MP8931A
Bit Error Rate Tester
Operation Manual

14th Edition

> For safety and warning information, please read this manual before attempting to use the equipment.
> Keep this manual with the equipment.

ANRITSU CORPORATION

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. Ensure that you clearly understand the meanings of the symbols BEFORE using the equipment. Some or all of the following symbols may be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.

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 in Manual

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure 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 a 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.

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For Safety

⚠ WARNING

- ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the advice in the operation manual is not followed there is a risk of personal injury or reduced equipment performance. The alert mark shown on the left may also be used with other marks and descriptions to indicate other dangers.

- Overvoltage Category
  This equipment complies with overvoltage category II defined in IEC 61010. DO NOT connect this equipment to the power supply of overvoltage category III or IV.

For Safety

⚠ **WARNING**

Electric Shock

- To ensure that the equipment is grounded, always use the supplied 3-pin power cord, and insert the plug into an outlet with an ground terminal. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock or causing damage to the internal components.

Repair

WARNING ⚠

- Only qualified service personnel with a knowledge of electrical fire and shock hazards should service this equipment. This equipment cannot be repaired by the operator. DO NOT attempt to remove the equipment covers or unit covers or to disassemble internal components. 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 components.

Calibration

- The performance-guarantee seal verifies the integrity of the equipment. To ensure the continued integrity of the equipment, only Anritsu service personnel, or service personnel of an Anritsu sales representative, should break this seal to repair or calibrate the equipment. Be careful not to break the seal by opening the equipment or unit covers. If the performance-guarantee seal is broken by you or a third party, the performance of the equipment cannot be guaranteed.

Falling Over

- This equipment should always be positioned in the correct manner. 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.
  Always set up the equipment in a position where the power switch can be reached without difficulty.

For Safety

⚠ CAUTION

Fuse Replacement

CAUTION ⚠

- Always remove the mains power cable from the power outlet before replacing blown fuses. There is a risk of electric shock if fuses are replaced with the power cable connected. Replace the fuses with the same type. Failure to do so may result in fire.

    T3.15A indicates a time-lag fuse.

Cleaning

- Always remove the main power cable from the power outlet before cleaning dust around the power supply and fan.
    - 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.

Check Terminal

- Never input a signal of more than the indicated value between the measured terminal and ground. Input of an excessive signal may damage the equipment.

Use in a residential environment

- This equipment is designed for an industrial environment.
In a residential environment this equipment may cause radio interference in which case the user may be required to take adequate measures.

Use in Corrosive Atmospheres

- Exposure to corrosive gases such as hydrogen sulfide, sulfurous acid, and hydrogen chloride will cause faults and failures.
Note that some organic solvents release corrosive gases.

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 National Institute of Advanced Industrial Science and Technology, and the National Institute of Information and Communications Technology, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation provides the following warranty against stoppages arising due to manufacturing error, and against problems with operation occurring even though the procedures outlines in the operation manual were followed.

Hardware:
Problems occurring within a period of one year from the date of delivery will be corrected by Anritsu Corporation at no cost to the user.

Software:
Software reported as faulty within a period of 6 months from the date of delivery will be corrected or replaced by Anritsu Corporation at no cost to the user.
Following correction or replacement the software will remain under warranty for either the remainder of 6 months from the date of initial delivery, or for a period of 30 days, whichever is shorter.
The hardware and software warranties are not valid under any of the following conditions:

- The fault is outside the scope of the warranty conditions separately described in the operation manual.
- The fault is due to mishandling, 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, wind, flooding, earthquake, lightning strike, or volcanic ash, etc.
- The fault is due to damage caused by acts of destruction, including civil disturbance, riot, or war, etc.
- The fault is due to explosion, accident, or breakdown of any other machinery, facility, or plant, etc.
- The fault is due to use of non-specified peripheral or applied equipment or parts, or consumables, etc.

- The fault is due to use of a non-specified power supply or in a non-specified installation location.
- The fault is due to use in unusual environments[Note].
- The fault is due to activities or ingress of living organisms, such as insects, spiders, fungus, pollen, or seeds.

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

Anritsu Corporation shall assume no liability for injury or financial loss of the customer due to the use of or a failure to be able to use this equipment.

Note:
For the purpose of this Warranty, "unusual environment" means use:
- In places of direct sunlight
- In dusty places
- Outdoors
- In liquids, such as water, oil, or organic solvents, and medical fluids, or places where these liquids may adhere
- In salty air or in places where chemically active gases (SO_2, H_2S, Cl_2, NH_3, NO_2, or HCl, etc.) are present
- In places where high-intensity static electric charges or electromagnetic fields are present
- In places where abnormal power voltages (high or low) or instantaneous power failures occur
- In places where condensation occurs
- In the presence of lubricating oil mists
- In places at an altitude of more than 2,000 m
- In the presence of frequent vibration or mechanical shock, such as in cars, ships, or airplanes

Anritsu Corporation Contact

In the event that this equipment malfunctions, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the CD version.

Crossed-out Wheeled Bin Symbol

Equipment marked with the Crossed-out Wheeled Bin Symbol complies with council directive 2002/96/EC (the "WEEE Directive") in European Union.

For Products placed on the EU market after August 13, 2005, please contact your local Anritsu representative at the end of the product's useful life to arrange disposal in accordance with your initial contract and the local law.

CE Conformity Marking

Anritsu affixes the CE conformity marking on the following product(s) in accordance with the Council Directive 93/68/EEC to indicate that they conform to the EMC and LVD directive of the European Union (EU).

CE marking

1. Product Model

Model:　　　　MP8931A Bit Error Rate Tester

2. Applied Directive

EMC:　Directive 2004/108/EC

LVD:　Directive 2006/95/EC

3. Applied Standards

- EMC: Emission:　EN 61326-1: 2006 (Class A)

  Immunity:　EN 61326-1: 2006 (Table 2)

	Performance Criteria*
IEC 61000-4-2 (ESD)	B
IEC 61000-4-3 (EMF)	A
IEC 61000-4-4 (Burst)	B
IEC 61000-4-5 (Surge)	B
IEC 61000-4-6 (CRF)	A
IEC 61000-4-11 (V dip/short)	B, C

*: Performance Criteria

A: During testing, normal performance within the specification limits.

B: During testing, temporary degradation, or loss of function or performance which is self-recovering.

C: During testing, temporary degradation, or loss of function or performance which requires operator intervention or system reset occurs.

Harmonic current emissions:

    EN 61000-3-2: 2006 +A1:2009 A2:2009

    (Class A equipment)

    : No limits apply for this equipment with an active input power under 75 W.

- LVD: EN 61010-1: 2010 (Pollution Degree 2)

4. Authorized representative

Name:	Murray Coleman
	Head of Customer Service EMEA
	ANRITSU EMEA Ltd.
Address, city:	200 Capability Green, Luton
	Bedfordshire, LU1 3LU
Country:	United Kingdom

C-Tick Conformity Marking

Anritsu affixes the C-Tick mark on the following product(s) in accordance with the regulation to indicate that they conform to the EMC framework of Australia/New Zealand.

C-Tick mark

N274

1. Product Model

       Model: MP8931A Bit Error Rate Tester

2. Applied Standards

       EMC:Emission: EN 61326-1: 2006 (Class A equipment)

Power Line Fuse Protection

For safety, Anritsu products have either one or two fuses in the AC power lines as requested by the customer when ordering.

Single fuse: A fuse is inserted in one of the AC power lines.

Double fuse: A fuse is inserted in each of the AC power lines.

Example 1:   An example of the single fuse is shown below:
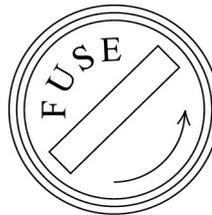
Fuse Holder

Example 2:   An example of the double fuse is shown below:

Fuse Holders
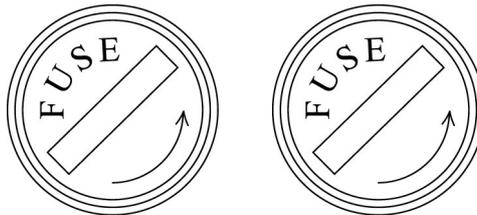
About This Manual

This operation manual explains the operation and maintenance of the MP8931A Bit Error Rate Tester.   Overview of basic functions and operations of the MP8931A are described in Section 1 "Outline."

Further details are given in subsequent sections in order easy to search.

Table of Contents

IV.

Section 1   Outline

This section describes the functional outline and features of the MP8931A Bit Error Rate Tester.

For performance and function specifications, refer to Appendix A.

1.1 About MP8931A Bit Error Rate Tester

The MP8931A has digital broadcast interfaces (DVB-ASI, DVB-SPI) in addition to the general bit-error-rate test function. It is suitable for quality evaluation at device production/construction and for maintenance after installation.

1.2 Features

(1) Standard I/O interface for digital broadcasting
The MP8931A is equipped with the following I/O interfaces for digital broadcasting as standard:
DVB-SPI (Digital Video Broadcast - Synchronous Parallel Interface)
DVB-ASI (Digital Video Broadcast - Asynchronous Serial Interface)

(2) Transmitting/Receiving packets
Up to 6 types of packets can be selected.

(3) DVB-ASI interface output rate setting
Outputting packet data rate can be set.

(4) Remote control
Remote control can be performed via GPIB or RS-232C interface.

1.3 Function

(1) Measuring error rate, number of errors and total number of received data
Measures total number of bits and number of error bits within received data to display error rate.

- Error rate display:
  Calculates error rate from total number of bits and number of error bits within received data, and displays it
- Error bits/total bits display:
  Displays number of error bits and total number of bits within received data in "number of error bits/total number of bits" format.

(2) Error addition function
Manual/continuous error addition possible.

(3) External clock input
Sends data that is synchronized with external clock.   However, this function is disabled when using DVB-ASI interface.

(4) Other

- Screen control:
  Brightness control and auto off setting of display are possible.
- Remote control:
  Control including setting measurement parameters, starting measurement and obtaining measured results can be performed via GPIB and RS-232C interfaces.
- Auto data save:
  Parameters and measurement conditions before power off are automatically saved in the internal memory to enable measurement under the same conditions after next power on.

1.4 Product Composition

This section describes the device composition with the MP8931A standard accessories.

1.4.1 Standard composition

Standard composition of the MP8931A is shown in the table below.
First, after opening the box, check that all items are included using the packing list.
Should you find that an item is missing or damaged, immediately contact Anritsu Corporation or one of our dealers.

Table 1.4.1-1

	Product name	Qty.	Model name or ordering No.	Remarks
Main unit	Bit Error Rate Tester	1	MP8931A	
Accessories	Power cord	1		
	Fuse	1	F0012	3.15A
	Operation Manual	1	W2249AE	

1.4.2 Optional parts

Table 1.4.2-1

Product name	Model name or ordering No.	Remarks
Protective cover	B0329A	
D-sub 25 cable	J1011	
Coaxial cord	J0026A	1 m
408JE-104 GPIB cable	J0007	1 m
408JE-102 GPIB cable	J0008	2 m
RS-232C cable	J1256A	1.5 m (Straight)
RACK MOUNT KIT	B0333A	

Section 2   Before Use

This section describes points that should be known before use.

2.1 Installing

Install MP8931A after you have taken it from a package box and have checked the packed items. This section describes how to install it and precautions before use.

2.1.1 Carrying unit

When carrying the MP8931A, hold both the right and left grips to keep the unit level.

⚠ CAUTION

- **Never carry the unit while the power is on. This may damage the internal circuits and result in fire, electric shock and/or failure.**

- **Carry the MP8931A by holding both grips to keep the unit level. Carrying by holding only one grip puts excess strain on internal precision components and may result in damage.**

2.1.2 Installing unit

Install the MP8931A horizontally in a stable place at an ambient temperature of 0 to 50°C. Install where the cooling vents on rear panel are at least 10 cm from walls, peripherals, or other obstructions so as not to block the air flow through the vents.

⚠ CAUTION

Never block the MP8931A internal ventilation, otherwise the internal temperature will rise, causing fire. Avoid the following uses:

- **In an upright position (on side).**

- **With the unit covered.**

- **With the fan or vents blocked by dust.**

Good   Bad   Bad   Bad
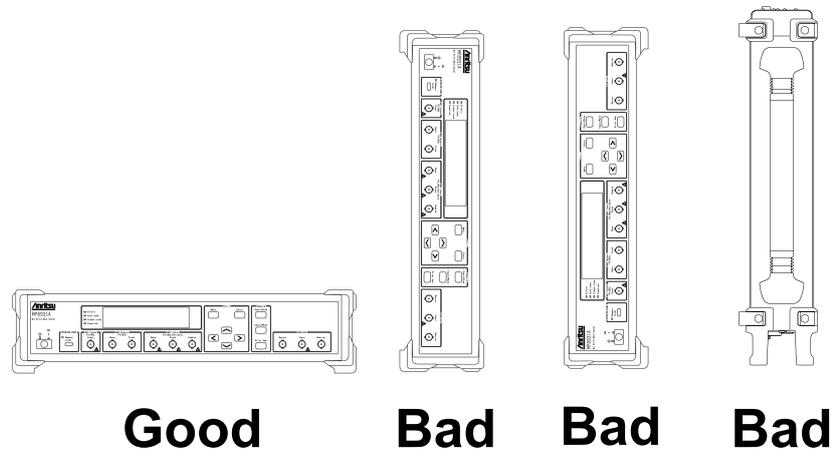
Figure 2.1.2-1   Installation Orientation

⚠ CAUTION

If the MP8931A is not installed in a Good direction as above, a small shock may turn it over and harm the user.

⚠ **CAUTION**

Avoid use or storage in locations, such as the following, since it may cause failure.

- **In direct sunlight for extended periods**
- **Outdoors**
- **In excessively dusty locations**
- **In liquids, such as water, oil, organic solvents, and medical fluids, or places where these liquids may adhere**
- **In salty air or where chemically active gases (SO_2, H_2S, Cl_2, NH_3, NO_2, or HCl, etc.) are present**
- **Where toppling over may occur**
- **Where static electric charges or high electromagnetic fields are present**
- **Where abnormal power voltages (high or low) occur**
- **In the presence of lubricating oil mists**
- **Where condensation occurs**
- **In places at an altitude of more than 2,000 m**
- **In the presence of frequent vibration or mechanical shock, such as in cars, ships, or airplanes**

2.1.3 Stacking units

When stacking two units on top of each other, ensure that the feet of the top unit are locked into the four adjusters on the top panel of the bottom unit. Secure the two units together with a strong strap to prevent them toppling over.

2.1.4 Mounting units in rack

An optional rack mount kit is required to mount units in a rack. For details on rack mounting, refer to the instructions supplied with the rack mount kit.

2.2   Power Connection

This section describes the procedures for supplying power.

2.2.1   Power Requirements

For normal operation of the instrument, observe the power voltage range described below.

Power source	Voltage range	Frequency
100 Vac system	100 to 120 V	50 to 60 Hz
200 Vac system	200 to 240 V	50 to 60 Hz

Vac-system changeover is automatically made between 100 Vac and 200 Vac.

⚠ CAUTION

Supplying power exceeding the above range may result in electrical shock, fire, failure, or malfunction.

2.2.2   Connecting the Power Cord

Check that the main power switch on the front panel is turned off (switched to the (O) side).

Insert the power plug into an outlet, and connect the other end to the power inlet on the rear panel. To ensure that the instrument is grounded, always use the supplied 3-pin power cord, and insert the plug into an outlet with a ground terminal.

Ground hole
Ground pin
Plug
3-pin power cord
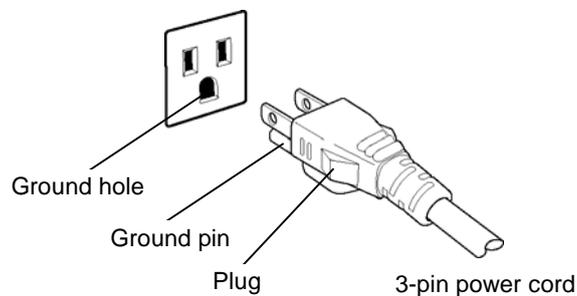
⚠ WARNING

Always connect the instrument to a properly grounded outlet. Do not use the instrument with an extension cord or transformer that does not have a ground wire.

If the instrument is connected to an ungrounded outlet, there is a risk of receiving a fatal electric shock. In addition, the peripheral devices connected to the instrument may be damaged.

Unless otherwise specified, the signal-connector ground terminal, like an external conductor of the coaxial connector, of the instrument is properly grounded when connecting the power cord to a grounded outlet. Connect the ground terminal of DUT to a ground having the same potential before connecting with the instrument. Failure to do so may result in an electric shock, fire, failure, or malfunction.

⚠ CAUTION

If an emergency arises causing the instrument to fail or malfunction, disconnect the instrument from the power supply by either turning off the main power switch on the front panel (switch to the (O) side), or by disconnecting either end of the power cord.

When installing the instrument, place the instrument so that an operator may easily operate the main power switch.

If the instrument is mounted in a rack, a power switch for the rack or a circuit breaker may be used for power disconnection.

2.3 Part Names

Name and function of each part are described below.

2.3.1 Front panel
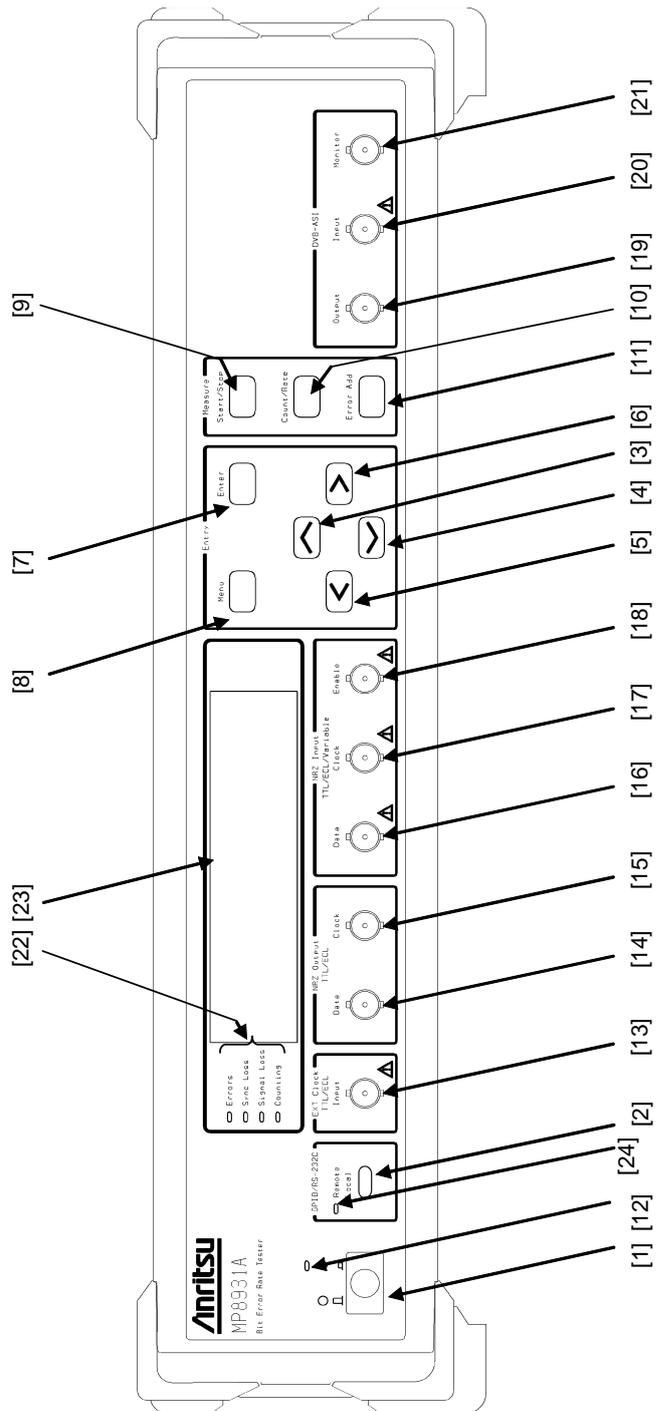
Fig. 2.3.1-1 Front panel

Table 2.3.1-1   Front panel components

No.	Label	Name	Description
[1]	○ ▯ □ ▯	Power switch	Turns ON/OFF the power. ON when pressed.
[2]	GPIB/RS-232C	Local key	Releases remote status and sets local status.
[3]	∧	Up key	Scrolls menu or used to inputting numeric values.
[4]	∨	Down key	Scrolls menu or used to inputting numeric values.
[5]	<	Left key	Backs to previous menu from selected item, or used to inputting numeric values/parameters.
[6]	>	Right key	Determines selected menu item, or used to inputting numeric values/parameters.
[7]	Enter	Enter key	Determines selected menu item, numeric values or parameters.
[8]	Menu	Menu key	Opens/closes the menu screen.
[9]	Start/Stop	Start/Stop key	Starts/stops measurement.
[10]	Count/Rate	Count/Rate key	Switches measured result display between "number of errors/total count" format and error rate.
[11]	Error Add	Error Add key	Used to add an error, manually.
[12]		Power lamp	LED for power status indication. Comes ON when the power switch is turned ON and the power is supplied to the main unit.
[13]	EXT Clock Input	EXT Clock Input connector	Input connector for external clock. ⚠ Refer to Appendix A "Specifications" for input level.
[14]	NRZ Output Data	NRZ Data Output connector	Output connector for NRZ data.
[15]	NRZ Output Clock	NRZ Clock Output connector	Output connector for NRZ clock.
[16]	NRZ Input Data	NRZ Data Input connector	Input connector for NRZ data. ⚠ Refer to Appendix A "Specifications" for input level.
[17]	NRZ Input Clock	NRZ Clock Input connector	Input connector for NRZ clock. ⚠ Refer to Appendix A "Specifications" for input level.
[18]	NRZ Input Enable	NRZ Enable Input connector	Input connector for NRZ enable signal. ⚠ Refer to Appendix A "Specifications" for input level.
[19]	DVB-ASI Output	DVB-ASI interface output connector	Output connector for DVB-ASI interface.
[20]	DVB-ASI Input	DVB-ASI interface input connector	Input connector for DVB-ASI interface. ⚠ Refer to Appendix A "Specifications" for input level.
[21]	DVB-ASI Monitor	DVB-ASI monitoring connector	Monitoring connector for DVB-ASI interface. Outputs signal input from DVB-ASI interface input connector.

Table 2.3.1-1 Front panel components (Cont'd)

No.	Label	Name	Description
[22]	Errors, Sync Loss, Signal Loss, Counting	Status display lamps	LEDs for status indication. Come on immediately after the power switch is turned ON and go off when the MP8931A is activated. • Errors (red): Indicates that an error occurred. Lights up for approx. 50 ms per error. • Sync Loss (red): Comes on when synchronization is lost. • Signal Loss (red): Comes on when Clock or measurement data is not input for a certain period of time. (Refer to Table 2.3.1-2.) • Counting (green): Blinks in approx. 500-ms interval during measurement. LEDs, except Counting, maintain the status immediately before the measurement is stopped.
[23]		Display	Displays measurement items, setting items and measured results. (Number of display characters: 20×2)
[24]		Remote lamp	Comes on when the MP8931A is in remote control status.

Table 2.3.1-2 Signal Loss LED operating conditions

Setting	Interface	Signal Loss turns on:	Signal Loss does not turn on:
Burst function is disabled	NRZ	When the Clock is not input for 50 ms or more.	When the Clock is not input for less than or equal to 1 ms.
	DVB-SPI	When PSYNC is not detected, or when the Clock is not input for 50 ms or more after PSYNC is detected.	When the Clock is not input for less than or equal to 1 ms after PSYNC is detected.
	DVB-ASI	When Frame synchronization is not established, or when measurement data is not detected for 50 ms or more after frame synchronization is established.	When Frame synchronization is established and measurement data is not detected for less than or equal to 1 ms.
Burst function is enabled	NRZ	When the Clock is not input for 600 ms or more.	When the Clock is not input for less than or equal to 50 ms.
	DVB-SPI	When PSYNC is not detected, or when the Clock is not input for 600 ms or more after PSYNC is detected.	When the Clock is not input for less than or equal to 50 ms after PSYNC is detected.
	DVB-ASI	When Frame synchronization is not established, or when measurement data is not detected for 600 ms or more after frame synchronization is established.	When Frame synchronization is established and measurement data is not detected for less than or equal to 50 ms.

