HIOKI

INSTRUCTION MANUAL

2351-20
2351-21
2352-20

AIR MODULE
WIRE MODULE

HIOKI E. E. CORPORATION

Contents

Introduction

Thank you for purchasing the HIOKI “Model 2351 AIR MODULE" and "Model 2352-20 WIRE MODULE.” To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

- **2351-20 can be used in EU area only.**
  Contains already Notified and Certified Transmitter Module:
  NB No.: 0682 Registration No.: E812974O-CC

- **2351-21 can be used in U.S.A. and Canada area only.**
  Contains FCC ID: AZP-FRH-SD07TU
  IC: 5829A-235121

  Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of this device.

  The following notices are for Canada only:
  This device has been designed to operate with an antenna having a maximum gain of 2.14 dB. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The Required antenna impedance is 50 ohms.

  To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website www.hc-sc.gc.ca/rpb.

In this manual, the 2351-20 and 2351-21 are indicated as 2351, except for the case that the full model number should be specified.

Inspection

When you receive the instrument, inspect it carefully to ensure that no damage occurred during shipping. In particular, check the panel switches, and connectors. If damage is evident, or if it fails to operate according to the specifications, contact your dealer or Hioki representative.

Accessories

Instruction manual 1

Options

9760	ANTENNA (With antenna base)*
9760-01	ANTENNA (Weatherproof with antenna base)*
9760-02	ANTENNA (Pencil-sharped with L-angle)*
9761	ANTENNA CABLE (1 m)*
9761-01	ANTENNA CABLE (2 m)*
9761-02	ANTENNA CABLE (5 m)*
9637	RS-232C CABLE (1.8 m)

*For 2351 only

Safety Notes

⚠DANGER This instrument is designed to comply with IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, mishandling during use could result in injury or death, as well as damage to the instrument. Be certain that you understand the instructions and precautions in the manual before use. We disclaim any responsibility for accidents or injuries not resulting directly from instrument defects.

This manual contains information and warnings essential for safe operation of the instrument and for maintaining it in safe operating condition. Before using it, be sure to carefully read the following safety precautions.

Safety Symbols

In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the instrument.

The ⚠ symbol printed on the instrument indicates that the user should refer to a corresponding topic in the manual (marked with the ⚠ symbol) before using the relevant function.

Indicates a grounding terminal.

Indicates DC (Direct Current).

The following symbols in this manual indicate the relative importance of cautions and warnings.

⚠DANGER	Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.
⚠WARNING	Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.
⚠CAUTION	indicates that incorrect operation presents a possibility of injury to the user or damage to the instrument.
NOTE	Indicates advisory items related to performance or correct operation of the instrument.

Other Symbols

	Indicates the prohibited action.
❖	Indicates the reference.

Measurement categories (Overvoltage categories)

To ensure safe operation of measurement instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT I to CAT IV, and called measurement categories. These are defined as follows.

CAT I Secondary electrical circuits connected to an AC electrical outlet through a transformer or similar instrument.

CAT II Primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.)

CAT III Primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders from the distribution panel to outlets.

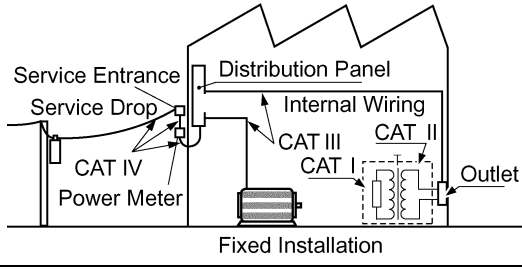
CAT IV The circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection instrument (distribution panel).

Higher-numbered categories correspond to electrical environments with greater momentary energy. So a measurement instrument designed for CAT III environments can endure greater momentary energy than a instrument designed for CAT II.

Using a measurement instrument in an environment designated with a higher-numbered category than that for which the instrument is rated could result in a severe accident, and must be carefully avoided.

Never use a CAT I measuring instrument in CAT II, III, or IV environments.

The measurement categories comply with the Overvoltage Categories of the IEC60664 Standards.



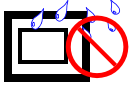
Notes on Use

Follow these precautions to ensure safe operation and to obtain the full benefits of the various functions.

