

**NR800L
Fourier Transform Near-Infrared
Analyzer, Desktop Type**

IM 12Y03C00-01E

Notices

■ Regarding This Manual

- This manual should be passed on to the end user.
- Read this manual carefully to fully understand how to operate this product before you start operation.
- This manual is intended to explain the functions of this product. Yokogawa Electric Corporation (hereinafter simply referred to as Yokogawa) does not warrant that the functions will suit a particular purpose of the user.
- All rights reserved. No part of this document may be reproduced in any form without Yokogawa's written permission.
- The contents of this manual are subject to change without prior notice.
- If any question arises or errors are found, or if any information is missing from this manual, please inform the nearest Yokogawa sales office.

■ Regarding Protection, Safety, and Prohibition Against Unauthorized Modification

- For the protection and safe use of the product and the system controlled by it, be sure to follow the instructions on safety described in this manual when handling the product.
- If protection/safety circuits are to be used with the product or the system controlled by it, they should be installed outside of the product.
- The user is responsible for ensuring that – when performing maintenance or installing safety circuitry for this equipment or any ancillary control systems – external safety or protective circuitry required by relevant electrical/safety regulations, laws, and standards in the country of use – is installed and satisfies the requirements. Do not modify or add parts to the internal circuitry.
- When replacing parts or consumables, be sure to use Yokogawa-recommended parts.
- Do not modify this equipment without permission.

■ Regarding Force Majeure

- Yokogawa makes no warranties regarding the product except those mentioned in the WARRANTY that is provided separately.
- In cases where the use of this product results in damage or loss to the user or a third party, Yokogawa will not be responsible for any incidental or consequential damage or loss, or any damage or loss suffered by the user or third party resulting from a defect or defects in this product which could not be foreseen by Yokogawa.

■ The following symbol marks are used in this manual:



WARNING

This symbol indicates that the operator must follow the instructions laid out in this manual in order to avoid the risk of injury to personnel, electric shock, or fatalities. The manual describes what special care the operator must exercise to avoid such risks.

"Danger" notes are aimed at preventing injury or death, and "Warning" notes are aimed at avoiding damage to equipment.



CAUTION

This symbol indicates that the operator must refer to the instructions in this manual in order to prevent the instrument (hardware) or software from being damaged, or a system failure from occurring.

CAUTION

This symbol draws attention to information essential for understanding the operation and functions.

NOTE

This symbol gives information that complements the present topic.



Electrical Shock



High temperature



Laser-generating system

■ Compliant Standard

This instrument is a Class A product, and is designed for use in an industrial environment. Please use this instrument in an industrial environment only.

(1) Safety

CSA: C22.2 No.61010-1

Installation category (Overvoltage category) II *

Pollution Degree 2 **

*: Describes a number which defines a transient overvoltage condition. It implies the regulation for impulse withstand voltage. "II" applies to electrical equipment which is supplied from fixed installations like distribution boards.

** : Describes the degree to a solid, liquid, or gas which deteriorates dielectric strength or surface resistivity is adhering. "2" applies to normal indoor atmosphere.

Normally, only non-conductive pollution occurs.

(2) EMC directive

Korea Electromagnetic Conformity Standard

RCM Mark

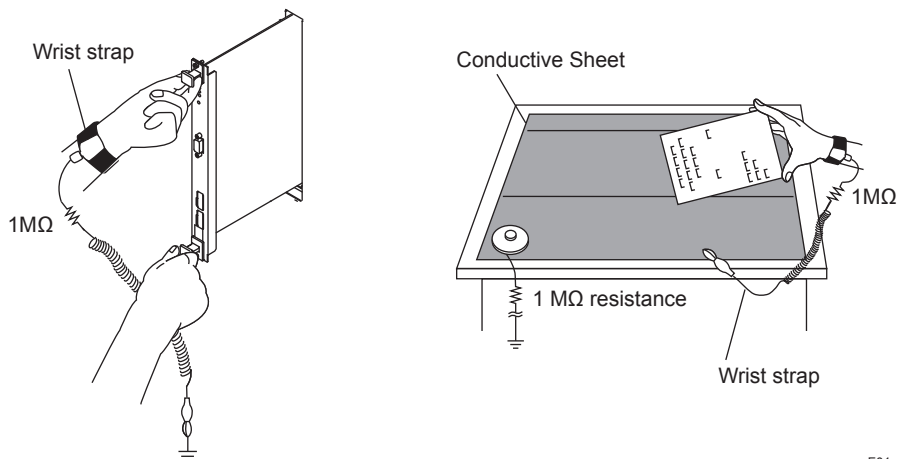
EN 61326-1 Class A (For use in industrial locations)

■ Precautions Against Electrostatic Damage

When handling cards with IC components mounted on them for maintenance or setting changes, take full precautions against electrostatic problems.

- When storing or carrying cards, enclose them in a conductive bag or antistatic bag. (Cards as shipped by Yokogawa are enclosed in a conductive bag or antistatic bag labelled with cautions against electrostatic problems.)

- When servicing cards, wear a wrist strap grounded via a 1 M Ω resistance. Connect the wrist strap to a ground terminal.
- When servicing cards on the bench, wear a wrist strap and place them on a conductive sheet grounded via a 1 M Ω resistance. Keep easily-chargeable plastic materials away from the bench.
- Never touch components mounted on the cards, the pattern side, connectors, pin components, etc. with bare hands, unless using a wrist strap and a conductive sheet.



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Example of wrist strap and conductive sheet

■ Power cord and fuses

Do not attempt to use power cords and fuses for any products except those supplied by Yokogawa.

■ General Precautions

- This Fourier-transform near-infrared spectrometer, depending on specifications, may come with process samples, standard samples and “utility” materials. These samples or materials may be flammable, combustible, poisonous, obnoxious smell, strong solvents, polymerizing, or corrosive. Please take adequate precautions.
- The NR800L analyzer weighs approximately 30 kg, and its center of gravity is positioned in the center of its shape. When transporting or installing the NR800L, including during piping or wiring work, take adequate precautions. Ideally use the NR800L by at least four people when moving it.
To avoid to damage to spectral apparatus, it should not be overturned during lifting up and carrying the analyzer.
- The NR800L is a precision instrument. Handle it with care not so as to receive mechanical shock. Before moving this instrument, fix the spectrometer, its inside mirror and Laser. Infixing them, use protective cushions attached in shipping.
- Operate this unit within specifications, otherwise we shall not accept the responsibility for use out of specification. All repairs and modifications should be performed by YOKOGAWA.
- Read the user’s manual before operating the NR800L.
- Strictly follow this user’s manual when installing and operating this equipment.
- For cleaning of analyzer, do not use any abrasives or organic solvent.

Precautions in Handling Laser-based Products

The instrument is classified as laser product of Class 1 according to IEC 60825-1.

In addition, in the U.S.A., the product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

Note the following and observe the given precautions when handling the unit:

- **Type of the Incorporated Laser Unit**

The following laser unit is incorporated within the spectrometer in the embedded laser product.

- Helium-neon gas laser head
 - Classification of laser product : Class 3R
 - Maximum power (CW) : < 4 mW
 - Wavelength : 632.8 nm
 - Beam divergence : 1.7 mrad

- **Handling Precautions**

- Do not remove the spectrometer cover for reasons other than parts replacement.
- For safety reasons, if you replace parts, always turn the power off before removing the spectrometer cover.

NOTE

The Helium-Neon Laser also stops operating even if you remove the spectrometer cover with the power switched on.

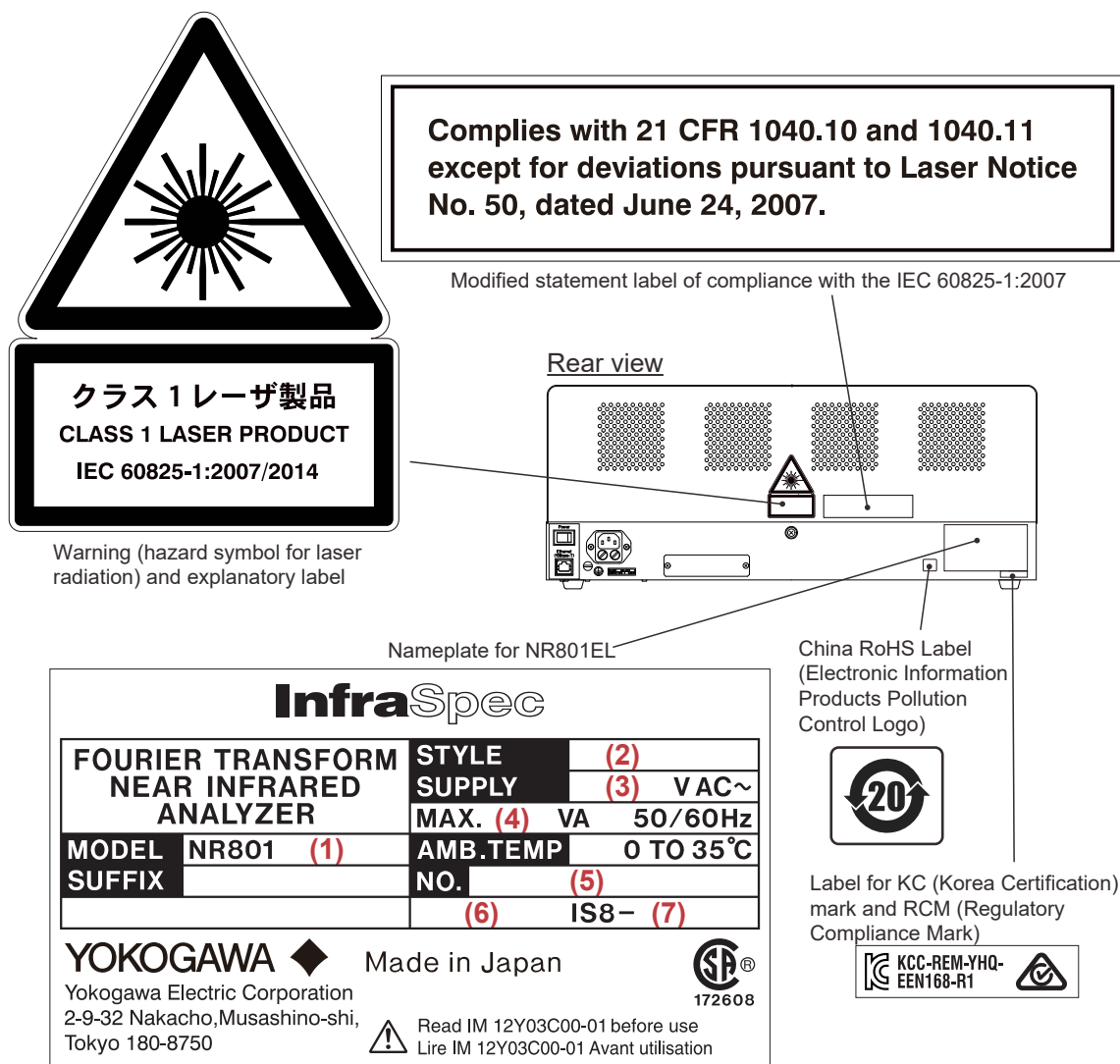


WARNING

Controlling and adjusting the unit for emitting laser beams using procedures other than those specified in this manual may result in hazardous exposure to laser radiation.

● Labeling

The following labels are placed on the analyzer.



No.	Text	Remarks
(1)	Model and suffix codes	With additional code
(2)	Latest style number	Product carrier code
(3)	100, 115, 200, 230	Depends on power specifications (1 to 6)
(4)	Maximum rated power	
(5)	Serial number	Format : 9 digit alpha-numerals
(6)	The month and year of manufacture	Format : 20YY-MM, YY and MM are a numeral of 2 digits
(7)	Engineering number	Format : IS8-XXXX, XXXX is a numeral of 4 digits

Cautions for Safety which apply to the Instrument

To avoid electrical shock, risks of death or injury to personal and hardware damage, the following instruction must be followed.



WARNING

- **Electric Power**

Please confirm that the instrument spec of electric power meet to electric supply before turn the power on.

- **Power Cord and Plug**

To avoid electrical shock and fire, use be power cord which is supplied from Yokogawa. The plug of 3 pin power code must be connected to 3 pronged receptacle which has grounding terminal. The protective function will no work if extension cable which has no ground wire is used.

- **Protective grounding**

To avoid electrical shock, please provide protective grounding, by using 3 pin power code (3rd wire is for grounding) which is provided with the instrument. The protective function will not work if the 3 pin/2 pin adapter and/or 2 pin cable is used.

- **Importance of Protective grounding**

Please do not cut or remove the grounding wire or terminal. It will be occurred that dangerous situation i.e. electrical shock and hardware damage.

- **Fault of Protective Function**

If in case the fault situation of protective grounding or defect of fuse is excepted, please do not operate the instrument. Please confirm the protective function has not fault before operation.

- **Fuse**

To avoid the fire, please use specified rating fuse (Ampere, Voltage, Type.) Please replace the fuse after power switch off and power code is pull off. Do not make short-circuit of the fuse holder.

- **Explosive Gas**

Do not operate the instrument under the flammable and combustible gas environment. It is very dangerous.

- **Remove Cover**

Do not remove the cover. It should be opened by Yokogawa's qualified personal. It has the risk of Electrical shock by high voltage.

- **Wiring Connection**

Please make sure the grounding wiring is connected. After it, make external wiring connection.

It need to touch the circuit instrument power must be cut off and confirm that no voltage is applied inside.

- **Handling of Instrument**

Do not make rough handling or vibration. Internal spectral apparatus and optical fiber may damaged.

- **High Pressure Gas Sample**

It is very dangerous to handle the high pressure gas sample which is over 980 kPa or equal. Please handle it carefully. In case certain regulation in certain countries, it is required the handling manager need to be assigned depending on the usage and type of gas.

After-sales Warranty

- Yokogawa warrants the product for the period stated in the quotation which was delivered before purchase. Yokogawa shall conduct defined warranty service based on its standard. When the customer site is located outside of the specified service area, a fee for dispatching the maintenance engineer will be charged to the customer.
- In the following cases, customer will be charged a repair fee regardless of warranty period.
 - Failure of components which are out of scope of warranty stated in instruction manual.
 - Failure caused by usage of software, hardware or auxiliary equipment, which Yokogawa did not supply.
 - Failure due to improper or insufficient maintenance by user.
 - Failure due to modification, misuse or outside-of-specifications operation which Yokogawa does not authorize.
 - Failure due to power supply (voltage, frequency) being outside specifications or abnormal.
 - Failure caused by any usage out of scope of recommended usage.
 - Any damage from fire, earthquake, storms or floods, lightning, disturbances, riots, warfare, radiation and other natural changes.
- Yokogawa does not warrant conformance with the specific application at the user site. Yokogawa will not bear direct/indirect responsibility for damage due to a specific application.
- Yokogawa Electric will not bear responsibility when the user configures the product into systems or resells the product.
- Maintenance service and supplying of repair parts will be covered for five years after the production ends. For repairs to this product, please contact the nearest sales office described in this user's manual.

