MU181640A
Optical Receiver
Operation Manual

Second Edition

- **For safety and warning information, please read this manual before attempting to use the equipment.**
- **Additional safety and warning information is provided in the MP1800A Signal Quality Analyzer Installation Guide and the MT1810A 4 Slot Chassis Installation Guide. Please also refer to one of these documents before using the equipment.**
- **Keep this manual with the equipment.**

ANRITSU CORPORATION

Document No.: M-W2999AE-2.0

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. 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.

MU181640A
Optical Receiver
Operation Manual

5 November 2007 (First Edition)
7 January 2013 (Second Edition)

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
- At low atmospheric pressure
- 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.

Notes On Export Management

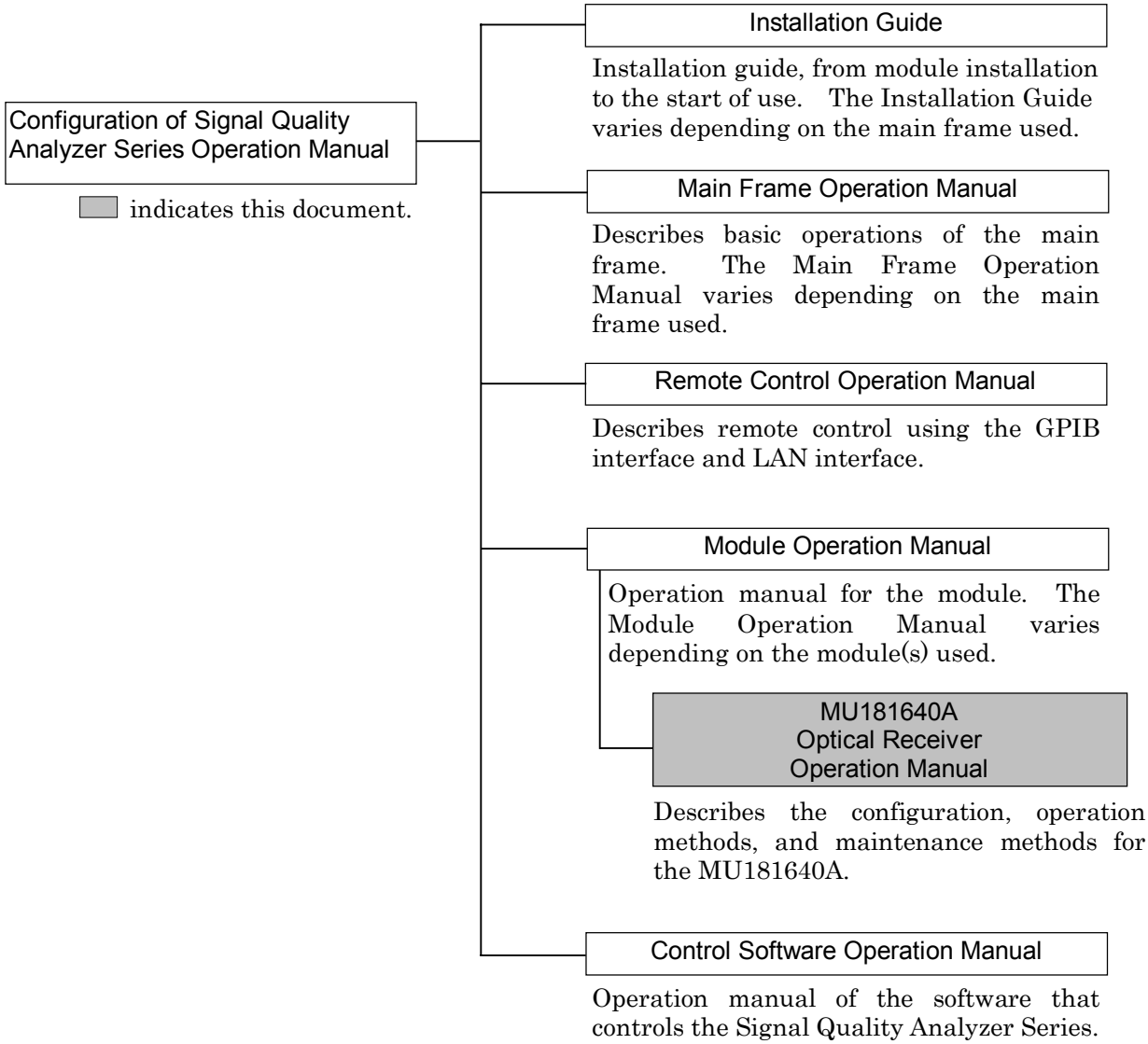
This product and its manuals may require an Export License/Approval by the Government of the product's country of origin for re-export from your country.

Before re-exporting the product or manuals, please contact us to confirm whether they are export-controlled items or not.

When you dispose of export-controlled items, the products/manuals need to be broken/shredded so as not to be unlawfully used for military purpose.

About This Manual

A testing system combining an MP1800A Signal Quality Analyzer or MT1810A 4-Slot Chassis mainframe, module(s), and control software is called a Signal Quality Analyzer Series. The operation manuals of the Signal Quality Analyzer Series consist of separate documents for the installation guide, the mainframe, remote control operation, module(s), and control software, as shown below.



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IV.

Section 1 Overview

This section provides an overview of the MU181640A Optical Receiver (hereinafter referred to as “MU181640A”).

1.1 Product Overview

The MU181640A is a plug-in module that can be built into a Signal Quality Analyzer Series main unit. It converts optical digital signals input from an external device into electrical digital signals. The MU181640A is therefore useful for research, development, and production of various types of digital communication equipment as well as digital communication modules and devices.

1.2 Product Composition

1.2.1 Standard composition

Table 1.2.1-1 shows the items standardly included with the MU181640A.

Table 1.2.1-1 Standard composition

Item	Model name/ symbol	Product name	Q'ty	Remarks
Main unit	MU181640A	Optical Receiver	1	Option MU181640A-004 is essential.
Accessories	Z0897A	Operation manual	1	CD-ROM
	J1359A	Coaxial adapter (For conversion between K-P and K-J SMA)	1	For K connector protection (Two adapters are supplied when MU181640A-001 is selected.)
	–	Replaceable optical connector	1	Select according to optical connector option.
	Z0918A	MX180000A Software CD	1	CD-ROM

1.2.2 Option

Table 1.2.2-1 shows the options for the MU181640A. All options are sold separately.

Table 1.2.2-1 Options

Item	Model name/symbol	Product name	Q'ty	Remarks
Options	MU181640A-004	Band Width 8.5 GHz	1	–
	MU181640A-037	FC Connector	1	Optical connector option
	MU181640A-040	SC Connector	1	

1.2.3 Application parts

Table 1.2.3-1 shows the application parts for the MU181640A. All application parts are sold separately.

