HIOKI

Smart Site

REMOTE MEASUREMENT SYSTEM 2300

Data Logger

Remote Measurement and Monitoring for the Networking Age

The HIOKI Remote Measurement and Monitoring System 2300 provides remote monitoring and automatic measurement over the internet or intranets. Central monitoring systems for buildings, plants, annexed facilities and offices can be easily constructed to reduce labor costs for monitoring and measuring, increase the efficiency of maintenance tasks, and in applications that require foreknowledge and prevention of faults, as well as system preservation. In addition to being easier to operate, the easier and instant initial system construction and maintenance of the Remote Measurement System 2300 Series present great cost-reduction opportunities when compared to equipment previously available for remote control, centralized monitoring and energy monitoring.

Flexible Modular System Configuration
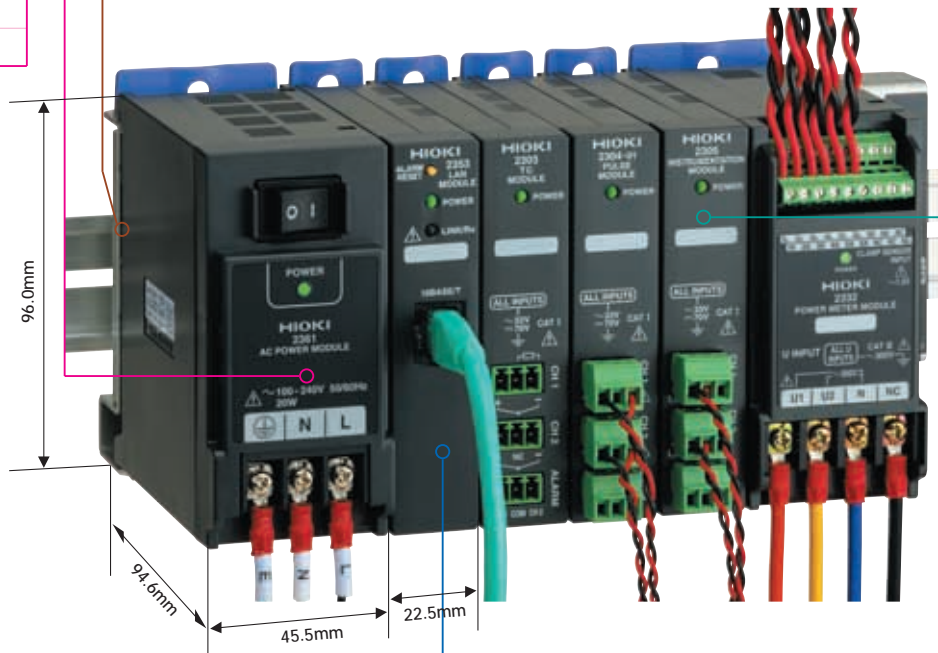
Power modules

DC POWER MODULE 2362-20

AC POWER MODULE 2361-20

INPUT 19V to 36V DC

INPUT 100V to 240V AC

POWER CORD 9239

Module bases

MODULE BASE 2392-02

MODULE BASE 2392-01

MODULE BASE 2391-03

MODULE BASE 2391-02

Used in combination

MODULE BASE 2391-01

96.0mm

94.6mm

45.5mm

22.5mm

Various communication modules

LAN MODULE 2353-20

10BASE-T interface

Modbus/TCP Compatible

LAN CABLE 9642

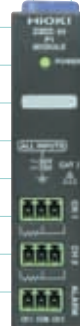(for Model 2353-20) Consists of a UTP straight-through cable and crossover adapter set
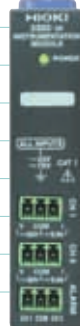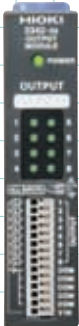
WIRE MODULE 2352-20

AIR MODULE 2351-20 *1

• Spread spectrum 2.4 GHz wireless type, excellent in noise immunity and high in reliability
• License is not required, and an external antenna must be installed.
• Communication distance: up to 300 m outdoors or 60m indoors
• HIOKI's proprietary multi-step relay method

RS-232C interface

Built-in SS 2.4GHz wireless device

RS-232C CABLE 9637

For connecting a PC to the 2352-20 Wire Module, and for setting up the 2351-20 Air Module

ANTENNA 9760
ANTENNA 9760-01
(All-weather type)
Cable length: 90cm

ANTENNA 9760-02
(Pencil type)

ANTENNA 9760-03
Planar Antenna (Single reception)

ANTENNA 9760-04
Planar Antenna (Diversity reception)
Cable length: 1m

ANTENNA CABLE
9761   1m
9761-01   2m
9761-02   5m

*1 Because standards and measurement conditions differ from country to country, please inquire with your local distributor or HIOKI for further details when purchasing.
-20 for EU area, Korea
-21 for USA, Canada

Measurement and Power Modules to Meet Your Needs

HUMIDITY MODULE 2301-20	Pt MODULE 2302-20	TC MODULE 2303-20	PULSE MODULE 2304-21	INSTRUMEN-TATION MODULE 2305-20	MULTI-FUNCTION MODULE 2306-20	INPUT MODULE (Di) 2341-20	OUTPUT MODULE (Do) 2342-20	RS LINK MODULE 2343-20

Built with Dedicated Sensors
Temperature 1ch
Humidity 1ch

Pt100 input 2ch

K,E,J,T,R input 2ch

Voltage and contact pulse input
(Current pulse input type also available. 2304-20)

DC voltage and current input 2ch

K,E,J,T,R and Pt100/JPt100 input DC voltage and current input 8ch

Logic signal (contact / voltage) input 8ch

Open collector output 8ch

Used in data collection and control of devices equipped with an RS-232C interface (such as certain HIOKI instruments or PLCs). For a list of compatible HIOKI instruments, please inquire with your local distributor or HIOKI.

HUMIDITY SENSOR 9764-50
Cable length: 3m

CLAMP ON SENSOR 9766 *
For 2304-20

Options for Power Modules

WAVEFORM MODULE 2321-20

LOGIC PROBE 9320-01
4-channel type, for voltage/contact signal ON/OFF detection

LOGIC PROBE 9321-01 (for power line)
4 isolated channels, ON/OFF detection of AC/DC voltage

Acquires Waveform Data
Analog 2ch
Logic 2ch

VOLTAGE CORD 9019-02
(Red/black. Cable length: 3 m)
VOLTAGE CORD 9019-03
(Red/black/yellow. Cable length: 3 m)
VOLTAGE CORD 9019-04
(Red/black/yellow/blue. Cable length: 3 m)
(Models 9019-02, -03 and -04 are for provisional measurements)

CLAMP ON SENSOR 9695-02
Rating: 50 A
CLAMP ON SENSOR 9695-03
Rating: 100 A
CLAMP SENSOR CABLE 9661-01
Rating: 500 A
Custom order clamps for up to 1000 or 5000A also available

9695-02/-03

9661-01

CLAMP SENSOR CABLE 9238
For 9695-02/-03. Cable length: 3 m
CLAMP ON SENSOR 9765 *
Rating: 5 A, Dedicated for secondary side of CT

* Not CE mark compliant.

POWER METER MODULE 2331-20

POWER METER MODULE 2332-20

Up to 260V of phase on 1φ2W, 1φ3W, and 3φ3W, 3φ4W circuits

Multi-channel power recording
1φ2W: 6 circuitries or 1φ3W,3φ3W: 3 circuitries
Up to 260V of phase on 1φ2W, 1φ3W, and 3φ3W circuits

Professional Windows Software

SMART SITE UTILITY PRO 9768

Use this Windows application program to configure initial communications routing and settings, to verify communications status and to configure measurement settings. Also use it to monitor measurement values, to start and stop data recording, data collection and display of the acquired data lists and graphs, and to generate reports.

▲ Viewer screen

Smart Site Utility Pro software 9768 includes an electronic version of the complete Instruction Manual that combines the documentation for the 2300-series modules and the 2300 Operating Manual. A printed version of this instruction manual is sold separately.
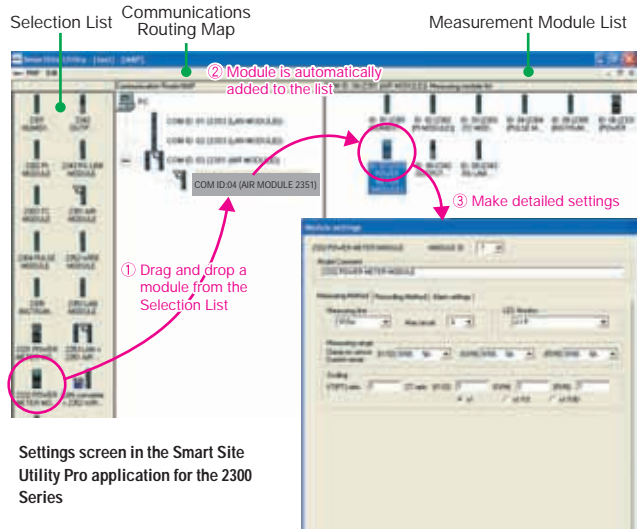
▲ Monitor screen

Features of the Remote Measurement and Monitoring System 2300

Simple setup

Initial setup of all the measurement and communication modules is performed by the Smart Site Utility Pro application.

To configure the modules, simply select those you want to add from the selection list with your mouse, and drop them into the appropriate trunks or branches.

When communication module settings have been completed, the measurement modules can be recognized from the PC, simplifying further setting procedures.

- Reduce costs and save time by bypassing complicated instrument setting procedures compared with competing systems such as PLC.
- Because of the simple operations, maintenance can be conducted without the need for any special training, and system expansion and relocation can be performed smoothly.
- Save on maintenance expenses by avoiding the need to call for outside contractors.

Selection List   Communications Routing Map   Measurement Module List

② Module is automatically added to the list

COM ID:04 (AIR MODULE 2351)

③ Make detailed settings

① Drag and drop a module from the Selection List

Settings screen in the Smart Site Utility Pro application for the 2300 Series

Eliminate data loss caused by PC or communication circuit failure

Each module functions as a data logger, with time stamps and individual data storage at specified intervals in its own internal memory, thereby unaffected by faults on the PC or communications circuit.

When the fault is corrected (by rebooting the PC or recovery of the communications circuit), data stored in the modules is automatically transferred to the PC.

Data synchronization is maintained by the 2300's internal clock (with periodic time calibration function)

Systems employed by competitors, such as the polling (sequential data acquisition) method from above (PLC or PC), cannot maintain synchronization. Such synchronization is particularly important in power measurements.

The communication module manages the internal clocks of the slave measurement modules to maintain synchronization with its master internal real-time clock. Meanwhile, the communication module synchronizes itself with the PC's clock when certain conditions are satisfied in the software.* (*Partial data loss can occur due to time correction.)

