User's Manual

32-Bit Digital I/O Module
WE7261/WE7262

IM 707261-01E
3rd Edition

YOKOGAWA ◆
Yokogawa Electric Corporation

Thank you for purchasing the 32-Bit Digital I/O Module WE7261/WE7262 for the PC-based measurement instruments, WE7000.

This User's Manual contains useful information about the function, connection to the measuring station, and troubleshooting of the WE7261/WE7262. This manual assumes 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 following manual that is included with the measuring station.

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

To ensure correct use, please read this manual thoroughly before operation. Keep this manual in a safe place for quick reference in the event a question arises.

Notes

- **The contents of this manual describe WE7000 Control Software Ver. 4.0.2.0 and module software Ver 3.06. If you are using another version of the software, the operating procedures or the figures given in this manual may differ from the actual software.**
- The contents of this manual are subject to change without prior notice as a result of continuing improvements to 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 dealer.
- Copying or reproducing any or all of the contents of this manual without YOKOGAWA's permission is strictly prohibited.

Trademarks

- Microsoft, Windows, and Windows NT are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- Adobe and Acrobat are trademarks of Adobe Systems Incorporated.
- Other product names are trademarks or registered trademarks of their respective holders.

Revisions

1st Edition: February 1999
2nd Edition: July 1999
3rd Edition: August 2000

Checking the Contents of the Package

Unpack the box and check the contents before operating the instrument. If the contents are not correct or missing or if there is physical damage, contact the dealer from which you purchased them.

Measurement Module

Check that the model name given on the name plate matches those on the order.

MODEL

Model	Suffix Code	Description
707261		WE7261 32-Bit Digital I/O Module
707262		WE7262 32-Bit Digital I/O Module (connectable with 707823/707824)
	/HE	English help message

NO.

When contacting the dealer from which you purchased the instrument, please quote the instrument No.
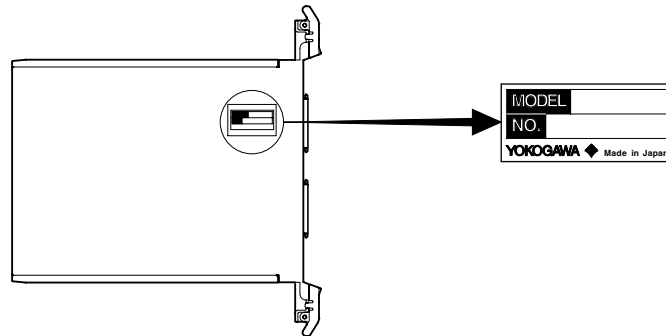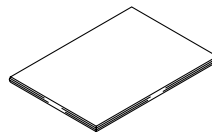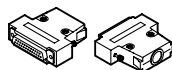

Standard Accessories

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

D-sub connector (25 pin, male) (2 pieces)   **User's Manual (1)**
                                                   IM707261-01E

Spare Parts for the Measuring Station (Sold Separately)

Name	Model
D-sub connector for I/O connection (25 pin, male)	AL1588JD/A1591JD

Optional Accessories (Sold Separately)

Name	Model	Description
16-bit input terminal box	707823	contact input for WE7262
16-bit output terminal box	707824	contact output for WE7262

How to Use This Manual

Structure of the Manual

This User's Manual consists of the following four chapters and an index.

Chapter	Title	Description
1	**Explanation of Functions**	Explains the system configuration and functions.
2	**Hardware Preparation**	Explains how to install the module into the measuring station and how to connect the input and output.
3	**Troubleshooting and Maintenance**	Explains the procedures for troubleshooting andself testing.
4	**Specifications**	Explains the specifications of the module.
Index		Index of contents.

Conventions Used in This Manual

Unit

k ......Denotes 1000. Example: 100 kHz

K .....Denotes 1024. Example: 720 KB

Displayed characters

Alphanumeric characters enclosed with [ ] usually refer to characters or settings that are displayed on the screen.

Symbols

The following symbol marks are used to attract the operator's attention.

|	
⚠	Affixed to the instrument. Indicates danger to personnel or to the instrument. The operator must refer to the User's Manual. The symbol is used in the User's Manual to indicate the reference.
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, or damage to the instrument.
Note	Provides information that is important for operating the instrument properly.

