User's Manual

30-CH Fast Digital Thermometer Module

WE7231

YOKOGAWA
Yokogawa Meters & Instruments Corporation

IM 707231-01E
1st Edition

Foreword

Thank you for purchasing the WE7231 30-CH Fast Digital Thermometer Module, a PC-based measurement instrument for the WE7000.
This user's manual contains useful information about the functions and operating procedures of the WE7231 as well as precautions that should be observed during use. This manual is written with the assumption that you will be using the WE7000 Control Software that is included with the measuring station.
For general information about the WE7000, (primarily the operations of the measuring station, the optical interface module, the optical interface card, and the WE7000 Control Software) see the WE7000 User's Manual (IM 707001-01E).

Manual Title	Manual No.
WE7000 User's Manual	IM707001-01E

To ensure proper use of the instrument, please read this manual thoroughly before beginning operation.
After reading the manual, keep it in a convenient location for quick reference in the event a question arises.

Notes

- **This manual was written for version 4.2.0.0 of the WE7000 Control Software and module firmware version 3.05. The operating procedures and screen contents described in this manual may differ from those in other versions of the software.**
- The contents of this manual are subject to change without prior notice as a result of improvements in the instrument's performance and functions.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA representative listed on the back cover of this manual.
- Copying or reproduction of all or any part of the contents of this manual without the permission of Yokogawa Electric Corporation is strictly prohibited.

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Revisions

1st Edition: November 2001

Disk No. WE16
1st Edition: Norbember 2001 (YK)

Checking the Contents of the Package

Unpack the box and check the contents before operating the instrument. If some items are missing or otherwise inconsistent with the contents description, please contact the dealer from which you purchased them.

Measurement Module

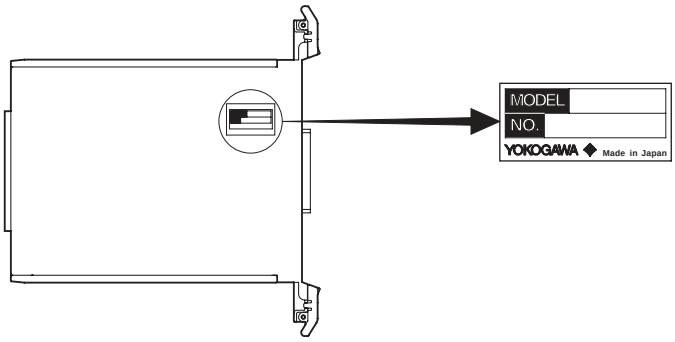
Check that the model name given on the name plate matches the one on your order form.

Model

Model	Suffix Code	Description
707231		WE7231 30-CH Fast Digital Thermometer Module
707231	/HE	English help message

NO. (Instrument Number)

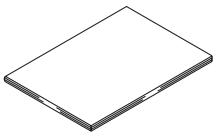
When contacting the dealer from which you purchased the instrument, please give them the instrument number.



Accessories

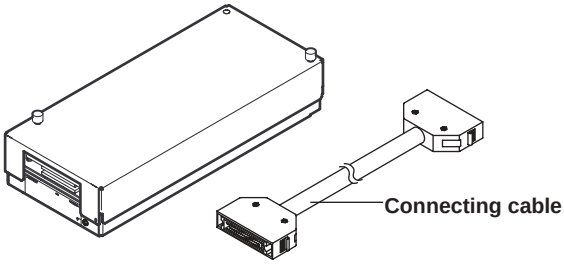
The following standard accessories are supplied with the instrument. Make sure that all items are present and undamaged.

One user's manual (this document)
IM 707231-01E



Optional Accessories (Sold Separately)

Part Name	Model Code	Description
30-CH Scanner Box	707815	M4 screw terminal and 1 meter connecting cable
30-CH Scanner Box	707815/L3	M4 screw terminal and 3 meter connecting cable



How to Use This Manual

Structure of the Manual

This manual consists of four chapters and an index as shown below.

Chapter	Title	Description
1	**Functions**	Describes the system configuration and functions.
2	**Hardware Preparation**	Explains how to install the module into the measuring station, and how to connect the input.
3	**Troubleshooting and Maintenance**	Explains the procedures for troubleshooting and self-testing.
4	**Specifications**	Outlines the specifications of the module.
Index		An alphabetical index.

Conventions Used in This Manual

- **Units**

  k Denotes 1000. (For example, 100 kHz)

  K Denotes 1024. (For example, 720 KB)

- **Boldface Characters**

  Characters set in boldface usually refer to items on-screen or on the instrument (such as knobs, windows and buttons) with which the user interacts.

- **Symbols**

  The following symbols are used in this manual to alert you to important information.

This symbol is affixed to the instrument, and indicates that due to possible danger to the user or instrument, the user's manual should be consulted. It is also printed on the corresponding reference page in the user's manual.

WARNING Describes precautions that should be observed to prevent injury or death to the user.

CAUTION Describes precautions that should be observed to prevent minor or moderate injury to the user, or damage to the instrument.

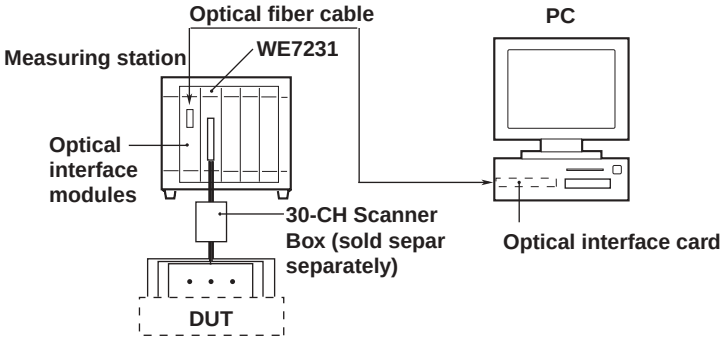
Note Provides information that is important for proper operation of the instrument.

Contents

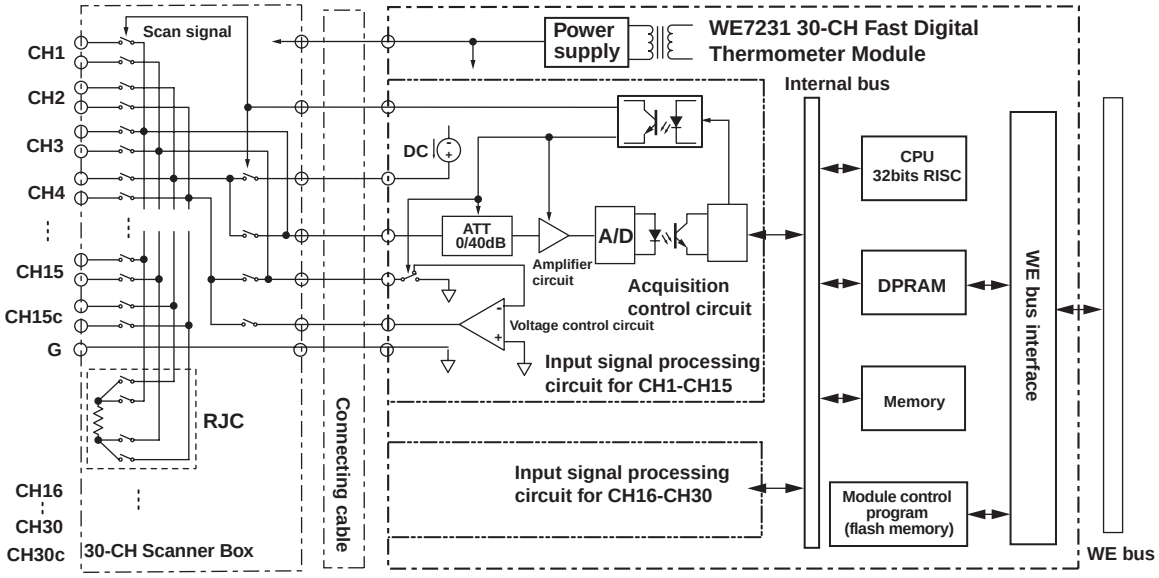
1.1 System Configuration and Block Diagram

System Configuration

The following is an example in which the 30-CH Fast Digital Thermometer WE7231 is installed into the measuring station and the measuring station is connected to a PC with the optical fiber cable.