■ Trademark Acknowledgments

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- Microsoft, Windows, Windows XP, Windows Vista and Windows 7 are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- Ethernet is a registered trademark of XEROX Corporation.
- All other company and product names mentioned in this user's manual are trademarks or registered trademarks of their respective companies.
- We do not use TM or ® mark to indicate those trademarks or registered trademarks in this user's manual.

NR800L**Fourier Transform Near-Infrared Analyzer, Desktop Type**

IM 12Y03C00-01E 8th Edition

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1. Introduction

Thank you for buying our InfraSpec™ NR800L Fourier-Transform Near-Infrared Spectrometer.

This manual describes its installation, its maintenance, and operating cautions. Be sure to read this manual carefully before using this spectrometer. "NR800L" in this manual means Model NR801EL. For the overview of NR800 Fourier-Transform Near-Infrared Spectrometer, refer to GS 12Y03C00-01E.

An exclusive User's Manual might be attached to the products whose suffix codes or option codes contain the code "Z" (made to customers' specifications). Please read it along with this manual.

For the use of the SPECTLAND™2 operation management software for spectrographic measurement, refer to the separate IM12Y03B01-11E.

Use only the supplied accessories in any case, otherwise malfunctions and damages on operation or maintenance may happen.

The information in handling this product are given, in this manual, with a symbol mark and a word such as "WARNING". The symbol mark and word is different, depending on the extent of importance. For human safety and prevention of instrument damage, strictly observe and comply with every safety caution and warning shown in this manual. CAUTION or WARNING labels are also on the product itself. They are indicated with the ALERT symbol such as the below examples.

— Examples of a the ALERT symbol —



WARNING



Electrical Shock



Laser-generating system

The analyzer is very dangerous (possibly resulting in serious injury or death) because a high voltage is always applied to it, and because a laser-generating device is incorporated. Before the analyzer cover is opened for maintenance purposes, be sure to turn off the power to the instrument.

- Do not open the cover.
Refer servicing to Yokogawa service personnel.
High voltage is presented on the inside parts.
If contacted, produce electric shock.
Turn off the power before opening the cover.
- The cover is fixed by the screws. It should be tightened by the tool after maintenance.

CAUTION

Before starting measurement, take a warm-up time if the instrument is not power supplied.

Especially if it is very cold in starting up the instrument for the first time, or after it has been stopped for a long time, take adequate warm-up time; more than 6 hours should be taken.

2. Components and System Configurations

For the correct use of the InfraSpec spectrometer, this chapter explains a typical system configuration and its components or unit. Be sure to read before installation. For the specification of each component, refer to GS 12Y03C00-01E.

2.1 System Configuration

A typical system configuration is shown in the Figure 2.1.

In this diagram, three optical fiber are used.

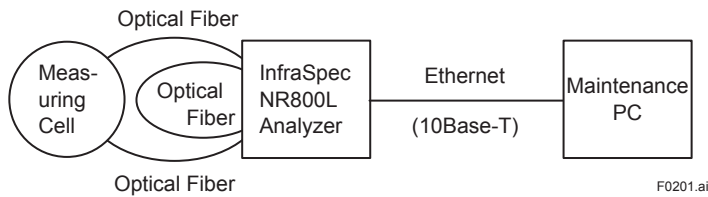


Figure 2.1 NR800L System Configuration Diagram

2.2 NR800L Analyzer

The names of external and internal key components of the NR800L are shown in Figures 2.2 to Figure 2.4.

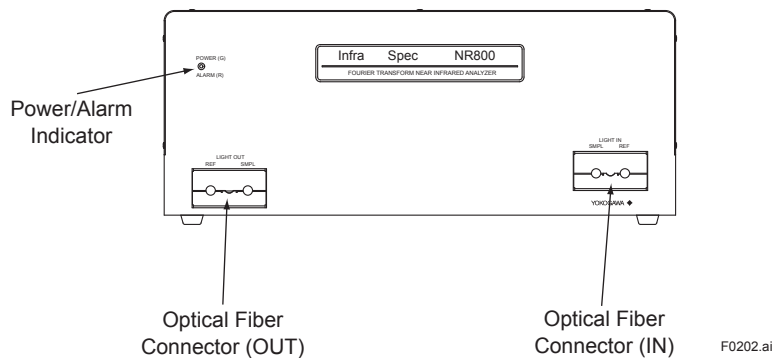


Figure 2.2 NR800L front side view

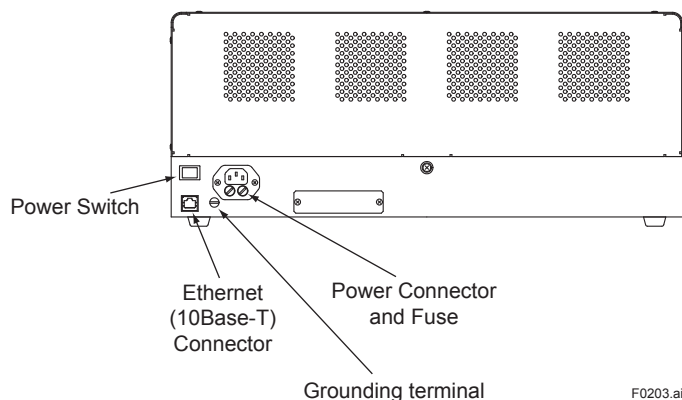


Figure 2.3 NR800L rear view

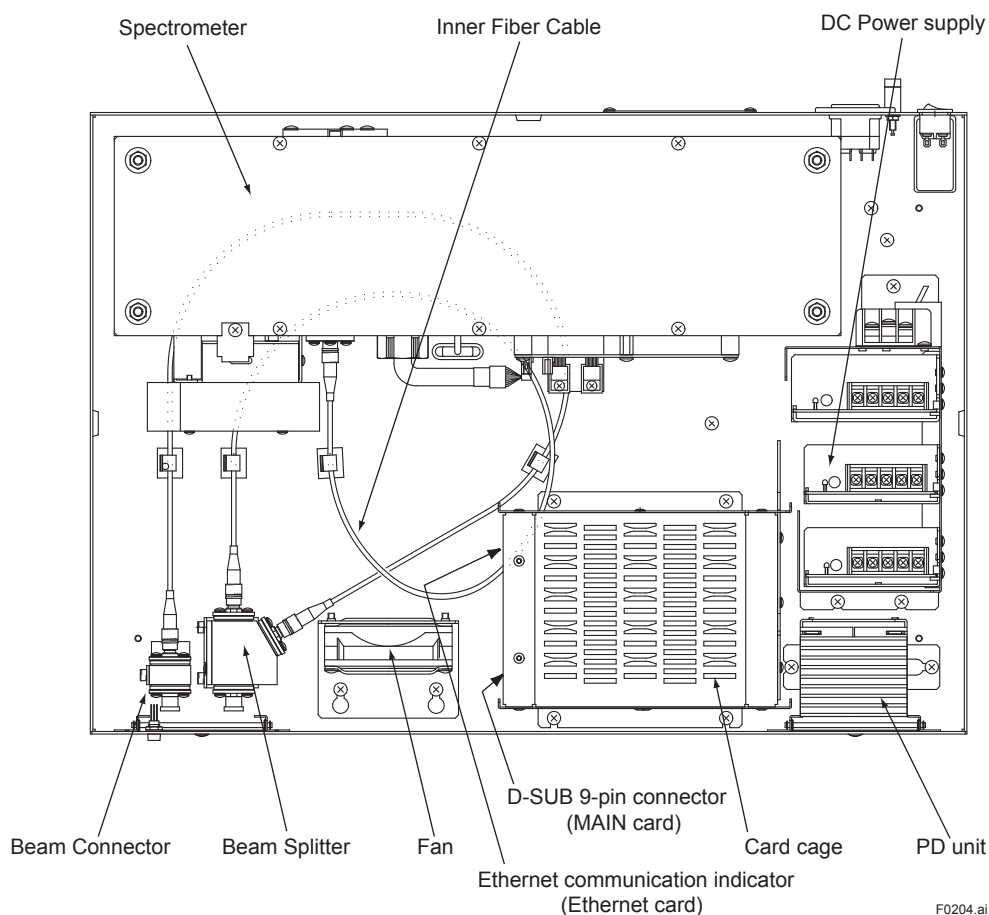


Figure 2.4 NR800L internal view (Top View)

2.3 Personal Computer

Connect the InfraSpec NR800L to a Personal Computer, set parameters and measure spectra, and download calibration models.

The SPECTLAND2 software requires the following condition to run:

(1) Personal computer

Model	IBM PC/AT compatible, desktop type
Operating system (OS)	Microsoft Windows 10 Professional 64bit
CPU	Intel Core i5 or higher
RAM	8 GB or more
Hard disk space	10 GB (for program) and 25 GB (for data storage) or more
Ethernet adapter	10 Base-T
Display	SVGA mode (1024 x 768 pixels or more)
Others	CD-R drive is recommended

(2) Printer (for color printing)

(3) Cabling for connecting to other instruments

2.4 Optical Fiber Cable

Two types of optical fiber cable, which can interconnect NR800L and measurement cell, are available. Select one type for your preference.

- (1) Flexible Fiber Cable (single core) : Three cables are necessary
- (2) Flexible metal-sheathed cable (dual core)

2.5 Accessories

- (1) Power cord

Power cord will be supplied in accordance with specifications on documents proposed by YOKOGAWA.

- (2) Fuse

* For main power supply 2 pieces

P/N:A1113EF (250 VAC 3.15A)

* For laser power supply 2 pieces

P/N:A1108EF (0.5A Time-lag) for 110 or 115 VAC

P/N:A1107EF (0.3A Time-lag) for 200 or 230 VAC

- (3) Model code:NR8SP01-04 Lamp assembly 1 unit

CAUTION

Do not use a power cord and fuse for the other equipment.

3. Installation, Piping and Wiring

3.1 NR800L Analyzer Installation

3.1.1 Installation Conditions and Utilities

Install the NR800L in a location that meets the following conditions.

Table 3.1 Normal Operating Conditions

Location	Non-hazardous location, indoors(nonexplosive atmosphere), where the analyzer shall not be exposed to weather, sunlight, or radiant heat.
Ambient temperature	0 to 35°C
Ambient humidity	0% to 80% RH (no condensation)
Vibration	Minimum vibration (vibration acceleration of 2 m/s ² or less).
Atmosphere	Minimum dust and no corrosive or toxic substances.
Altitude	Up to 2000 m above sea level.
Shock	Not acceptable

- **Well-ventilated location**

To prevent overheating, install the NR800L in a well-ventilated location. Keep a clearance of 50 mm or greater around the right, left and top surfaces of the NR800L.

- **Minimal mechanical vibration (Refer to Figure 3.1)**

Choose an installation location with minimal mechanical vibration.

- **Horizontal**

Install the NR800L horizontally.

NOTE

Condensation may occur if the NR800L is moved to another place where both the ambient temperature and humidity are higher, or where the temperature changes rapidly. In this case, let the NR800L adjust to the new environment for at least six hours before use.

Do not install the NR800L in the following places (avoid such locations):

- **In direct sunlight or near heat sources**

Install the NR800L in a place near room temperature (23°C) and with small temperature fluctuations. Placing the NR800L in direct sunlight or near heat sources can damage the instrument.

- **Where an excessive amount of soot, steam, moisture, dust, or corrosive gases are present:**

Soot, steam, moisture, dust, and corrosive gases may damage the NR800L.

- **Near strong magnetic field sources**

Do not bring magnets or instruments that produce electromagnetic fields close to the NR800L. Operating the NR800L in strong magnetic fields can cause measurement errors.

Use the appropriate power supply (details depend on Model and suffix codes)

Table 3.2 NR800L analyzer

Item	Specifications
Power supply voltage	100, 115, 200, or 230 V AC, single phase, 50/60 Hz *
Voltage fluctuation	Rating 10 %, 50/60 \pm 2 Hz
Power consumption	Approx. 200 VA

* : To be specified for ordering. For details, refer to "Model and Suffix Codes."

3.1.2 Space for Maintenance

When installing the analyzer, keep space around it to facilitate operation and maintenance, as illustrated in Fig. 3.1.

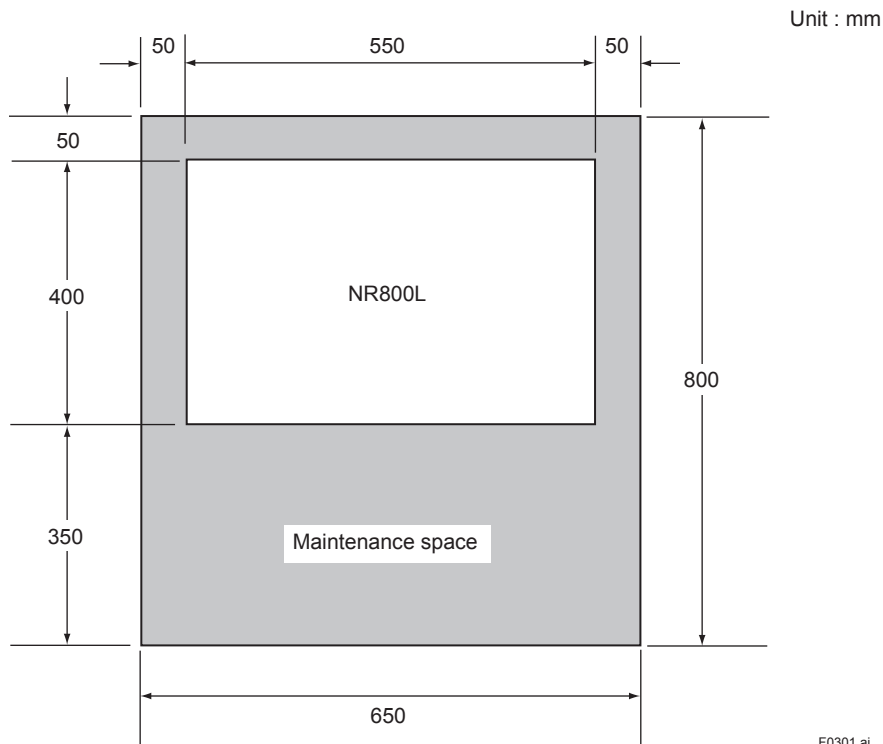


Figure 3.1 Maintenance space for NR800L analyzer

3.1.3 Installation

Fig. 3.2 shows an external view of the NR800L Analyzer. Mount it as horizontally as possible.

