORY STORE	"RMS x " x = 0 to F	Store the frequency in the memory number
MEMORY RECALL	"RMR x " x = 0 to F	Recall the frequency from the memory number
CLOCK RATE	"CR x" or "CR xE+6" x = 1000.000 to 10000.000	Set the Frequency Unit: MHz (former case) or Hz (later case)
PATTERN MODE		Set the Pattern mode
PRBS	"PRBS"	PRBS
WORD	"WORD"	WORD
PRBS 2^N-1	"PBx, 0" x = 07 = 09 = 10 = 11 = 15 = 17 = 20 = 23 "PB-15, 0", for the generating polynomial of $X^{15} + X^1 + 1$.	Selects the PRBS, 2^N-1 mode and the number of stages
MARK RATIO	"MR0/8" "MR1/8" "MR1/4" "MR1/2" "MR8/8" "MR7/8" "MR3/4" "MR1/2B"	Select the Mark ratio
AC MODE	"ACCLKON"/"ACCKOF" "ACDAON"/"ACDAOF"	AC mode output from CLOCK DC On/Off AC mode output from DATA On/Off

Table 5 - 2 Remote Code (cont'd)

Function name	Code	Contents
MEMORY (WORD)		(Word pattern memory number)
MEMORY STORE	"WMS x" x = 0 to 9	Store the word pattern in the memory number
MEMORY RECALL	"WMR x" x = 0 to 9, or A or B	Recall the word pattern from the memory number
POLARITY (WORD)		Set the Word pattern polarity
NORMAL	"WPN"	Normal polarity
INVERSE	"WPI"	Inverse polarity
PATTERN		
BIT LENGTH	"BL x" x = 1 to 65536	Set the pattern bit length
PATTERN		
ADDRESS	"ADR x" x = 0 to 524287	Set the pattern address
CROSS-POINT CAL		Set the cross-point CAL
DATA ON	"CPCON"	Cross-point CAL On
DATA OFF	"CPCOF"	Cross-point CAL Off

Table 5 - 2 Remote Code (cont'd)

Function name	Code	Contents
PATTERN transfer Binary pattern data transfer	"BIN x, y" Address Byte count x = 0 to 4095 y = 1 to 8192	When this code is received once, binary pattern data transfer mode is set until the byte count is transferred or EOI is received the next time. A series of binary data to be transferred is stored from the address number specified on the left. The number of transfer patterns are determined by the byte count. The LSB of binary data is the first clock.
Hexadecimal pattern data transfer	"WP x, y, z" Address Size Arrangement of pattern data by size x = 0 to 4095 y = 1 to 128 z = Each character is 0 to 9 or A to F.	A series of pattern data has each character made up of four bits and the number of characters are specified. A series of pattern data is stored from the specified address number. The LSB of one-character data indicates the first clock.
ERROR ADDITION	"EAD x" x = 0 (SINGLE) = 4 = 5 = 6 = 7 = 8 = 9 = S (One error generation)	Select the Error addition

Table 5 - 2 Remote Code (cont'd)

Function name	Code	Contents
LEVEL		Set the output level
BCL TO -2 V	"ECL"	ECL
VARIABLE TO 0 V	"VAR"	VARIABLE
DATA OUTPUT		Set the Data output
AMPLITUDE	"DAMP x" x = 0.50 to 2.00	DATA AMPLITUDE Unit: Vp-p
OFFSET	"DOFF #x" # = + or - or ␣ ␣ is regarded as +. x = -2.00 to +2.00	DATA OFFSET Unit: V
CLOCK OUTPUT		Set the Clock output
AMPLITUDE	"CAMP x" x = 0.50 to 2.00	Clock amplitude Unit: Vp-p
OFFSET	"COFF #x" # = + or - or ␣ ␣ is regarded as +. x = -2.00 to +2.00	Clock offset Unit: V
DUTY ADJ		Set the DUTY ADJ
ON	"DTYON"	DUTY ADJ On
OFF	"DTYOF"	DUTY ADJ Off
DELAY	"DLY #x" # = + or - or ␣ ␣ is regarded as +. x = -400 to +400	Set the delay Unit: ps
PANEL LOCK		Set the Panel Lock
ON	"PLKON"	Panel lock On
OFF	"PLKOF"	Panel lock Off

Table 5 - 2 Remote Code (cont'd)

Function name	Code	Contents
RECORD DELIMITER		Select the Recode delimiter
RECORD DELIMITER at the time of TALKER output when using the OP command		
- CR, LF (+EOI)	"DL0"	CR, LF (+EOI)
- LF only	"DL1"	LF
- EOI only	"DL2"	EOI

* EOI: End or Identify

5.5.6 Canceling the Master Function

To cancel the D3185 master function from the controller, issue a command that set the GPIB connector's IFC pin (No. 9) at the lower level (e.g., "abort 7" of HP). Thus, the master control key is set off and the master function is canceled.

5.6 OP (Output Interrogated Parameter) Command

5.6.1 Outline of OP Command

The output interrogated parameter (OP) command allows the state of the parameter, function or mode which is specified from the D3185 to the GPIB to be output.

In programming, enter the code for the parameter to be output after entering the OP command. "OP" is unnecessary when using codes with "?".

Example: HP200 series

```
10  DIM A$ [20]
20  OUTPUT  708 ; "CR1234.56"
30  OUTPUT  708 ; "OPCR" (or "CR?")
40  ENTER   708 ; A$
50  DISP    A$
60  END
```

(Program description)

Line No.	Description
10	Reserves 20 bytes for character string variable A$.
20	Sets the clock rate 1234.56 MHz for the D3185.
30	Instructs to output the clock rate data.
40	Specifies the D3185 as a talker and reads data.
50	Displays input data A$.
60	Terminates the program.

