MU931431A
Optical Sensor
Operation Manual

Third Edition

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

ANRITSU CORPORATION

Document No.: M-W1896AE-3.0

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.

MU931431A
Optical Sensor
Operation Manual

27 March 2001 (First Edition)
9 May 2008 (Third Edition)

For Safety

WARNING ⚠

1. ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the 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.

2. IEC 61010 Standard
   The IEC 61010 standard specifies four categories to ensure that an instrument is used only at locations where it is safe to make measurements. This instrument is designed for measurement category I (CAT I). DO NOT use this instrument at locations specified as category II, III, or IV as defined below.
   Measurement category I (CAT I):
   Secondary circuits of a device that is not directly connected to a power outlet.
   Measurement category II (CAT II):
   Primary circuits of a device that is directly connected to a power outlet, e.g., portable tools or home appliance.
   Measurement category III (CAT III):
   Primary circuits of a device (fixed equipment) to which power is supplied directly from the distribution panel, and circuits running from the distribution panel to power outlet.
   Measurement category IV (CAT IV):
   Building service-line entrance circuits, and circuits running from the service-line entrance to the meter or primary circuit breaker (distribution panel).

For Safety

WARNING ⚠

Repair

WARNING ⚠

3. This equipment cannot be repaired by the operator. DO NOT attempt to remove the equipment covers or unit covers or to disassemble internal components. Only qualified service personnel with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

Falling Over

4. 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.

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 will repair this equipment free-of-charge if a malfunction occurs within one year after shipment due to a manufacturing fault, under the condition that this warranty is void when:

- The fault is outside the scope of the warranty conditions 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, flooding, earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.

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

Anritsu Corporation 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.

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.

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

Plug-in Units: MU931431A Optical Sensor

2. Applied Directive and Standards

When the MU931431A TDMA Modulation Unit is installed in the MT9810A/B and MT9812B, the applied directive and standards of this unit conform to those of the MT9810A/B main frame.

PS: About main frame

Please contact Anritsu for the latest information on the main frame types that MU931431A can be used with.

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 marking

1. Product Model

Plug-in Units: MU931431A Optical Sensor

2. Applied Directive and Standards

When the MU931431A TDMA Modulation Unit is installed in the MT9810A/B and MT9812B, the applied directive and standards of this unit conform to those of the MT9810A/B main frame.

PS: About main frame
Please contact Anritsu for the latest information on the main frame types that MU931431A can be used with.

About This Manual

This manual explains how to operate, calibrate, and maintain the MU931431A optical sensor.

The mark "" points to the item no. of the further detailed explanation or the related description. Moreover, the operational notes, convenient contents and more are described in the "Point" for your reference.

The MU931431A is a plug-in unit used by installing the MT9810A optical test set (option 01) and in the MT9812B multi-channel box (option 01).

"This equipment" used in the text means MU931431A optical sensor.

Moreover, "main unit' means the MT9810A optical test set or the MT9812B multiplexed channel box where MU931431A optical sensor is installed.

Refer to the manual of the main unit for the operation of this equipment from the main unit.

MT9810A Operation manual (W1482AW)
MT9812B Operation manual (W1555AW)

Table of Contents

Section 1 Overview

This chapter explains the outline of the functions and product composition of this equipment.

1.1 Feature

- High-optical power measurement
  High-optical power up to +33 dBm can be measured.

- Low-uncertainty optical power measurement
  High-output optical power can be measured with low uncertainty of ±5% and the linearity of ±0.05 dB.

- High-speed analog output
  The strong modulated light of maximum 10 kHz (3 dB bandwidth) can be demodulated.

1.2 Optical Connector

To specify the optical connector, add the following two digits with a hyphen to the end of model name of this optical sensor. When these digits are not attached, it indicates an optical sensor with the FC connector.

Optical sensor with FC connector	<Model name> – 37
Optical sensor with ST connector	<Model name> – 38
Optical sensor with DIN connector	<Model name> – 39
Optical sensor with SC connector	<Model name> – 40
Optical sensor with HMS-10/A connector	<Model name> – 43
Optical sensor with MU connector	<Model name> – 32

☞ Appendix B Ordering Information

Section 2 Part Names and Functions

This chapter describes the name, function and usage for each part of this.