Block Diagram



Description of Operation

The 30-CH Scanner Box (sold separately) connects to the input connector of the 30-CH Fast Digital Thermometer WE7231 using the connecting cable, and the devices under measurement are connected to each terminal of the 30-CH Scanner Box. If the device under measurement is a thermocouple or if you are measuring DC voltage, the input terminals are connected using a 2-wire system. When measuring resistance or resistance temperature detectors, a 4-wire system is used.

A scanning signal is sent through the connecting cable from the WE7231 to the 30-CH Scanner Box, and the response from the device under measurement determines which signals are selected for input to the WE7231.

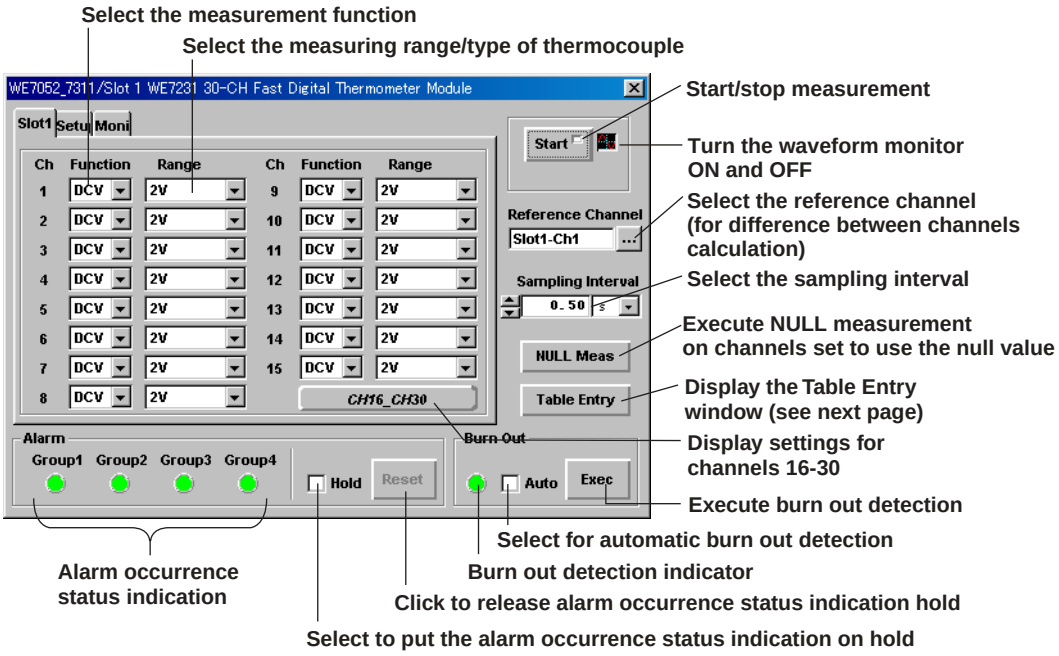
With thermocouple or DC voltage input measurement, the input signal is modified in the attenuator (ATT) and amplifier circuits then undergoes A/D conversion. When measuring resistance such as in resistance temperature detectors, a constant current is given through the connecting cable from the WE7231 to the device being measured, and in the same manner as during thermocouple or DC voltage input measurement, the voltage signal generated at both ends of the device being measured is input to the WE7231 where it undergoes A/D conversion. These converted digital signals are isolated in the photocoupler and the digital data which represents the measured values is stored in memory.

When measuring temperature, the reference junction temperature is measured using the platinum resistance temperature detector inside the scanner box, and the CPU performs reference junction compensation, or RJC, (this function can be turned ON/OFF) and voltage-temperature conversion on the previously stored measurement data from the thermocouple. These results are then re-stored. The data stored in memory can be recalled from a PC through communications.

1.2 Operation Panel

The WE7000 Control Software installed in the PC is used to control the 30-CH Fast Digital Thermometer WE7231. The WE7000 Control Software displays operation panels similar to those shown in the figure below. This user's manual does not explain the operations of the operation panel or waveform monitor. For these operations, see the WE7000 Control Software's online help.

Basic Settings



Other Settings

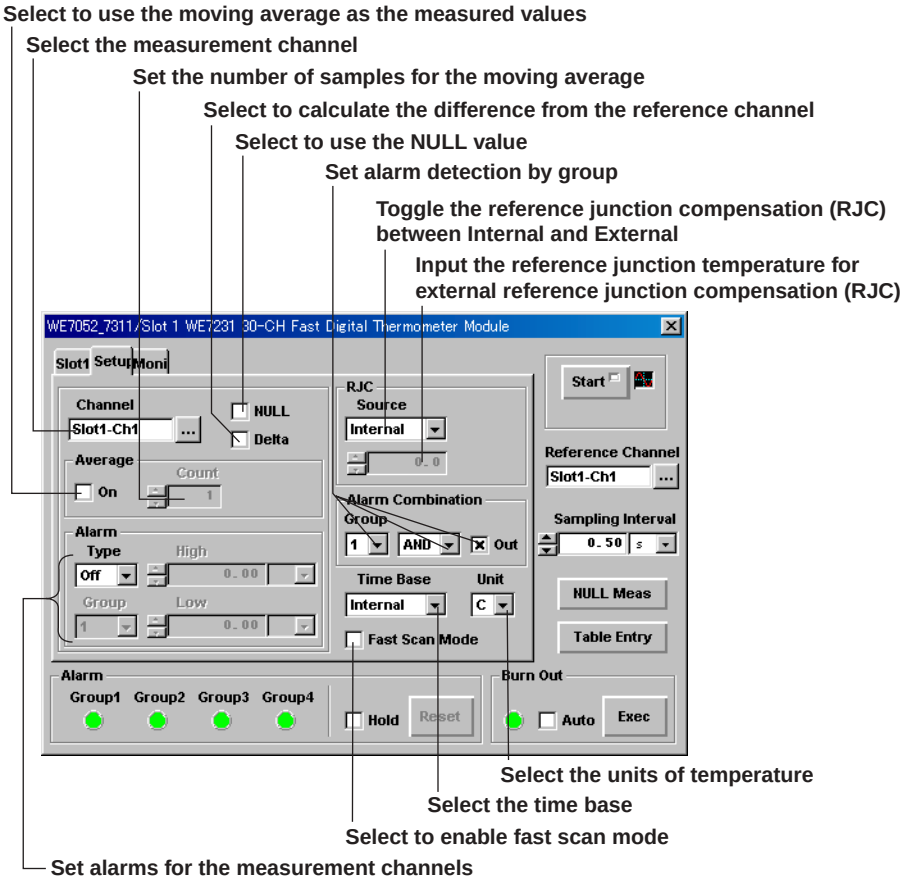
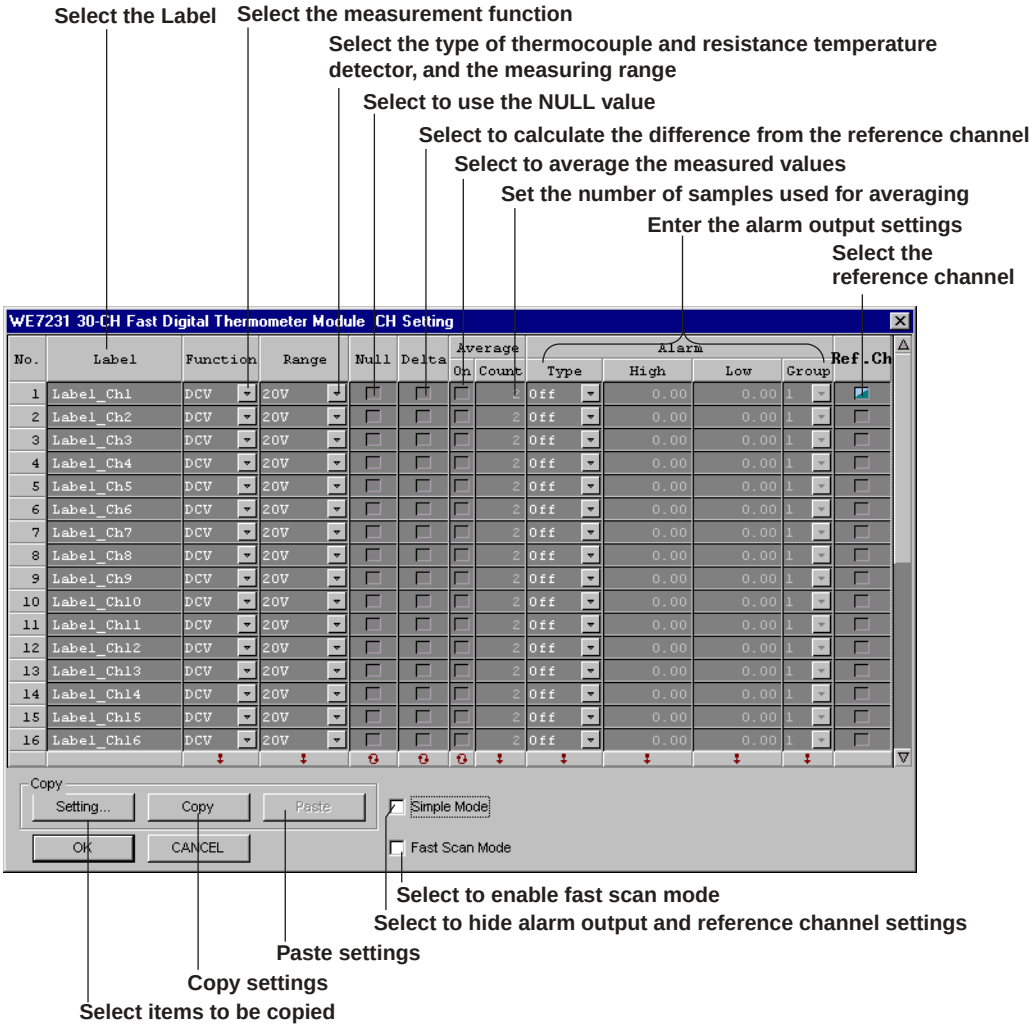
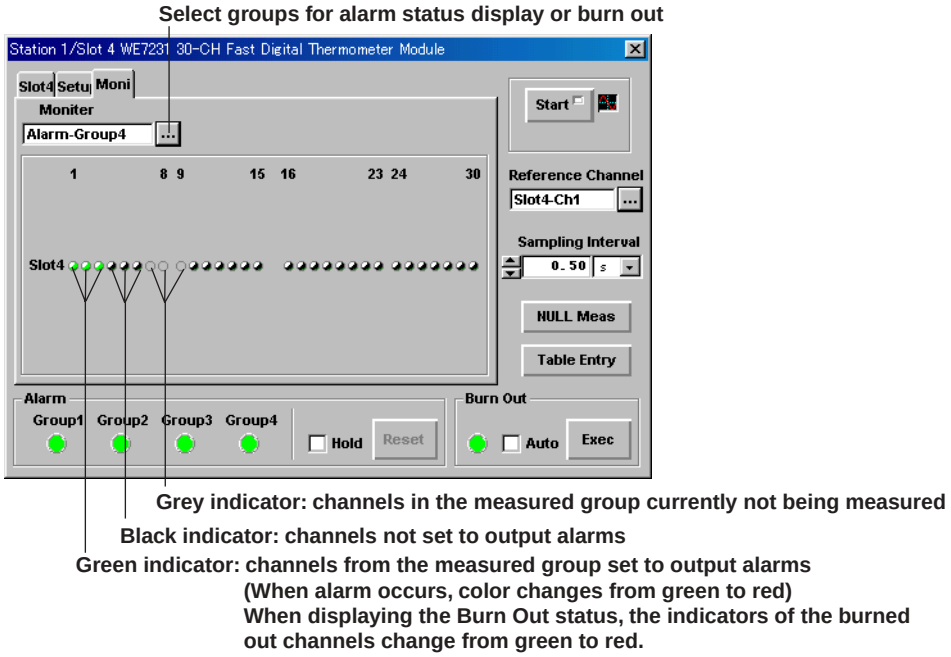