2.3.2   Rear panel
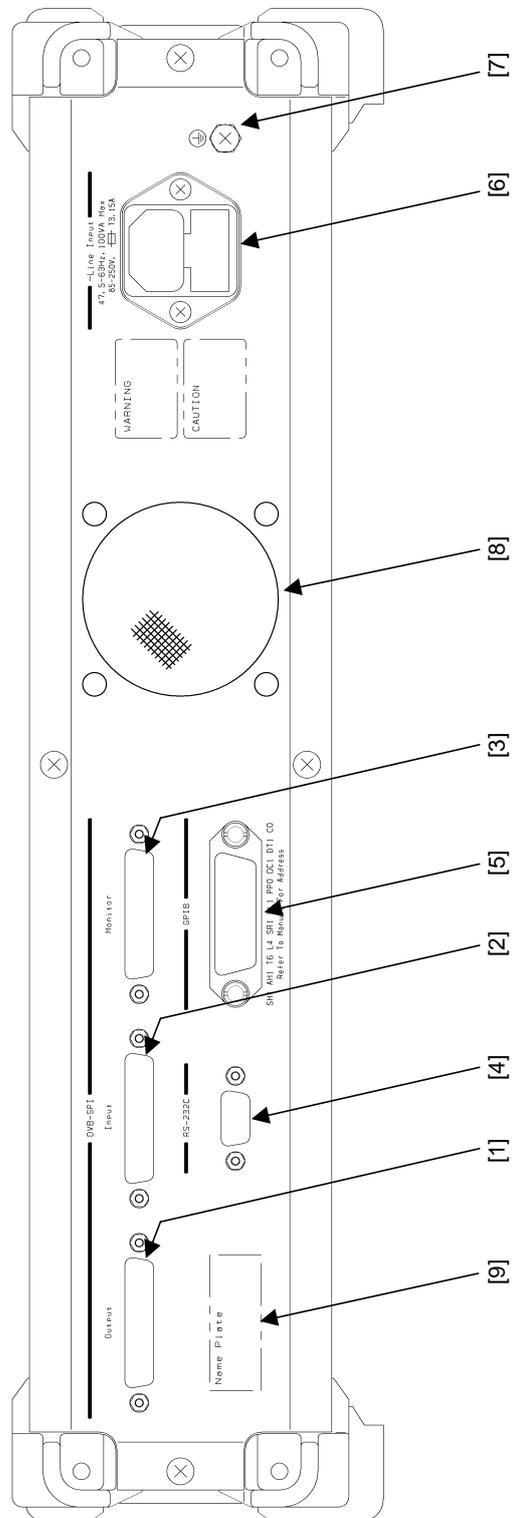
Fig. 2.3.2-1   Rear panel

Table 2.3.2-1   Rear panel components

No.	Label	Name	Description
[1]	DVB-SPI Output	DVB-SPI interface output connector	Output connector for DVB-SPI interface.
[2]	DVB-SPI Input	DVB-SPI interface input connector	Input connector for DVB-SPI interface.
[3]	DVB-SPI Monitor	DVB-SPI monitoring connector	Monitoring connector for DVB-SPI interface. Outputs signals input from DVB-SPI interface input connector.
[4]	RS-232C	RS-232C connector	Connector for RS-232C.
[5]	GPIB	GPIB connector	Connector for GPIB.
[6]		AC inlet	Inlet for power cord connection.
[7]		Functional earth terminal	This is the terminal that is electrically connected to the chassis of the equipment.
[8]		Fan	Cooling fan
[9]		Name plate	Indicates serial number of the MP8931A.

2.4 Peripheral Equipment Connection

Connection between the MP8931A and peripheral equipment is described below.   Be sure to perform connection when power is off.
Do not input signals exceeding the rating value when peripheral equipment is connected.   Doing so may damage the inside of the MP8931A.

2.4.1 RS-232C cable connection

The MP8931A can be controlled from remote via RS-232C (D-sub 9 pins).
Refer to Section 5 "Remote Control" for details.

2.4.2 GPIB cable connection

The MP8931A can be controlled from remote via GPIB.
Refer to Section 5 "Remote Control" for details.

2.5 Connection for Measurement

This section describes connection for measurement.

Be sure to perform connection when power is off.   Do not input signals exceeding the rating value when peripheral equipment is connected. Shapes of all BNC and D-sub 25-pin (DVB-SPI) connectors are the same. Therefore, be sure to check input/output connectors when connecting. Not doing so may damage the inside of the MP8931A. Refer to Appendix A "Specifications" for DVB-SPI connector pin assignment.

Note that the MP8931A continues outputting signals according to parameter settings while the power is on.

Section 3   Screen Display

This section describes screen display at power on and measurement screen display.

[   ] and ☐ indicates panel keys.

3.1   Status at Turning Power On

Before turning the MP8931A on, first confirm that protective grounding has been performed as a safety measure. Then insert the attached power cord to the AC inlet.

⚠ **WARNING**

Turning power on without protective grounding may cause an accident due to electric shock. Insert the supplied 3-pin cord into an outlet with a ground terminal before powering the MP8931A.

3.2 Turning Power On

The power switch of the MP8931A is located at the position shown in the figure below and indicated by symbols "|" (power On) and "○" (power Off.)
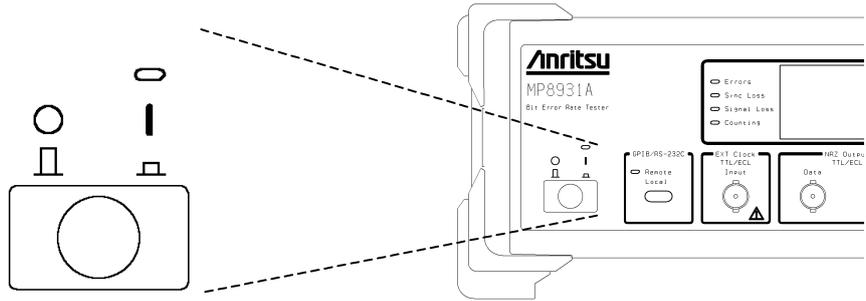
3.3 Display during Startup

When turning the MP8931A on, the startup screen shown below appears and the self-test is executed.

If an error screen appears, the MP8931A may be faulty.   Contact Anritsu Corporation or one of our dealers.

Self-test error display and description are shown in Table 3.3-1.

Power ON

Display activated

Startup completed

To measurement screen

Self-test error

To self-test error screen
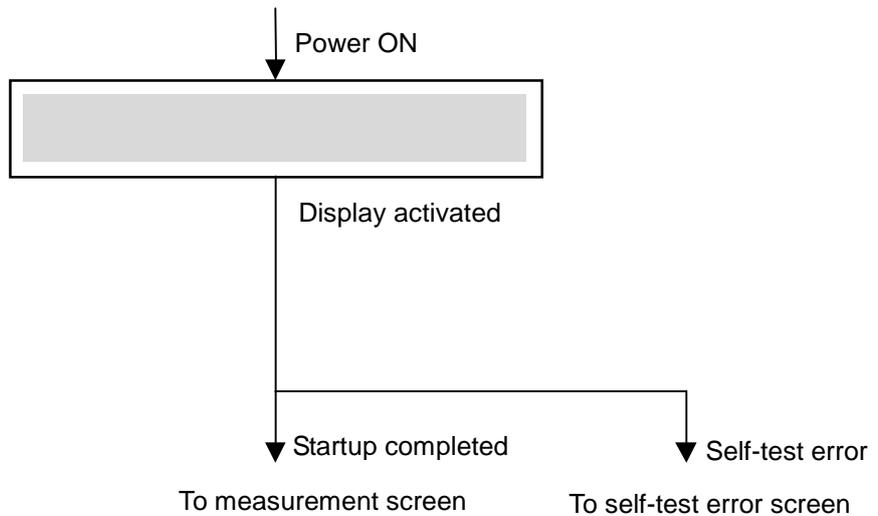
Table 3.3-1   Self-test error display

Display	Description
Boot Program Error	Boot program error
Application Program Error	Application program error
FPGA Program Error	FPGA program error
FPGA Configuration Error	FPGA configuration error
Parameter Error Push Enter Key	Parameter error

3.4 Measurement Screen

When the MP8931A starts up normally, the measurement screen shown below appears.   It consists of three blocks.

Interface Display	Clock display
Measured results display	

Interface Display	Clock display
Measured results display Elapsed measurement time display Remaining measurement time display	
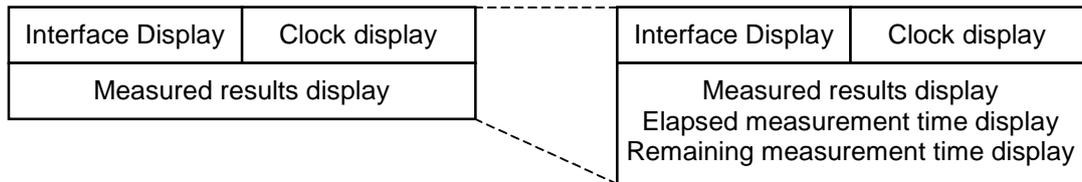
3.4.1 Interface display section

Displays currently selected interface (NRZ, DVB-SPI or DVB-ASI.) When NRZ interface is selected, output level is also displayed.   The example on the next page shows that the NRZ interface is selected and ECL level is set.

3.4.2 Clock display section

Displays whether external or internal clock is being used.   When using internal clock, displays the frequency.   The example on the next page shows that internal clock is used and 155 MHz is selected for frequency.

3.4.3 Measured results display section

Displays the error rate, number of errors/total count or Over Flow.

(1) Over Flow display
The "Over Flow" display blinks when the total count becomes more than 1.00×10^{15}.

(2) Measured results display conditions
When overflow occurs or the number of measurement bits is being set, results are displayed at the time when overflow was detected or the number of measurement bits was exceeded.   When "Sync Loss" is detected while "Auto Sync" is set to ON, re-synchronization is established and the measured results are cleared.
The results just before Sync Loss detection are displayed until re-synchronization is established and the measured results are cleared.

3.4.4 Elapsed measurement time display section

Displays the time that has elapsed from the start of measurement. When Repeat is set to On, the elapsed time for each interval (time period for each repetition) is displayed.
When the elapsed time exceeds 999 hours 59 minutes 59 seconds, the display is reset to 0 and counting continues again.

The example below shows that 1 hour 25 minutes 34 seconds have elapsed from the start of measurement.

3.4.5   Remaining measurement time display section

Displays the time remaining from the start of measurement.   When Repeat is set to On, the remaining time for each interval (time period for each repetition) is displayed.

Remaining measurement time display is enabled when "Time" is selected for "Measure*" on the Measurement menu.   When a value other than "Time" is selected for "Measure*" on the Measurement menu, "–" is displayed for each digit in the remaining measurement display.

The example below shows that remaining measurement time is 1 hour 34 minutes 26 seconds.

Examples:

Interface display	Clock display
Measured results display	

$\Rightarrow$

```
NRZ(ECL)    155,000
   RATE  0.00E+00
```
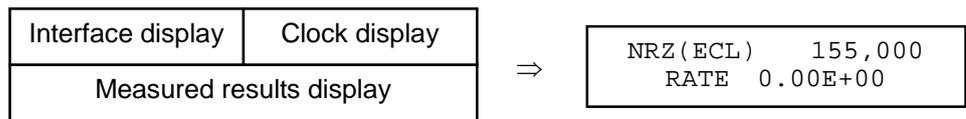
Scroll the screen using the Up and Down cursor keys (expressed by $\boxed{\wedge}$ and $\boxed{\vee}$ in the following example) to display the measured results, elapsed measurement time and remaining measurement time.

Interface display	Clock display
Measured results display	

$\Rightarrow$

```
NRZ(ECL)    155,000
   RATE  0.00E+00
```

Press $\boxed{\vee}$.

Measured results display
Elapsed measurement time display

$\Rightarrow$

```
   RATE  0.00E+00
PASS   0001h25m34s
```

Press $\boxed{\vee}$.

Elapsed measurement time display
Remaining measurement time display

$\Rightarrow$

```
PASS   0001h25m34s
LEFT   0001h34m26s
```

Press $\boxed{\wedge}$.

Measured results display
Elapsed measurement time display

$\Rightarrow$
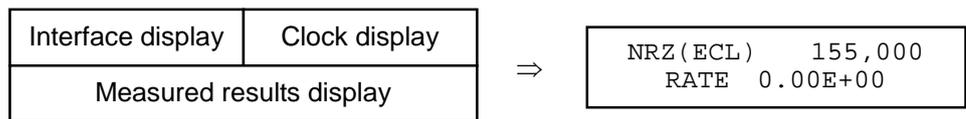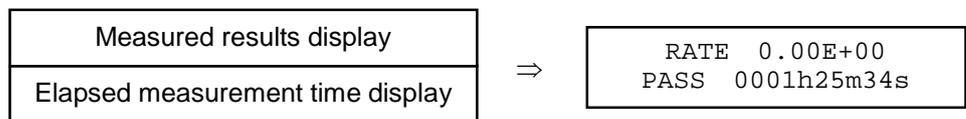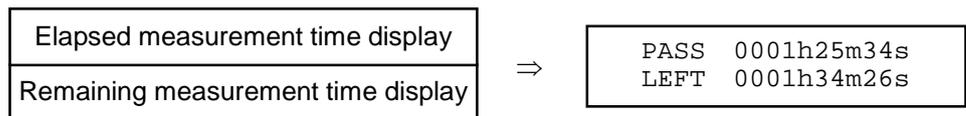
```
   RATE  0.00E+00
PASS   0001h25m34s
```
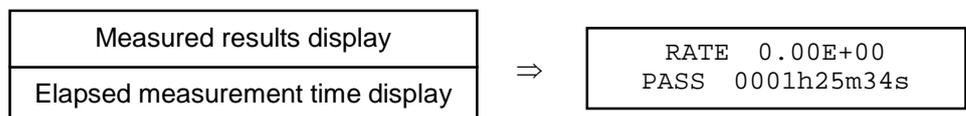
3.5 Main Menu Screen

The main menu screen is used to set and change the measurement pa-
rameters of the MP8931A.
Pressing the [Menu] button opens the main menu screen. Pressing it
again closes the main menu screen (measurement screen display).

When the MP8931A is turned off, the setting conditions at that point are
stored into the internal memory to be read out at the next power On.
Refer to Appendix B "Initial Value List" on the stored contents.

3.5.1   Menu configuration

Menu configuration is shown in the figure below. Menu with setting items under its submenu is indicated by " * ".

```
┌─────────────────┐
│ Main menu       │
└─────────────────┘
        │   ┌──────────────────────────────────┐
        ├───│ Pattern setting (Pattern)        │
        │   └──────────────────────────────────┘
        │   ┌──────────────────────────────────┐
        ├───│ Interface setting (Interface)    │
        │   └──────────────────────────────────┘
        │   ┌──────────────────────────────────┐
        ├───│ Error addition setting (Error)   │
        │   └──────────────────────────────────┘
        │   ┌──────────────────────────────────┐
        ├───│ Auto Sync setting (Auto Sync)    │
        │   └──────────────────────────────────┘
        │   ┌──────────────────────────────────┐
        ├───│ Output On/Off setting (Output)   │
        │   └──────────────────────────────────┘
        │   ┌──────────────────────────────────┐
        ├───│ Monitoring On/Off setting (Monitor) │
        │   └──────────────────────────────────┘
        │   ┌──────────────────────────────────┐
        ├───│ External clock input menu (EXT Clock*) │
        │   └──────────────────────────────────┘
        │           │   ┌──────────────────────────────┐
        │           ├───│ On/Off setting (EXT Clock)   │
        │           │   └──────────────────────────────┘
        │           │   ┌──────────────────────────────┐
        │           ├───│ Level setting (Level)        │
        │           │   └──────────────────────────────┘
        │           │   ┌──────────────────────────────┐
        │           └───│ Termination resistor setting │
        │               │ (Termination)                │
        │               └──────────────────────────────┘
        │   ┌──────────────────────────────────┐
        ├───│ Measurement menu (Measure*)      │
        │   └──────────────────────────────────┘
        │           │   ┌──────────────────────────────┐
        │           ├───│ Selection (Measure)          │
        │           │   └──────────────────────────────┘
        │           │   ┌──────────────────────────────┐
        │           ├───│ Repetition setting (Repeat)  │
        │           │   └──────────────────────────────┘
        │           │   ┌──────────────────────────────┐
        │           ├───│ Measurement value display    │
        │           │   │ setting (Select)             │
        │           │   └──────────────────────────────┘
        │           │   ┌──────────────────────────────┐
        │           ├───│ Time setting (Time)          │
        │           │   └──────────────────────────────┘
        │           │   ┌──────────────────────────────┐
        │           └───│ Number of counts setting     │
        │               │ (Count)                      │
        │               └──────────────────────────────┘
        │   ┌──────────────────────────────────┐
        └───│ Burst setting (Burst)            │
            └──────────────────────────────────┘
        │
```

Continued to the next page.

Continued from the previous page.

```
├── NRZ output menu (NRZ Output*)
│         ├── Frequency setting (FREQ)
│         ├── Level setting (Level)
│         ├── Data polarity setting (Data)
│         └── Clock polarity setting (Clock)
│
├── NRZ input menu (NRZ Input*)
│         ├── Level setting (Level)
│         ├── Data polarity setting (Data)
│         ├── Clock polarity setting (Clock)
│         ├── Enable polarity setting (Enable)
│         ├── Termination resistor setting (Termination)
│         ├── Termination voltage setting for Variable (Variable Vtt)
│         └── Threshold voltage setting for Variable (Variable Vth)
│
├── DVB-SPI menu (DVB-SPI*)
│         ├── Frequency setting (FREQ)
│         └── Packet type setting (PKT)
│
├── DVB-ASI menu (DVB-ASI*)
│         ├── Packet type setting (PKT)
│         └── Data rate setting (Data Rate)
│
└── System menu (System*)
          ├── Initialization (Initialize)
          ├── GPIB address setting (GPIB Address)
          ├── RS-232C baud rate setting (RS-232C Baud)
          ├── RS-232C parity bit setting (RS-232C Parity)
          ├── Display Auto-Off control setting (Display Off)
          ├── Display brightness setting (Display Dimmer)
          └── Version information (Version)
```

Section 4   Operation

This section describes item functions and their operation procedures.

[   ] and ⬚ indicate panel keys.

4.1 Basic System Settings

Set the MP8931A system parameters and check version information.
Select "System*" on the main menu screen to perform settings.

<Procedure>

1. Press [Menu] and select "System*" by using the $\boxed{\wedge}$ and $\boxed{\vee}$ keys.

2. Press [Enter] or $\boxed{>}$ to display the System* setting screen (shown at left in the figure below.)

```
▶ Initialize                      Initialize
  GPIB Address        15    ◀     GPIB Address          15
                                  RS232C Baud         9600
                                  RS232C Parity       None
                                  Display Off         None
                                  Display Dimmer      100%
                                  Version
```
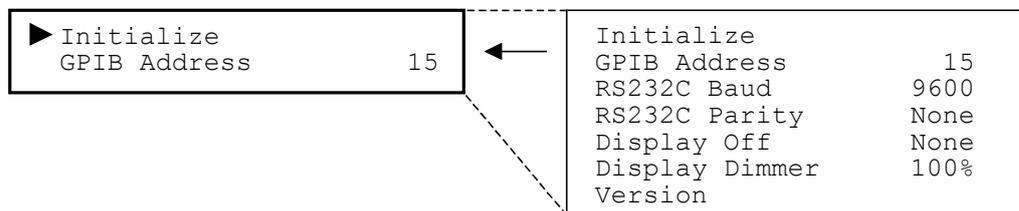
Notes:

- The left part of the above figure shows screen display, and the right shows parameters that can be set.   The format applies to the succeeding explanations.

- When [Menu] is pressed instead of [Enter] during setting, the menu is closed without saving the changes made.

- Pressing $\boxed{<}$ during setting returns to the previous screen. However, this is excluded on the measurement time setting and frequency setting screens.

- When [Menu] is pressed again on Main menu screen, the item (selected immediately before closing menu) is displayed.

4.1.1   Initialization (Initialize)

Initializes parameters.

Select "Initialize" on the system menu screen to execute it.

Refer to Appendix B "Initial Value List" on items to be initialized.

```
┌─────────────────────────┐
│       Initialize?       │
│     Push Enter Key      │
└─────────────────────────┘
```

Press [Enter]

```
┌─────────────────────────┐
│       Initializing      │
└─────────────────────────┘
```

Initialization completed

```
┌─────────────────────────┐
│        Completed        │
└─────────────────────────┘
```

To system menu display

<Procedure>
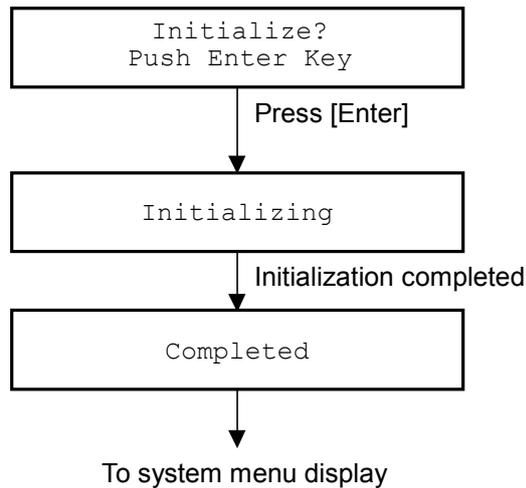
1. Select "Initialize" by using the ⟨∧⟩ and ⟨∨⟩ keys on the System* setting screen.

2. Press [Enter] or ⟨>⟩ to display the confirmation screen for Initialize.

3. Press [Enter] to execute initialization.

4.1.2   GPIB address setting (GPIB Address)

Set GPIB address.

Select "GPIB Address" on the system menu screen to perform the setting.

```
┌─────────────────────────┐          ┌─────────────────────────┐
│►      GPIB Address       │          │           30            │
│             15           │  ◄────   │            :            │
└─────────────────────────┘          │           00            │
                                      └─────────────────────────┘
```

<Procedure>
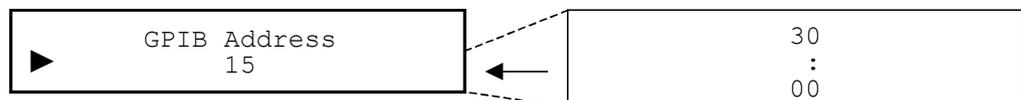
1. Select "GPIB Address" by using the ⟨∧⟩ and ⟨∨⟩ keys on the System* setting screen.

2. Press [Enter] or ⟨>⟩ to display the GPIB Address setting items.

3. Select GPIB address by using the ⟨∧⟩ and ⟨∨⟩ keys and press [Enter] to finalize the setting.

4.1.3   RS-232C baud rate setting (RS-232C Baud)

Set baud rate for RS-232C.

Select "RS-232C Baud" on the system menu screen to perform setting.

```
┌──────────────────────────────┐         ┌──────────────────────────┐
│                              │         │        115200bps         │
│ ▶  RS-232C Baud Rate         │ ◀────   │         57600bps         │
│         9600bps              │         │         38400bps         │
│                              │         │         19200bps         │
└──────────────────────────────┘         │          9600bps         │
                                          │          4800bps         │
                                          │          2400bps         │
                                          │          1200bps         │
                                          └──────────────────────────┘
```

<Procedure>
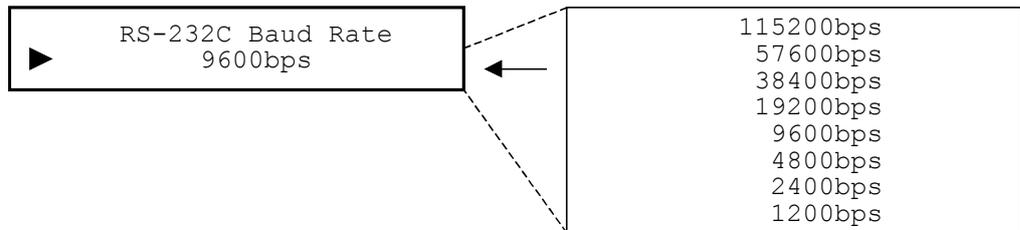
1. Select "RS-232C Baud" by using the [∧] and [∨] keys on the System* setting screen.

2. Press [Enter] or [>] to display the RS-232C Baud Rate setting items.

3. Select baud rate for RS-232C by using the [∧] and [∨] keys and press [Enter] to finalize the setting.

4.1.4   RS-232C parity bit setting (RS-232C Parity)

Set parity bit for RS-232C.