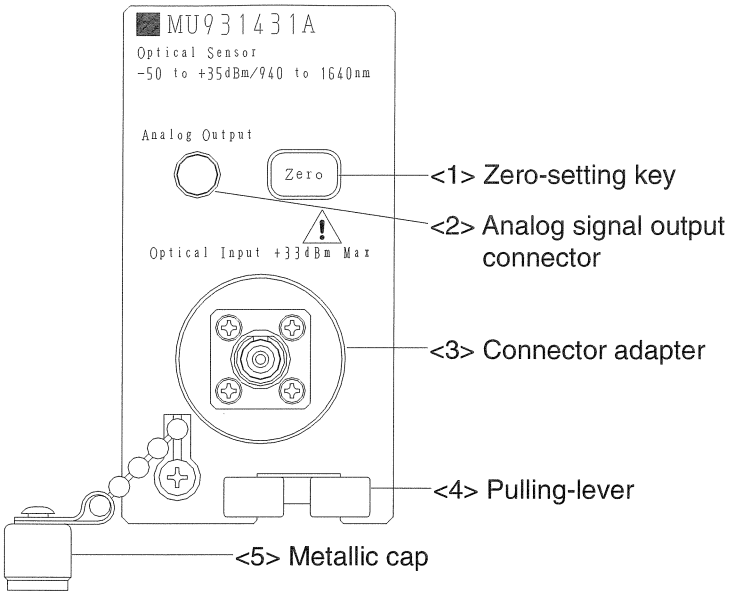
2.1 Unpacking

Take out this unit from the container. Check the articles provided with the component list. Contact ANRITSU or ANRITSU dealer immediately if any article is found to be missing or broken.

Components

Product name	Quantity	Model name/Ordering number
–Main unit–		
Optical sensor	1	MU931431A
–Standard accessory–		
Operation manual	1	M-W1896AW

2.2 Front Panel



<1> Zero-setting key — Used for removing an electric error from the optical receiving circuit.

<2> Analog signal output connector

It is SMA connector for the analog-output having the output range between about 0 and 2 V and having the output impedance of 1 kΩ. The electric power proportional to an optical input is output.

When optical signal of a full-scale level is received* in each measurement range, roughly 2 V of electric power is output.

* For instance, it indicates the case when the optical signal –10 dBm is input in –10 dBm range.

CAUTION ⚠

The analog signal output connector is only for the output. This equipment or the connected signal source might be damaged if the signal is input by mistake.
Do not unplug the cord while it is connected to the analog signal output connector. The connector, the internal circuit and other equipment may be damaged.

Point

Analog signal output is directly output to the optical sensor without correcting the wavelength sensitivity for the received optical circuit signal. Therefore, the relation between the displayed level and the output voltage is a rough guide, and is not necessarily equal. However, it is effective in observing the more minute change than the numeric value change displayed in the main unit.

<3> Pulling-lever — The lever has a lock mechanism when the sensor adapter is installed in the main unit. When removing it, pull it out holding the lever.

<4> Connector adapter — To input a measured optical signal, connect the optical fiber cable.
The connector adapter can be replaced. Connector adapters (optional) compatible with connectors other than FC are available. Refer to ordering information.

CAUTION ⚠

Never input an optical signal larger than the maximum input ratings. There is danger of causing permanent damage to the equipment by burning the optical signal receiving instrument, etc.

<5> Metallic cap — This is a cap used for optical connector protection, dust-proofing, and shading.

Section 3 Before Use

This chapter explains matters you are advised to learn before you start using this equipment. It is recommended that you read through this chapter at least once since this chapter provides descriptions of matters that require attention in order to ensure safety during device use and to avoid failures.

3.1 Measuring High-Power Output

WARNING ⚠

This optical sensor can measure extremely high optical power. Such high optical power may injure human body even if it is a reflection beam, not a direct beam. For safety, be sure to check the connection of an optical connector before measuring optical signals.
Make sure that a laser is cut off when connecting and disconnecting the connector of an optical fiber. Refer to the manual of a light source to operate it.

