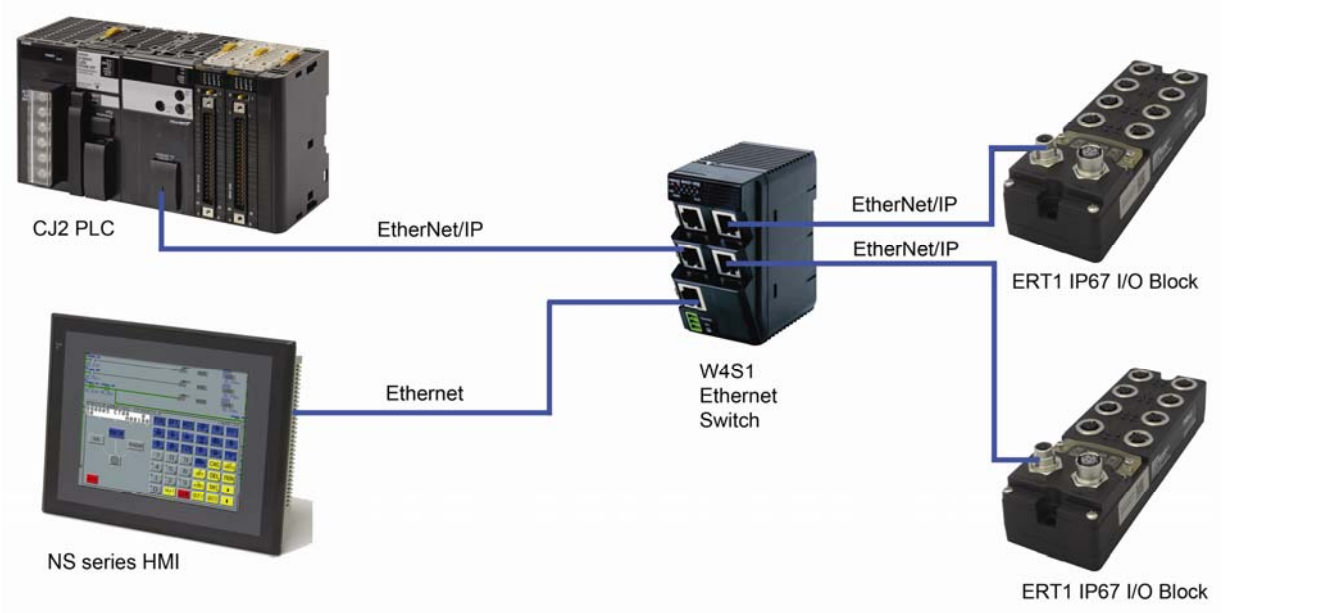
EtherNet/IP I/O Blocks, IP67 Rated Environmental Resistance

ERT1-□□16CH-1

IP67 Rated EtherNet/IP Slave I/O Blocks With Short- and Open-Circuit Detection

- **SmartClick D-coding M12 connectors** – The “click” after 1/8 turn lets you know the watertight connection is good. This connector used for each I/O, power, and the Ethernet connection**.**
- **Tag Data Links** – Multi-vendor communications using CIP messaging make it easy to talk to Omron and 3rd party masters.
- **Auto Baud Rate** – automatically detects the baud rate of the connected switch, simplifies installation.
- **I/O Power Monitor** – the I/O block detects the field sensor I/O power and can provide fault status back to the master for easy maintenance.
- **Short- and Open Circuit Detection with status and error LEDs for each input/output** – allows for very fast troubleshooting of broken sensors, cables, or output devices.
- **Manual Node Address Setting** – rotary switches support fast maintenance, easy swap out.
- **IP67 Rated** – for mounting directly on the machine, no panel required.
- **EtherNet/IP conformance tested** – for interoperability with devices from other brands.
- **16-Point Input and Output Blocks** with M12 SmartClick D-coding connectors; combine with Omron XS5W connector cables.
- **International Approvals:** CE, cULus

System Configuration



Diagnostics that Pinpoint Wiring Shorts and Sensor Errors in Seconds Not Hours

The ERT1 I/O Block detects shorts at the sensor and prevents the short from affecting the rest of the inputs. It also has LEDs to tell you which input or output is shorted. It also has I/O bits back to the master telling you if an input or output is shorted or open (broken sensor or broken wire to sensor). Each group of 16 I/O has its own power terminals and the communications module has its own power terminals. This way the module can also tell you if power to the I/O terminals is lost.