5.6.2 Table of OP Code Output Data

Table 5 - 3 Table of OP Code Output Data

Function name (Function/mode)	Code	Output result and format	Contents
MEMORY (CLOCK)	"OPRM" (Rate Memory) or "RM?"	"RM x" x = 0 to F	(Clock rate Memory number) Read the memory number of frequency
CLOCK RATE	"OPCR" or "CR?"	"CR␣xE+6" x = 01000.000E + 6 to 10000.000E + 6	Read the frequency setting Unit: Hz
PATTERN MODE PRBS WORD	 "OPPM" or "PM?"	 "PRBS" "WORD"	Read the setting value of the Pattern mode PRBS WORD
PRBS 2^N-1	"OPPB" or "PB?"	"PB x, 0" x = 07 = 09 = 10 = 11 = 15 = 17 = 20 = 23 "PB-15, 0", for the generating polynomial of $X^{15} + X^1 + 1$.	Read the setting value of PRBS, 2^N-1 mode and the number of stages
MARK RATIO	"OPMR" or "MR?"	"MR x" x = 0/8␣ = 1/8␣ = 1/4␣ = 1/2␣ = 8/8␣ = 7/8␣ = 3/4␣ = 1/2B	Read the setting value of the Mark ratio(-STOP-RECALL-)

Table 5 - 3 Table of OP Code Output Data (cont'd)

Function name (Function/mode)	Code	Output result and format	Contents
MEMORY (WORD)	"OPWM" (Word Memory) or "WM?"	"WM x" x = 0 to 9, A, or B	(Word pattern Memory number) Read the Word patter memory number
POLARITY (WORD)			Read the Word pattern polarity
NORMAL	"OPWP" or "WP?"	"WPN"	Normal polarity
INVERSE		"WPI"	Inverse polarity
PATTERN BIT LENGTH	"OPBL" or "BL?"	"BL␣x" x = 00001 to 65536	Read the setting value of the pattern bit length
PATTERN ADDRESS	"OPADR" or "ADR?"	"ADR␣x" x = 000000 to 524287	Read the setting value of the pattern address
ERROR ADDITION	"OPEAD" or "EAD?"	"EAD x" x = 0 = 4 = 5 = 6 = 7 = 8 = 9	Read the setting value of the error addition SINGLE $1X10^{-4}$ $1X10^{-5}$ $1X10^{-6}$ $1X10^{-7}$ $1X10^{-8}$ $1X10^{-9}$
AC mode output from CLOCK DC ON/OFF	"OPACCK" or "ACCK?"	"ACCKON" "ACCKOF"	Read the setting value of the clock DC output in AC mode On Off
AC mode output from DATA ON/OFF	"OPACDA" or "ACDA?"	"ACDAON" "ACDAOF"	Read the setting value of the data output in AC mode On Off

Table 5 - 3 Table of OP Code Output Data (cont'd)

Function name (Function/mode)	Code	Output result and format	Contents
LEVEL			Read the setting value of the output level
ECL TO -2 V	"OPLVL" or "LVL?"	"ECL"	ECL
VARIABLE TO 0 V		"VAR"	VARIABLE
DATA OUTPUT			Read the setting value of the data output
AMPLITUDE	"OPDAMP" or "DAMP?"	"DAMP␣x" x = 0.50 to 2.00	Amplitude value Unit: Vp-p
OFFSET	"OPDOFF" or "DOFF?"	"DOFF#x" # = + or - or ␣ ␣ is regarded as +. x = -2.00 to +2.00	Offset value Unit: V
CLOCK OUTPUT			Read the setting value of the clock output
AMPLITUDE	"OPCAMP" or "CAMP?"	"CAMP x" x = 0.50 to 2.00	Amplitude value Unit: Vp-p
OFFSET	"OPCOFF" or "COFF?"	"COFF #x" # = + or - or ␣ ␣ is regarded as +. x = -2.00 to +2.00	Offset value Unit: V
DELAY	"OPDLY" or "DLY?"	"DLY #x" # = + or - or ␣ ␣ is regarded as +. x = -400 to +400	Read the setting value of the delay Unit: ps
DUTY ADJ			Read the setting value of the duty adjustment
ON	"OPDTY" or "DTY?"	"DTYON"	On
OFF		"DTYOF"	Off
CROSS-POINT CAL			Read the setting value of the cross-point CAL
DATA ON	"OPCPC" or "CPC?"	"CPC ON"	On
DATA OFF		"CPC OF"	Off

Table 5 - 3 Table of OP Code Output Data (cont'd)

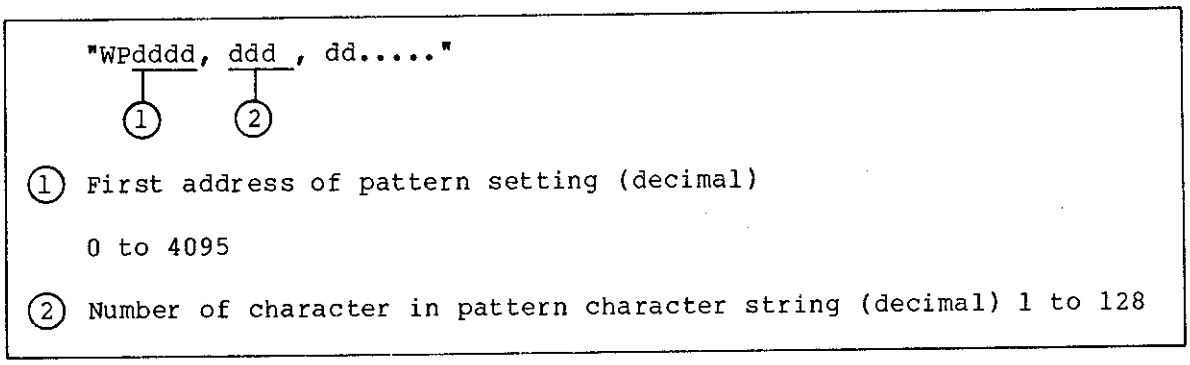
Function name (Function/mode)	Code	Output result and format	Contents
PANEL LOCK			Read the setting value of the panel lock
ON	"OPPLK" or "PLK?"	"PLKON"	On
OFF		"PLKOF"	Off
Service request function			Read the setting value of the service request function
S0 (SRQ transmission)	"OPS" or "S?"	"S0"	SRQ transmission
S1 (No transmission of SRQ)		"S1"	No SRQ transmission
Talker data delimiter function			Read the setting value of the talker data delimiter function
DL0 (CR, LF + EOI)	"OPDL" or "DL?"	"DL0"	CR, LF + (EOI)
DL1 (LF only)		"DL1"	LF
DL2 (EOI only)		"DL2"	EOI

* EOI: End or Identify

5.7 Setting a Word Pattern (Hexadecimal Mode)

There are two modes for setting a word pattern of this unit from the GPIB: (a) hexadecimal mode (ASCII code) and (b) binary mode. This section explains only the hexadecimal mode format. For the binary mode, see Section 5.8.