Table Entry Window



Displaying Alarm Status and Burn out by Channel



Note

When an alarm occurs frequently, the alarm status display overloads processing resources and may make it impossible to perform panel operations such as setting changes. If this happens, turn the Monitor setting OFF.

1.3 Setting Measurement Conditions

Selecting the Measurement Function

Choose from TC (thermocouple), DCV (DC voltage), RTD (resistance temperature detector), and OHM (resistance). RTD (resistance temperature detector) and OHM (resistance) can only be selected for the odd-numbered channels between CH1 and CH15, or the even-numbered channels between CH16 and CH30. Also, if at least one channel among CH1-CH15 or CH16-CH30 is set to RTD (resistance temperature detector) or OHM (resistance), measurement on the even-numbered channels from CH1 to CH15 or the odd-numbered channels from CH16 to CH30 will no longer be possible. Hence, you will not be able to enter measurement function settings on those channels.

Selecting the Type of Thermocouple and Resistance Temperature Detector and the Range

The following is a breakdown by measurement function of the type, range, and measurement range that can be selected.

Thermocouple (TC)

Type	Measurement Range	Resolution
K	–200.0 to 1300.0°C	0.1°C
E	–200.0 to 800.0°C	0.1°C
J	–200.0 to 1100.0°C	0.1°C
T	–200.0 to 400.0°C	0.1°C

Resistance Temperature Detector (RTD)

Type	Measurement Range	Resolution*
Pt100	–200.0 to 650.0°C	0.01°C (0.1°C)

* The resolution in parentheses is for an integral time of 1 ms or 4 ms.

DC Voltage Input (DCV)

Range	Measurement Range	Resolution*
20 mV	±19.9999 mV	100 nV (1 μV)
200 mV	±199.999 mV	1 μV (10 μV)
2 V	±1.99999 V	10 μV (10 μV)
20 V	±19.9999 V	100 μV (1 mV)

*The resolution in parentheses is for an integral time of 1 ms or 4 ms.

Resistance (OHM)

Range	Measurement Range	Resolution*
20 OHM	0.0 to 19.9999 Ω	100 μΩ (1mΩ)
200 OHM	0.0 to 199.9999 Ω	1 μΩ (10 mΩ)
2 kOHM	0.0 to 1.99999 Ω	10 mΩ (100 mΩ)
20 kOHM	0.0 to 19.99999 kΩ	100 mΩ (1 Ω)
200 kOHM	0.0 to 199.99999 kΩ	1Ω (10 Ω)
2 MOHM	0.0 to 1.9999 MΩ	10 Ω (100Ω)

*The resolution in parentheses is for an integral time of 1 ms or 4 ms.

NULL

For each channel, you can set whether the null value is applied to measurement values. When the **NULL** check box is selected, the measured value is equal to the actual value minus the null value. Using the NULL value, the residual voltage can be cancelled, for example when measuring in microvolts.

If the **NULL** check box is selected during measurement, the value measured immediately thereafter is used as the null value. If the **NULL** check box is selected while measurement is stopped, the value measured immediately after measurement starts is used as the null value.

If you click the NULL Meas button, the null values of the channels whose NULL check boxes are selected are measured again.

Difference Computation of the Input Between Two Channels

You can assign a channel from other linked 30-CH Fast Digital Thermometer WE7231s or equivalent modules as the reference channel, and calculate the difference against the input of the reference channel, select the **Delta** check box of the channel on which to calculate the difference.

The Moving Average of the Measured Values

Select the **On** check box under **Average** to calculate the moving average of the measured value. Select the average from 2 to 100.

Fast Scan Mode

If you select the **Fast Scan Mode** check box, only the odd-numbered channels from groups 1 (CH1 to CH15) and 2 (CH16 to CH30) are available, thereby allowing a short sampling interval.
When Fast Scan Mode is OFF (normal scan mode), all channels are enabled.

Sampling Interval

The sampling interval applies to all channels.

When using Internal Time Base

Normal Scan	Fast Scan	Integration time
0.10 to 0.19 s	0.06 to 0.11 s	1 ms
0.2 to 0.79 s	0.12 to 0.44 s	4 ms
0.8 to 3.49 s	0.45 to 1.99 s	16.7/20 ms*
3.50 s to	2.0 s to	100 ms

* The integration time is automatically switched depending on the frequency of the power supply.

When using External Time Base

Normal Scan	Fast Scan	Integration time
0.15 to 0.24 s	0.10 to 0.14 s	1 ms
0.25 to 1.09 s	0.15 to 0.59 s	4 ms
1.10 to 3.69 s	0.60 to 2.09 s	16.7/20 ms*
3.7 s to	2.1 s to	100 ms

* The integration time is automatically switched depending on the frequency of the power supply.

Note

- If any channel uses the 200 kΩ or 2 MΩ range, an additional 0.8 s for normal scan or 0.4 s for fast scan are added.
- If you change the sampling interval after starting measurement, the Time Since the Start of Measurement display will not be accurate.