The correct setting of the PC clock can be maintained by linking to a network time server (Windows function) on the internet or an intranet, or to a radio-controlled clock.

Smart Site Utility Pro.

PC Clock

Data

Time-stamped data is automatically backed up

Link to correct clock

Catering to a wide variety of communication methods
Internet
Mobile Network
Broadband, WiFi

Internal Clock

Data Memory

Backed up data is transferred and saved

Periodic time calibration

Data Memory

Internal Clock

Site N   Site N+1

Optimum solution for control over the Internet, mobile or wireless broadband network

Communications with remote locations via public circuits (Internet, mobile or WLAN, etc.) are subject to interruptions. However, public circuits are economical, and services with fixed running costs have become widespread, with demand increasing.

A core concept in the development of the 2300 Series was to provide a communication system that would remain reliable even between remote sites using public circuits. Its specifications called for non-real-time data transfers, with the data to be stored in the memory of the instrument installed at the worksite and used as a data logger, and retrieved daily, weekly or whenever the application requires.
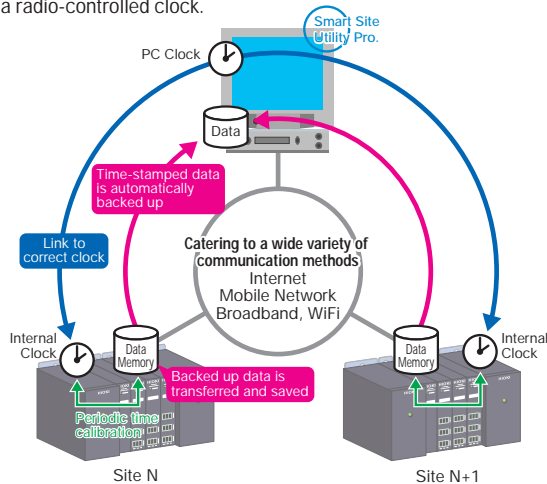
Although one can easily imagine systems in which the worksite instrument package consists of a control PC and PLC or other remote I/O signaling in order to provide such data logger functionality, this is unsuitable for most applications because of the uncertainties of the PC environment and long-term instability. The 2300 Series can take care of all of these problems.

Send an E-mail Alarm to Your Mobile Phone

The e-mail function of the LAN Module 2353-20 can send warning state notifications by e-mail through a mail server on the network (LAN or other communication circuits).

Warning e-mails can be sent to multiple pre-designated addresses, and even include customized messages to alert you of the nature of the alarm.

Catering to a wide variety of communication methods
Internet
Mobile Network
Broadband, WiFi

Mail Server

Warning Event

Warning E-Mail

Site N   Site N+1
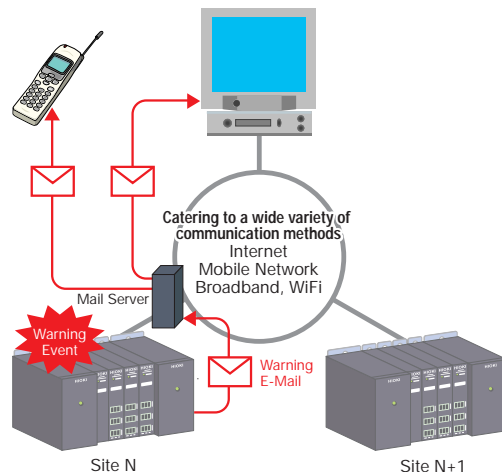
Extensible Local Bus

Data transfer between the communications and measurement modules is provided over a CAN Bus. Up to 63 measurement modules can be connected to each communication module by drop wiring of shielded conductor pairs.

HIOKI offers a maximum CAN Bus transfer rate is 500 kbps, while competitive local bus rates are considerably slower (typically 9.6 kbps), so the monitored value refresh rate and data acquisition speed are significantly faster.

Maximum CAN Bus wiring length is 100 meters for 500 kbps transfers.

Up to 63 measurement modules can be connected to each communication module.
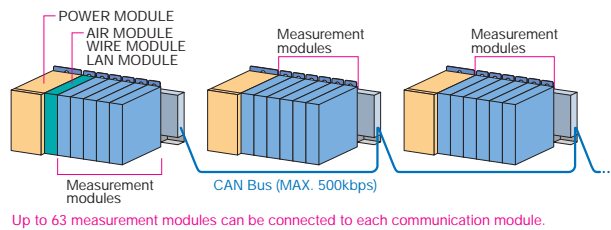
How Data is Saved

The sampling rate is once per second, and you can choose to record and store the instantaneous value captured at every set interval (see available intervals below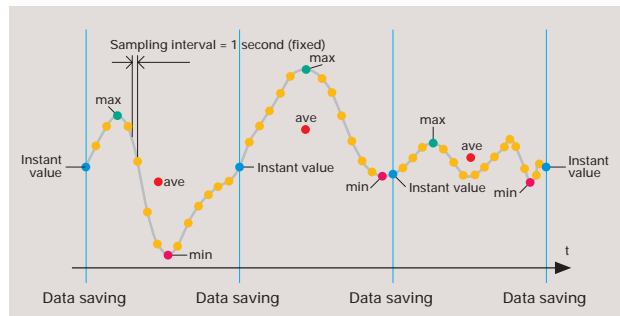), and/or the maximum, minimum and average RMS values within that interval, in the measurement module's internal memory. In addition, the interval at which to sample can be set for each measurement module can be set individually.

Large Internal Memory

During continuous long-term measurement and monitoring, the maximum time span of measurement data that can be stored within each module is shown in the table below. When the internal memory becomes full during measurement, the oldest data is overwritten by newly acquired data.

Note Recording intervals are limited by the following conditions:

- **The number of measurement modules**
- **The type of communication module**
- **The number of relays and RF environment for wireless communication**
- **The communication speed when using a public communication network**

Measurement storage capacity per module model, and maximum recordable time span (with endless recording[*3] enabled)

A: instantaneous value, B: max/min/avg, C: instantaneous + max/min/avg

Modules	Modules 2301 through 2305			Module 2306			Module 2321[*7]			Module 2331			Module 2332		
Recording mode[*4]	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Quantity of data stored	26000	13000	10000	49140	18900	14430	5300	2000	1500	10000	4400	3400	4433	1774	1365
Recording interval[*2]	Modules 2301 through 2305 Max. stored time span[*1]			Module 2306 Max. stored time span[*1]			Module 2321 Max. stored time span[*1]			Module 2331 (1P3W or 3P3W) Max. stored time span[*1,5]			Module 2332 (1P3W or 3P3W, 3-cct) Max. stored time span[*1,6]		
1 s	7.5 h	3.5 h	2.5 h	13 h	5 h	4 h	80 min	30 min	25 min	2.5 h	1 h	30 min	1 h	20 min	20 min
2 s	14.5 h	7 h	5.5 h	1 d	10.5 h	8 h	2.5 h	1 h	50 min	5.5 h	2 h	1.5 h	2 h	50 min	40 min
5 s	1.5 d	18 h	14.5 h	2.5 d	1 d	20 h	7 h	2.5 h	2 h	14.5 h	6 h	4.5 h	6 h	2 h	1.5 h
10 s	3 d	1.5 d	1 d	5.5 d	2 d	1.5 d	14.5 h	5.5 h	4 h	1 d	12 h	9.5 h	12 h	4.5 h	3.5 h
15 s	4.5 d	2 d	1.5 d	8.5 d	3 d	2.5 d	22 h	8.5 h	6.5 h	1.5 d	18 h	14 h	18 h	7 h	5.5 h
20 s	6 d	3 d	2 d	11 d	4 d	3 d	1 d	11 h	8.5 h	2 d	1 d	19 h	1 d	9.5 h	7.5 h
30 s	9 d	4.5 d	3.5 d	17 d	6 d	5 d	1.5 d	17 h	13 h	3.5 d	1.5 d	1 d	1.5 d	14.5 h	11 h
1 min	18 d	9 d	7 d	34 d	13 d	10 d	3.5 d	1 d	1 d	7 d	3 d	2 d	3 d	1 d	22.5 h
2 min	36 d	18 d	14 d	68 d	26 d	20 d	7 d	2.5 d	2 d	14 d	6 d	4.5 d	6 d	2 d	1.5 d
5 min	92 d	46 d	36 d	171 d	66 d	50 d	18 d	7 d	5 d	36 d	15 d	11 d	15 d	6 d	4.5 d
10 min	184 d	92 d	73 d	341 d	131 d	100 d	37 d	14 d	11 d	73 d	30 d	23 d	30.5 d	12 d	9 d
15 min	277 d	138 d	110 d	512 d	197 d	150 d	55 d	21 d	16 d	110 d	46 d	35 d	46 d	18 d	14 d
20 min	369 d	184 d	147 d	683 d	263 d	200 d	74 d	28 d	22 d	147 d	61 d	47 d	62 d	24.5 d	18.5 d
30 min	554 d	277 d	221 d	1024 d	394 d	301 d	111 d	43 d	33 d	221 d	92 d	71 d	92 d	37 d	28 d
60 min	1109 d	554 d	443 d	2048 d	788 d	601 d	222 d	85 d	65 d	443 d	184 d	143 d	185 d	74 d	57 d

[*1] When alarm recording is enabled, recording capacity is reduced according to the number of alarm events.
[*2] Sampling is performed once per second.
[*3] When set to stop when memory is full, the storable time span is longer than shown.
[*4] Modules 2304 and 2304-01 record instantaneous values only.
[*5] Module 2331, when measuring single-phase 3-wire or three-phase 3-wire. When measuring single-phase 2-wire, the storable time span is longer than shown. When measuring three-phase 4-wire, the storable time span is shorter than shown.
[*6] Module 2332, when measuring single-phase 3-wire or three-phase 3-wire, three circuits. Maximum storage time span depends on the type of measurement circuit.
[*7] Data recorded by interval recording with Waveform Module 2321 consists of instantaneous, maximum, minimum and average values and logic data sampled from waveform peak, trough, average and rms values once per second.

Waveform Module 2321 Features

Trend Recording to Manage Tendencies

Monitor continuously with gapless calculation. The following values are calculated from waveform data each second during interval recording (one second is the shortest recording interval).
Maximum, minimum, average, rms, peak-to-peak and peak values, and crest factor (peak/rms)
Trends in waveform data from a measurement object are normally tracked by monitored values or trend graphs.