(1) Format of Hexadecimal Mode



① First address of pattern setting (decimal)

0 to 4095

② Number of character in pattern character string (decimal) 1 to 128

(2) Pattern Character String

A pattern character string is a combination of 0 to 9 and A to Z. Characters as many as the number specified in item ② above are set from the address specified in item ①.

A four-bit pattern is set for each character. When each code is represented by a binary code, the least significant bit (LSB) is assigned as the bit which is nearer to the beginning.

Example:

Set code: "WP12,5,E4BA2"

Result:

Address \ Bit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
12	0	1	1	1	0	0	1	0	1	1	0	1	0	1	0	1
13	0	1	0	0	x	x	x	x	x	x	x	x	x	x	x	x

x indicates a fixed bit.

5.8 Setting a Word Pattern (Binary Mode)

This section explains the method of setting a word pattern in the binary mode. For the hexadecimal mode, see Section 5.7.

(1) Format of Binary Mode

"BINdddd, dddd"

① ②

① First address for pattern setting (decimal)

0 to 4095

② Setting pattern byte count (decimal)

1 to 8192

A delimiter (see 5.5.1 "Basic Format") is written after the byte count to complete step 1.

In the binary mode, two steps are used for word pattern setting.

(Step 1)
A binary mode, first address, and byte count are specified.

(Step 2)
Eight-bit binary codes equivalent to the number of bytes specified in item ② are written from the first bit (bit 1) of the first address specified in item ①.

An 8-bit pattern is set for each byte. The least significant bit (LSB) is assigned as the bit which is nearer to the beginning.

A single wire signal EOI (End Or Identify) must be assigned to the last byte.

If EOI is received or specified number of bytes are received, this unit stops pattern transmission and enters the usual ASCII code reception mode again.

Example:

Set code: "BIN12,3"
Binary code (decimal notation): 78.171,2

Result:

Address \ Bit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
12	0	1	1	1	0	0	1	0	1	1	0	1	0	1	0	1
13	0	1	0	0	0	0	0	0	x	x	x	x	x	x	x	x

x indicates a fixed bit.

5.9 Initial States

5.9.1 Initial State of Operation

When a SDC, DCL, or program code is received, this unit is initialized as follows:

(1) Status Byte

All bits are set to 0s.

(2) Service Request

The "S1" mode is set (an SRQ is not issued).

(3) OP Mode

This mode is canceled.

(4) Word Pattern Setting Mode

The binary mode is canceled.
It cannot be canceled with a program code "C".

5.9.2 Initialization of Parameters

All parameters are initialized by program code "Z".

(1) Clock Section

Clock rate	:	1000.000MHz (CR 100.000E+6)
Memory number	:	0 (RM0)
Edit	:	OFF

(2) Output Section

Data amplifier	:	1.00V (DAMP␣1.00)
Data offset	:	0.00V (DOFF␣0.00)
Cross point CAL:		OFF (CPCOF)
Clock amplifier:		1.00V (CAMP␣1.00)
Clock offset	:	0.00V (COFF␣0.00)
Duty ADJ	:	OFF (DTYOF)
Error edition	:	OFF (EAD0)
Level	:	VALIABLE TO 0V (VAR)

(3) Pattern Section

Pattern mode : WORD (WORD)
PRBS 2^N-1 : N=15 (PB15)
Mark ratio : 1/2 (MR1/2)
Memory number : 0 (WMR0)
Edit : OFF
Polarity : NORMAL (WPN)
Bit length : 16 (BL16)
Address : 0 (ADR0)
Word pattern : 0101010101010101
(WP0,4,AAAA)
Memory contents:
Bit lengths of memory numbers 0 to 9: 16 (BL16)
Even-number pattern:
0101010101010101
(WP0,4,AAAA)
Odd-number pattern:
1010101010101010
(WP0,4,5555)

(4) Control Section

Panel lock : OFF (PLKOF)

(5) GPIB

Send record delimiter:
CR,LF+EOI (DL0)
SRQ issue : Not issued (S1)

5.10 Program Example

This section gives an example of GPIB program.

The controller used is the Hewlette Packard HP9000 Series 300 and the language used is BASIC.

5.10.1 Setting a Word Pattern (Hexadecimal Mode)

This program converts a binary pattern (character string consisting of 0s and 1s) input from the keyboard into a hexadecimal character string, thus setting a word pattern.

(1) Program List

```
100    DIM P$[600],Q$[512],H$[128]
110    Ppg=708
120    OUTPUT Ppg:"WORD"
130    LOOP
140      INPUT "BIT LENGTH = ?",B1
150    EXIT IF B1>0 AND B1<1024
160    EXIT IF B1>=1024 AND B1<=65536 AND (B1 MOD 64)=0
170      BEEP
180    END LOOP
190    PRINT "BIT LENGTH :";B1
200    OUTPUT Ppg;"BL";B1
210    LOOP
220      LOOP
230        INPUT "TOP ADDRESS = ?",Adrs
240      EXIT IF Adrs>=0 AND Adrs<=4095
250        BEEP
260      END LOOP
270      PRINT "TOP ADDRESS :";Adrs
280      INPUT "PATTERN = ?",P$
290      L=LEN(P$)
300    EXIT IF L=0
310      !
320      Q$=""
330      FOR I=1 TO L
340        IF P$[I,I]="0" OR P$[I,I]="1" THEN
350          IF LEN(Q$)<128 THEN Q$=Q$&P$[I,I]
360        END IF
370      NEXT I
380      L=LEN(Q$)
390    EXIT IF L=0
400      !
410      IF (L MOD 4)>0 THEN
420        FOR I=1 TO 4-(L MOD 4)
430          Q$=Q$&"0"
440        NEXT I
450        L=LEN(Q$)
```