Contents

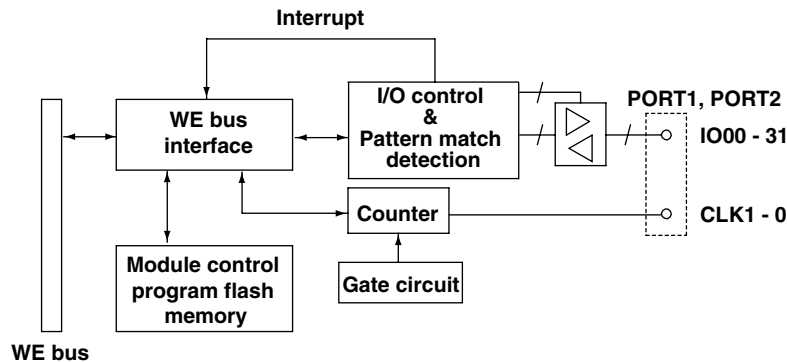**1**

2

3

4

Index

1.1   System Configuration and Block Diagram

System Configuration

The following is an example in which the 32-Bit Digital I/O Module WE7261/WE7262 is installed into the measuring station and the measuring station is connected to the PC with the optical fiber cable.
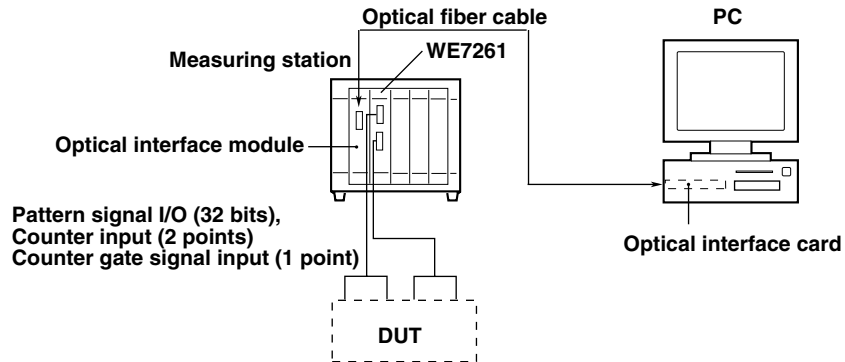
Block Diagram

Description of Operation

The 32-bit digital I/O module has 16 bits $\times$ 2 ports of I/pins and each bit can be set to function either as input or output.

The output pattern data that are passed to the measuring station from the PC via the communication interface are written to the output data register inside the module. These digital patterns are output from the pins that are set to function as output ports.

The digital pattern signal that is input to the pins (that are set to function as input ports) can be read by the PC through the communication interface.

The input pattern can also be compared against a preset pattern set by the PC. The result of the comparison can then be reported back to the PC. However, the WE7000 Control Software does not support this function. You can make use of this function by writing an original program using the WE Control API (sold separately).

In addition, this module has a counter function with a maximum operating frequency of 2 MHz. The counter I/O pins are allocated to each channel of each port. The counter can be controlled manually, using the module's internal timer or an external gate signal.

1.2   Operation Panel

The WE7000 Control Software that is installed in the PC is used to control the 32-Bit Digital I/O Module WE7261/WE7262. 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 the operations of these items, see the on-line help that is provided with the WE7000 Control Software.

Digital pattern input/output function

Select the format of the values used for setting and displaying

Set the input sampling interval

Start/stop input pattern measurement

Turn waveform monitor ON/OFF

Check when continuously measuring the input pattern

Update pattern

Input/output selection button (green: output, black: input)

Select Input/output (input values)

Set output pattern

Display input pattern

Counter function

Cntr tab

Select the start/stop method for the counter

Start/stop count

Set the time when measuring with the timer

Displays the count value of the count signal of port 1

Displays the count value of the count signal of port 2

Count overflow indicator (turns red during overflow)

# 1.3   Digital Pattern Input/Output Function

Selecting the Type of Values to Use for Setting and Displaying

Using the [Type] option button, select binary, octal, decimal, or hexadecimal for setting the input/output function and the output pattern and for displaying the input pattern.

Type
- ○ Binary
- ○ Octal
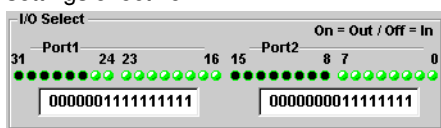- ○ Decimal
- ◉ Hex Decimal
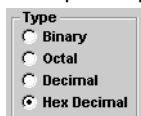
Selecting Input/Output

The digital signal I/O section is used for both input and output as shown in the figure below. The input and output functions are switched by enabling or disabling the output buffer. (Enable: output, disable: input)

Output buffer

PORT

I/O control

Enable/Disable

Input buffer
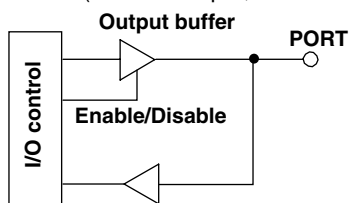
This circuit exists for each of the 32 bits, and you can individually select input or output. In the operation panel of the WE7000 Control Software, set 1's for the bits you wish to output and 0's for the bits you wish to input. Click the [Update] button to make the new settings effective.