- It is recommended that dirt on the fiber edge and connector should be wiped off before use.

☞ 6.1 Daily Maintenance

- Be sure to set the attached metallic cap after making measurements, or when the sensor is not used.

- Do not use the sensor in dusty places.

☞ 6.2 Notes on Storage

- When a high-power optical signal of is measured, we recommend that the fiber with APC comector be used.

CAUTION ⚠

The optical fiber edge surface reflects the laser beam when optical fiber for the PC connector is used; the laser main unit may be damaged because of this reflected beam.

Section 4 Operation

This chapter explains the operation on the main unit and the function applied only to this equipment. Most operations are performed on the main unit. Refer to the operation manual of the main unit for the operation of this equipment from the main unit.

4.1 Zero-Setting

This is a function to remove electric errors in the optical sensor's optical signal-receiving circuit. The key is self-illuminating, and is in the front panel of the sensor adapter.

<Execution procedures>

1) Attach in the connector adapter the metallic cap installed in front of the optical sensor.
2) To perform zero-setting, press "Zero". The key lights up during the execution.

Point

It usually takes approximately 10 to 30 seconds to execute the zero-setting, however, it may take longer because of ambient temperature or other conditions.
Be sure to perform zero-setting after turning on the power.
Moreover, to measure with high accuracy, zero-setting is recommended before every measurement.

4.2 Setting the Band

The band for the optical-signal receiving circuit can be set. Either AUTO set in the optimum band automatically or an arbitrary fixed value can be set. The following table shows bands that are set to AUTO. Moreover, the band displayed in the main unit when the arbitrary fixed value is set is 3 dB bandwidth. For operations and setting, refer to the main unit manual.

Table 4-1 Relation between measurement range and band for MU931431A band AUTO

MU931431A

Range	Band
+33 to +30 dBm	1 kHz
+30 to +20 dBm	1 kHz
+20 to +10 dBm	1 kHz
+10 to 0 dBm	1 kHz
0 to –10 dBm	1 kHz
–10 to –20 dBm	10 Hz
–20 to –30 dBm	10 Hz
–30 to –40 dBm	1 Hz
–40 to –50 dBm	1 Hz

The band that can be set is different according to the optical sensor used. Moreover, when setting is in MANUAL RANGE, the settable band is also limited. The combination of × signs in the table below cannot be set. It is possible to set only those marked with ○.

Still, when a combination becomes × if the band (range) is raised (lowered) in the same range (band), it is changed automatically to the range of ○.

Example 1:

When the band is changed to 1 kHz from a range of –30 dBm and a band of 100 Hz in MA931431A, the range is changed automatically to –20 dBm.

Example 2:

When the range is changed to –30 dBm from a range of –20 dBm and a band of 1 kHz in MA931431A, the band is changed automatically to 100 Hz.

Table 4-2 Relation between measurement range and band for each sensor and band manual setting

MU931431A

Range	0.1 Hz	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz
+33 to +30 dBm	○	○	○	○	○	○
+30 to +20 dBm	○	○	○	○	○	○
+20 to +10 dBm	○	○	○	○	○	○
+10 to 0 dBm	○	○	○	○	○	○
0 to –10 dBm	○	○	○	○	○	○
–10 to –20 dBm	○	○	○	○	○	○
–20 to –30 dBm	○	○	○	○	○	×
–30 to –40 dBm	○	○	○	○	×	×
–40 to –50 dBm	○	○	○	×	×	×

Section 5 Performance Test and Calibration

This chapter explains how to check the performance of this equipment and calibrate the measurement value.

When performance test standard described here are not met, contact the nearest ANRITSU branch office, branch shop, sales office or ANRITSU dealer listed in this manual.

Confirm the following matters beforehand when repair is requested.

(1) Equipment name and instrument number written at the back panel or chassis
(2) Failed state
(3) Person in charge and address to which to make contact when content of breakdown is confirmed or is reported when repair is completed

5.1 Optical Sensor Performance Test

To check the performance of this unit's optical sensor, the following four items are examined.

