HIOKI

INSTRUCTION MANUAL

2391-01
2391-02
2391-03

MODULE BASE

HIOKI E. E. CORPORATION

Contents

Introduction

Thank you for purchasing the HIOKI “Model 2391-01, 2391-02, 2391-03 MODULE BASE”. To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

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

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 location of reference information.

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.

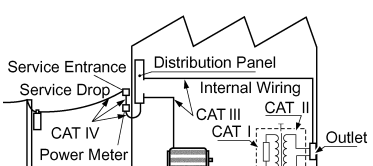
CAT IV The circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection instrument (distribution panel).

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

Do not allow the instrument to get wet.

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, and do not take measurements with wet hands.
The instrument may be damaged.

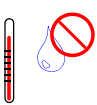
Corrosive or combustible gases

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

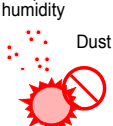
Electromagnetic radiation or highly electrically charged object

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.



Temperature or humidity



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.

⚠CAUTION

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

Be especially careful to avoid physical shock from dropping.

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 short-circuiting.
- 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.
- Do not use any available terminal for relaying or any other purpose as electric shock, errors, or malfunction may result.

⚠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.

⚠CAUTION

- 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.
- When the power and signal lines may be subject to a lightning-induced surge, install a lightning arrester between another instrument or module connected to this module and line to protect the system.
- 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 the first time, verify that it operates normally to ensure that the no damage occurred during storage or shipping. If you find any damage, contact your dealer or Hioki representative.

Overview Chapter 1

1.1 Product Overview

- The 2391-01, 2391-02, 2391-03 MODULE BASE is a module base of Hioki "Smart Site" (remote measurement system).
- It houses the communications module, measurement module, and power supply module.
- The module base has module-to-module communications and power supply functions.

Number of Connectable Modules

Model	2361, 2362 Power Module	2351, 2352 Communications Module	2301 to 2305, 2331 Measurement Module
2391-01*1	1 instrument	1 instrument	0 instrument
2391-02	1 instrument	1 instrument	5 instruments*2
2391-03	1 instrument	1 instrument	10 instruments*3

*1: Module base for relay and host modules. This module base can supply power to the 2371 FA SERVER from its terminal.
*2: For the 2331 POWER MODULE, one or two instruments can be connected.
*3: For the 2331 POWER MODULE, one or five instruments can be connected.

(Conceptual image)

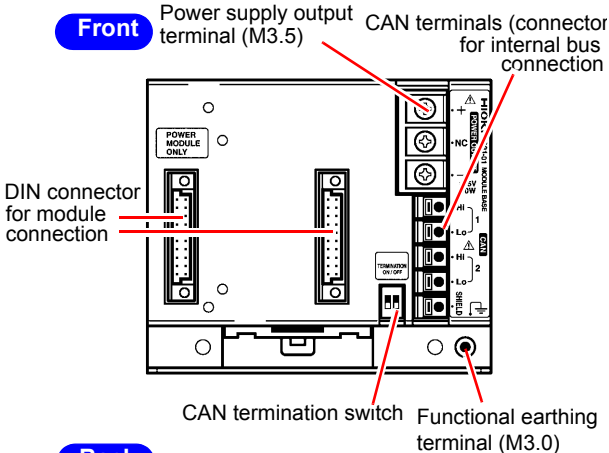
1.2 Major Features

- The module base has a function to supply power to the 2371 FA SERVER (2391-01 only).

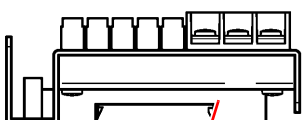
- The internal buses can be connected using the CAN terminals and up to 63 measurement modules can be connected to one communications module. Please note that each module base must have a power supply module (all models 2391-01 to 2391-03).

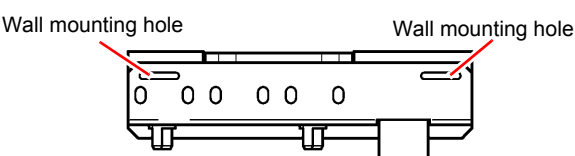
1.3 Name and Function of the Parts

Front



Back



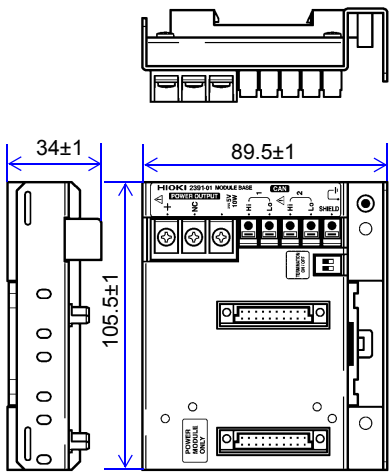


The figure shows the 2391-01.