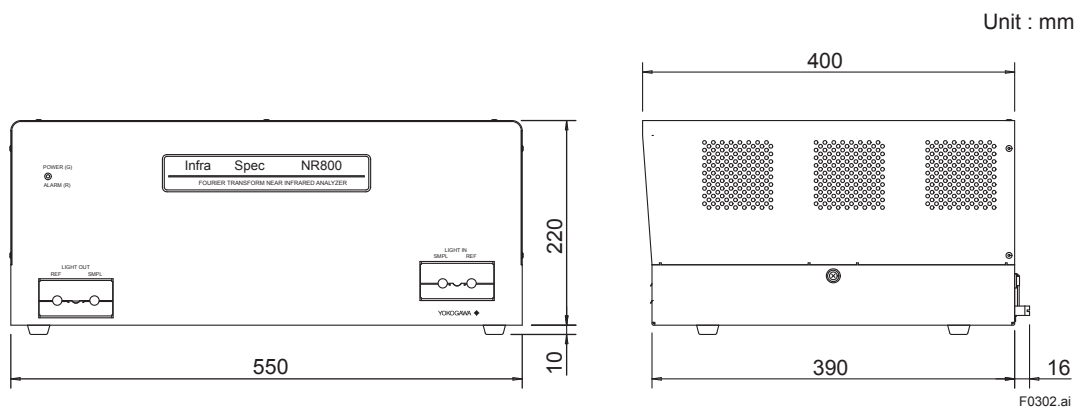


Figure 3.2 External view of NR800L

3.1.4 Removal of Protective Cushions used in Shipping

(1) Removal of Protective Cushions

After installing the NR800L analyzer, open the cover and remove the (two) cushions on both sides of the internal spectrometer unit. Keep the cushions because they are re-used when transporting the unit.

After removing the cushions, tighten a bit the four bolts (as shown a in Figure 3.3) holding the spectrometer.

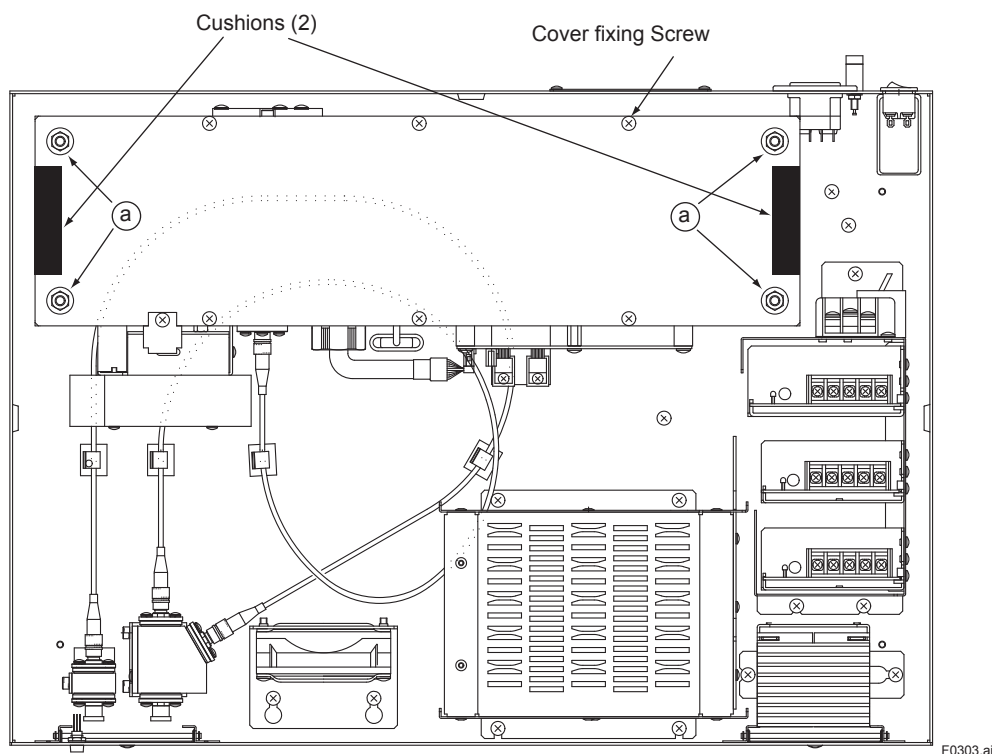


Figure 3.3 Cushions to fix the spectrometer

Remove spectrometer cover fixing screws (6 pieces) and open the cover. Remove a laser cushion and moving mirror cushions (4 pieces) as shown in Figure 3.4. Keep the cushions because they are re-used when transporting the unit.

(2) Adjusting the Laser position

- Loosen four screws (as shown c in Figure 3.4).
- Adjust the gap between the Laser front part and the circular block side (as shown b) to approximately 2 mm.
- Tighten the four screws so that the laser is positioned with the yellow label facing upward.
- Close the spectrometer cover and lock it with the six removed screws.

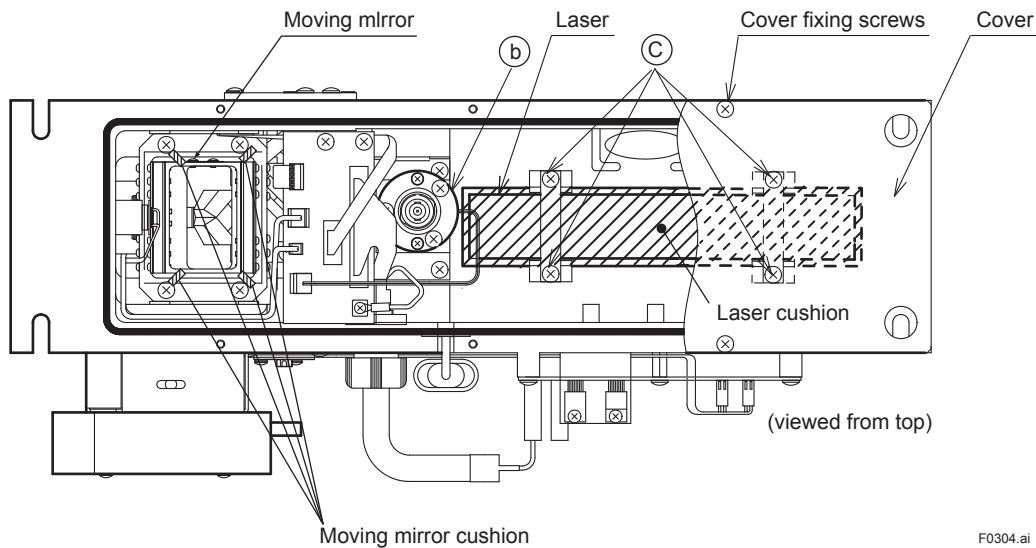


Figure 3.4 Cushions in the spectrometer

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3.2 Wiring and Piping

3.2.1 Power Supply Wiring

Exercise precautions before wiring the power supply line

To prevent electric shock and damage to the NR800L and a human body, observe the following warnings.



WARNING

- Confirm that the supply voltage to be used is within the power supply voltage specification rating before connecting the power cord.
- Confirm that the power is turned OFF before connecting the power cord.
- To prevent electric shock and the possibility of fire, use only the power cord supplied by YOKOGAWA.
- Always use protective ground terminal to prevent electric shock. Connect the power cord to a three-pole power outlet.
- Never use an extension cord that does not have a protective ground terminal, otherwise the protection function will not be effective.

● Connection procedure

1. Check the analyzer is turned OFF.
2. Connect the power cord (supplied with the NR800L) to the power connector on the rear panel of the NR800L.
3. Connect the other end of the power cord to a power supply outlet that meets the requirements.

3.2.2 Optical Fiber Wiring in using single core cables

The model NR825, NR826, NR821, NR822, NR823, NR824 optical fiber cables can be used.

Table 3.3 Specification outline of fiber cables

Model	Description	Fiber bending radius
NR825	Silica glass fiber cable: includes 2 fibers for measurement and 1 fiber for reference.	$R \geq 100\text{mm}$
NR826	Fluoride glass fiber cable: includes 2 fibers for measurement and 1 fiber for reference.	$R \geq 100\text{mm}$
NR821/NR822	Silica glass fiber cable sheathed with metal: 1 unit	$R \geq 120\text{mm}$
NR823/NR824	Fluoride glass fiber cable sheathed with metal: 1 unit	$R \geq 120\text{mm}$

See figure 3.6. There are two optical paths necessary to be connected: one for sample (SMPL) and one for reference (REF). Use optical fiber(s) to connect between LIGHT OUT port and LIGHT IN port for each path.

When flexible single-core optical cables are used, connect them as follows.

(1) Connection of the optical beam path for reference

Open the doors in front of LIGHT OUT connectors and LIGHT IN connectors on the front panel. Remove caps on connector tips of cables and instrument if they are attached.

Keep these caps. Put a male connector of the cable into a female connector of REF side on the LIGHT IN.

Turning the grip of male connector, fix the connection between them. In the same way, make a connection between the cable and SMPL side on the LIGHT OUT.

(2) Connection of the optical beam path for sample

Two optical fiber cables are used to link the sample path. In the same way as (1), connect one side of a cable to the female connector of SMPL on the LIGHT IN, and one side of another cable to the female connector of SMPL on the LIGHT OUT. Connect the other side of each cable to the measuring cell. (Refer to Figure 3.6)

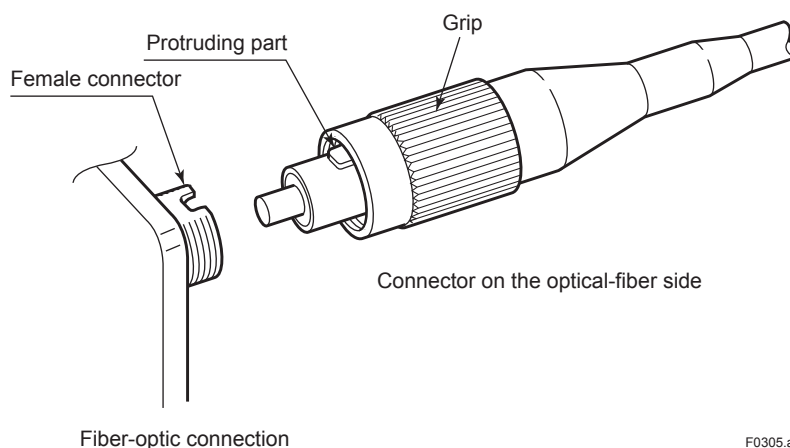


Figure 3.5 Optical fiber Cable Connection of FC type connector

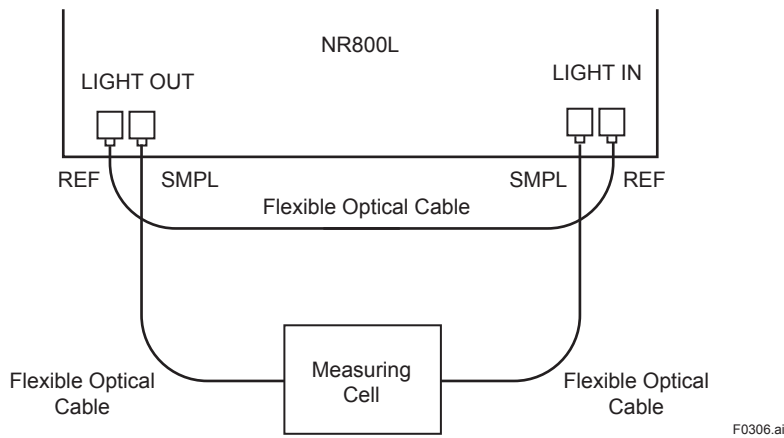


Figure 3.6 Wiring flexible optical cables



WARNING

- There are cases of not fitting a male connector with a female connector because of different type of connector, though YOKOGAWA supplies cables so as to meet customers requirement. In respect with the analyzers and measuring cells made by YOKOGAWA, FC type connectors are built-in. However, measuring cells made by a third party may be applied with SMA type connectors. In the combination of YOKOGAWA analyzer and the measuring cell, both connectors of the cable ends are different in specification.
Pay attention to "which cable end fits which device connection, for a analyzer or for a measuring cell".
- Before connecting optical fiber, check that there is no dirt or oil on connectors of the cables, the analyzer, and the measuring cell. To remove dirt or oil, gently wipe it off with a soft-cloth containing a little ethyl alcohol. Do not scratch fibers.
- Do not leave connectors uncapped if they are under disconnection for a long time.
- Fix optic fiber cables within bending radius is shown in Table 3.3.

3.2.3 Optical fiber wiring in using a two-core cable

Connect the two-core flexible metal-sheath cable as shown in Figure 3.7.

The blue sheathed optical fibers are for the SMPL and the measuring cell. The yellow one are for the REF. For these connection procedure, refer to the description and cautions in 3.2.2.

In addition, when jointing between two yellow sheathed optical fibers, the reference side connector is necessary. Before connecting with the reference-side connector, apply a little of the matching oil (part no. K9420PR) to the edges of the fiber cable. The connection without the oil may become unstabilized in measurement value.

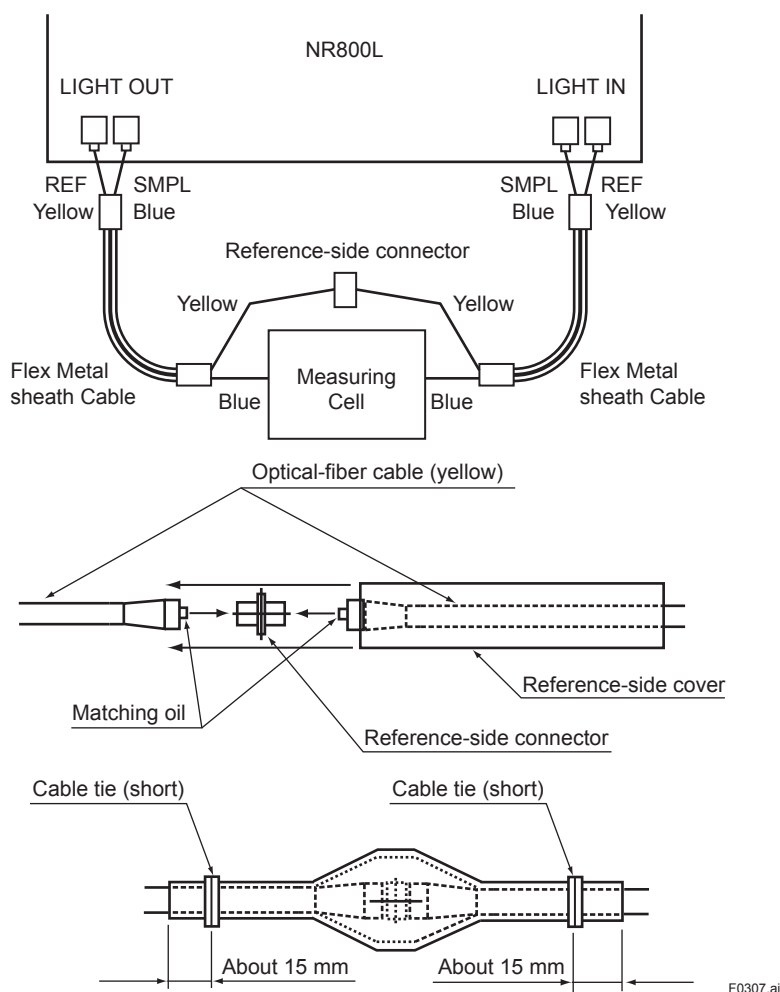


Figure 3.7 Optical wiring using flexible metal sheath cable

NOTE

- The reference-side connector is a female-female joint. Check the connector type meets the cable connector type. Please purchase it, if necessary, because it is not contained in the contents of the fiber cable.
- The matching oil is not supplied with the fiber cables. Please purchase it, if necessary.
- In a dirty environment, use the reference-side cover as shown in Figure 3.7. Please purchase it, if necessary, because it is not contained in the contents of fiber cable.