Reference Junction Compensation

To carry out reference junction compensation using the internal circuitry, select **Internal** from the **RJC Source** list box. Select **External** for external reference junction compensation. Set the reference junction temperature when performing external reference junction compensation. This setting applies to all channels.

Burn Out

This function is available only when TC (thermocouple) is selected as the measurement function. When the **Auto** check box is selected, burn out is automatically detected during measurement. If you click the **Exec** button, burn out detection is executed. This setting applies to all channels.
When a burn out is detected in the thermocouple, the indicators displayed on the **Moni** tab of the operation panel turn red and **Burn Out** appears in the measured value display. Also, current flows to connected thermocouples during burn out detection.

Note

- When the sampling interval is set to one of the following values, the indicators are displayed at every other channel. 1-0.14 s, 0.2-0.24 s, 0.8-1.14 s, 3.5-3.84 s.
- When burn out is automatically detected, the load on the PC can be large so updating of the displayed waveform may be temporarily disabled.

Time Base

You can select whether to sample the input signal with the sampling interval based on the module's internal clock, or to sample to the time base signal (CMNCLK) of the measuring station (the BUSCLK setting). If you select **BUSCLK**, time base signals with an interval shorter than the specified interval are ignored.

Units for Temperature Measurement

In the **Unit** box, select the units of temperature (**C**, **K, or F**) to be used by the module (or all modules if more than one are linked) during temperature measurement.

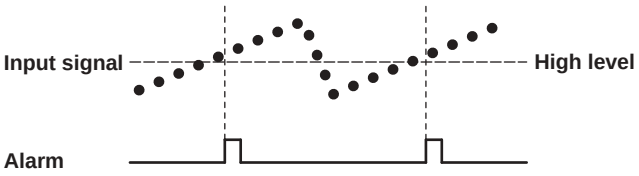
1.4 Setting the Alarm

Alarm Type

Select the alarm type from the following choices.

Off: Do not detect alarms

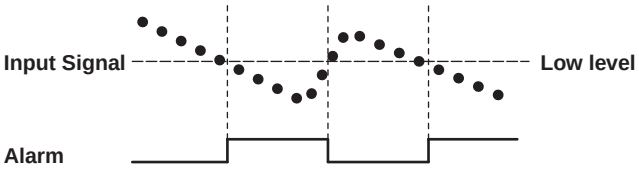
Rise: Output when measured value changes from a value less than the specified upper limit to a value greater than the specified upper limit.



Fall: Output when a measured value changes from a value exceeding the specified lower limit to a value less than the lower limit.

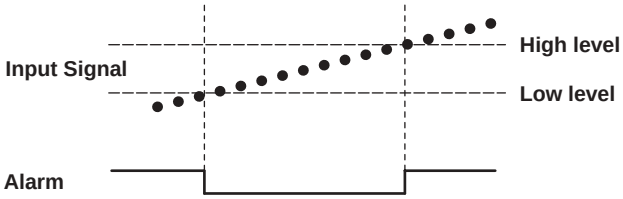
High: Output when a measured value is greater than or equal the specified upper limit.

Low: Output when a measured value is less than or equal the specified lower limit.



In: Output when a measured value is between the specified upper and lower limits (inclusive).

Out: Output when a measured value is less than the specified lower limit or greater than the specified upper limit.



Group

You can divide the channels for which alarms were set into four groups. The alarm occurrence status for each group is displayed in the operation panel, and can be output to external devices by selecting the **Out** check box. You can assign any channel to any group.

Combination

Select the condition under which alarms are output for each group.

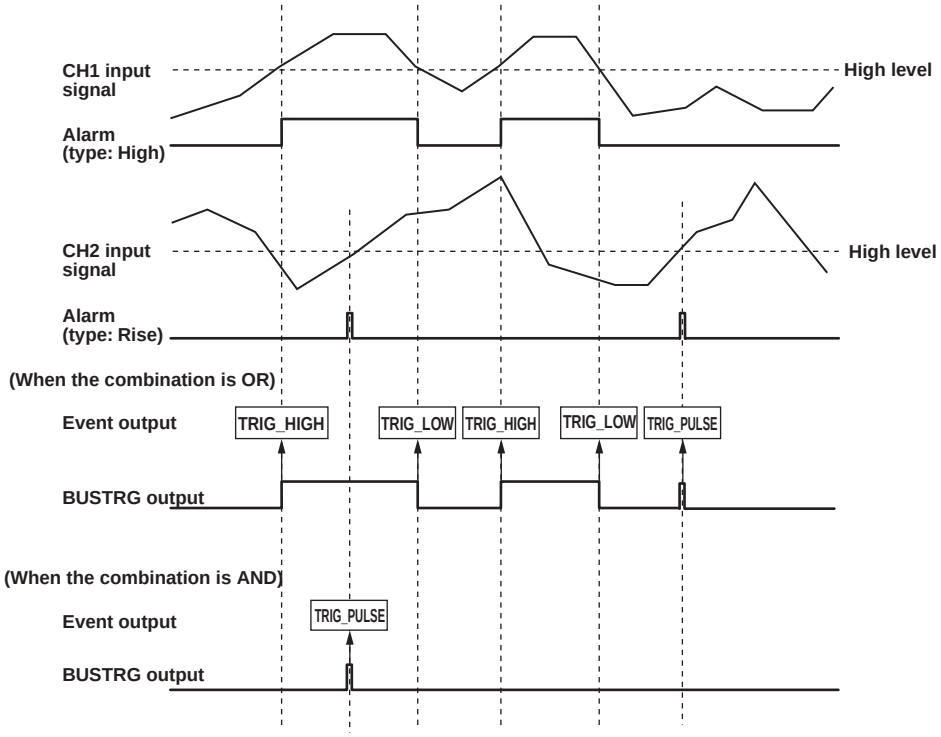
OR: output alarm if any one channel in the group generates an alarm

AND: output alarm when all channels in the group generate an alarm

Alarm Output

When the Out check box is selected, you can output the alarm occurrence status as a bus trigger to the measuring station's BUSTRG1 or BUSTRG2.
An alarm is output if any of the groups for which alarm output was specified generate an alarm.
When an alarm occurs and the bus trigger signals are set to output from the WE7231 in the Trigger Source/Time Base Source/Arming settings dialog box, if the alarm output conditions are Rise/Fall when the conditions are met, the bus trigger signal is set to True for approximately 1 μs. When the alarm output conditions are High, Low, In, or Out, the bus trigger signal is **True** for as long as the conditions are met. For information about the settings in the Trigger Source/Time Base Source Setting dialog box, see section 4.6, "Setting the Trigger Source/Time Base Source/Arming" in the WE7000 User's Manual (IM 707001-01E).

Example of Alarm Output



Alarm Status Indicator

The alarm occurrence status for each group is displayed according to the combination setting. Also, when you select the group you wish to display under the Moni tab, the button displaying the alarm status appears. You can confirm the alarm status of each channel, and when an alarm occurs, the button color turns from green to red.

Alarm Status Indicator Hold

When the **Hold** check box is selected, the alarm occurrence status indicator is held from the point when an alarm occurs. If you click **Reset**, the hold is released.

1.5 Waveform Display, Automatic Saving of Measured Data, File Conversion, and Other Functions

The following functions are common to all measurement modules controlled by the WE7000 Control Software. For details, see the WE7000 User's Manual (IM 707001-01E).

Controlling the Timing of Measurement Start (Arming)

You can control the measurement start timing using the arming signal which is set in the Trigger Source/Time Base Source/Arming Setting dialog box. When the measurement module is connected to the arming signal (ARM) bus in the Trigger Source/Time Base Source/Arming Settings dialog box, the arming signal enters a wait state when the user clicks the **Start** button in the operation panel, and measurement starts when the arming signal becomes **True**. For information about the settings in the Trigger Source/Time Base Source/Arming Setting dialog box, see section 4.6, "Setting the Trigger Source/Time Base Source/Arming" in the WE7000 User's Manual (IM 707001-01E).

Waveform Display

You can display measured data as a waveform on the WE7231. When measurement is started on WE7231's operation panel, waveforms are automatically displayed by default in the WE7000 Control Software's waveform monitor.