Power supply output terminal	Supplies power to the 2371 FA SERVER.
CAN terminals (connector for Internal bus connection)	Used to extend the internal bus. Connect terminal 1 to the module base near the communications module (upstream); connect terminal 2 to the module base far from the communications module (downstream). Use the communications cable for the CAN bus (CAN cable). Also be sure to connect the shielded wire.
CAN termination switch (TERMINATION ON/OFF)	Usually leave this switch ON. When using a CAN terminal, turn off the switch of the number corresponding to the terminal used to turn it off.
Functional earthing terminal	This is a functional earthing terminal. Be sure to ground this terminal.
DIN connector for module connection	These connectors are used to mount the power supply, communications, and measurement modules on the module base. The leftmost slot is used exclusively for the power supply module.
Connector for DIN rail fixing	This connector is used for mounting the module base on a DIN rail (35 mm wide).
Wall mounting hole	Used to mount the module base on a wall.

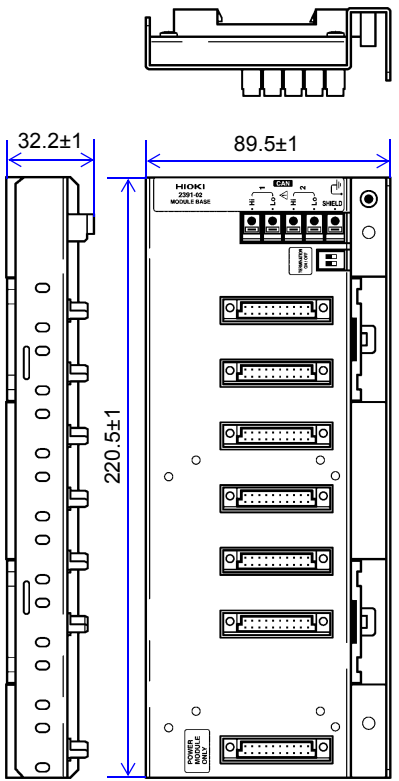
1.4 Dimension Diagrams

2391-01



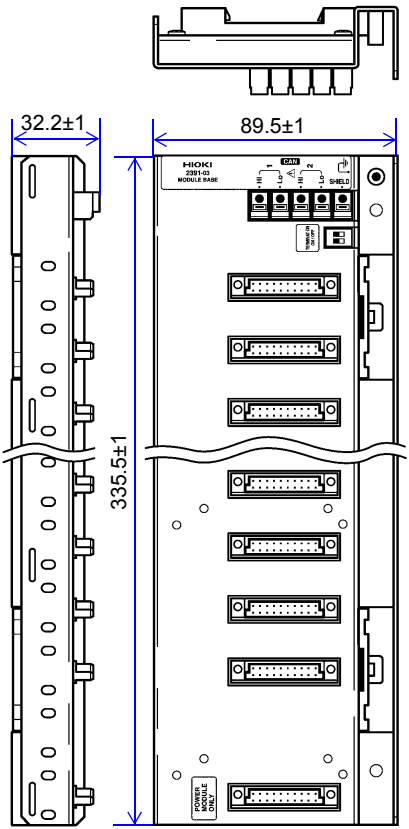
(Unit: mm)

2391-02



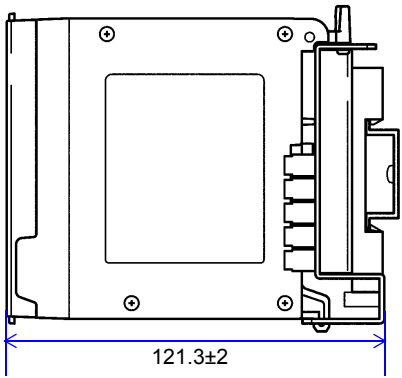
(Unit: mm)