Enhanced Trigger Functions Acquire the Desired Waveforms

Acquire waveforms at the specified sampling speed (up to 400 kS/s) when trigger criteria are met. Acquired waveforms can be up to 32 kWords long. Enhanced trigger functions make capturing waveform anomalies easy.
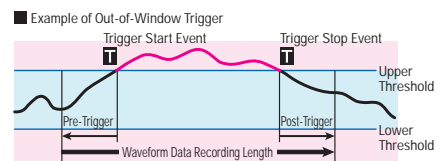
Windows Application Program Displays Waveforms

View waveform data and instrument setting information using our Smart Site Utility Pro 9768 Windows program.
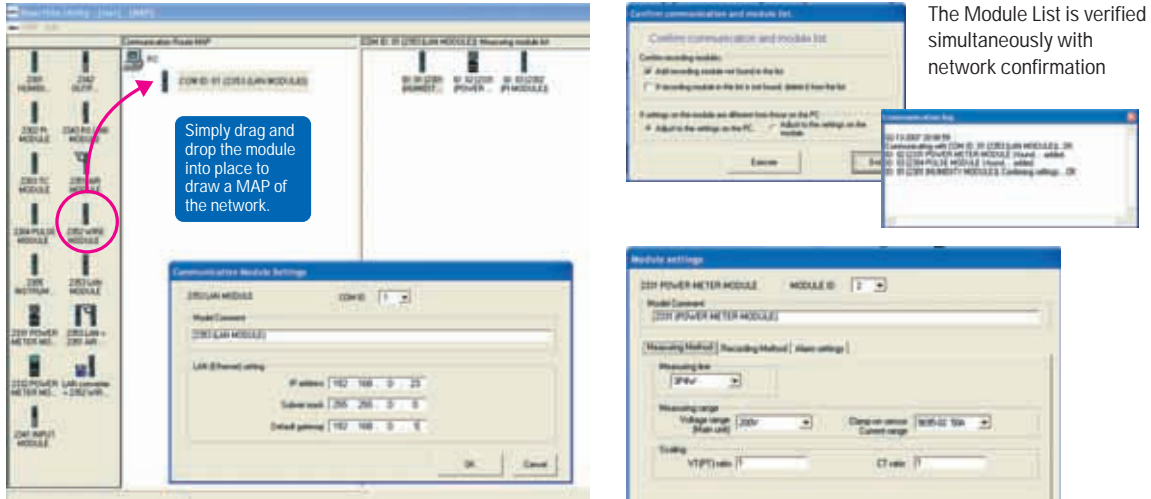
Reliable Support for Mission-Critical System Construction

Smart Site Utility Pro

### 1 Set up the Remote Measurement 2300 Series with Ease

Before starting measurement, use Smart Site Utility Pro to set up the communication route, check for a reliable network, and configure modules.

Simply drag and drop the module into place to draw a MAP of the network.

The Module List is verified simultaneously with network confirmation

Communication route settings can be made simply using the map editor

Configure module settings

2 Monitor and Retrieve Data in Real-Time

Three monitor sizes are available and digital data can be displayed simultaneously.
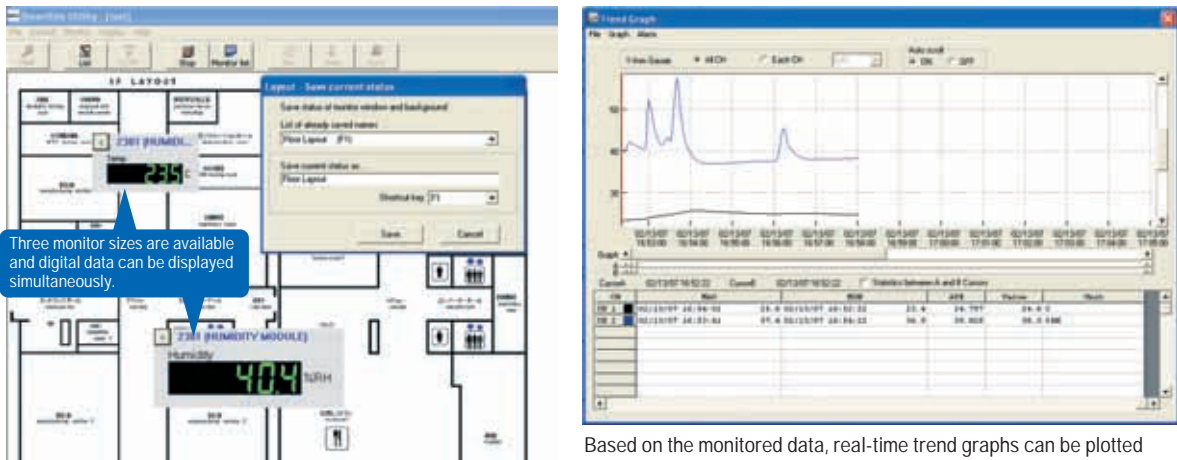
A simple monitoring screen can be created by merely superimposing a background image representing the measurement site. You can import images in bmp, gif or jpeg format.

Based on the monitored data, real-time trend graphs can be plotted and displayed.

3 Collect Data Periodically Using Simple Settings
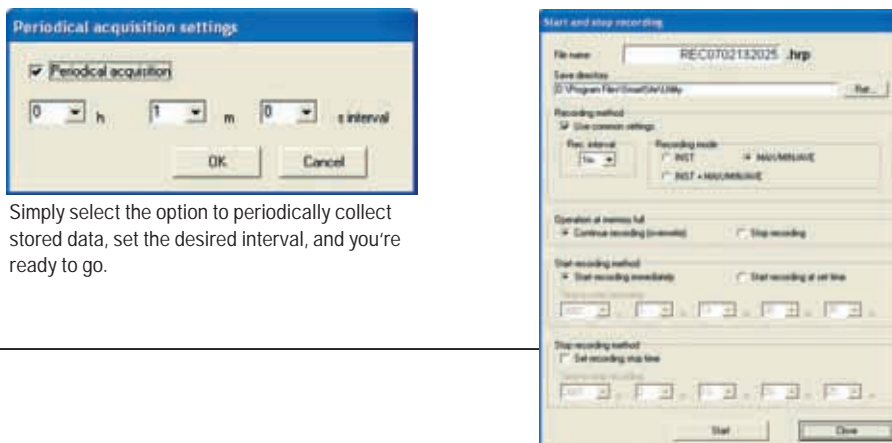
Simply select the option to periodically collect stored data, set the desired interval, and you're ready to go.

Different recording intervals and recording modes for each module can also be set independently.

4 Smart Site Viewer offers high-speed data processing and strong graphic display capabilities
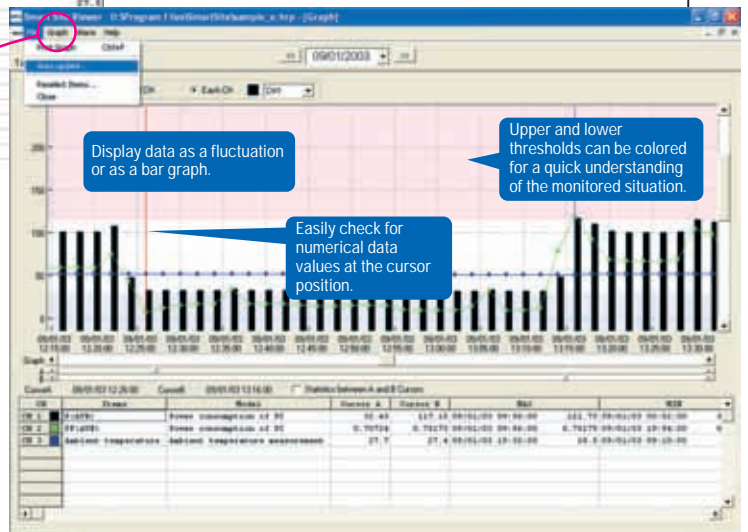

Paste data to Excel or output as CSV files.

Maximum values appear in blue, and minimum values appear in red.

With the Smart Site Viewer, you can quickly display measurement data and also convert measured results into CSV format data.
Simply select the data you want to display from the acquired measurement results.

Multiple viewers can be opened simultaneously, each set up according to your application and viewing needs. Mix and match display conditions to create your own customized graph of the measurement results.

Update graphs periodically according to your desired refresh rate.

Display data as a fluctuation or as a bar graph.

Upper and lower thresholds can be colored for a quick understanding of the monitored situation.

Easily check for numerical data values at the cursor position.

5 Automatically Generate Daily and Monthly Reports

Versatile daily and monthly reports can be automatically created by linking Smart Site Viewer with Excel.

Reports are automatically output from the measurement data onto your favorite templates.

Measurement Data

Template

Automatically generated daily report

Application Examples

Here are some of the many ways the HIOKI 2300 Series is being used.

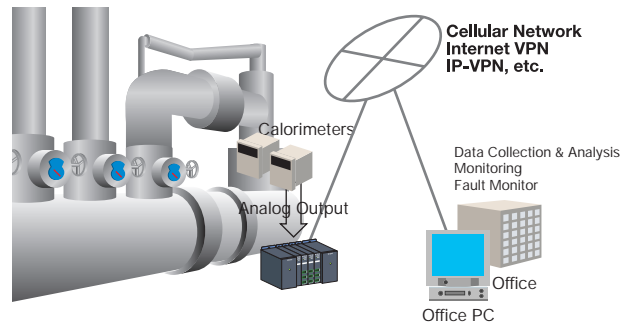## Remote monitoring control systems for small and mid-size buildings

Small and mid-size buildings are remotely managed using IP-VPN.

Remote Monitoring Center

Cellular Network

IP-VPN

LAN

LAN

Small Buildings

Mid-Size Buildings
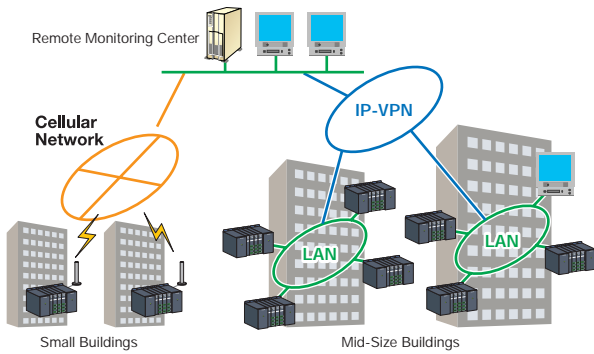
Remote Monitoring of Heating Calorimeters

Calorie pulses from calorimeters and temperature signals are applied to the 2300 Series and monitored from a control room in another building or at a remote office.
The stored data facilitates timely maintenance.

Cellular Network
Internet VPN
IP-VPN, etc.

Calorimeters

Analog Output

Data Collection & Analysis
Monitoring
Fault Monitor

Office

Office PC

Energy consumption survey (ESCO diagnostic and survey tool)

The HIOKI 2300 Series serves as a tool for surveying energy consumption in buildings and factories. The internal memory of the measurement modules enables their use as loggers, and using a mobile phone, trends are captured right in the office so that reports are generated and action plans formulated smoothly.

