

MP1763B
Pulse Pattern Generator
Operation Manual

Fourteenth Edition

Read this manual before using the equipment.
Keep this manual with the equipment.

Digital. com Division
Measurement Solutions
ANRITSU CORPORATION


Document No.: M-W1023AE-14.0


Safety Symbols


To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Insure that you clearly understand the meanings of the symbols BEFORE using the equipment.

Some or all of the following symbols may not be used on all Anritsu equipment. In addition, there may be other labels attached to products which are not shown in the diagrams in this manual.

Safety Symbols Used in Manual

DANGER  This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

WARNING  This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

CAUTION  This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and/or in Manual

The following safety symbols are used inside or on the equipment near operation locations, and/or in manual to provide information about safety items and operation precautions. Insure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.



This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.



This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.



This indicates warning or caution. The contents are indicated symbolically in or near the triangle.



This indicates a note. The contents are described in the box.



These indicate that the marked part should be recycled.

MP1763B
Pulse Pattern Generator
Operation Manual

30 August 1995 (First Edition)
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The contents of this manual may be changed without prior notice.

WARNING

1. **ALWAYS** refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced. Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.
 2. When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, before supplying power to the equipment, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.
 3. This equipment cannot be repaired by the user. **DO NOT** attempt to open the cabinet or to disassemble internal parts. Only Anritsu-trained service personnel or staff from your sales representative with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision parts.
 4. This equipment should be used in the correct position. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.
-

CAUTION

1. **Before changing the fuses, ALWAYS remove the power cord from the poweroutlet and replace the blown fuses. ALWAYS use new fuses of the type and rating specified on the fuse marking on the rear panel of the cabinet.**

T__A indicates a time-lag fuse.

__A or F__A indicate a normal fusing type fuse.

There is risk of receiving a fatal electric shock if the fuses are replaced with the power cord connected.

2. **Keep the power supply and cooling fan free of dust.**
 - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
 - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.
 3. **Use two or more people to lift and move this equipment, or use a trolley. There is a risk of back injury, if this equipment is lifted by one person.**
-

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories including the Electrotechnical Laboratory, the National Research Laboratory of Metrology and the Communications Research Laboratory, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within 1 year after shipment due to a manufacturing fault, provided that this warranty is rendered void under any or all of the following conditions.

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to misoperation, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster including fire, flooding and earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation will not accept liability for equipment faults due to unforeseen and unusual circumstances, nor for faults due to mishandling by the customer.

Anritsu Corporation Contact

If this equipment develops a fault, contact Anritsu Corporation or its representatives at the address in this manual.

Storage medium

This instrument uses floppy disks for storing data and programs.

Incorrect use of the floppy disks or errors can cause the data stored on the medium to be erased.

Back up the floppy disk as a precaution.

Anritsu will not compensate for loss of the stored data.

Note the following points when using this instrument. Especially, do not remove the floppy disk from the drive during disk access. For details, see the main text of this manual.

- Satisfy the specified environmental conditions. Do not use this instrument in ;places subject to dirt.
- Clean head of floppy disk drive with 3.5 inch head cleaning disk set regularly.
- Keep floppy disks away from magnetized products. Do not bend the floppy disk.

Disposing of the product

The MP1763B uses chemical compound semiconductor including arsenic and timer including manganese dioxide Lithium Battery and mercury.

At the end of it's life, the MP1763B should be recycled or disposed properly.

CE Marking

Anritsu affix the CE Conformity Marking on the following product (s) in accordance with the Council Directive 93/68/EEC to indicate that they conform with the EMC directive of the European Union (EU).

CE Conformity Marking



1. Product Name/Model Name

Product Name: Pulse pattern Generator

Model Name: MP1763B

2. Applied Directive

EMC : Council Directive 89/336/EEC

Safety: Council Directive 73/23/EEC

3. Applied Standards

EMC:

Electromagnetic radiation:

EN55011 (ISM, Group 1, Class A equipment)

Immunity:

EN50082-1

IEC801-2 (ESD) 4 kVCD, 8 kVAD

IEC801-3 (Rad.) 3 V/m

IEC801-4 (EFT) 1 kV

Performance Criteria*

B

A

B

*: Performance Criteria

A: No performance degradation or function loss

B: Self-recovered temporary degradation of performance or temporary loss of function

Harmonic current emissions:

EN61000-3-2 (Class A equipment)

Safety: EN61010-1 (Installation Category II, Pollution Degree 2)

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SECTION 1

GENERAL

1.1 Features

The MP1763B Pulse Pattern Generator has two data output channels (DATA and DATA) and three clock output channels (CLOCK1, CLOCK1, CLOCK2). The MP1763B is used with the MP1764A Error Detector to test high-speed digital communication systems and high-speed semiconductors. It operates over the 50 MHz to 12.5 GHz frequency range and generates four pulse patterns: alternate, programmable, zero substitution, and pseudorandom. Programmable DATA pattern can generate data up to 8 M bits and send six STM-64(OC192) frames.

There are also seven 2^N-1 ($N=7, 9, 11, 15, 20, 23, 31$) pseudorandom patterns. The pseudorandom pattern mark ratio can be selected from among $0/8, 1/8, 1/4, 1/2, 1/2, 3/4, 7/8,$ and $8/8$. Both 50Ω GND and ECL outputs are supported. The offset and level can be varied. The clock (CLOCK1, CLOCK1) delay can also be adjusted by

Section 1 GENERAL

1.2 Specifications

Operation frequency range	Internal Clock (OPTION 01)	0.05 to 12.5 GHz
Pattern generation	PRBS	

Continuous 0 pattern can be inserted up to pattern length -1.
Patterns

Error insertion	Error ratio	1
<hr/>		
CLOCK1/CLOCK1, CLOCK2		3 systems

Section 1 GENERAL

		20ps or less (p-p)
		7% or less, or 100 mV or less, whichever is larger.
		50

1.2 Specifications

1/8 output		8 data outputs, 1 clock output
	<p>Waveform distortion</p> <p>Skew</p> <p>Output bit rate</p>	<p>300 ps or less (20-80%)</p> <p>100 ps or less (p-p)</p> <p>15% or less</p> <p>150 ps or less (relative to falling edge of 1/8 clock)</p> <p>1/8 of fundamental frequency</p> <p>50</p>

Section 1 GENERAL

Error Disable input		Error ON/OFF controlled by external input signal Error rate can be selected over this range
	Input level	0/-1 V 50

1.2 Specifications

Option-01	Name	Internal synthesizer
	Frequency range	0.05 to 12.5 GHz
	Output level	0.5 to 2.3 Vp-p
	Resolution	1 kHz/1 MHz (switchable)
	Frequency accuracy	1ppm (

Section 1 GENERAL

1.3 Options

The following options are available:

OPTION 01 Internal synthesizer

OPTION 03 1/4 SPEED OUTPUT

1.4 Composition

The standard composition of the MP1763B Pulse Pattern Generator is shown in Table 1.4-1.