2391-03

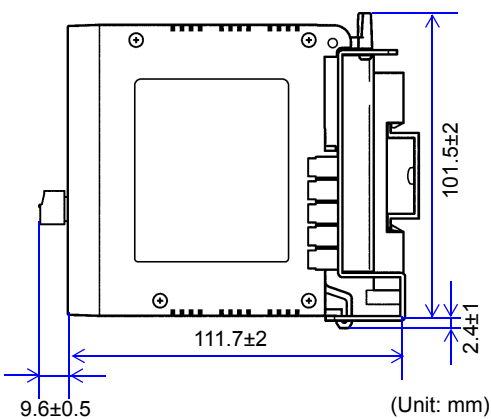


(Unit: mm)

2331, 2361, 2362



2301 to 2305



(Unit: mm)

Preparations Chapter 2

2.1 Installing the Module

2.1.1 Installing the Module Base

⚠CAUTION

- Do not mount the module base on the ceiling where it may fall off.
- The module base shall be fastened using the proper means. If the module base slides right and left due to tolerances of the DIN rail dimensions, modules may fall off, wires may be short-circuited, or circuits broken.

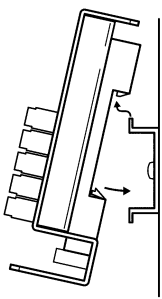
Fasten the module base securely using either method below.

Mounting the Module Base on a DIN Rail

Use the DIN rail mount connector on the rear of the base to mount the module base on a DIN rail (35 mm wide).

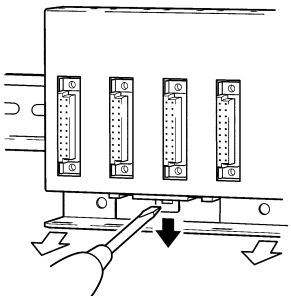
The side of the module base with square holes is the bottom.

Hang the top hook of the DIN rail mount connector on the DIN rail, then push down the bottom of the server.



Removing the Module Base

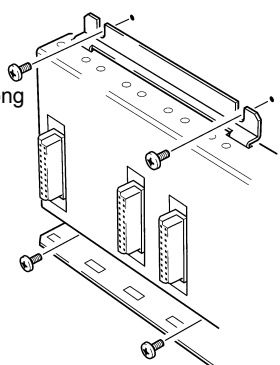
Remove the module base from the DIN rail, while using a flat blade screwdriver to push down the orange lever at the bottom of the connector.
Use the module base for screwdriver leverage.

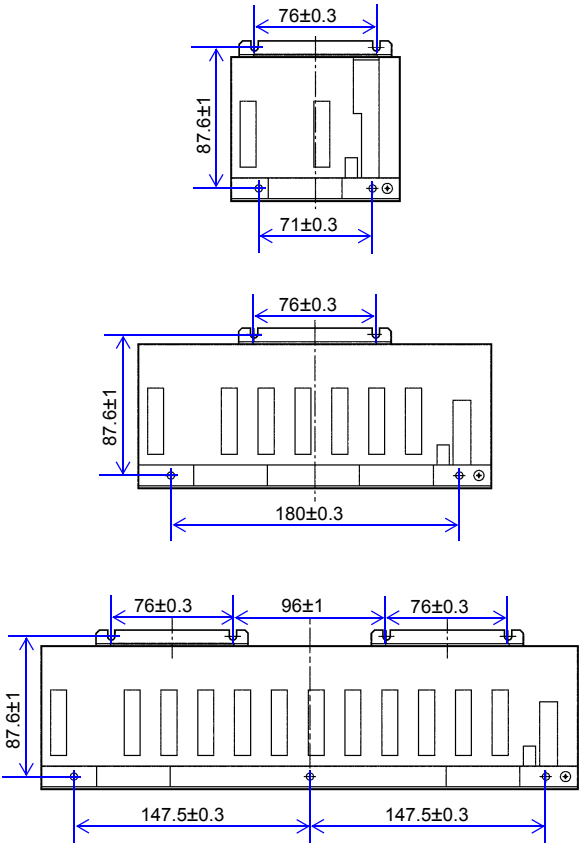


Mounting the Module Base on a Wall

Mount the module base on a wall by using the wall mounting holes.
Ensure that the wall is sufficiently strong. Insert and tighten the screws where shown below.