Select "RS-232C Parity" on the system menu screen to perform setting.

```
┌──────────────────────────────┐         ┌──────────────────────────┐
│                              │         │          None            │
│ ▶  RS-232C Parity            │ ◀────   │          Odd             │
│         None                 │         │          Even            │
│                              │         │                          │
└──────────────────────────────┘         └──────────────────────────┘
```

<Procedure>
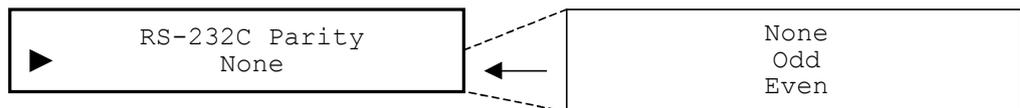
1. Select "RS-232C Parity" by using the [∧] and [∨] keys on the System* setting screen.

2. Press [Enter] or [>] to display the RS-232C Parity setting items.

3. Select parity bit for RS-232C by using the [∧] and [∨] keys and press [Enter] to finalize the setting.

4.1.5   Display Auto-Off control setting (Display Off)

Set time until turn the screen display off when there is not key operation.
Select "Display Off" on the system menu screen to perform setting.
Note that pressing any panel key at screen display Off turns screen display On, and the MP8931A operates according to the set parameters.
Screen display Off status is not affected by remote control (except the screen display setting command.)

```
┌──────────────────────────┐              ┌──────────────────────┐
│                          │              │          60min       │
│   Display Auto Off       │              │          50min       │
│ ▶         None           │  ◀───        │          40min       │
│                          │              │          30min       │
└──────────────────────────┘              │          20min       │
                                          │          10min       │
                                          │           5min       │
                                          │           1min       │
                                          │          None        │
                                          └──────────────────────┘
```

<Procedure>
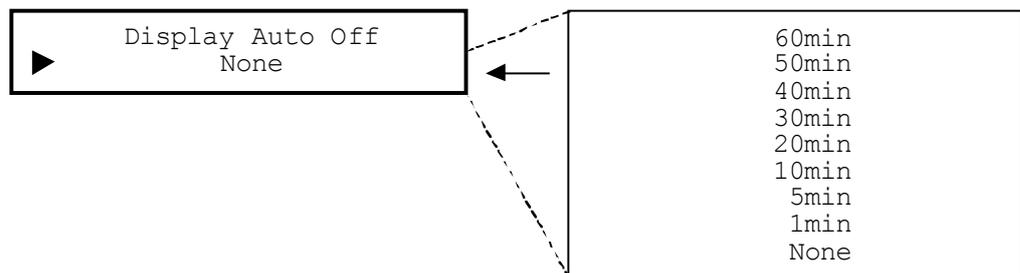
1.   Select "Display Off" by using the [∧] and [∨] keys on the System* setting screen.

2.   Press [Enter] or [>] to display the Display Auto Off setting items.

3.   Select screen display control by using the [∧] and [∨] keys and press [Enter] to finalize the setting.

4.1.6   Display brightness setting (Display Dimmer)

Set brightness of screen display.
Select "Display Dimmer" on the system menu screen to perform setting.

```
┌──────────────────────────┐              ┌──────────────────────┐
│   Display Dimmer         │              │          100%        │
│ ▶         100%           │  ◀───        │           75%        │
│                          │              │           50%        │
└──────────────────────────┘              │           25%        │
                                          └──────────────────────┘
```

<Procedure>
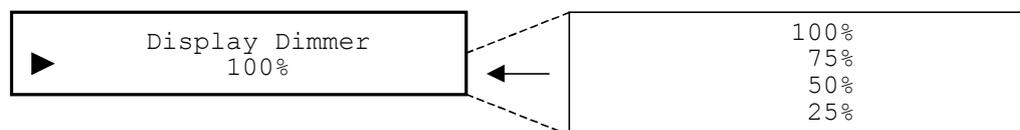
1.   Select "Display Dimmer" by using the [∧] and [∨] keys on the System* setting screen.

2.   Press [Enter] or [>] to display the Display Dimmer setting items.

3.   Select brightness of screen display by using the [∧] and [∨] keys and press [Enter] to finalize the setting.

4.1.7   Version information (Version)

Use this item to check the versions of: MP8931A (Unit), boot program (Boot), application program (Application) and FPGA (FPGA).
Select "Version" on the system menu screen for confirmation.

```
▶ Unit            xx.xx          ◀   Unit            xx.xx
  Boot            xx.xx              Boot            xx.xx
                                     Application     xx.xx
                                     FPGA            xx.xx
```

<Procedure>
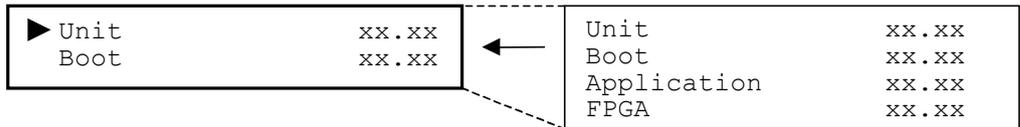
1. Select "Version" by using the [∧] and [∨] keys on the System* setting screen.

2. Press [Enter] or [>] to display the Version confirmation screen.

3. Check the versions by using the [∧] and [∨] keys to scroll the screen.

4. Press [Enter] to return to the system menu screen.

4.2 Setting Parameters

Set measurement parameters.

Select the parameter item to be set on the main menu screen. The setting procedures are shown below.

<Procedure>

1. Press [Menu] and select the parameter item to be set (ex. "Pattern") by using the $\boxed{\wedge}$ and $\boxed{\vee}$ keys.

2. Press [Enter] or $\boxed{>}$ to display the setting screen for the selected item (ex. "Pattern").

4.2.1 Pattern setting (Pattern)

Set pseudo-random noise pattern or fixed pattern to be measured.

Details on pseudo-random noise are shown in the block diagram below.

Select "Pattern" on the main menu screen to perform setting.

```
 ▶        Pattern
          PN23
```

```
            PN9
        PN9  Reverse
            PN15
        PN15 Reverse
            PN23
        PN23 Reverse
            ALL0
            ALL1
            1010
```

<Procedure>
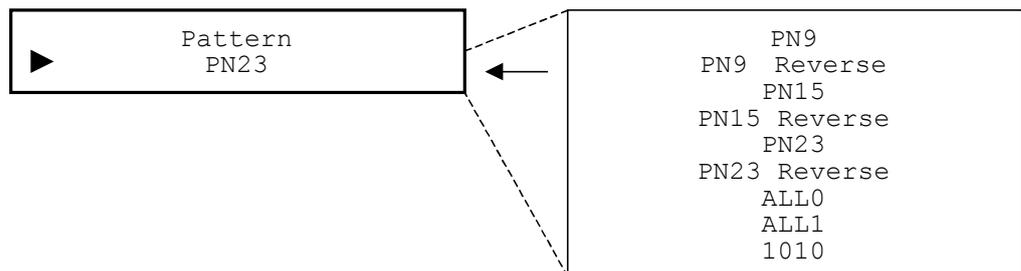
1. Select measurement pattern by using the $\boxed{\wedge}$ and $\boxed{\vee}$ keys on the Pattern setting items. Press [Enter] to finalize the setting.

    When this setting is performed during measurement, measurement is restarted and the menu closes. When this setting is performed while measurement is stopped, the measurement menu is displayed again.

[1] PN 9: 2^9-1 (511 patterns), $1+X^5+X^9$
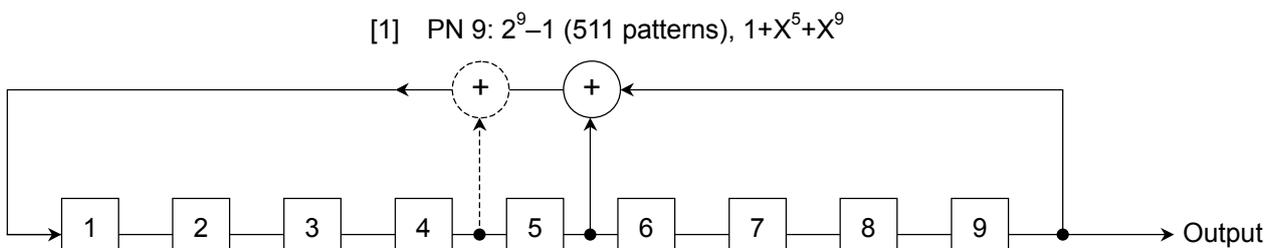
Note:

Broken line indicates PN 9 Reverse (reverse direction.)

[2]   PN 15: $2^{15}-1$, $1+X^{14}+X^{15}$

Note:

Broken line indicates PN 15 Reverse (reverse direction.)

[3]   PN 23: $2^{23}-1$, $1+X^{18}+X^{23}$

Output
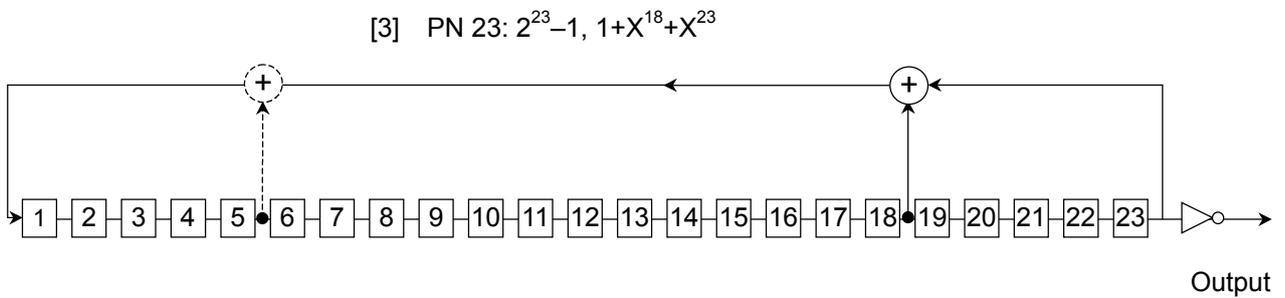
Note:

Broken line indicates PN 23 Reverse (reverse direction.)

4.2.2   Interface setting (Interface)

Set measuring interface. Multiple interfaces cannot be used simultaneously.

Select "Interface" on the main menu screen to perform setting.

<Procedure>
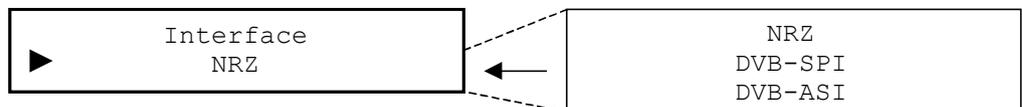
1.   Select measuring interface by using the ⌃ and ⌄ keys for the Interface setting items.   Press [Enter] to finalize the setting.

     When this setting is performed during measurement, measurement is restarted and the menu closes. Or, when measurement is stopped, returns to the main menu.

4.2.3   Error addition setting (Error)

Set the error addition on or off and the adding method.   When error addition period is set to manual, one error bit is added each time [Error ADD] is pressed.   Once [Error ADD] is pressed, an error is added; however, no additional errors are added until the key is released.   If error addition period is set to 1×10^{-2}, 1×10^{-3}, 1×10^{-4}, 1×10^{-5}, 1×10^{-6} or 1×10^{-7}, errors are added periodically and automatically (1×10^{-3}: one error bit is continuously added for each 10^3 bits.)   Note, however, that one error bit is added for each 64 bits when the error addition period is set to 1×10^{-2} and the DVB-ASI or DVB-SPI interface is selected.

Select "Error" on the main menu screen to perform setting.

```
┌─────────────────────────────┐        ┌─────────────────────────────┐
│        Error Add            │        │            None             │
▶        None                 │   ←─── │          Manual             │
└─────────────────────────────┘        │           1E-2              │
                                        │           1E-3              │
                                        │           1E-4              │
                                        │           1E-5              │
                                        │           1E-6              │
                                        │           1E-7              │
                                        └─────────────────────────────┘
```
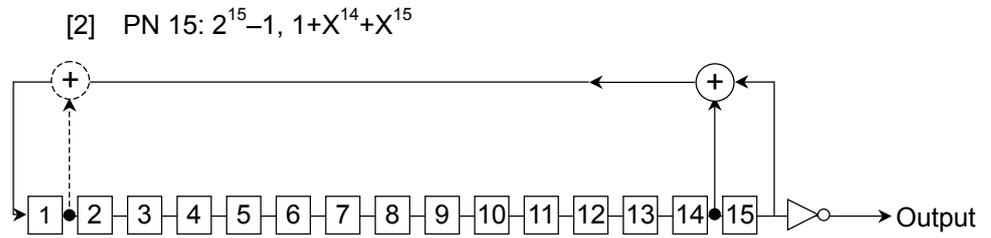
<Procedure>
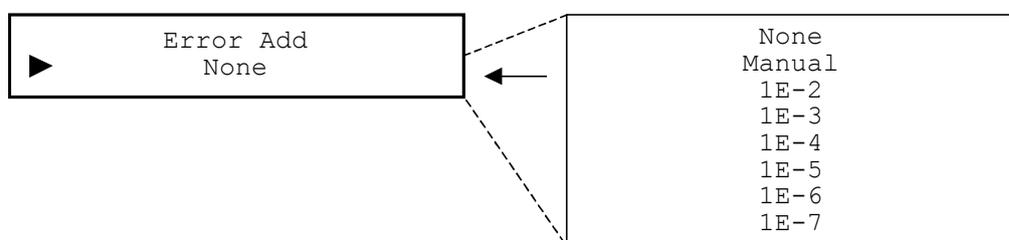
1.   Select On/Off of error addition or adding method by using the $\boxed{\wedge}$ and $\boxed{\vee}$ keys on the Error setting items.   Press [Enter] to finalize the setting.
     When this setting is performed during measurement, measurement is restarted and the menu closes.   When this setting is performed while measurement is stopped, the measurement menu is displayed again.

4.2.4   Auto Sync setting (Auto Sync)

Set measurement method when sync loss detected during measurement.
With this function set to On, measurement is stopped when synchroniza-tion is lost and restarts measurement when re-synchronization is estab-lished.   All counters are cleared at this time.

When set to Off, measurement continues without establishing re-synchronization.   However, if sync-loss occurred, Sync Loss lamp does not go on.

Select "Auto Sync" on the main menu screen to perform setting.

Sync loss occurs when the MP8931A detects 6 error bits out of 64 bits.

If the measurement object is a signal of the lower error rate than that of sync loss condition at Auto Sync On, the measurement may not be per-formed due to alternative repeating of sync loss and sync gain at burst error.

```
▶      Auto Sync                             Off
          Off               ◄───             On
```

<Procedure>
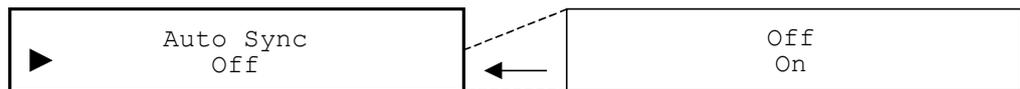
1.   Select measurement method at sync loss detection during measure-ment by using the [∧] and [∨] keys on the Auto Sync setting items.   Press [Enter] to finalize the setting.

When this setting is performed during measurement, measurement is restarted and the menu closes.   When this setting is performed while measurement is stopped, the measurement menu is displayed again.

4.2.5   Output On/Off setting (Output)

Enable/disable the output of the output terminal for each interface.   Set to Disable to disable output in case of using the MP8931A for input only.

Output terminal is fixed to Low level when this item is set to Disable.

Output function of interface not selected is disabled, regardless of the setting for this item.

Select "Output" on the main menu screen to perform setting.

```
▶       Output                             Disable
        Enable              ◄───           Enable
```

<Procedure>
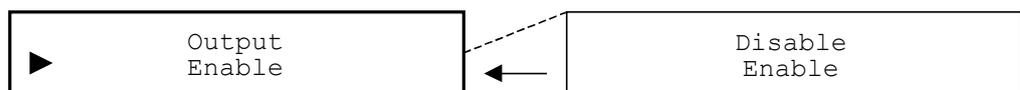
1.   Select enable/disable of output terminal for each interface by using the [∧] and [∨] keys on the Output setting items.   Press [En-ter] to finalize the setting.

4.2.6   Monitoring On/Off setting (Monitor)

Enable/disable the output of the monitoring terminal that outputs signal input from the input terminal.   This function is enabled when DVB-SPI or DVB-ASI interface is selected.

Set this function in case of connecting the MP8931A to other device. Monitoring terminal is set to high-impedance state when this function is set to Disable.

Monitoring terminal function of interface not selected becomes high-impedance state, regardless of setting for this function.

Select "Monitor" on the main menu screen to perform setting.

```
┌──────────────────────────┐        ┌──────────────────────────┐
│            Monitor       │        │           Disable        │
│ ▶          Enable        │ ◀───   │           Enable         │
└──────────────────────────┘        └──────────────────────────┘
```

<Procedure>
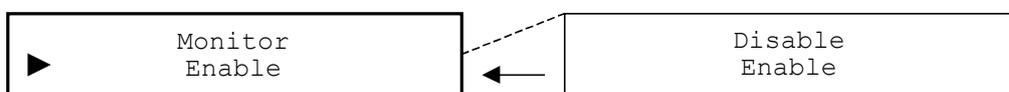
1.   Select enable/disable of monitoring terminal output by using the [∧] and [∨] keys on the Monitor setting items.   Press [Enter] to finalize the setting.

4.2.7   External clock setting

Enable/disable measurement using an external clock, and set parameters when it is used.   This function is enabled when NRZ or DVB-SPI interface is selected.

Note that the external clock is used as a byte clock when DVB-SPI interface is selected.

Inputting an external signal out of specifications may cause failure.   Be sure to perform settings according to the specifications.

Select "EXT Clock*" on the main menu screen to perform setting.

```
┌─────────────────────────┐        ┌─────────────────────────┐
│ ▶ EXT Clock     Disable  │        │ EXT Clock       Disable  │
│   Level            TTL   │  ◀──   │ Level              TTL   │
│                          │        │ Termination        75Ω   │
└─────────────────────────┘        └─────────────────────────┘
```

<Procedure>
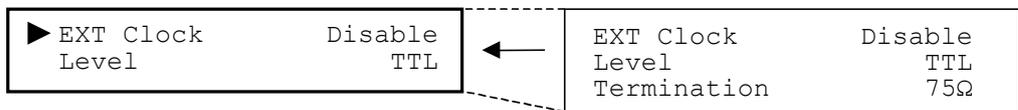
1.   Select setting item by using the [∧] and [∨] keys on the EXT Clock* setting items.   Press [Enter] or [>] to display the item to be set.

(1)   Enable/disable setting

Enable/disable the use of external clock.

Select "EXT Clock" on the external clock input menu screen to perform setting.

```
┌─────────────────────────┐        ┌─────────────────────────┐
│            EXT Clock     │        │         Disable          │
│ ▶          Disable       │        │         Enable           │
│                          │  ◀──   │                          │
└─────────────────────────┘        └─────────────────────────┘
```

<Procedure>
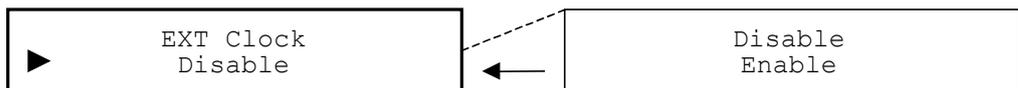
1.   Select "EXT Clock" by using the [∧] and [∨] keys on the EXT Clock* setting screen.

2.   Press [Enter] or [>] to display the EXT Clock setting items.

3.   Select enable/disable of external clock by using the [∧] and [∨] keys.   Press [Enter] to finalize the setting.
     When this setting is performed during measurement, measurement is restarted and the menu closes.   When this setting is performed while measurement is stopped, the external clock input menu is displayed again.

(2)   Input level setting

Set input level.
Select "Level" on the external clock input menu screen to perform setting.
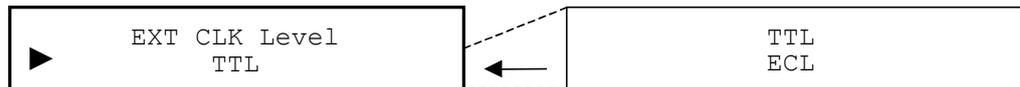
```
┌─────────────────────────────┐         ┌─────────────────────────────┐
│                             │    ╱     │                             │
│ ▶   EXT CLK Level           │  ╱       │               TTL           │
│           TTL               │ ◀──      │               ECL           │
│                             │  ╲       │                             │
└─────────────────────────────┘    ╲     └─────────────────────────────┘
```

<Procedure>

1.   Select "Level" by using the [∧] and [∨] keys on the EXT Clock* setting screen.

2.   Press [Enter] or [>] to display the Level setting items.

3.   Select level to be input by using the [∧] and [∨] keys. Press [Enter] to finalize the setting.
      When this setting is performed during measurement, measurement is restarted and the menu closes.   When this setting is performed while measurement is stopped, the external clock input menu is displayed again.

(3)   Termination resistor setting

Set termination resistor.
Select "Termination" on the external clock input menu screen to perform setting.
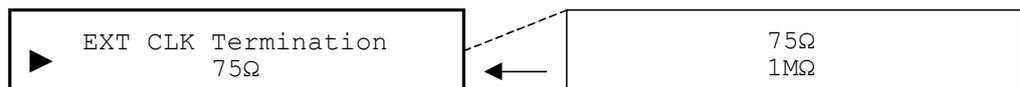
```
┌─────────────────────────────┐         ┌─────────────────────────────┐
│                             │    ╱     │                             │
│ ▶   EXT CLK Termination     │  ╱       │               75Ω           │
│           75Ω               │ ◀──      │               1MΩ           │
│                             │  ╲       │                             │
└─────────────────────────────┘    ╲     └─────────────────────────────┘
```

<Procedure>

1.   Select "Termination" by using the [∧] and [∨] keys on the EXT Clock* setting screen.

2.   Press [Enter] or [>] to display the Termination setting items.

3.   Select termination resistor by using the [∧] and [∨] keys. Press [Enter] to finalize the setting.
      When this setting is performed during measurement, measurement is restarted and the menu closes.   When this setting is performed while measurement is stopped, the external clock input menu is displayed again.

4.2.8 Measurement menu setting

Set whether to perform measurement for the specified time, the specified number of bits, or none (start/stop manually). Then perform the settings of time, the number of bits (count), measurement repetition and measured results display. Automatic measurement stop is possible by specifying the measurement time or count. Measurement can be performed repeatedly by enabling measurement repetition.

Select "Measure*" on the main menu screen to perform settings.

```
▶ Measure           None          Measure            None
  Time         000h00m01s    ◀     Repeat              Off
                                   Select          Current
                                   Time         000h00m01s
                                   Count            1E+03
```

<Procedure>
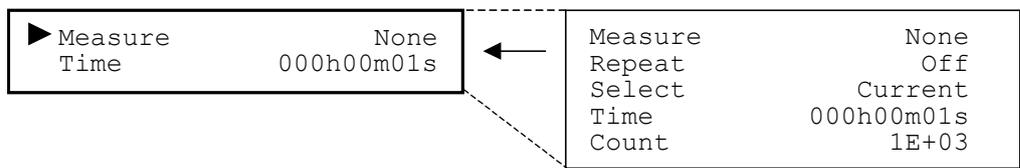
1. Select a setting item by using the [∧] and [∨] keys for the Measure* setting items. Press [Enter] or [>] to display the item to be set.

(1) Measurement method setting

Set whether to perform measurement for the specified time, the specified number of bits or none (start/stop manually), as below.

Select "Measure" on the measurement menu screen to perform settings.

```
▶           Measure                       None
            None             ◀            Time
                                          Count
```

<Procedure>
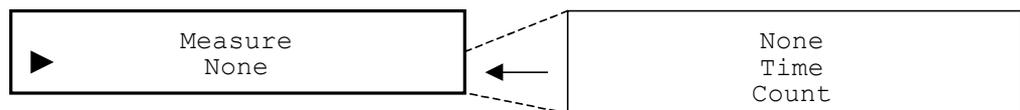
1. Select "Measure" by using the [∧] and [∨] keys on the Measure* setting screen.

2. Press [Enter] or [>] to display the Measure setting items.

3. Select whether to perform measurement for the specified time (Time), the specified number of bits (Count) or none (None) by using the [∧] and [∨] keys. Press [Enter] to finalize the setting.

When this setting is performed during measurement, measurement is restarted and the menu closes. When this setting is performed while measurement is stopped, the measurement menu is displayed again.

(2) Measurement repetition setting

This setting is valid when the measurement method is set to "Time" or "Count." Specify whether to repeat measurement for the specified time (when "Time" is selected) or the specified number of bits (when "Count" is selected).