I/O Select   On = Out / Off = In
Port1   Port2
31   24 23   16 15   8 7   0

0000001111111111   0000000011111111

Setting the Output Pattern

For the bits that are set to function as output, select "1" or "0." If you assign "1" to a bit that is set to function as an input, the value becomes "0" when the [Update] button is clicked. You specify the bits in the operation panel of the WE7000 Control Software as shown below.

Output

0000000000011000   0000000000101111

Displaying the Input Pattern

If you click the [Start] or [Update] button in the operation panel of the WE7000 Control Software, the current input pattern is displayed as in the figure below. For the bits that are set to function as output, the output values are displayed.

Input

1111110000011000   1111110000101111

Setting the sampling interval

If you selected the [Repeat] check box, then the input is measured at the specified sampling interval until the [Start] button is clicked again. The range of sampling interval available during continuous measurements is "10 ms to 10 s" (resolution: 0.01 s).

Sampling Interval
0.10 s
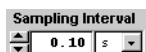
Displaying the input pattern using the waveform monitor
When making continuous measurements on the input pattern, a waveform monitor appears on the WE7000 Control Software as shown below. The following figure shows an example in which patterns of four bits are displayed in divided areas of the display.
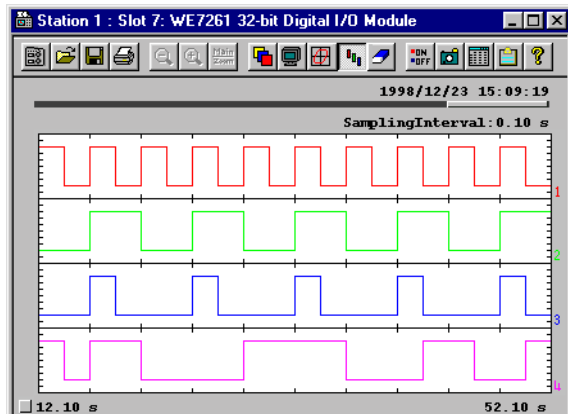
Saving the input pattern
When making continuous measurements on the input pattern, you can save the measured data by setting the save conditions in the dialog box of the WE7000 Control Software as shown below.
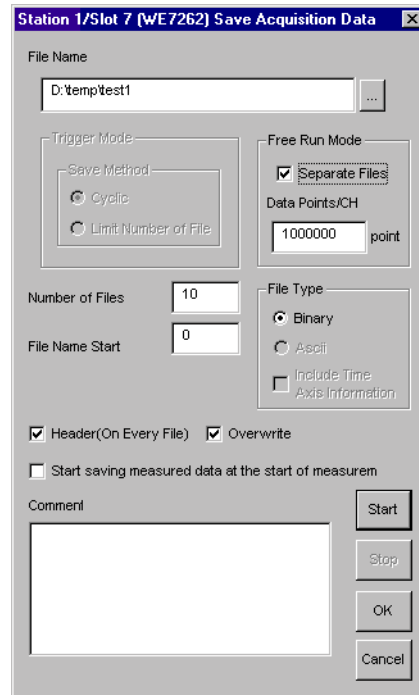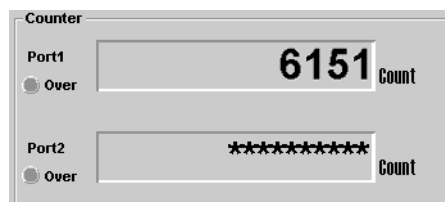

Pattern Match Detection

Detects whether the input pattern matches a preset pattern.
The detection is performed for every eight bits and interrupts are generated for each detection. However, this function is not supported by the WE7000 Control Software. You can make use of this function by writing an original program using the WE Control API (sold separately, model: 707741).

1.4   Counter Function

One channel of count input is provided for each input/output port.

The count value is displayed in the setting panel of the WE7000 Control Software. The maximum count is 4,294,836,224 (FFFE0000H).

```
Counter
Port1                                        6151  Count
 Over
Port2                                  **********  Count
 Over
```

Selecting the Start/Stop Method for the Counter

You can select from the following three methods to start/stop the counter on the WE7000 Control Software.

- Manual   : From the first time the [Start] button is clicked to the next time it is clicked.
- Timer   : The specified time period after the [Start] button is clicked. Enter the time from 1 ms to 600 s in steps of 0.1 ms in the [Gate Time] entry box.
- External gate (External) : During the time the external gate input signal is ON. After clicking the [Start] button, apply an external gate input signal. For the procedures on inputting the external gate input signal, see section 2.2, "Connecting the Input/Output Cable" (page 2-3).

```
Gate Mode   Timer
Gate Time        1.0000  s
```
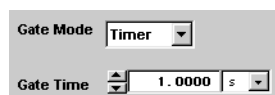
Note

When starting/stopping the counter using the external gate input signal, the count value may be off by ±1 count depending on the relative timing of the time base signal and the external gate input signal.