The LEDs are yellow for on, red for shorted, red flashing for disconnected, and off for off. The short and open circuit detection can be enabled or disabled for each input/output.

Ordering Information

Inputs	Outputs	I/O type	Input current	Output current	Model
16	---	PNP	6mA at 24 VDC max.	---	**ERT1-HD16CH-1**
---	16	PNP	---	0.5A/point; 4.0A/common	**ERT1-WD16CH-1**

Slave I/O Block Compatibility with Omron Controllers

PLC Type	ERT1-HD16CH-1	ERT1-WD16CH-1
CJ2M-CPU3□	Yes	Yes
CJ2H-CPU6□-EIP	Yes	Yes
CJ1, NSJ with CJ1W-EIP21	Yes	Yes
CS1 with CS1W-EIP21	Yes	Yes
NJ501-1□00	Yes	Yes
CP1E	No	No
CP1L	No	No
CP1H	No	No

Notes:
1) All units require a 24 VDC power supply.
2) Minimum current for disconnection detection is 0.2 mA.
3) Maximum current for short circuit detection is 50 mA/point min.
4) Shorting of one input or output does not affect the rest of the inputs or outputs.
5) Short-circuit and disconnection detection can be turned on for each I/O independently.

Status Areas

Generic Status Area

Generic Status Area which is Tag Set Input_100.
The Digital I/O Slave Unit's Generic Status Area contains the following 16 bits.

Bit	Content	Description
00	I/O Power Supply Status Flag OFF: I/O power is ON ON: I/O power is not ON	Turns ON when I/O power is not being supplied.
01	Reserved	---
02	Reserved	---
03	Reserved	---
04	Power or Load short-circuit detection flag: OFF: Normal ON: Short-circuit	Turns ON when there is a short in the power supply or load connection to the connected devices, including wiring mistakes and connected device failure.
05	Disconnection flag; OFF: Connected ON: Disconnected	Turns ON when the sensor power supply is not connected or the load is disconnected due to a wiring error, failure in the connected device, etc.
06	Reserved	---
07	Reserved	---
08	EEPROM data error flag: OFF: Normal ON: Error occurred	Turns ON when there is an error in the EEPROM data.
09	Reserved	---
10	Reserved	---
11	Reserved	---
12	Reserved	---
13	Reserved	---
14	Reserved	---
15	Reserved	---

I/O Status Area

I/O Status Area which is Tag Set Input_135.
The I/O Status Area for a Digital I/O Slave Unit consists of the following 8 bytes (64 bits). The I/O Status Area indicates the short-circuit and disconnection error status for each terminal.

Byte offset	Data							
	Bit 07	**06**	**05**	**04**	**03**	**02**	**01**	**00**
0	Power or Load Short-circuit Detection Flags for Terminal Block 1							
	07	06	05	04	03	02	01	00
1	Power or Load Short-circuit Detection Flags for Terminal Block 1							
	15	14	13	12	11	10	09	08
2	Power or Load Short-circuit Detection Flags for Terminal Block 2							
	07	06	05	04	03	02	01	00
3	Power or Load Short-circuit Detection Flags for Terminal Block 2							
	15	14	13	12	11	10	09	08
4	Disconnection Flags for Terminal Block 1							
	07	06	05	04	03	02	01	00
5	Disconnection Flags for Terminal Block 1							
	15	14	13	12	11	10	09	08
6	Disconnection Flags for Terminal Block 2							
	07	06	05	04	03	02	01	00
7	Disconnection Flags for Terminal Block 2							
	15	14	13	12	11	10	09	08

16 input module

There are 16 inputs which are input Tag Set Input_5.