- Absolute-level uncertainty
- Linearity
- Polarization dependency
- Noise level

Clean the optical connector before starting the test.

☞ 6.1 Daily Maintenance

Moreover, perform measurement after sufficient time for warming up following power activation.

☞ Appendix A Specification

WARNING ⚠

The power of the light source required for this performance test, conforms to IEC 825-1 Class 4 and 21CFR1040.10 (FDA) Class IV of the laser safety standards.
For the performance test, confirm that the measurement environment satisfies the above safety standards.
For the measuring instruments to be used on the test, confirm the tolerance and reliability. If the tolerance is insufficient for the test; it may damage the instruments, resulting in raid and fire by the leakage of light from the damaged portion.

Point

To record measurement results, it is advised to copy "Appendix C: Performance Test Result Record Table" at the end of this manual or prepare a similar list.

The main measurement instrument necessary for each test

- Optical attenuator
  Wavelength: 1.1 to 1.65 μm
  Maximum attenuation Amount: 60 dB or more
  Maximum optical input level: +33 dBm or more

- Optical switch
  Switching reproducibility: 0.02 dB or less
  Maximum optical input level: +33 dBm or more
- Light source
  Optical signal output: +33 dBm or more
  Stability: ±0.01 dB
- Reference power meter
  uncertainty: ±2%
  Linearity: ±0.02 dB

* Polarization dependency and Noise level: measurable even with the following measurement instruments for the noise level examination.

- Optical attenuator
  Wavelength: 1.1 to 1.65 μm
  Maximum attenuation amount: 60 dB or more
  Maximum optical input level: +18 dBm or more
- Light source
  Optical signal output: +10 dBm or more
  Stability: 0.005 dB or less

5.1.1 Absolute-level Uncertainty Measurement

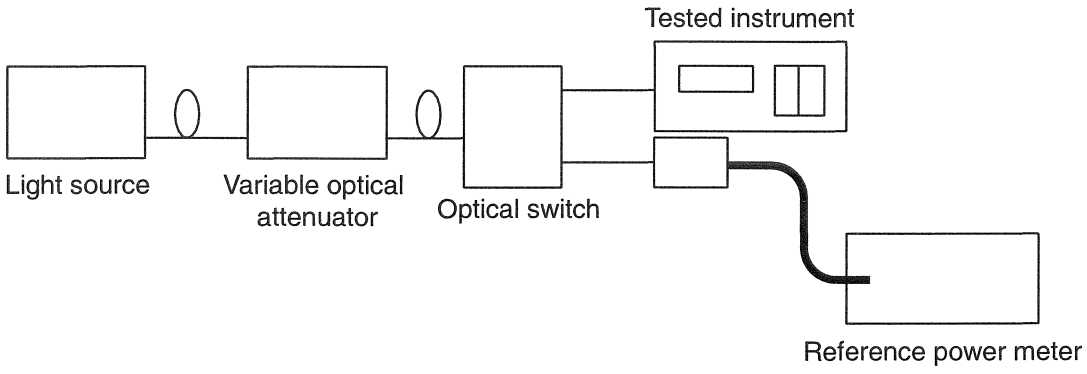


Fig. 5-1

1. Set up the measurement system as in Fig. 5-1.
2. Shade and perform the zero-setting operation.
3. Set the light source wavelength in the tested instrument. Offset the reference power meter if necessary and set the wavelength, calibration value, etc. necessary for the measurement.
4. Turn the switch to the reference power meter-side so that the display becomes +30 dBm.
5. Turn the switch to the optical sensor-side of the tested instrument and record the measured value.
6. Repeat the operation 4 to 5 five times and compare the average values.