M4.0 at least 6 mm long



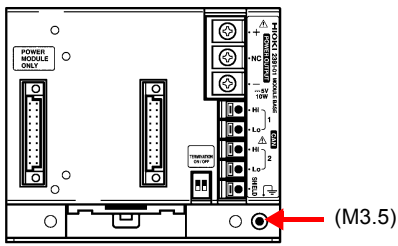


Positions of Wall Mounting Holes (Unit: mm)

2.1.2 Connecting the Functional Earthing Terminal

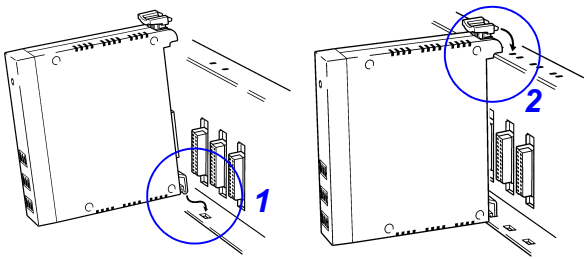
Ground the functional earthing terminal.
We recommend that you use a cable with a conductor cross section of 0.75 mm^2 or more and a round solderless terminal (tightening torque: 0.5 Nom).

Example:
RAV1.25-3



2.1.3 Mounting a Module on the Module Base

Connect a module to the connector of the module base as shown below. Ensure that the levers make a clicking sound.



2.2 Connecting Power Supply Output Cord (2391-01 only)

⚠WARNING

- Before turning the instrument on, make sure the supply voltage matches that indicated on the its power connector. Connection to an improper supply voltage may damage the instrument and present an electrical hazard.
- Ensure that module base power is OFF when connecting the power supply output cable. If the switch is ON when connecting the power cable, sparks may be generated and ignite a battery, organic solvent, or any other nearby volatile substance.

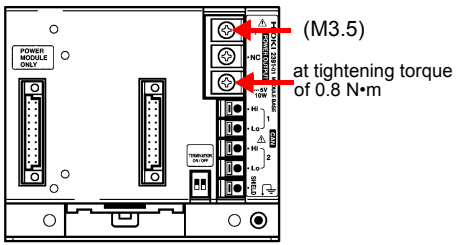
⚠CAUTION

- Be careful to avoid connecting voltage improperly, as the internal circuitry may be destroyed.
- Ensure that the cable is not live when connecting it. This will prevent short-circuiting.

NOTE A cable more than 3 meters long may be affected by external noise or the electromagnetic environment, and instruments may malfunction due to a drop in supply voltage.

To supply power (5 VDC, 13W) to the 2371 FA SERVER, use the power supply output cable to connect the power supply output terminal to the 2371 FA SERVER.

❖ 1.3 Name and Function of the Parts

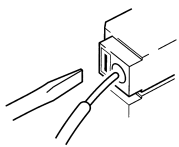


For the power supply output cable, use a cable with a conductor cross section of 0.75 mm^2 (AWG18) or more and length of up to 1 meter.

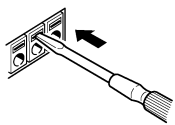
Example:

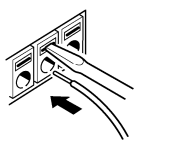
UL1007 AWG18/AWG16 (equivalent to 0.75 mm^2/ 1.25 mm^2) or equivalent
300V vinyl-cabtire cable
VCTF 2-core, 1.0 mm^2 or more
The cable length shall not exceed 1 meter.

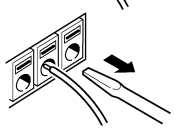
2.3 Connecting the CAN Cable



You can extend the internal bus by connecting a CAN cable to the CAN terminal.