3.2.4 Wiring of Ethernet Communication Cable (10Base-T)

Connect the Ethernet communication cable to the Ethernet connector on the rear of the analyzer.

3.3 Power ON procedure

3.3.1 Check Items before power on

- (1) Check the installation environment requirements for this product on the specification.
Confirm that there is no equipment nearby that may adversely affect operation of this product.
- (2) Check that the power switch is turned OFF.
- (3) Confirm that there is no visible external or internal damage. Please report, and consult with our company or agent if there is any damage.
- (4) Confirm that a protective ground which meets the specifications is correctly wired to the protective ground terminal of this product (by using a three-pin plug with ground connection, or by running a separate ground wire).
- (5) Confirm that wires (for power supply, optical or electrical signals) are correctly connected to this product.
- (6) Confirm that the rated working voltage of this product matches the power source voltage.
Do not turn on the power unless the power source voltage meets the voltage requirement of this product.

3.3.2 Power ON procedure of NR800L analyzer

- (1) Re-check items in 3.3.1 before power on.
- (2) Reconfirm that the power switch on the NR800L analyzer is turned off.
- (3) The power-on procedure is as follows:
For safety, it is recommended that you do not work alone.
 - Turn on the power to the NR800L analyzer. Confirm that the NR800L normally starts up. If front panel indicator emits a green light, proceed to the next procedure; If the indicator emits a red light, trouble shoot in accordance with the description in Chapter 3 "Alarms".
 - Confirm that the Ethernet connection between the NR800L analyzer and a PC is normal (check status LEDs, etc).
 - Use instrument after enough warming-up time (6 hours or more is recommended).

3.4 Laying Optical Cable

An optical fiber can be usually laid as-is, without any weather-proof precautions; however, exercise cautions in the following cases.

- If it can receive a direct shock, it should be installed in a protective tube (conduit).
- Avoid installing or laying the cable in the place which gives the cable much fluctuation in temperature or vibration. As the result that the cable is exposed by rain, sunlight, or heat emission, measurement values may be changed.
- Install the fiber cable under the height of the measuring cell connector.

This treatment can prevent liquid such as water drops (running along the cable) from entering the measuring cell.



WARNING

- Be careful not to touch the optical fiber core in the optical connector, and not to allow dust and dirt to adhere to it. Skin oils on its surface may affect its characteristics and prevent normal measurement. When storing it or before laying it, be sure to cap the end of the cable.
- When installing the optical fiber, be sure to observe the specified maximum tension and minimum bend radius limits. Prevent the optical fiber from shock, excess tension, small-radius bends, twisting, or crushing. Or the optical fiber may be damaged or broken.

3.4.1 NR821 or NR822 Silica fiber cable

Be very careful when handling the optical fiber. Ask experienced people to lay it.

■ Permissible Conditions

- Tension when laying cables

Connector : 98 N or less
Branch cable : 245 N or less
Main cable : 294 N or less

- Bending radius : R100 mm or greater

(the larger the radius, the better, for minimum effect on transmittivity)

■ Notes on Laying Cables

- (1) If it is necessary to pass cable through protective conduit, calculate the approximate tension required for pulling a cable, with 0.5 of friction coefficient.
- (2) In hanging cables in space, use messenger wires, which support the weight of the cable and minimize tension applied directly to the cable. If the wires cannot be used, be sure to hang the cables within permissible tension condition: 98N or less.
The applied tension can be estimated by the suspended cable length and the cable sag.
(Since the estimation method is not shown in this Manual, look for the method in other technical books if necessary.)
- (3) In laying (by pull) the cable on the rack, pull it within permissible conditions and with the approximate tension as calculated in (1) . If the cable is uncoiled and directly laid on the rack without pull, the tension calculation is unnecessary.



WARNING

The cable may be twisted when uncoiled.
Don't pull a twisted cable. Or it can be broken.

CAUTION

Check the transmittivity before and after laying.
Laying the fiber cable carefully, observing the above notes and general precautions.
If the laying is properly done, the increase in transmission loss should be not more than 20%.
In case of more than 20% increase, check the laying situation and that cables meet the laying requirement. Re-do so as to become not more than 20%.

■ Messenger Wire Attachment Procedure for Passing Cables Through a Tube

Messenger wire is used for supporting the fiber cable strength and preventing the cable breakage.

Refer to Figure 3.8 and 3.9

- (1) Attach the wire to the main cable, which can best withstand the tension involved in cable laying.
- (2) Cover the connectors with protective caps.
- (3) Tightly bundle the two (REF and SMPL) connectors with PVC adhesive tape.
- (4) Fix the connectors to the messenger wire PVC adhesive tape, and clamp the cable to the wire with tie-band at intervals, allowing some slack so that tension is not directly applied to the cable.
- (5) With PVC adhesive tape, wrap parts and portions which can prevent to pass the cable through. Especially, the edges of connectors and cable branching portion can be preventive.

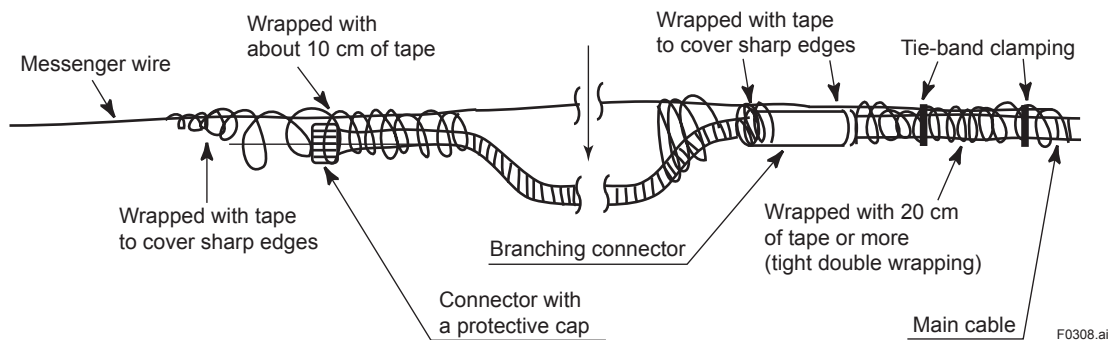
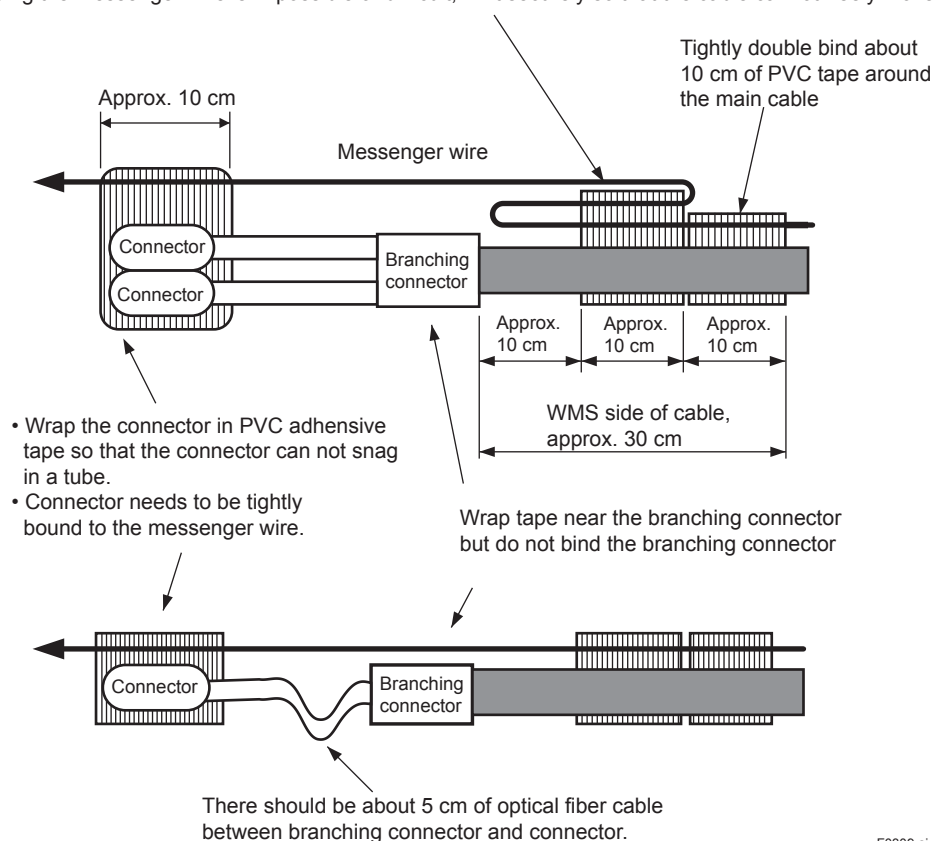


Figure 3.8 Attachment Procedure of Messenger wire

As shown in the below figure, bend the messenger wire beside the branching connector. Fix the wire to the main cable with PVC adhesive tape so that the wire cannot pull off from the cable. If bending the messenger wire is impossible or difficult, fix it securely so that the cable cannot freely move.



F0309.ai

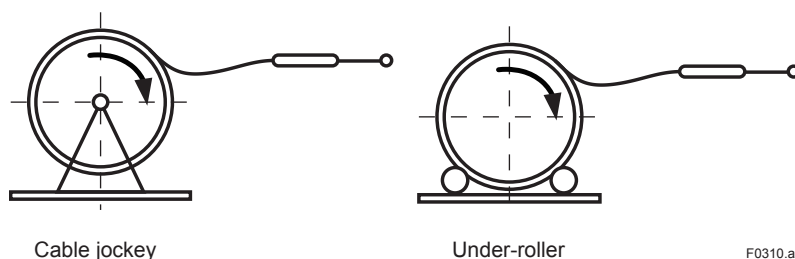
Figure 3.9 Example of attaching a cable to the messenger wire

■ Unwinding (Pulling) Optical Fiber from Cable Drum

CAUTION

In pulling optical fiber cables, use a cable drum equipped with a cable jockey or under-rollers. Ensure that the cable drum rotates smoothly. Set the drum so that a cable can be fed from the top of it.

1. When laying the cable, do not pull its branching connector.
2. Pull the cable straight off the drum (Don't pull it from the side of the drum.) and rotate the drum while laying the cable so as not to put any load on the cable. If you pull the cable off the side of the drum, the glass fiber may twist. As a result, damage such as its breakage or optical loss may occur. Please refer to the following figure:



F0310.ai

Figure 3.10 How to pull cable

3.4.2 NR823 or NR824 Fluoride fiber cable



WARNING

Compared with NR821 or NR822 Silica fiber cable, NR823 or NR824 Fluoride fiber cable has low mechanical strength. Be sure to observe the cautions below.

If the fluoride cable is carelessly handled, it will be damaged and must be replaced (it is quite expensive).

1. Bending radius should be 120 mm or greater (the greater the better, for minimum effect on transmittivity).
2. Other installation cautions:
 - (1) Lay the fiber on top of boards slowly and carefully. If it needs pulling, use a messenger wire. (Attach the wire as shown in Fig. 3.8 and 3.9 so that direct tension cannot be applied to the optical fiber.)
 - (2) Don't lay the cables in space. Such laying can break it, giving a direct tension.
 - (3) The cable may be twisted in uncoiled. Don't pull a twisted cable. Or it can be broken.
 - (4) Don't give shock or tension to the cable when laying it.
 - (5) Check the transmittivity before and after laying.
Laying the fiber cables carefully, observing the above notes and general precautions. If the laying is properly done, the increase in transmission loss should be not more than 20%. In case of more than 20% increase, check the laying situation and that cables meets the laying requirement. Re-do so as to become not more than 20%.
3. Notes on Storage
Measurement Optical fiber cable of NR823, NR824 is deliquescent material (fluoride). Please store the fiber in the water-impermeable plastic seal bag with desiccant. Please take an appropriate action of humidity removal, such as frequent replacement of desiccant.

3.5 Ethernet Connection to Management Personal Computer

3.5.1 Specifications of Ethernet Interface

(1) Basic specifications

Table 3.3

Electrical and mechanical specifications	Conform to IEEE 802.3
Maximum transmission rate	10 Mbps
Transmission media	10Base-T
Protocol	TCP/IP, FTP, UDP

(2) The maximum number of simultaneous connections to NR800L analyzer

A single NR800L can be connected to up to 4 Personal Computers (PC).

(3) The maximum number of simultaneous connections to SPECTLAND2

A single PC can run up to four instances of the SPECTLAND2 software, so can connect to four NR800L analyzers simultaneously. However, different instances of SPECTLAND2 running on a PC may not access the same NR800L analyzer simultaneously.

(4) Port no. for Ethernet communication

A table of the ports used by the NR800L analyzer for Ethernet communications is shown in Table 3.4.

Port no. 34293 to 34299 and 34311 and 34312 are dedicated to communications between the NR800L and SPECTLAND2. If these ports conflict with existing network use, it is possible to change the port nos. and use other ports, but as far as possible these standard port nos. should be used.

Table 3.4

Port no	Protocol	Name of signal	Comments
34293	TCP/IP	Operation commands, data settings	Dedicated
34294	TCP/IP	Connection confirmation, spectra event	Dedicated
34295	UDP/IP	Period data communication	Dedicated
34296-34299	UDP/IP	Period data communication	Dedicated
21	FTP	File data send/receive	Standard port for this protocol
34311	TCP/IP	Atline commands and settings	Dedicated
34312	TCP/IP	Atline commands and settings	Dedicated

3.5.2 Ethernet Interface Connection

(1) Dedicated connection between the NR800L and single PC

Connect via hub as shown below. Connect to the hub via up to 40m of shielded 10Base-T straight cable (Cat. 3 or Cat. 5). You can also connect the NR800L and PC directly (without the hub) by using shielded 10Base-T cross cable.

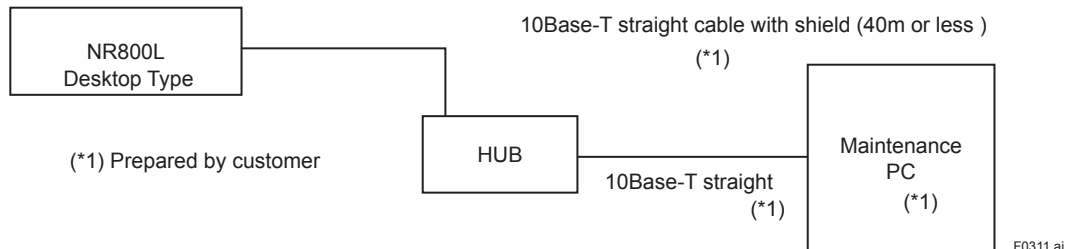


Figure 3.11 An Example of System configuration using Hub

(2) Network connection to existing Ethernet

Figure 3.12 shows a NR800L Analyzer connected to a Personal Computer on an existing Ethernet

When the NR800L is connected to an existing network, set the IP address, Domain, Gateway etc. so as not to conflict with the existing network. Consult your network administrator if you need a detailed Network information.