(cont'd)

```
460       END IF
470       !
480       PRINT "BINARY PATTERN :"
490       FOR I=1 TO L STEP 4
500         PRINT Q$[I,I+3];" ";
510       NEXT I
520       PRINT
530       !
540       H$=""
550       FOR I=1 TO L STEP 4
560         H=0
570         FOR J=0 TO 3
580           H=H+VAL(Q$[I+J,I+J])*2^J
590         NEXT J
600         IF H<10 THEN
610           H$=H$&VAL$(H)
620         ELSE
630           H$=H$&CHR$(NUM("A")-10+H)
640         END IF
650       NEXT I
660       Lh=LEN(H$)
670       !
680       PRINT "HEXADECIMAL PATTERN :"
690       FOR I=1 TO INT(Lh/4)*4+1 STEP 4
700         PRINT H$[I,I+3];" ";
710       NEXT I
720       PRINT
730       OUTPUT Ppg;"WP";Adrs;",";LEN(H$);",";H$
740     END LOOP
750     END
```

(2) Execution Result

```
BIT LENGTH : 15
TOP ADDRESS : 0
BINARY PATTERN:
1001 1011 0111 1110
HEXADECIMAL PATTERN :
9DE7
TOP ADDRESS : 0
```

(3) Explanation of Program

Line No.	Description
100	Character strings P$ (max. 600 characters), Q$ (max. 512 characters), and H$ (max. 128 characters) as defined arrays.
110	7 is defined as the select code of GPIB and 8 as the address of this unit.
120	WORD is specified as the pattern mode of this unit.
130 to 180	Input a bit length from the keyboard.
190 to 200	Print the bit length and set the bit length in this unit.
210 to 800	Input a pattern setting starting address and pattern. The input pattern is converted and set for this unit. This operation is repeated until " " (null character string) is input as a pattern.
220 to 260	Input the pattern setting starting address from the keyboard.
270	Print the starting address.
280	Input a pattern from the keyboard in binary notation (character string composed of 0s and 1s). Any character other than 0 and 1 may be inserted between characters as delimiters.
290	L is defined as the length of the input character string.
300	If the length of the character string is 0, control exits from the loop.
320 to 380	Only 0s and 1s are extracted from the input character string to make a new character string "Q$". L is defined as the length of character string Q$. If this length exceeds 128 characters, the excessive characters are discarded.
390	If the length of character string Q$ is 0, control exits from the loop.
410 to 460	0s are added after character string Q$ so that its length becomes a multiple of 4. Then, L is defined as the length of new character string.
480 to 520	Character string Q$ is printed. In this case, a space is printed per 4 characters for easier reading.
540 to 660	Character string Q$ is converted to decimal values in units of 4 characters from the beginning of this character string. Then, these values are converted to hexadecimal values to create a hexadecimal character string. Lh is defined as the length of this hexadecimal character string.
680 to 720	A hexadecimal character string is printed. In this case, a space is printed per 4 characters for easier reading.

(cont'd)

Line No.	Description
730	The starting address and pattern are set for this unit.
740	End of loop (Control returns to the beginning of the loop.)
750	Program end

5.10.2 Setting a Word Pattern (Binary Mode)

This program converts a binary pattern (character string consisting of 0s and 1s) input from the keyboard into a binary character string, thus setting a word pattern.

(1) Program list

```
100   DIM P$[600],Q$[512],B(64)
110   Ppg=708
120   OUTPUT Ppg;"WORD"
130   LOOP
140     INPUT "BIT LENGTH = ?",B1
150   EXIT IF B1>0 AND B1<1024
160   EXIT IF B1>=1024 AND B1<=65536 AND (B1 MOD 64)=0
170     BEEP
180   END LOOP
190   PRINT "BIT LENGTH :";B1
200   OUTPUT Ppg;"BL":B1
210   LOOP
220     LOOP
230       INPUT "TOP ADDRESS = ?",Adrs
240     EXIT IF Adrs>=0 AND Adrs<=4095
250       BEEP
260     END LOOP
270     PRINT "TOP ADDRESS :";Adrs
280     INPUT "PATTERN = ?",P$
290     L=LEN(P$)
300   EXIT IF L=0
310     !
320     Q$=""
330     FOR I=1 TO L
340       IF P$[I,I]="0" OR P$[I,I]="1" THEN
350         IF LEN(Q$)<128 THEN Q$=Q$&P$[I,I]
360       END IF
370     NEXT I
380     L=LEN(Q$)
390   EXIT IF L=0
400     !
410     IF (L MOD 8)>0 THEN
420       FOR I=1 TO 8-(L MOD 8)
430         Q$=Q$&"0"
440       NEXT I
```

(cont'd)

```
450       L=LEN(Q$)
460     END IF
470     !
480     PRINT "BINARY PATTERN :"
490     FOR I=1 TO L STEP 4
500       PRINT Q$[I,I+3];" ";
510     NEXT I
520     PRINT
530     !
540     N=0
550     FOR I=1 TO L STEP 8
560       B(N)=0
570       FOR J=0 TO 7
580         B(N)=B(N)+VAL(Q$[I+J,I+J])*2^J
590       NEXT J
600       N=N+1
610     NEXT I
620     !
630     PRINT "BYTE PATTERN :"
640     FOR I=0 TO N-1
650       PRINT USING "#,4D";B(I)
660     NEXT I
670     PRINT
680     !
690     OUTPUT Ppg;"BIN";Adrs;",";N
700     FOR I=0 TO N
710       IF I<N THEN
720         OUTPUT Ppg;CHR$(B(I));
730       ELSE
740         SEND 7;DATA B(N) END
750       END IF
760     NEXT I
770   END LOOP
780   END
```