Table 1.4-1 MP1763B Standard Composition

Item	No.	Name	Qty	
Main Unit	MP1763B	MP1763B Pulse Pattern Generator	1	
Accessory	J0500A	Semirigid cable (50 cm)	2	APC ¥ 3.5J-APC ¥ 3.5J 13A (2.6 m) 408JE-102 MF51NR8A Formatted *
	J0672E	Semirigid cable (10 cm)	1	
	J0496	Conversion connector	4	
	J0693	SMA cable (1 m)	1	
	J0491	Shield power cord	1	
	J0008	GPIB cable (2 m)	1	
	F0071	Fuse	2	
	Z0168	3.5 inch floppy disk (2HD)	2	
	Z0306A	Wrist strap	1	
	M-W1023AE	Operation manual	1	
	M-W1024AE	GPIB Operation manual	1	
	Z0481	12.5G/3.2G BERTS APPLICATION SOFTWARE DEMO	1	
	Application parts	MB24B	Caster	
B0163		Portable carrying case		2 pcs/set
B0171		Protective carrying case		
B0044		For mounting kit 1MW ¥ 5U		
Z0416		3.5 inch head cleaning disk		

* The capacity of the formatted type is 1,440 kilobytes. The quasi PRBS^{2¹⁰-1} patterns (mark ratio 1/2, 1/4, 1/8) are saved on one floppy disk.

SECTION 2 PREPARATIONS

2.1 Environmental Conditions of Installation Site

Do not use and store the instrument in the following locations:

- where vibrations are severe.
- where it is damp or dusty.
- where there is exposure to direct sunlight.
- where there is exposure to active gases.

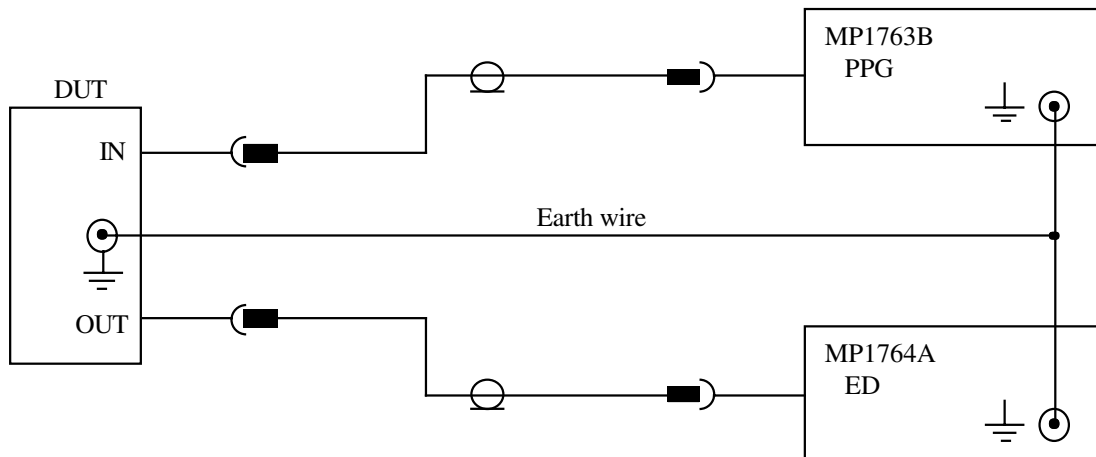
Long-term storage at high temperatures will shorten the life of the internal battery. Store the instrument below normal room temperature.

Operating temperature range 0

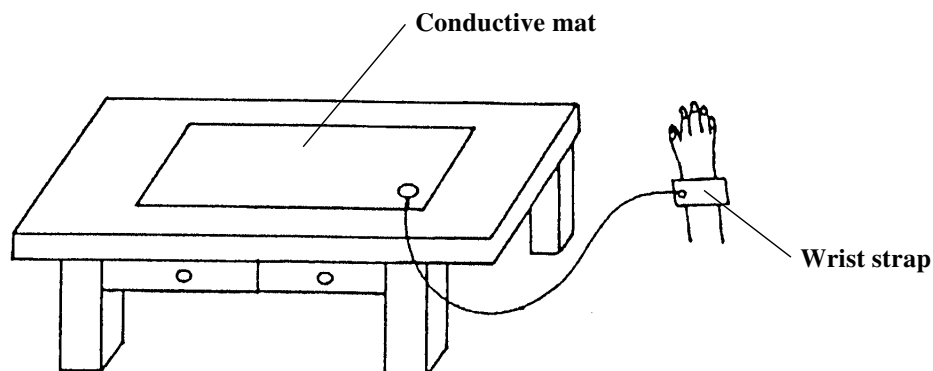
Section 2 PREPARATIONS

2.5 Damage Prevention Measures

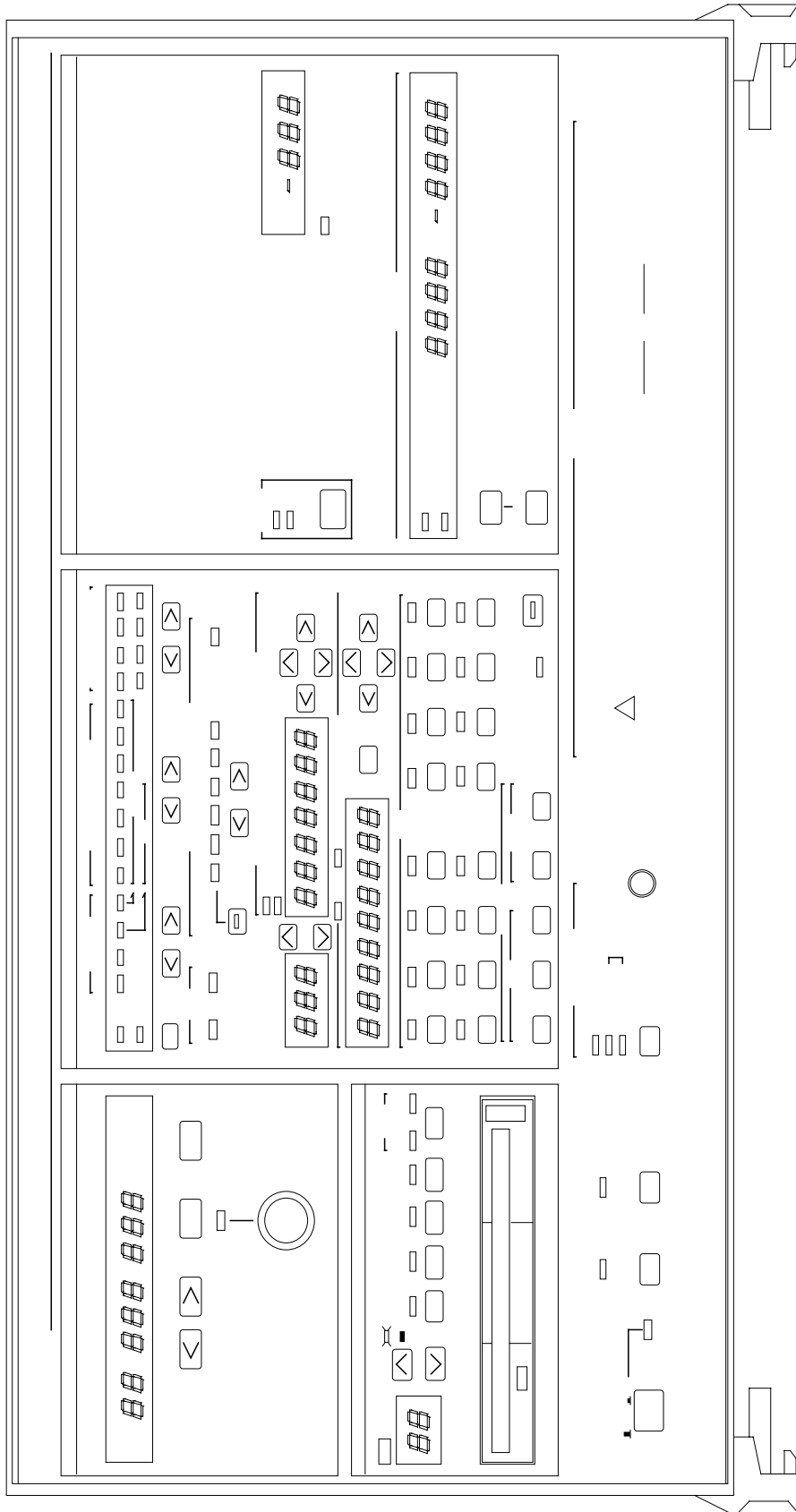
- Do not apply an excessive voltage when inputting the signal to this instrument. The circuits may be destroyed.
- Terminate the output with 50Ω . Do not feed current to the output. The load must be a 50Ω pure resistor terminated at ground potential.
- Before connecting the input and output terminals, ground the other equipment (including test circuits) with a ground wire. (Static electric countermeasure)
- The outer and inner conductors of the coaxial cable may be charged as a capacitor. Therefore, discharge them with a piece of metal before using the cable.
- This instrument contains hybrid ICs and other important circuits and parts. These parts are extremely vulnerable to static electricity. Therefore, never remove the bottom cover.
- The hybrid ICs inside this instrument are hermetically sealed. Never break this seal. If the hybrid ICs are unsealed and the instrument deteriorates performance as specified, note that the maintenance may be refused.
- Ventilation holes are drilled into the bottom cover. Be careful not to block the ventilation.