About the External Gate and Count Error

Depending on the relative timing of the time base signal and the external gate input signal, the count value may be off by ±1 count.

The error occurs in the following cases.

- When the counter is started when the time base signal is low and stopped when it is high
  Error: −1 (4 counts instead of 5)
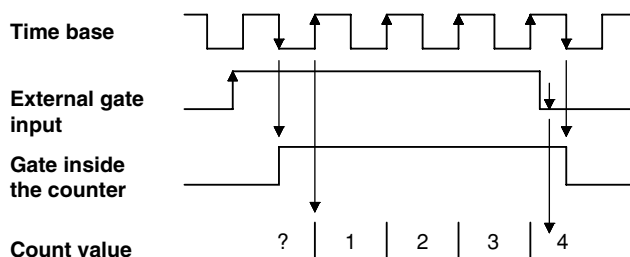
Time base

External gate
input

Gate inside
the counter

Count value   ?   1   2   3   4

- When the counter is started when the time base signal is low and stopped when it is low
  Error: −1 (3 counts instead of 4)

Time base	
External gate input	
Gate inside the counter	
Count value	? | 1 | 2 | 3 | 4
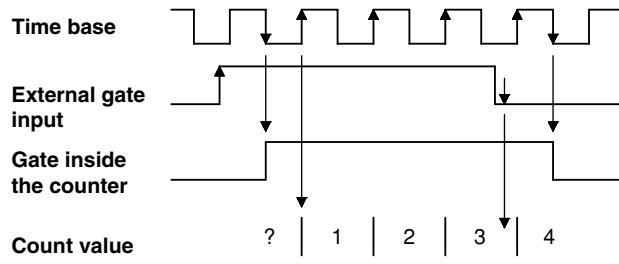
- When the rising edge of the next time base signal appears less than 2 ms after the falling edge of the external input
  Error: +1 (N +1 counts instead of N)

Time base	2 ms
External gate input	
Gate inside the counter	
Count value	N −2 | N −1 | N
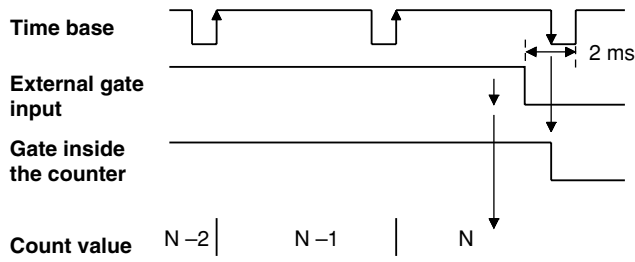
1.5   Other Functions

Controlling the Timing of the Start of the Measurement (Arming)

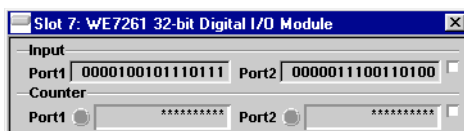If [Repeat] check box of the [Start] button is selected for making continuous measurements, the start timing of the measurement can be controlled by the arming signal that is set in the trigger source/time base source setting dialog box.

When the arming signal bus is connected to the measurement module in the trigger source/time base source setting dialog box, clicking the [Start] button on the operation panel causes the module to enter the arming signal wait state. The measurement starts when the arming signal becomes [True].

For details on 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 (IM7070001-01E).
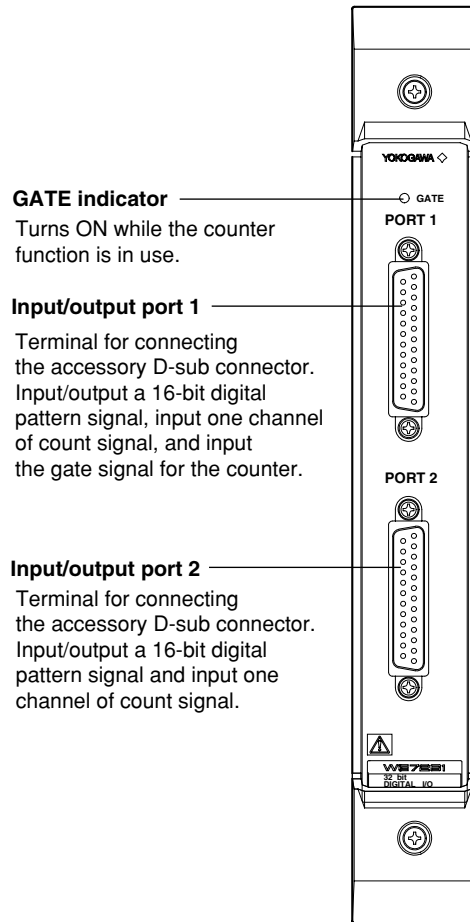
Switching between the Operation Panel/Monitor Panel

If you do not have to control the settings, you can switch the operation panel to a monitor panel that just displays the measured values as shown below.