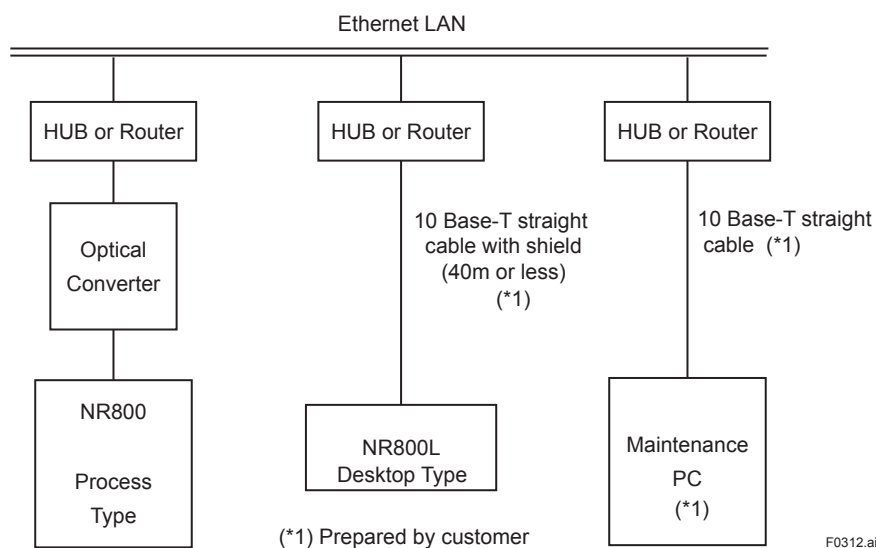


Figure 3.12 Example of Connection to Existing Ethernet

CAUTION

Communications between the NR800L Analyzer and SPECTLAND2 is confirmed to work in a network environment; however if the network is overloaded with traffic or the bus is in an electrically noisy location, communications may fail to work normally.

3.5.3 Ethernet Interface Settings

The following settings are required to use the NR800L's Ethernet functions.

The IP address should be set to a value like 192.168.111.24 (four "octet" values, each between 0 and 255, with period [.] separator).

- **IP address**

The NR800L Analyzer requires a fixed IP address. For a single-PC connection, use a private IP address (example: 192.168.1.xxx). The most significant three octets (higher rank of octets) should be the same for the NR800L and PC, while the least significant octet should be different.

For a network connection, ask your network administrator to allocate an IP address.

The default setting is 192.168.1.1. Change the setting if necessary.

- **Subnet mask**

The subnet address divides the IP address into a subnet address and node address.

For a single-PC connection, use 255.255.255.0. For a network connection, ask your network administrator the subnet mask to be set.

- **Default gateway**

This is used to access devices outside the subnet. It has no meaning for a single-PC connection; for a network, ask your network administrator.

3.5.4 Setting of Ethernet Parameter

The IPL command function is used for setting the Ethernet parameters. Set the parameter as the following procedure.

- (1) Turn off the power supply to the NR800L and connect the communication connector D-SUB 9pin (See Fig 1.4) of CPU card to the serial connector of the PC via a cross cable.
- (2) Turn on the PC. Start up the terminal function of the PC, the communication conditions are as follows: Transmission rate 38,400 bps, 8 data bits, 1 stop bit, and no parity.
- (3) Turn on the power supply of NR800L. After turning on it, the IPL command function starts up and the following message appears on the PC terminal; press the [ENTER] key within 5 seconds, as the message says.

```
NR800 system Initial Program Loader (Version : 0100)
If you want to change the IPL_mode, press ENTER key in 5 seconds
[ENTER]
Welcome to IPL_mode ..
IPL>>
```

- (4) Set the IP address as xx.xx.xx.xx, and the subnet mask as yy.yy.yy.yy by entering the following command:

```
IPL>>etherip -i xx.xx.xx.xx -s yy.yy.yy.yy [ ENTER ]
```

- (5) To set the default gateway. An example: Enter the following command in case that the gateway is zz.zz.zz.zz.

```
IPL>>gtwayip -i zz.zz.zz.zz [ENTER]
```

- (6) To Quit IPL command mode, press "q".

```
IPL>>etherip [ENTER]
IP address on Ethernet :xx.xx.xx.xx
Subnet mask for Ethernet interface :yy.yy.yy.yy

IPL>>gtwayip [ENTER]
Gateway IP address on Ethernet :zz.zz.zz.zz

IPL>>q [ENTER]

NR800 system Initial Program Loader (Version : 0100)
If you want to change the IPL_mode, press ENTER key in 5 seconds

/*****
/*
/* NR800 maintenance terminal system
/*
/*****/
```

After finishing the Ethernet parameter settings, turn off the power supply of NR800L, and remove the serial cable. When the power supply of NR800L is turned on, it is restarted, the setting becomes effective, and normal operation starts.

3.5.5 Checking Ethernet Interface Connection Status

(1)Checking the connection by NR800L Ethernet card

Open the cover of the NR800L analyzer, and check the three indicators on the top of the Ethernet card (See Fig 1.4). The top one shows Ethernet connection status.

Table 3.5

Indicator	Ethernet Interface Connection Status
Lit (green)	Ethernet interface is electrically connected
Blinking (green)	Data being transmitted
Off	Ethernet interface is not electrically connected

(2)Checking the connection by using Ping Command

In order to check the connectivity between the PC and the NR800L, send a ping command to the NR800L's IP address. The sending procedure are as follow.

1. [Start] -> [Program] -> [Command Prompt] to get a Command Prompt.
2. ping 192. 168. 1. 50 [Enter]

("192. 168. 1. 50" is an example of IP address of the NR800L.)

Examples of "success connection message" and "Failed connection message" are shown below.

[Connected successfully]

Reply from 192. 168. 1. 50 : bytes = 32 time < 10 ms TTL = 64

[Failed]

Request timed out

(3)Checking double-using IP addresses

If the Ping fails, check for double-using IP addresses as follows:

1. Disconnect the Ethernet cable from the NR800L, re-execute the above Ping command and confirm that time out happens.
2. Connect the Ethernet cable to the NR800L, re-execute the above Ping command.

The success of the Ping command shows that another PC or network device is not using the NR800L address.

(4)Checking the connection to SPECTLAND2

After finishing three checking (1) to (3), the connection with SPECTLAND2 is possible.

For detail, see "the SPECTLAND2 operation guide : IM12Y03B01-11E"

4. Alarms

4.1 Alarm Types

In InfraSpec, when hardware errors or outlier measurements are detected, alarm LEDs light in RED. The messages corresponding to each type of alarm are listed in Table 4.1.

Table 4.1 List of alarm messages

1	DSP malfunction
2	Laser burnout
3	Lamp burnout
5	Connection error with A/D converter
6	Movement mirror displacement meter malfunction
7	Movement mirror driving system malfunction
8	Movement mirror [midpoint] driving system malfunction
9	PD (PhotoDiode) output failure
11	Movement mirror [midpoint] displacement meter malfunction
12	Dual gain error
13	AD conversion number is out of range.
14	AD convert peak position is error.
15	DSP memory failure
101	PD (PhotoDiode) temperature control failure
104	Calculation parameter error
105	Measurement failed due to interferogram failure
106	Outlier
107	Cooling fan breakdown
108	Resolution specification is error.
109	Sample line signal error
110	Intrtferogram data failure
111	Intrtferogram data failure (data insufficient after peak)
200	Laser lifetime has expired
201	Lamp lifetime has expired
300	Interferogram failure. Light level.
301	Channel no. of finished measuring-spectrum is error.

Note: You can see alarm details from the SPECTLAND2 software running on the management PC. Refer to the section 6 of the IM12Y03B01-11E SPECTLAND2 Operation Guide for details.
Check the alarm on SPECTLAND2.

(*) Cooling fan breakdown alarm does not activate with the NR800L .

4.2 Alarm Details

The following tables show the NR800L alarm details: including type of display output, method of detection, automatic processing, required user response and cautions.

DATA1, DATA2, DATA3, and DATA4 in the table represent related information to aid in diagnosis. This information can only be viewed from SPECTLAND2 running on the management PC. Fail contact output does not activate with the NR800L.

Alarm 001: DSP malfunction

Alarm no.	1
Alarm displayed on front panel	DSP
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	DSP malfunction
Contact output	NR800L fail alarm contact
Level	High priority (H)
Auto recovery	Yes
Location detected	CPU (DSP supervisor task)
Method of detection	At startup, if the DSP doesn't write a test pattern, or the 1-min. interval watchdog signal from the DSP stops.
Processing	Switches to MAINT mode
User action	Try turning power OFF then ON again; If this does not fix the problem then contact our service representative

Alarm 002: Laser burnout

Alarm no.	2
Alarm displayed on front panel	LASER BO
Front-panel LED	LED (LASER)
Displayed by SPECTLAND2	Laser burnout
Contact output	NR800L fail alarm contact
Level	High priority (H)
Auto recovery	Yes
Location detected	Hardware (on DSP board)
Method of detection	DSP receives laser fail interrupt and relays it to CPU.
Processing	Switches to MAINT mode
User action	If spectrometer mirror is still operating, follow laser replacement procedure in manual.

Alarm 003: Lamp burnout

Alarm no.	3
Alarm displayed on front panel	LAMP BO
Front-panel LED	LED (LAMP)
Displayed by SPECTLAND2	Lamp burnout
Contact output	NR800L fail alarm contact
Level	High priority (H)
Auto recovery	Yes
Location detected	CPU (DSP monitoring task)
Method of detection	PD output of all reference channels is low.
Processing	Switches to MAINT mode
User action	Follow lamp replacement procedure in manual.

Alarm 005: Connection error with A/D converter

Alarm no.	5
Alarm displayed on front panel	ADC CN c (c is channel no.)
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Connection error with A/D converter
Contact output	NR800L fail alarm contact
Level	High priority (H)
Auto recovery	Yes
DATA1	Channel no.
Location detected	CPU (DSP monitoring task)
Method of detection	No A/D conversion on A/D board, check cable and connectors of PD-DSP board
Processing	None
User action	Check A/D converter & PD board connections. If normal, contact service rep.

Alarm 006: Movement mirror displacement meter malfunction

Alarm no.	6
Alarm displayed on front panel	SENSOR M
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Movement mirror displacement meter malfunction
Contact output	NR800L fail alarm contact
Level	High priority (H)
Auto recovery	Yes
DATA1	0
DATA2	0
DATA3	SUM value
Location detected	CPU (DSP monitoring task)
Method of detection	Sum value over limit. Servo-driven movement mirror controller failure.
Processing	Switches to MAINT mode
User action	Try turning power OFF then ON again; If this does not fix the problem then contact our service representative.

Alarm 007: Movement mirror driving system malfunction

Alarm no.	7
Alarm displayed on front panel	VCM M
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Movement mirror driving system malfunction
Contact output	NR800L fail alarm contact
Level	High priority (H)
Auto recovery	Yes
DATA1	0
DATA2	0
DATA3	Control deflection
Location detected	CPU (DSP monitoring task)
Method of detection	Control deflection over limit. Deviation sensor normal, mirror abnormal.
Processing	Switches to MAINT mode
User action	Try turning power OFF then ON again; If this does not fix the problem then contact our service representative.

Alarm 008: Movement mirror [midpoint] driving system malfunction

Alarm no.	8
Alarm displayed on front panel	VDM C
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Movement mirror [midpoint] driving system malfunction
Contact output	NR800L fail alarm contact
Level	High priority (H)
Auto recovery	Yes
DATA1	0
DATA2	0
DATA3	Driving voltage at the midpoint
Location detected	CPU (DSP monitoring task)
Method of detection	Driving voltage at the midpoint of the servo-driven movement mirror over limit. Servo-driven movement mirror controller failure.
Processing	Switches to MAINT mode
User action	Try turning power OFF then ON again; If this does not fix the problem then contact our service representative.

Alarm 009: PD (PhotoDiode) output failure

Alarm no.	9
Alarm displayed on front panel	PDOVFL cf (c: channel, f=S: sample f=R: reference)
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	PD output failure
Contact output	NR800L fail alarm contact
Level	High priority (H)
Auto recovery	Yes
DATA1	Channel no.
DATA2	Sample: 1, Reference: 2
DATA3	PD output value
Location detected	CPU (DSP monitoring task)
Method of detection	PD output out of range. Not output if lamp failure).
Processing	None
User action	Check measurement cell. Contact our service representative. representative.

Alarm 011: Movement mirror [midpoint] displacement meter malfunction

Alarm no.	11
Alarm displayed on front panel	SENSOR C
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Movement mirror [midpoint] displacement meter malfunction
Contact output	NR800L fail alarm contact
Level	High priority (H)
Auto recovery	Yes
DATA1	0
DATA2	0
DATA3	Midpoint SUM value
Location detected	CPU (DSP monitoring task)
Method of detection	Midpoint sum value over limit. Servo-driven movement mirror controller failure
Processing	None
User action	Try turning power OFF then ON again; If this does not fix the problem then contact our service representative

Alarm 012: Dual gain error

Alarm no.	12
Alarm displayed on front panel	DGA cf (c: channel, f=S: sample f=R: reference)
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Dual gain error
Contact output	NR800L fail alarm contact
Level	High priority (H)
Auto recovery	Yes
DATA1	Channel no.
DATA2	Sample: 1, Reference: 2
DATA3	Dual gain value
Location detected	CPU (DSP monitoring task)
Method of detection	Dual gain value (approx. 16) over limit.
Processing	None
User action	Contact our service representative.

Alarm 013: AD conversion number is out of range.

Alarm no.	13
Alarm displayed on front panel	ADNUM
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	AD conversion number is out of range.
Contact output	NR800L fail alarm contact
Level	High priority (H)
Auto recovery	Yes
DATA1	Maximum resolution
DATA2	Odd : 1, Even : 100, Both : 101
DATA3	No. of odd data
DATA4	No. of even data
Location detected	CPU (DSP monitoring task)
Method of detection	A/D converter data over limit
Processing	None
User action	May need to adjust mirror movement span; if this does not fix the problem then contact our service representative.

Alaem 014: AD convert peak position is error.

Alarm no.	14
Alarm displayed on front panel	ADPEAK
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	AD convert peak position is error.
Contact output	NR800L fail alarm contact
Level	High priority (H)
Auto recovery	Yes
DATA1	Maximum resolution
DATA2	Odd : 1, Even : 100, Both : 101
DATA3	Odd peak position
DATA4	Even peak position
Location detected	CPU (DSP monitoring task)
Method of detection	Interferogram peak data over limit
Processing	None
User action	May need to adjust mirror actuator; if this does not fix the problem then contact our service representative.