Table 1.2.3-1 Application parts

Model name/symbol	Product name	Q'ty	Remarks
J0617B	Replaceable optical connector (FC-PC)	1	
J0619B	Replaceable optical connector (SC)	1	
J0635A	FC•PC-FC•PC-1M-SM	1	Single mode fiber FC-PC at both ends, 1 m
J0660A	SC•PC-SC•PC-1M-SM	1	Single mode fiber SC-PC at both ends, 1 m
J0893B	FC•PC-FC•PC-2M-GI	1	Multi-mode fiber FC-PC at both ends, 2 m
J0894B	FC•PC-FC•PC-2M-GI (62.5/125)	1	Multi-mode fiber FC-PC at both ends, 2 m
J1342A	Coaxial cable 0.8 m	1	APC3.5 connector
W2999AE	Operation manual	1	Printed version
Z0284	Adapter cleaner	1	Stick type (200 pcs/set)
Z0914A	Ferrule cleaner	1	CRETOP type
Z0915A	Replacement cartridge	1	6 pcs/set
Z0916A	Ferule side cleaner	1	Stick type (200 pcs/set)

1.3 Specifications

Table 1.3-1 Specifications

Item		Specifications
Operating bit rate		0.1 to 12.5 Gbit/s
–3 dB band		DC to 8.5 GHz (MU181640A-x04, Bandwidth 8.5 GHz)
Optical input		These specifications are defined assuming that the signal output from the Optical Output connector of the MU181620A Stressed Eye Transmitter (PRBS2^{31} – 1, Mark Ratio 1/2) is used for the input signal, and is looped back in the MU181640A.
	Code	NRZ (Mark Ratio = 1/2)
	Return loss	≤–14 dB (MM) ≤–27 dB (SM)
	Wavelength	750 to 1650 nm
	Max. input (Average)	+2.0 dBm
	Rated input (Peak)	+7.00 dB
	Max. linear input	–2 dBm (Typical) (For 1-dB compression, 1550 nm SM, 1310 nm SM)
	Sensitivity BER ≤ 10^{-12}	≤–5 dBm (–15.5 dBm Typ.) (Bit rate: 10.3 Gbit/s, 1550 nm, SM, Input waveform extinction ratio ≥ 10 dB) ≤–5 dBm (–15.5 dBm Typ.) (Bit rate: 10.3 Gbit/s, 1310 nm, SM, Input waveform extinction ratio ≥ 10 dB) ≤–3 dBm (–10 dBm Typ.) (Bit rate: 10.3 Gbit/s, 850 nm, MM, Input waveform extinction ratio ≥ 10 dB)
	Applicable fiber	10/125 μm SM (ITU-T G.652) 50/125 μm MM 62.5/125 μm MM
	Connector	FC connector (PC type), MU181640A-037 SC connector (PC type), MU181640A-040 Replaceable by users

Table 1.3-1 Specifications (Cont'd)

Item		Specifications
Electrical data output	Output level	≥150 mVp-p (1550 nm, SM, –4 dBm) ≥160 mVp-p (1310 nm, SM, –4 dBm) ≥90 mVp-p (850 nm, MM, –4 dBm)
	Conversion Gain (50 Ω)	≥400 V/W (1550 nm, SM, –4 dBm) ≥425 V/W (1310 nm, SM, –4 dBm) ≥230 V/W (850 nm, MM, –4 dBm)
	Connector	K connector
	Terminator	50 Ω/GND
Mechanical performance	Dimensions	234 mm (W) × 21 mm (H) × 175 mm (D) (Compact-PCI 1 slot) (Protrusions excluded)
	Mass	1.5 kg or less (Options included)
Environmental performance	Operating temperature	+5 to +40°C (temperature around equipment when installed in the mainframe)
	Storage temperature	–20 to +60°C (recommended range: +5 to +30°C)

Section 2 Preparation before Use

This section describes preparations required before using the MU181640A.

2.1 Installation to Signal Quality Analyzer

For information on how to install the MU181640A to the Signal Quality Analyzer and how to turn on the power, refer to Section 2 “Preparation before Use” in the Signal Quality Analyzer Series Installation Guide.

2.2 How to Operate Application

The modules connected to the Signal Quality Analyzer are controlled by operating the MX180000A Signal Quality Analyzer Control Software (hereinafter, referred to as “MX180000A”).

For information on how to start up, shut down, and operate the MX180000A, refer to the MX180000A Signal Quality Analyzer Control Software Operation Manual.

2.3 Preventing Damage

Be sure to observe the rating voltage ranges when connecting input and output of the MU181640A. Otherwise, the MU181640A may become damaged.

CAUTION ⚠

1. **When signals are input to the MU181640A, avoid excessive voltage beyond the rating. Otherwise, the circuit may be damaged.**

2. **Use a 50 Ω/GND terminator at the output. Never feed any current to the output.**

3. **As a countermeasure against static electricity, ground other devices to be connected (including experimental circuits) with ground wires before connecting the I/O connector.**

4. **The outer conductor and core of the coaxial cable may become charged as a capacitor. Use metal like a copper wire to discharge electricity between the outer conductor and core before use.**

5. **Never open the MU181640A. If you open it and sufficient performance cannot be obtained, we may decline to repair the MU181640A.**

6. **To protect the MU181640A from electrostatic discharge failure, a conductive sheet should be placed onto the workbench, and the operator should wear an electrostatic discharge wrist strap. Connect the ground connection end of the wrist strap to the conductive sheet or to the ground terminal of the mainframe.**

Section 3 Panel Layout and Connectors

This section describes the panels and connectors of the MU181640A.

3.1 Panel Layout

3.1.1 Panel layout of MU181640A

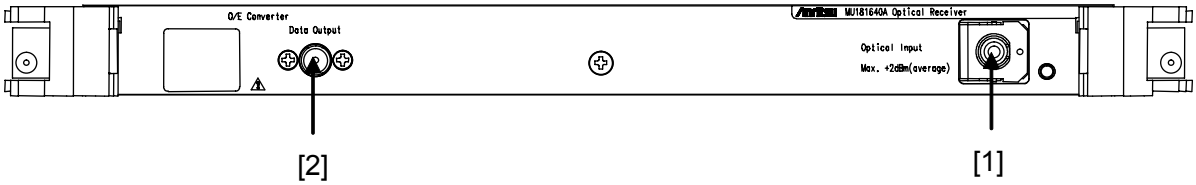


Fig. 3.1.1-1 Panel of MU181640A

Table 3.1.1-1 Name and Function of Each Part on MU181640A

No.	Name	Description
[1]	Optical Input	Connector to input optical signals.
[2]	Data Output	Connector to output electrical data signals.

3.2 Inter-Module Connection

A connection example between the MU181640A, MU181000A 12.5 GHz Synthesizer (hereinafter referred to as "MU181000A"), MU181020A 12.5 Gbit/s PPG (hereinafter referred to as "MU181020A"), MU181620A Stressed Eye Transmitter (hereinafter referred to as "MU181620A"), and MU181040A 12.5 Gbit/s ED (hereinafter referred to as "MU181040A") that are installed into a mainframe is shown below.