Mobile Phone Network

Data Collection & Analysis
Monitoring

Office PC

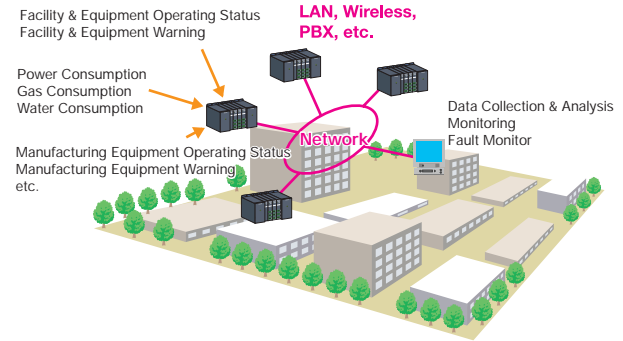The 2300 Series as a
Portable Logging System

Office and Factory Central Monitoring System

Besides measuring energy consumption within a factory, the 2300 Series monitors facilities annexed to the factory such as receiving and transformer equipment, as well as air-conditioning equipment.
In environments where a LAN cannot be used, installation costs can still be minimized by using wireless devices or PBX lines.
The 2300 Series is also used to monitor operating status and quality control in manufacturing plants.

Facility & Equipment Operating Status
Facility & Equipment Warning

LAN, Wireless,
PBX, etc.

Power Consumption
Gas Consumption
Water Consumption

Data Collection & Analysis
Monitoring
Fault Monitor

Manufacturing Equipment Operating Status
Manufacturing Equipment Warning
etc.

Network

Multi-channel Leakage Current Monitoring Systems

Multi-channel leakage current monitoring is performed by combining the Power Module 2332-20 and a CT (zero-phase current transformer).
Also, contact point output from an existing leakage warning panel is received by the Input Module 2341-20, so that overall local leakage current monitoring can be managed by one system.

Leakage
Warning Panel

Contact
Point
Outputs

Zero-Phase CT

Monitoring
Fault Monitor

OR

2341   2332   2353

LAN

Office PC
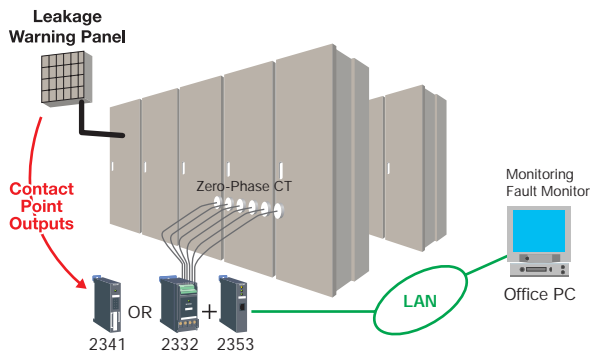
Monitoring the Temperature and Current Monitoring in Data Centers and Server Farms

The HIOKI 2300 Series serves to protect and maintain mission-critical equipment such as servers and other information processing equipment, broadcasting and disaster prevention equipment that could cause serious losses if unexpectedly damaged.
Equipment current consumption and temperature data are used for server management. The 2300 Series can also be reconstructed for 1U rack mounting.
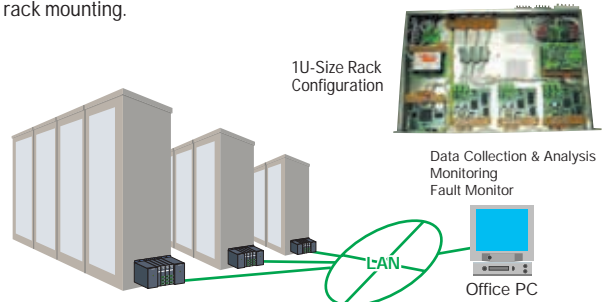
1U-Size Rack
Configuration

Data Collection & Analysis
Monitoring
Fault Monitor

LAN

Office PC

Temperature and Humidity Monitoring Systems for Storage and Clean Rooms

The 2300 Series is used for monitoring temperature- and humidity-controlled storage and clean rooms, and is commonly paired with the Temperature and Humidity Sensor 9764-50 that boasts a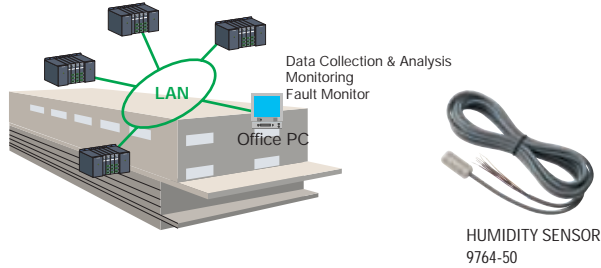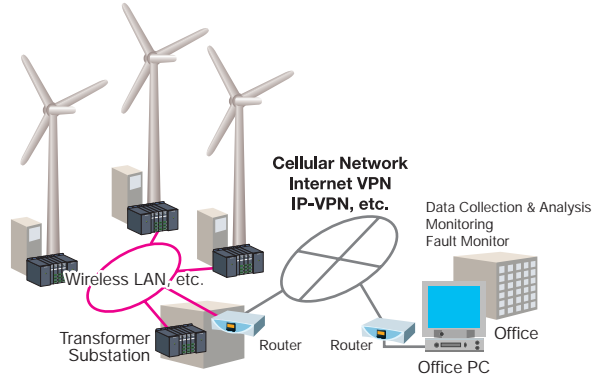n extended operating life. Another attractive feature is the system's usefulness for meeting ISO 9002 requirements for calibration and for generating calibration documentation.

LAN

Data Collection & Analysis
Monitoring
Fault Monitor

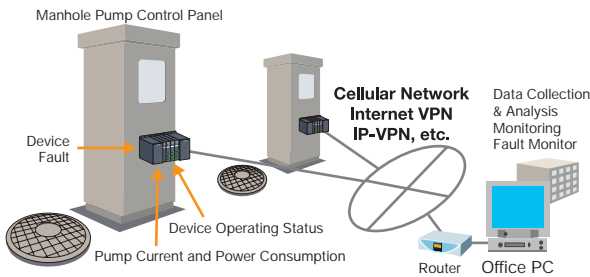Office PC

HUMIDITY SENSOR
9764-50

Remote Monitoring of Wind Power Generators and Plant equipment

The operating status and power generated at multiple wind power sites are monitored to spot anomalies from a remote office. Open ISDN and ADSL are used to communicate with the remote sites using secure protocols (Internet VPN or IP-VPN) for remote monitoring.

Cellular Network
Internet VPN
IP-VPN, etc.

Data Collection & Analysis
Monitoring
Fault Monitor

Wireless LAN, etc.

Transformer
Substation

Router   Router

Office

Office PC

Remote Monitoring of Manhole Pumps

The HIOKI 2300 Series has been used remotely to monitor the operating status of manhole pumps for device faults, efficiency, fault prevention and preventative maintenance by creating a database for analog data such as pump current and power consumption.
Secure communication channels are implemented using IP - VPN or mobile network services.

Manhole Pump Control Panel

Cellular Network
Internet VPN
IP-VPN, etc.

Data Collection
& Analysis
Monitoring
Fault Monitor

Device
Fault

Device Operating Status

Pump Current and Power Consumption
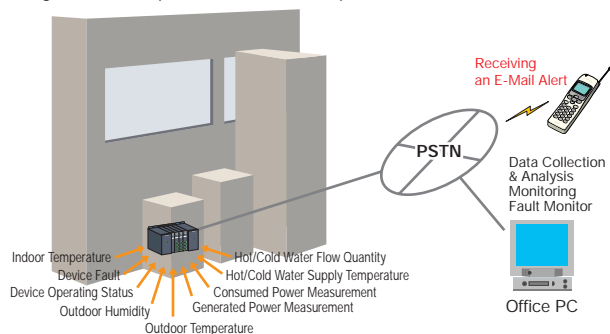
Router   Office PC

Single-point Management of Theme Parks and Outdoor Facilities

Take advantage of the 2300 Series' flexible customizability to monitor equipment operating status and energy consumption at theme parks and outdoor facilities typically made up of numerous functional buildings spread around the site.
In addition to using the existing LAN, existing PBX phone lines and wiring can be used for communication to minimize network construction costs.

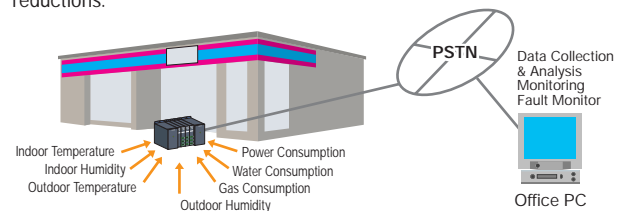Network   LAN, Wireless,
PBX, etc.
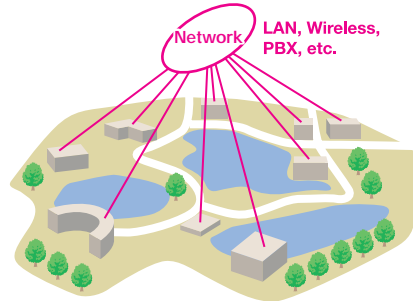
Remote Data Collection and Monitoring of Co-generation and Fuel Cells

The HIOKI 2300 Series has been applied in the development of new energy technologies to monitor the operating status, capability evaluation and anomalies of the load-side equipment. As well as serving to maintain efficiency, the saved analog data provides feedback to the design and development teams for fault prevention and maintenance.

Receiving
an E-Mail Alert

PSTN

Data Collection
& Analysis
Monitoring
Fault Monitor

Indoor Temperature
Device Fault
Device Operating Status
Outdoor Humidity
Outdoor Temperature
Hot/Cold Water Flow Quantity
Hot/Cold Water Supply Temperature
Consumed Power Measurement
Generated Power Measurement

Office PC

Measuring the Energy Consumption at Convenience Stores

To measure the details of energy consumption, input from each breaker on the distribution panel and flow meter (gas and water) is applied to a Power Module set up in the HIOKI 2300 Series. In addition, indoor and outdoor temperature and humidity, internal display case temperatures and outdoor insulation values are measured to analyze external influences on energy consumption.
Analyze the collected data to facilitate energy conservation and cost reductions.