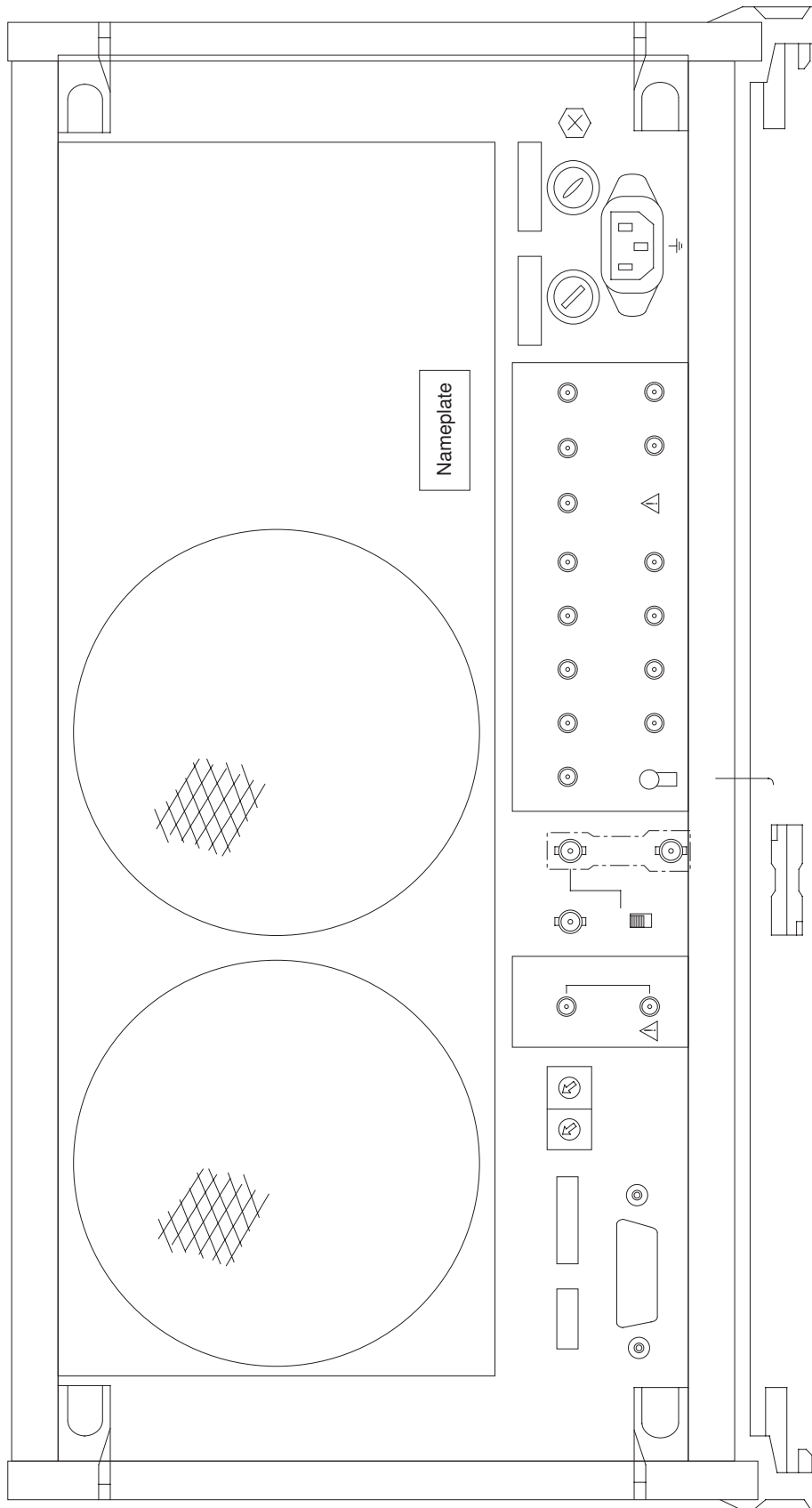
- To protect this instrument against electrostatic damage, place a conductive mat on the work bench, and wear a wrist strap. Connect the other end of the wrist strap to the conductive mat, or the GND terminal of this instrument.



SECTION 3
DESCRIPTION OF PANELS AND CONNECTORS







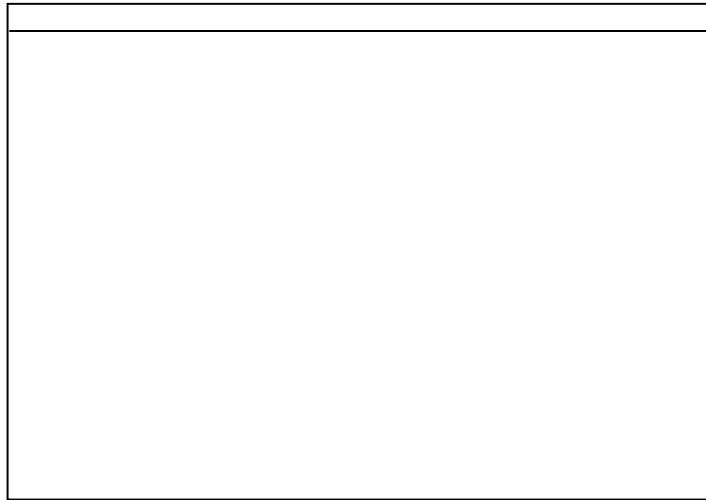


Section 3 DESCRIPTION OF PANELS AND CONNECTORS

SECTION 4 OPERATING INSTRUCTIONS

4.1 Internal Clock Generator Frequency Setting (OPTION 01)

This section sets the frequency of the internal clock generator when the CLOCK generator (OPTION 01) is used.