1. Connect the 3-pin power cord of the mainframe to the outlet. Be sure to use the 3-pin power cord supplied with the mainframe and a 3-pin outlet.
2. Connect the Clock Output connector of the MU181000A-001 and the Ext. Clock Input connector of the MU181020A, using a coaxial cable.
3. Connect the Data Output connector of the MU181020A and the Data Input connector of the MU181620A, using a coaxial cable.
4. Connect the Clock Output connector of the MU181020A and the Clock Input connector of the MU181620A, using a coaxial cable.
5. Connect the 1310 nm Filtered Data Output (or 1550 nm Filtered Data Output) connector and the Filtered Data Input connector of the MU181620A, using the supplied semirigid cable. Calibration results may be incorrect if a cable other than the supplied semirigid cable is used.

Note:

Be sure to perform this connection, since the maximum power (+7 dBm) will be output if this connection is not implemented.

6. Connect the Noise Input connector of the MU181620A and the Output connector of the noise generator, using a coaxial cable.
7. Connect the Optical Output connector of the MU181620A and the input connector of the DUT, using optical fiber cables.
8. Connect the output connector of the DUT and the Optical Input connector of the MU181640A, using optical fiber cables.
9. Connect the Data Output connector of the MU181640A and the Data Input connector of the MU181040A, using a coaxial cable.

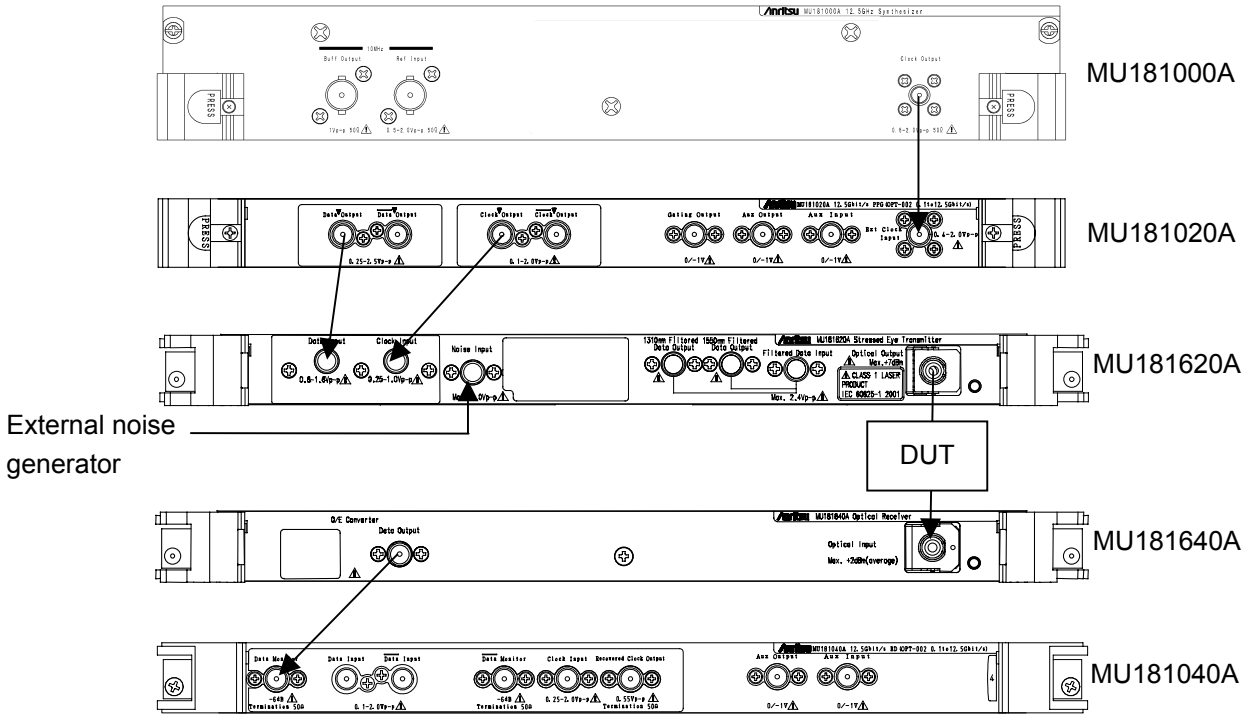


Fig. 3.2-1 Example of inter-module connection

WARNING ⚠

1. When signals are input to the MU181640A, avoid excessive optical power beyond the rating. Otherwise, the circuit may be damaged.

2. As a countermeasure against static electricity, ground other devices to be connected (including experimental circuits) with earth wires before connecting the I/O connector.

3. The outer conductor and core of the coaxial cable may become charged as a capacitor. Use any metal object to discharge the outer conductor and core before use.

4. The power supply voltage rating for the mainframe is shown on the rear panel. Be sure to operate the mainframe within the rated voltage range. The mainframe may be damaged if a voltage beyond the rated range is applied.

5. To protect the MU181640A from electrostatic discharge failure, a conductive sheet should be placed onto the workbench, and the operator should wear an electrostatic discharge wrist strap. Connect the earth connection end of the wrist strap to the conductive sheet or to the earth jack of the mainframe.

6. When removing a cable from a connector on the front panel of the MU181640A, be careful not to add excessive stress to the connector. Addition of excessive stress to a connector may result in characteristic degradation or a failure. Use a torque wrench (recommended torque: 0.9 N-M) when attaching or removing a cable.

Section 4 Configuration of Setup Dialog Box

This section describes the configuration and the operation methods of the setup dialog box for the MU181640A.

4.1 Configuration of Entire Setup Dialog Box

The configuration of the setup dialog box when the MU181640A is inserted into a mainframe is shown below.