Automatic Saving

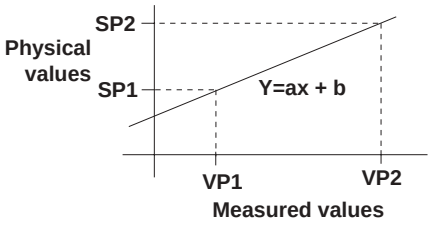
Besides saving the waveform data from those displayed in the waveform monitor, measured data can also be automatically saved. You can select to save the data to one file or by specifying the number of data points you may save to multiple files.

File Conversion

Saved measurement data can be converted from ASCII data in CSV format (*.csv) or physical values in 32-bit floating point format (*.wvf, conforming the IEEE754-1985 standard).

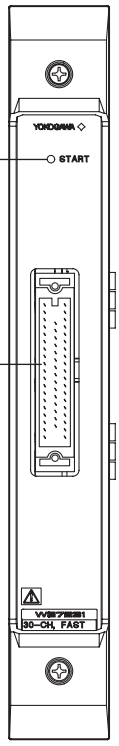
Measured Data Scaling

Set two arbitrary points from the measured values (VP1, VP2) and the physical value corresponding to those measured values (SP1, SP2). The scale conversion equation (y=mx+b) is determined based on these four values. The measured values are converted to physical values according to this equation, and can be displayed in a waveform or saved as measurement data.



1.6 Name and Functions of Each Part

Front Panel



Start indicator
Lights when measurement starts

Input connector
Connector for the scanner box

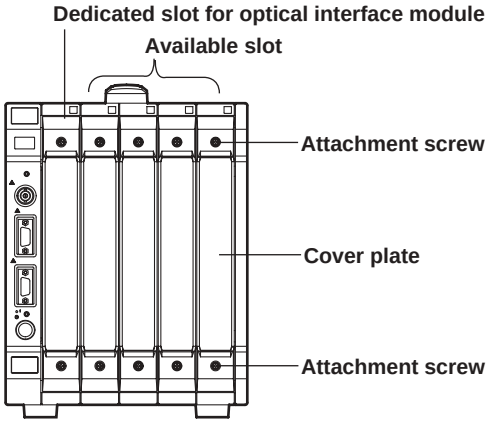
* See page 2-5 for the names and functions of each part of the 30-CH Scanner Box (sold separately).

2.1 Mounting Modules in the Measurement Station

Preparation

Before shipping, a cover plate is affixed to each slot on the measuring station as shown below. Confirm that there is no power being supplied to the measuring station, then loosen the two attachment screws and remove the cover plate of the slot into which a module will be installed. Please note that the left-most slot is reserved for communications modules, and cannot be used for the WE7231.

* The example below shows the WE400 Measuring Station.



Installing the 30-CH Fast Digital Thermometer Module

WARNING

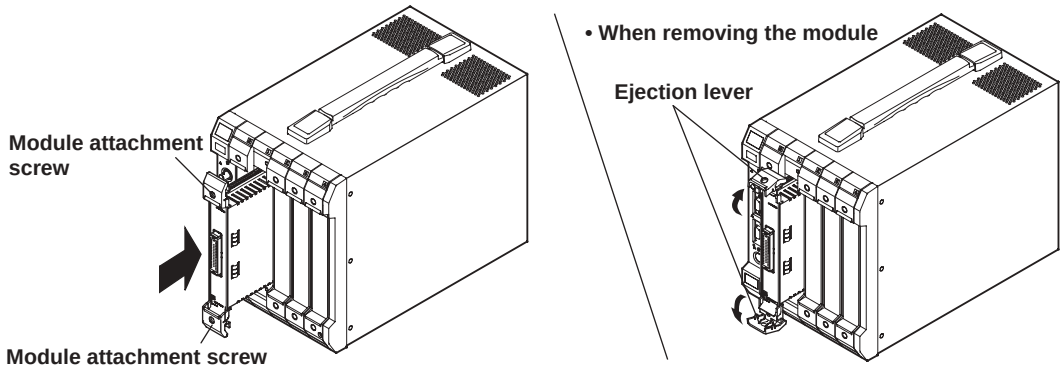
- Be sure to tightly fasten the upper and lower attachment screws. Connecting an input cable without first tightening the screws may result in electric shock because the protective grounding of the measuring station may be rendered ineffective (depending on the power supply cord).

CAUTION

- To avoid damage to the instrument, turn OFF the standby power switch on the measuring station when installing a measurement module.
- When inserting the module into the slot, be careful not to pinch your finger in the release lever. Also, the module guide protrudes from inside the slot, so do not insert your hand into the slot.
- Do not remove the cover plate from any slot unless a module will be mounted into it. Doing so could cause problems, for example if the temperature rises. The cover plate also suppresses the potentially damaging effects of magnetic waves.

Insert the module along the guide rail of the slot from which you removed the cover plate. Push the module until it clicks into the connector. Be careful not to get your fingers caught in the ejection lever while inserting the module. When the module is securely inserted, fasten the module attachment screws (tightening torque: 0.6 to 0.7 N-m).
To remove the module, loosen the module attachment screws and pull the ejection lever from the inside to the outside. This will force the module out of the slot.

See illustration on the next page.



Note

When synchronization of the measurements of multiple input signals is desired (linking the modules), install the multiple digital thermometer modules in adjacent slots.

2.2 Connecting the 30-CH Scanner Box and the Input Signal Wire

You cannot connect the input signal wires directly to the 30-CH Fast Digital Thermometer Module WE7231. To connect the input signal wires, you need the 30-CH Scanner Box (model 707815, sold separately).

Connecting the 30-CH Scanner Box to the Input Signal Wire

WARNING

- There is a danger of electric shock between the input terminals since they only have functional isolation. Functional isolation means isolation that removes the effect of noise from the electric potential difference occurring between 2 points, and is intended to satisfy measurement specifications rather than to provide protection from electric shock.
- The guard terminal is common within groups (CH1-CH15 and CH16-CH30). Also the guard terminal is connected to the L terminal of the measurement channel inside the module. If the potential of the L terminal at each channel differs, the module or connected device may be damaged so don't use the guard terminal.

CAUTION

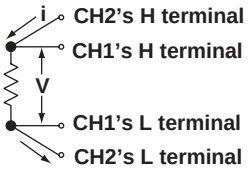
- Do not apply a voltage exceeding the following levels, as it may damage the module.
  Maximum allowable input range: 30 VACrms, 42.4 Vpeak or ±60 VDC between H and L.
  (Overvoltage category: CAT I and II)
  Maximum noise across channels: 60 VACrms or ±100 VDC
- Do not apply the voltage exceeding 60 VACrms or ±100 VDC between input channels, as it may damage the module and 30-CH Scanner Box.
- Remove the 30-CH Scanner Box from the module when connecting the signal wires to avoid damaging the module.
- Do not apply voltage between the L terminal and guard terminal (terminal with the G signal) as this may result in damage to the module and any connected devices. The guard terminal is connected to the circuit common inside the module. When measuring voltage, the guard terminal and L terminal form a direct connection since the L terminal is connected to the circuit common. Also, when measuring resistance, L terminal is the standard for the circuit common.

Note

- When performing internal reference junction compensation on the thermocouple input, consider the following suggestions for stabilizing the temperature at the terminal section.
  - Make sure the terminal cover is in place.
  - Keep the temperature constant in the area where the instrument is operating.
  - Do not use thick wires (a cross sectional area of 0.5 mm^2 or more) that have large radiation effects.
  - Place the 30-CH Scanner Box at a sufficient distance from the point of measurement so that the heat from the point of measurement will be conducted through the wiring rather than to the 30-CH Scanner Box.
- To prevent noise, you can use the functional grounding terminal on the side of the 30-CH Scanner Box to ground the guard terminal or L terminal (see next page).

- **Thermocouple/Voltage Measurement**
  Connects to the H and L terminals of channels 1-30 using a 2 wire system. Each H and L terminal of channel 15C and 30C is a dedicated input terminal for resistance temperature detector/resistance measurement. Don't connect these when measuring thermocouple/voltage.

- **Resistance Temperature Detector/Resistance Measurement**
  Connect using a 4 wire system. When the measurement function is set to RTD (resistance temperature detector) or OHM (resistance), measurement is performed on the input signal voltages from the odd-numbered channels between CH1 and CH15, or the even-numbered channels between CH16 and CH30. The next-numbered channel becomes the current output terminal of the voltage measurement channel. For example, if channel 1's H and L terminals are the voltage input terminals, then channel 2's H and L terminals are the current output terminals. The each H and L terminal of channel 15 or 30 become current output terminals.