1.6 Names and Functions of Sections

Front Panel

GATE indicator
Turns ON while the counter
function is in use.

Input/output port 1

Terminal for connecting
the accessory D-sub connector.
Input/output a 16-bit digital
pattern signal, input one channel
of count signal, and input
the gate signal for the counter.

Input/output port 2

Terminal for connecting
the accessory D-sub connector.
Input/output a 16-bit digital
pattern signal and input one
channel of count signal.

GATE

PORT 1

PORT 2

WE7251
32 bit
DIGITAL I/O

2.1   Installing the Module into the Measuring Station

Preparing to Install the Module

When the measuring station is first purchased, each slot is covered with a cover plate as shown in the figure below. Verify that the power supply is not connected to the measuring station, then loosen the module attachment screws (2 locations) and remove the cover plate from the slot where the module is going to be installed. Please note that the slot on the left end is dedicated to the communication module and therefore this module cannot be installed there.

* The following figure shows an example of the measuring station WE400.

Slot dedicated to the optical interface module

Slots for other modules

Module attachment screw

Cover plate

Module attachment screw
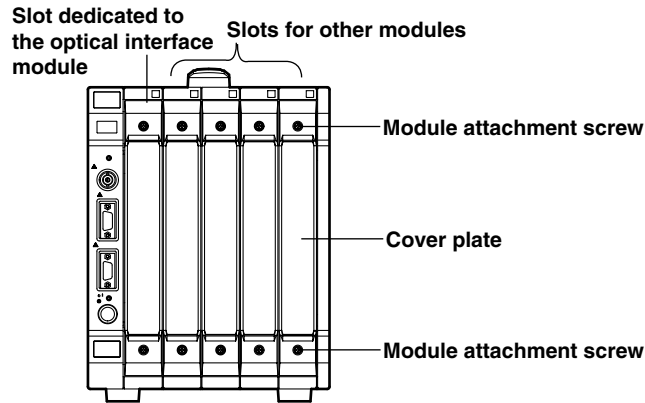
Installing the Digital I/O Module

WARNING

• Make sure to fasten the top and bottom attachment screws. If you connect the input signal cable without fastening the attachment screws, the protective grounding of the measuring station provided by the power cord is compromised and may cause electric shock.

CAUTION

• To avoid damaging the instrument when installing modules, make sure to turn OFF the standby power switch of the measuring station.
• Be careful not to get your fingers caught in the ejection lever when inserting the module. In addition, do not put your hand inside the slot, because there are protrusions along the module guide that may injure your fingers.
• Do not remove the cover plates from unused slots. It can cause overheating and malfunction. The cover plates are also needed to minimize the influence of electromagnetic interference.

Insert the module along the guide rail of the slot from which you removed the cover plate. Insert 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.
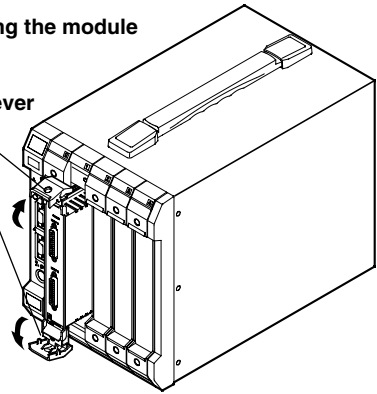
<There is an illustration on the next page.>
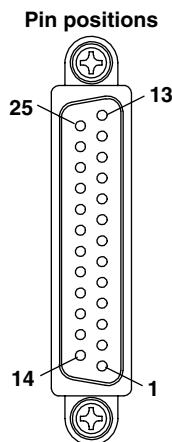
Module attachment screw

Module attachment screw
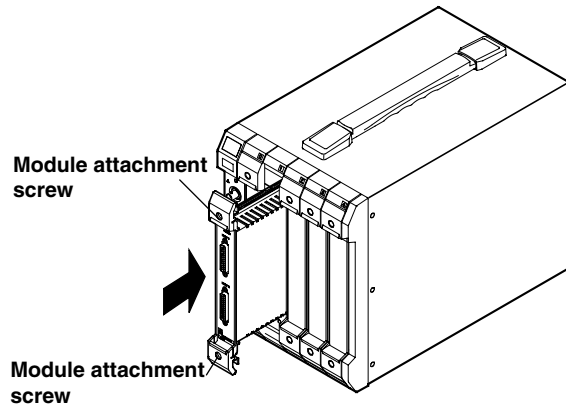
• **When removing the module**