PSTN

Data Collection
& Analysis
Monitoring
Fault Monitor

Indoor Temperature
Indoor Humidity
Outdoor Temperature
Power Consumption
Water Consumption
Gas Consumption
Outdoor Humidity

Office PC

System Configration
Features
Smart Site Utility Pro
Application Examples
Remote Communication Examples
PC Application Software
Specifications

Examples of remote communication using HIOKI Smart Site Series 2300

Communication method **1** **Using IPSec VPN over GPRS**

- When installing in the locations where internet is not available
- When use is only temporary
- When unauthorized access prevention is necessary
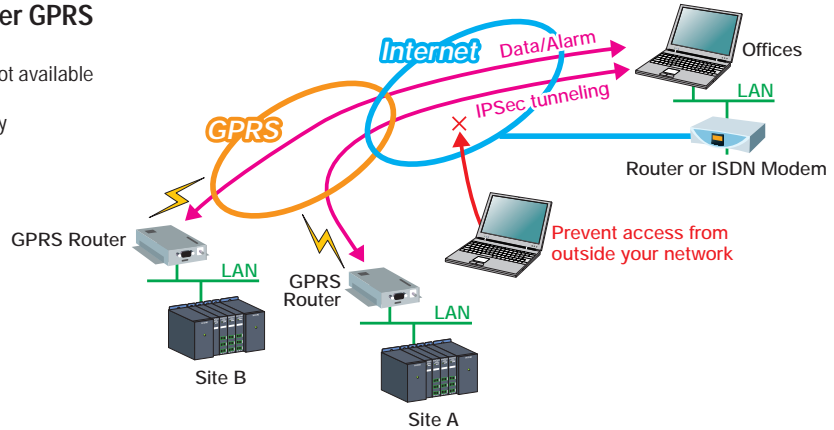
Required configuration for communication:
1. **Offices**
   IPSec configurable Router or ISDN modem :1
2. **Remote site**
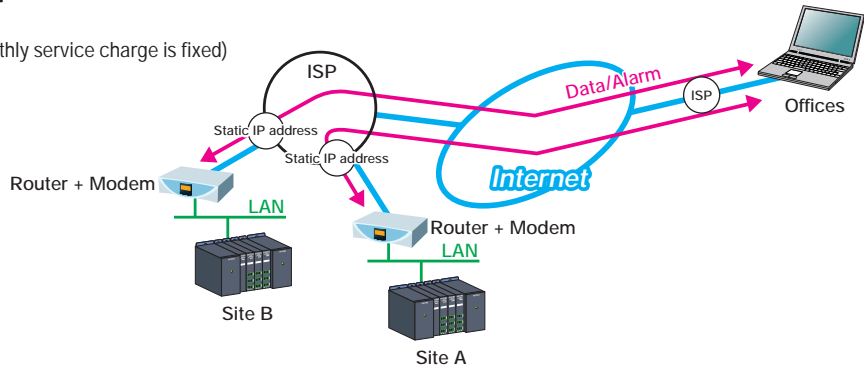   IPSec configurable GPRS router   : Per Site

Communication method **2** **Using the Internet**

- When constant connection is needed (and monthly service charge is fixed)

Required configuration for communication:
1. **Offices**
   Ordinal internet connection :1
2. **Remote sites**
   Ordinal internet connection
   + Static IP address   :Per Site

Communication method **3** **Using internet VPN**

- When constant connection is necessary (when monthly service charge is fixed)
- When unauthorized access prevention is necessary
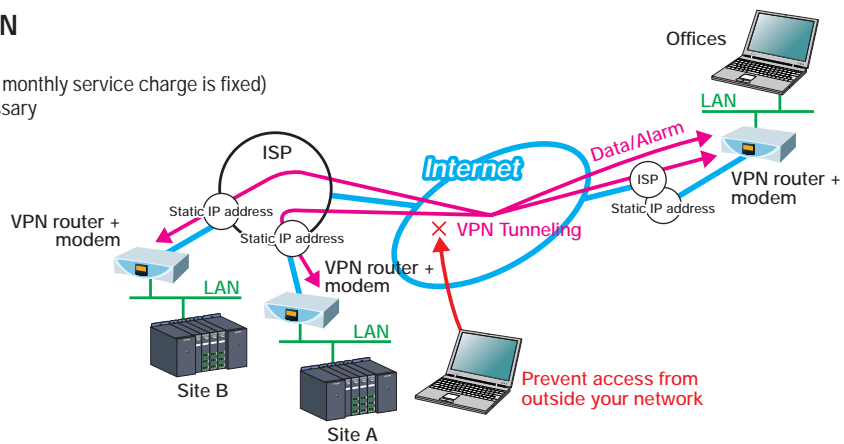
Required configuration for communication:
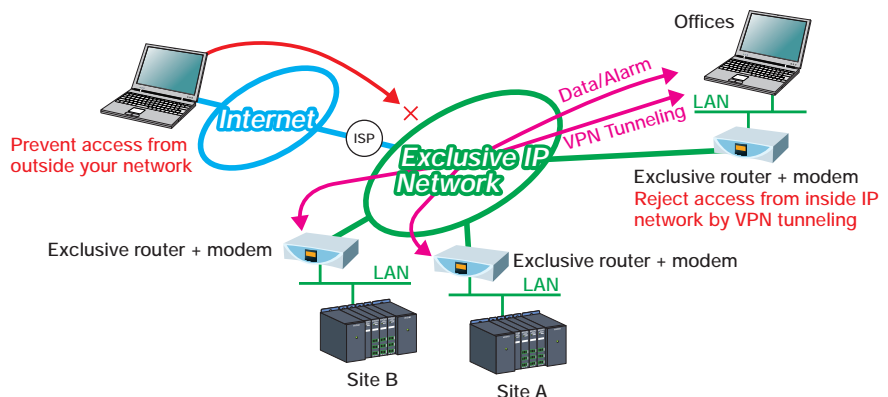1. **Offices**
   Ordinal internet connection
   + VPN router   :1
2. **Remote site**
   Ordinal internet connection
   + VPN router
   + Static IP address   :Per Site

Communication method **4** **Using IP-VPN**

- When constant connection is needed (when monthly service charge is fixed)
- More sophisticated method is required for unauthorized access prevention

Communication Methods within company grounds

In addition to existing wired networks, wireless communication can be used to connect neighboring sites. Typical communication methods available are described below.

Communication Methods 1 — Using an Existing LAN

- To use an existing LAN, specify an IP address for the LAN Module 2353-20.
- Installation costs are minimized by using existing infrastructure.
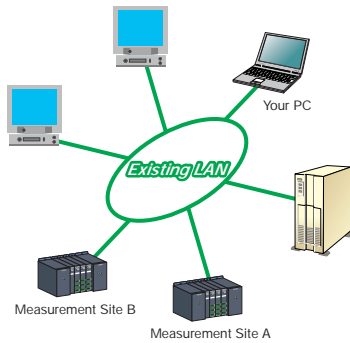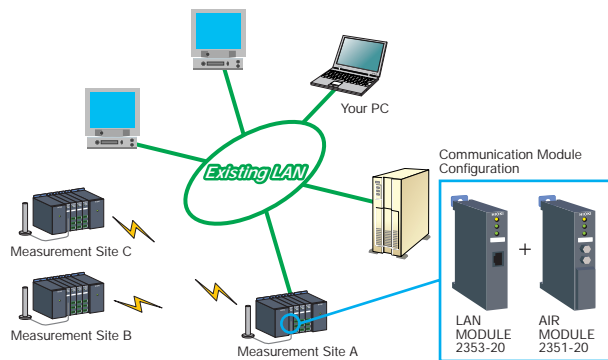

Communication Methods 2 — Wireless LAN

- Compatible with commonly available WiFi (802.11b/a/g) wireless LANs.
- Installation costs can be minimized by employing wireless connections to sites that cannot otherwise be connected to a LAN.
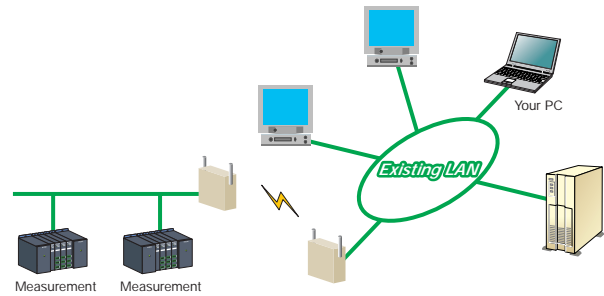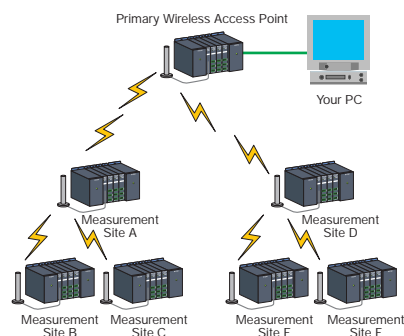

Communication Methods 3 — Construct Wireless Connections Using Industrial Wireless Devices

- Wireless connections can be made to a wired LAN using the LAN Module 2353-20 and the Air Module 2351-20 connected to the wired LAN.
- The Air Module 2351-20 utilizes an ex-standard wireless protocol, ensuring excellent security. Because it is inaccessible to WiFi systems, unauthorized access is difficult.

Communication Methods 4 — Constructing a Wireless Network

- Use the Air Module 2351-20 to construct a wireless network.
- With an optional antenna, the network radius is about 60 meters indoors and 200 to 300 meters outdoors, with even greater distances achievable using higher gain antennas.
- Relay stations can be employed to reliably extend wireless communication networking integrity - up to seven relay levels.
- Security is assured by using a non-standard wireless protocol. Because it is inaccessible to WiFi systems, unauthorized access is difficult.

Communication Methods 5 — Constructing a New LAN

- If an existing LAN is not available for use, one can be constructed.
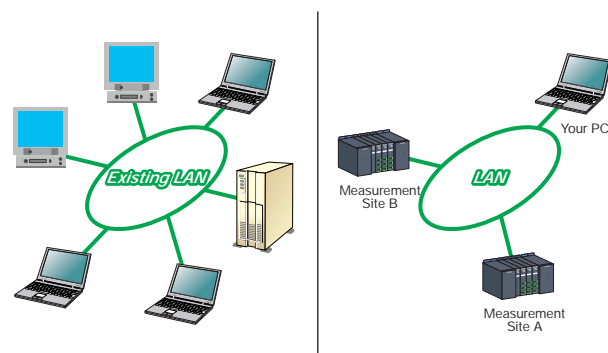
Communication Methods 6 — Using an Existing PBX

- If a LAN is not available, a communication system can be constructed using an existing PBX.
- Construction costs are minimized by utilizing existing communication lines.
- PBX usage has been declining with the introduction of internal mobile and IP telephones, so unused telephone lines can be effectively re-utilized.
- Installing VDSL modems between the exchange equipment and the ends of the phone lines enables system applications using TCP/IP.