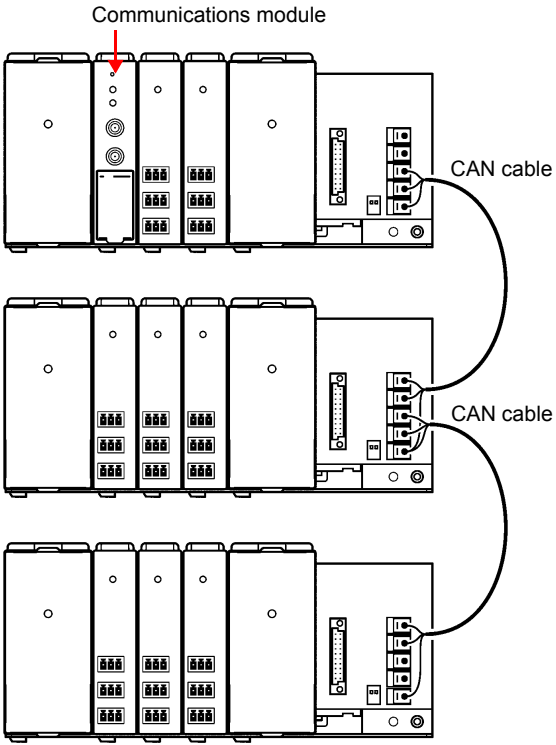


1. Use a flat blade screwdriver or similar tool to hold down the button of the terminal.
2. While holding down the button, insert a lead into the lead connection hole.
3. Release the button to lock the lead in place.
4. Turn OFF the termination switch of the number corresponding to the CAN terminal used to turn it off.

Use a cable compliant with ISO 11898 as the CAN cable.

NOTE

- The cable length shall not exceed 100 meters.
- Connect terminal 1 to the module base near the communications module (upstream); connect terminal 2 to the module base far from the communications module (downstream).
- Be sure to connect the shielded wire.



Connect Hi to Hi and Lo to Lo of the module bases.

Specifications Chapter 3

3.1 Basic Specifications

Basic Functions	Sends signals and supply power to remote measurement system modules connected thereto via the built-in internal bus (CAN bus). Also supplies power to the FA server (2391-01 only).

2391-01

Number of Module Connection Connectors	3 connectors (All connectors are used for a power supply module and communications module.)
Interface	• Connector for internal bus extension 5 terminals × 1 Hi1 : No. 1 Lo1 : No. 2 Hi2 : No. 3 Lo2 : No. 4 Shield : No. 5 • Power supply terminal for FA server 3 terminals × 1 VCC : No. 1 GND : No. 2 FG : No. 3

2391-02

Number of Module Connection Connectors	8 connectors (3 connectors are used for a power supply module and communications module.)
Interface	Connector for internal bus extension 5 terminals × 1 Hi1 : No. 1 Lo1 : No. 2 Hi2 : No. 3 Lo2 : No. 4 Shield : No. 5

2391-03

Number of Module Connection Connectors	13 connectors (3 connectors are used for a power supply module and communications module.)
Interface	Connector for internal bus extension 5 terminals × 1 Hi1 : No. 1 Lo1 : No. 2 Hi2 : No. 3 Lo2 : No. 4 Shield : No. 5

3.2 Function Specifications

Internal Bus Termination	Terminates the internal bus with a termination switch.

3.3 General Specifications

Rated Supply Voltage	5 VDC
Maximum Supplying Power	15 W
Withstand Voltage	0.5 kVAC (Between frame GND and internal bus) Response current 5 mA
Dimensions	2391-01: Approx. 105.5W × 89.5H × 26.5D mm (4.15"W × 3.52"H × 1.04"D) 2391-02: Approx. 220.5W × 89.5H × 26.5D mm (8.68"W × 3.52"H × 1.04"D) 2391-03: Approx. 335.5W × 89.5H × 26.5D mm (13.21"W× 3.52"H × 1.04"D) (excluding projections)
Mass	2391-01: Approx. 165 g (5.8 oz.) 2391-02: Approx. 315 g (11.1 oz.) 2391-03: Approx. 460 g (16.2 oz.)
Accessories	Instruction manual
Operating Temperature and Humidity	0 to 50°C (32 to 122°F), 80%RH or less (non-condensating)
Storage Temperature and Humidity	-10 to 50°C (14 to 122°F), 80%RH or less (non-condensating)
Operating Environment	Indoors, altitude up to 2000 m (6562-ft.)
Applicable Standards	Safety EN61010-1:2001 Pollution degree II EMC EN61326:1997+A1:1998+A2:2001 CLASS A

Maintenance and Service Chapter 4

4.1 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.

4.2 Servicing

⚠WARNING 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 2391-01, 2391-02, 2391-03 or a system containing this module, tape the front of the module or take similar measures to avoid losing internal components.

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name: HIOKI E.E. CORPORATION

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

Product Name: MODULE BASE

Model Number: 2391-01, 2391-02, 2391-03
2392-01, 2392-02

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 product herewith complies 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

2391A999-00