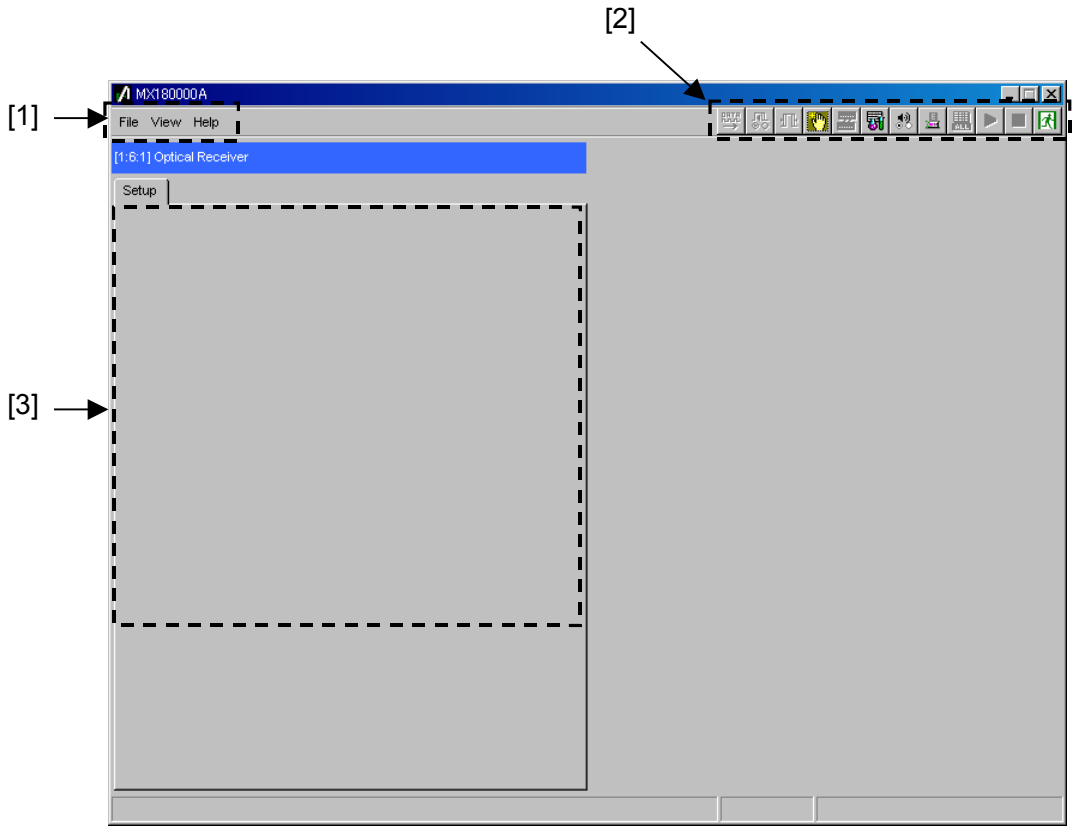


Fig. 4.1-1 Configuration of entire setup dialog box

The setup dialog box consists of three blocks as shown in Fig. 4.1-1. The following table describes each of the blocks.

Table 4.1-1 Functions of blocks

No.	Block	Function
[1]	Menu bar	Selects the settings related to the entire device. Refer to the MX180000A Signal Quality Analyzer Control Software Operation Manual for details.
[2]	Module function buttons	Shortcut buttons for the function items specific to the displayed module. Users can customize the pre-defined function buttons according to their own applications. Refer to the MX180000A Signal Quality Analyzer Control Software Operation Manual for details.
[3]	Operation windows	This window is provided to configure the setting specific to each module, but the MU181640A has no specific setting.

Section 5 Use Example

This section provides measurement examples using the MU181640A.

5.1 Measurement Example Using MU181640A

The following shows an example of how to measure the light receiving sensitivity of a device for the 9.9 G SDH/SONET interface, using the MU181640A.

5.1.1 Connection

A connection example of the test system using the MU181640A is shown below.

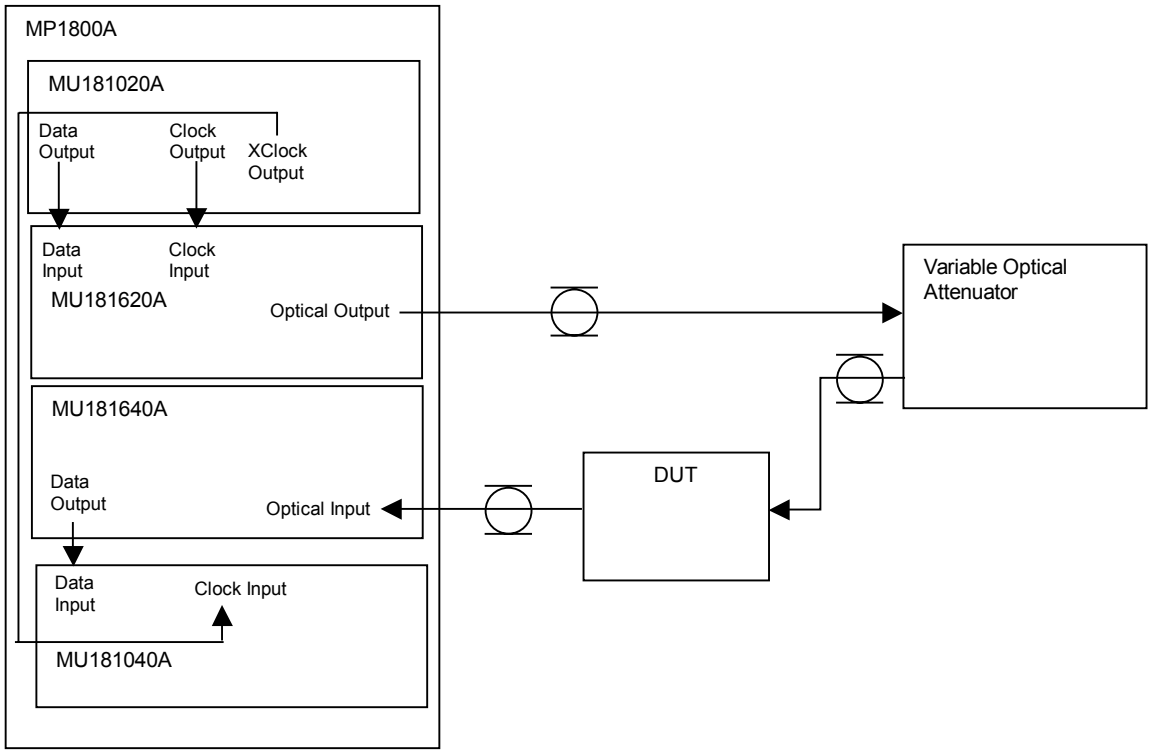


Fig. 5.1.1-1 Connection diagram

CAUTION

The protective circuit may be damaged by an excessive voltage applied to the electrical input connector. Avoid any input beyond the rated voltage. See Section 3.2 "Inter-Module Connection" for details.

The circuit may be damaged by excessive optical power applied to the optical input connector. Avoid any input beyond the rated value.

5.1.2 Measurement procedure

1. Connect the Optical Input connector of the DUT (device under test) and the Optical Output connector of the MU181620A via a variable optical attenuator, and connect the optical output signal of the DUT to the Optical Input connector of the MU181640A (see Fig. 5.1.1-1). Next, connect the Data Output connector of the MU181640A and the Data Input connector of the MU181040A.
2. Set the bit rate and test pattern (PRBS $2^{31} - 1$) for measurement to the MU181020A and MU181040A.
3. Set the attenuation level of the variable optical attenuator to be within the receivable range of the DUT.
4. Output optical signals from the MU181620A and check that no error occurs in the MU181040A.
5. Gradually increase the attenuation level of the variable optical attenuator to find a point where an error is detected.
6. Decrease the attenuation level to find a point where the measurement result at the MU181040A equals the specified error rate. The optical input average power to the DUT at that point is determined to be the light receiving sensitivity.

Section 6 Performance Test

This section describes the performance testing of the MU181640A.

6.1 Overview

Performance tests are executed to check that the major functions of the MU181640A meet the required specifications. Execute performance tests at acceptance inspection, operation check after repair, and periodic (once every six months) testing.

6.2 Devices Required for Performance Tests

Before starting performance tests, warm up the MU181640A and the measuring instruments for at least 30 minutes. Table 6.2-1 shows the devices required for performance tests.