Select "Repeat" on the measurement menu screen to perform setting.

```
▶   Measure Repeat                    Off
          Off         ◀------          On
```

<Procedure>

1. Select "Repeat" by using the [∧] and [∨] keys on the Measure* setting screen.

2. Press [Enter] or [>] to display the Repeat setting items.

3. Select whether to repeat measurement (On) or perform measurement once and finish (Off) by using the [∧] and [∨] keys. Press [Enter] to finalize the setting.
   When this setting is performed during measurement, measurement is restarted and the menu closes. When this setting is performed while measurement is stopped, the measurement menu is displayed again.

(3) Measured results display setting

Specify whether to display measured results in real time (Current) or display the measured result of the last interval (Last). When "Last" is selected, the measured results display is not updated until measurement in the current interval is complete. If measurement is stopped manually by the user, the measured result in this case is the same as that when "Current" is selected.

Select "Select" on the measurement menu screen to perform setting.

```
▶   Measure Select                 Current
        Current       ◀------         Last
```
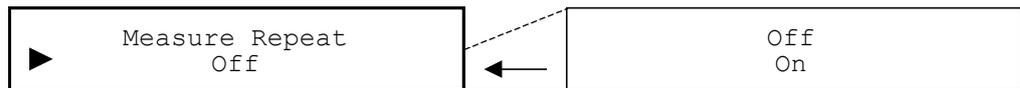
<Procedure>
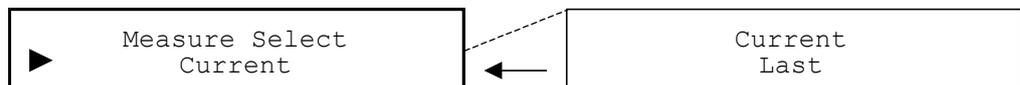
1. Select "Select" by using the [∧] and [∨] keys on the Measure* setting screen.

2. Press [Enter] or [>] to display the Select setting items.

3. Select whether to display measured results in real time (Current) or display the measured result of the last interval by using the [∧] and [∨] keys. Press [Enter] to finalize the setting.

The following shows how measured results are displayed according to the Repeat parameter setting.

[When Repeat is set to On]
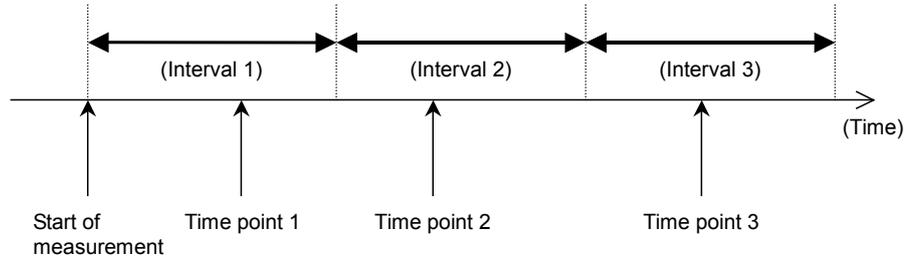
- When "Current" is selected:
  The measurement results at time points 1 through 3 are displayed.
- When "Last" is selected:
  The measurement results are displayed as follows.

At time point 1:	NRZ(ECL) 155,000 RATE -.--E+--
	"–" is displayed for each digit in the measured results display.
At time point 2:	The measured result at the end of Interval 1 is displayed during Interval 2.
At time point 3:	The measured result at the end of Interval 2 is displayed during Interval 3. The same goes for the subsequent intervals.

[When Repeat is set to Off]
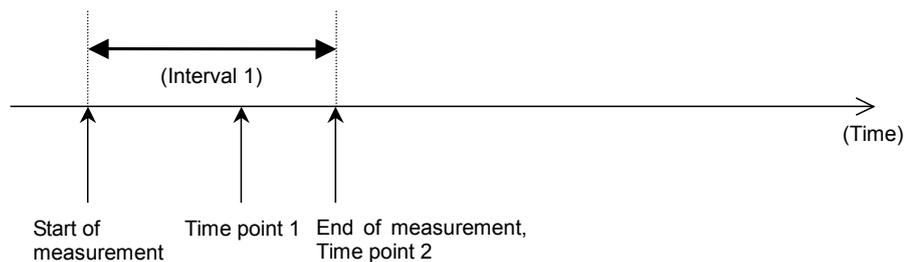
- When "Current" is selected:
  The measurement results at time points 1 and 2 are displayed.
- When "Last" is selected:
  The measurement results are displayed as follows.

At time point 1:	NRZ(ECL) 155,000 RATE -.--E+--
	"–" is displayed for each digit in the measured results display.
At time point 2:	The measured result at the end of Interval 1 is displayed.

(4) Measurement time setting

Set measurement time.

It can be set from 1 second to 999 hours 59 minutes 59 seconds in 1-second steps on "Time" setting.

Select "Time" measurement method on the measurement menu screen to perform setting and measurement.

```
        Measure Time
 ►      000h 00m 01s
```
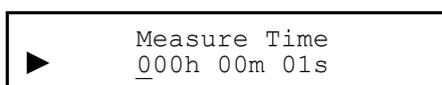
Note:

> The measurement time can be set from 1 second to 999 hours 59 minutes 59.90 seconds in 0.1 second steps, by using the remote control command MEASDTIME.
>
> (Note, however, that decimal values are truncated when the measurement time is displayed on the screen.)

<Procedure>

1. Select "Time" by using the [∧] and [∨] keys on the Measure* setting screen.

2. Press [Enter] or [>] to display the Time setting screen.

3. Move the cursor to the digit to be set by using the [<] and [>] keys.

4. Increase/decrease the count at the digit with the cursor by using the [∧] and [∨] keys.
    Count can be increased/decreased over the current and upper digits.

5. Repeat Steps 3 and 4.   Press [Enter] to finalize the setting.
    When this setting is performed during measurement, measurement is restarted and the menu closes.   When this setting is performed while measurement is stopped, the measurement menu is displayed again.

(5)   Measurement bit setting

Set the number of bits to be measured.

The number can be set from 1×10^3 to 1×10^{15} in 1×10^n steps.   Measurement stops when the set number of bits is exceeded.   The MP8931A has limitations on the number of bits to be measured (valid number of bits) corresponding to frequency.   Refer to the following descriptions when perform the setting.

For example, even if the number of bits is set to "1E+3" while frequency is set to 10 MHz, measurement stops between "1E+4" to "1E+5."

Select "Count" measurement method on the measurement menu screen to perform setting and measurement.

```
┌─────────────────────────────┐        ┌─────────────────────────────┐
│ ▶     Measure Count         │ ←----  │         1E+15               │
│           1E+03             │ ←----  │           :                 │
│                             │        │         1E+03               │
└─────────────────────────────┘        └─────────────────────────────┘
```

<Procedure>

1.   Select "Count" by using the ⌃ and ⌄ keys on the Measure* setting screen.

2.   Press [Enter] or > to display the Count setting items.

3.   Select the number of bits to be measured by using the ⌃ and ⌄ keys.   Press [Enter] to finalize the setting.
     When this setting is performed during measurement, measurement is restarted and the menu closes.   When this setting is performed while measurement is stopped, the measurement menu is displayed again.

<Relationship between frequency and minimum valid number of bits setting>

Frequency	Minimum valid number of bits
1 kHz	1E+3
10 kHz	1E+3 to 4
100 kHz	1E+3 to 4
1 MHz	1E+3 to 4
10 MHz	1E+4 to 5
100 MHz	1E+5 to 6

4.2.9   Burst function setting

Enable/disable the Burst function.   The Burst function should be enabled when using inputs other than consecutive inputs within a frequency range from 1 kHz to 155 MHz.

Note that the signal loss detection time is 600 ms maximum when the Burst function is enabled.
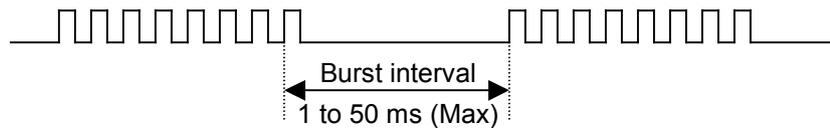
Select "Burst" on the main menu screen to perform setting.

<Procedure>
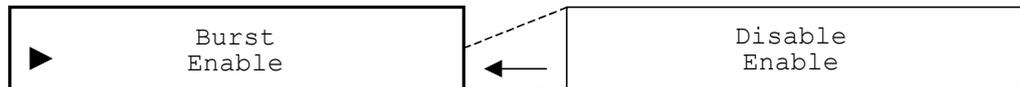
1.   When the Burst setting items are displayed, select whether to enable the Burst function (Enable) or not (Disable) by using the [∧] and [∨] keys.   Press [Enter] to finalize the setting and display the main menu again.

4.2.10 Output function of NRZ interface setting

Set output parameters when using NRZ interface.

Select "NRZ Output*" on the main menu screen to perform setting.

```
▶ FREQ          10,000,000        FREQ          155,000,000
  Level                 TTL    ◀  Level                 TTL
                                  Data             Positive
                                  Clock                Rise
```

<Procedure>
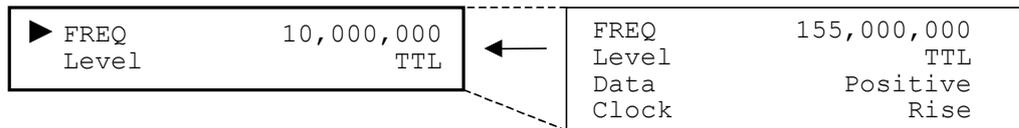
1. Select setting item by using the $\boxed{\wedge}$ and $\boxed{\vee}$ keys on the NRZ Output* setting items. Press [Enter] or $\boxed{>}$ to display the item to be set.

(1) Frequency setting

Set the output frequency, ranging 1 kHz to 155 MHz in 1 Hz steps.

Select "FREQ" on the NRZ output menu screen to perform setting.

```
            NRZ Frequency
  ▶         010,000,000Hz
```

<Procedure>

1. Select "FREQ" by using the $\boxed{\wedge}$ and $\boxed{\vee}$ keys on the NRZ Output* setting screen.

2. Press [Enter] or $\boxed{>}$ to display the FREQ setting screen.

3. Move the cursor to the digit to be set by using the $\boxed{<}$ and $\boxed{>}$ keys.

4. Increase/decrease the count at the digit with the cursor by using the $\boxed{\wedge}$ and $\boxed{\vee}$ keys.

    Count can be increased/decreased over the current and upper digits.

5. Repeat Steps 3 and 4 to set the desired frequency. Press [Enter] to finalize the setting.

    When this setting is performed during NRZ measurement, measurement is restarted and the menu closes. When this setting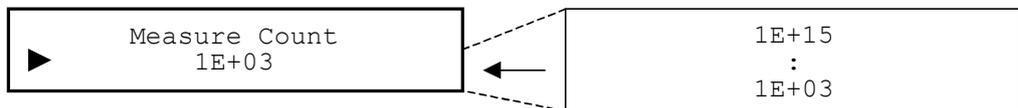 is performed while measurement is stopped or during DVB-SPI or DVB-ASI measurement, the NRZ output menu is displayed again.

(2) Level setting

Set level.

Select "Level" on the NRZ output menu screen to perform setting.
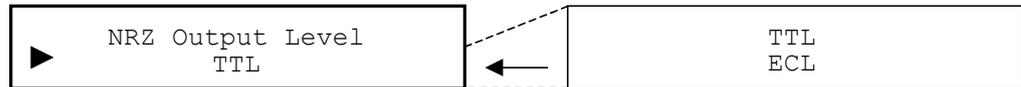
```
┌────────────────────────────┐        ┌────────────────────────────┐
│ ▶   NRZ Output Level        │╌╌╌     │              TTL           │
│              TTL            │  ◀───  │              ECL           │
└────────────────────────────┘  ╌╌╌   └────────────────────────────┘
```

<Procedure>

1. Select "Level" by using the [∧] and [∨] keys on the NRZ Output* setting screen.

2. Press [Enter] or [>] to display the Level setting items.

3. Select level by using the [∧] and [∨] keys. Press [Enter] to finalize the setting.
    When this setting is performed during NRZ measurement, measurement is restarted and the menu closes. When this setting is performed while measurement is stopped or during DVB-SPI or DVB-ASI measurement, the NRZ output menu is displayed again.

(3) Data polarity setting

Set data polarity.

Select "Data" on the NRZ output menu screen to perform setting.
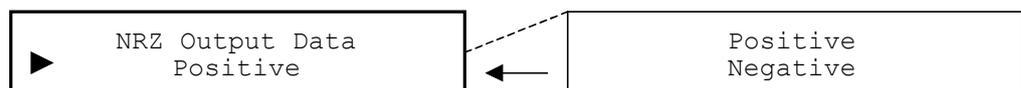
```
┌────────────────────────────┐        ┌────────────────────────────┐
│ ▶   NRZ Output Data         │╌╌╌     │            Positive        │
│           Positive          │  ◀───  │            Negative        │
└────────────────────────────┘  ╌╌╌   └────────────────────────────┘
```

<Procedure>

1. Select "Data" by using the [∧] and [∨] keys on the NRZ Output* setting screen.

2. Press [Enter] or [>] to display the Data setting items.

3. Select data polarity by the using [∧] and [∨] keys. Press [Enter] to finalize the setting.
    When this setting is performed during NRZ measurement, measurement is restarted and the menu closes. When this setting is performed while measurement is stopped or during DVB-SPI or DVB-ASI measurement, the NRZ output menu is displayed again.

(4) Clock polarity setting

Set clock polarity.   Refer to Appendix A "Specifications" on phase relationships.

Select "Clock" on the NRZ output menu screen to perform setting.

```
 ┌────────────────────────────┐                ┌────────────────────────────────┐
 │    NRZ Output Clock        │                │                    Rise         │
▶│          Rise              │◄─────          │                    Fall         │
 └────────────────────────────┘                └────────────────────────────────┘
```

<Procedure>

1.   Select "Clock" by using the ⌃ and ⌄ keys on the NRZ Output* setting screen.

2.   Press [Enter] or ＞ to display the Clock setting items.

3.   Select clock polarity by using the ⌃ and ⌄ keys.   Press [Enter] to finalize the setting.

When this setting is performed during NRZ measurement, measurement is restarted and the menu closes.   When this setting is performed while measurement is stopped or during DVB-SPI or DVB-ASI measurement, the NRZ output menu is displayed again.

4.2.11 Input function of NRZ interface setting

Set input parameters when using NRZ interface.

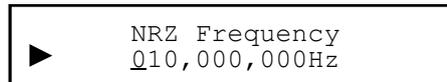Select "NRZ Input*" on the main menu screen to perform setting.

```
▶ Level            TTL        ◀─     Level            TTL
  Data        Positive               Data        Positive
                                     Clock            Rise
                                     Enable            Off
                                     Termination       75Ω
                                     Variable Vtt     0.0V
                                     Variable Vth    +1.4V
```

<Procedure>
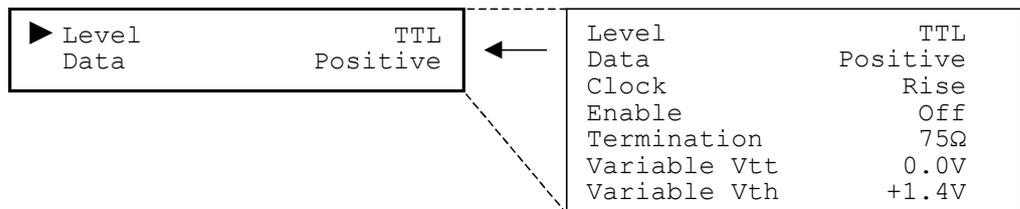
1. Select setting item by using the ⎣∧⎦ and ⎣∨⎦ keys on the NRZ Input* setting items. Press [Enter] or ⎣>⎦ to display the item to be set.

(1) Level setting

Set input level.

Select "Level" on the NRZ input menu screen to perform setting.
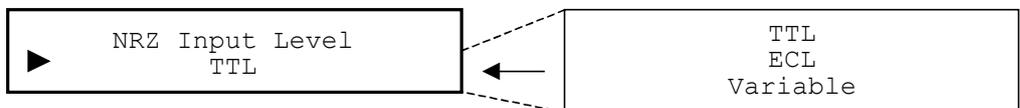
```
       NRZ Input Level             TTL
▶           TTL             ◀─     ECL
                                   Variable
```

<Procedure>

1. Select "Level" by using the ⎣∧⎦ and ⎣∨⎦ keys on the NRZ Input* setting screen.

2. Press [Enter] or ⎣>⎦ to display the Level setting items.

3. Select input level by using the ⎣∧⎦ and ⎣∨⎦ keys. Press [Enter] to finalize the setting.

    When this setting is performed during NRZ measurement, measurement is restarted and the menu closes. When this setting is performed while measurement is stopped or during DVB-SPI or DVB-ASI measurement, the NRZ input menu is displayed again.

(2)   Data polarity setting

Set data polarity.
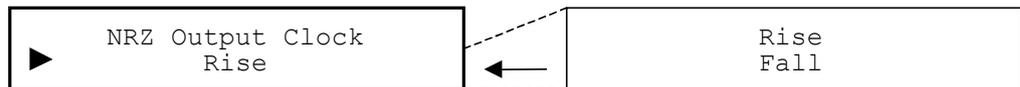Select "Data" on the NRZ input menu screen to perform setting.
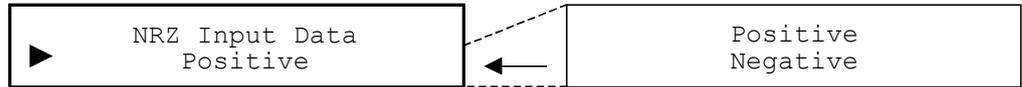
```
┌──────────────────────────┐           ┌──────────────────────────┐
│ ►  NRZ Input Data        │ - - - -   │      Positive            │
│        Positive          │ ←───────  │      Negative            │
└──────────────────────────┘           └──────────────────────────┘
```

<Procedure>

1.   Select "Data" by using the [∧] and [∨] keys on the NRZ Input* setting screen.

2.   Press [Enter] or [>] to display the Data setting items.

3.   Select data polarity by using the [∧] and [∨] keys. Press [Enter] to finalize the setting.
     When this setting is performed during NRZ measurement, measurement is restarted and the menu closes. When this setting is performed while measurement is stopped or during DVB-SPI or DVB-ASI measurement, the NRZ input menu is displayed again.

(3)   Clock polarity setting

Set clock polarity. Refer to Appendix A "Specifications" on phase relationships.
Select "Clock" on the NRZ input menu screen to perform setting.
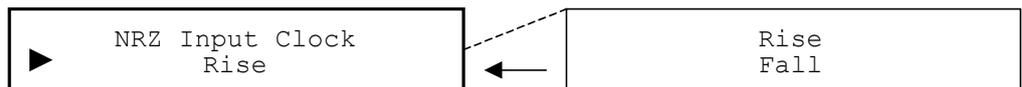
```
┌──────────────────────────┐           ┌──────────────────────────┐
│ ►  NRZ Input Clock       │ - - - -   │      Rise                │
│        Rise              │ ←───────  │      Fall                │
└──────────────────────────┘           └──────────────────────────┘
```

<Procedure>

1.   Select "Clock" by using the [∧] and [∨] keys on the NRZ Input* setting screen.

2.   Press [Enter] or [>] to display the Clock setting items.

3.   Select clock polarity by using the [∧] and [∨] keys. Press [Enter] to finalize the setting.
     When this setting is performed during NRZ measurement, measurement is restarted and the menu closes. When this setting is performed while measurement is stopped or during DVB-SPI or DVB-ASI measurement, the NRZ input menu is displayed again.

(4)   Enable function setting

Set enable polarity or enables/disables its use.   When this function is set to Positive, clock and data are enabled if level is High.   When set to Negative, they are enabled if level is Low.   They are enabled regardless of the set level if this function is set to Off.

Select "Enable" on the NRZ input menu screen to perform setting.

```
▶   NRZ Input Enable              Positive
        Positive          ◀──     Negative
                                     Off
```

<Procedure>
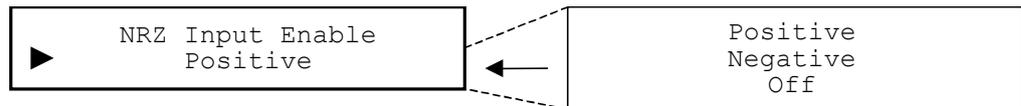
1.   Select "Enable" by using the ⌐∧⌐ and ⌐∨⌐ keys on the NRZ Input* setting screen.

2.   Press [Enter] or ⌐>⌐ to display the Enable setting items.

3.   Select enable polarity or its use On/Off by using the ⌐∧⌐ and ⌐∨⌐ keys.   Press [Enter] to finalize the setting.
     When this setting is performed during NRZ measurement, measurement is restarted and the menu closes.   When this setting is performed while measurement is stopped or during DVB-SPI or DVB-ASI measurement, the NRZ input menu is displayed again.

(5)   Termination resistor setting

Set termination resistor value.
Select "Termination" on the NRZ input menu screen to perform setting.
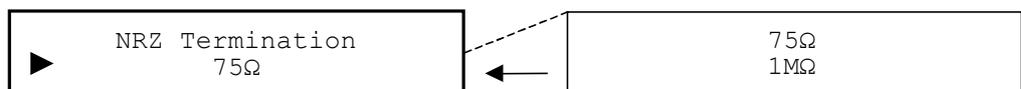
```
▶   NRZ Termination               75Ω
        75Ω               ◀──     1MΩ
```

<Procedure>

1.   Select "Termination" by using the ⌐∧⌐ and ⌐∨⌐ keys on the NRZ Input* setting screen.

2.   Press [Enter] or ⌐>⌐ to display the Termination setting items.

3.   Select termination resistor value by using the ⌐∧⌐ and ⌐∨⌐ keys.   Press [Enter] to finalize the setting.
     When this setting is performed during NRZ measurement, measurement is restarted and the menu closes.   When this setting is performed while measurement is stopped or during DVB-SPI or DVB-ASI measurement, the NRZ input menu is displayed again.

(6) Setting termination voltage for Variable

Set the termination voltage value.
Select "Variable Vtt" on the NRZ input menu screen to perform set-
ting.

```
▶   NRZ Variable Vtt                         +3.3V
          0.0V                                  :
                          ◀                    0.0V
                                                 :
                                               -2.5V
```

<Procedure>
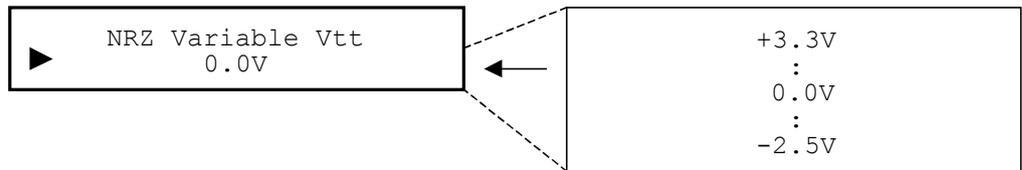
1. Select "Variable Vtt" by using the [∧] and [∨] keys on the
    NRZ Input* setting screen.

2. Press [Enter] or [>] to display the Variable Vtt setting items.

3. Select termination voltage value by using the [∧] and [∨]
    keys.   Press [Enter] to finalize the setting.
    When this setting is performed during NRZ measurement,
    measurement is restarted and the menu closes.   When this
    setting is performed while measurement is stopped or during
    DVB-SPI or DVB-ASI measurement, the NRZ input menu is
    displayed again.

(7) Setting threshold voltage for Variable

Set the threshold voltage value.
Select "Variable Vth" on the NRZ input menu screen to perform set-
ting.

```
▶   NRZ Variable Vth                         +3.0V
         +1.4V                                   :
                          ◀                    0.0V
                                                 :
                                               -2.0V
```

<Procedure>
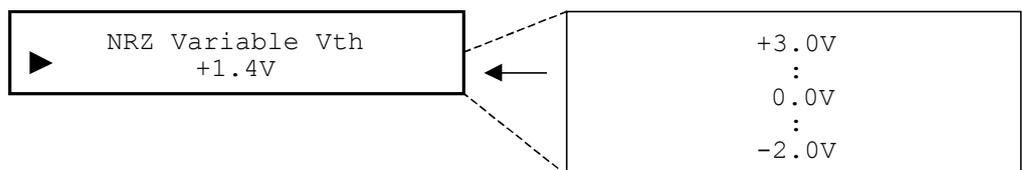
1. Select "Variable Vth" by using the [∧] and [∨] keys on the
    NRZ Input* setting screen.