System Configuration

Features

Smart Site Utility Pro

Application Examples

Remote Communication Examples

PC Application Software
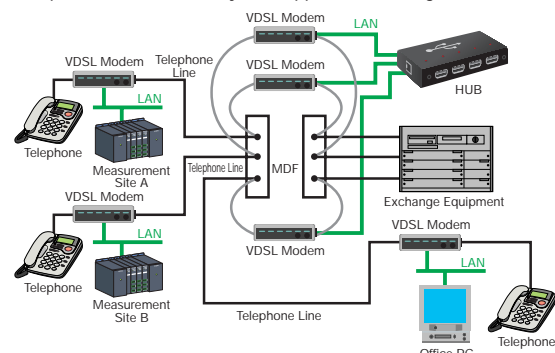
Specifications

PC Application Software

Systems can be constructed to customer specifications using various software applications offered by third-party developers.

TAKEBISHI — DeviceXPlorer

Supplier : TAKEBISHI CORPORATION
URL http://www.faweb.net/us/

OPC (OLE for Process Control) is an open interface standard established by the OPC Foundation in the USA for communications between cooperating software applications.

When using OPC, FA devices such as PLCs and various client applications such as SCADA software can be easily interconnected, so that client applications constructed beforehand with an OPC-compliant interface can be used without modification even when different FA devices are used with each system.

The DeviceXPlorer OPC Server communicates with field devices such as the 2300 Smart Site, serving as communications middleware to receive and transmit data to any other applications through the OPC interface.

Therefore, you can construct an application with an OPC-compliant interface that is independent of 2300 Smart Site specifications, and can be used with the DeviceXPlorer OPC Server to control other-brand PLCs, making hybrid systems with such sequencers easy to construct.

Major Functions and Features

★ **Complete compatibility with the 2300 Smart Site**
  Modbus memory addresses are provided beforehand for the various 2300 Smart Site modules, so systems can be constructed without concern for Modbus memory addressing.
★ **Distributed computing**
  Clients such as OPC servers and SCADA clients can be controlled by separate PCs, enabling flexible support of systems configured with completely separate monitoring and communications nodes, and large-scale systems that require distributed processing.
★ **Simultaneous access by multiple clients**
  While monitoring with SCADA, one OPC server can execute custom logic in VB or logging by data collection applications. The OPC server sorts and communicates registered tag information even while being accessed by multiple clients, so throughput is not degraded.
★ **OPCDA 3.0 Compatible**
  The latest OPCDA 3.0 standard published in 2003 is supported, ensuring trouble-free operation even when using the latest SCADA.
★ **Communication redundancy and simulation functions**
  When a fault occurs in the communications route, the redundancy function can switch to an alternate route, or the simulation function can allow client development to proceed even if no controller is installed.
★ **Ready for any SCADA**
  OPC interconnection testing conducted by the OPC Council of Japan has confirmed smooth connections compatibility with the main SCADA as above.
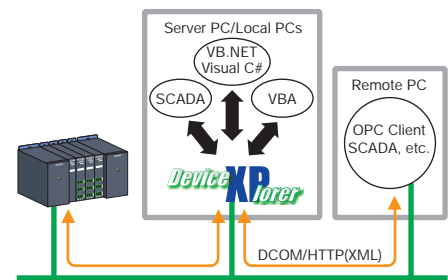
DeviceXPlorer OPC Server Software

Model Type	PLC System
MODBUS OPC Server	HIOKI 2300 Smart Site
MELSEC OPC Server	MELSEC-A/QnA/Q/FxN
SYSMAC OPC Server	SYSMAC-C/CV/CS1/CJ1
FA-M3 OPC Server	FA- M3
TOYOPUC OPC Server	PC2J/PC3J/PC3JG

SCADA Software Compatibility Examples

Vender	Product name
Rockwell Automation	RS View
Wonderware	InTouch, Industrial SQL Server
GE Fanuc Intellution	iFix, iHistorian
Siemens	WinCC, Protool/Pro
National Instruments	LAB View, Bridge View
CITECT	Citect5
Microsoft	Visual Basic, Visual C++, Visual C#, VB.NET, EXCEL(VBA)

System Configuration Example

Server PC/Local PCs
VB.NET Visual C#
SCADA — VBA
DeviceXPlorer

Remote PC
OPC Client SCADA, etc.

DCOM/HTTP(XML)

Digital / Pro-face

Human Machine Interface

Supplier : Digital Electronics Corporation
URL http://www.pro-face.com/

The 2300 Smart Site can be connected to the programmable display devices of Digital Corporation, which are widely used at manufacturing sites
Digital's GP-PRO/PBIII C-Package 03 screen generation and logic program software supports the 2300 Smart Site.
Of course, PC-less systems can be built, and systems that display data using the GP & GLC series and store data on a PC can be easily constructed.

Major Functions and Features

• Connects with the GP & GLC series using the Ethernet interface. Ask about supported models.
• One display device can display data from up to 16 LAN modules.
• Two display devices can be connected to each LAN module.
• Models equipped with a CF card slot can save recording data.
• Other-brand PLCs and the 2300 Smart Site can be combined in one system (with some connection limitations).

The following features compare the 2300 Smart Site with systems using PLC:
• Because the products are specialized for measurement, systems requiring no controls can be constructed cheaply.
• Modular measurement instrumentation allows temperature and power to be measured directly.
• Module and system settings can be easily performed with special-purpose software, reducing the complexity and cost of program development.
• Each module includes its own memory and internal clock, so even in the worst case of communication failure, no data is lost.

Pro-face Display Example

System Structure Example

Computer
Can be used together with Smart Site Utility Pro

Pro-face
Graphic Operator Interfaces GP Series
Graphic Logic Controller GLC Series
Each display device can show the data from up to 16 LAN modules

Smart Site
Remote Measurement and Moniteting System
Data from one LAN module can be displayed on two display devices.
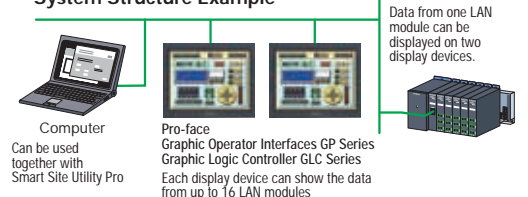
Smart Site Utility Pro Windows Program Specifications

Module and Options	SMART SITE UTILITY PRO 9768		
Features	Confirm initial settings and communication status for communications path and conditions. Monitor measurement values, start/stop data recording, acquire data, view acquired data in lists and graphs, create reports for standard software, and add options for more advanced functions.		
Major Functions	Smart Site Utility functions • Comm. Module settings • Meas. module settings • Create monitor screen	• Acquire and record data using PC • Monitor measurements • Alarm setting/mgmt.	Smart Site Viewer functions • Load, print and display recorded data in graphs • Create reports (Excel format)
Computer operating environment	PC	CPU: At least 1 GHz OS: Windows 2000/XP with .NET Framework 2.0, Internet Explorer 5.01 or later	
	Memory	At least 512 MB	
	Display Screen	1024 x 768 dots, at least 65,536 colors	
	Hard Disk	Free space: at least 30 MB (if .NET Framework 2.0 is not installed, an additional 500 MB is required). Additional space is required for saving recorded data.	
	Interface	COM port, LAN	
Options	SERVER/CLIENT OPTION 9768-01, LAN MODULE MAIL OPTION 9768-02, MODBUS SERVER OPTION 9768-03		

Module and Options	SERVER/CLIENT OPTION 9768-01	LAN MODULE MAIL OPTION 9768-02	MODBUS SERVER OPTION 9768-03
Features	Adds Server and Smart Site Client functions to Smart Site Utility Pro 9768.	Provides setting functions for sending e-mail from LAN Module 2353 to Smart Site Utility Pro 9768, to control e-mail sending and the network warning lamp for alarm events.	Adds Modbus server functions to Smart Site Utility 9768.
Major Functions	Optional Server function The following are added to Smart Site Utility Pro 9768: • The Server function provides measurement information to Smart Site Client (simultaneously monitors measurements from up to ten PCs) • A function to provide device usage information to Smart Site Client Smart Site Client functions • Measurement Monitor function (Measurements are acquired and displayed by communication with the installed Smart Site Utility Server option.) • Alarm function • Monitor screen creation function Smart Site Viewer functions • Print and view recorded data as graphs	The following setting functions are added to Smart Site Utility Pro 9768 for sending e-mail from LAN Module 2353. E-Mailing Functions • Register up to 20 e-mail destination addresses. • LAN Module 2353 can send e-mail notification when an alarm event occurs on a connected CAN Bus measurement module. • Supported protocols: SMTP, POP before SMTP • Test Mail sending function Network warning lamp control Notes: E-mail functions require a LAN Module 2353 with firmware version 2.35 or later. Compatible warning lamps are the Network Alert Lamp DN-1000 series from ISA Co., Ltd.	Modbus Server function Modbus/TCP communications enables acquisition of values from measurement modules for monitoring by other application programs.
Computer Operating Environment	Version 4.2 or later of the Smart Site Utility Pro 9768 application software, in addition to the basic operating requirements of Model 9768		

Module Specifications and Options

Module and Options	HUMIDITY MODULE 2301-20	Pt MODULE 2302-20	TC MODULE 2303-20
Special Characteristic	Utilizes a temperature and humidity sensor that features longterm reliability to measure temperature and relative humidity	Platinum temperature measurement resistance input (Pt100)	Thermo couple input (K, E, J, T)
Input Channel	1 channel each of temperature and humidity	2 temperature channels of Pt100 (3-wire method)	2 temperature channels of thermo couple input (K, E, J, T)
Specifications	Temperature: -40.0 to 85.0 °C (0.1 °C resolution) Humidity: 0.0 to 100.0%RH (0.1%RH resolution) (Displayable Range: -10.0 to 110.0%RH) Sensor Accuracy: Temperature -40.0 to -0.1 °C ±1.0 °C 0.0 to 35.0 °C ±0.5 °C 35.1 to 70.0 °C ±1.0 °C 70.1 to 85.0 °C ±2.0 °C Humidity 	Temperature: -100.0 to 300.0 °C (0.1 °C resolution) Main Unit Measurement Accuracy: ±0.1%rdg. ±0.4 °C	(see thermocouple tables below) (Incl. reference contact compensation. When connecting an external reference contact compensation sensor between center and right pin on Channel 1) Reference Contact Compensation Accuracy: ±2.0 °C (Reference Contact Compensation Range: 0 to 50 °C)

Thermocouple	K/E/J	T
Measurement Range	-100.0 to 1000.0 °C	-100.0 to 400.0 °C
Resolution	0.1 °C	
Measurement Accuracy	±0.1%f.s. ±2.0 °C	

Thermocouple	R
Measurement Range	0.0 to 1600.0 °C
Resolution	0.3 °C (0.0 to 100 °C) 0.2 °C (100 to 1000 °C) 0.1 °C (1000 to 1600 °C)
Measurement Accuracy	±6 °C (0.0 to 100 °C) ±4 °C (100 to 1000 °C) ±2 °C (1000 to 1600 °C)

Module and Options			PULSE MODULE 2304-20	PULSE MODULE 2304-21
Special Characteristic			Measures pulse and supports pulse output from power meters and flux gauges.	
Input Channel			1 channel each of: Clamp Type Current Pulse and Voltage/Contact (non-voltage) Pulse.(measure both channels simultaneously) (detects external attachment of Clamp On Sensor 9766)	Voltage/Contact (non-voltage) Pulse (2 channels)
Specifications	Measurable Parameters	Voltage Pulse Contact (non-voltage) Pulse:	4kHz max. Voltage Pulse: Counted when voltage level changes from L to H Contact (non-voltage) Pulse: Counted when changed from "Short" to "Open" between two terminals (Short: 500Ω or less, Open: 500kΩ or more)	
		Current Pulse	Detectable Current Range 10mAp-p to 20mAp-p Pulse Width: More than 12.5msec. Pulse Interval: More than 25msec. (40Hz max.) Rise/Fall Speed: Less than 0.8msec. (When using Clamp On Sensor 9766 in a less than AC50A/m magnetic field)	

			Filter: Effective on "Contact (non-voltage) Pulse" input (Can be set by commands)
			• For Mechanical Contact:
			  Pulse Width: More than 20msec.
			  Pulse Interval: More than 40msec. (Less than 25Hz Frequency) (No filter available on Current Pulse Input)	

			Measurement Accuracy: ±1dgt.	Measurement Accuracy: ±1dgt.
			Measurement Interval Accuracy: ±2msec. Display Range: Integrated value on each channel at each interval (16,000,000 max.)	