TUNING ON/OFF

The frequency can be changed only when the TUNING LAMP is lit.

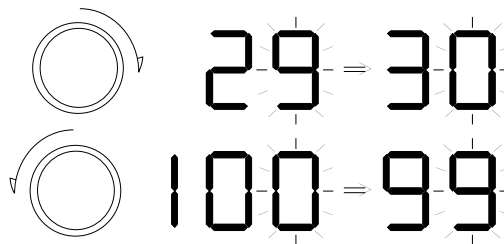
RESOLUTION

Used when setting the frequency down to the kHz order. Pressing this key again returns the setting to the MHz order.

Select the digit to be changed. The figure of the digit to be changed blinks.

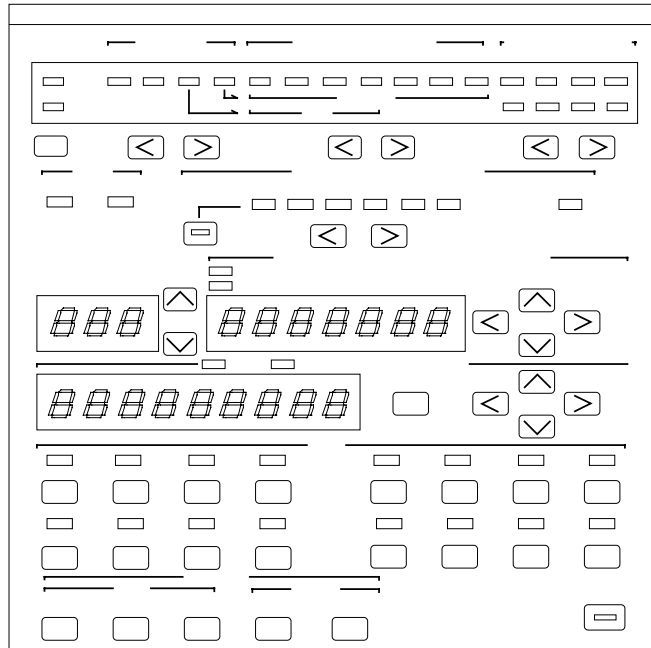
Used when changing the blinking digit.

The figure is carried over.



Section 4 OPERATING INSTRUCTIONS

4.2 Generation Pattern Setting



LOGIC	Inverts the output pattern logic.
PATTERN	Selects the output pattern type.
PRBS/ZERO SUB	Selects the kind of pseudorandom pattern. (If ZERO SUB is selected, the 2^N pattern is selected.)
Mark ratio	Selects the output pattern (pseudorandom pattern) mark ratio.
Alternate	Selects alternate pattern A or B.
Number of alternate loops	Sets the number of A or B pattern loops.
DATA length/continuous 0 bits length	Sets the DATA length. For Z.S., sets the continuous 0 bit length.
PAGE/pattern sync position	Sets the page selection (ALTN/DATA) and pattern synchronization position.
Bit setting	Sets the output pattern for each 16 bits.
Bit setting (special)	Sets all DATA to 0 or 1.
Bit setting (special)	Sets DATA to 0 or 1 in page units.
Error addition ON/OFF	Turns error addition on and off.
Error addition rate selection	Selects the error addition rate.
Single error addition	In the single error addition mode, one error is added each time this key is pressed.
Tracking ON/OFF	When tracking is turned on, the settings of the transmitter and receiver are changed at the same time (the one set as the master is followed by the other).
Display switching	Selects page display or pattern sync position display.

Section 4 OPERATING INSTRUCTIONS

4.2.1 Logic modification

Change the BIT value with the button below the LED. When LOGIC is positive, lighting of the LED indicates high level.

Used the PRESET ALL or PAGE key when changing DATA collectively.

PAGE 0 or 1 All BITS of the displayed PAGE are set to 0 or 1.

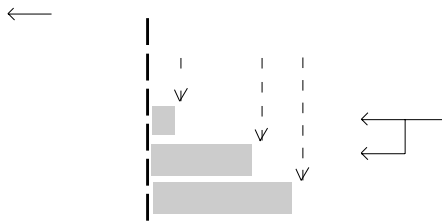
ALL 0 or 1 Pressing this key while holding down the GUARD key sets all BITS specified by DATA LENGTH to 0 or 1.

Next, set

Section 4 OPERATING INSTRUCTIONS

4.2.3 DATA pattern setting

4.2.4 ZERO SUBSTITUTION



Section 4 OPERATING INSTRUCTIONS

4.2.5 Pseudo random pattern setting

4.2.6 ERROR addition

Section 4 OPERATING INSTRUCTIONS

4.2.7 Tracking

4.2.8 Pattern SYNC. position

Select the sync output.

When VARIABLE POSITION is selected, set the SYNC OUT position as described in the following.

1/64 CLOCK, FIXED POSITION, OR VARIABLE POSITION can be selected.

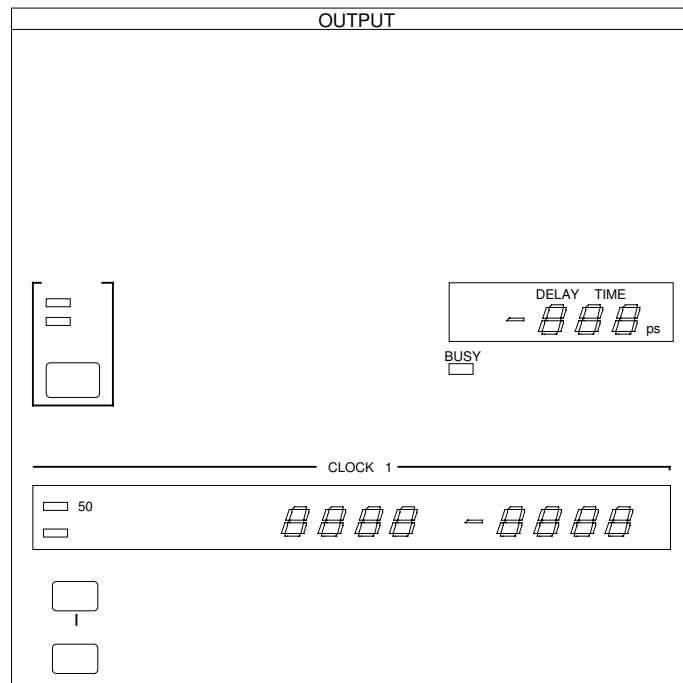
1/64 CLOCK: 1/1 CLOCK is divided by 64.

FIXED POSITION: The sync pulse output fixed on page 1 of VARIABLE POSITION is generated.