Ejection lever

2.2   Connecting the Input/Output Cable

Connecting the Accessory D-sub Connector

Pin positions

25 — 13

14 — 1

The D-sub connectors (25 pins, male) are connected to the two I/O ports, "PORT 1" and "PORT 2," on the front panel of the module.The pin assignments of the I/O ports are as follows.
The power supply terminal "VPW" exists only on the WE7262.

• Signal name and function

|			
IO00 to IO31	: Digital pattern input/output	GND	: Ground
CLK0, CLK1	: Count input	NC	: Not used (Do not connect)
GATE	: Gate signal input for the counter function	VPW	: External power supply

• Port 1 pin assignments

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	GND	11	IO26	21	IO25
2	CLK0	12	IO28	22	IO27
3	GND	13	IO30	23	GND
4	IO16	14	GND/VPW	24	IO29
5	IO18	15	GATE	25	IO31
6	GND	16	IO17		
7	IO20	17	IO19		
8	IO22	18	IO21		
9	IO24	19	GND		
10	GND	20	IO23		

• Port 2 pin assignments

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	GND	11	IO10	21	IO09
2	CLK1	12	IO12	22	IO11
3	GND	13	IO14	23	GND
4	IO00	14	GND/VPW	24	IO13
5	IO02	15	NC	25	IO15
6	GND	16	IO01		
7	IO04	17	IO03		
8	IO06	18	IO05		
9	IO08	19	GND		
10	GND	20	IO07		

I/O Circuit

<div align="center">

⚠
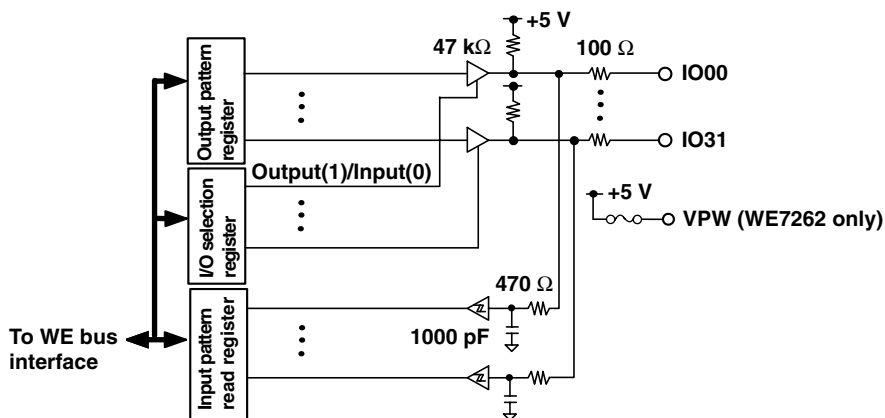
CAUTION

</div>

• Applying a voltage exceeding the maximum input voltage may damage the input section.

Specifications of the digital pattern signal input/output section

| Parameter	Specification
Maximum output current	±3.2 mA
Output voltage	H level @ −3.2 mA: 3.8 V min, L level @ 3.2 mA: 0.5 V max
Input voltage	H level: 2.0 V min, L level: 0.6 V max
Maximum allowable input voltage	−3 V to +8 V (Overvoltage Category: CAT I and II)
Output impedance	Approx. 100 Ω
Input impedance	Approx. 47 kΩ
Input/output method	Non-isolated unbalanced

Specifications of the counter section

Parameter	Specification
Number of input channels	2
External input frequency	2 MHz max
Minimum input pulse width	100 ns
Input voltage	H level: 2.0 V min, L level: 0.4 V max
Maximum allowable input voltage	−3 V to +8 V (Overvoltage Category: CAT I and II)
Input impedance	Approx. 47 kΩ
Input format	Non-isolated unbalanced

Specifications of the external gate input section

Parameter	Specification
Number of inputs	1
Input pulse width	1 ms or more
Input voltage	H level: 2.0 V min, L level: 0.4 V max
Maximum allowable input voltage	−3 V to +8 V (Overvoltage Category: CAT I and II)
Input impedance	Approx. 47 kΩ
Input format	Non-isolated unbalanced

Attaching the Connector

To securely connect the D-sub connector, make sure to tighten the attachment screws. When connecting the 16-Bit Digital Input Terminal Box (707823) or the 16-Bit Digital Output Terminal Box (707824) to the 32-Bit Digital I/O Module WE7262, see the user's manual that came with each terminal box.