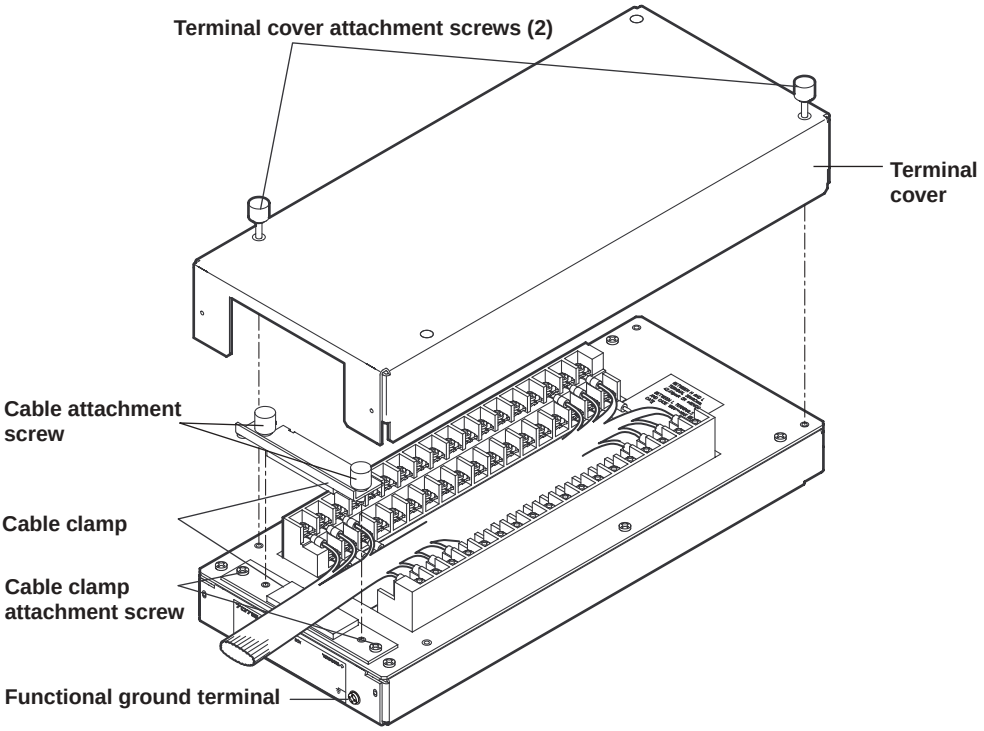


Mixing 2 and 4 Wire Systems

The terminals on the scanner box are divided into groups 1 and 2, and you can specify a 2 or 4 wire system for each group. Even for one channel, when you select measurement with a 4 wire system (resistance temperature detector/resistance measurement), you can only measure the odd-numbered channels from group 1 or even-numbered channels from group 2. However you can mix 2 and 4 wire systems; for example if you measure a resistance temperature detector or resistance with a 2 wire system on CH1, you can have a 4 wire system such as the thermocouple or voltage on CH3.
Group 1: CH1-CH15, Group 2: CH16-CH30

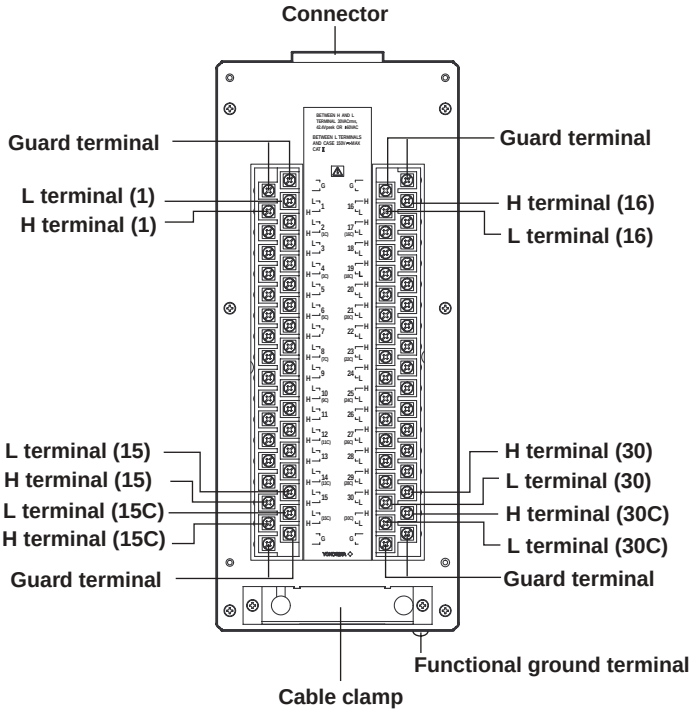
Attaching and Removing the Terminal Cover

Unscrew the two attachment screws in the upper part of the 30-CH Scanner Box and remove the cover as shown in the diagram below. After connecting all of the input signal wires to the input terminals, fasten the input signal wire with the cable clamp, re-attach the terminal cover, and tighten the terminal cover attachment screws. Use crimp-on lugs to ensure the connection to the input terminal is secure, and if it's not necessary to use the cable clamp, you can remove the clamp to widen the opening, and allow thicker wiring. When connecting to all input terminals, the maximum allowable cross-sectional area per cable (due to the restriction on the area of the cover opening) is the following.
With a cable clamp: 2 mm^2, without a cable clamp: 19 mm^2



Example of terminal arrangement

M4 screw for each terminal

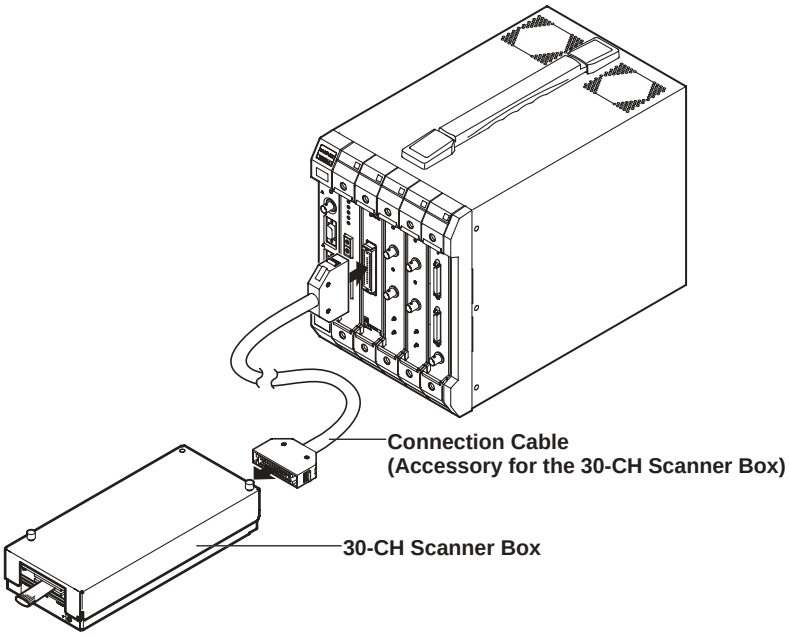


Connecting to a Module

CAUTION

- Turn OFF the standby power switch on the measuring station when connecting a module to the 30-CH Scanner Box.

As in the diagram below, use the cable that came with the 30-CH Scanner Box between the scanner box and the module input connector.



3.1 Troubleshooting

- If servicing is required, or if the instrument is not operating correctly after performing the corrective actions listed below, contact your nearest YOKOGAWA dealer as listed on the back cover of this manual.
- To verify that the module is operating correctly, perform the self test described on the next page.