16 output module

There are 16 outputs which are input Tag Set Output_35.

Note: All of the open and short-circuit status bits are mapped in one of the I/O maps which allows the user to monitor I/O and status bits using polled I/O instead of having to use explicit messages. This makes getting diagnostic data much easier.

Specifications

ERT1-HD16CH-1 - 16-point Transistor Input Unit, IP67 Environmental Resistance

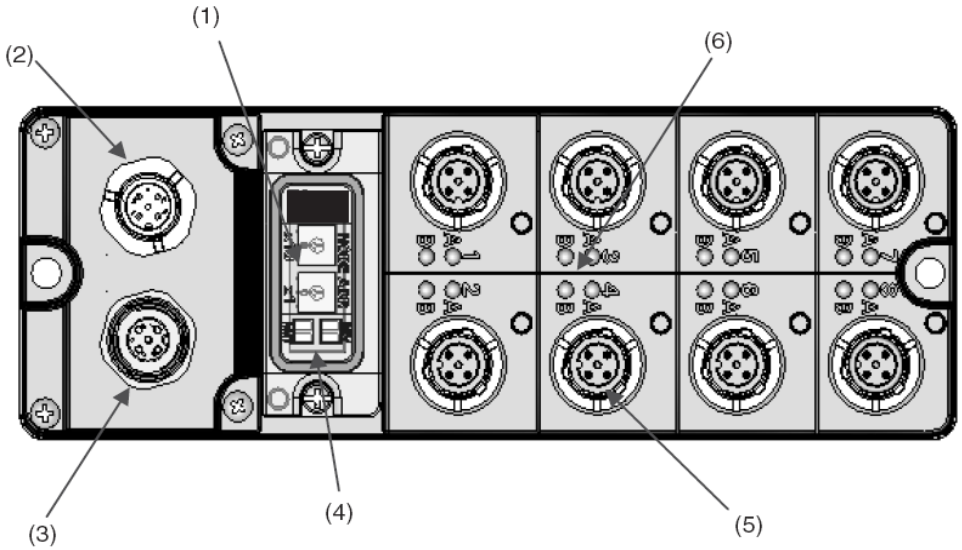
Item	Specifications
Input points	16 points
Internal I/O common	PNP
ON voltage	15 V DC minimum (between each input terminal and 0 V)
OFF voltage	5 V DC max. (between each input terminal and 0 V)
OFF current	1.0 mA max.
Input current	6.0 mA max. at 24 V DC 3.0 mA max. at 17 V DC
ON-delay time	1.5 ms max.
OFF-delay time	1.5 ms max.
Number of circuits	16 points with one common circuit
Isolation method	Photocoupler isolation
Input indicators	LEDs (yellow)
Power supply short-circuit protection	Operates at 50 mA/point minimum
Disconnection detection	Operates at 0.2 mA/point maximum
Current consumption	Communications power supply (including internal circuits): 110 mA max.
Connection forms	SmartClick M12 connector: Omron XS5□ (connectors lock easily with 1/8 of a turn)
Mounting	Through-hole mounting
Weight	445 g max.
Standard accessories	None

ERT1-WD16CH-1 - 16-point Transistor Output Unit, IP67 Environmental Resistance

Item	Specifications
Output points	16 points
Internal I/O common	PNP
Output current	0.5 A/point, 4.0 A /common
Residual voltage	1.2 V max. (0.5 A DC, between each output terminal and the V terminal)
Leakage current	0.3 mA max. (24 V DC, between each output terminal and the V terminal)
ON-delay time	0.5 ms max.
OFF-delay time	1.5 ms max.
Number of circuits	16 points with one common circuit
Isolation method	Photocoupler isolation
Output indicators	LEDs (yellow)
Power supply short-circuit protection	Operates when output current is exceeded.
Disconnection detection	Operates at current consumption of 3 mA/point max. (Not detected at 3 mA or less.)
Current consumption	Communications power supply (including internal circuits): 120 mA max.
Connection forms	SmartClick M12 connector: Omron XS5□ (connectors lock easily with 1/8 of a turn)
Mounting	Through-hole mounting
Weight	435 g max.
Standard accessories	None