⚠CAUTION

Operation and Installation environment.
This instrument should be installed and operated indoors only, between 0 and 50°C (32 to 122°F) and 80% RH or less.

Do not allow the instrument to get wet.



Do not allow the instrument to get wet, and do not take measurements with wet hands.
The instrument may be damaged.

Corrosive or combustible gases

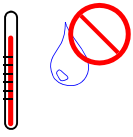
Do not use the instrument where it may be exposed to corrosive or combustible gases.
The instrument may be damaged.

Electromagnetic radiation or highly electrically charged object

Do not use the instrument near a source of strong electromagnetic radiation, or near a highly electrically charged object.
These may cause a malfunction.

This instrument is not designed to be entirely water- or dust-proof.
Do not use it in an especially dusty environment, nor where it might be splashed with liquid. This may cause damage.
When the module is used in a dusty environment, place it in a dustproof case and take measures to ensure heat dissipation.

⚠CAUTION



Temperature or humidity

Dust

Direct sunlight

Do not store or use the instrument where it could be exposed to direct sunlight, high temperature or humidity, or condensation.
Under such conditions, the instrument may be damaged and insulation may deteriorate so that it no longer meets specifications.

To avoid damage to the instrument, protect it from physical shock when transporting and handling.
Be especially careful to avoid physical shock from dropping.

Do not obstruct the ventilation holes.
Ventilation holes for heat radiation are provided on the top and rear panels of the instrument. Leave sufficient space around the ventilation holes and install the instrument with the holes unobstructed. Installation of the instrument with the ventilation holes obstructed may cause a malfunction or fire.

When using the instrument in the case, drill ventilation holes.
Drill ventilation holes or install a ventilation fan to prevent heat buildup.

Wiring

⚠WARNING

- A qualified electrician shall perform the wiring to prevent electric shock.
- Avoid live-line electrical work to prevent electric shock and accidents due to shortcircuiting.
- When tightening the screws, confirm that all screws are securely tightened. A loose screw may result in module errors, fire, or electric shock.
- Tighten the screws within the specified torque. Excessive torque may damage the terminals. Inadequate torque may result in module errors, fire, or electric shock.
- Ensure that the power supply module and input are OFF until all wiring work is finished.
  This will prevent module trouble and electric shock.
- Ensure that the power supply module and input are OFF when connecting or disconnecting the module to the system. This will prevent electric shock, errors, and malfunction.

⚠CAUTION

- Connect the module to a power source that matches the rating in order to prevent fire.
- Ensure that the power supply, input, and output are correctly wired according to the wiring diagram. (See the chapter on "Preparations" in the instructions manual for each module.) This will prevent fire, malfunction, and errors.
- Use cables of the proper sizes for the rated current. This will prevent entire system errors and fire resulting from broken wire.
- Use crimp connectors suitable for the cable sizes. This will prevent module errors and fire due to broken wires.
- If power supply noise poses a problem, use of a noise filter is recommended.
- Avoid stepping on or pinching cables, which could damage the cable insulation.
- Keep the cables well away from heat sources, as bare conductors could be exposed if the insulation melts.

Preliminary Checks

⚠WARNING

Before using the instrument, make sure that the insulation on the cables is undamaged and that no bare conductors are improperly exposed. Using the product in such conditions could cause an electric shock, so contact your dealer or Hioki representative for repair.

Before using the instrument, make sure that the insulation on the cables is undamaged and that no bare conductors are improperly exposed. Using the product in such conditions could cause an electric shock, so contact your dealer or Hioki representative for repair.

Overview Chapter 1

1.1 Product Overview

- The 2351 and 2352-20 are the communications module of Hioki "Smart Site" (remote measurement system).
- The 2351 and 2352-20 are used with the power supply module, measurement module, and module base.
- This module links the measurement modules with a PC, server, and communications infrastructure, and transfers data.
- The transmission speed is 51.9 kbps for wireless communications and 57.6 kbps for RS-232C communications.