Problem	Possible Causes/Corrective Actions	Reference Page
Module does not operate.	Check that the module is installed correctly into the station. Also, install the module into another slot, and check whether it will operate there. If it operates in the other slot, the measuring station is likely to have malfunctioned. If the module is installed correctly and does not operate, the fuse might have melted, the connector might be bad, or the IC may have malfunctioned. In any case, contact your nearest YOKOGAWA dealer to have it repaired.	2-1, *
Waveform data cannot be acquired.	Check that the input signal wires are connected properly. Also check the connection between the 30-CH Scanner Box and the module.	2-3 to 2-6
Noise enters the input signal	If the signal line and the AC power supply line are close to each other, move them apart. Also make sure that the signal line is away from the noise source.	2-3
	Change to a shielded signal wire if you are not already using one.	2-3
Measured values are not correct.	Check that the ambient temperature and humidity are within the allowed ranges. If you did not allow a warm-up time of 30 minutes, try measuring again after the warm-up time has passed.	4-5
	Check to see that the input signal level is not exceeding the measurement range.	4-1, 4-2
Temperature measurement is not correct.	Check that the RJC setting is correct.	1-3, 1-5
	Check whether the thermocouple type and polarity are set properly.	
	Check to see that the thermocouple is not burnt out after clicking the Exec button under Burn Out.	
	Check whether the terminal cover for the 30-CH Scanner Box is attached.	2-5
	Check to see that there is no draft in the area where the instrument is located that might cause significant changes in temperature.	
	Check to see that the two types of thermocouple wires are not too far apart, the tip is not touching a metal object, and that the thermocouple is being handled properly.	
	Check to see that the input signal level from the object being measured is within the measurement range.	
The displayed waveform does not get updated.	Check whether the measurement has been started on the operation panel.	1-3
	Check whether the sampling interval is set properly on the operation panel.	1-6
The waveform is not displayed.	Check whether measurement has been started on the operation panel.	1-3
	If the time base setting is BUSCLK, check to see that the time base source is set properly in the Trigger Source/Time Base Source/Arming Setting dialog box of the WE7000 Control Software.	1-6, *
	Check to see that the input signal level from the object being measured is within the measurement range.	
The waveform monitor is not displayed.	Check that the waveform monitor ON/OFF button located to the right of the **Start** button on the operation panel is turned ON.	1-3

* See the WE7000 User's Manual (IM707001-01E).

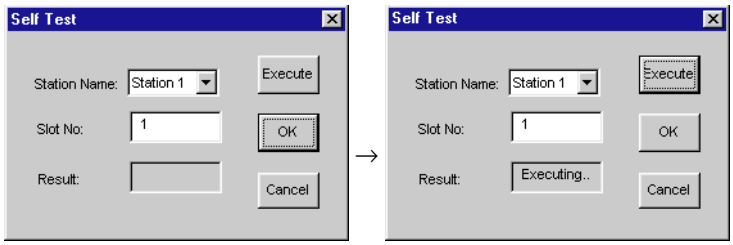
3.2 Self Test

If you believe that the module is not operating correctly, perform the self test according to the following steps.

Executing the Self Test

1. In the WE7000 Control Software, select **System** > **Self Test**.

2. In the **Self Test** dialog box, select the station name and slot number of the module to be tested, and click the **Execute** button.
   "Executing" is displayed in the **Result** box.



Verifying Test Results

If a value other than 0 is displayed in the **Result** box of the **Self Test** dialog box, the module is probably malfunctioning. Contact your nearest YOKOGAWA representative as listed on the back cover of this manual.

3.3 Maintenance

Maintenance of Parts

There are no parts in this module that require periodic replacement.

Calibration

We recommend that you calibrate the measurement module once a year to assure its measurement accuracy.
Contact your nearest YOKOGAWA representative as listed on the back cover of this manual for calibration.

4.1 Performance Specifications

Input Signal

Thermocouple:	K, E, J, T (2 wire system)
DC voltage:	20 mV, 200 mV, 2 V, 20 V (2 wire system)
Resistance temperature detector:	Pt100 (4 wire system)
Resistance:	20 Ω, 200 Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2 MΩ (4 wire system)

Number of input channels

With only 2 wire systems connected: 30, with only 4 wire systems connected: 16
Groups: Group 1 (CH1-CH15), Group 2 (CH16-CH30)
Possible to specify wiring (2 wire system/4 wire system) for each group.

Input format

Floating unbalance input, isolated between input and ground

Input terminal type

Multi-pole square connector (to connect the 30-CH Scanner Box, sold separately)

Measurement Mode

Normal Scan:	all channels (30 channels total)
Fast Scan:	odd channels from group 1, and even channels from group 2 (16 channels total)

Sampling interval

Internal time base

Normal scan:	0.10 s to 60 min (0.9 s or more if any channel uses the 200 kΩ/2 MΩ range)
Fast Scan:	0.06 s to 60 min (0.46 s or more if any channel uses the 200 kΩ/2 MΩ range)

Normal Scan	Fast Scan	Integration time
0.10 to 0.19 s	0.06 to 0.11 s	1 ms
0.2 to 0.79 s	0.12 to 0.44 s	4 ms
0.8 to 3.49 s	0.45 to 1.99 s	16.7/20 ms
3.5 s to	2.0 s to	100 ms

If any channel uses the 200 kΩ or 2 MΩ range, an additional 0.8 s and 0.4 s are added during normal scan and fast scan. Can be specified in units of 0.01 s for the 0.06 s to 60.0 s range and 60.0 s to 60.0 min range.

External Time Base

Normal Scan:	0.15 s to 60 min (0.95 s or more if any channel uses the 200 kΩ/2 MΩ range)
Fast Scan:	0.1 s to 60 min (0.5 s or more if any channel uses the 200 kΩ/2 MΩ range)

Normal Scan	Fast Scan	Integration time
0.15 to 0.24 s	0.10 to 0.14 s	1 ms
0.25 to 1.09 s	0.15 to 0.59 s	4 ms
1.10 to 3.69 s	0.60 to 2.09 s	16.7/20 ms
3.7 s to	2.1 s to	100 ms

If any channel uses the 200 kΩ or 2 MΩ range, an additional 0.8 s and 0.4 s are added during normal scan and fast scan. Can be specified in units of 0.01 s for the 0.06 s to 60.0 s range and 60.0 s to 60.0 min range.

Measurement Range and Resolution

TC Input

Type	Measurement Range	Resolution
K	–200.0 to 1300.0°C	0.1°C
E	–200.0 to 800.0°C	0.1°C
J	–200.0 to 1100.0°C	0.1°C
T	–200.0 to 400.0°C	0.1°C

Units: °C, K or °F can be selected.
Reference junction compensation: internal or external can be selected.
Burn out: auto or manual detect can be selected.

Resistance temperature detector (4 wire system)

Range	Measurement Range	Resolution	Measured Current
Pt100	–200 to 650°C	0.01 (0.1)°C	1 mA

The resolution in the parentheses is for an integration time of 1 ms or 4 ms.

DC voltage

Range	Maximum display	Resolution
20 mV	19.9999(19.999)	100 nV (1 μV)
200 mV	199.999(199.99)	1 μV (10 μV)
2 V	1.99999(1.9999)	10 μV (10 μV)
20V	19.9999(19.999)	100 μV (1 mV)

The resolution in the parentheses is for an integration time of 1 ms or 4 ms.

Resistance (4 wire system)

Range	Maximum display	Resolution	Measured Current
20 Ω	19.9999(19.999)	100 μΩ (1 mΩ)	1 mA
200 Ω	199.999(199.99)	1 mΩ (10 mΩ)	1 mA
2 kΩ	1.99999(1.9999)	10 mΩ (100 mΩ)	1 mA
20 kΩ	19.9999(19.999)	100 mΩ (1 Ω)	100 μA
200 kΩ	199.999(199.99)	1 Ω (10 Ω)	10 μA
2 MΩ	1.99999(1.9999)	10 Ω (100Ω)	1 μA

Open terminal voltage: 10 V max.
The resolution in the parentheses is for an integration time of 1 or 4 ms.

Accuracy

Thermocouple ±(% of reading +°C)

Range	Measurement Range	Gain error (%)	Offset error °C (for every integration time) 100 ms	16.7/20 ms	4 ms	1 ms
K	–200≤t<–100°C	0.035	0.5	0.6	2	3.0
	–100≤t<1300°C	0.035	0.3	0.4	1	1.5
E	–200≤t<–100°C	0.035	0.3	0.4	1.5	2.0
	–100≤t<800°C	0.035	0.2	0.3	1.0	1.5
J	–200≤t<–100°C	0.035	0.4	0.5	2.0	2.5
	–100≤t<1100°C	0.035	0.2	0.3	2.0	1.5
T	–200≤t<–100°C	0.035	0.5	0.6	2.5	3.5
	–100≤t<400°C	0.035	0.3	0.4	1.5	2.0

Resistance temperature detector ±(% of reading +°C)

Range	Measurement Range	Gain error (%)	Offset error °C (for every integration time) 100 ms	16.7/20 ms	4 ms	1 ms
Pt100	–200≤t<200°C	0	0.3	0.3	0.4	0.5
	200≤t<650°C	0.1	0.1	0.1	0.2	0.3

DC voltage ±(% of reading + digit)

Range	Gain error (%)	Offset error (digit) (for every integration time) 100 ms	16.7/20 ms	4 ms	1 ms
20 mV	0.03	60	80	30	50
200 mV	0.025	8	10	4	8
2 V	0.02	5	7	3	6
20 V	0.035	5	7	3	6

Resistance ±(% of reading + digit)

Range	Gain error (%)	Offset error (digit) (for every integration time) 100 ms	16.7/20 ms	4 ms	1 ms
20 Ω	0.04	60	80	30	50
200 Ω	0.04	8	10	4	8
2 kΩ	0.035	6	8	3	6
20 kΩ	0.035	6	8	3	6
200 kΩ	0.035	6	8	3	6
2 MΩ	0.3	20	25	40	60

Reference Junction Compensation Accuracy

1°C (the value not including the noise component when the temperature of the 30-CH Scanner Box is balanced).