(2) Execution Result

```
BIT LENGTH : 15
TOP ADDRESS : 0
BINARY PATTERN :
BYTE PATTERN :
 217 126
TOP ADDRESS : 0
```

(3) Explanation of Program

Line No.	Description
100	Character strings P$ (max. 600 characters), Q$ (max. 512 characters), and H$ (max. 128 characters) as defined arrays.
110	7 is defined as the select code of GPIB and 8 as the address of this unit.
120	WORD is specified as the pattern mode of this unit.
130 to 180	Input a bit length from the keyboard.
190 to 200	Print the bit length and set the bit length in this unit.
210 to 770	Input a pattern setting starting address and pattern. The input pattern is converted and set for this unit. This operation is repeated until " " (null character string) is input as a pattern.
220 to 260	Input the pattern setting starting address from the keyboard.
270	Print the starting address.
280	Input a pattern from the keyboard in binary notation (character string composed of 0s and 1s). Any character other than 0 and 1 may be inserted between characters as delimiters.
290	L is defined as the length of the input character string.
300	If the length of the character string is 0, control exits from the loop.
320 to 380	Only 0s and 1s are extracted from the input character string to make a new character string "Q$". L is defined as the length of character string Q$. If this length exceeds 128 characters, the excessive characters are discarded.
390	If the length of character string Q$ is 0, control exits from the loop.
410 to 460	0s are added after character string Q$ so that its length becomes a multiple of 8. Then, L is defined as the length of new character string.
480 to 520	Character string Q$ is printed. In this case, a space is printed per 4 characters for easier reading.
540 to 610	Character string Q$ is converted to decimal values (0 to 255) in units of 8 characters from the beginning of this character string. N is defined the number of decimal values.
630 to 670	Decimal values are printed sequentially.
690	The binary mode, string address, byte count N are set for this unit.
700 to 760	Patterns are set for this unit byte by byte. EOI is sent together with the last byte.

(cont'd)

Line No.	Description
770	Loop end (Controll exits from the loop.)
780	Program end

5.11 Master/Slave Operation

If GPIB connectors are connected with a cable, the MASTER switch of this unit is set to ON, and the SLAVE switch of the D3285 is set to ON when this unit is used together with the D3285, the settings in the pattern setting block of this unit become the same as those of the D3285. In this case, keys and switches in the pattern setting block of the D3285 are ineffective.

During master/slave operation, any other GPIB device must not be connected to this unit and the D3285.

Setting the IFC (connector pin No.9) of the GPIB bus line at the lower level will cancel the master function of this unit and reset the MASTER switch to OFF.

5.12 Error Indications and Trouble Indications

This section explains various error and trouble indications.

5.12.1 CPU Error Indication

When an error occurs in the CPU controlling the internal operations of this unit, an error message is displayed on the frequency indicator (① in Figure 2-2) on the front panel. If such an error message is displayed, turn this unit off and turn it on again after waiting more than 5 seconds.

If the error is displayed again, this unit is defective. Contact the nearest dealer or the sales and support offices.

Addresses and telephone numbers are listed at the end of this manual.

Error indication format: Err x

x: Error code (4-digit number)

Error code	Contents
0001 to 1717	Memory error
8000 to 8008	Error in CPU's peripheral circuit

5.12.2 Low Battery Level Indication

When this unit is turned on, the following message may be displayed on the bit length indicator (⑩ in Figure 2-3) or address number indicator (⑬ in Figure 2-3) on the front panel:

LobAt

This message indicates that parameter settings saved in the memory have been cleared at power-off operation because the NiCd battery level was below the minimum level.

The low-battery indication lasts for about 3 seconds then the indicator starts displaying usual data. However, parameters have been initialized, that is, parameters are set to the initial values (see Section 5.9) as if they were initialized by GPIB program code "Z". The GPIB device address is initialized to 8.

To charge the NiCd battery from the lowest level up to the full level, this unit must be powered for at least 15 hours. If the low-battery message is displayed again even after charging the NiCd battery fully, the battery life has ended. Contact the nearest dealer or the sales and support offices.

Addresses and telephone numbers are listed at the end of this manual.

5.12.3 Delay Trouble Indication

If the absolute value of the delay indicated in the delay setting section ((34) in Figure 2-4) changes the tolerance or more, the automatic calibration routine starts and the following message is displayed for a maximum of 12 seconds:

CAL

In this case, the lower limit detection function and upper limit detection function are performed. If an error is detected, the following error indication will be made:

Err

When this is displayed, the system is undoubtedly defective, contact the nearest dealer or the sales and support offices.
Addresses and telephone numbers are listed at the end of this manual.

While this message is displayed, the delay setting control is ineffective. To make this knob effective, turn this unit off and turn it on again; the error indication will disappear but it will be displayed again after displaying CAL for several seconds unless the cause of the trouble is not remedied.

5.12.4 Initialization

To initialize D3185 as specified in Section 5.9.2, hold down the pattern setting key [2], and turn the POWER switch on.

5.12.5 Pattern Data Initialization

The order of the pattern generation may sometimes go wrong when the clock frequency value is changed in wide range or the cable between this unit and the external clock generator is disconnected. In this case, press [PRBS] or [WORD] key once to initialize the pattern data.

6. SPECIFICATIONS

- Clock indicate

Frequency range	:	1 GHz to 10 GHz
Frequency setting resolution	:	1 kHz (2 kHz when 8.01 GHz or more)
Frequency accuracy	:	±10 ppm (in combination with TR4515)
Frequency memory	:	16 patterns

- External clock

Frequency range	:	1 GHz to 10 GHz
Input level	:	0.7 Vp-p to 1.5 Vp-p
Input waveform	:	Sine wave
Impedance	:	50 ohm (Nominal value)
Connector	:	K (plug)

- Pseudo-random pattern

2^N-1 : N = 7, 9, 10, 11, 15, 17, 20, 23
($2^{15}-1$ is true with either $X^{15} + X^{14} + 1$ or $X^{15} + X + 1$.)
Mark ratio: 0/8, 1/8, 1/4, 1/2, 8/8, 7/8, 3/4, 1/2

- Word pattern

Bit length	:	1 bit to 65536 (2^{16}) bits
Bit length step	:	1 bit step for a length of up to 1024 bits 64 bit step for a length of over 1024 bits
Logic inversion	:	Possible
Pattern memory	:	Programmable 10 Types Fixed-pattern 2 Types