Number of communications modules connectable to one host	Up to 88 units (2351)
Number of measurement modules connectable to one wireless module	Up to 63 units (2351, 2352-20)

(Conceptual image)

1.2 Major Features

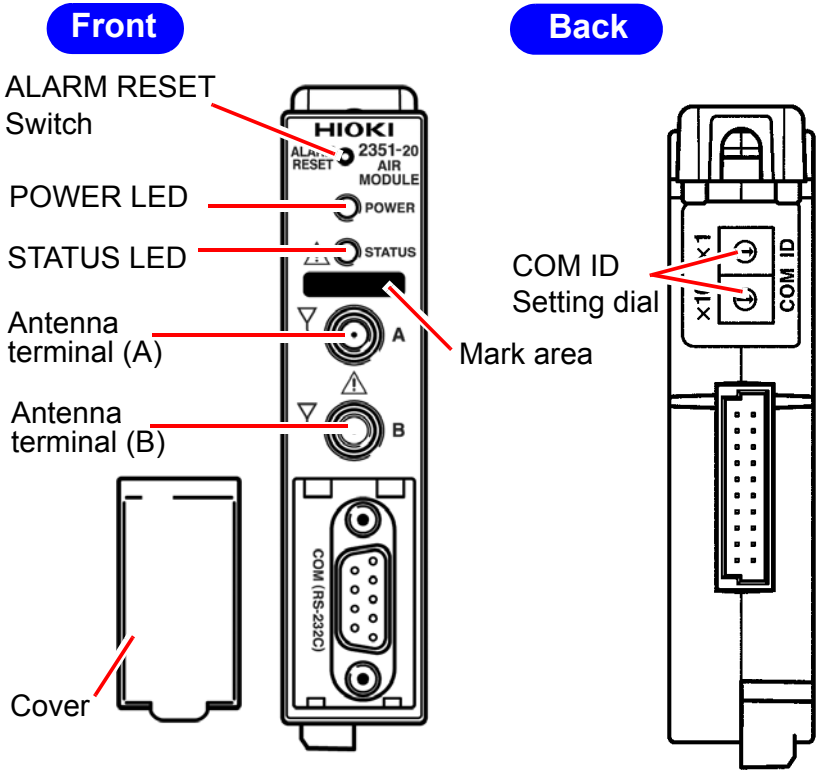
2351 AIR MODULE

- This communications module employs SS wireless technology, which is one feature of this system. It requires no communications cables, which reduces cost and installation time, and simplifies configuration of a measurement system.
- The module has two antenna terminals and supports diversity reception. (Only one terminal is used for sending.)

2352-20 WIRE MODULE

- This communications module sends and receives data via the RS-232C.
- This module is designed to be incorporated into the customer's equipment or used for a small system consisting of one 2300 Module.

1.3 Name and Function of the Parts



The figure shows the 2351-20.

POWER LED	Goes on or flashes when power is supplied to the module. Remains on, flashes, or changes to another color according to the state of the module. **POWER LED indication** Lit in green : Operating normally Lit in yellow : Alarm output. Lit in red : Non-recoverable error occurred.*1 Flashing in red : Recoverable error occurred. *2
STATUS LED	Remains on, flashes, or changes to another color according to the state of the module. **STATUS LED indication** Lit in green :Communicating
Mark area	Use this area to make a note of the object to measure or the COM ID. Use an ink pen, since pencil lead may rub off.
RS-232C terminal	Connect the RS-232C cable to this terminal. Use the 9637 RS-232C CABLE (option).
Antenna terminal (A) (2351 only)	Connect the sending/receiving antenna to this terminal. Antenna terminal (B) has no transmission function. When using only one antenna, connect it to this terminal.
Antenna terminal (B) (2351 only)	This terminal is for the receiving antenna only. To perform diversity reception, connect the receiving antenna to this terminal.
ALARM RESET switch	This switch cancels alarm output. Hold down the switch for at least one second to cancel the alarm.
COM ID setting dial	Use the dial to set the module's identification No.