2. Press [Enter] or [>] to display the Variable Vth setting items.

3. Select threshold voltage value by using the [∧] and [∨]
    keys.   Press [Enter] to finalize the setting.
    When this setting is performed during NRZ measurement,
    measurement is restarted and the menu closes.   When this
    setting is performed while measurement is stopped or during
    DVB-SPI or DVB-ASI measurement, the NRZ input menu is
    displayed again.

4.2.12 Function of DVB-SPI interface setting

Set parameters for DVB-SPI interface.
When using this interface, DVALID signal output level is fixed to High.
Select "DVB-SPI*" on the main menu screen to perform setting.

```
▶ FREQ           13,500,000          FREQ           13,500,000
  PKT          (1)+187+(16)     ◀    PKT          (1)+187+(16)
```

<Procedure>

1. Select setting item by using the [∧] and [∨] keys on the DVB-SPI* setting items. Press [Enter] or [>] to display the item to be set.

(1) Frequency setting

Set output byte clock frequency. No input setting available. Proper operation is not guaranteed when frequency exceeding specified value is input.
The setting range is 10 kHz to 13.5 MHz in 1 Hz steps.
Select "FREQ" on the DVB-SPI menu screen to perform setting.

```
           DVB-SPI Frequency
    ▶        13,500,000Hz
```

<Procedure>

1. Select "FREQ" by using the [∧] and [∨] keys on the DVB-SPI* setting screen.

2. Press [Enter] or [>] to display the FREQ setting screen.

3. Move the cursor to the digit to be set by using the [<] and [>] keys.

4. Increase/decrease the count at the digit with the cursor by using the [∧] and [∨] keys.
    Count can be increased/decreased over the current and upper digits.

5. Repeat Steps 3 and 4 to set the desired frequency. Press [Enter] to finalize the setting.
    When this setting is performed during DVB-SPI measurement, measurement is restarted and the menu closes. When this setting is performed while measurement is stopped or during NRZ or DVB-ASI measurement, the DVB-SPI menu is displayed again.

(2)   Packet setting

Set packet type used for input/output.   Packets (measurement target part) available for the MP8931A are shown in the figure below. Note that data (PID, 16 valid extra bytes etc.) except the measurement target part is fixed to High level for output, and not compared for input.

[1] When 187 bytes of 204-byte packet are measurement targets
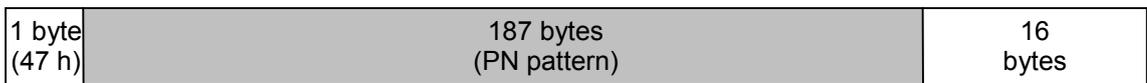
1 byte (47 h)	187 bytes (PN pattern)	16 bytes

[2] When 187 bytes of 188-byte packet are measurement targets

1 byte (47 h)	187 bytes (PN pattern)

[3] When 184 bytes of 204-byte packet are measurement targets

1 byte (47 h)	3 bytes (PID)	184 bytes (PN pattern)	16 bytes

[4] When 184 bytes of 188-byte packet are measurement targets

1 byte (47 h)	3 bytes (PID)	184 bytes (PN pattern)

[5] When 203 bytes of 204-byte packet are measurement targets

1 byte (47 h)	203 bytes (PN pattern)

[6] When 200 bytes of 204-byte packet are measurement targets

1 byte (47 h)	3 bytes (PID)	200 bytes (PN pattern)
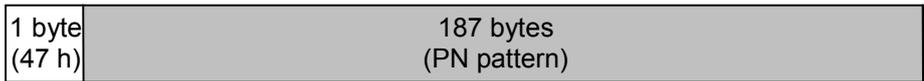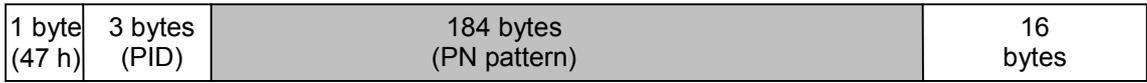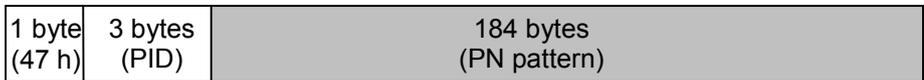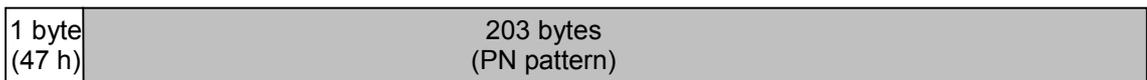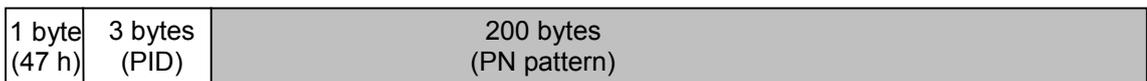
Measurement targets

Fig. 4.2.12-1   Packet types

Select "PKT" on the DVB-SPI menu screen to perform setting.
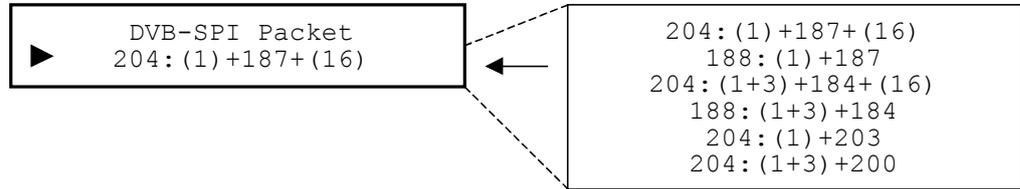
```
▶    DVB-SPI Packet              204:(1)+187+(16)
     204:(1)+187+(16)         ◀     188:(1)+187
                                  204:(1+3)+184+(16)
                                    188:(1+3)+184
                                     204:(1)+203
                                    204:(1+3)+200
```

<Procedure>

1. Select "PKT" by using the ⌃ and ⌄ keys on the DVB-SPI* setting screen.

2. Press [Enter] or ⌄ to display the Packet setting items.

3. Select packet type used for input/output by using the ⌃ and ⌄ keys. Press [Enter] to finalize the setting.
    When this setting is performed during DVB-SPI measurement, measurement is restarted and the menu closes. When this setting is performed while measurement is stopped or during NRZ or DVB-ASI measurement, the DVB-SPI output menu is displayed again.

4.2.13 Function of DVB-ASI interface setting

Set parameters for DVB-ASI interface.

Frame detection (synchronization establishment) condition at DVB-ASI interface is that synchronization is established when SYNC (47h) is detected 3 times continuously, and sync loss detection is not performed after synchronization is established.

Output packet format is not supported in burst mode.

Select "DVB-ASI*" on the main menu screen to perform setting.

```
▶ PKT          (1)+187+(16)          PKT          (1)+187+(16)
  Data Rate          27MHz    ◀      Data Rate          27MHz
```

<Procedure>

1.   Select setting item by using the [∧] and [∨] keys for the DVB-ASI* setting items. Press [Enter] or [>] to display the item to be set.

(1)   Packet setting

Set packet type used for input/output. Available packets are the same as those for DVB-SPI interface.

Select "PKT" on the DVB-ASI menu screen to perform setting.
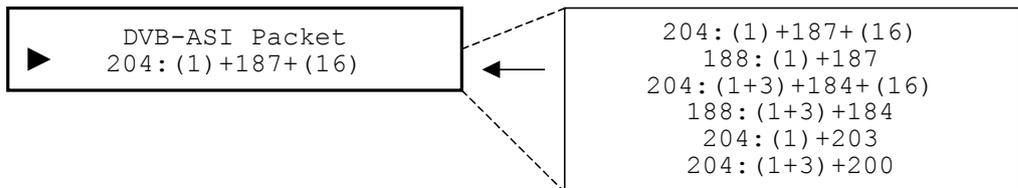
```
▶      DVB-ASI Packet                204:(1)+187+(16)
       204:(1)+187+(16)  ◀             188:(1)+187
                                      204:(1+3)+184+(16)
                                        188:(1+3)+184
                                        204:(1)+203
                                        204:(1+3)+200
```

<Procedure>

1.   Select "PKT" by using the [∧] and [∨] keys on the DVB-ASI* setting screen.

2.   Press [Enter] or [>] to display the Packet setting items.

3.   Select packet type used for input/output by using the [∧] and [∨] keys. Press [Enter] to finalize the setting.
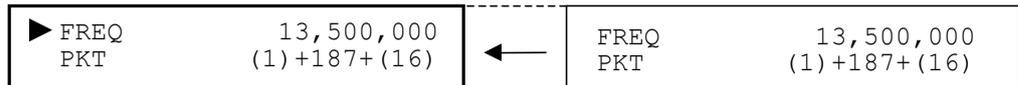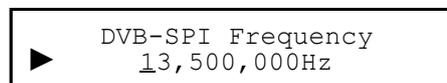   When this setting is performed during DVB-ASI measurement, measurement is restarted and the menu closes. When this setting is performed while measurement is stopped or during NRZ or DVB-SPI measurement, the DVB-ASI menu is displayed again.

(2) Data rate setting

The MP8931A supports variable data rate by inserting Stuffing Data between packets of data rate 27 Mbits/s before 8b/10b conversion at output.   Refer to the figure below:

- Relationship between transmission packet and Stuffing Data
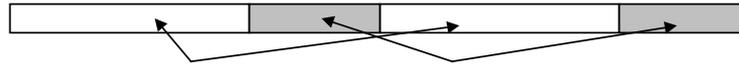
Packet (188 or 204×10 bits)   Stuffing Data (valiable: number of Stuffing Data×10 bits)

Approximate relationship between data rate to be set and number of Stuffing Data is shown in the table below.   Note that two Stuffing Data are assumed to be included when data rate is set to 27 MHz.

Table 4.2.13-1 Approximate relationship between data rate and number of Stuffing Data

Data rate (MHz)	Number of Stuffing Data	
	For 204 bytes	For 188 bytes
1	5304	5200
2	2550	2500
3	1632	1600
4	1173	1150
5	898	880
6	714	700
7	583	571
8	485	475
9	408	400
10	347	340
11	297	291
12	255	250
13	220	215
14	189	186
15	163	160
16	140	138
17	120	118
18	102	100
19	86	84
20	71	70
21	58	57
22	46	45
23	35	35
24	26	25
25	16	16
26	8	8
27	2	2

Select "Data Rate" on the DVB-ASI menu screen to perform setting.

```
┌──────────────────────────┐          ┌──────────────────────────┐
│   DVB-ASI Data Rate      │          │          27MHz           │
│ ▶      1MHz              │   ◀──     │           :              │
│                          │          │          1MHz            │
└──────────────────────────┘          └──────────────────────────┘
```

<Procedure>
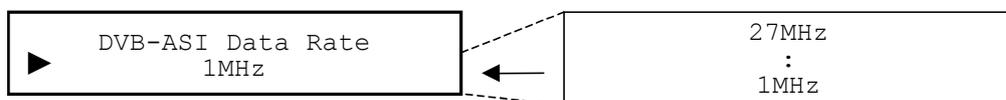
1. Select "Data Rate" by using the [∧] and [∨] keys on the DVB-ASI* setting screen.

2. Press [Enter] or [>] to display the Data Rate setting items.

3. Select output data rate by using the [∧] and [∨] keys. Press [Enter] to finalize the setting.
    When this setting is performed during DVB-ASI measurement, measurement is restarted and the menu closes. When this setting is performed while measurement is stopped or during NRZ or DVB-SPI measurement, the DVB-ASI menu is displayed again.

Section 5   Remote Control

This section describes remote function and setting procedures.

5.1   Outline

The MP8931A supports remote control to perform measurement automatically by using an external controller.   For this purpose, the MP8931A is equipped with GPIB interface (IEEE std 488.2-1987) and RS-232C interface as standard.

The MP8931A has the following interface functions:

- Control of all functions except power switch, [Local] key, etc.
- Readout of all setting conditions and measured results
- Configuration of automatic measuring system in combination with PC or other measuring instruments

Following is an example of a system-up:

GPIB

PC

MP8931A

PRINTER
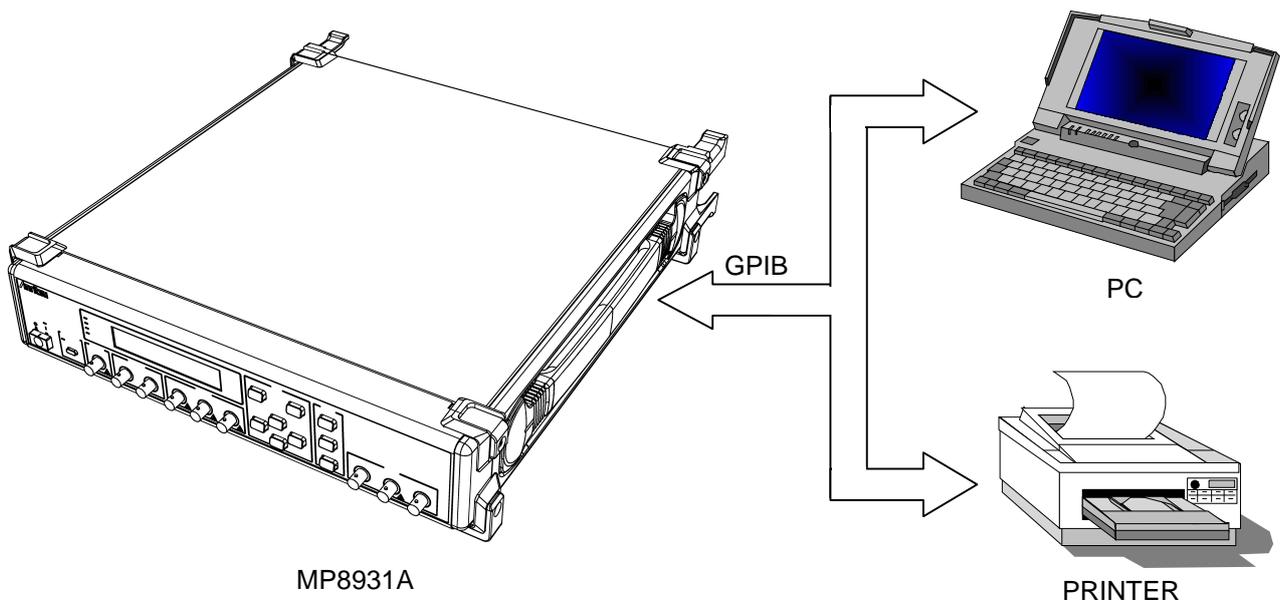
5.2 GPIB Interface

5.2.1 GPIB interface function

The MP8931A has only device functions and does not have controller functions.

Interface functions are shown in the table below.

Table 5.2.1-1   GPIB interface function

Code	Interface function	IEEE488.2 standard
SH1	All source handshake functions	All functions are standard equipped
AH1	All acceptor handshake functions	All functions are standard equipped
T6	Basic talker functions Serial pole function No talk-only function MLA talker release function	Device should have one of T5, T6, TE5 or TE6 subset.
L4	Basic listener functions No listen-only function MLA listener release function	Device should have one of L3, L4, LE3 or LE4 subset.
SR1	All service request functions	All functions are standard equipped
RL1	All remote/local functions	RL0 (no function) or RL1 (all functions)
PP0	No parallel pole function	PP0 (no function) or PP1 (all functions)
DC1	All device clear functions	All functions are standard equipped
DT1	All device trigger functions	DT0 (no function) or DT1 (all functions)
C0	No system controller function	C0 (no function), C4 and C5, or one of C7, C9 and C11

Pin assignment of the GPIB connector is shown in the figure below:
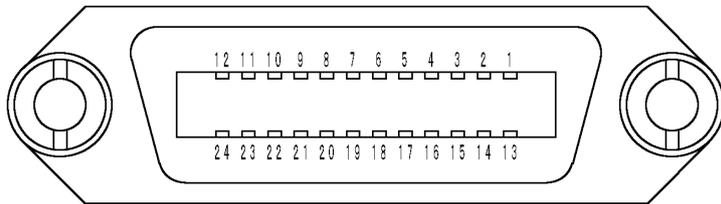
Fig. 5.2.1-1   Pin assignment of GPIB connector

No	Name	
1	DIO1	DATA INPUT OUTPUT1
2	DIO2	DATA INPUT OUTPUT2
3	DIO3	DATA INPUT OUTPUT3
4	DIO4	DATA INPUT OUTPUT4
5	EOI	END OF IDENTITY
6	DAV	DATA VALID
7	NRFD	NOT READY FOR DATA
8	NDAC	NOT DATA ACCEPTED
9	IFC	INTERFACE CLEAR
10	SRQ	SERVICE REQUEST
11	ATN	ATTENTION
12	SHIELD	
13	DIO5	DATA INPUT OUTPUT5
14	DIO6	DATA INPUT OUTPUT6
15	DIO7	DATA INPUT OUTPUT7
16	DIO8	DATA INPUT OUTPUT8
17	REN	REMOTE ENABLE
18	DAV ground	DATA VALID ground
19	NRFD ground	NOT READY FOR DATA ground
20	NDAC ground	NOT DATA ACCEPTED ground
21	IFC ground	INTERFACE CLEAR ground
22	SRQ ground	SERVICE REQUEST ground
23	ATN ground	ATTENTION ground
24	Logic ground	

5.2.2   Bus commands

Bus command refers to internal communication of interface transmitted when the bus mode is set to command mode (ATN line is "L").
Bus commands are listed in the table below.

Table 5.2.2-1   Bus command contents

Bus command	Operation
IFC (Interface Clear)	Puts the IFC line to active status for approx. 100 μs to initialize interface functions of all devices connected to the GPIB bus line.
DCL (Device Clear)	Initializes message exchange of all devices on the GPIB interface.
SDC (Selected Device Clear)	Initializes message exchange of the specified device.

5.2.3   Connecting GPIB cable

Connect the GPIB cable connector to the connector on the rear panel.
System using GPIB interface has restrictions shown at right side of the figure below.
Connect devices following the conditions shown below.

GPIB connector
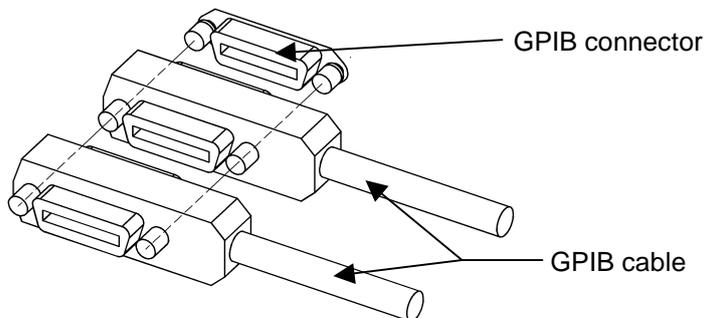
GPIB cable

Number of connecting devices: ≤ 15
Total cable length: ≤ 20 m
Inter-device cable length: ≤ 4 m

Fig. 5.2.3-1   GPIB cable connection diagram

5.2.4   Setting GPIB address

Set GPIB address.
Refer to Section 4.1.2 "Setting GPIB address" for details.

5.2.5   Initializing device

IEEE488.2 standards define system initialization in 3 levels including bus initialization, message initialization and device initialization.
The MP8931A is in the following status after power-on:

- Status at the last power OFF is set.
- Input buffer and output queue are cleared.
- Syntax analysis field, effective control field and response formatter are reset.

Table 5.2.5-1   System initialization types

Level	Initialization type	Description
1	Bus initialization (IFC function)	Initializes bus by the IFC statement. Puts the IFC line to active status for approx. 100 µs to initialize interface functions of all devices connected to the GPIB bus line.
2	Message initialization (DCL and SDC functions)	Initializes message exchange by the DCL or SDC bus command. Initializes messages of all or specified devices on the GPIB interface Purpose of message exchange is to prepare for transmission of new command from the controller when the message exchange area inside the device is improper to be controlled from the controller due to execution of other program, etc., while panel setting status is not required to be changed. DCL: Initializes message exchange of all devices on the GPIB interface. SDC: Initializes message exchange of the specified device.
3	Device initialization (*RST function)	Initializes device by the *RST command. Initializes the device-unique functions regardless of past use history. (Refer to Appendix B "Initial Value List.")

5.3   RS-232C Interface

5.3.1   Connecting RS-232C cable

Connect the RS-232C cable connector to the connector on the rear panel.
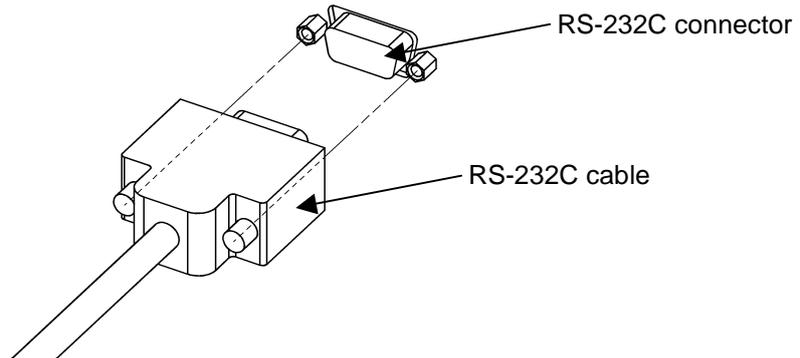
Fig. 5.3.1-1   RS-232C cable connection

5.3.2   Setting RS-232C

Set RS-232C parameters (baud rate, parity).

Refer to Sections 4.1.3 "Setting RS-232C baud rate" and 4.1.4 "Setting RS-232C parity bit" for details.

Before using RS-232C as remote control interface, set the MP8931A to local status.

Table 5.3.2-1   Settings when using RS-232C interface

Item	Standards
Communication formula	Step-by-step synchronization, half-duplex
Flow Control	Xon/Xoff function
Baud rate	1200, 2400, 4800, 9600, 19.2 k, 38.4 k, 57.6 k and 115.2 k
Data length	8 bits (fixed)
Parity	Odd number (ODD), even number (EVEN), none (NONE)
Start bit	1 bit (fixed)
Stop bit	1 bit (fixed)

Pin assignment of the RS-232C connector is shown in the figure below:
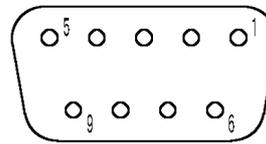
Fig. 5.3.2-1   Pin assignment of RS-232C connector

No	Name
1	(NC)
2	RD
3	TD
4	(NC)
5	GND
6	(NC)
7	RTS
8	CTS
9	(NC)

NC: Not connected
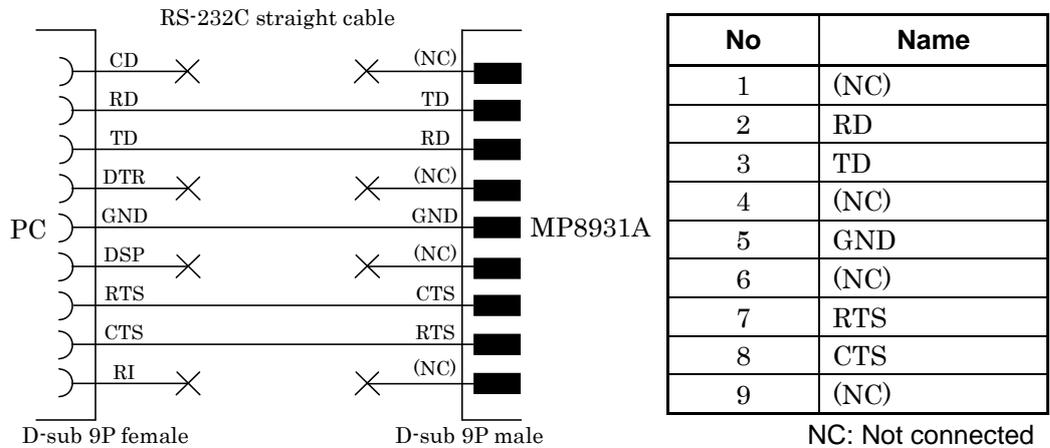
Fig. 5.3.2-1   Interfacing to personal computer

Note：

The use of the Anritsu application parts "J1256A" is recommended.

5.3.3 Initializing device

The MP8931A supports the *RST command (refer to GPIB section 5.2.5) for device initialization when using RS-232C interface. Device status after power-on is the same as that for GPIB interface.

5.3.4 Transmission format

Transmission format is shown below:

Message	CR	LF

Message (ASCII code): Command/query/response.   Up to 256 bytes.
CR (0DH):   Receives LF to indicate the end of transmission.
LF (0AH):   Indicates the end of transmission with CR.