- Data output

Amplitude range	:	0.5 Vp-p to 2 Vp-p, 10 mV step
Offset range	:	-2 V to +2 V, 10 mV step, high-order level standard
Rise/fall time	:	30 ps or less (20% to 80% for amplitude)
ECL level	:	Possible (Approx. -0.8 V for high-order level and approx. -1.6 V for low-order level at a 50 ohm load between coupled -2 V, offset and amplitude can be variable at ±200 mV)
Cross point CAL	:	Can be changed manually
Load impedance	:	50 ohm
Connector	:	K (plug)

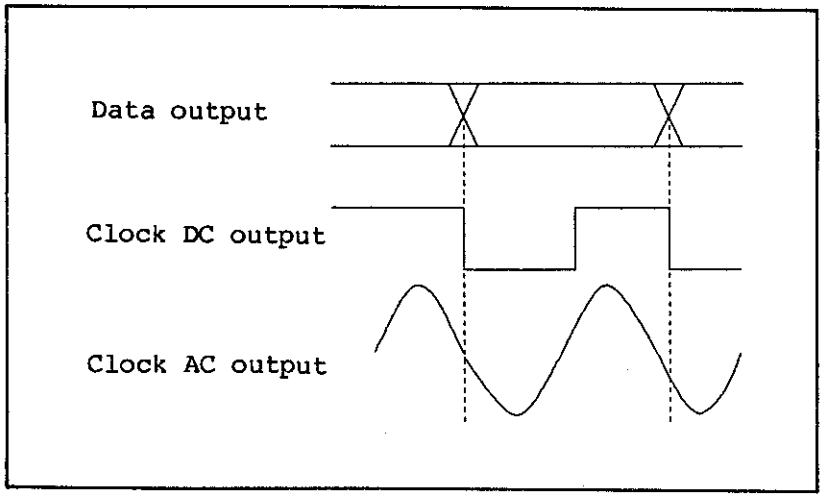
- Clock DC output

Amplitude range	:	0.5 Vp-p to 2 Vp-p, 10 mV step
Offset range	:	-2 V to +2 V, 10 mV step, high-order level standard
Rise/fall time	:	30 ps or less (20% to 80% for amplitude) 6 GHz to 10 GHz 50 ps or less (20% to 80% for amplitude) 1 GHz to 6 GHz
Variable duty factor	:	Possible
Variable duty rate	:	Can be procedured the minor arrangement manually
Duty rate CAL	:	Can be procedured the rough arrangement manually
Phase difference to data output	:	6 GHz or more ±80 ps or less Less than 6 GHz ±100 ps or less (with variable delay 0)
Phase difference to clock AC output	:	6 GHz or more ±80 ps or less Less than 6 GHz ±100 ps or less
Variable delay	:	±400 ps, 1 ps step
ECL level	:	Possible (Approx. -0.8 V for high-order level and approx. -1.6 V for low-order level at 50-ohm load between coupled -2 V, offset and amplitude can be variable at ±200 mV)
Load impedance	:	50 ohm
Connector	:	K (plug)

- Clock AC output

Amplitude	:	1 Vp-p ±30% or less
Central level	:	0 V ±0.2 V
Variable delay	:	±400ps, 1 ps step (Common to clock DC output)
Load impedance	:	50 ohm
Connector	:	K (plug)

Output phase



- Error insertion

  Error rate: 1 x 10-N, N = 4 to 9, or single

- Synchronous signal output

Clock synchronization	:	1/32 divided output of clock frequency
Pattern synchronization	:	A synchronous signal at an arbitrary position can be selected in 16 bit units.
Output level	:	0 V±0.2 V for high-order, -1 V±0.2 V for low-order.
Load impedance	:	50 ohm
Connector	:	BNC

- Auxiliary output

Output bit rate	:	1/4 of operation clock frequency
Number of pattern outputs	:	4-systems
Number of clock outputs	:	1-system
Skew between pattern outputs	:	±150 ps or less (Referencing to falling edge of clock output)
Output level	:	0 V/-1 V
Load impedance	:	50 ohm
Connector	:	SMA

- External gate input

Functions	:	Inhibition of data output Inhibition at low-order level
Input level	:	0 V/-1 V
Input puolse width	:	20 ns or more
Rise/fall time	:	10 ns or less
Impedance	:	Approx. 50 ohm
Connector	:	BNC

- TR4515 control function

Purpose	:	Controlling from D3185, the output level and frequency level of TR4515 as used as an external clock source.
Connection	:	The dedicated GPIB connector is used. For TR4515, the address should be "20".

- Master/slave function

Purpose	:	Being used in combination with the D3285 unit, the pattern setting contents of the D3285 are automatically identical to that of the D3185.
Connection method	:	Connection of the D3185 with the D3285 via the GPIB cable between their respective GPIB connectors.

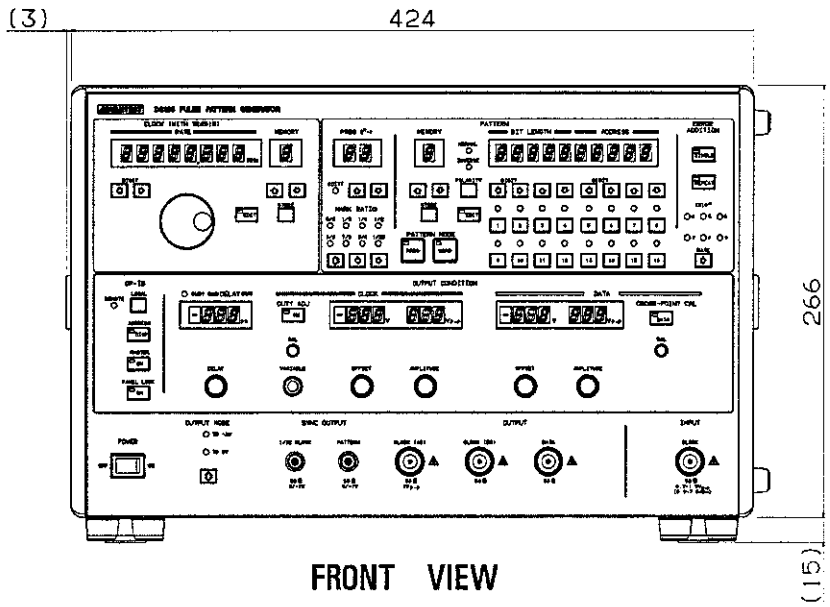
- Remote control

Interface	:	GPIB IEEE 488-1978 (standard equipment)
Ability of the remote control	:	All the settings on the front panel are readable except suply on/off the power, the DUTY ADJ, cross point CAL, and GPIB addressing.