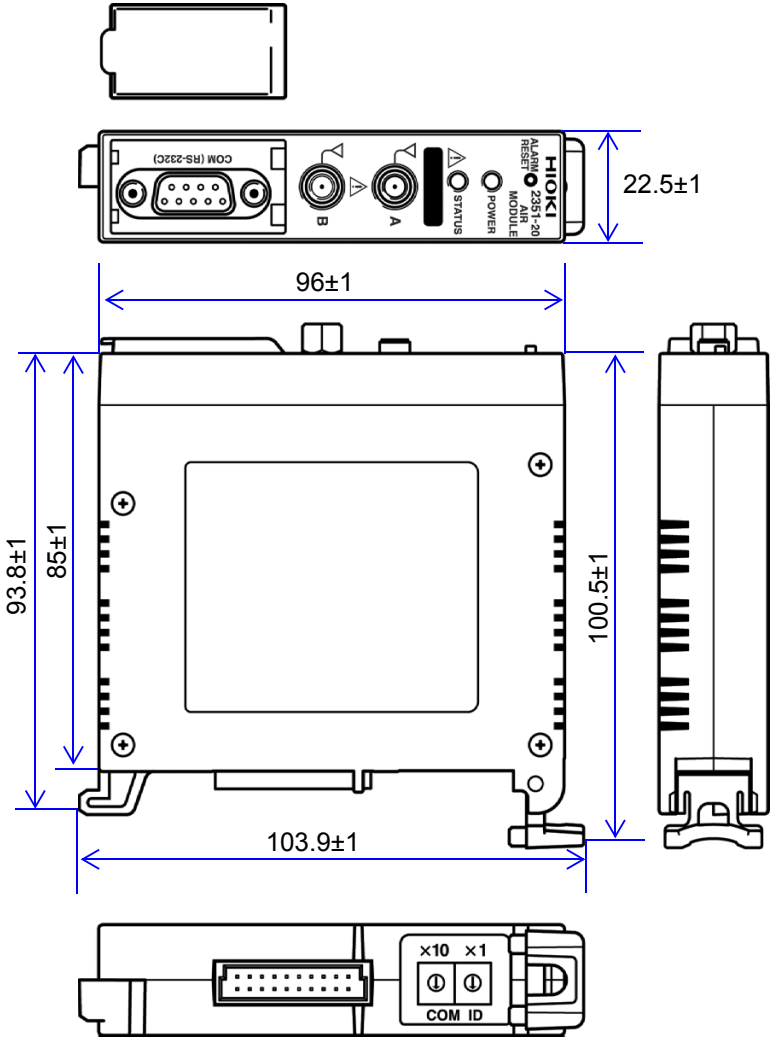
*1: The module needs repair. Contact your vendor (agent) or nearest Hioki office.

*2: More than one communications module may be connected to one internal bus (CAN bus).

NOTE

- Antenna terminal (B) is for receiving only and has no transmission function.
- The LED starts flashing in yellow when power is turned on. If it does not stop flashing after 20 seconds, check the setting of the CAN termination switch on the module base [**TERMINATION ON/OFF**]. (The switch should normally be set ON. When using the CAN bus, be sure to turn off the switch of the corresponding terminal No.) If the setting is not correct, turn off the power, then correct the setting.

1.4 Dimension Diagrams



(Unit: mm)

Settings Chapter 2

2.1 Setting the COM ID

You can connect up to 89 communications modules to a PC or server.

Setting Procedure

Use the COM ID setting dial to set the ID No. of the module from 01 to 89. (You cannot set it to a number other than indicated above.)

NOTE

- Ensure that the set ID is not used by any other communications module on the system controlled by the same PC or server.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID are not related and can be set independently.

Preparations Chapter 3

3.1 Installing the Module

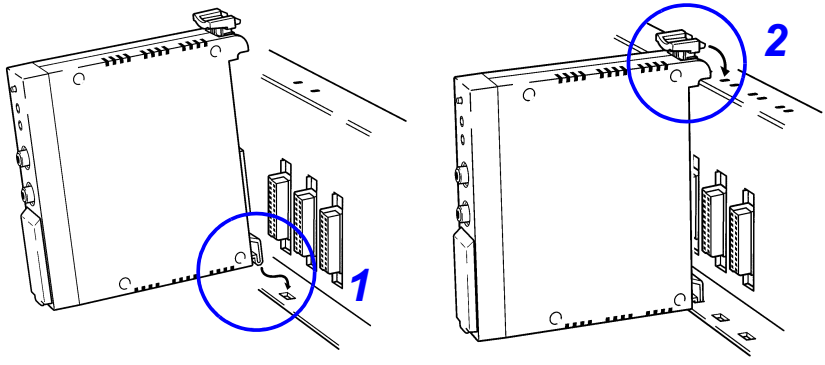
3.1.1 Installing the Module Base

⚠CAUTION Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the 2391 or 2392 series MODULE BASE instruction manual.