Alaem 015: DSP memory error

Alarm no.	15
Alarm displayed on front panel	
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	DSP memory error
Contact output	NR800L fail alarm contact
Level	High priority (H)
Auto recovery	Yes
DATA1	0
DATA2	0
DATA3	0
DATA4	0
Location detected	CPU (DSP monitoring task)
Method of detection	Detect the check sum error alarm of spectrum
Processing	Change the mode to MAINT mode automatically
User action	Contact our service representative

Alarm 101: PD (PhotoDiode) temperature control failure

Alarm no.	101
Alarm displayed on front panel	PD TEMP c (c: channel no.)
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	PD temperature control failure
Contact output	NR800L fail alarm contact
Level	Intermediate priority (M)
Auto recovery	Yes
DATA1	Channel no
DATA2	Sample : 1, Reference : 2
DATA3	PD temperature control output
Location detected	CPU (DSP monitoring task)
Method of detection	PD temperature control output over limit.
Processing	None
User action	Check cooling fan and room temp.; if OK then contact our service representative.

Alarm 104: Calculation parameter error

Alarm no.	104
Alarm displayed on front panel	PARA ss (ss: stream no.)
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Calculation parameter error
Contact output	NR800L fail alarm contact
Level	Intermediate priority (M)
Auto recovery	Yes
DATA1	Stream no.
DATA2	Constituent no
DATA3	Calibration model no.
DATA4	Code for calculation where error occurred
Location detected	CPU (measurement processing task)
Method of detection	Error check in calculation Cell blank file not downloaded Cell blank file wrong resolution Calibration model file not downloaded Calibration model contents bad
Processing	Calculation can't proceed
User action	Check calculation error code, set corresponding parameters.
Notes	Typically occurs if can't open calibration model file. If error occurs in spectra then DATA2 (Constituent no.) and DATA3 (Calibration model no.) are zero.

Alarm 105: Measurement failed due to interferogram failure

Alarm no.	105
Alarm displayed on front panel	ITFR c (c: channel no.)
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Measurement failed due to interferogram failure
Contact output	NR800L fail alarm contact
Level	Intermediate priority (M)
Auto recovery	Yes
DATA1	Channel no.
DATA2	Detailed error code
DATA3	No. of times occurred
DATA4	Abnormal value
Location detected	DSP
Method of detection	Interferogram bad. (Alarm 300 repeats)
Processing	Interferogram, power spectrum and spectrum all set to zero.
User action	Check optical fiber connection and measurement cell. If intermittent then contact our service representative.

Alarm 106: Outlier

Alarm no.	106
Alarm displayed on front panel	OUTL ss cc (ss: stream no., cc:constituent no.)
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Outlier
Contact output	Channel alarm contact of I/O unit
Level	Intermediate priority (M)
Auto recovery	Yes
DATA1	Stream no.
DATA2	Constituent no
DATA3	Mahalanobis path (zero if not measured)
DATA4	Residual deviation (RMSSR) (zero if not measured)
Location detected	CPU (measurement processing task)
Method of detection	Mahalanobis path or residual deviation over limit.
Processing	None
User action	Check calibration models.
Notes	Set Mahalanobis path or residual deviation using Set Property Values dialog or parameter window.

Alarm 107: Cooling fan breakdown

Alarm no.	107
Alarm displayed on front panel	FAN
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Cooling fan breakdown
Contact output	NR800L fail alarm contact
Level	Intermediate priority (M)
Auto recovery	Yes
DATA1	Cooling fan no. (1-4)
Location detected	CPU (DSP monitoring task)
Method of detection	Fan failure contact output
Processing	None
User action	Replace cooling fan.

Note: Cooling fan breakdown alarm does not activate with the NR800L.

Alarm 108: Resolution specification is error.

Alarm no.	108
Alarm displayed on front panel	RSRV ss (ss: stream no.)
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Resolution specification is error.
Contact output	NR800L fail alarm contact
Level	Intermediate priority (M)
Auto recovery	Yes
DATA1	Channel no.
DATA2	Stream no.
DATA3	Measurement resolution
DATA4	Maximum resolution
Location detected	CPU (stream mode switching task)
Method of detection	Specified resolution for specified stream is over maximum resolution.
Processing	Stream where alarm occurred is not measured.
User action	Check stream resolution and max. settings

Alarm 109: Sample line signal error

Alarm no.	109
Alarm displayed on front panel	STRM c (c: channel no.)
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Sample line signal error
Contact output	NR800L fail alarm contact
Level	Intermediate priority (M)
Auto recovery	Yes
DATA1	Channel no.
DATA2	0: Stream signal obtained from DCS 1: Stream signal obtained from module A 2: Stream signal obtained from module B
Location detected	CPU (stream mode switching task)
Method of detection	Channel no. and stream no. are related. Stream signal can't be acquired.
Processing	Stream switching command invalid
User action	Check I/O unit or DCS that should be providing stream no.
Notes	Channel no. and stream no. correspondence depend on channel mode, no. of channels, and whether or not channel switching is supposed to occur. Error occurs if stream no. is invalid. E.g. if communications with DCS fails and old channel no. info. remains.

Alarm 110: Intrtferogram data failure

Alarm no.	110
Alarm displayed on front panel	
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Intrtferogram data failure
Contact output	NR800L fail alarm contact
Level	Intermediate priority (M)
Auto recovery	Yes
DATA1	0
DATA2	0
DATA3	0
DATA4	0
Location detected	DSP Card (DSP)
Method of detection	Scan direction changes before data collection
Processing	None
User action	Contact our service representative in case frequently happened.

Alarm 111: Intrtferogram data failure (data insufficient after peak)

Alarm no.	111
Alarm displayed on front panel	
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Intrtferogram data failure (data insufficient after peak)
Contact output	NR800L fail alarm contact
Level	Intermediate priority (M)
Auto recovery	Yes
DATA1	0
DATA2	0
DATA3	0
DATA4	0
Location detected	DSP Card (DSP)
Method of detection	Data shortage error after Interferogram peak
Processing	None
User action	Confirm optical fiber connection and measurement cell. Contact our service representative in case frequently happened.

Alarm 200: Laser lifetime has expired

Alarm no.	200
Alarm displayed on front panel	LASER LF
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Laser lifetime has expired
Contact output	None
Level	Low priority (L)
Auto recovery	Yes
Location detected	CPU (DSP monitoring task)
Method of detection	DSP monitoring task counter increments every minute. Alarm occurs when this counter exceeds the laser life setting.
Processing	None
User action	Replace laser (see manual)

Alarm 201: Lamp lifetime has expired

Alarm no.	201
Alarm displayed on front panel	LAMP LF
Front-panel LED	Alarm LED
Displayed by SPECTLAND2	Lamp lifetime has expired
Contact output	None
Level	Low priority (L)
Auto recovery	Yes
Location detected	CPU (DSP monitoring task)
Method of detection	DSP monitoring task counter increments every minute. Alarm occurs when this counter exceeds the lamp life setting.
Processing	None
User action	Replace lamp (see manual)

Alarm 300: Interferogram failure. Light level.

Alarm no.	300
Alarm displayed on front panel	None
Front-panel LED	None
Displayed by SPECTLAND2	Interferogram failure. Light level.
Contact output	None
Level	Low priority (L)
Auto recovery	Yes
DATA1	Channel no
DATA2	Detailed error code.
DATA3	No. of repeats
DATA4	Abnormal value
Location detected	DSP
Method of detection	Detected by DSP
Processing	None
User action	If occurs repeatedly, check optical fiber connections and measurement cell.
Notes	Refer to detailed error code.

Alarm 301: Channel no. of finished measuring-spectrum is error.

Alarm no.	301
Alarm displayed on front panel	None
Front-panel LED	None
Displayed by SPECTLAND2	Channel no. of finished measuring-spectrum is error.
Contact output	None
Level	Low priority (L)
Auto recovery	Yes
Location detected	CPU (Stream mode switching task)
Method of detection	Stream no. of stream that has not been measured.
Processing	None
User action	Perform spectrum measurement

5. Maintenance and Inspection



WARNING

Maintenance and inspection should not be executed by operators. They should be executed by Yokogawa authorized service representative or officially-trained service personnel.

5.1 Maintenance

For keeping good operations, the periodic checks and maintenance are recommended.

Table 5.1 shows limited-life items and recommended replacement intervals for preventative maintenance. But this interval does not represent a guarantee that these parts will not fail. Examine the optimum replacement interval based on operating conditions.

Table 5.1

Items for check/maintenance	Recommended interval
Cleaning the porthole window pane of flow-through cell	*1
Replacing the lamp assembly *2	Once in 5000 hours
Replacing the desiccant of spectrometer *2	Once in a year
Replacing the laser head *2	Once in 12000 hours
Replacing the NR800L analyzer's cooling fan *2	Once in three years
Replacing the NR800L analyzer's insulator *3	Once in three years

*1: Recommended interval depends on operating conditions.

*2: Maintenance parts should be replaced by Yokogawa's service representative or authorized service who is trained by Yokogawa.

*3: Maintenance parts should be replaced by Yokogawa's service representative.

5.2 Replacing Parts



WARNING



Electrical Shock



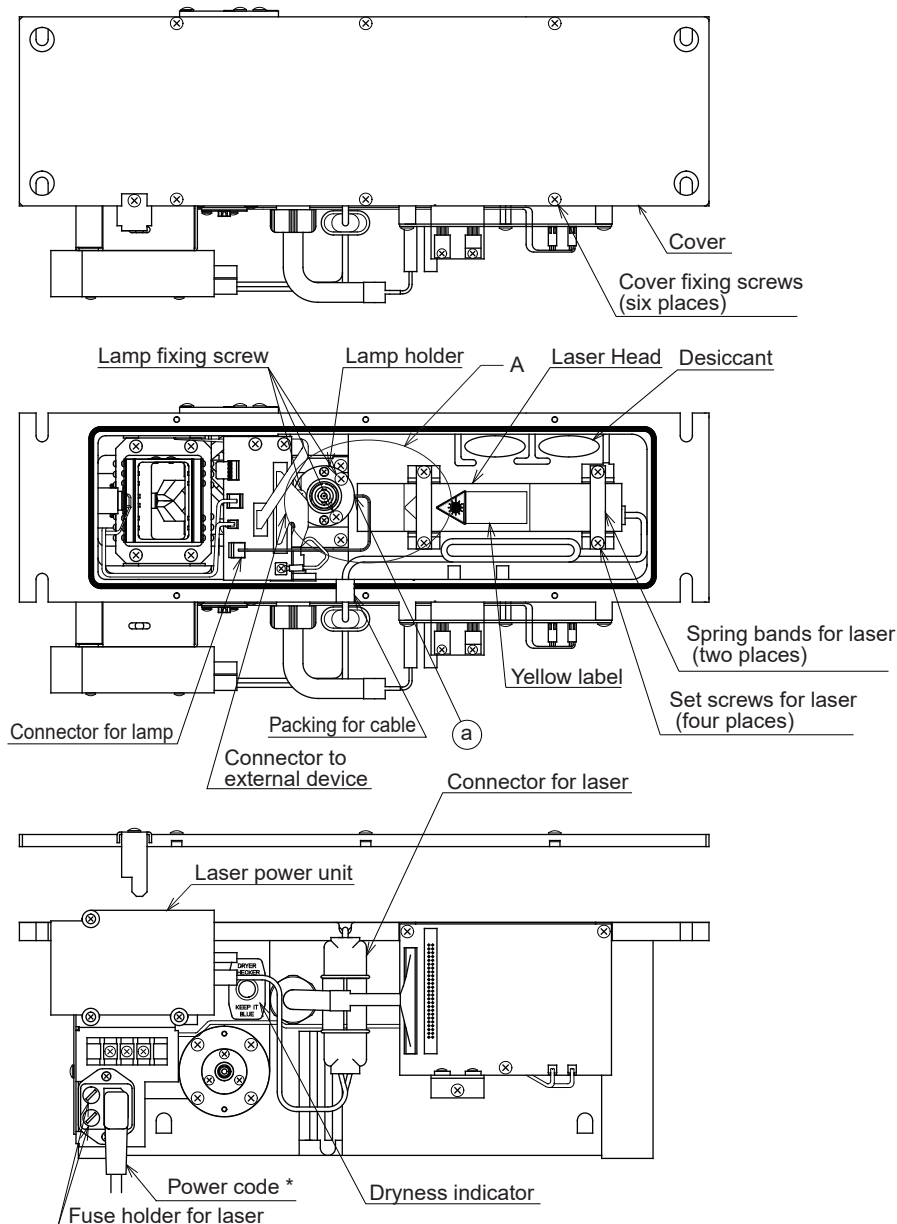
High temperature

The analyzer can cause dangerous electrical shock (which may lead to serious injury or death). Always turn off the analyzer before replacing any parts.

Specially, since the lamp is very hot immediately after power off, you will get burned if you touch it. Do not directly touch the lamp when you replace it.

Take the spectrometer out from the analyzer and remove its cover when you replace parts according to the instructions given in Subsection 5.2.1, "Replacing the Lamp," Subsection 5.2.2, "Replacing the Laser," Subsection 5.2.3, "Replacing the Laser Fuse" and Subsection 5.2.4, "Replacing the Spectrometer Desiccants."

Refer to "Customer Maintenance Parts List" for the replacement parts number.



* Do not disconnect the power code when connecting or disconnecting the cable connector.
An electric shock may be caused.

Figure 5.1 Spectrometer Parts to be replaced

5.2.1 Replacing the Lamp

Replace the lamp assembly (Model code: NR8SP01-04) after every 5000-hour operation or when it burns out.

(1) Removing the Lamp

Detach the lamp connector. Remove the setscrews (in three places) for fixing the lamp, and then pull the lamp with the holder straight up.

(2) Installing a New Lamp

Insert a new lamp with its holder straight into the original position. Then, fix the lamp assembly with setscrews. Handle the lamp assembly carefully because the lamp has been preadjusted to sit in place. Position the lamp so the setscrews and their mating holes align properly, and then fix it with the setscrews.



CAUTION

No wirings of the spectrometer may run across the top opening of the lamp holder.

5.2.2 Replacing the Laser

Replace the laser head after every 12,000-hour operation or when it burns out. Since the laser is equipped with a protective fuse. If the alarm "Laser burn-out" turns on, check the fuse before the laser replacement (refer to Subsection 5.2.3, "Replacing the Laser Fuse.")

(1) Removing the Laser

First remove the cable packing and laser connector. Then, remove the setscrews (in four places) for fixing the laser and the two springs for holding down the laser. Pull the laser out upward.



CAUTION

Before removing the laser head, check the exit position of the power cable on the laser head. (Figure 5.2) The power cable exit position must be in the same position in the spectrometer after replacing the laser head.

To provide an optimum replacement, the following is recommended. Before replacement, draw an aligning mark (approx. 1 cm) in a position where the laser head and the retaining clip cross each other and remove the laser head. Mark a line on the new laser head at the same position as the old one in reference to exit position of the power cable. Align the new laser head drawn mark and the clip's drawn mark so that the new laser head should be installed.



WARNING



Electrical Shock

The analyzer can cause dangerous electrical shock (leading to death or serious injury).

The laser may remain electrically charged in 15 minutes or more immediately after power-off.

Do not touch the laser connector.