Table 6.2-1 Devices required for performance tests

Device	Required Performance
Synthesizer (MP1800A + MU181000A)	Operating frequency: 9.5 to 12.5 GHz Clock output amplitude: 0.4 to 2.0 Vp-p
Pulse pattern generator (MP1800A + MU181020A-002)	Operating frequency: 0.1 to 12.5 GHz NRZ data output amplitude: Connect to MU181620A 1/1 clock output amplitude: 0.25 Vp-p or more, for MU181620A clock input
Error Detector (MP1800A + MU181040A)	Operating frequency: 9.5 to 12.5 GHz Data input sensitivity: 0.1 Vp-p or more
Stressed Eye Transmitter (MP1800A + MU181620A)	Operating frequency : 9.5 to 12.5 GHz Wavelength range: 1290 to 1330 nm, 1530 to 1565 nm Optical output: –4.0 to +7 dBm
Optical transceiver (XFP) (MP1800A + MU181600A + G0174A)	Operating frequency: 9.5 to 12.5 GHz Wavelength range: 830 to 870 nm Optical output: –4.0 to –1.08 dBm
Sampling oscilloscope	Optical interface: 28 GHz or more band (1310 nm, 1550 nm band) 8 GHz or more band (850 nm band) Electrical interface: 40 GHz or more band
Optical power meter (MT9810B + MU931422A)	Wavelength range: 750 to 1700 nm Linearity: ±0.05 dB or more
Optical loss test set (MS9020D + MS0907A)	Wavelength range: 1310 ± 30 nm

Note:

Before starting the performance tests, warm up the device under test and the measuring instruments for at least 30 minutes and wait until they become sufficiently stabilized, unless otherwise specified. Additional conditions are required for maximum measurement accuracy: measurements must be performed at room temperature, fluctuations of AC power supply voltage must be small, and noise, vibration, dust, and humidity must be insignificant.

6.3 Performance Test Items

This section describes the following test items.

(1) Light receiving sensitivity

(2) Data output level

(3) Return loss

6.3.1 Light receiving sensitivity

(1) Specifications

Table 6.3.1-1 Specifications for receiver light receiving sensitivity

Option	Wavelength	Light Receiving Sensitivity, –BER ≤ 10^{-12}
MU181640A-004	1550 nm, SM	≤–5 dBm (10.3 Gbit/s, Input waveform extinction ratio ≥ 10 dB)
	1310 nm, SM	≤–5 dBm (10.3 Gbit/s, Input waveform extinction ratio ≥ 10 dB)
	850 nm, MM	≤–3 dBm (10.3 Gbit/s, Input waveform extinction ratio ≥ 10 dB)

(2) Connection and procedure for 850-nm wavelength

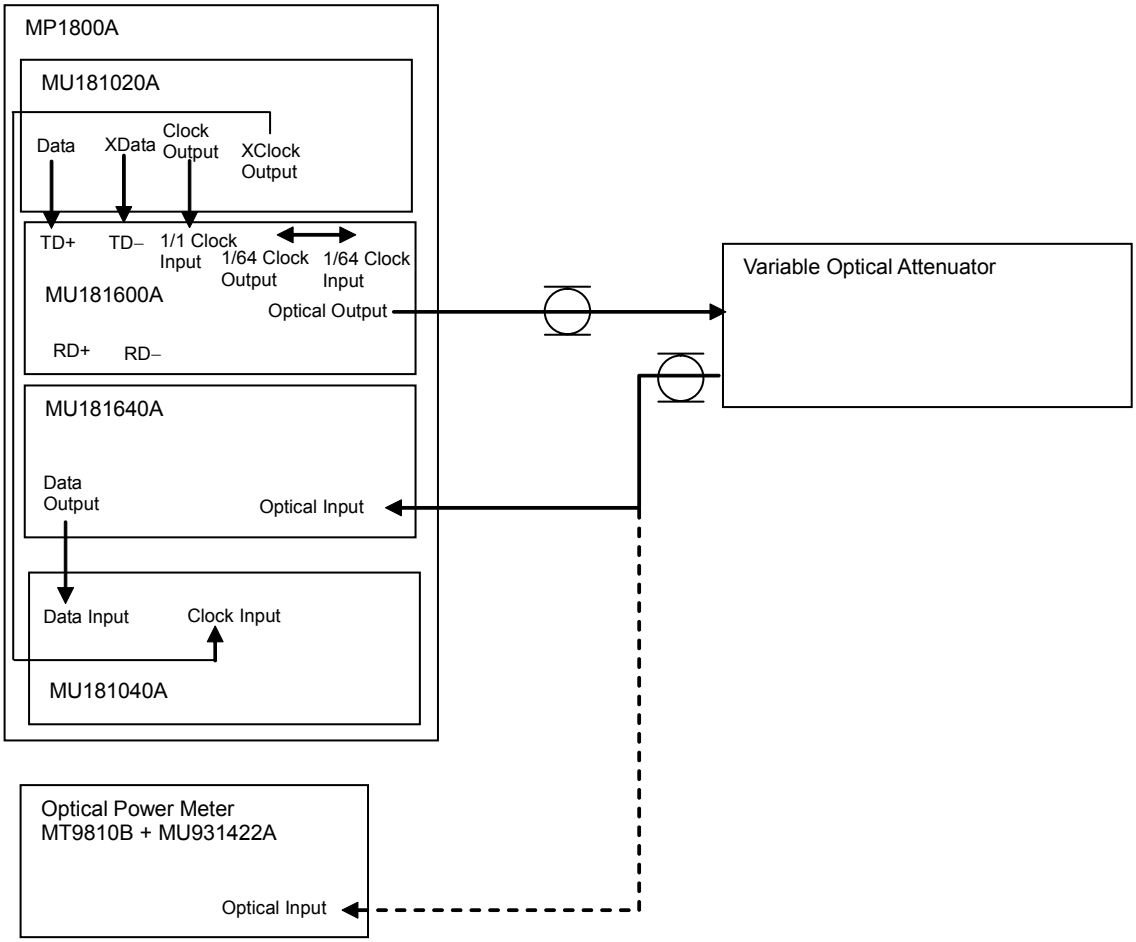


Fig. 6.3.1-1 Connection diagram for receiver light receiving sensitivity measurement (850 nm)

Perform connection and measurement using the following procedure:

1. Install the modules into the MP1800A, connect the cables, and then turn on the power.
2. Turn on the variable optical attenuator and optical power meter, and warm up the measuring instruments.
3. Set the target wavelength for measurement using the variable optical attenuator and optical power meter.
4. Set the amplitude to 1.2 Vp-p, test pattern to PRBS2^{31} − 1, and mark ratio to 1/2 for the Data Output signal of the MU181020A.
5. Set the MU181020A signal output to ON to output signals.
6. Set the optical power at the Optical Input connector of the MU181640A, using the variable optical attenuator.
7. Check that the bit error rate at this time is no greater than 1.0E − 12 (light receiving sensitivity).