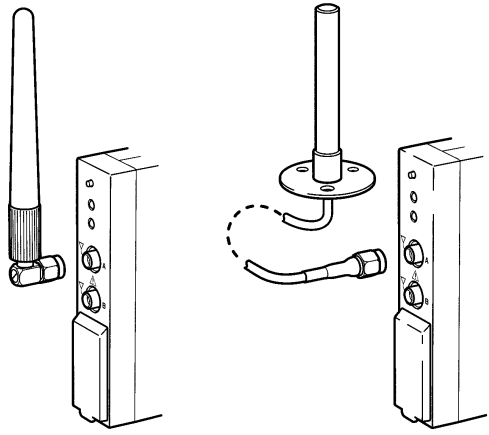
3.1.2 Mounting a Module on the Module Base

Install this module next to the power module.
Insert the levers of the module into the module-mounting slots to mount the module as shown below. Ensure that the levers click into position.



3.2 Connecting Sending/Receiving Antenna to Module (2351 Only)

1. Insert the antenna into the module.
2. Tighten the SMA nut on the antenna side by hand.
3. Then use an 8-mm spanner to securely tighten the nut.



NOTE

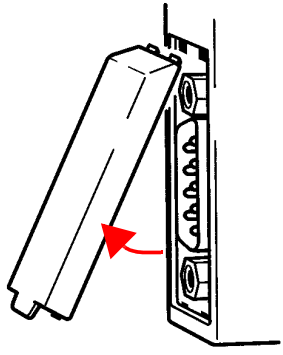
- Antenna terminal (A) can transmit and receive signals. Use this terminal when using only one antenna for communications.
- Antenna terminal (B) is for receiving only and has no transmission function. To perform diversity reception, connect the receiving antenna to this terminal.

Compatible Antennas and Extension Cables:

9760	ANTENNA (With antenna base)
9760-01	ANTENNA (Weatherproof with antenna base)
9760-02	ANTENNA (Pencil-sharped with L-angle)
9761	ANTENNA CABLE (1 m)
9761-01	ANTENNA CABLE (2 m)
9761-02	ANTENNA CABLE (5 m)

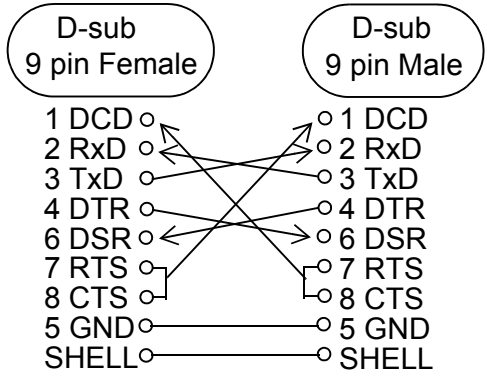
3.3 Connecting RS-232C Cable to Module

- Connect an RS-232C cable to the RS-232C terminal for communicating with a PC or server via RS-232C.
- Remove the cover from the RS-232C terminal and connect an RS-232C cable to it.



Compatible Cables

- The 9637 RS-232C CABLE (1.8 m) for PC/AT compatible PC
- When using a commercially available cable, use one with the following wiring configuration:



Specifications Chapter 4

4.1 Basic Specifications

Operation	Enables communications between a PC and the measurement modules when positioned between both. Also relays communications between wireless modules (2351 only).
External Communications Interface	SS wireless* (SMA connector for connecting antenna × 2, transmission speed of 51.9 kbps for diversity reception, 2351 only) RS-232C (D-sub 9-pin, used for setting parameters, transmission speed of 57.6 kbps)
Internal Communications Interface	CAN (Connecting communications modules to measurement modules, transmission speed of 500 kbps)

*** Frequency Assignments**

1.Frequency Band

The 2351 has 48 individual frequencies between 2426 MHz and 2473 MHz with 1 MHz separation in each frequency. One band consists of 24 frequencies in the 48 frequencies for select/ operate. See the table below for the exact frequency assignments.