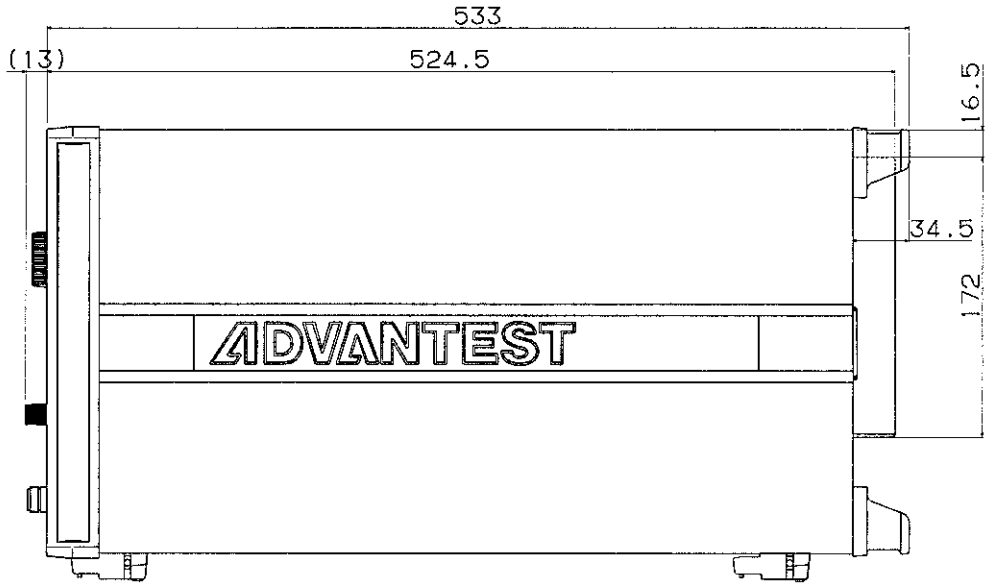
- General specifications

Numeric indicator	:	Green 7-segment LED
Storage of panel setting	:	For 2 weeks or more after used for 12 hours in use
Working temperature range	:	0°C to +40°C
Working humidity range	:	40% to +85%RH
Storage temperature range	:	-20 to +60°C
Storage humidity range	:	30% to 85%RH
Power supply	:	90 to 132V AC (standard) 198 to 250V AC (option 40) 48 to 63 Hz, Sine wave
Power consumption	:	600 VA or less
Weight	:	35 kg or less
Dimensions	:	Approx. 266 (height) x 424 (width) x 524.5 (depth) mm