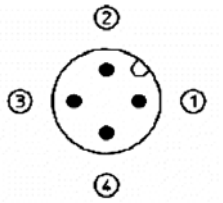
Component Names and Functions

ERT1-HD16CH-1 - 16-point Transistor Input Unit, IP67 Environmental Resistance



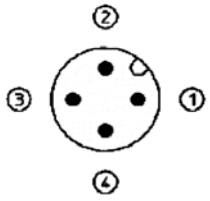
(1) Rotary Switches
These switches are used to set the node address

(2) Ethernet Connector
The network communications cable is connected to this connector.
This is a SmartClick D-coding M12 connector (connector that locks easily with 1/8 of a turn).



Pin	Signal
1	TD+
2	RD+
3	TD-
4	RD-

(3) Power Supply Connector
The power supply is connected to this connector.
This is a SmartClick D-coding M12 connector (connector that locks easily with 1/8 of a turn).



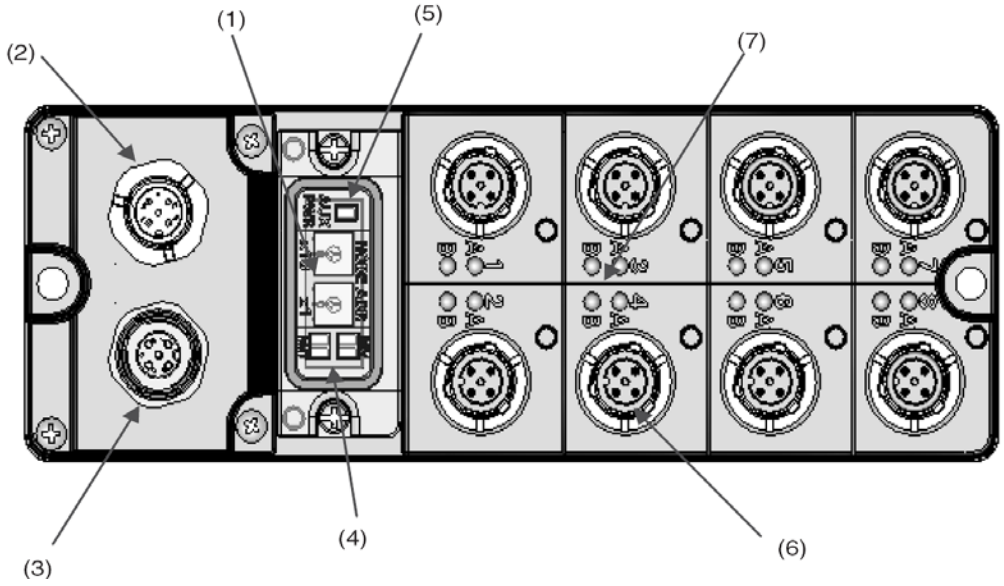
Pin	Signal
1	V+ (24 V: for internal circuits and inputs)
2	NC
3	V- (0 V: for internal circuits and inputs)
4	NC

(4) Communications Indicators: MS and NS
These indicators show the Unit communications status and network communications status.

(5) Input Connectors
The input devices are connected to these connectors.

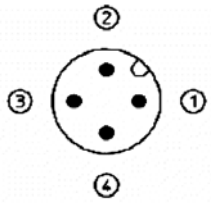
(6) Input Indicators
These indicators show the ON/OFF status of the inputs and the error status of connected devices.

ERT1-WD16CH-1 - 16-point Transistor Output Unit, IP67 Environmental Resistance



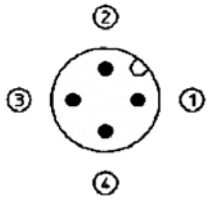
(1) Rotary Switches
These switches are used to set the node address

(2) Ethernet Connector
The network communications cable is connected to this connector.
This is a SmartClick D-coding M12 connector (connector that locks easily with 1/8 of a turn).