2. Frequency Allocation

24 Frequency are assigned each frequency band (01,and 02) with 1 MHz separation. If 1 MHz adjacent frequency separation is utilized in a same area, the possibility of adjacent channel interference exists because the difference of reception signal level between the desired signal and undesired leakage from the adjacent channel.

Therefore, more than 2 MHz separation operation is recommended.

Frequency Table

Freq. No.	Freq. (MHz)	
	01 Band	02 Band*
0	2426	2450
1	2427	2451
2	2428	2452
3	2429	2453
4	2430	2454
5	2431	2455
6	2432	2456
7	2433	2457
8	2434	2458
9	2435	2459
10	2436	2460
11	2437	2461
12	2438	2462
13	2439	2463
14	2440	2464
15	2441	2465
16	2442	2466
17	2443	2467
18	2444	2468
19	2445	2469
20	2446	2470
21	2447	2471
22	2448	2472
23	2449	2473

*Both France and Spain are band limited, please use 02 Band for operation.

4.2 Function Specifications

Clock Function	RTC is built in (year, month, day, hour, minute, and second). Corrects the internal clock of each measurement module at irregular intervals.
Alarm Clear	Clears alarm output of a measurement module, controlled by key operation or communications.
Number of Modules to Connect	• External communications: up to 89 units (Assign a COM ID to each communications module.) • Internal communications: up to 63 units (Assign a MODULE ID to each measurement module.)

4.3 General Specifications

Clock Accuracy	±30 ppm (Reference value at temperature from 0 to 50°C (32 to 122°F))
Backup	Clock (uses a lithium battery) ♦Battery life: approx. 5 years (Reference value at temperature 25°C (77°F)
Rated Supply Voltage	5 V±0.3 VDC
Maximum Rated Power	1.4 W
Dimensions	Approx. 22.5W × 96H × 85D mm (0.89"W × 3.78"H × 3.35"D) (excluding projections)
Mass	2351: Approx. 150 g (5.3 oz.) 2352-20: Approx. 125 g (4.4 oz.)
Accessory	Instruction manual 1

Options	9760 ANTENNA (With antenna base)* 9760-01 ANTENNA (Weatherproof with antenna base)* 9760-02 ANTENNA (Pencil-sharped with L-angle)* 9761 ANTENNA CABLE (1 m)* 9761-01 ANTENNA CABLE (2 m)* 9761-02 ANTENNA CABLE (5 m)* 9637 RS-232C CABLE (1.8 m) *For 2351 only
Operational Ranges for Temperature and Humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Temperature and Humidity Ranges for Storage	-10 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Location for Use	Max. 2000 m (6562-ft.) height, indoors
Standards Applying	Safety*1 : EN61010-1:2001 Pollution Degree 2 EMC*1 : EN61326:1997+A1:1998+A2:2001 CLASS A R&TTE*1: EN300 440-2 V1.1.1:2001 (Registration No.: E812974O-CC) FCC*2 : Part 15.247 (FCC IDENTIFIER: AZP-FRH-SD07TU) IC*2 : RSS210 (IC IDENTIFIER: 5829A-235121) *1: For 2351-20 only *2: For 2351-21 only

Maintenance and Service Chapter 5

5.1 Cleaning

To clean the instrument, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.

5.2 Service

⚠CAUTION Never modify the instrument. Only Hioki service engineers should disassemble or repair the instrument. Failure to observe these precautions may result in fire, electric shock, or injury.

- If the instrument seems to be malfunctioning, confirm that the cables are not open circuited before contacting your dealer or Hioki representative.

- When sending the instrument for repair, pack carefully to prevent damage in transit. Include cushioning material so the instrument cannot move within the package. Be sure to include details of the problem. Hioki cannot be responsible for damage that occurs during shipment.

- When transporting the 2351, 2352-20 or a system containing this module, tape the front of the module or take similar measures to avoid losing internal components.

- The instrument contains a built-in backup lithium battery, which offers a service life of about five years. If the date and time deviate substantially when the instrument is switched on, it is the time to replace that battery. Contact your dealer or Hioki representative.

5.3 Disposal of Module

This module uses a lithium battery for system backup.