VARIABLE POSITION: The sync pulse position is shifted by 16 bits every time the PATTERN SYNC POSITION value is changed by one. The page numbers are changed by the PRBS step numbers, and all positions in one cycle can be selected by 16-bit interval.

PRBS	Value of PATTERN SYNC POSITION
2^7	

4.3 Output Interface



Termination conditions setting (DATA side)

DATA/DATA displaying switching and DATA/DATA tracking

Amplitude (DATA side)

Offset (DATA side)

Output ON/OFF

Offset display standard setting

1/1 SPEED / 1/4 SPEED display switching

CLOCK delay

Termination conditions setting (CLOCK 1 side)

Amplitude (CLOCK 1 side)

Offset (CLOCK 1 side)

Section 4 OPERATING INSTRUCTIONS

4.3.1 DUMMY terminal voltage switching

When only one of the CLOCK 1 and CLOCK 1 complementary outputs is used, use the attached semirigid cable (10 cm) to connect the unused side to the DUMMY terminal.

If the termination condition of the side used is 50

4.3.2 Amplitude, offset, and delay setting

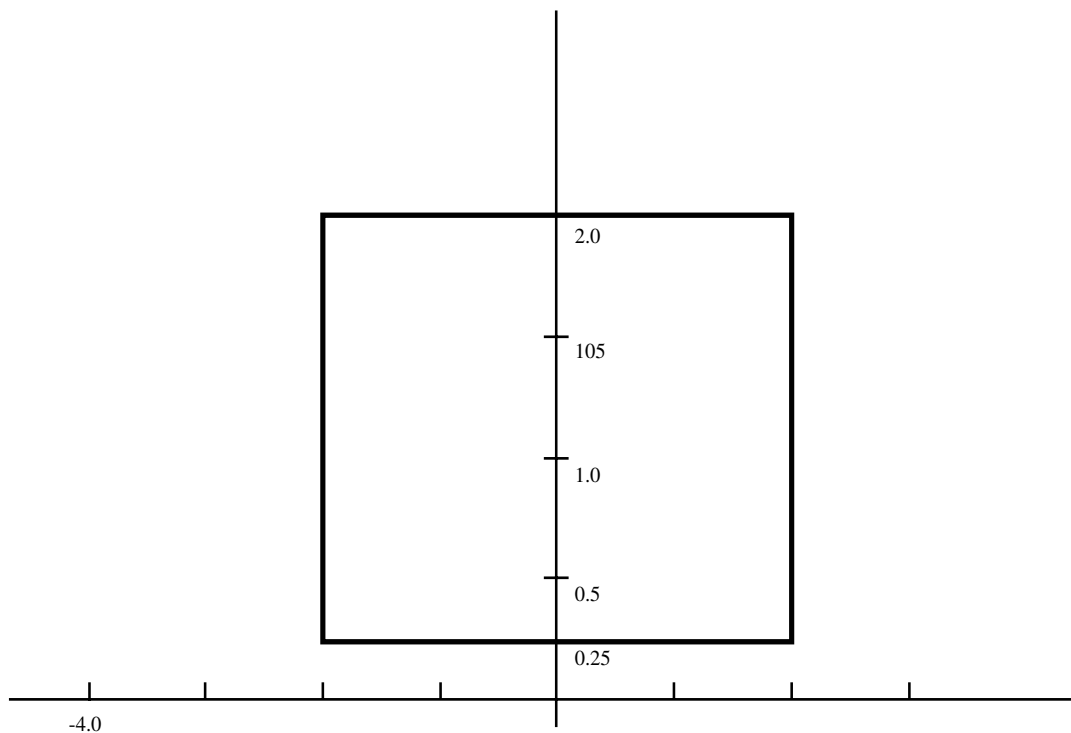
Section 4 OPERATING INSTRUCTIONS

Section 4 OPERATING INSTRUCTIONS

4.3.5 Offset voltage setting range

Fig. 4.3.5-1 Offset Reference Value and Amplitude Change

Note: Since the offset-voltage upper and lower limit values are limited by V_{OH} (-2.0 V



Section 4 OPERATING INSTRUCTIONS

• Offset reference: V_{TH}

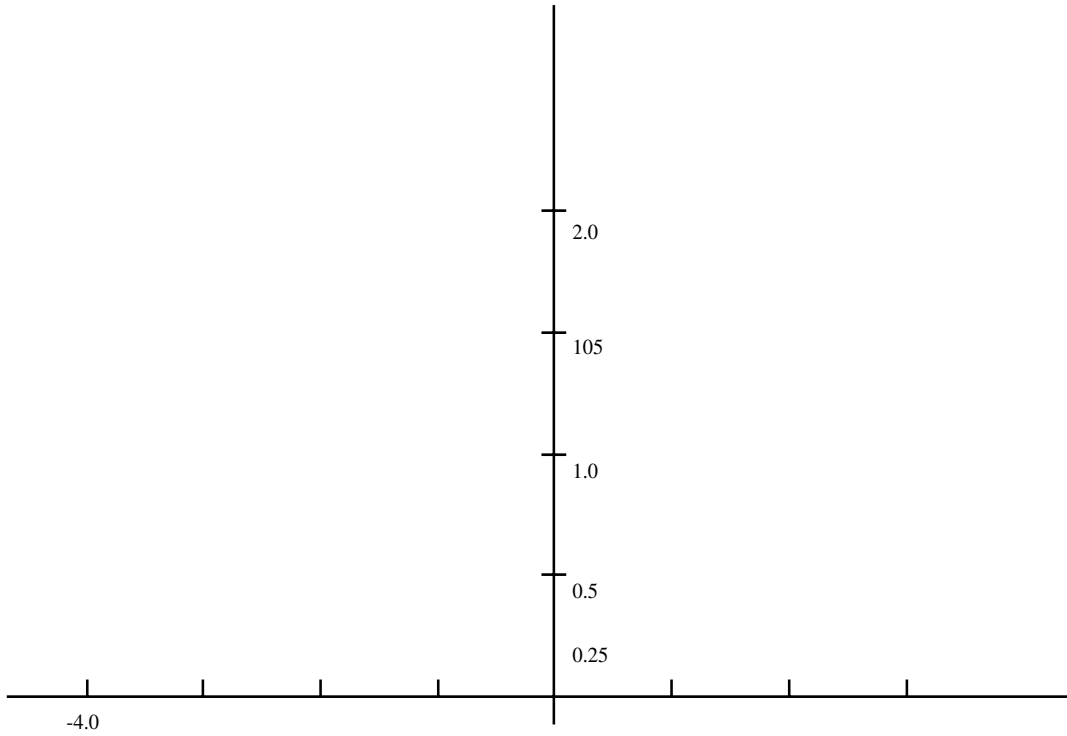


Fig. 4.3.5-3 Amplitude and Offset Voltage Setting Range Corresponding to Offset Reference Value