Module and Options	INSTRUMENTATION MODULE 2305-20
Special Characteristic	Compatible with 1 to 5V DC and 4 mA to 20 mA DC signals of user's own measuring systems, and inputs of up to ±50V DC, 100 mA DC.
Input Channel	2 channels of either voltage and current
Specifications	Measurement Range: Voltage: ±50mV / ±500mV / ±5V / ±50V Current: -2mA to 110mA (31/2-digit resolution: Measurement functions (incl. Range) settings have to be setbefore recording.) Measurement Accuracy: ±0.3%rdg. ±5dgt.

Module Specifications and Options

Module and Options		POWER METER MODULE 2331-20	POWER METER MODULE 2332-20
Special Characteristic		Clamp-on power meter for single-phase to three-phase 4-wire 100/200V AC installations. Demand measurementis possible.	Clamp-on power meter for multi-circuit power measurement common to 100/200V AC voltage installations
Input Channels		1φ2W, 1φ3W, 3φ3W and 3φ4W Number of measurable circuits :1 (at same voltage as the system)	Number of measurable circuits: 1φ2W: 6 circuits, or 1φ3W, 3φ3W: 3 circuits (at same voltage as the system)
Specifications	Measurement Lines	1 circuit of either 1φ2W/1φ3W/3φ3W/3φ4W	Up to 6 circuits of 1φ2W, or up to 3 circuits of 1φ3W/3φ3W
	Measurable Parameters	Voltage, Current, Effective Power, Power Factor, Integrated Effective Power, Frequency	Voltage, Current, Effective Power, Reactive Power, Power Factor, Integrated Effective Power, Frequency
	Voltage/Current Measurement	Measurement Range: • Voltage (U1/U2/U3): 100V/200V (70 to 130V AC / 140 to 260V AC, Can be changed by switch.) • Current (I1/I2/I3): 1A/5A/50A/100A/200A/500A/1000A (Depends on clamp-on sensor used and range setting. Please refer to "List 1".) Measurement Accuracy: • Voltage: ±1.0%f.s. • Current: ±1.0%f.s. + Clamp-on Sensor Accuracy * To assist you in choosing the appropriate clamp on sensor for your application, please contact your local HIOKI distributor.	Measurement Range: • Voltage (U1): 200V (70 to 260V AC) • Current ((I1 and I2)/(I3 and I4)/(I5 and I6)): 1A/5A/50A/100A/200A/500A/1000A (Depends on clamp-on sensor used and range setting. Please refer to "List 1". Current range set for every two channels.)
		List 1 Compatible Clamp-on Sensors and Selectable Current Ranges	
	Effective Power Measurement	Measurement Range (P): = Voltage Range x Current Range Measurement Accuracy: ±1.5%f.s. + Clamp-on Sensor Accuracy	
	Reactive Power Measurement		Measurement Range (Q): = Voltage Range x Current Range Measurement Accuracy: ±5.0%f.s. + Clamp-on Sensor Accuracy
	Integrated Effective Power Measurement	Measurement Range (Wh+):Integrated effective power within pre-set interval (Consumed element only) Integration Accuracy: ±1.6%f.s. ± Clamp-on Sensor Accuracy ("f.s." = Voltage Range x Current Range)	
	Power Factor	Measurement Range (PF): 0 to 1 Measurement Accuracy: ±5%rdg. (At full scale input and power factor = 1)	
	Frequency Measurement	Measurement Range (FREQ): 40 to 70Hz Measurement Method: Reciprocal Method Measurement Accuracy: ±0.5%rdg. [At 70% to 130%f.s. (against voltage range) input / 2331-20, at 35% to 130%f.s. (against voltage range) input / 2332-20] Measurement Source: Voltage U1	

List 1 Compatible Clamp-on Sensors and Selectable Current Ranges

Compatible Clamp-on Sensors (with respective current range)	Current Range (Selectable on PC Application Software)
(Custom-order Sensor: 1A) (100mV/A)*	1A
9765 5A (20mV/A)	5A
9695-02 50A (10mV/A)	5A
	50A
9695-03 100A (1mV/A)	100A
9661-01 500A (1mV/A)	100A
	500A
(Custom-order Sensor: 1000A) (0.5mV/A)*	200A
	1000A

Module and Options		CLAMP ON SENSOR 9695-02	CLAMP ON SENSOR 9695-03	CLAMP ON SENSOR 9661-01	CLAMP ON SENSOR 9765 * *Not CE mark compliant
Special Characteristic		Space-saving clamp on current sensor			Dedicated clamp on current sensor for CT secondary
Input Channel		Rated Primary Line Current: 50A AC	Rated Primary Current: 100A AC	Rated Primary Current: 500A AC	Rated Primary Current: 5A AC
Specifications	Application	For POWER METER Module 2331-20 or POWER METER Module 2332-20			
	Rated Primary Line Current:	50A AC	100A AC	500A AC	5A AC
	Output Voltage	10mV AC/A	1mV AC/A	1mV AC/A	20mV AC/A
	Amplitude Accuracy	±0.3%rdg. ±0.02%f.s. (f.s. = 50A, 45 to 66Hz, at Core Center Position)	±0.3%rdg. ±0.02%f.s. (f.s. = 100A, 45 to 66Hz, at Core Center Position)	±0.3%rdg. ±0.01%f.s. (f.s. = 500A, 45 to 66Hz, at Core Center Position)	45Hz to 66Hz: ±2% f.s.; 66Hz to 5kHz: ±5%f.s. (23 °C ±5 °C, less than 80%RH, 45 to 66Hz, at sine wave)
	Phase Angle Accuracy	Within ±2 degrees (45Hz to 5kHz)	Within ±2 degrees (45Hz to 5kHz)	Within ±0.5 degrees (45Hz to 5kHz)	Within ±3 degrees (45Hz to 66Hz at sine wave)
	Amplitude Frequency Characteristics	40Hz to 5kHz: Within ±1% (Deviation from accuracy)			
	Influence of Conductor Position	Within ±0.5% on any position inside the core (Deviation from center)			
	Influence of External Magnetic Field	Less than 0.1A equivalent against 400A/m AC magnetic field			Max. ±3%f.s. against 400Arms/m, 50/60Hz magnetic field
	Maximum allowable input	60Arms cont. (45 to 66Hz, 50 °C ambience)	130Arms cont. (45 to 66Hz, 50 °C ambience)	550Arms continuous (45 to 66Hz, 50 °C ambience)	10A cont. (45 to 66Hz, 50 °C ambience)
	Temperature Coefficient	0.02%rdg./ °C			0.03%f.s./ °C
	Measurable Conductor Diameter	Up to 15 mm		Up to 46 mm	Up to 10 mm

Module Specifications and Options

Module and Options	INPUT MODULE (Di) 2341-20	OUTPUT MODULE (Do) 2342-20	RS LINK MODULE 2343-20
Special Characteristic	Capture contact/voltage signals from external device for monitoring	Outputs control signal, according to commands from above or based on measurement module data.	Remote monitoring and control of existing devices equipped with RS-232C. Connectable with Power HiTESTERs 3331 and 3332, and compatibility with other HIOKI instruments planned.
Input Channels	8 contact points/voltage (active-low)	Open collector output: 8ch	External communication interface: RS-232C (57.6 kbps maximum communication speed)
Specifications	8 channels of Voltage/Contact (non-voltage): • Voltage Level: HIGH: VIN - 1.0 (V) to VIN (V) LOW: 0 to 1.0 V • Contact point detection threshold On resistance: 500 Ω maximum Off resistance: 500 kΩ minimum • Internal isolated power: 5 ±0.5 V DC @20 mA max. (Between V OUT and COM) • External power supply: 4.5 to 30 V DC (between V IN and COM)	• Internal isolated power: none • External power supply: Between V IN and COM, 30 V DC max. • External sink current: 250 mA DC per channel • Maximum applied voltage 30 V DC	• Compatible devices: HIOKI Models 3331 and 3332 • Instrument control: Setting commands from PC applications Sending commands from modules

Module and Options	AIR MODULE 2351-20*	WIRE MODULE 2352-20	LAN MODULE 2353-20
Special Characteristic	Communication module based on SS wireless technologies	Embed into existing user devices or use in small-scale systems	Communication module for direct connection to LAN
Communication protocol	2.4 GHz range SS wireless type, with RS-232C	RS-232C	LAN (Ethernet, 10BASE-T), Modbus/TCP
Specifications	• Number of connectible modules: External communication: 89 total (with a COM ID assigned to each module) Internal communications: 63 total (with a MODULE ID assigned to each measurement module) Sending commands from modules *NOTE: Requires modification according to regional or national standards. Please contact HIOKI for further information.		

Module and Options	AC POWER MODULE 2361-20	AC POWER MODULE 2362-20
Special Characteristic	AC power supply for measurement and communication modules	DC power supply for measurement and communication modules
Power voltage	100 to 240 V AC	19 to 36 V DC
Output	5V DC, 2.4A (supports up to 10 measurement modules)	

Module and Options	MODULE BASE 2391	MODULE BASE 2392
Special Characteristic	Module connection board with three dedicated slots for power and communication modules	For connecting modules (also connects with additional MODULE BASEs for increased measurement capabilities)
Specifications	For 2391-01: 3 (for relay and master station) For 2391-02: 8 (5 measurement module slots) For 2391-03: 13 (10 measurement module slots)	For 2392-01: 1 slot; includes power and internal bus connection terminal For 2392-02*: 2 slots; connect with 2392-01 for additional measurement modules *NOTE: POWER MODULE not compatible; must use with Model 2392-01 to access POWER MODULE

Module and Options	Multi-Function Module 2306
Features	Eight input channels support multi-function measurements of temperature (thermocouple or RTD) or DC voltage or current.
Input Channels	Eight (per-channel settings provided for thermocouple types K, E, J, T and R, RTD [resistance temperature detector, 3-wire type], or DC voltage and current).