Connector attachment screw
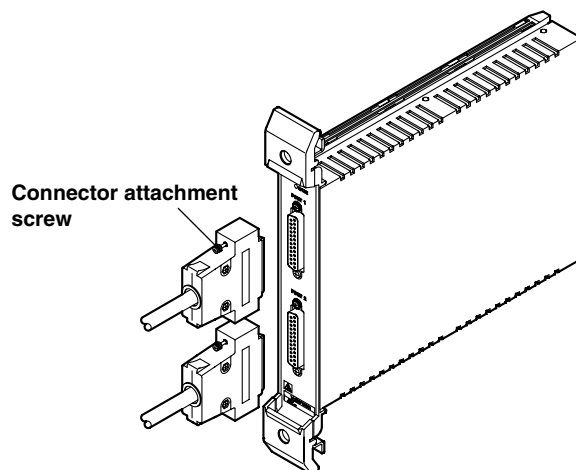
Note

To reduce the effects of electro-magnetic interference, use shielded cables to connect to the input and output ports. If you are connecting the accessory D-sub connector to the input/output port, connect the cable shield to the connector housing.

3.1 Troubleshooting

- If servicing is necessary, or if the instrument is not operating correctly after performing the following corrective actions, contact your nearest YOKOGAWA dealer.
- To verify that the module is operating correctly, perform the self test as described on the next page.

Problem	Probable Cause/Corrective Action	Reference
Module does not operate.	Check to see 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, *
Measured values are not correct.	Check whether 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.	4-4
The waveform monitor is not displayed.	Check that the [Waveform monitor ON/OFF] button, that is located to the right of the [Start] button on the operation panel, is turned ON.	1-2

* See the WE7000 User's Manual (IM 707001-01E).

3

Troubleshooting and Maintenance

3.2 Self Test

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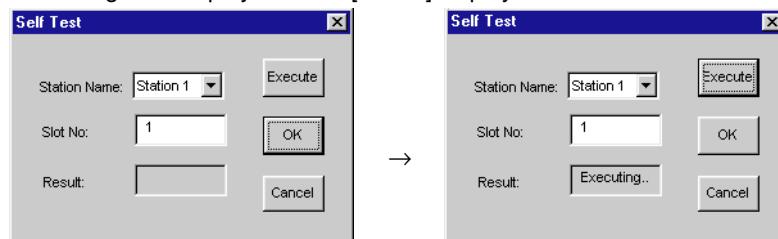
Executing Self Test

1. Select [Self Test] from the [System] menu of the WE7000 Control Software.

2. In the [Self Test] dialog box that appears, select the station name and enter the slot number corresponding to the module, and click the [Execute] button.
   "Executing..." is displayed in the [Result] display box.

Verifying Test Results

If a value other than "0" is displayed in the "Result" display box of the "Self Test" dialog box, the module is probably malfunctioning. Please contact your nearest YOKOGAWA dealer.

3.3 Maintenance

Maintenance of Parts

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

4.1 Performance Specifications

Input/Output Section

Number of input/output points

32 points

Maximum output current

±3.2 mA

Output voltage

H level @–3.2 mA: 3.8 V min

L level @3.2 mA: 0.5 V max

Input voltage

H level: 2.0 V min

L level: 0.6 V max

Maximum allowable input voltage

–3 V to +8 V (Overvoltage Category: CAT I and II)

Sampling interval during continuous measurement of input pattern[1]

10 ms to 10 s

Output impedance

Approx. 100 Ω

Input impedance

Approx. 47 kΩ

Input format

Non-isolated unbalanced

Connector type

D-sub type 25 pins (female)

Pattern match detection[2]

Detection bit: Compares every 8 bits of input, generates up to 4 interrupts

Chattering elimination: ON/OFF selectable. When turned ON, eliminates bouncing of frequencies less than or equal to 1 ms

Counter Section

Number of input channels

2

External input frequency

2 MHz max

Minimum input pulse width

100 ns

Input voltage

H level: 2.0 V min

L level: 0.4 V max

Maximum allowable input voltage

–3 V to +8 V (Overvoltage category: CAT I and II)

Input impedance

Approx. 47 kΩ

Input format

Non-isolated unbalanced

Maximum number of counts

FFFE0000H (4294836224)

Overflow detection

Counter overflow detectable

Control (Count enable)

- Manual gate
- Internal gate: Control with the timer
  - Selectable range: 1 ms to 600 s
  - Resolution: 0.1 ms
  - Accuracy[*3]: $\pm$(0.02% of setting + 1 μs)
- External gate: Control with external signal, H active, common to both input channels
  - Number of inputs: 1
  - Input pulse width: 1 ms or more

External Power Supply (WE7262 Only)

Supplied voltage

+5 V +5/-10%

Supplied current

0.2 A maximum (for each input/output connector)

Protective function

Cut off during short circuit, automatically resume when no longer a short circuit

*1 When making continuous measurements on four or more WE7141/WE7161/WE7162 modules, the sampling interval of those modules must be set greater than equal to 20 ms. Otherwise, measurements may fail.