• Offset reference: V_{OL}

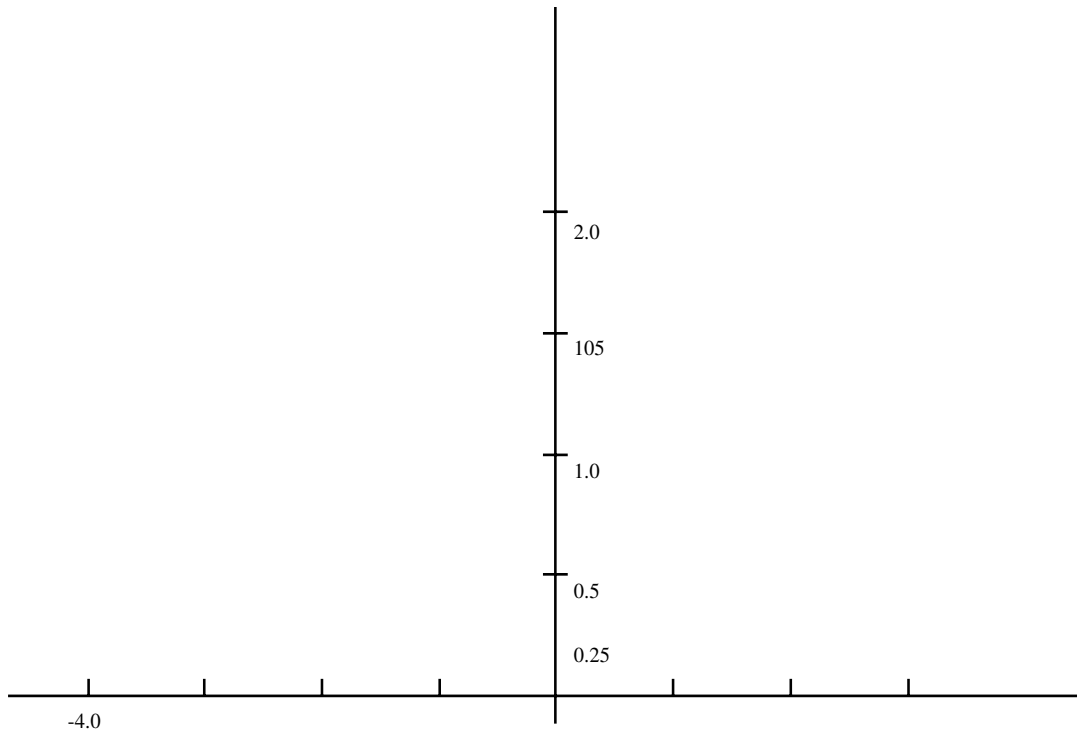
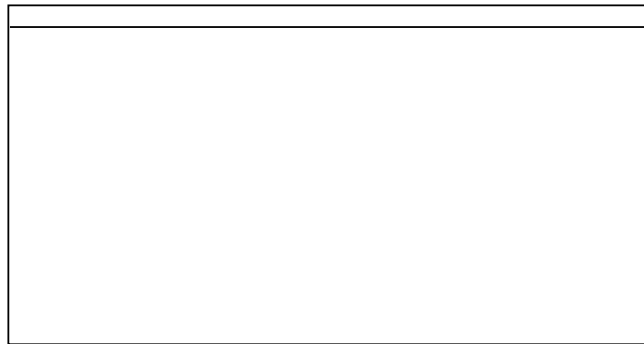


Fig. 4.3.5-4 Amplitude and Offset Voltage Setting Range Corresponding to Offset Reference Value

Section 4 OPERATING INSTRUCTIONS

4.4 MEMORY (Floppy Disk)



File No. selection

File control

Mode selection

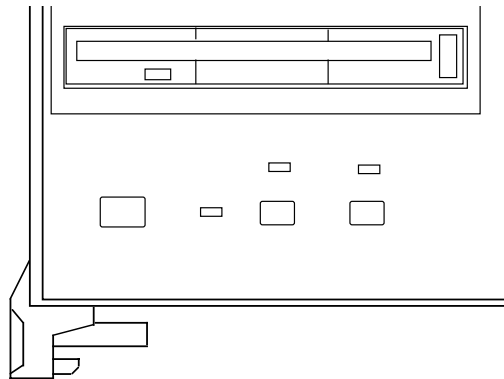
Eject

4.4.1 File save

Section 4 OPERATING INSTRUCTIONS

4.4.2 File recall

4.4.4 File deletion



Item	Initial setting
FREQUENCY	12, 500 MHz
TUNING	ON
MEMORY	00 (PTN mode, FILE NO. mode)
PATTERN	PRBS $2^{15}-1$, MARK RATIO 1/2
LOGIC	POS
ERR ADDITION	OFF
OFFSET	VOH
DATA TERM	GND
DATA AMPLITUDE	1.0 V _{p-p}
DATA OFFSET	0V
CLOCK TERM	GND
CLOCK AMPLITUDE	1.0 V _{p-p}
CLOCK OFFSET	0V
CLOCK DELAY	0ps
OUTPUT	OFF
DISPLAY	1/1 SPEED

Section 4 OPERATING INSTRUCTIONS

4.6 Functions of the FUNCTION Switch

Table 4.6-1 lists the functions of the FUNCTION switch on the rear of the instrument.

Table 4.6-1 Functions of the FUNCTION Switch

SW	Item	Function															
1	AND bit shift count for the mark ratio	0: 1 bit 1: 3 bits															
2	External error injection	0: OFF 1: ON															
3	Floppy disk format type	0: 1440/720KB 1: 1232/640KB															
4	Alternate pattern A/B switching timing	0: INTERNAL 1: EXTERNAL															
5, 6	Bit shift number for Alternate A/B select timing	<table border="0"> <tr> <td>SW6</td> <td>SW5</td> <td></td> </tr> <tr> <td>0</td> <td>0</td> <td>: 0 BIT</td> </tr> <tr> <td>0</td> <td>1</td> <td>: 1 BIT</td> </tr> <tr> <td>1</td> <td>0</td> <td>: 2 BIT</td> </tr> <tr> <td>1</td> <td>1</td> <td>: 3 BIT</td> </tr> </table>	SW6	SW5		0	0	: 0 BIT	0	1	: 1 BIT	1	0	: 2 BIT	1	1	: 3 BIT
SW6	SW5																
0	0	: 0 BIT															
0	1	: 1 BIT															
1	0	: 2 BIT															
1	1	: 3 BIT															

SECTION 5

PRINCIPLES OF OPERATION

5.1 Pseudorandom Pattern (PRBS Pattern)


The principle of pseudorandom pattern generation is shown in Table 5.1-1. The pseudorandom pattern is represented by the Nth-order generation polynomial shown in Table 5.1-1. One period is 2^N-1 . A PRBS pattern with a 2^N-1 period produces one N bits continuous “1” pattern per period.

When LOGIC is set to POS (positive logic), PRBS pattern output level “1” corresponds to low level and “0” corresponds to High level.

The PRBS pattern mark ratio is generated by the block shown in Fig. 5.1-1. There are four mark ratios of 1/2, 1/4, 1/8, and 0/8 (all 0). For 1/4 and 1/8, 1-bit shift or 3 bit shift can be selected using the Dip switch on the rear of the instrument, depending on the generation method (see section 4.6, “Functions of the FUNCTION Switch”).