Temperature coefficient

- In the 20 V range: ±(accuracy/5)/°C
- Other ranges: ±(accuracy/10)/°C

However, at 5 to 18°C or 20 to 40°C

Computaion

The calculations below can be turned ON/OFF for each channel.

- **Difference**
  Difference from the reference channel. When modules are linked, the difference can be computed across modules. However, difference cannot be computed between two different measurement functions.
- **NULL**
  Sets the NULL value for each channel.
- **Moving Average**
  100 samples maximum. Can be specified for each channel.

Alarm Output

Can output trigger signals to the internal bus (BUSTRG1/BUSTRG2) of the measuring station on the AND/OR condition of the alarm detection result specified by high, low, in, out, rising, or falling of each channel.

4.2 Factory Default Settings

Function (measurement function): TC
Range (measurement range): Type T
Reference Channel: CH 1 on the module
Sampling Interval: 0.80 s
Burn Out (Auto Detect): Off
Alarm Hold: Off
Channel: CH 1 on the module
NULL (use NULL value): Off
Delta (difference measurement): Off
Averaging: Off
Type (alarm type): Off
RJC Source (internal/external switch for the reference junction compensation): Internal
Alarm Combination: AND
Out (alarm output): On
Time Base: Internal
Unit (units of temperature measurement): °C
Fast Scan Mode: Off
Monitor (group selection of alarm status for each channel/burn out status display): Off

4.3 General Specifications

Safety Standards

Complies with CSA C222 No. 1010.1 and EN61010-1, conforms to JIS C1010-1

Standard Operating Conditions

Ambient Temperature: 23±5°C
Ambient Humidity: 50±10% RH
After the warm-up time has passed.

Warm-up Time

At least 1 hour

Operating Condition

Same as those of the measuring station

Storage Condition

Temperature: –20 to 60°C
Humidity: 20 to 80% RH (no condensation)

Maximum Allowable Input Range

30 VACrms, 42.4 Vpeak or ±60 VDC
(Overvoltage category: CAT I and II)

Maximum Common Mode Voltage

150 V rms or ±150 VDC between ground and L terminal

Maximum Noise between Channels

60 VACrms, 84.8 Vpeak or ±100 VDC

Input Resistance

1 GΩ or more (except, 10 MΩ ±1% for the 20 V range)

Allowable Signal Resistance

1 kΩ or lower (when using thermocouple or resistance temperature detector)

Normal Mode Rejection Ratio

Approximately 60 dB
(at an integration time of 16.7 ms or longer, 50/60 Hz ±0.1%)

Common Mode Rejection Ratio

Approx. 120 dB or more.
(at an integration time of 16.7 ms or longer, 50/60 Hz ±0.1%, and unbalanced input Rs=1 kΩ)

Withstand Voltage

1500 VAC at 60 Hz between ground and L terminal for one minute

Power Consumption

7.0 VA (typical value* at 100 V/50 Hz when connected to the 30-CH Scanner Box (model: 707815))

External Dimensions

Approx. 33(W) × 243(H) × 232(D) mm (projections excluded)

Weight

Approx. 0.8 kg

Number of Used Slots

1

Standard Accessories

User's manual (1)

Optional Accessories

707815 30-CH Scanner Box (cable length: 1 m)
707815/L3 30-CH Scanner Box (cable length: 3 m)

* The typical value is a typical or average value. It is not strictly guaranteed.

4.4 Specifications for the 30-CH Scanner Box

Number of Input Channels

30

Input Format

Isolation between input and ground

Functional isolation between the Input channels*.

* Functional isolation means insulation that removes the effect of noise from the electric potential difference occurring between 2 points, and is intended to satisfy measurement specifications rather than to provide protection from electric shock.

Input Terminal type

M4 Screw

The maximum allowable cross-sectional area per one cable (due to the restriction on the area of the cover opening) when connecting to all input terminals.

When using the cable clamp: 2 mm^2

Without the cable clamp: 19 mm^2

Operating Conditions

Temperature: 5 to 40°C

Humidity: 20-80% RH (except maximum wet-bulb temperature of 29°C, no condensation)

Maximum Allowable Input Voltage

30 VACrms, 42.4 Vpeak or ±60 VDC between H and L terminals (overvoltage category: CAT I and II).

Maximum Noise between Channels

60 VACrms, ±100 VDC.

Insulation Withstand Voltage

Between voltage input terminals and case: 60 Hz 1500 VACrms for one minute

Insulation Resistance

Between input terminal and ground: 10 MΩ (500 VDC) or more

Modules that can be Connected

707231 (WE7231 30-CH Fast Digital Thermometer Module)

Weight

Approx. 1.3 kg

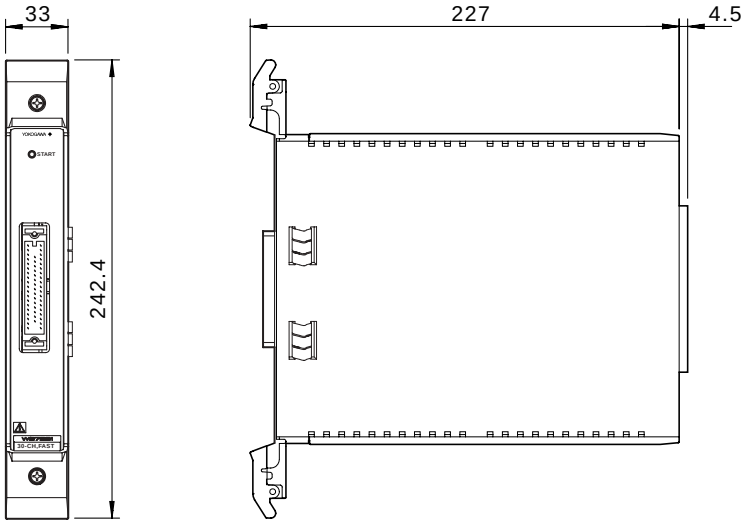
External Dimensions

Approx. 123(W) × 76(H) × 305(D) mm (projections excluded)

4.5 External Dimensions

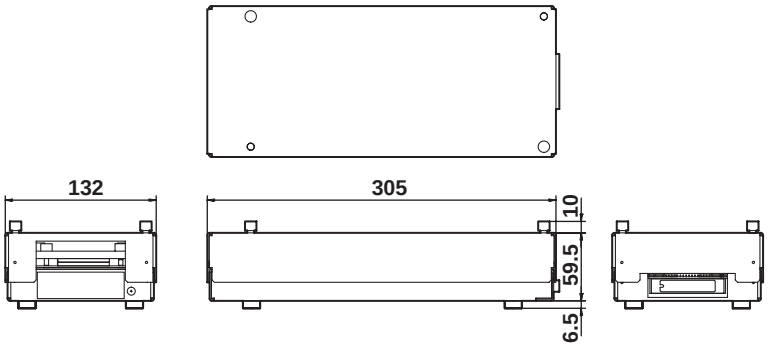
Units: mm

WE7231 30-CH Fast Digital Thermometer Module



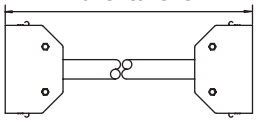
30-CH Scanner Box (Model 707815)

Main Unit



Connecting cable

707815: 1 m
707815/L3: 3 m



If not specified, the tolerance is ±3%. However, if less than 10 mm, the tolerance is ±0.3 mm.

Index

Symbols

A

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