*2 Not supported by the WE7000 Control Software. Can be used with the WE Control API (sold separately, model: 707741).

*3 Measurement value obtained under standard operating conditions.

4.2 Default Values (Factory Default Settings)

Digital pattern input /output settings

Type (type of values to use for setting and displaying): Hex Decimal

Sampling Interval (input/output sampling interval): 0.1 s

Port (selection of input/output): 0x00000000 (all bit input)

Output (output bit data): 0x00000000

Repeat (input pattern during continuous measurements): On

Counter function settings

Gate Mode (counter start/stop method): Timer

Gate Time (time when measuring with the timer): 1 s

4.3 General Specifications

Safety Standards

Complies with CSA C22.2 No.1010.1 and EN61010-1, conforms to JIS C1010-1
- Overvoltage Category CAT I and II[*1]
- Pollution Degree 1 and 2[*2]

EMC Standards

Emission

Complying Standard

EN55011 Group 1 Class A

This product is a Class A (for commercial environment) product. Operation of this product in a residential area may cause radio interference in which case the user is required to correct the interference.

Immunity

Complying Standard

EN50082-2

Testing Condition

• Connect with the 3 m, 25 pin shielded cable.

• Input signal : 2 MHz (for counter input of Port 1 and 2)

Standard Operating Conditions

Temperature

23°C ±2°C, Humidity: 50 ±10% RH

Power voltage/frequency error

Within 1% of rating, after the warmup time has passed

Warm-up Time

At least 30 minutes

Operating Conditions

Same as those of the measuring station

Storage Conditions

Temperature: –20 to 60°C

Humidity: 20 to 80% RH

Power Consumption

WE7261: 1.2 VA (Typical value at 100 V/50 Hz[*3])

WE7262: 4 VA (Typical value at 100 V/50 Hz[*3])

Weight

Approx. 0.6 kg

External Dimensions

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

Number of Used Slots

1

Standard Accessories

User's Manual (1), D-sub connector (25 pin, male) (2 pieces)

Optional Accessories

A1588JD/A1591JD   D-sub connector for I/O connection (25 pin, male)

[*1] Overvoltage Categories define transient overvoltage levels, including impulse withstand voltage levels.
Overvoltage Category I: Applies to equipment supplied with electricity from a circuit containing an overvoltage control device.
Overvoltage Category II: Applies to equipment supplied with electricity from fixed installations like a distribution board.
[*2] Pollution Degree: Applies to the degree of adhesion of a solid, liquid, or gas which deteriorates withstand voltage or surface resistivity.
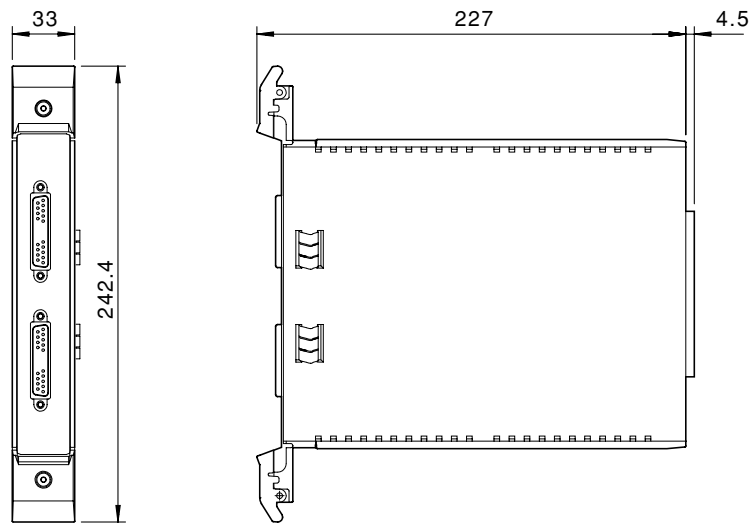Pollution Degree 1: Applies to closed atmospheres (with no, or only dry, non-conductive pollution).
Pollution Degree 2: Applies to normal indoor atmospheres (with only non-conductive pollution).
[*3] Typical value represents a typical or average value. It is not strictly guaranteed.

4.4 Dimensional Drawings

32-Bit Digital I/O Module (WE7261/WE7262)

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

4

Specifications

▌Index

Index

Index