When the rear panel 1/8 SPEED output is a PRBS pattern, a pattern is produced train as shown in Fig. 5.1-2.

Table 5.1-1 Principle of Pseudorandom Pattern Generation

Period	Generation polynomial	Pattern generation block diagram
		

Section 5 PRINCIPLES OF OPERATION

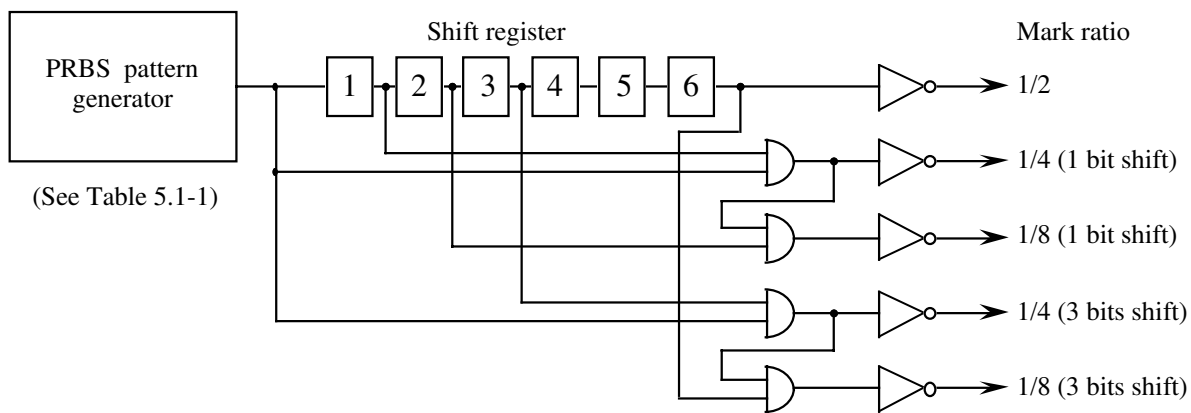


Fig. 5.1-1 Mark Ratio 1/4, 1/8 Pattern Generator

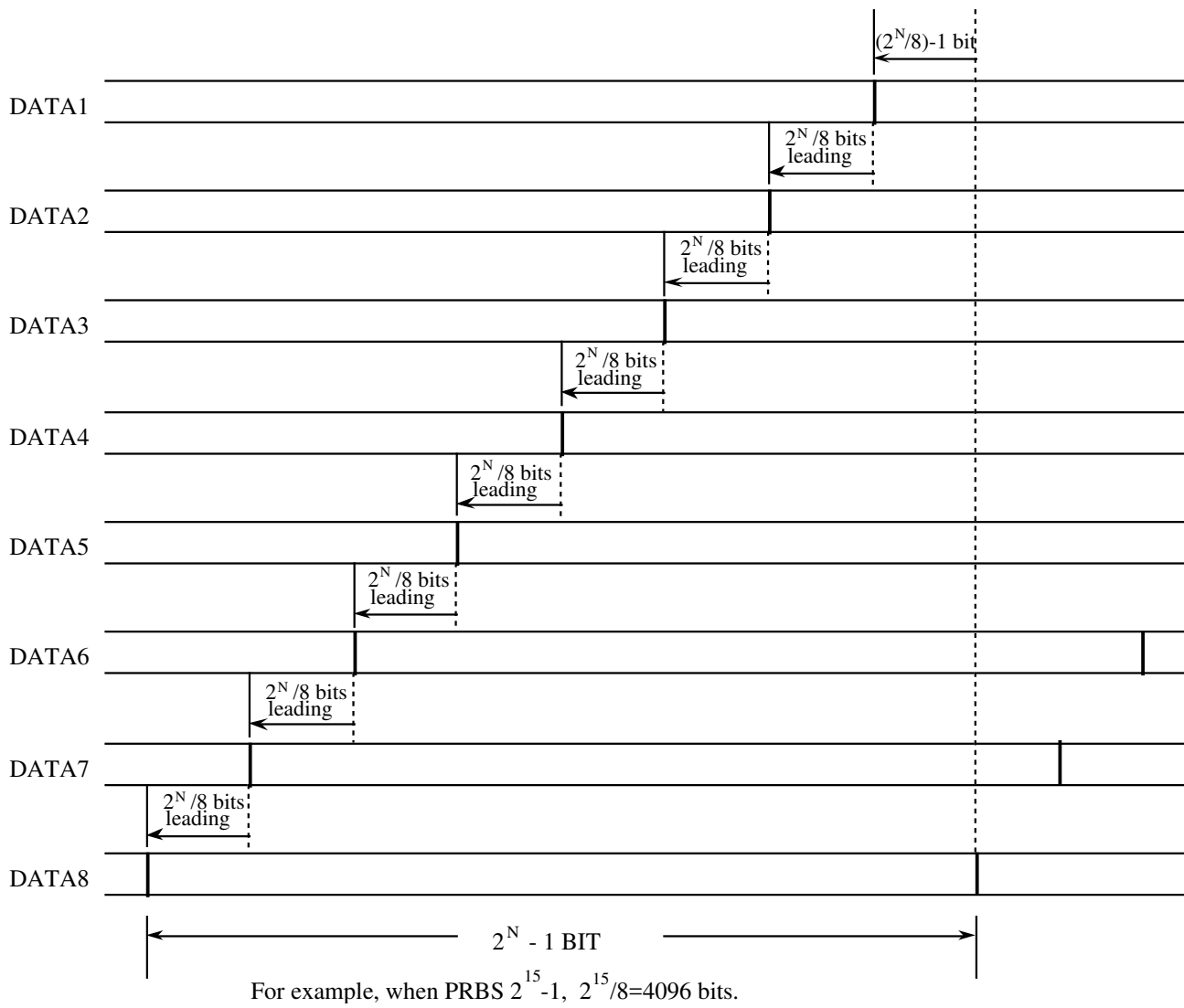
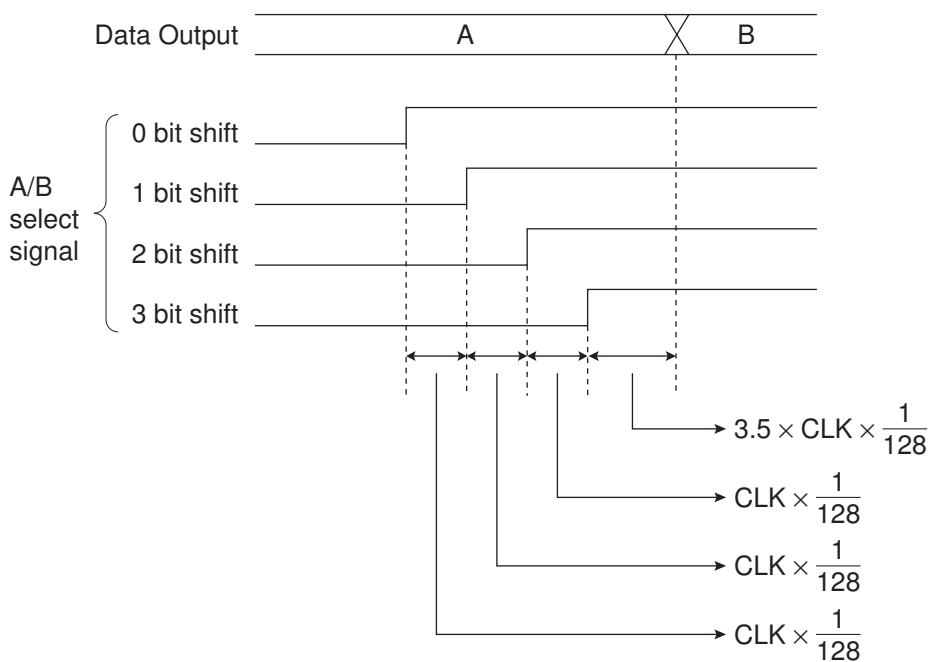


Fig. 5.1-2 Example of Pseudorandom Pattern

Section 5 PRINCIPLES OF OPERATION

5.3 Bit shift for Alternate A/B select timing

A timing between Alternate pattern A/B select signal and Data output can be selected using the Dip switch on the rear of the instrument, and its selection step is one 128th of setting frequency.