Measurement Object	Range	Measurable Range	Resolution	Measurement Accuracy
Thermocouple	K	-200°C to 1350°C	0.1°C	±0.25% rdg. ±1°C*
	E	-200°C to 1000°C		
	J	-200°C to 1200°C		
	T	-200°C to 400°C		
	R	0°C to 1700°C		±0.25% rdg. ±2°C*(above 400°C)
RTD(3-wire)	Pt100	-200°C to 800°C	0.1°C	±0.25% rdg. ±0.5°C
	JPt100	-200°C to 500°C		
DC Voltage(±50000 counts)	50 mV	-50 mV to 50 mV	1 µV	±0.25% rdg. ±40 dgt.
	500 mV	-500 mV to 500 mV	10 µV	
DC Current(±30000 counts)	5 V	-5 V to 5 V	100 µV	±0.25% rdg. ±10 dgt.
	50 V	-50 V to 50 V	1 mV	
	30 mA	-30 mA to 30 mA	1 µA	±0.25% rdg. ±10 dgt.

* Add standard junction compensation accuracy when using internal reference junction compensation.

General Specifications:

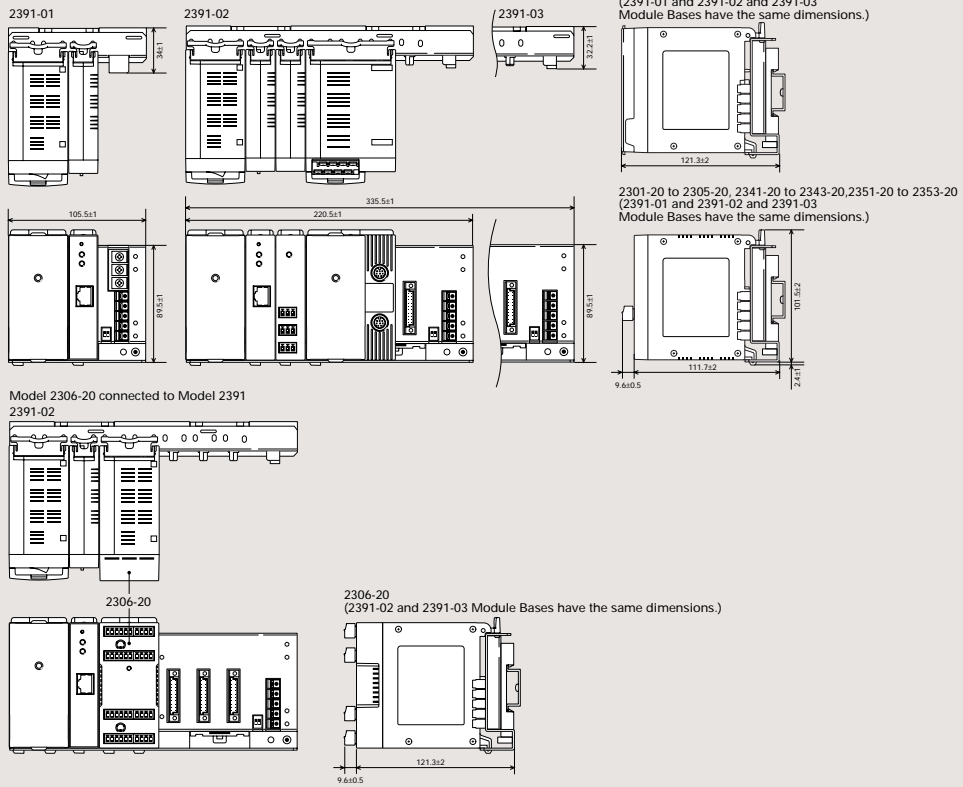|	
Standard Junction Compensation	Internal/External selectable (for thermocouple measurements)
Standard Junction Compensation Accuracy	±1°C
Digital Filter	OFF, 50 Hz, 60 Hz, 10 Hz
Sampling	1 s/count (with Digital Filter Off) 2 s/count (with 50 or 60 Hz Digital Filter) 10 s/count (wit 10 Hz Digital Filter)
Max. Allowable Input	Voltage Measurement Terminals: ±50 V DC Current Measurement Terminals: ±30 mA DC
Max. Rated Voltage to Ground	33 Vrms AC, 70 V DC

Module Specifications and Options

Module and Options	Waveform Module 2321	
Features	Performs gapless calculations on waveform data acquired once per second, for interval recording and continuous monitoring. Waveforms are acquired when trigger criteria are met.	
Input Channels	Two analog voltage channels and four 2-input logic channels (with Logic Probe 9320-01 or 9321-01)	
Specifications	**General Specifications**	
	Ranges	50 V to 50 mV (in 10 ranges), each range up to 100%, resolution is 1/1600 of full scale for that range
	Input Impedance	1 MΩ ±1%
	Input Configuration	Unbalanced (Floating)
	Accuracy	DC Accuracy: ± 0.5% f.s. (with 5-Hz filter) Frequency Characteristic: DC to 40 kHz (-3 dB @ 40 kHz)
	Max. Input Voltage	33 Vrms AC, 70 V DC
	Max. Rated Voltage to Ground	33 Vrms AC, 70 V DC
	Trigger Input	Threshold Levels: L = +0.0 V to +1.0 V, H = +2.5 V to +5.0 V Maximum Input Voltage: 10 V DC
	Trigger Output	Open-Collector, 30 V DC @ 500 mA max. Trigger Output Timing: Continuous (Reset from PC application), Specified interval (Reset at 1 to 255 s, or from PC application), Output only during waveform acquisition
	Functional Specifications (Calculation Value Recording)	
	Calculation Value Recording	Records calculation values at specified interval
	Recording Interval	1 s to 60 min (in 15 ranges)
	Calculation Values	Analog waveform maximum, minimum, peak-to-peak and peak values, crest factor (peak value/rms), average and rms values once per second Every second for analog waveforms, instantaneous value for logic waveforms
	RMS Calculation	One data calculation per second from 10 kS/s (constant)
	Functional Specifications (Waveform Recording)	
	Waveform Recording	Records analog and logic waveforms according to specified trigger criteria. Sampling and trigger criteria can be set independently for each channel.
	Max. Recording Length	32 kWords per waveform (with two memory partitions)
	Memory Partitioning	2, 4, 8, 16, 32 partitions
	Sampling Rate	400 kS/s to 10 S/s (in 19 ranges)
	Trigger	Analog (Level or Window), Logic, External, timed, by software, between channels, by calculated value
	Pre- and Post-Trigger	Independently settable
	Trigger Filter	0 to 255 samples
	Alarm Judgment	Implemented by Output Module 2342

Module and Options	Logic Probe 9320-01		Logic Probe 9321-01	
Features	Detector to record High/Low voltage states and relay contact signals		Detector to record High/Low AC or DC relay operating signals Detects power line outages	
Specifications	Input Section	Four Channels (between probe tips and channels, common ground), Digital/Contact input switch (Contact inputs detect open-collector signals) Input Impedance: 1 MΩ (for 0 to +5V digital input), 500 kΩ or more (for +5 to +50 V digital input) Pull-Up Resistance: 2 kΩ (Contact Inputs: internal pull-up to +5 V)	Input Section	Four Channels (between probe tips and isolated channels), selectable High/Low ranges Input Impedance: 100 kΩ or more (High range), 30 kΩ or more (Low range)
	Digital Input Threshold	1.4 V, 2.5 V or 4.0 V	Output Detection (H)	170 to 250 V AC, ±70 to ±250 V DC (High range) 60 to 150 V AC, ±20 to ±150 V DC (Low range)
	Contact Input Detection Impedance	1.5 kΩ or more (Open) and 500 Ω or less (Short), 3.5 kΩ or more (Open) and 1.5 kΩ or less (Short), 25 kΩ or more (Open) and 8 kΩ or less (Short)	Output Detection (L)	0 to 30 V AC, 0 to ±43 V DC (High range) 0 to 10 V AC, 0 to ±15 V DC (Low range)
	Response Time	500 ns or less	Response Time	Rise time 1 ms or less, Fall time 3 ms or less (at 200 V DC High range, 100V DC Low range)
	Max. Input Voltage	0 to +50 V DC (max. between input terminals without damage)	Max. Input Voltage	250 Vrms (High range),150 Vrms (Low range), (max. between input terminals without damage)
	Cable Length	1.5 m between devices, 30 cm input section	Cable Length	1.5 m between devices, 1 m input section

Specifications (External Dimensions)

With Model 2391 Installed

2391-01

2391-02

2391-03

34±1

3.2.2±1

105.5±1

335.5±1

220.5±1

89.5±1

89.5±1

2321-20,2331-20,2332-20,2361-20,2362-20
(2391-01 and 2391-02 and 2391-03
Module Bases have the same dimensions.)

121.3±2

2301-20 to 2305-20, 2341-20 to 2343-20,2351-20 to 2353-20
(2391-01 and 2391-02 and 2391-03
Module Bases have the same dimensions.)

101.5±2

9.6±0.5

111.7±2

2.4±1

Model 2306-20 connected to Model 2391
2391-02

2306-20

2306-20
(2391-02 and 2391-03 Module Bases have the same dimensions.)

121.3±2

9.6±0.5

With Model 2392 Installed

2392-02   2392-01

2392-02   2392-01

(*2)   (*1)

(*2)   (*1)

2321-20,2331-20,2332-20,2361-20,2362-20
(2392-01 and 2392-02 Module Bases have the same dimensions.)

(*1)Modules that can connect to the
2392-01, 2361-20, 2362-20
(*2)Modules that can connect to the
2392-01, 2301-20 to 2306-20, 2321-20,
2331-20, 2332-20, 2341-20 to 2343-20,
2351-20 to 2353-20

113.2±2

46±1   46±1   46±1

90±1

2301-20 to 2305-20, 2341-20 to 2343-20, 2351-20 to 2353-20
(2392-01 and 2392-02 Module Bases have the same dimensions.)

102±1

9.6±0.5

103.6±2

8.5±1

Model 2306-20 connected Model 2391

2392-02   2392-01

2306

2306-20
(2392-01 and 2392-02 Module Bases have the same dimensions.)

113.2±2

9.6±0.5

(Unit: mm)