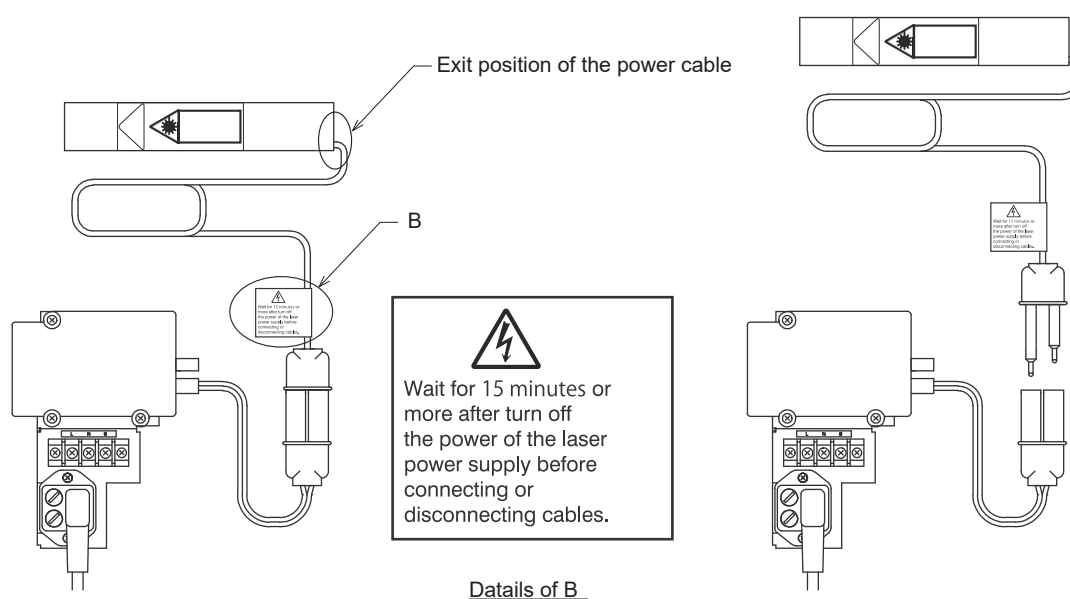


Figure 5.2 Caution tag label (rear surface is displayed in Japanese)

(2)Installing a New Laser

Before connecting the power connector or mounting the Laser head, check that the shutter in front of the Laser beam exit hole is open. Visually check that the black shutter of the hole is not closed. If it is closed, "Referring to Figure 5.3"

Turn the screw in the direction of the arrow to open the shutter. Install the new Laser head, and move the retaining "clip" to hold it in place. At this time, attach the laser head so that the exit position of the power cable on the laser head is the same as before replacement. Mount the Laser head so that its front is about 2 mm from the back of the lamp holder (shown as ① in the Figure 5.1). Attach the connector and push the packing onto the cable. Roll up the excess cable and band it, taking care that it doesn't obstruct the laser beam path.

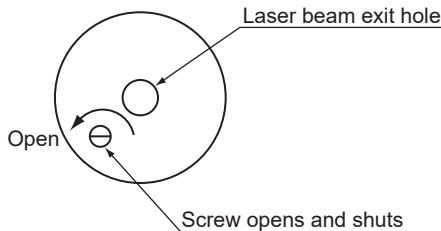


Figure 5.3 How to open the shutter

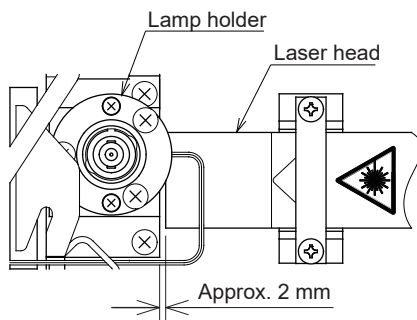


Figure 5.4 Details of "A" of Figure 5.1

5.2.3 Replacing the Laser Fuse

If the analyzer raises an alarm for a "Laser burnout," first check the fuse. Turn the fuse holder cap shown in Figure 5.1 counterclockwise, and remove the fuse. If the fuse is blown, replace it with a new one. As a replacement fuse, always use a 0.5 A (100, 115 VAC), and a 0.3 A (200, 230VAC) slow-acting fuse. Part number is A1108EF and A1107EF.

5.2.4 Replacing the Spectrometer Desiccants

Examine the dryness indicator . If it looks faded in color, replace the desiccants (three packs in all). The model code for replacement desiccant is NR8SP01-06. The indicator keeps blue when the analyzer is dry. In this case the desiccants don't need replacing.

5.3. Parts for Maintenance

The analyzer uses limited-life components. The recommended replacement periods are listed in the Table 5.2.

- (1) Limited service-life components are defined as those which are presumed to be worn out or to be broken within five years under normal operating or storage conditions.
Components with more than five year of service life are out of limited service-life components.
- (2) The table 5.2 only involves the recommended periods for conducting preventive maintenance for limited service-life components; these periods do not guarantee that accidental failures will not occur.
- (3) The recommended replacement periods are tentative and depend on operating conditions.
- (4) The recommended replacement periods may vary, depending on the increase of our field data.

Table 5.2

Part	MS code	Quantity used	Remarks	Recommended replacement period
Lamp assembly	NR8SP01-04	1	LAMP (adjusted) *2	5000 hours
Desiccant	NR8SP01-06	1	Desiccant for spectrometer (9 packets included) *2	One year
Laser head	NR8SP01-05	1	Laser head *2	12000 hours
Fan	NR8SP01-09	1	NR800L analyzer's cooling fan *2	3 years
Fuse	A1113EF	2	For power supply *2	*1
	A1107EF	2	For laser (for 200/230 V AC) *2	*1
	A1108EF	2	For laser (for 100/115 V AC) *2	*1
Insulator	NR8SP01-03	1	Spectrometer support insulator (4 packets included) *3	3 years

*1: Recommended interval depends on operating conditions.

*2: Maintenance parts should be replaced by Yokogawa's service representative or authorized service who is trained by Yokogawa.

*3: Maintenance parts should be replaced by Yokogawa's service representative.

6. Measuring Principles

The measuring principles of the Near-infrared Analyzer (InfraSpec) are described below. InfraSpec applies near-infrared rays of wavelengths between 0.9 to 2.5 mm to a material to be measured, determines the spectrum absorbed by this material, and computes desired property values from the spectrum. The block diagram in Figure 6.1 shows the entire system configuration. In this configuration, the principles are described in the order of the signal flow.

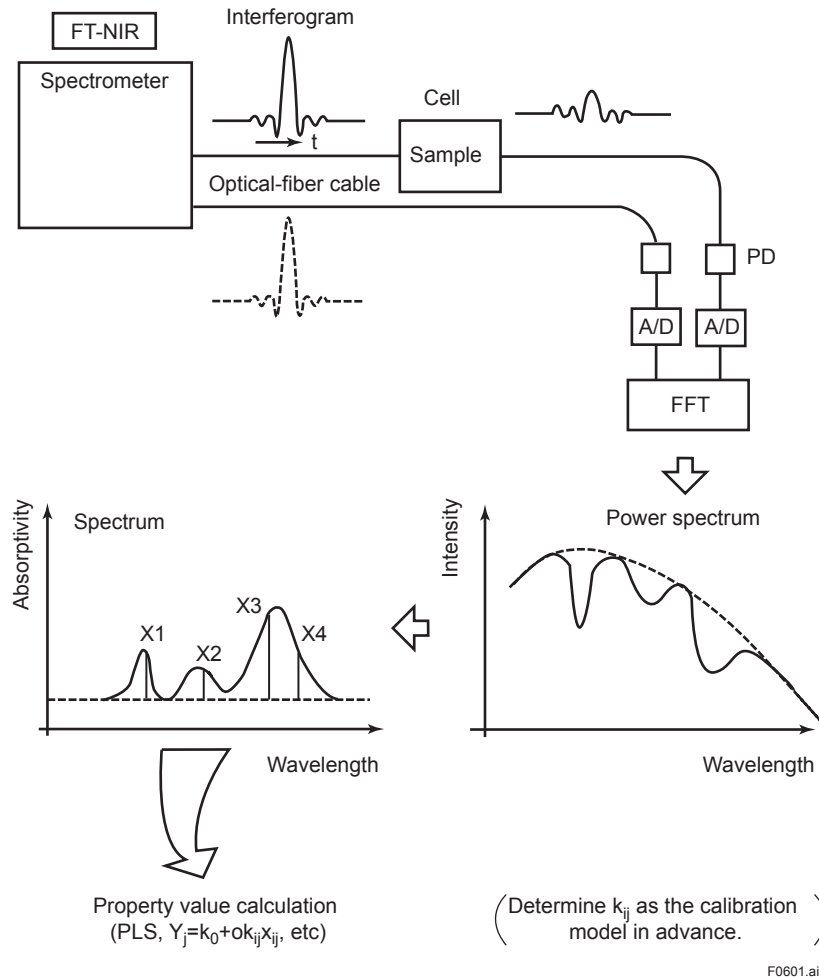


Figure 6.1 Measuring Principles

(1) Spectrometer

The spectrometer generates the light for measurement, by changing the light beam of the halogen lamp. The spectrometer consists of a half-silvered mirror, a fixed mirror and a movable mirror. The light beam of the halogen lamp goes to a half-silvered mirror first, and is split in two by it. One split beam goes to the fixed mirror, another to the movable mirror. After reflected by mirrors, the lights return to the half-mirror.

In these processes, a light interfere with another. The light source for measurement is generated by the interference. When the optical length of the two light beams is in the same phase, they strengthen each other. As a result, the amplitude of the light source becomes larger than that of each light. When the optical length of the two light beams is different by a half wavelength, they weaken each other. As a result, the amplitude of the light source becomes smaller than that of each light. Thus, its amplitude is changed with time-passing by the movement of the movable mirror.

In addition, the light source contains light with multi-wave length because of using the halogen lamp. The diagram showing the interference between lights with multi-wave length is called a interferogram.

(2)Optical transmission paths

The light source for measurement is, after going through the half mirror, split in two by a beam splitter. One is used for a signal; another for a reference. Both are transmitted with optical fiber cable.

(3)Cell

A sample is passed through the cell in which the signal light is applied to the sample.

Some of the signal light is absorbed by the sample. The transmitted light is guided to the analyzer through the transmission path and has information about light absorption by the sample. The reference light is guided directly to the analyzer without absorption by the sample.

(4)Optical detector and A/D conversion and dual gain

The light guided to the optical detector in the analyzer is converted to electrical signals, subjected to A/D conversion, and stored as time-series digital data. These data compose an interferogram containing the sample information.

A/D conversion employs a dual gain function which can improve resolution of the interferogram and decrease noise.

(5)Fourier transform and power spectrum

A spectrum absorbed by the sample is obtained by subjecting the interferogram that is taken out to a Fast Fourier Transform (FFT). When the sample-side and reference-side interferograms are Fourier-transformed, power spectra is gotten. The vertical axis of power spectra is light intensity. The power spectra is a function not only of optical absorption by the sample but also the intensity/distribution of light from the optical source, the absorption of the optical fiber, and the sensitivity characteristic of the optical detector.

By taking the logarithm of the ratio of the power spectra from sample side and reference side, the absorption spectrum of the sample can be gotten.

This operation can be considered to be the opposite of the process by which the interferogram in Figure 6.2 is created. That is, each wavelength component can be taken out from an interferogram.

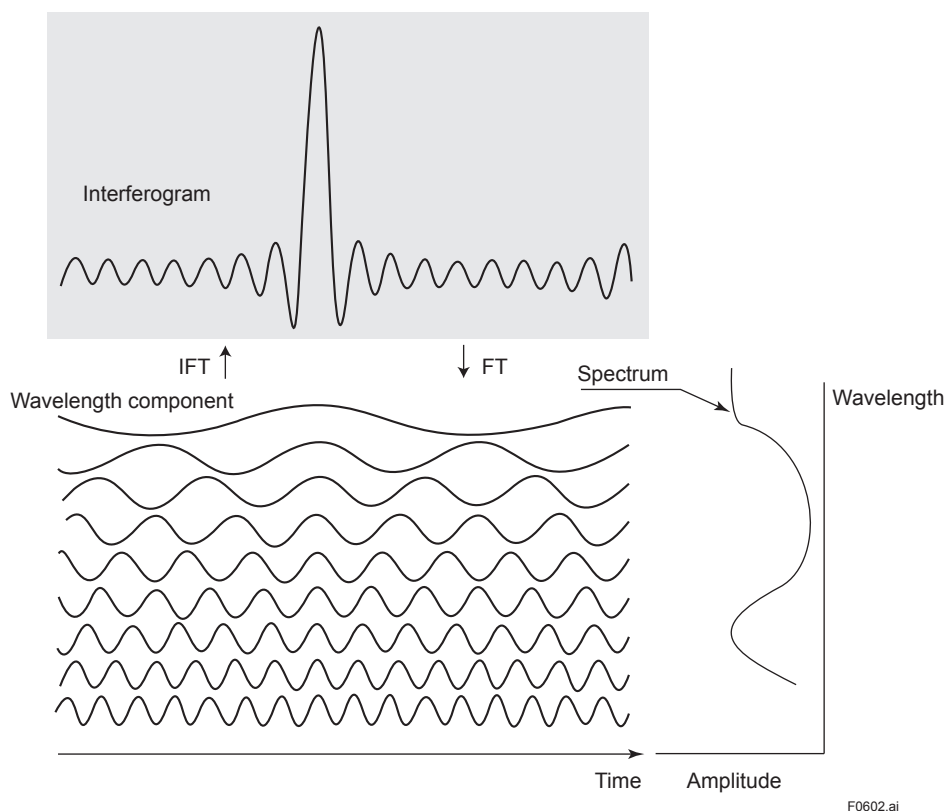


Figure 6.2 Interferogram and Its Wavelength Components

(6) Calculation of property values

By the calibration model from an obtained spectrum, the property values are computed.

This calibration model is a relational expression in which the relationship between the spectrum and property value to be obtained, which is determined in advance by using chemometrics software from many spectra and lab values.

(7) Other terminology

Zero filling:	Adding zero data at the both sides of the interferogram has the effect of improving the spectral resolution
Apodizing	This is like a Fourier window function which has the effect of reducing ripple on the Fourier transform.
IV gain	This is the current-to-voltage gain of the circuit which converts the output current of the light detector to a signal voltage.
A/D gain:	This is the amplifier gain of the input stage of the A/D converter. It also can be set to "Automatic".

7. Troubleshooting



WARNING



Electrical Shock



Laser-generating system

The analyzer is very dangerous (possibly resulting in serious injury or death) because a high voltage is always applied to it, and because a laser-generating device is incorporated. Before the analyzer cover is opened for maintenance purposes, be sure to turn off the power to the instrument.

This Chapter describes the solutions in cases of Alarm lamp lighting, abnormal analyzed value or interruption of communicating. The causes of these failures can be not only due to the analyzer itself but also due to mistakes in setting or operating of it. If the analyzer has not been worked since your reception of it, refer to this chapter as well as the other chapter in this manual; especially, chapter 2 and 5.