Xoff (13H):   Indicates suspend of transmission.
Xon (11H):   Indicates resumption of transmission.

5.3.5 Transmission procedures

(1) Normal command

The MP8931A returns "ANS 0" for command.

The controller receives the reply and transmits next message.
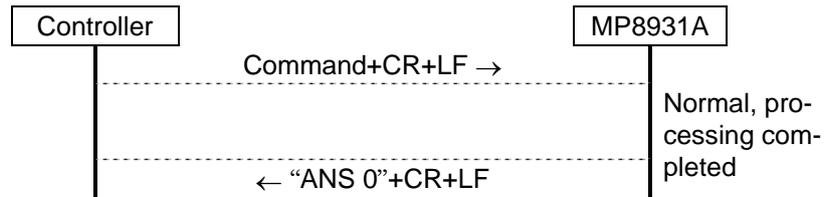
(2) Normal query

The MP8931A returns response for query.
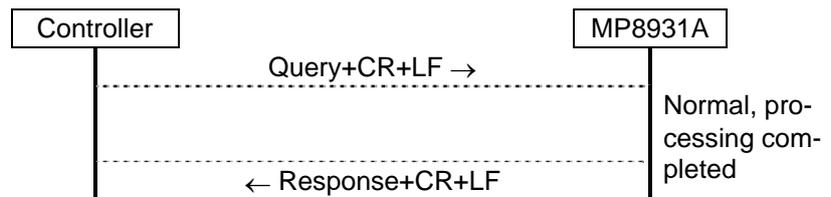
(3) Abnormal message

When the MP8931A received a message that is not supported or it is not ready to execution, "ANS xxxx" is returned as a response. xxxx indicates error code.
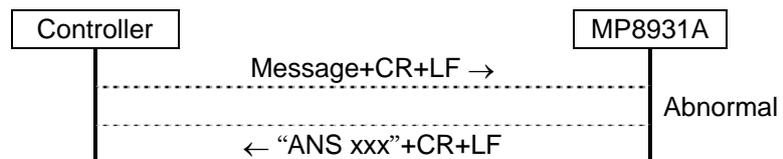
(4)   Abnormal reply or response

When the Controller detects error for reply or response that the MP8931A has transmitted, Controller retries transmission.

```
          ┌──────────────┐                                    ┌──────────┐
          │  Controller  │                                    │ MP8931A  │
          └──────────────┘                                    └──────────┘
          │                      Message +CR+LF →                        │
          │- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - │
          │                                                              │  Normal, pro-
          │- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - │  cessing com-
          │                        ← ?????                               │  pleted
          │- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - │
Response is not │                                                        │
received normal-│                                                        │
   ly.    │                                                              │
Re transmission │          Message +CR+LF →                              │
          │- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - │
          │                                                              │  Normal, pro-
          │                                                              │  cessing com-
          │                                                              │  pleted
          │- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - │
```
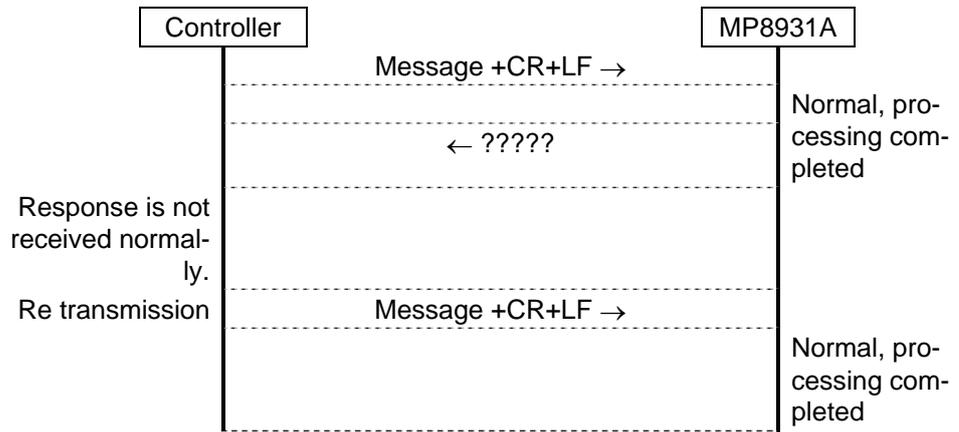
(5)   Timeout detection

When reply or response for command or query is not detected after 3 seconds elapsed, the Controller retries transmission.

```
          ┌──────────────┐                                    ┌──────────┐
          │  Controller  │                                    │ MP8931A  │
          └──────────────┘                                    └──────────┘
          │                      Message +CR+LF →                        │
          │- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - │
          │                                                              │  Normal, pro-
          │                                                              │  cessing com-
3 seconds │                                                              │  pleted
 elapsed  │- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - │
Re-transmission │          Message +CR+LF →                              │
          │- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - │
          │                                                              │  Normal, pro-
          │                                                              │  cessing com-
          │                                                              │  pleted
          │- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - │
```
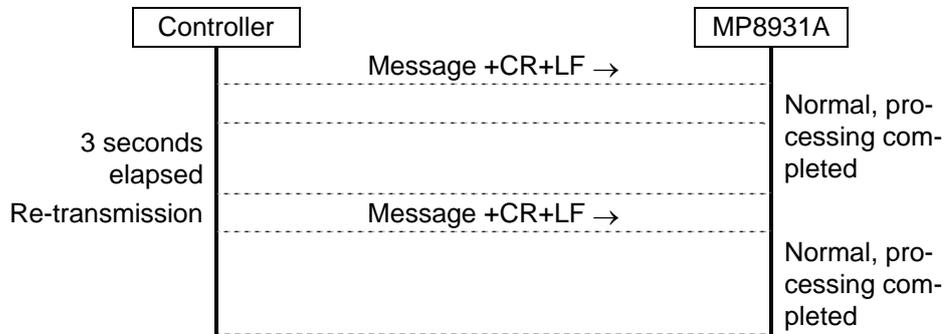
(6) Xon/Xoff reception

When the MP8931A receives Xoff, transmission is suspended half-way and resumed when it receives Xon.

```
┌─────────────┐                                    ┌──────────┐
│ Controller  │                                    │ MP8931A  │
└─────────────┘                                    └──────────┘
      │            Command+CR+LF →                      │
      │ - - - - - - - - - - - - - - - - - - - - - - - - │
      │                                                 │  Normal, pro-
      │                ← 'A'                            │  cessing com-
      │ - - - - - - - - - - - - - - - - - - - - - - - - │  pleted
      │                ← 'N'                            │
      │ - - - - - - - - - - - - - - - - - - - - - - - - │
      │                 Xoff →                          │
      │ - - - - - - - - - - - - - - - - - - - - - - - - │  Xoff reception:
      │                                                 │   transmission
      │                                                 │   stopped
      │ - - - - - - - - - - - - - - - - - - - - - - - - │
      │                 Xon →                           │
      │ - - - - - - - - - - - - - - - - - - - - - - - - │  Xon reception:
      │                                                 │   transmission
      │                                                 │   resumed
      │ - - - - - - - - - - - - - - - - - - - - - - - - │
      │                ← 'S'                            │
      │ - - - - - - - - - - - - - - - - - - - - - - - - │
      │                ← ' '                            │
      │ - - - - - - - - - - - - - - - - - - - - - - - - │
      │                ← '0'                            │
      │ - - - - - - - - - - - - - - - - - - - - - - - - │
```
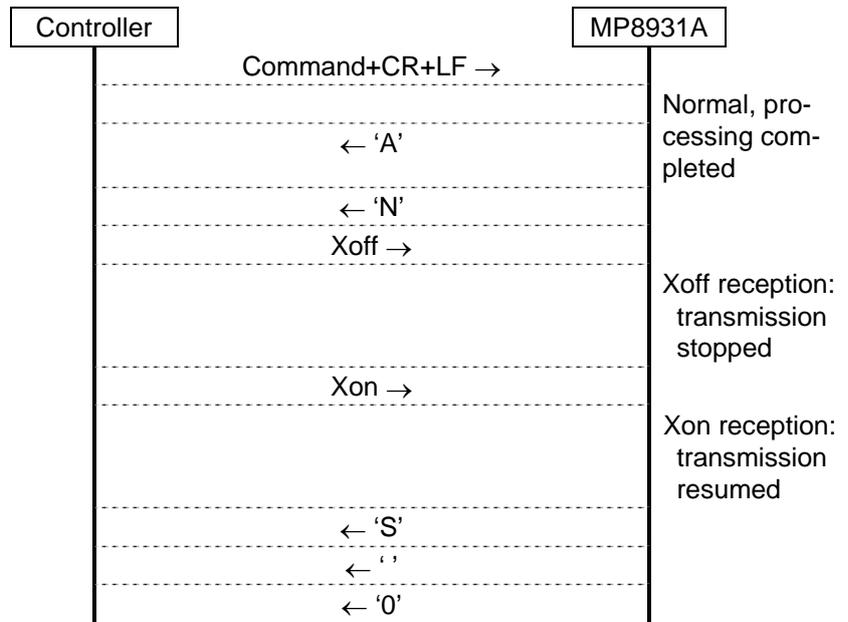
5.3.6 Error codes

Error codes for reply message are for command error, execution error and query error.

Error code	Error name
0	Normal
4	Query error
16	Execution Error
32	Command error

5.4 Device Message

5.4.1 Outline

Device messages are data transmitted/received between controller and devices, and consist of program messages (output from controller to the MP8931A) and response messages (input to controller from the MP8931A). Program messages consist of program commands for setting MP8931A parameters or specifying processing, and program queries for querying parameters or measured results.

5.4.2 Supported IEEE488.2 common commands

IEEE488.2 common commands supported by the MP8931A are shown in the table below.

Table 5.4.2-1   IEEE488.2 common command list

	Mnemonic	Full spelling	IEEE488.2 standards
1	*CLS	Clear Status Command	Mandatory
2	*ESE	Standard Event Status Enable Command	Mandatory
3	*ESE?	Standard Event Status Enable Query	Mandatory
4	*ESR?	Standard Event Status Register Query	Mandatory
5	*IDN?	Identification Status Query	Mandatory
6	*OPC	Operation Complete Command	Mandatory
7	*OPC?	Operation Complete Query	Mandatory
8	*RST	Reset Command	Mandatory
9	*SRE	Service Request Enable Command	Mandatory
10	*SRE?	Service Request Enable Query	Mandatory
11	*STB?	Read Status Byte Query	Mandatory
12	*TRG	Trigger Command	Mandatory for T1
13	*TST?	Self Test Query	Mandatory
14	*WAI	Wait to Continue Command	Mandatory

*CLS (Clear Status Command)

■ Function   Clears all status data structure (event register and queue) except output queue and its MAV summary message.

Header	Program command	Query	Response
*CLS	*CLS	---	---

■ Example use   *CLS

*ESE (Standard Event Status Enable Command/Query)

■ Function   Enables corresponding bit of standard event status enable register.

Header	Program command	Query	Response
*ESE	*ESE n	*ESE?	n

■ Value of n   0 to 255

■ Example use   *ESE 16
                  *ESE?

■ Example response message   16

*ESR? (Standard Event Status Register Query)

■ Function   Outputs standard event status register.

Header	Program command	Query	Response
*ESR?	---	*ESR?	n

■ Value of n   0 to 255

■ Example use   *ESR?

■ Example response message   16

*IDN? (Identification Query)

■ Function   Outputs manufacturer name, model number and device version.

Header	Program command	Query	Response
*IDN?	---	*IDN?	ANRITSU,MP8931A,0000,n

■ Value of n   <Device version> xx.xx

■ Example use   *IDN?

■ Example response message   ANRITSU,MP8931A,0000,01.01

*OPC (Operation Complete Command)

■ Command function Sets operation complete bit of standard event status register after all device operation completed.

■ Query function   Sets 1 for output queue after all device operation completed, and waits MAV summary message is generated.

Header	Program command	Query	Response
*OPC	*OPC	*OPC?	n

■ Value of n   1

■ Example use   *OPC
                  *OPC?

■ Example response message   1

Note:

There is not overlap command when using the MP8931A, so the command is executed immediately.

*RST (Reset Command)

■ Function   Initializes the MP8931A at level 3.

Header	Program command	Query	Response
*RST	*RST	---	---

■ Example use   *RST

■ Description

     (1) Initializes targeted device parameters.
     (2) Puts the device into OCIS (Operation Complete Command Idle State.)
     (3) Puts the device into OQIS (Operation Complete Query Idle State.)

     The following items are not affected by this command:
     (1) GPIB interface status
     (2) GPIB address
     (3) RS-232C interface status
     (4) Output queue
     (5) Service request enable register
     (6) Standard event status enable register

*SRE (Service Request Enable Command/Query)

■ Function   Enables the specified bit of service request enable register.

Header	Program command	Query	Response
*SRE	*SRE n	*SRE?	n

■ Value of n   0 to 255

■ Example use   *SRE 1
                       *SRE?

■ Example response message   1

*STB? (Read Status Byte Query)

■ Function   Outputs status byte register containing MSS bit.

Header	Program command	Query	Response
*STB?	---	*STB?	n

■ Value of n   0 to 255

■ Example use   *STB?

■ Example response message   1

*TRG (Trigger Command)

■ Function   Same function as IEEE488.1 GET-Group Execute Trigger bus command.   Executes
                  the START command on the MP8931A.

Header	Program command	Query	Response
*TRG	*TRG	---	---

■ Example use   *TRG

*TST? (Self Test Query)

■ Function   Executes self-test and outputs the results.

Header	Program command	Query	Response
*TST?	---	*TST?	n

■ Value of n   0: No error
                    1: An error detected during self-test at startup

■ Example use   *TST?

■ Example response message   0

*WAI (Wait to Continue Command)

■ Function   Executes overlap command as sequential command.

Header	Program command	Query	Response
*WAI	*WAI	---	---

■ Example use   *WAI

Note:

There is no overlap commands for the MP8931A, so the command is executed immediately.

5.4.3   Status messages

The structure of service summary message of status byte register of the MP8931A is shown below:

(1) Standard event status register

Status byte register
Set to ESB bit

Bit	Event name	Description
7	Power on	Set when power supply status is changed from Off to On.
6	User request	Set to send user request to the controller. Always 0 on the MP8931A.
5	Command error	(1) Set when syntax error is detected. (2) Set when message not supported by the MP8931A is received. (3) Set when GET is detected during message reception.
4	Execution error	(1) Set when command exceeding setting range is received. (2) Set when the MP8931A is not in a status capable of message execution. (3) Set when using GPIB or RS-232C.
3	Device dependent error	Set when an error except command error, execution error or query error is detected.
2	Query error	(1) Set when readout is executed while output queue is empty. (2) Set when output queue overflows.
1	Bus control-right request	Sets when requesting to be the controller. Always 0 on the MP8931A.
0	Operation completed	Set when the *OPC command is received in a status capable of receiving new message. The MP8931A does not have overlap command, so always sets 1 when the *OPC command is received.

(2)   Extended ERR event status register

Status byte register
Set to ERR bit

Bit	Event name	Description
7	Not used	Always 0.
6	Not used	Always 0.
5	Not used	Always 0.
4	Not used	Always 0.
3	Not used	Always 0.
2	EEPROM write error	Set when writing to EEPROM failed.
1	Parameter error	Set when parameters cannot be restored by automatic parameter restoration at power-on.
0	FPGA configuration error	Set when FPGA configuration failed during self-test at power-on.

(3) Extended STA event status register

Status byte register
Set to STA bit

Extended STA event status enable register   Extended STA event status register

Bit	Event name	Description
7	Not used	Always 0.
6	Not used	Always 0.
5	Not used	Always 0.
4	Not used	Always 0.
3	Signal Loss	Set when Signal Loss is detected during measurement.
2	Over Flow	Set when Over Flow is detected during measurement.
1	Sync Loss	Set when Sync Loss is detected during measurement.
0	Errors	Set when errors are detected during measurement.

(4)   Extended END event status register

Status byte register
Set to END bit

Bit	Event name	Description
7	Not used	Always 0.
6	Not used	Always 0.
5	Not used	Always 0.
4	Not used	Always 0.
3	Measurement end by Over Flow	Set when measurement is completed by Over Flow detection.
2	Measurement end by count	Set when measurement is completed by measurement count reached to full.
1	Measurement end by time	Set when measurement is completed by measurement time reached to full.
0	Measurement end by the user	Set when measurement is completed by pressing [Stop] key or receiving measurement stop command.

5.4.4 MP8931A device message list

Measurement-related messages are listed in Table 5.4.4-1.

Table 5.4.4-1   Measurement-related message list

	Function			Message	Remarks
1	Start measurement	Command		START	---
		Query		---	
		Response		---	
2	Stop measurement	Command		STOP	---
		Query		---	
		Response		---	
3	Measurement status	Command		---	n: Measurement status
		Query		STAT?	0: Measurement stopped
		Response		STAT n	1: Measurement in progress
4	Error addition	Command		ERRADD	---
		Query		---	
		Response		---	
5	Error rate read-out (Current)	Command		---	n: Error rate
		Query		ERRRATE?	
		Response		ERRRATE n	
6	Number of errors/total count read-out (Current)	Command		---	n1: Number of errors
		Query		ERRCNT?	n2: Total count
		Response		ERRCNT n1, n2	
7	Measured results display method	Command		MEASDISP n	n: Display method
		Query		MEASDISP?	0: Error Rate
		Response		MEASDISP n	1: Error/Count
8	Error rate read-out (Last)	Command		---	n: Error rate
		Query		ERRRATEL?	
		Response		ERRRATEL n	
9	Number of errors/total count read-out (Last)	Command		---	n1: Number of errors
		Query		ERRCNTL?	n2: Total count
		Response		ERRCNTL n1, n2	
10	Elapsed measurement time read-out	Command		---	n1: Hour 0 to 9999
		Query		PASSTIME?	n2: Minute 0 to 59
		Response		PASSTIME n1, n2, n3	n3: Second 0 to 59
11	Remaining measurement time read-out	Command		---	n1: Hour -, 0 to 999
		Query		LEFTTIME?	n2: Minute -, 0 to 59
		Response		LEFTTIME n1, n2, n3	n3: Second -, 0 to 59

Measurement parameter-related messages are listed in Table 5.4.4-2.

Table 5.4.4-2   Measurement parameter-related message list

	Function		Message	Remarks
1	Pattern	Command	PTN n	n: Pattern 0: PN9 1: PN9 Reverse 2: PN15 3: PN15 Reverse 4: PN23 5: PN23 Reverse 6: ALL0 7: ALL1 8: 1010
		Query	PTN?	
		Response	PTN n	
2	Interface	Command	INTFC n	n: Interface type 0: NRZ 1: DVB-SPI 2: DVB-ASI
		Query	INTFC?	
		Response	INTFC n	
3	Error addition interval	Command	ERRINT n	n: Error addition period 0: None 1: Manual 2: 1×10^{-2} 3: 1×10^{-3} 4: 1×10^{-4} 5: 1×10^{-5} 6: 1×10^{-6} 7: 1×10^{-7}
		Query	ERRINT?	
		Response	ERRINT n	
4	Auto Sync	Command	SYNC n	n: Auto Sync On/Off 0: Off 1: On
		Query	SYNC?	
		Response	SYNC n	
5	Enable/disable output	Command	OUTPUT n	n: Enable/disable of output 0: Disable 1: Enable
		Query	OUTPUT?	
		Response	OUTPUT n	
6	Enable/disable monitoring	Command	MONITOR n	n: Enable/disable of monitoring 0: Disable 1: Enable
		Query	MONITOR?	
		Response	MONITOR n	
7	Enable/disable Burst function	Command	BURST n	n: Enable/disable of Burst function 0: Disable 1: Enable
		Query	BURST?	
		Response	BURST n	

External clock parameter-related messages are listed in Table 5.4.4-3.

Table 5.4.4-3   External clock parameter-related message list

	Function		Message	Remarks
1	Enable/disable external clock	Command	EXTCLK n	n: Enable/disable of external clock 0: Disable 1: Enable
		Query	EXTCLK?	
		Response	EXTCLK n	
2	External clock input level	Command	EXTLVL n	n: Level 0: TTL 1: ECL
		Query	EXTLVL?	
		Response	EXTLVL n	
3	Termination resistor for external clock input	Command	EXTTERM n	n: Termination resistor 0: 75 Ω 1: 1 MΩ
		Query	EXTTERM?	
		Response	EXTTERM n	

Measurement time/count parameter-related messages are listed in Table 5.4.4-4.

Table 5.4.4-4   Measurement time/count parameter-related message list

	Function		Message	Remarks
1	Measurement selection	Command	MEAS n	n: Selection 0: None 1: Time 2: Count
		Query	MEAS?	
		Response	MEAS n	
2	Measurement time	Command	MEASTIME n1, n2, n3	n1: Hour 0 to 999 n2: Minute 0 to 59 n3: Second 0 to 59
		Query	MEASTIME?	
		Response	MEASTIME n1, n2, n3	
3	Measurement count	Command	MEASCNT n	n: Count 3 to 15: 1×10^3 to 1×10^{15}
		Query	MEASCNT?	
		Response	MEASCNT n	
4	Measurement repetition	Command	MEASRPT n	n: Measurement repetition 0: Off 1: On
		Query	MEASRPT?	
		Response	MEASRPT n	
5	Measured results display selection	Command	MEASSEL n	n: Display selection 0: Current 1: Last
		Query	MEASSEL?	
		Response	MEASSEL n	
6	Measurement time (Detailed)	Command	MEASDTIME n1, n2, n3, n4	n1: Hour 0 to 999 n2: Minute 0 to 59 n3: Second 0 to 59 n4: 0.1 Second 0 to 9
		Query	MEASDTIME?	
		Response	MEASDTIME n1, n2, n3, n4	

NRZ measurement parameter-related messages are listed in Table 5.4.4-5.

Table 5.4.4-5   NRZ measurement parameter-related message list

	Function			**Message**	**Remarks**
1	NRZ frequency	Command		NRZFREQ n	n: Frequency 1 kHz to 155 MHz (1-Hz steps)
		Query		NRZFREQ?	
		Response		NRZFREQ n	

2	NRZ I/O level	Command		NRZLVL
				  n1, n2
					n1: Output level
					  0: TTL
					  1: ECL
					n2: Input level
					  0: TTL
					  1: ECL
					  2: Variable

		Query		NRZLVL?	
		Response		NRZLVL n1, n2	

3	NRZ I/O data polarity	Command		NRZDATA
				  n1, n2
					n1: Output data po-
					  larity
					  0: Positive
					  1: Negative
					n2: Input data polar-
					  ity
					  0: Positive
					  1: Negative

		Query		NRZDATA?	
		Response		NRZDATA n1, n2	

4	NRZ I/O clock polari-
	ty
		Command		NRZCLK
				  n1, n2
					n1: Output clock po-
					  larity
					  0: Rise
					  1: Fall
					n2: Input clock polar-
					  ity
					  0: Rise
					  1: Fall

		Query		NRZCLK?	
		Response		NRZCLK n1, n2	

5	NRZ input Enable
	polarity
		Command		NRZENA n	n: Input Enable po-
					  larity
					  0: Positive
					  1: Negative
					  2: Off

		Query		NRZENA?	
		Response		NRZENA n	

6	NRZ I/O termination
	resistor
		Command		NRZTERM n	n: Termination resis-
					  tor
					  0: 75 Ω
					  1: 1 MΩ

		Query		NRZTERM?	
		Response		NRZTERM n	

7	Voltage when NRZ
	I/O level is Variable
		Command		NRZV
				  n1, n2
					n1: Termination
					  voltage
					  −2.5 to +3.3 V
					  (0.1-V steps)
					n2: Threshold voltage
					  −2 to +3 V
					  (0.1-V steps)

		Query		NRZV?	
		Response		NRZV n1, n2	

DVB-SPI measurement parameter-related messages are listed in Table 5.4.4-6.

Table 5.4.4-6   DVB-SPI measurement parameter-related message list

	Function		Message	Remarks
1	DVB-SPI frequency	Command	SPIFREQ n	n: Frequency 10 kHz to 13.5 MHz (1-Hz steps)
		Query	SPIFREQ?	
		Response	SPIFREQ n	
2	DVB-SPI packet type	Command	SPIPKT n	n: Packet type 0: (1)+187+ (16) 1: (1)+187 2: (1+3)+184+ (16) 3: (1+3)+184 4: (1)+203 5: (1+3)+200
		Query	SPIPKT?	
		Response	SPIPKT n	

DVB-ASI measurement parameter-related messages are listed in Table 5.4.4-7.