5.1.2 Linearity Measurement

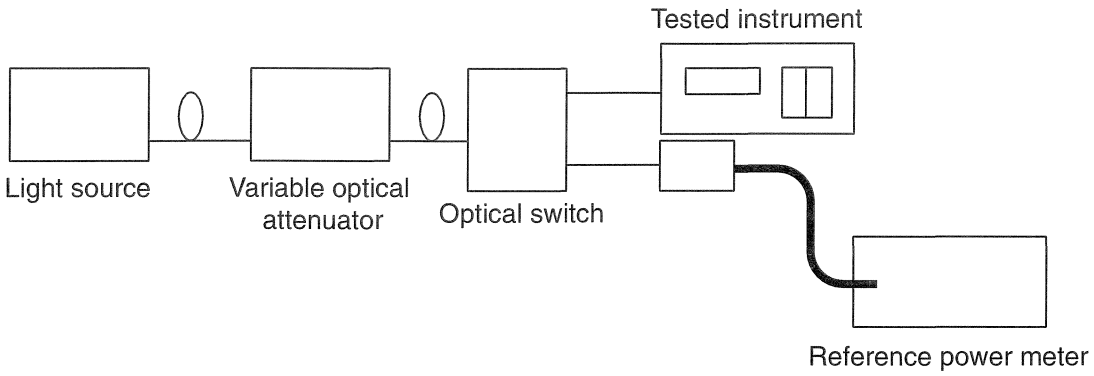


Fig. 5-2

1. Set up the measurement system as in Fig. 5-2.
2. Shade and perform the zero-setting operation.
3. Set the wavelength of light source in the tested instrument. Offset the reference power meter if necessary and set the wavelength and calibration value, etc. necessary for the measurement.
4. Turn the switch to the reference power meter-side so that its display becomes +33 dBm.
5. Turn the switch to the optical sensor-side of the tested instrument and record the measured value.
6. Repeat the operation 4 to 5 five times, assuming the average value of the reference power meter to be Power1 and that of the tested instrument to be Power2.
7. Turn the switch to the reference power meter-side so that its display becomes +30 dBm.
8. Perform the measurement for 6.
9. Repeat this operation every 10 dB up to –40 dBm.

5.1.3 Polarization Dependency Measurement

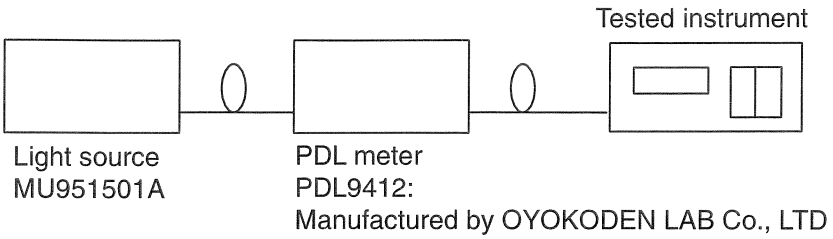


Fig. 5-3

1. Set up a measurement system as in Fig. 5-3.
2. Shade and perform the zero-setting operation.
3. Set the P-P measurement on the tested instrument.
4. To measure, rotate the polarizing surface with the PDL meter by 360 degrees or more (about 30 seconds or more).
5. The P-P value after measurement is the measurement value of the polarization light dependency.

5.1.4 Noise Level Measurement

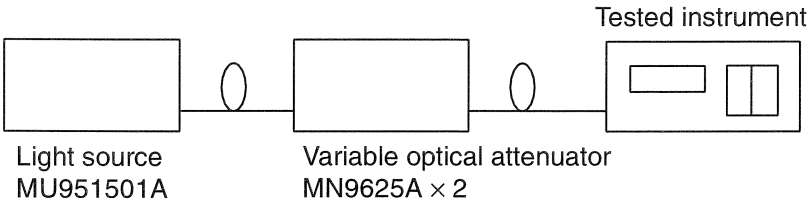


Fig. 5-4

1. Set up a measurement system like Fig. 5-4.
2. Set the tested instrument to 1 Hz band and the average count to ten times.
3. Perform zero-setting operation while shaded.
4. Adjust the optical attenuator so that the display of the tested instrument becomes –40 dBm.
5. Set the P-P measurement (%-display), and perform the measurement approximately ten minutes.
6. The noise level is obtained from the following expression by using the P-P value after measurement.