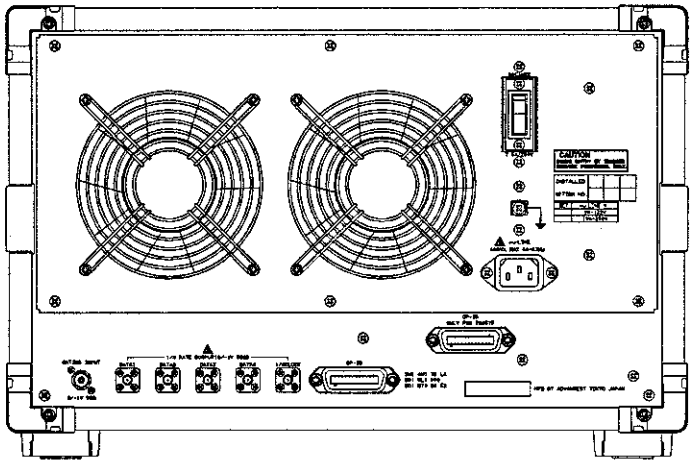
INDEX



FRONT VIEW

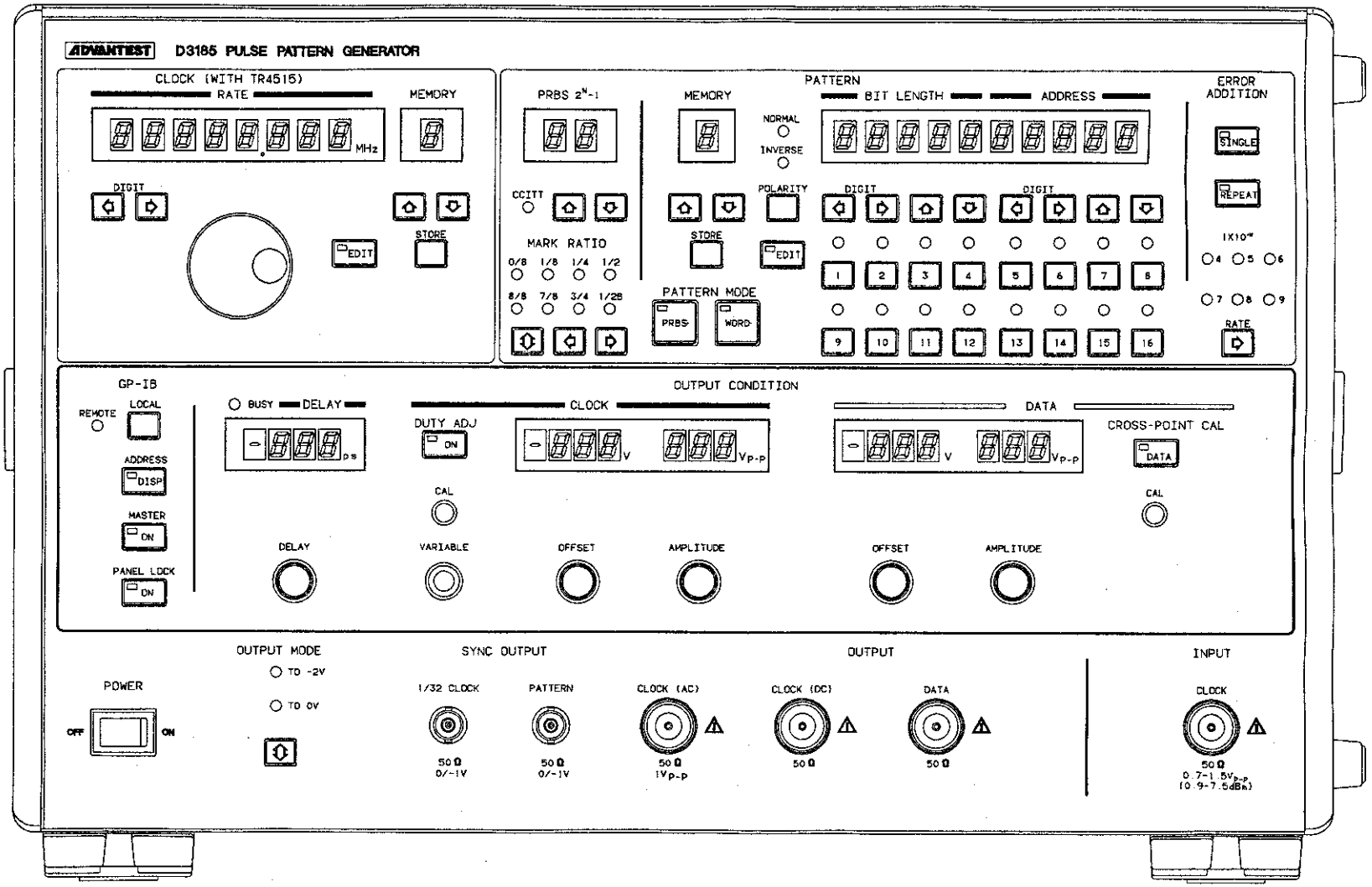


SIDE VIEW



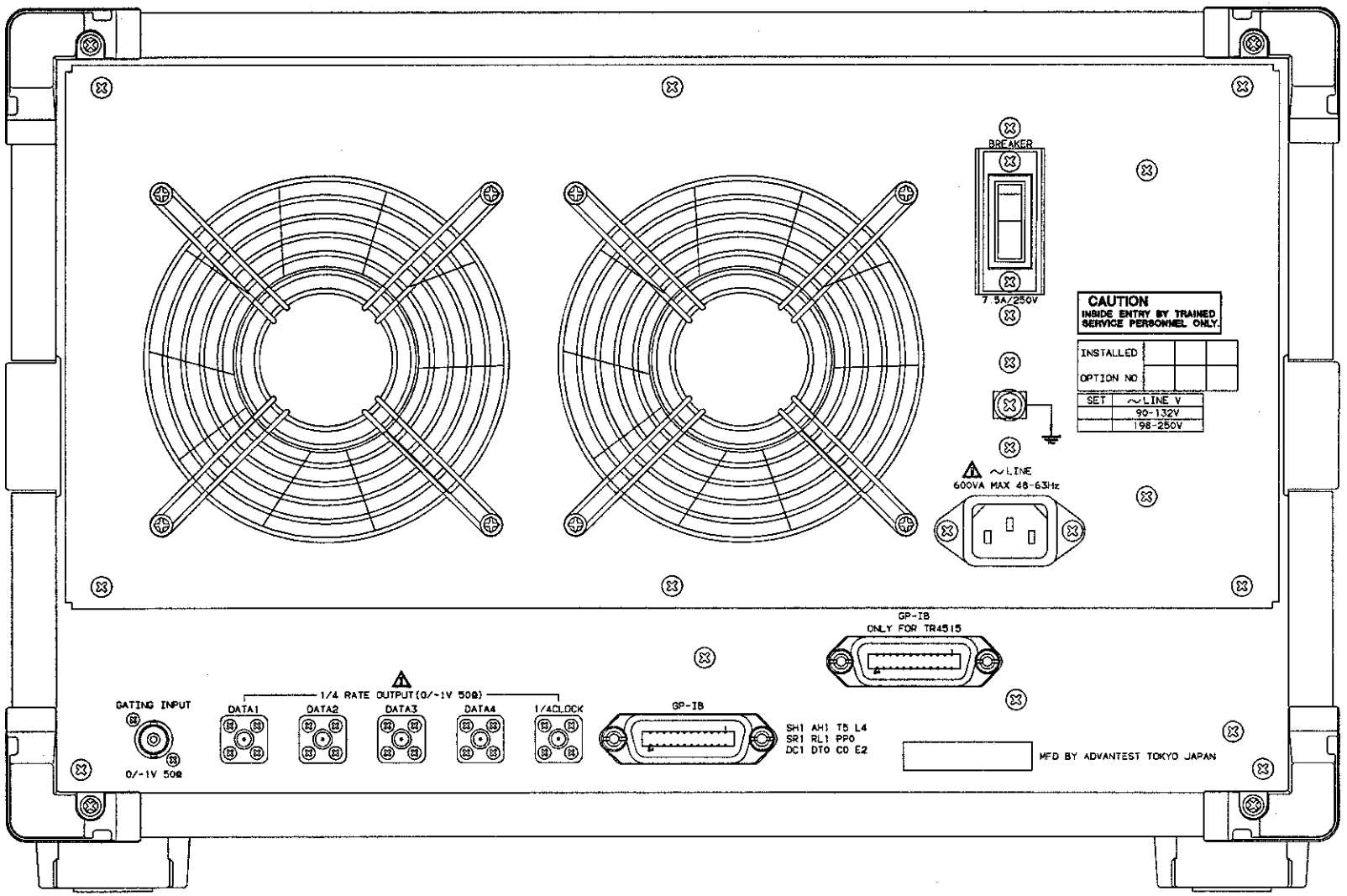
REAR VIEW

D 3185
EXTERNAL VIEW



FRONT VIEW

EXT2-9103-B



REAR VIEW

EXT3-9109-C

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

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

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