Table 5.4.4-7   DVB-ASI measurement parameter-related message list

	Function		Message	Remarks
1	DVB-ASI packet type	Command	ASIPKT n	n: Packet type 0: (1)+187+ (16) 1: (1)+187 2: (1+3)+184+ (16) 3: (1+3)+184 4: (1)+203 5: (1+3)+200
		Query	ASIPKT?	
		Response	ASIPKT n	
2	DVB-ASI data rate	Command	ASIRATE n	n: Data rate 1 to 27 MHz (1-MHz steps)
		Query	ASIRATE?	
		Response	ASIRATE n	

System data-related messages are listed in Table 5.4.4-8.

Table 5.4.4-8   System data-related message list

	Function		Message	Remarks
1	GPIB	Command	---	n: GPIB address
		Query	GPIB?	0 to 30
		Response	GPIB n	

2	RS-232C	Command	---	n1: Baud rate
				    1200: 1.2 kbps
				    2400: 2.4 kbps
				    4800: 4.8 kbps
				    9600: 9.6 kbps
				    19200: 19.2 kbps
				    38400: 38.4 kbps
				    57600: 57.6 kbps
				    115200: 115.2 kbps

		Query	RS232C?	

		Response	RS232C
			  n1, n2
				n2: Parity bit
				  0: None
				  1: Odd (odd number)
				  2: Even (even number)

3	Display	Command	DISPLAY
			  n1, n2
				n1: Auto Off control
				  0: None
				  1: 1 min.
				  5: 5 min.
				  10: 10 min.
				  20: 20 min.
				  30: 30 min.
				  40: 40 min.
				  50: 50 min.
				  60: 60 min.

		Query	DISPLAY?	

		Response	DISPLAY
			  n1, n2
				n2: Brightness
				  25: 25%
				  50: 50%
				  75: 75%
				  100: 100%

4	Version	Command	---	n1: Device version n2: Boot program version
		Query	VERSION?	n3: Application program version
		Response	VERSION n1, n2, n3, n4	n4: FPGA program version

Extended event register-related messages are listed in Table 5.4.4-9.

Table 5.4.4-9　Extended event register-related message list

	Function		Message	Remarks
1	Extended ERR event status enable register	Command	ESE1 n	n: Extended ERR event status enable bit 0 to 255
		Query	ESE1?	
		Response	ESE1 n	
2	Extended ERR event status register	Command	---	n: Extended ERR event status 0 to 255
		Query	ESR1?	
		Response	ESR1 n	
3	Extended STA event status enable register	Command	ESE2 n	n: Extended STA event status enable bit 0 to 255
		Query	ESE2?	
		Response	ESE2 n	
4	Extended STA event status register	Command	---	n: Extended STA event status 0 to 255
		Query	ESR2?	
		Response	ESR2 n	
5	Extended END event status enable register	Command	ESE3 n	n: Extended END event status enable bit 0 to 255
		Query	ESE3?	
		Response	ESE3 n	
6	Extended END event status register	Command	---	n: Extended END event status 0 to 255
		Query	ESR3?	
		Response	ESR3 n	

5.5 Device Message Details

The MP8931A-specific commands are described in this section.

5.5.1   Measurement-related messages

START (Start Command)

■ Function   Starts measurement.

Header	Program command	Query	Response
START	START	---	---

■ Example use   START

STOP (Stop Command)

■ Function   Stops measurement.

Header	Program command	Query	Response
STOP	STOP	---	---

■ Example use   STOP

STAT? (Status Query)

■ Function   Outputs measurement status.

Header	Program command	Query	Response
STAT?	---	STAT?	STAT n

■ Value of n   0: Measurement is stopped.

1: Measurement is in progress.

■ Example use   STAT?

■ Example response message   STAT 0

ERRADD (Error Add Command)

■ Function   Adds an error.

Header	Program command	Query	Response
ERRADD	ERRADD	---	---

■ Example use   ERRADD

ERRRATE? (Error Rate Query)

■ Function   Outputs error rate.

Header	Program command	Query	Response
ERRRATE?	---	ERRRATE?	ERRRATE n

■ Value of n   <Error rate>

■ Example use   ERRRATE?

■ Example response message   ERRRATE 1.85E-14

ERRCNT? (Error Count Query)

■ Function   Outputs number of errors/total count.

Header	Program command	Query	Response
ERRCNT?	---	ERRCNT?	ERRCNT n1,n2

■ Value of n1   <Number of errors>

■ Value of n2   <Total count>

■ Example use   ERRCNT?

■ Example response message   ERRCNT 1.12E+01,3.45E+06

MEASDISP (Measure Display Command/Query)

■ Function   Sets the measured results display method.

Header	Program command	Query	Response
MEASDISP	MEASDISP n	MEASDISP?	MEASDISP n

■ Value of n   0: Error rate display
                    1: Number of errors/total count display

■ Example use   MEASDISP 0
                     MEASDISP?

■ Example response message   MEASDISP 0

ERRRATEL? (Error Rate Last Query)

■ Function   Outputs the error rate at the end of the previous measurement interval.

This query can be used regardless of whether the measured results display is Current or Last (set by MEASSEL).

Header	Program command	Query	Response
ERRRATEL?	---	ERRRATEL?	ERRRATEL n

■ Value of n   <Error rate>

Note that "-.--E+--" is returned during single measurement and during the first measurement interval of repeat measurement.

■ Example use   ERRRATEL?

■ Example response message   ERRRATEL 1.85E-14
                                  ERRRATEL -.--E+--

ERRCNTL? (Error Count Last Query)

■ Function   Outputs the number of errors/total count at the end of the previous measurement interval.

This query can be used regardless of whether the measured results display is Current or Last (set by MEASSEL).

Header	Program command	Query	Response
ERRCNTL?	---	ERRCNTL?	ERRCNTL n1,n2

■ Value of n1   <Number of errors>

Note that "-.--E+--" is returned during single measurement and during the first measurement interval of repeat measurement.

■ Value of n2   <Total count>

Note that "-.--E+--" is returned during single measurement and during the first measurement interval of repeat measurement.

■ Example use   ERRCNTL?

■ Example response message   ERRCNTL 1.12E+01,3.45E+06
                                  ERRCNTL -.--E+--, -.--E+--

PASSTIME? (Passed Time Query)

■ Function   Displays the elapsed measurement time.

Header	Program command	Query	Response
PASSTIME?	---	PASSTIME?	PASSTIME n1,n2,n3

■ Value of n1   <Hour>   0 to 9999

■ Value of n2   <Minute>   0 to 59

■ Value of n3   <Second>   0 to 59

■ Example use   PASSTIME?

■ Example response message   PASSTIME 1,25,34

LEFTTIME? (Left Time Query)

■ Function   Displays the remaining measurement time.

Header	Program command	Query	Response
LEFTTIME?	---	LEFTTIME?	LEFTTIME n1,n2,n3

■ Value of n1   <Hour>   –, 0 to 999
                   * "–" is displayed when the remaining measurement time display is disabled.

■ Value of n2   <Minute>   –, 0 to 59
                   * "–" is displayed when the remaining measurement time display is disabled.

■ Value of n3   <Second>   –, 0 to 59
                   * "–" is displayed when the remaining measurement time display is disabled.

■ Example use   LEFTTIME?

■ Example response message   LEFTTIME 1,34,26
                                 LEFTTIME –,–,–

5.5.2   Measurement parameter-related messages

PTN (Pattern Command/Query)

■ Function   Sets pattern.

Header	Program command	Query	Response
PTN	PTN n	PTN?	PTN n

■ Value of n   0: PN9
                    1: PN9 Reverse
                    2: PN15
                    3: PN15 Reverse
                    4: PN23
                    5: PN23 Reverse
                    6: ALL0
                    7: ALL1
                    8: 1010

■ Example use   PTN 0
                     PTN?

■ Example response message   PTN 0

INTFC (Interface Command/Query)

■ Function   Sets interface to be used.

Header	Program command	Query	Response
INTFC	INTFC n	INTFC?	INTFC n

■ Value of n   0: NRZ
                    1: DVB-SPI
                    2: DVB-ASI

■ Example use   INTFC 0
                     INTFC?

■ Example response message   INTFC 0

ERRINT (Error Add Interval Command/Query)

■ Function   Sets error addition interval.

Header	Program command	Query	Response
ERRINT	ERRINT n	ERRINT?	ERRINT n

■ Value of n   0: None
                  1: Manual
                  2: 1×10^{-2}
                  3: 1×10^{-3}
                  4: 1×10^{-4}
                  5: 1×10^{-5}
                  6: 1×10^{-6}
                  7: 1×10^{-7}

■ Example use   ERRINT 0
                   ERRINT?

■ Example response message   ERRINT 1

SYNC (Auto Sync Command/Query)

■ Function   Sets on/off of Auto Sync.

Header	Program command	Query	Response
SYNC	SYNC n	SYNC?	SYNC n

■ Value of n   0: OFF
                  1: ON

■ Example use   SYNC 0
                  SYNC?

■ Example response message   SYNC 0

OUTPUT (Output Command/Query)

■ Function   Enables/disables output.

Header	Program command	Query	Response
OUTPUT	OUTPUT n	OUTPUT?	OUTPUT n

■ Value of n   0: Disable
                  1: Enable

■ Example use   OUTPUT 0
                  OUTPUT?

■ Example response message   OUTPUT 0

MONITOR (Monitor Command/Query)

■ Function   Enables/disables monitoring.

Header	Program command	Query	Response
MONITOR	MONITOR n	MONITOR?	MONITOR n

■ Value of n   0: Disable
                  1: Enable

■ Example use   MONITOR 0
                  MONITOR?

■ Example response message   MONITOR 0

BURST (BURST Command/Query)

■ Function   Enables/disables the Burst function.

Header	Program command	Query	Response
BURST	BURST n	BURST?	BURST n

■ Value of n   0: Disable
                  1: Enable

■ Example use   BURST 0
                  BURST?

■ Example response message   BURST 0

5.5.3 External clock parameter-related messages

EXTCLK (External Clock Command/Query)

■ Function   Enables/disables use of external clock.

Header	Program command	Query	Response
EXTCLK	EXTCLK n	EXTCLK?	EXTCLK n

■ Value of n   0: Disable

                        1: Enable

■ Example use   EXTCLK 0

                        EXTCLK?

■ Example response message   EXTCLK 0

EXTLVL (External Clock Level Command/Query)

■ Function   Sets external clock level.

Header	Program command	Query	Response
EXTLVL	EXTLVL n	EXTLVL?	EXTLVL n

■ Value of n   0: TTL

                        1: ECL

■ Example use   EXTLVL 0

                        EXTLVL?

■ Example response message   EXTLVL 1

EXTTERM (External Clock Termination Command/Query)

■ Function   Sets termination resistor of external clock.

Header	Program command	Query	Response
EXTTERM	EXTTERM n	EXTTERM?	EXTTERM n

■ Value of n   0: 75 Ω

                        1: 1 MΩ

■ Example use   EXTTERM 0

                        EXTTERM?

■ Example response message   EXTTERM 0

5.5.4   Measurement time/count parameter-related messages

MEAS (Measure Select Command/Query)

■ Function   Select measurement method.

Header	Program command	Query	Response
MEAS	MEAS n	MEAS?	MEAS n

■ Value of n   0: None
                      1: Time
                      2: Count

■ Example use   MEAS 0
                       MEAS?

■ Example response message   MEAS 0

MEASTIME (Measure Time Command/Query)

■ Function   Sets measurement time.

Header	Program command	Query	Response
MEASTIME	MEASTIME n1,n2,n3	MEASTIME?	MEASTIME n1,n2,n3

■ Value of n1   <Hour> 0 to 999

■ Value of n2   <Minute> 0 to 59

■ Value of n3   <Second> 0 to 59

■ Example use   MEASTIME 0,0,1
                       MEASTIME?

■ Example response message   MEASTIME 0,10,0

MEASCNT (Measure Count Command/Query)

■ Function Sets measurement count.

Header	Program command	Query	Response
MEASCNT	MEASCNT n	MEASCNT?	MEASCNT n

■ Value of n 3 to 15: 1×10^3 to 1×10^{15}

■ Example use MEASCNT 3
MEASCNT?

■ Example response message MEASCNT 4

MEASRPT (Measurement Repeat Command/Query)

■ Function Sets measurement repetition On/Off.

Header	Program command	Query	Response
MEASRPT	MEASRPT n	MEASRPT?	MEASRPT n

■ Value of n 0: OFF
1: ON

■ Example use MEASRPT 0
MEASRPT?

■ Example response message MEASRPT 0

MEASSEL (Measurement Select Command/Query)

■ Function Selects the measured results display.

Header	Program command	Query	Response
MEASSEL	MEASSEL n	MEASSEL?	MEASSEL n

■ Value of n 0: Current
1: Last

■ Example use MEASSEL 0
MEASSEL?

■ Example response message MEASSEL 0

MEASDTIME (Measurement Detailed Time Command/Query)

■ Function   Sets measurement time in 0.1 second steps.

Header	Program command	Query	Response
MEASDTIME	MEASDTIME n1,n2,n3,n4	MEASDTIME?	MEASDTIME n1,n2,n3,n4

■ Value of n1   \<Hour\>   0 to 999

■ Value of n2   \<Minute\>   0 to 59

■ Value of n3   \<Second\>   0 to 59

■ Value of n4   \<0.1 Second\> 0 to 9

■ Example use   MEASDTIME 0,0,1,2
                   MEASDTIME?

                   Note:

                          MEASDTIME is an extension function of MEASTIME. It can be used only
                          during remote control.
                          The settable measurement time range is from 1 second to 999 hours 59 minutes
                          59.90 seconds.
                          Note that decimal values are truncated when the measurement time is dis-
                          played on the screen or when it is read out by using the MEASTIME? query.

■ Example response message   MEASDTIME 0,10,0,7

5.5.5   NRZ measurement parameter-related messages

NRZFREQ (NRZ Frequency Command/Query)

■ Function   Sets NRZ frequency.

Header	Program command	Query	Response
NRZFREQ	NRZFREQ n	NRZFREQ?	NRZFREQ n

■ Value of n   1 kHz to 155 MHz (1-Hz steps)

■ Suffix   When omitted: Hz
                    HZ: Hz
                    KHZ: kHz
                    MHZ: MHz

■ Example use   NRZFREQ 1000
                    NRZFREQ?

■ Example response message   NRZFREQ 1000HZ

NRZLVL (NRZ Input/Output Level Command/Query)

■ Function   Sets NRZ input/output level.

Header	Program command	Query	Response
NRZLVL	NRZLVL n1,n2	NRZLVL?	NRZLVL n1,n2

■ Value of n1   0: TTL
<Output level>   1: ECL

■ Value of n2   0: TTL
<Input level>   1: ECL
                    2: Variable

■ Example use   NRZLVL 0,0
                    NRZLVL?

■ Example response message   NRZLVL 0,0

NRZDATA (NRZ Input/Output Data Command/Query)

■ Function   Sets polarity of NRZ input/output data.

Header	Program command	Query	Response
NRZDATA	NRZDATA n1,n2	NRZDATA?	NRZDATA n1,n2

■ Value of n1   0: Positive
<Output data>   1: Negative

■ Value of n2   0: Positive
<Input data>   1: Negative

■ Example use   NRZDATA 0,0
                     NRZDATA?

■ Example response message   NRZDATA 1,0

NRZCLK (NRZ Input/Output Clock Command/Query)

■ Function   Sets polarity of NRZ input/output clock.

Header	Program command	Query	Response
NRZCLK	NRZCLK n1,n2	NRZCLK?	NRZCLK n1,n2

■ Value of n1   0: Rise
<Output clock>   1: Fall

■ Value of n2   0: Rise
<Input clock>   1: Fall

■ Example use   NRZCLK 0,0
                     NRZCLK?

■ Example response message   NRZCLK 0,1

NRZENA (NRZ Input Enable Command/Query)

■ Function   Sets an NRZ input enable polarity.

Header	Program command	Query	Response
NRZENA	NRZENA n	NRZENA?	NRZENA n

■ Value of n   0: Positive
                    1: Negative
                    2: Off

■ Example use   NRZENA 0
                    NRZENA?

■ Example response message   NRZENA 0

NRZTERM (NRZ Input Termination Command/Query)

■ Function   Sets NRZ input termination resistance.

Header	Program command	Query	Response
NRZTERM	NRZTERM n	NRZTERM?	NRZTERM n

■ Value of n   0: 75 Ω
                    1: 1 MΩ

■ Example use   NRZTERM 0
                    NRZTERM?

■ Example response message   NRZTERM 1

NRZV (NRZ Input Variable Voltage Command/Query)

■ Function   Sets voltage when NRZ input level is Variable.

Header	Program command	Query	Response
NRZV	NRZV n1,n2	NRZV?	NRZV n1,n2

■ Value of n1 -2.5 to $+3.3$ V

<Termination voltage>

■ Value of n2 -2 to $+3$ V

<Threshold voltage>

■ Suffix   When omitted: V

        V: V

■ Example use   NRZV 0,0

        NRZV?

■ Example response message   NRZV -2.5V,3.0V

5.5.6   DVB-SPI measurement parameter-related messages

SPIFREQ (DVB-SPI Frequency Command/Query)

■ Function   Sets DVB-SPI frequency.

Header	Program command	Query	Response
SPIFREQ	SPIFREQ n	SPIFREQ?	SPIFREQ n

■ Value of n   10 kHz to 13.5 MHz (1-Hz steps)

■ Suffix   When omitted: Hz
                    HZ: Hz
                    KHZ: kHz
                    MHZ: MHz

■ Example use   SPIFREQ 10000
                    SPIFREQ?

■ Example response message   SPIFREQ 10000HZ

SPIPKT (DVB-SPI Packet Command/Query)

■ Function   Sets DVB-SPI packet type.

Header	Program command	Query	Response
SPIPKT	SPIPKT n	SPIPKT?	SPIPKT n

■ Value of n   0: (1)+187+(16)
                    1: (1)+187
                    2: (1+3)+184+(16)
                    3: (1+3)+184
                    4: (1)+203
                    5: (1+3)+200

■ Example use   SPIPKT 0
                    SPIPKT?

■ Example response message   SPIPKT 1

5.5.7   DVB-ASI measurement parameter-related messages

ASIPKT (DVB-ASI Packet Command/Query)

■ Function   Sets DVB-ASI packet type.

Header	Program command	Query	Response
ASIPKT	ASIPKT n	ASIPKT?	ASIPKT n

■ Value of n   0: (1)+187+(16)
                   1: (1)+187
                   2: (1+3)+184+(16)
                   3: (1+3)+184
                   4: (1)+203
                   5: (1+3)+200

■ Example use   ASIPKT 0
                   ASIPKT?

■ Example response message   ASIPKT 2

ASIRATE (DVB-ASI Data Rate Command/Query)

■ Function   Sets DVB-ASI data rate.

Header	Program command	Query	Response
ASIRATE	ASIRATE n	ASIRATE?	ASIRATE n

■ Value of n   1 to 27 MHz (1-MHz steps)

■ Suffix   When omitted: MHz
                   MHZ: MHz

■ Example use   ASIRATE 1
                   ASIRATE?

■ Example response message   ASIRATE 27MHZ

5.5.8 System data-related messages

GPIB? (GPIB Address Query)

■ Function   Queries GPIB address.

Header	Program command	Query	Response
GPIB?	---	GPIB?	GPIB n

■ Value of n   0 to 30

■ Example use   GPIB?

Note:

> GPIB address change takes about one second.

■ Example response message   GPIB 15

RS232C? (RS232C Query)

■ Function   Queries RS-232C communication conditions.

Header	Program command	Query	Response
RS232C?	---	RS232C?	RS232C n1,n2

■ Value of n1   <Baud rate>   1200: 1.2 kbps
                                  2400: 2.4 kbps
                                  4800: 4.8 kbps
                                  9600: 9.6 kbps
                                  19200: 19.2 kbps
                                  38400: 38.4 kbps
                                  57600: 57.6 kbps
                                  115200: 115.2 kbps

■ Value of n2   <Parity>   0: None
                                  1: Odd (odd number)
                                  2: Even (even number)

■ Example use   RS232C?

Note:

> Changing RS-232C communication conditions takes about one second.

■ Example response message   RS232C 19200,0

DISPLAY (Display Command/Query)

■ Function   Sets display control.

Header	Program command	Query	Response
DISPLAY	DISPLAY n1,n2	DISPLAY?	DISPLAY n1,n2

■ Value of n1   0: None

1: 1 min

5: 5 min

10: 10 min

20: 20 min

30: 30 min

40: 40 min

50: 50 min

60: 60 min

■ Value of n2   25: 25%

50: 50%

75: 75%

100: 100%

■ Example use   DISPLAY 0,100

DISPLAY?

■ Example response message   DISPLAY 0,75

VERSION? (Version Query)

■ Function   Obtains version.

Header	Program command	Query	Response
VERSION?	---	VERSION?	VERSION n1,n2,n3,n4

■ Value of n1   <Device version> xx.xx

■ Value of n2   <Boot program version> xx.xx

■ Value of n3   <Application program version> xx.xx

■ Value of n4   <FPGA program version> xx.xx

■ Example use   VERSION?

■ Example response message   VERSION 01.00,01.00,01.00,01.00

5.5.9   Extended event status-related messages

ESE1 (Extended ERR Event Status Enable Command/Query)

■ Function   Sets extended ERR event status enable bits.

Header	Program command	Query	Response
ESE1	ESE1 n	ESE1?	ESE1 n

■ Value of n   0 to 255

■ Example use   ESE1 1
                    ESE1?

■ Example response message   ESE1 1

ESR1? (Extended ERR Event Status Register Query)

■ Function   Obtains extended ERR event status.

Header	Program command	Query	Response
ESR1?	---	ESR1?	ESR1 n

■ Value of n   0 to 255

■ Example use   ESR1?

■ Example response message   ESR1 1

ESE2 (Extended STA Event Status Enable Command/Query)

■ Function   Sets extended STA event status enable bits.

Header	Program command	Query	Response
ESE2	ESE2 n	ESE2?	ESE2 n

■ Value of n   0 to 255

■ Example use   ESE2 1
                    ESE2?

■ Example response message   ESE2 1

ESR2? (Extended STA Event Status Register Query)

■ Function   Obtains extended STA event status.

Header	Program command	Query	Response
ESR2?	---	ESR2?	ESR2 n

■ Value of n   0 to 255

■ Example use   ESR2?

■ Example response message   ESR2 1

ESE3 (Extended END Event Status Enable Command/Query)

■ Function   Sets extended END event status enable bits.

Header	Program command	Query	Response
ESE3	ESE3 n	ESE3?	ESE3 n

■ Value of n   0 to 255

■ Example use   ESE3 1
                      ESE3?

■ Example response message   ESE3 1

ESR3? (Extended END Event Status Register Query)

■ Function   Obtains extended STA event status.

Header	Program command	Query	Response
ESR3?	---	ESR3?	ESR3 n

■ Value of n   0 to 255

■ Example use   ESR3?

■ Example response message   ESR3 1

Section 6   Performance Test

This section describes the performance test.

6.1   Overview

This section describes how to execute a performance test and judge Pass/Fail of the performance test results.

Conduct a performance test during acceptance inspection, performance evaluation after repairing the MP8931A, or calibration.
Conduct this test periodically for important items as preventive maintenance.
The recommended interval for periodic testing is once or twice a year.

If you find an item that does not meet the specifications through a performance test, request repair by contacting one of the Anritsu Service and Sales offices listed at the back of the paper-edition manual or on the separate file in the CD-edition manual.
The following items are required when asking for repair:

(a) Model name and serial number on the rear panel of this unit
(b) Details of problem
(c) Name of person who is responsible for confirmation of the problem details and should be informed when repair is complete, and his/her contact address

6.2   Devices Required for Performance Test

Device	Recommended Model Name	Required Specifications	Measurement Item
Oscilloscope	---	Frequency range: DC to 500 MHz	Refer to 6.4.1 and 6.4.2.
Frequency counter	---	Frequency range: 1 Hz to 200 MHz	Refer to 6.4.1.
75 Ω/50 Ω converter	MP548A	Frequency range: DC to 200 MHz $$\text{Conversion ratio:} \frac{\text{Voltage at } 50\ \Omega}{\text{Voltage at } 75\ \Omega} = \frac{1}{10}$$	Refer to 6.4.1 and 6.4.2.