SECTION 6

PERFORMANCE TEST

6.1 Test Equipment

- Error detector (12.5 GHz or more measurement possible)
- Sampling oscilloscope (bandwidth 50 GHz or more)
- Clock generator (capable of covering the 0.05 to 12.5 GHz range)

Section 6 PERFORMANCE TEST

6.3 Test Method

Connect the MP1763B DATA and CLOCK1 connectors to the error detector as shown in 6.2-(1).

Set Error Free at the setting shown below.

Pattern	LOGIC		POS
	PRBS		$2^{31}-1$
	Mark ratio		1/2
Output	DATA	amplitude	0.5 Vp-p
		offset	0 Vp-p
	CLOCK	amplitude	0.5 Vp-p
		offset	0.0 V _{OH}
		Delay	0 ps

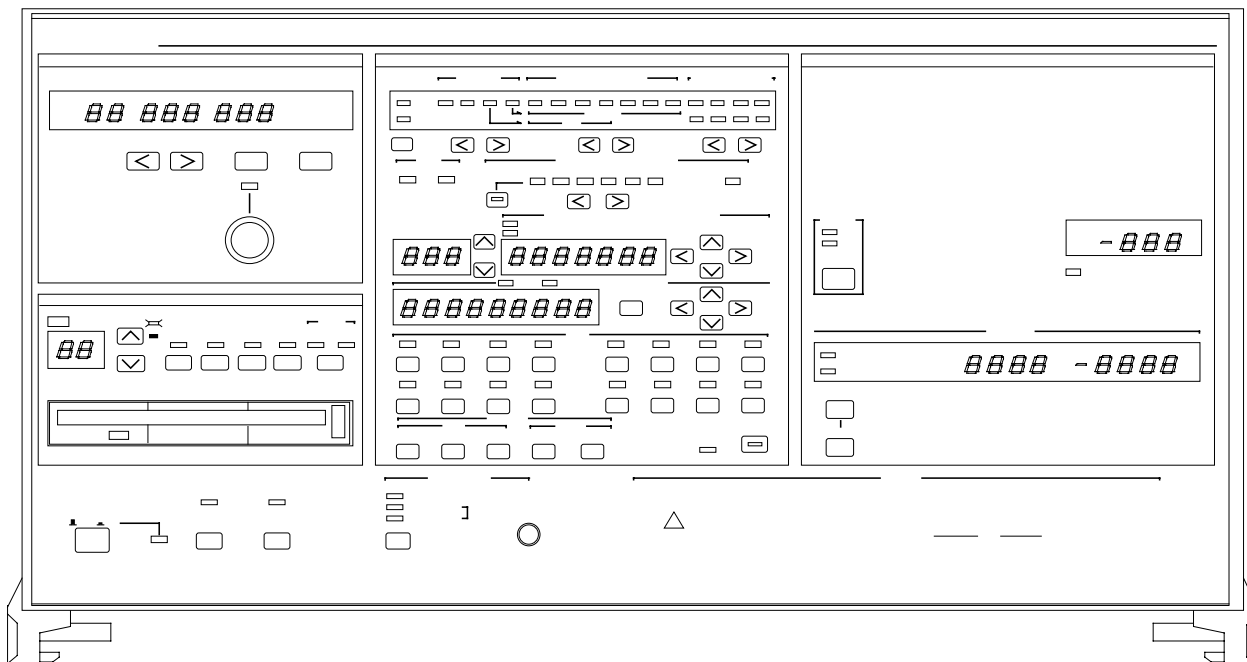


Fig. 6.3-1 Connection of front panel

Set the Error Detector to the same conditions as the MP1763B or set the margin to maximum. Confirm that the following points are Error Free:

Frequency	50 MHz, 1 GHz, 3 GHz, 5 GHz, 12.5 GHz
Amplitude	0.25 Vp-p, 2.0 Vp-p
Offset	0V _{OH} , -V _{OH} , +2 V _{OH}
Mark ratio	1/2, 1/8, 1/2, 7/8

Check DATA and CLOCK1 in the same way. However, since CLOCK is inverted, invert the detector CLOCK polarity.

Check the 1/8 SPEED output with the connection shown at the below.

Pattern	LOGIC	POS
	PRBS	$2^{31}-1$
	Mark ratio	1/2

Check all the outputs with the connections DATA1

Section 6 PERFORMANCE TEST

SECTION 7

CALIBRATION

This instrument cannot be calibrated except by the manufacturer. To guarantee performance, periodic calibration is recommended.

When a problem is encountered at the performance test described in the preceding section, please contact our Service Department.

Section 7 CALIBRATION

SECTION 8 MAINTENANCE

8.1 Daily Maintenance

The daily maintenance method and maintenance period are shown in Table 8.1-1.

Table 8.1-1

Item	Period	Maintenance method
External dirt	• Before long-term storage	Wipe with a cloth dipped in a dilute neutral cleanser.
Adhesion of dust	• When used in a dusty place	Blow off with compressed air. Clean head of floppy disk drive with 3.5 inch head cleaning disk set.
Loosening of parts installed with screws, etc.	• When detected	Retighten with the prescribed tool.

8.2 Preparation for Shipment

When shipping this instrument, if the packing material was saved when the instrument was unpacked, use it to repack the instrument. If the packing material was not saved, pack the instrument as described below. When handling the instrument, always wear clean gloves and handle it gently so that it does not get dented or otherwise damaged.

- (a) Remove dirt and dust from the outside of the instrument with a dry cloth.
- (b) Check that there are no loose or missing screws.
- (c) Protect parts that protrude or may be easily deformed and wrap the instrument in a polyethylene sheet. Also wrap it in waterproofing paper, etc.
- (d) Place the wrapped instrument in a cardboard box and seal the box with adhesive tape. Also consider the shipping distance, shipping means, etc. and place the instrument in a wood crate, as required.

Section 8 MAINTENANCE

SECTION 9

TROUBLESHOOTING AND REPAIR

9.1 Before Considering Trouble

If the instrument is not operating properly for some reason, check it as follows:

- **Power is not turned on**

Section 9 TROUBLESHOOTING AND REPAIR

- **Floppy disk drive is not used.**