Equation: Noise level (dBm) = (full-scale value at the lowest range)
$+\mathrm{Log}_{10}\{(100 - \text{measured value})/100\}$

5.2 Performance Test Result

5.2.1 Relation between Reference Value and Guard Band

The guard band is based on the idea that "the calibration value is insufficient in judging whether standards are met." Because measurement uncertainty always accompanies the calibration value, the standard value should include the uncertainty of the calibration value.

Therefore, the guard band should be set in a strict value taking into consideration the amount of uncertainty, this value should then be the reference for comparing with the calibration value.

5.2.2 How to Obtain Measurement Uncertainty

There are two types of uncertainties of the measurement.

(1) A type uncertainty (U_a): Uncertainty evaluated by statistical method

(2) B type uncertainty (U_b): Uncertainty evaluated by method other than statistical

Evaluation of A type uncertainty:

A series of measurement data are substituted for the next expression, and the uncertainty of the targeted element is evaluated. These are used to evaluate the difference, etc. of the measurement system.

Measure n times, and the value is obtained from the data of n pieces with the expression (1).

$$u_a = \frac{1}{n}\sqrt{\frac{\sum_{i=1}^{n}(X_i - X_m)^2}{n-1}} \quad \text{.....(1)}$$

n: Number of measurements X_i: i-th Measurement value

X_m: Average of measurement values

U_a shows the standard deviation of the difference between X_m and true value. The larger the number of measurement times n, the smaller the uncertainty.

Evaluation of B type uncertainty:

For the element of the uncertainty that cannot be evaluated by a statistical technique like the A type uncertainty, an individual element is substituted for the expression (2) and is assumed to be the evaluation of the B type uncertainty.

$$u_b = \sqrt{u_1^2 + u_2^2 + \cdots + u_n^2} \quad \text{.....(2)}$$

u_i: Uncertainty element evaluated by technique other than statistical

Evaluation of synthetic standard uncertainty:

The A type and B type uncertainty obtained with the expressions (1) and (2) are synthesized by the RSS (square root of sum of squares) method, and the synthetic standard uncertainty (U_c) is obtained.

$$u_c = \sqrt{u_a^2 + u_b^2} \quad \text{.....(3)}$$

u_a: A type uncertainty u_b: B type uncertainty

u_c: Synthetic standard uncertainty

Evaluation of synthetic enhancement:

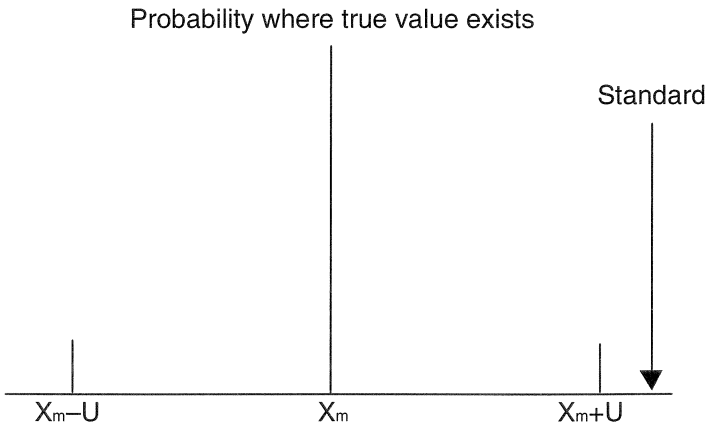
The synthetic enhancement (U) is an amount to define the range expected to include most parts where the values that originate in the measurement objects, for the measurement results, are distributed.

It is obtained by multiplying inclusion coefficient (k) by the synthetic standard uncertainty (U_c).

$$U = k \times u_c \quad \text{.....(4)}$$

k: Inclusion coefficient (when k = 2, reliability = 95%)

From X_m and U obtained from the measurement value of n pieces, true value exists in the range of X_m–U and X_m+U at the probability of 95%. If the difference between the standard of the measurement item and X_m is U or more, the probability that comes off the standard is 2.5% or less.



5.3 Calibration

To maintain uncertainty of the measurement instrument, calibration is needed. Most calibrations are performed by comparing measurement results of a product with those of the standard. Therefore, the uncertainty of the product depends on the quality of the standard.