(3) Connection and procedure for 1310-nm and 1550-nm wavelengths

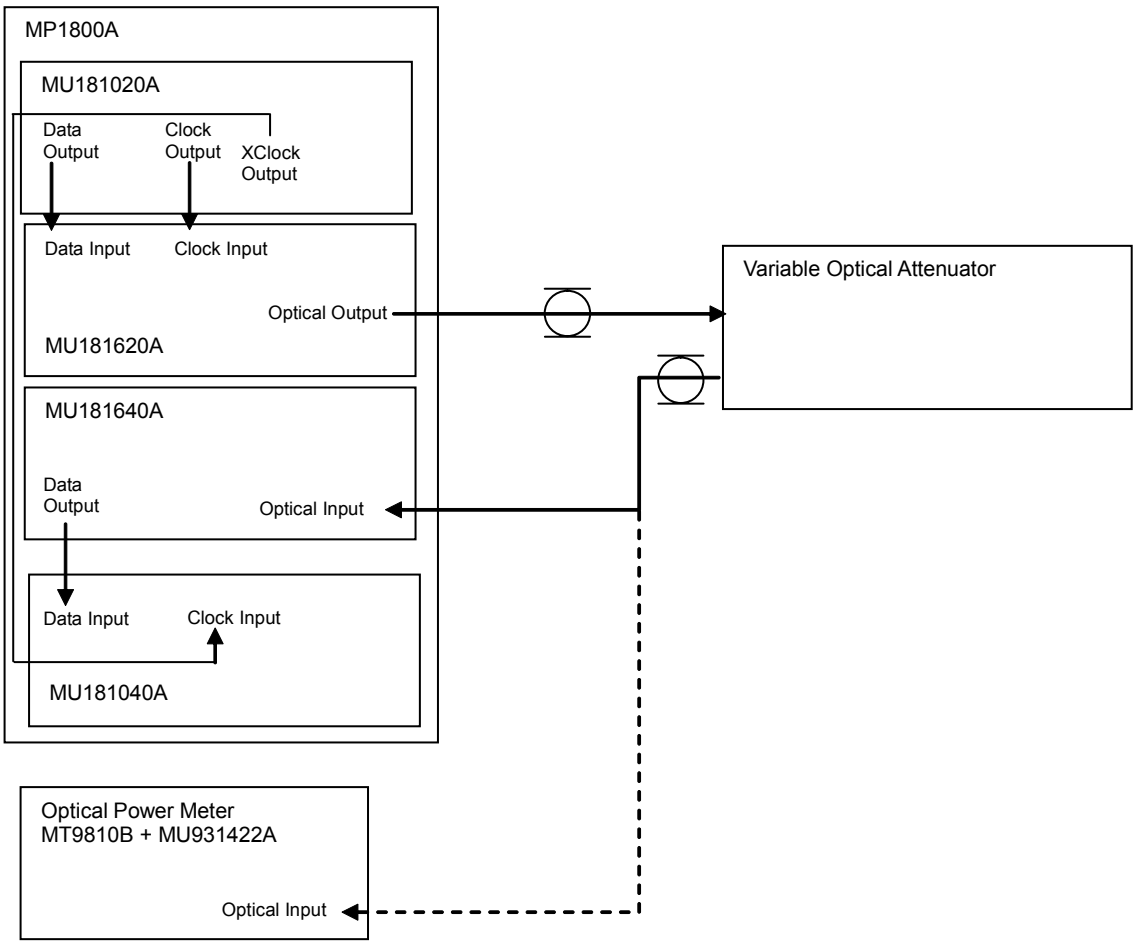


Fig. 6.3.1-2 Connection diagram for receiver light receiving sensitivity measurement (1310 nm, 1550 nm)

Perform connection and measurement using the following procedure:

1. Install the modules into the MP1800A, connect the cables, and then turn on the power.
2. Turn on the variable optical attenuator and optical power meter, and warm up the measuring instruments.
3. Set the target wavelength for measurement using the variable optical attenuator and optical power meter.
4. Set the amplitude to 1.2 Vp-p, test pattern to PRBS2^{31} − 1, and mark ratio to 1/2 for the Data Output signal of the MU181020A.
5. Set the MU181020A signal output to ON to output signals.
6. Set the optical power at the Optical Input connector of the MU181640A, using the variable optical attenuator.
7. Check that the bit error rate at this time is no greater than 1.0E − 12 (light receiving sensitivity).

6.3.2 Data output level

(1) Specifications

Table 6.3.2-1 Specifications for receiver data output level

Option	Wavelength	Data Output Level
MU181640A -004	1550 nm, SM	≥150 mVp-p, –4 dBm input
	1310 nm, SM	≥160 mVp-p, –4 dBm input
	850 nm, MM	≥90 mVp-p, –4 dBm input

(2) Connection and procedure for 850-nm wavelength

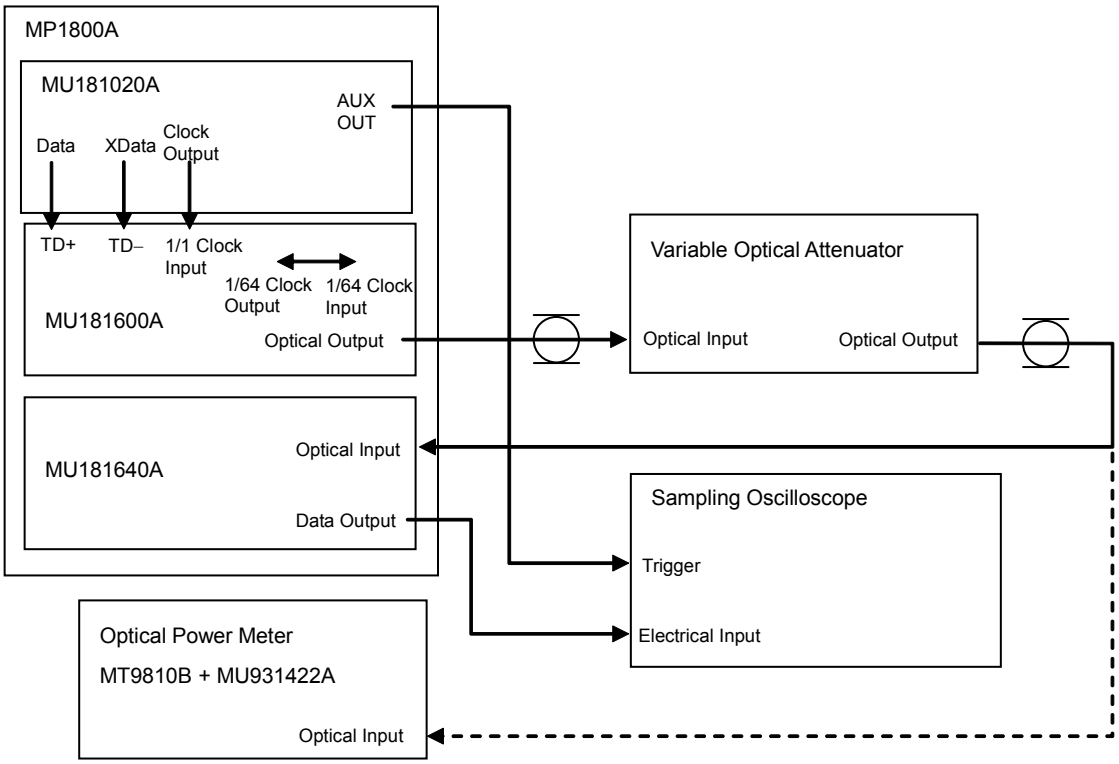


Fig. 6.3.2-1 Connection diagram for receiver data output level measurement (850 nm)

Perform connection and measurement using the following procedure:

1. Install the modules into the MP1800A, connect the cables except for the optical fiber cable, and then turn on the power.
2. Turn on the sampling oscilloscope, and warm up the measuring instruments.
3. Set the amplitude to 1.2 Vp-p, test pattern to PRBS2^{31} − 1, and mark ratio to 1/2 for the Data Output signal of the MU181020A.
4. Select the 1/64-divided clock for the AUX output.
5. Set the MU181020A signal output to ON to output signals.
6. Check that the measured data output level of the MU181640A meets the specification requirements.