7.1 Lighting of Alarm Lamps

If the alarm lamps light (red), refer to Chapter 3. "ALARM", and take adequate action.

7.2 Abnormal Analyzed Value

When Alarm lamp dose not light in red and an analyzed value is abnormal, examine the cause as the following procedure:

1. Check installation condition of the analyzer
Example: Removal of protection goods attached upon shipment
2. Check wiring and piping of the analyzer
3. Check optical fiber cable laying
Confirm that the optical fiber cables are sufficiently inserted in the slots of the two-way splitter connectors in the case of FC type connector.
4. Check installation, wiring, and piping of the cell
Confirm that the optical fiber cable connections are not loose. If loose, tighten them properly. Also, confirm that there are no bubbles or dust particles stick to the cell. If they are, clean the cell referring to Chapter 4. "Maintenance."
5. Check the parameters of the analyzer
Place the analyzer in the parameter setting mode and confirm that all settings are correct on SPECTLAND2 parameter window.
 - (1) Setting of calibration model number
 - (2) Setting of final correction coefficient (slope)
 - (3) Setting of final correction coefficient (bias)
 - (4) Specifying outliers
 - (5) Setting for outlier use/non-use
 If the parameter settings are not correct, re-set them properly.
6. Confirm that the file names containing the following parameter data in the analyzer correctly appeared on the connected PC Monitor.
It is necessary that the analyzer move in the parameter setting mode.

After confirming that the file names are correct, check the validity of the data themselves. If the file names are not correct or if the data themselves have been changed, re-transmit correct data.

(1) Blank-cell spectrum

(To obtain data for a stabilized blank-cell spectrum, increase the number of averages when measuring blank-cell spectra (example: 256 times)).

(2) Calibration model data

(3) Outlier numbers and outlier data (if [outlier detection] is set)

(4) Standard spectrum used for correcting MSC (for the use of the calibration model prepared by correcting MSC)

7.3 Not communicating of between PC and NR800L

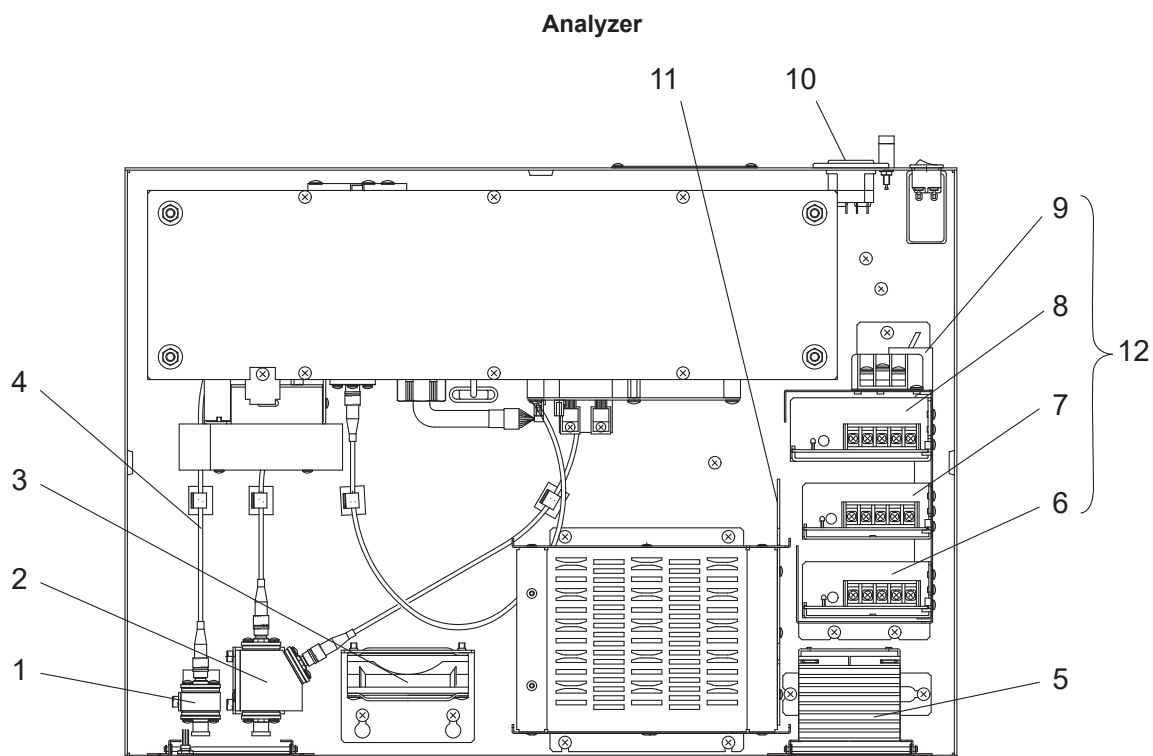
If Management PC is not communicating with the NR800L by Ethernet, check the following items:

1. Power to NR800L, PC and the related equipment.
2. Ethernet status lamps on network cards.
3. Connection and wiring of communication cable.
4. Network and PC settings, Refer to Section 2.5 for details of procedure.

Customer Maintenance Parts List

InfraSpec NR800 Fourier-Transform Near-Infrared Spectrometer [NR800L Desktop Type]

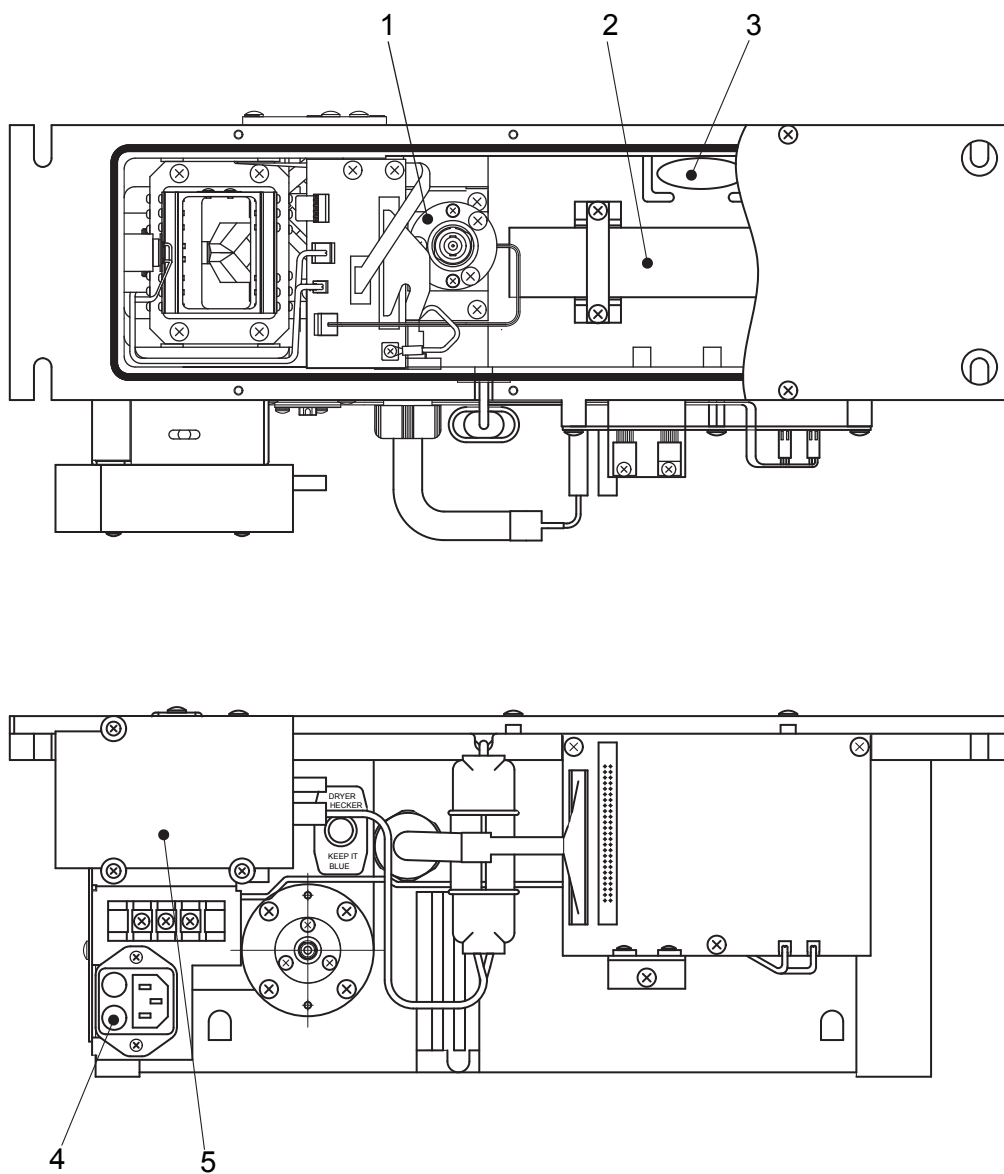
[Style: S2.05 and after]



Item	Part No.	Qty	Description
1*	K9429YA	1	Beam Connector
2*	K9429YB	1	Beam Splitter
3	NR8SP01-09	1	Fan
4*	K9420JA	2	Fiber-optic Cable (SilicaType)
	K9428JL	2	Fiber-optic Cable (FluorideType)
5*	K9468KE	1	PD Unit
6*	A1578UP	1	Power Unit 5 V DC for NR801EL
	A1609UP	1	Power Unit 5 V DC for NR801JL
7*	A1579UP	1	Power Unit -12 V DC for NR801EL
	A1754UP	1	Power Unit -12 V DC for NR801JL
8*	A1580UP	1	Power Unit +12 V DC for NR801EL
	A1755UP	1	Power Unit +12 V DC for NR801JL
9*	K9469BV	1	Surge Arrester
10	A1113EF	2	Fuse (100, 115, 200, 230 V AC, Slow Blow, 3.15 A)
11*	K9428QB	1	Back Board
12*	K9469BS	1	Power Supply Assembly for NR801EL
	K9469BK	1	Power Supply Assembly for NR801JL

* Do not exchange these parts. Call serviceman.

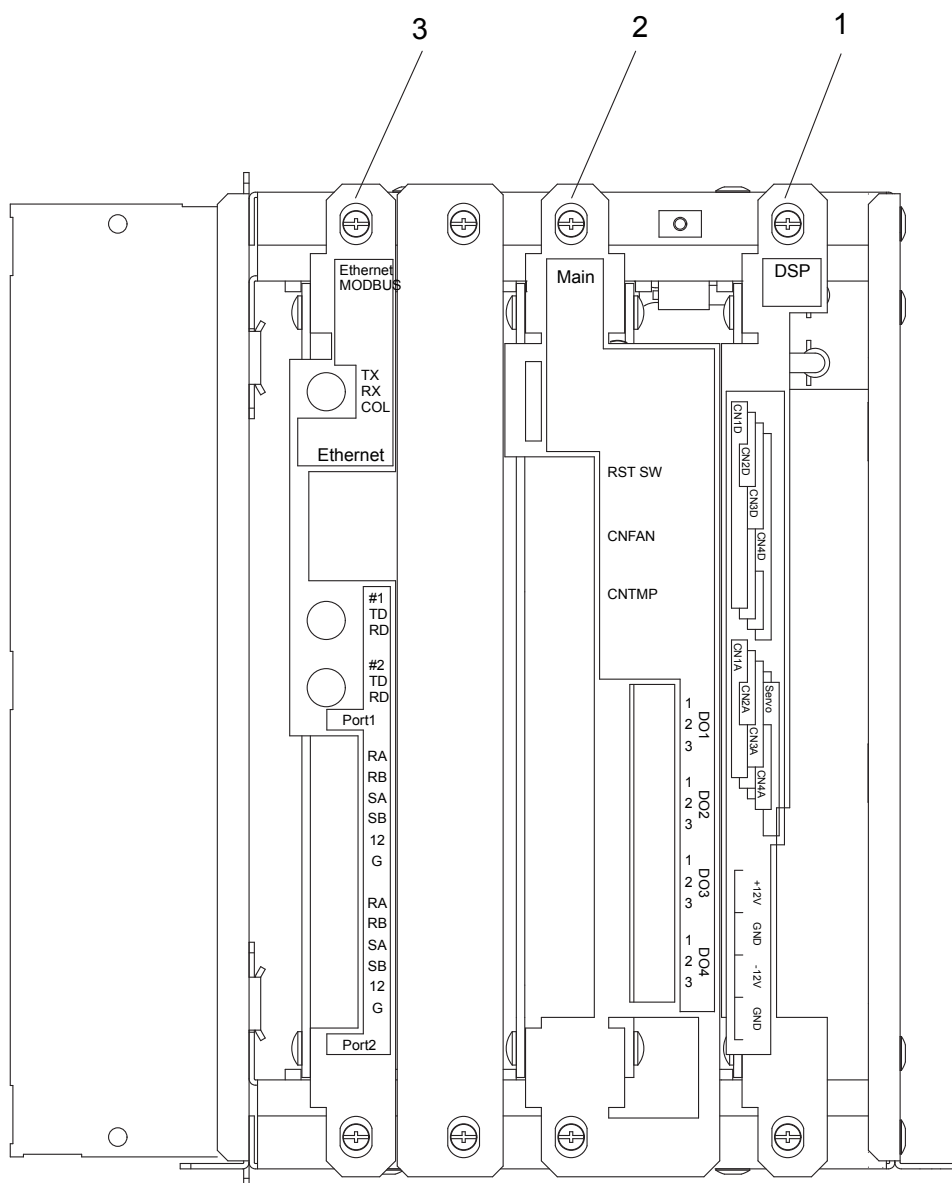
Spectrometer



Item	Part No.	Qty	Description
1	NR8SP01-04	1	Lamp Assembly (calibrated)
2	NR8SP01-05	1	Laser Head
3	NR8SP01-06	1	Desiccant (9 pcs included)
4	A1108EF	1	Fuse (for Laser 100, 115 V AC, Slow Blow, 0.5 A)
	A1107EF	1	Fuse (for Laser 200, 230 V AC, Slow Blow, 0.3 A)
5*	K9428HA	1	Power Unit (for Laser Head, 100 V AC)
	K9428HC	1	Power Unit (for Laser Head, 115 V AC)
	K9428HD	1	Power Unit (for Laser Head, 200 V AC)
	K9428HF	1	Power Unit (for Laser Head, 230 V AC)

* Do not exchange these parts. Call serviceman.

Card Rack



Item	Part No.	Qty	Description
1*	K9428TG	1	DSP Card
2*	K9428RA	1	Main Card
3*	K9428PA	1	Ethernet/MODBUS Card

* Do not exchange these parts. Call serviceman.

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- Manual No. : IM 12Y03C00-01E

Jan. 2023/8th Edition

Deletion of at-line measurement software "SPECTLAND2 at-line" (pages 1-1, 2-2, 3-13)
PC specifications change (page 2-2)

Jun. 2021/7th Edition

Added the CAUTION (page 5-3)
Changed the description (page 5-4)

Apr. 2019/6th Edition

CMPL was revised.

Oct. 2018/5th Edition

Corrections (pages iv, v, 5-2, 5-3, 5-4)

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