When the customer performs calibration, the uncertainty of this calibrated equipment might be off of the specifications according to the uncertainty of the instrument used as a standard. To maintain low uncertainty, the calibration is recommended to leave to our company.

Section 6 Maintenance and Re-transportation

This chapter describes notes on daily maintenance and re-transportation.

6.1 Daily Maintenance

Exterior dirt

When used in a dusty area, when the exterior is dirty or before long-term storage; wipe dirt off lightly with a cloth that soaked in soapy water. Using thinner or benzine may hurt the coating.

CAUTION ⚠

When wiping dirt off with a cloth soaked in soapy water, first turn off the power to the main unit and pull out the power cord. Trying to clean without unplugging the power cord from the outlet may cause electric shock.

Cleaning of optical connector adapter

Clean the optical connector adapter according to the following procedures. To maintain the performance of the equipment, clean regularly.

1) Remove the metallic cap.
2) Wipe dirt in the connector off with the adapter cleaner.

Cleaning of optical fiber cable

To clean the ferrule located at the end of the optical fiber cable, use the ferrule cleaner (Z0282), an article related to the equipment.

CAUTION ⚠

Using solvent such as alcohol applied on the end of the optical fiber cable with a swab stick results in cotton being left over after the solvent evaporates. To clean the optical fiber, use the ferrule cleaner (Z0282) that does not require a solvent such as alcohol.

6.2 Notes on Storage

Avoid the following places when storing this equipment. Moreover, be sure to mount the attached metallic cap after measurement or when the fiber is not installed.

- Place that is 70°C or higher; or place that is –20°C or less.
- Place exposed to the direct sunlight
- Dusty place
- Place of high humidity that may cause condensation
- Place likely to be exposed to activated gas

6.3 Re-transportation

Note the following points when you transport this equipment again.

- Use the packing material used when this equipment was purchased.
- Let the transportation agent know that "getting it wet" and "throwing it", etc. are strictly prohibited because it is a precise electronic equipment.

Do as follows if you lost the packing material used when you purchased it.

(1) Prepare air mats (bubble wrap) or the equivalent cushion sheet.

(2) Wrap the whole equipment in the prepared sheet.

(3) Prepare a strong container that is either made of cardboard, wood or aluminum and that has 10 to 15 cm space on all sides for the equipment wrapped in the sheet; then pack cushion of 10 to 15 cm thick into the bottom of the box.

(4) Put the equipment wrapped in the sheet in the box, and pack cushioning around it.

(5) Wrap the box firmly either with string, tape, and belt, etc.

Appendix

A.1 Specifications

Model name		MU931431A
Light receiving element		InGaAs
Wavelength range		940 to 1640 nm
Optical power measurement range	Continuous optical signal	+33 to –50 dBm
Noise level*1		–43 dBm
Polarization dependency*2	PC Connector	0.05 dB or less
	APC connector	0.1 dB or less
Optical power measurement uncertainty*3	Reference condition	±4%
	Operating condition	±5%
Linearity*4		±0.05 dB ±30 nW
Wavelength sensitivity characteristic correction function		Inputtable in 0.01 nm measurement wavelength
Measurement interval*5		1 ms to 99 hours 59 minutes 59 seconds
Average setting		2 to 1000 times
Analog output*6		About 2 V
Band switching*7		Auto, manual Manual setting value: 0.1, 1, 10, 100, 1 k, 10 kHz
Optical connector*8		Corresponding to FC-PC, FC-APC, ST, DIN, HMS-10/A, SC, MU
Environmental conditions	Operating temperature	0 to 40°C, humidity 90% or less (No condensation)
	Custody temperature	–40 to 71°C, humidity 90% or less (No condensation)
Size, mass		78.4 H × 40.8 W × 335.2 D (mm) 880 g or less

*1: Measurement interval 1 s, peak to peak

*2: SM fibers (ITU-T-G652) use.
Wavelength 1550 nm

*3: Standard conditions: Connector adapter, SM fiber (ITU-T.G.652), APC connectors used
Power level 1 W (+30 dBm), CW light, and wavelength 1550 nm
Ambient temperature 23±2°C, humidity 60%±10%
Warm-up time: 30 minutes, day of calibration