(3) Connection and procedure for 1310-nm and 1550-nm wavelengths

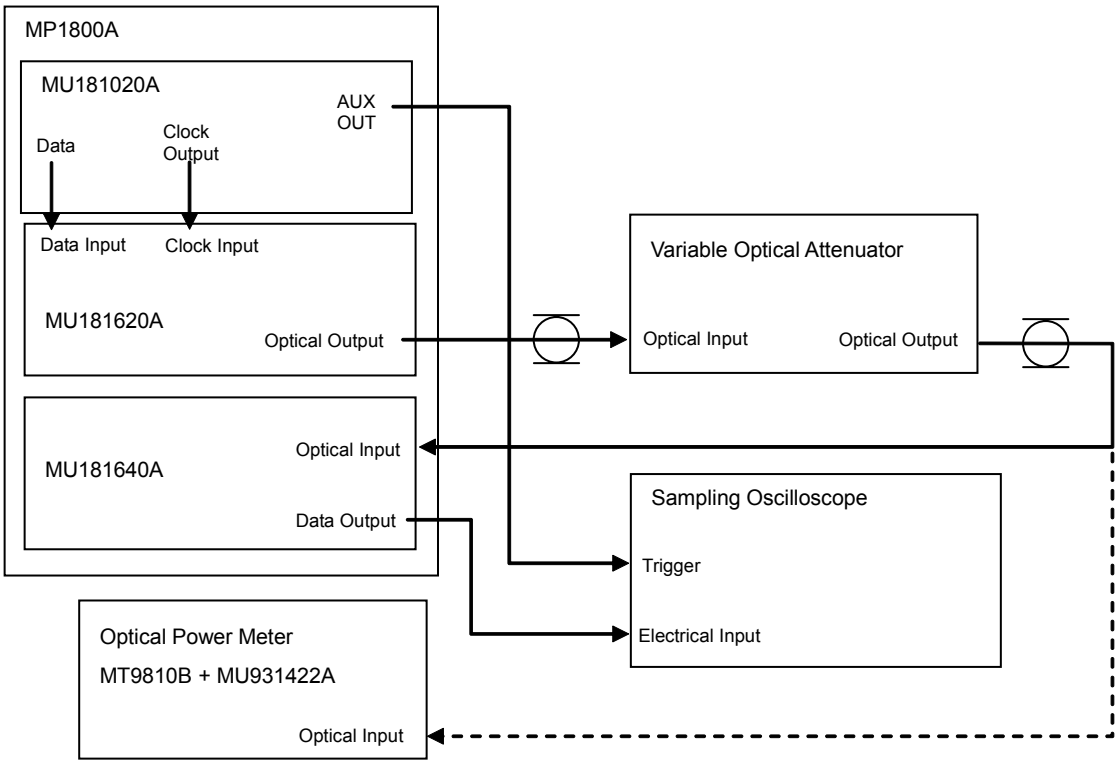


Fig. 6.3.2-2 Connection diagram for receiver data output level measurement (1310 nm, 1550 nm)

Perform connection and measurement using the following procedure:

1. Install the modules into the MP1800A, connect the cables except for the optical fiber cable, and then turn on the power.
2. Turn on the sampling oscilloscope, and warm up the measuring instruments.
3. Set the amplitude to 1.2 Vp-p, test pattern to PRBS2^{31} − 1, and mark ratio to 1/2 for the Data Output signal of the MU181020A.
4. Select the 1/64-divided clock for the AUX output.
5. Set the MU181020A signal output to ON to output signals.
6. Check that the measured data output level of the MU181640A meets the specification requirements.

6.3.3 Return loss

(1) Specifications

Table 6.3.3-1 Specifications for return loss

Fiber	Return Loss
MM	≤–14 dB
SM	≤–27 dB

(2) Connection and procedure

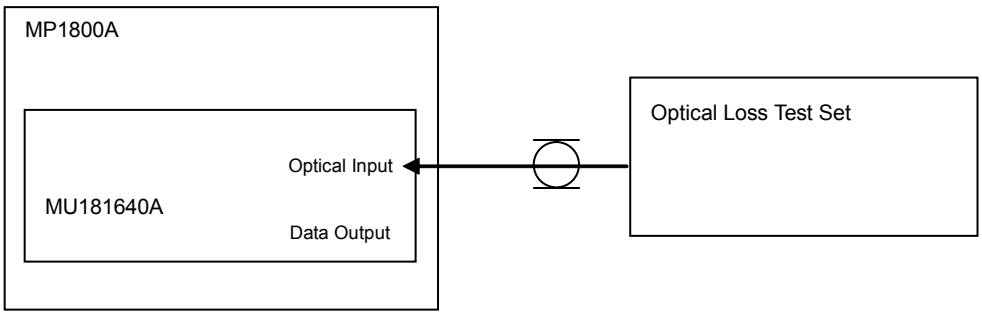


Fig. 6.3.3-1 Connection diagram for return loss measurement

Perform connection and measurement using the following procedure:

1. Connect the Optical Input connector of the MU181640A to the Optical Loss Test Set.
2. Check that the measured return loss meets the specification requirements.

Section 7 Maintenance

This section describes the maintenance of the MU181640A.

7.1 Daily Maintenance

- Wipe off any external stains with a cloth damped with diluted mild detergent.
- Vacuum away any accumulated dust or dirt with a vacuum cleaner.
- Tighten any loose parts fixed with screws, using the specified tools.

7.2 Cleaning Optical Connector and Optical Adapter

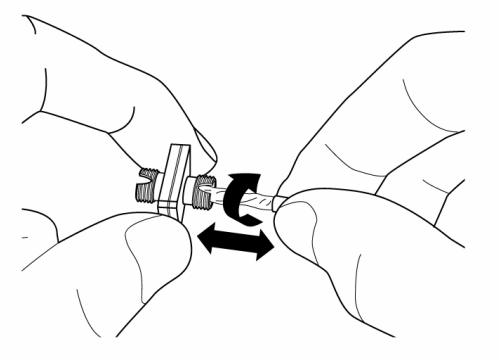
Cleaning optical adapter

When cleaning an optical adapter used for optical fiber cable connection, be sure to use an adapter cleaner that is specified as the application parts for the MU181640A(see Table 1.2.3-1 in Section 1).

The following shows how to clean an optical adapter, taking an FC adapter as an example. Clean other types of optical adapters in the same manner. The following method should also be used for cleaning the adapter, which is removed before cleaning the end surface of the MU181640A optical cable ferrule.

(1) Insert an adapter cleaner inside the split sleeve of the optical adapter.

(2) Rotate the adapter cleaner in one direction, while moving the optical adapter back and forth.