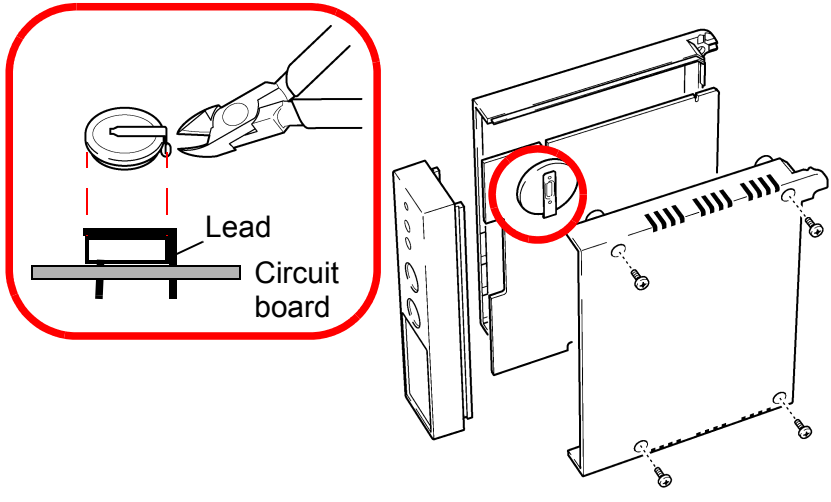
⚠WARNING

- To avoid electrocution, turn off the power switch of the POWER MODULE and disconnect the power cord and communication cables before removing the lithium battery.
- To avoid the possibility of explosion, do not short circuit, disassemble or incinerate battery.

⚠CAUTION

When disposing of this instrument, remove the lithium battery and dispose of battery and instrument in accordance with local regulations.

1. Remove the four screws securing the bottom case.
2. Use nippers to cut the two leads of the button-shaped lithium battery. The battery is located in a corner of the circuit board.



HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name: HIOKI E.E. CORPORATION

Manufacturer's Address: 81 Koizumi, Ueda, Nagano 386-1192, Japan

Product Name: AIR MODULE

Model Number: 2351-20

Options:
9637 RS-232C CABLE
9760 ANTENNA
9760-01 ANTENNA
9760-02 ANTENNA
9761 ANTENNA CABLE
9761-01 ANTENNA CABLE
9761-02 ANTENNA CABLE

The above mentioned products conform to the following product specifications:

Safety:	EN61010-1:2001
EMC:	EN61326:1997+A1:1998+A2:2001 Class A equipment Equipment intended for use in industrial location
R&TTE:	EN300 440-2 V1.1.1:2001

Supplementary Information:

The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC, the EMC Directive 89/336/EEC, and the R&TTE Directive 1999/5/EC.

HIOKI E.E. CORPORATION

18 March 2005

T. Yoshiike

Tatsuyoshi Yoshiike

President

2351A999-01

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name: HIOKI E.E. CORPORATION

Manufacturer's Address: 81 Koizumi, Ueda, Nagano 386-1192, Japan

Product Name: WIRE MODULE

Model Number: 2352-20

Option: 9637 RS-232C CABLE

The above mentioned products comform to the following product specifications:

Safety: EN61010-1:2001

EMC: EN61326:1997+A1:1998+A2:2001
Class A equipment
Equipment intended for use in industrial location

Supplementary Information:

The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

HIOKI E.E. CORPORATION

16 July 2004

Yuji Hioki

President

2352A999-00

HIOKI 2351-20/21 AIR MODULE,
2352-20 WIRE MODULE
Instruction Manual

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Edited and published by HIOKI E.E. CORPORATION
Technical Support Section

All inquiries to International Sales and Marketing Department
81 Koizumi, Ueda, Nagano, 386-1192, Japan
TEL: +81-268-28-0562 / FAX: +81-268-28-0568
E-mail: os-com@hioki.co.jp
URL http://www.hioki.co.jp/

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HIOKI

HIOKI E. E. CORPORATION

HEAD OFFICE
81 Koizumi, Ueda, Nagano 386-1192, Japan
TEL +81-268-28-0562 / FAX +81-268-28-0568
E-mail: os-com@hioki.co.jp
URL http://www.hioki.co.jp/

HIOKI USA CORPORATION
6 Corporate Drive, Cranbury, NJ 08512, USA
TEL +1-609-409-9109 / FAX +1-609-409-9108

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