Operating conditions: SM fiber (ITU-T.G.652), APC connectors used
Power level 1 W (+30 dBm), CW light, wavelength 980±1 nm, and 1240 to 1340, 1440 nm to 1640 nm
Ambient temperature 23±5°C, warm-up time 30 minutes, within 6 months after calibration
NA≤0.29 (1% added when fiber is used)
2% added when wavelengths besides above are used (humidity 60%±10%)

*4: Measurement condition: Temperature constant at 23±5°C
Arbitrary one wavelength within the range of measurement wavelength, CW light
Warm-up time 30 minutes, band: AUTO , at setting 0.1.1.10 Hz

*5: However, if the measured interval is 20 ms or less, only at the measurement of the record.

*6: At the full scale of each measurement range

*7: About 3 dBm bandwidth

*8: The connector that is specified with the optical signal option is a standard attachment.
If not specified, FC connector (option 37) is a standard attachment.

B.1 Ordering Information

Model name, code	Product name	Remarks
	–Main unit–	
MU931431A	Optical sensor	
	–Standard accessories–	
W1896AW	MU931431A Operation manual	
W1896EW	MU931431A OPERATION MANUAL	English
	–Option–	
J0127	Coaxial code, 1 m	BNC-P, RG58A/U, BNC-P
J0003	Coaxial code, 1 m	SMA-P, Special-3D-2W, SMA-P
J0901	HRM-517 (09)	SMA-P, BNC-J Conversion connector
J0902	HRM-518 (09)	SMA-J, BNC-P Conversion connector
Z0282	Ferrule cleaner	
Z0283	Ferrule cleaner replacement tape	6 pieces/set
Z0284	Adapter cleaner	Stick-type, 200 pieces/set
MZ8012A	Connector cleaning set	
	<Optical connector option> *1	
Model name–37	FC connector	Replicable by the user
Model name–38	ST connector	Replicable by the user
Model name–39	DIN connector	Replicable by the user
Model name–40	SC connector	Replicable by the user
Model name–43	HMS-10/A connector	Replicable by the user
Model name–32	MU connector	Replicable by the user

*1: The connector that is specified with the optical signal option when contracting is attached.
If not, FC connector (option 37) is a standard attachment.

Appendix C Performance Test Result Record Table

C.1 Performance Test Result Record Table

Date year month day

Model name

Serial No.

Temperature ˚C

Humidity %

Atmospheric pressure hPa

Person in charge

1. Uncertainty Test

Minimum (dBm)		Reading (dBm)		Maximum (dBm)
29.797	≤		≤	30.203

2. Linearity Test

Level	Power1 (dBm)		Power2 (dBm)		Power1–Power2 (dB)	
33 dBm		–		=		= <1>
30 dBm		–		=		= <2>
20 dBm		–		=		= <3>
10 dBm		–		=		= <4>
0 dBm		–		=		= <5>
–10 dBm		–		=		= <6>
–20 dBm		–		=		= <7>
–30 dBm		–		=		= <8>
–40 dBm		–		=		= <9>

Range	Minimum		Calculation		Maximum
33 dBm (<1>–<2>)	–0.050 dB	≤		≤	0.050 dB
30 dBm			0.000 dB		
20 dBm (<3>–<2>)	–0.050 dB	≤		≤	0.050 dB
10 dBm (<4>–<2>)	–0.050 dB	≤		≤	0.050 dB
0 dBm (<5>–<2>)	–0.050 dB	≤		≤	0.050 dB
–10 dBm (<6>–<2>)	–0.051 dB	≤		≤	0.051 dB
–20 dBm (<7>–<2>)	–0.063 dB	≤		≤	0.063 dB
–30 dBm (<8>–<2>)	–0.178 dB	≤		≤	0.178 dB
–40 dBm (<9>–<2>)	–0.189 dB	≤		≤	1.189 dB

3. Polarization Dependence Test

Reading		Maximum (dB)
	≤	0.05

4. Noise Level Test

Calculation		Maximum (dBm)
	≤	–43

Anritsu

MU931431A

Optical Sensor

Operation Manual

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

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