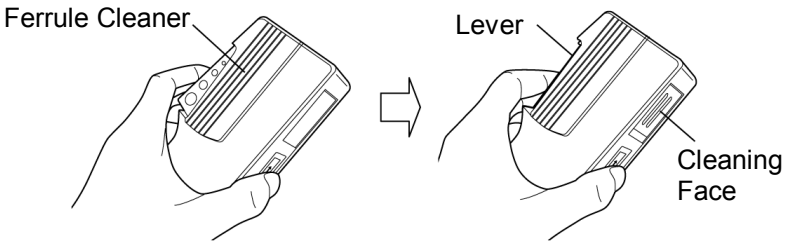


Cleaning ferrule end surface of optical fiber cable

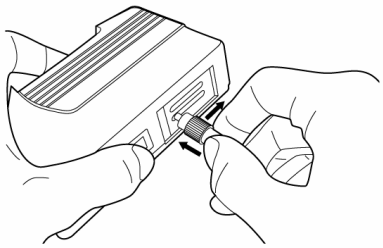
When cleaning the ferrule end surface of an optical fiber cable, be sure to use a ferrule cleaner that is specified as the application parts for the MU181640A(see Table 1.2.3-1 in Section 1).

The following shows how to clean the ferrule end surface, taking an FC connector as an example. Clean other types of optical connectors in the same manner.

(1) Push the lever of the ferrule cleaner to show the cleaning face.



(2) While holding the lever in a depressed position, press the ferrule end surface of the optical connector against the cleaning face, and slide it in one direction.



Cautions on cleaning

(1) Do not use used ferrule cleaners for cleaning.

(2) Do not use a cotton swab for final cleaning because cotton fiber may adhere to the ferrule.

(3) Place a cap onto the connector not in use.

WARNING

When cleaning and checking the ferrule end surface, check that there is no light being emitted.

CAUTION ⚠

Performance will be unsatisfactory if the MU181640A is used with dust or dirt accumulated on the ferrule end surfaces. The ferrule end surfaces of the connected may burn if high-output lights are used with dust or dirt accumulated. Thoroughly clean the ferrule end surfaces of the connected fibers and the MU181640A before measurement.

7.3 Cautions on Storage

Wipe off any dust, soil, or stain on the MU181640A prior to storage. Avoid storing the MU181640A in any of the following locations:

- Where there is direct sunlight
- Where there is dust
- Where humidity is high and dew may accumulate
- Where chemically active gases are present
- Where the MU181640A may become oxidized
- Where strong vibrations are present
- Under the following temperature and humidity conditions:
  Temperature range of ≤–20°C or ≥ 60°C
  Humidity range of ≥85%

Recommended storage conditions

In addition to the abovementioned storage cautions, the following environment conditions are recommended for long-term storage.

- Temperature range of 5 to 30°C
- Humidity range of 40 to 75%
- Slight daily fluctuation in temperature and humidity

7.4 Transportation

Use the original packing materials, if possible, when packing the MU181640A for transport. If you do not have the original packing materials, pack the MU181640A according to the following procedure. When handling the MU181640A, always wear clean gloves, and handle it gently so as not to damage it.

<Procedure>

1. Use a dry cloth to wipe off any stain or dust on the exterior of the MU181640A.
2. Check for loose or missing screws.
3. Provide protection for structural protrusions and parts that can easily be deformed, and wrap the MU181640A with a sheet of polyethylene. Finally, cover with moisture-proof paper.
4. Place the wrapped MU181640A into a cardboard box, and tape the flaps with adhesive tape. Furthermore, store it in a wooden box as required by the transportation distance or method.
5. During transportation, place it under an environment that meets the conditions described in Section 7.3 “Cautions on Storage”.

7.5 Calibration

Regular maintenance such as periodic inspections and calibration is essential for the Signal Quality Analyzer Series for long-term stable performance. Regular inspection and calibration are recommended for using the Signal Quality Analyzer Series in its prime condition at all times. The recommended calibration cycle after delivery of the Signal Quality Analyzer Series is twelve months.

If you require support after delivery, 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.

We may not provide calibration or repair if any of the following cases apply.

- Seven or more years have elapsed after production and parts for the instrument are difficult to obtain, or it is determined that reliability cannot be maintained after calibration/repair due to significant wear.
- Circuit changes, repair, or modifications are done without our approval.
- It is determined that the repair cost would be higher than the price of a new item.

7.6 Disposal

Confirm the notes described in the Signal Quality Analyzer Series Installation Guide and observe national and local regulations when disposing of the MU181640A.

Section 8 Troubleshooting

This section describes how to check whether a failure has arisen when an error occurs during the operation of the MU181640A.

8.1 Problems Discovered during Module Replacement

Table 8.1-1 Remedies for problems discovered during replacement of module

Symptom	Location to Check	Remedy
A module is not recognized	Is the module installed properly?	Install the module again by referring to Section 2.3 "Installing and Removing Modules" in the installation guide.
	Is the module supported by the main frame?	Check our Web site (http://www.anritsu.co.jp/E/MP1800) for the supported modules and the software version of the MU181640A. If the module is supported, it may have failed. 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.

8.2 Problems Discovered during use of MU181640A

Table 8.2-1 Remedies for problems discovered during use of MU181640A

Symptom	Location to Check	Remedy
Output waveform is defective	Is the cable loose?	Tighten the connector.
	Is the unused output connector terminated?	Terminate it properly.
	Are the optical connector end faces clean?	Use a ferrule cleaner to clean the connector end faces.
	Is the used fiber appropriate for the MU181640A?	Replace the fiber with an applicable fiber for the MU181640A.
	Do the cables and connectors used have good high-frequency characteristics?	Use cables and connectors with good high-frequency characteristics.
	Is the input optical signal used within the specification range?	Connect a signal that meets the input specifications for Optical Input.
	Is the measurement system for waveforms set as shown in Section 6.3 "Performance Test Items?"	Check the performance test procedure again.

If a problem cannot be solved by using any of the items listed above, perform initialization and check the items again. If the problem still occurs, 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.

Appendix

A.1 Performance Test Result Sheet

Device name: MU181640A Optical Receiver

Serial No.: _____

Ambient temperature: _____°C

Relative humidity: _____%

Table A.1-1 Light receiving sensitivity test

Option	Wavelength	Specifications	Measured Result
MU181640A -004	1550 nm, SM	≤–5 dBm (10.3 Gbit/s, Input waveform extinction ratio: ≥ 10 dB)	
	1310 nm, SM	≤–5 dBm (10.3 Gbit/s, Input waveform extinction ratio: ≥ 10 dB)	
	850 nm, MM	≤–3 dBm (10.3 Gbit/s, Input waveform extinction ratio: ≥ 10 dB)	

Table A.1-2 Data output level test

Option	Wavelength	Specifications	Measured Result
MU181640A -004	1550 nm, SM	≥150 mVp-p, –4 dBm input	
	1310 nm, SM	≥160 mVp-p, –4 dBm input	
	850 nm, MM	≥90 mVp-p, –4 dBm input	

Table A.1-3 Return loss test

Option	Fiber	Specifications	Measured Result
MU181640A -004	MM	≤–14 dB	
	SM	≤–27 dB	