6.3   Preparation Before Starting Performance Test

The measured equipment and measuring instruments should have been turned On at least 30 minutes before a performance test for a stable operation unless otherwise specified. To obtain the maximum measurement accuracy, besides following the instruction above, conduct a test at room temperature, with a stable AC power supply voltage, and avoid noise, strong vibration, dust and humidity.

6.4 Performance Test

6.4.1 NRZ interface output level

(1) Testing specifications

Item	Specifications	Remarks
Level (TTL)	High: +2.5 ±0.3 V Low: 0 ±0.3 V	Common for Data/Clock
Level (ECL)	High: −0.9 ±0.2 V Low: −1.7 ±0.2 V	Common for Data/Clock
Clock	±10 ppm	

(2) Setup
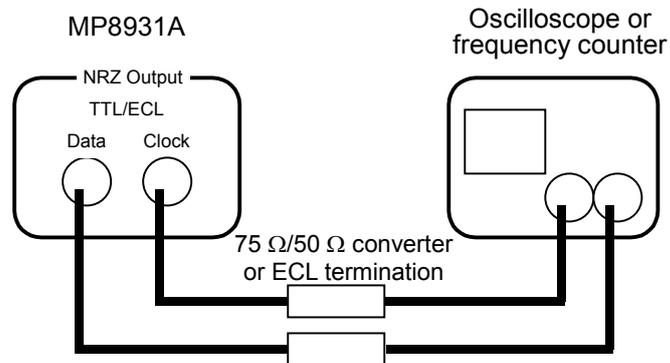
Fig. 6.4.1-1   Setup for NRZ interface output level test

(3) Test procedure

1. Set up the equipment as shown in Fig. 6.4.1-1.

2. Open the main menu screen by pressing [Menu], and select System* → Initialize to perform initialization.

3. On the main menu screen, select NRZ Output* → Level to set the NRZ output level to TTL or ECL.

4. On the main menu screen, select NRZ Output* → FREQ to set the NRZ output frequency.

5. Check that the obtained level or frequency meets the specifications.

6.4.2   DVB-ASI interface output level

(1)   Testing specifications

Item	Specifications	Remarks
Level	800 mV(p-p) ±10%	

(2)   Setup
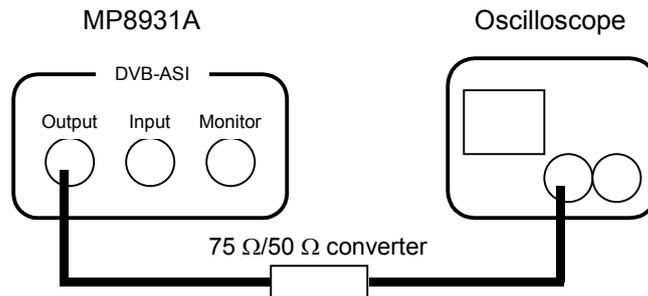
Fig. 6.4.2-1   Setup for DVB-ASI interface output level test

(3)   Test procedure

1.   Set up the equipment as shown in Fig. 6.4.2-1.

2.   Open the main menu screen by pressing [Menu], and select System* → Initialize to perform initialization.

3.   On the main menu screen, select Interface → DVB-ASI to set the interface.

4.   Check that the obtained level meets the specifications.

6.4.3   DVB-SPI interface output level

(1)   Testing specifications

Item	Specifications	Remarks
Offset Voltage	1.125 to 1.35 V	
Differential Voltage	247 to 454 mV	

(2)   Setup
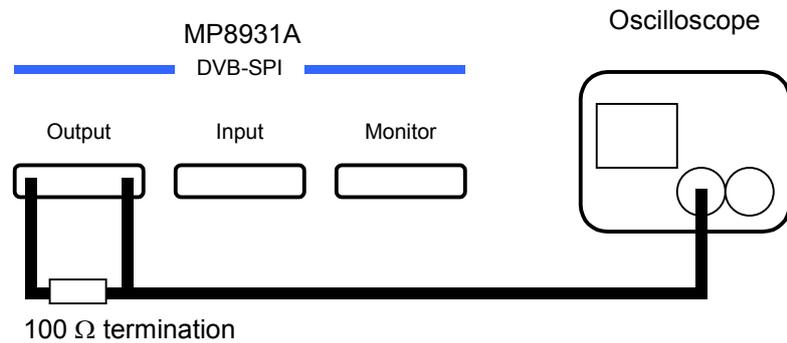
Fig. 6.4.3-1   Setup for DVB-SPI interface output level test

(3)   Test procedure

1.   Set up the equipment as shown in Fig. 6.4.3-1.

2.   Open the main menu screen by pressing [Menu], and select System* → Initialize to perform initialization.

3.   On the main menu screen, select Interface → DVB-SPI to set the interface.

4.   Check that the obtained level meets the specifications.
Refer to "Connector" in (3) DVB-SPI interface of Appendix A "Specifications" for details of signals.

Section 7   Maintenance

This section explains daily maintenance and precautions on storage in order to maintain the MP8931A performance.

7.1 Daily Maintenance

Daily maintenance procedures and timing are shown below:

Table 7.1-1 Daily maintenance

Item	Timing	Procedure
Dirt on exterior	• Before long-term storage • After use in dusty place	Wipe with a cloth soaked in a diluted neutral detergent.
Dust	• When foreign object goes inside. • When dust goes inside.	Vacuum off. Set the vacuum power as low as possible when cleaning the fan.
Loose screws on attachment	• When found.	Tighten with specified tool.

7.2 Storage

(1) Notes on storage

When storing the MP8931A for a long period, note the followings:

- Wipe the dust or dirt off the device before storing.
- Avoid storing in an environment with a temperature of +70°C or more, –40°C or less, or humidity of 80% or more.
- Avoid places subject to direct sunlight or that are dusty.
- Avoid places where water adhesion or corrosion by activated gas is possible.
- Avoid places where the equipment can be oxidized or there is extreme vibration.

(2) Recommended storage conditions

In addition to the above items, the MP8931A should be stored under the following conditions:

- Temperature: 5 to 30°C
- Humidity: 40 to 75 %
- A place with infrequent variations in temperature and humidity

(3) Transportation

When transporting the MP8931A, use the original packaging material. If the packaging material was not kept, pack it according to Steps (3) and (4) below.

Re-packing procedures are as follows:

(1) Wipe the MP8931A exterior with a dry cloth.

(2)   Check that no screws are loose or falling out.

(3) Provide adequate protection for projections and parts prone to damage, and then wrap the MP8931A with a polyester sheet.

(4) Place the wrapped instrument in a cardboard box and seal it with adhesive tape. Then, place it into a wooden box, etc. according to the transportation distance or method.

(1) Common items

Item	Specifications
Measurement interface	NRZ, DVB-SPI, DVB-ASI
Remote control interface	GPIB, RS-232C
Internal clock frequency setting	Setting range: 1 kHz to 155 MHz, Resolution: 1 Hz, Accuracy: ±10 ppm

Transmission/ measurement pattern	Pseudo-random code: PN9, PN9_REV, PN15, PN15_REV, PN23, PN23_REV, ALL"0", ALL"1", "1010"
	Synchronization establish condition:
	    • NRZ: 50 bits +N bits (N: number of stages, "0" when fixed), when normal
	    • DVB-SPI, SVB-ASI: $8 \times (8 + N)$ bits, when normal
	Synchronization loss condition: when 6 error bits of 64 bits detected.

Error addition	Manual, Continuous (10^{-2}, 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}, 10^{-7})
Measurement time/number of bits	Measurement time (000h00m01s00 to 999h59m59s90) Number of measurement bits (10^3 to 10^{15}) Repeat
AUTOSYNC	ON, OFF
Burst	Disable, Enable
Status indicator LED	Counting, Sync Loss, Signal Loss, Errors
Screen display	[1] Switch between "Error rate" and "Number of errors/total count" [2] Over Flow display [3] Error display [4] Passed (elapsed) time/left (remaining) time display [5] Current/Last display
Display screen control	Screen display OFF: None or 1, 5, 10, 20, 30, 40, 50, 60 (min) Brightness adjustment: 25%, 50%, 75%, 100%
Auto save of setting data	Saves the set parameters just before power-off and sets them automatically at the next power-on.
Power supply	Rated Voltage: AC 100 to 120 V or 200 to 240 V * Rated Frequency: 50 to 60 Hz
Power consumption	50 VA or less
Operating temperature	0 to 50°C
Operating humidity	0 to 80% (No condensation)
External dimensions	426 (W)×88 (H)×451 (D) mm, excluding protrusions
Mass	7 kg or less

*: Operating voltage: within the range of +10% to −15% from the rated voltage (Max. 250 V)

(2) NRZ interface

Item			Specifications
Common (I/O)	Connector		BNC (75 Ω)
Output signal	Signal type		Data/Clock
	Common to data/clock	Level	<ECL> High: −0.9 ±0.2 V, Low: −1.7 ±0.2 V <TTL> High: +2.5 ±0.3 V, Low: 0 ±0.3 V
		Termination voltage conditions	ECL: −2 V, TTL: GND
		Termination	Fixed to 75 Ω
		Polarity switching	Data: Positive, Negative Clock: Rise, Fall CLK (Rise) Data
		Enable/Disable	Enable/disable (fixed to Low) setting
	Data	Bit Rate	1 kHz to 155 MHz, Resolution: 1 Hz
		Waveform	NRZ
		Tr/Tf (20 to 80%)	1 ns or less (ECL), 1.5 ns or less (TTL)
	Clock	Frequency	1 kHz to 155 MHz, Resolution: 1 Hz Accuracy: ±10 ppm
		Duty	50% ±10%
		Tr/Tf (20 to 80%)	1 ns or less (ECL), 1.5 ns or less (TTL)
		Output phase	Data Clock (Rise) t $\lvert t \rvert \le 1$ ns (at ECL level) $\lvert t \rvert \le 2$ ns (at TTL level) Data Clock (Fall) t $\lvert t \rvert \le 1$ ns (at ECL level) $\lvert t \rvert \le 2$ ns (at TTL level)
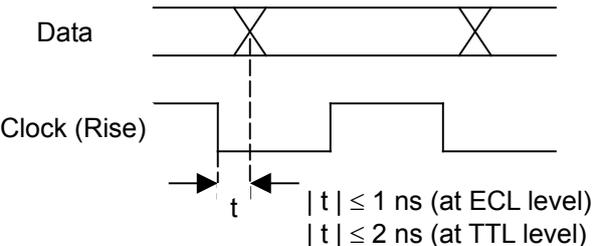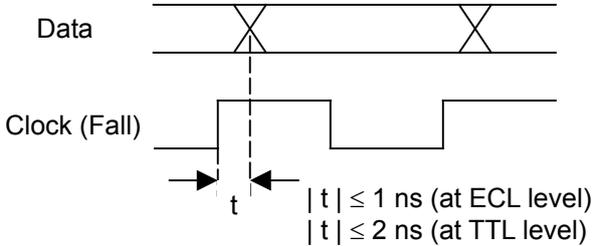
Item			Specifications
Input signal	Signal type		Data/Clock/Enable
	Common to data/clock enable	Level	<ECL> High: 0 to –1.0 V, Low: –1.5 to –2.5 V <TTL> High: +1.8 to +5.0 V, Low: 0 to +1.0 V <Variable> Shown below
		Termination voltage conditions	ECL: –2 V, TTL: GND Variable: –2.5 to +3.3 V (user-defined) Resolution: 0.1 V
		Threshold voltage conditions	ECL: –1.3 V, TTL: +1.4 V Variable: –2 to +3 V (user-defined) Resolution: 0.1 V
		Termination	75 Ω/1 MΩ
		Polarity switching	Data: Positive, Negative Clock: Rise, Fall Enable: Positive, Negative, Off CLK (Rise) Data
	Data/enable	Waveform	NRZ
	Clock	Frequency	1 kHz to 155 MHz, Accuracy: ±100 ppm
		Duty	50% ±10%
		Pulse width	3 ns or more
		Phase	Data/Enable Clock (Rise) t $\lvert t \rvert \leq T/10$ Data/Enable Clock (Fall) t $\lvert t \rvert \leq T/10$
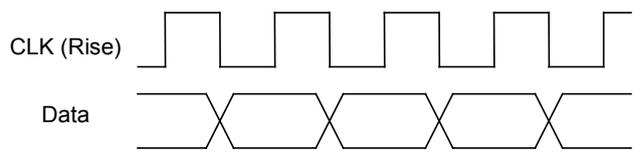
(3) DVB-SPI interface

Item			Specifications
Common (I/O)	Connector		D_Sub 25 (Female)
			Table Pin Contact Assignment
			<table><tr><td>Pin</td><td>Signal</td><td>Pin</td><td>Signal</td></tr><tr><td>1</td><td>Clock A</td><td>14</td><td>Clock B</td></tr><tr><td>2</td><td>System GND</td><td>15</td><td>System GND</td></tr><tr><td>3</td><td>Data 7 A (MSB)</td><td>16</td><td>Data 7 B (MSB)</td></tr><tr><td>4</td><td>Data 6 A</td><td>17</td><td>Data 6 B</td></tr><tr><td>5</td><td>Data 5 A</td><td>18</td><td>Data 5 B</td></tr><tr><td>6</td><td>Data 4 A</td><td>19</td><td>Data 4 B</td></tr><tr><td>7</td><td>Data 3 A</td><td>20</td><td>Data 3 B</td></tr><tr><td>8</td><td>Data 2 A</td><td>21</td><td>Data 2 B</td></tr><tr><td>9</td><td>Data 1 A</td><td>22</td><td>Data 1 B</td></tr><tr><td>10</td><td>Data 0 A</td><td>23</td><td>Data 0 B</td></tr><tr><td>11</td><td>DVALID A</td><td>24</td><td>DVALID B</td></tr><tr><td>12</td><td>PSYNC A</td><td>25</td><td>PSYNC B</td></tr><tr><td>13</td><td>Cable shield</td><td></td><td></td></tr></table>
			Logical conversion
			1: Voltage of A is higher than that of B.
			0: Voltage of A is lower than that of B.
	Termination		100 Ω
	Signal type		Data [7:0], Clock, Dvalid, Psync
	Packet type		[1] 204: (1)+187+ (16) packets [2] 188: (1)+187 packets [3] 204: (1+3)+184+ (16) packets [4] 188: (1+3)+184 packets [5] 204: (1)+203 packets [6] 204: (1+3)+200 packets
Output signal	Common to Clock, Data DVALID, PSYNC	Level (LVDS)	Offset Voltage: 1.125 to 1.35 V Differential Output Voltage: 247 to 454 mV
		Tr/Tf (20 to 80%)	≤T/7
		Enable/Disable	Enable/disable (fixed to Low) setting
	Data	Data out of PN range	"Sync": 47 h (fixed) "16 Valid extra bytes", "PID": ALL1 (fixed)
	DVALID	Level	Fixed to "High"
	Clock (byte clock)	Frequency	10 kHz to 13.5 MHz, Resolution: 1 Hz
		Duty	50% ±10%
		Phase	

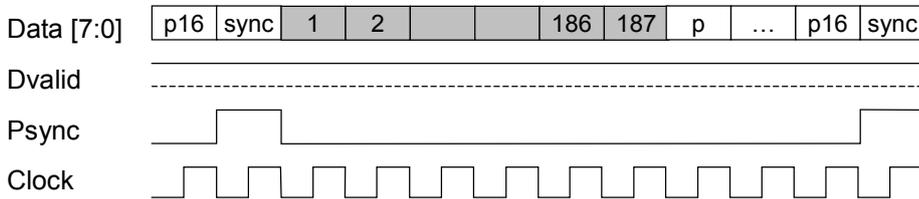| Item			Specifications
Input signal	Common to Clock, Data DVALID, PSYNC	Level (LVDS)	0.1 to 2.0 Vp-p
	Data	Data out of PN range	Data are not compared for "Sync," "16 Valid extra bytes" or "PID."
	Clock (byte clock)	Frequency	10 kHz to 13.5 MHz
		Duty	50% ±10%
		Phase	Data/PSYNC/ DVALID Clock td T Clock Period: T = 1/f Data Hold Time: td = T/2±T/10
Monitor output			Enable/disable (high-impedance) setting
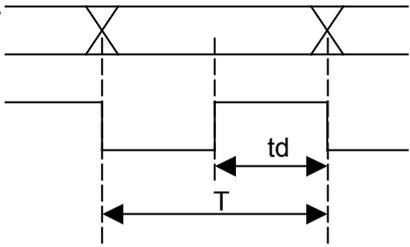
Note:

An external clock (byte clock) can be used when this interface is selected.   Refer to Section 4.2.7 "External clock setting" for details including settings.
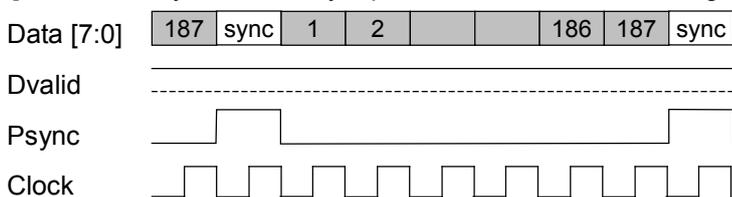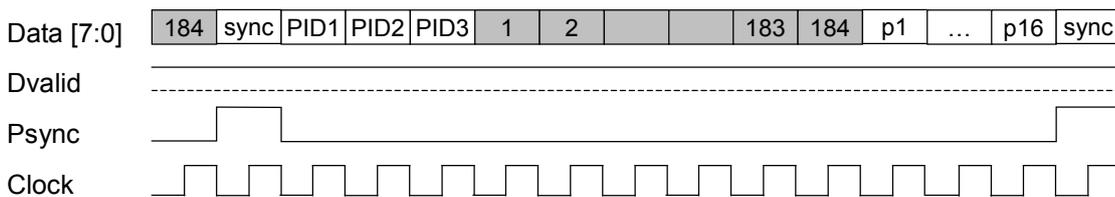
● Timing

[1] When 187 bytes of 204-byte packet are measurement target: (1)+187+(16)

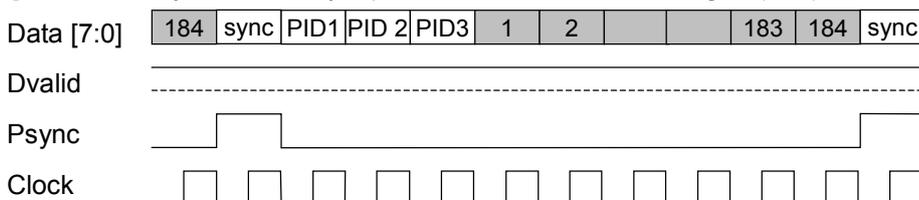Data [7:0] | p16 | sync | 1 | 2 | | 186 | 187 | p | … | p16 | sync

Dvalid

Psync

Clock

[2] When 187 bytes of 188-byte packet are measurement target: (1)+187

Data [7:0] | 187 | sync | 1 | 2 | | 186 | 187 | sync

Dvalid

Psync

Clock

[3] When 184 bytes of 204-byte packet are measurement target: (1+3)+184+(16)

Data [7:0] | 184 | sync | PID1 | PID2 | PID3 | 1 | 2 | | 183 | 184 | p1 | … | p16 | sync

Dvalid

Psync

Clock

[4] When 184 bytes of 188-byte packet are measurement target: (1+3)+184

Data [7:0] | 184 | sync | PID1 | PID 2 | PID3 | 1 | 2 | | 183 | 184 | sync

Dvalid

Psync

Clock

[5] When 203 bytes of 204-byte packet are measurement target: (1)+203

Data [7:0] | 203 | sync | 1 | 2 | | 202 | 203 | sync

Dvalid

Psync

Clock

[6] When 200 bytes of 204-byte packet are measurement target: (1+3)+200

Data [7:0] | 200 | sync | PID1 | PID2 | PID3 | 1 | 2 | | 199 | 200 | sync

Dvalid

Psync

Clock

(4) DVB-ASI interface

	Item	Specifications
Common (I/O)	Connector	BNC (75 Ω)
	Termination	75 Ω
	Frequency	270 MHz (internal clock)
	Packet type	[1] 204: (1)+187+ (16) packets [2] 188: (1)+187 packets [3] 204: (1+3)+184+ (16) packets [4] 188: (1+3)+184 packets [5] 204: (1)+203 packets [6] 204: (1+3)+200 packets
Output	Level	800 mV (p-p) ±10%
	Tr/Tf (20 to 80%)	≤1.2 ns or less
	Line Rate	270 Mbaud ±100 ppm
	Data out of PN range	"Sync": 47 h (fixed) "16 Valid extra bytes," "PID": ALL1 (fixed)
	Output mode	Packet mode
	Data rate	1 to 27 MHz, Resolution: 1 MHz When set to 27 MHz: Two "Stuffing Data" are inserted between packets.
	Enable/Disable	Enable/disable (fixed to Low) setting
Input	Level	Min. Sensitivity: 200 mV Max. Input Voltage: 880 mV
	Impedance	75 Ω
	Parity check (except "Sync")	Data is not compared for "16 Valid extra bytes" and "PID."
	Frame sync establishment conditions	"Sync" (47 h) detection, successively for three frames.
	Frame sync loss conditions	None (ignored)
Monitor output		Enable/disable (high impedance) setting

(5) External clock input

Item	Specifications
Level	<ECL> High: 0 to –1.0 V, Low: –1.5 to –2.5 V <TTL> High: +1.8 to +5.0 V, Low: 0 to +1.0 V
Terminal voltage conditions	ECL: –2 V, TTL: GND
Threshold voltage conditions	ECL: –1.3 V, TTL: +1.4 V
Termination	75 Ω/1 MΩ
Frequency	1 kHz to 155 MHz (ECL), 1 kHz to 100 MHz (TTL) Accuracy: ±100 ppm
Duty	50% ±10%
Pulse width	3 ns or more

Appendix B   Initial Value List

Initial values at factory shipment and after executing the *RST command (initialization) as well as automatically saved items are shown below.

Item			Initial value (at factory shipment)	Result of *RST command execution (initialization)	Auto save
Transmission/measurement patterns			PN 23	Same as the left	√
External input clock			Disable	Same as the left	√
(External input clock)	Input level		TTL	Same as the left	√
	Termination		75 Ω	Same as the left	√
Interface setting			NRZ	Same as the left	√
(NRZ output)	Internal clock frequency		10 MHz	Same as the left	√
	Output level		TTL	Same as the left	√
	Output polarity (Data/Clock)		Positive/Rise	Same as the left	√
(NRZ input)	Input level		TTL	Same as the left	√
	Input termination voltage		0.0 V	Same as the left	√
	Input threshold voltage		+1.4 V	Same as the left	√
	Termination		75 Ω	Same as the left	√
	Input polarity (Data/Clock)		Positive/Rise	Same as the left	√
	Input polarity (Enable)		OFF	Same as the left	√
(DVB-SPI)	Internal clock frequency		13.5 MHz	Same as the left	√
	I/O packet type		(1)+187+(16)	Same as the left	√
(DVB-ASI)	I/O packet type		(1)+187+(16)	Same as the left	√
	Throughput		27 MHz	Same as the left	√
Error addition			None	Same as the left	√
AUTOSYNC			Off	Same as the left	√
Measurement	Measurement time/number of measurement bits setting		None	Same as the left	√
	Measurement repetition setting		Off	Same as the left	√
	Measured result display setting		Current	Same as the left	√
	Measurement time		000h 00m 01s	Same as the left	√
	Number of measurement bits		1E+3	Same as the left	√
Output terminal enable			Enable	Same as the left	√
Monitoring terminal			Enable	Same as the left	√
BURST			Disable	Same as the left	√
System	Display screen control	Display OFF	None	–	√
		Brightness control	50%	–	√
	GPIB	Address	15	–	√
	RS-232C	Baud rate	9600	–	√
		Parity	None	–	√

Note:

√ indicates "Supported."

Appendix C   Performance Test Result Sheet

Model Name: MP8931A Bit Error Rate Tester
Serial No.:   _____
Ambient Temperature: _____   °C
Relative Humidity   _____   %

- NRZ Output Interface (Common for Data and Clock)

Output Level	Specifications	Result
−0.9 V (ECL High)	±0.2 V	
−1.7 V (ECL Low)	±0.2 V	
+2.5 V (TTL High)	±0.3 V	
0 V (TTL Low)	±0.3 V	

- DVB-ASI Output Interface

Output Level	Specifications	Result
800 mV (p-p)	±80 mV	

- DVB-SPI Output Interface

Output Level	Specifications	Result
1.125 to 1.35 V (Offset Voltage)	–––	
247 to 454 mV (Differential Voltage)	–––	