Pin	Signal
1	TD+
2	RD+
3	TD-
4	RD-

(3) Power Supply Connector
The power supply is connected to this connector.
This is a SmartClick D-coding M12 connector (connector that locks easily with 1/8 of a turn).



Pin	Signal
1	V+ (24 V: for internal circuits and inputs)
2	NC
3	V- (0 V: for internal circuits and inputs)
4	NC

(4) Communications Indicators: MS and NS
These indicators show the Unit communications status and network communications status.

(5) Output Power Indicator
This indicator shows the status of the output power supply.

(6) Output Connectors
The output devices are connected to these connectors.

(7) Output Indicators
These indicators show the ON/OFF status of the outputs and the error status of connected devices.

Output Power Indicator

This indicator shows the status of the output power supply.

Indicator	Color	Status	Meaning (main error)
AUX (external power supply		Lit green.	Output power is being supplied.
		Not lit.	Output power is not being supplied.

Setting the Node Address

The rotary switches are used to set the lower digits of the IP address.

Setting method	Two hexadecimal digits
Setting range	01 to FE

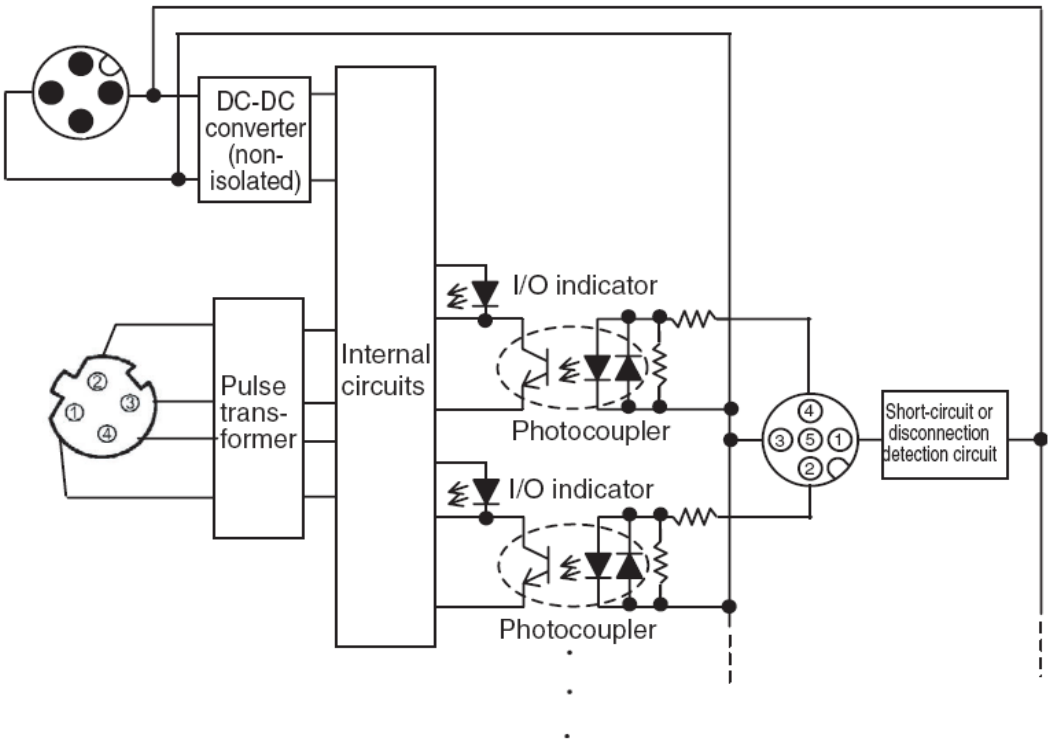
Rotary Switch Settings

00 hex: BOOTP or tool setting enabled (factory setting)
01 to FE hex: Setting on rotary switches is lower 8 bits of IP address.
(Default setting of upper 24 bits: 192.168.250.)
FF hex: Restores default setting.

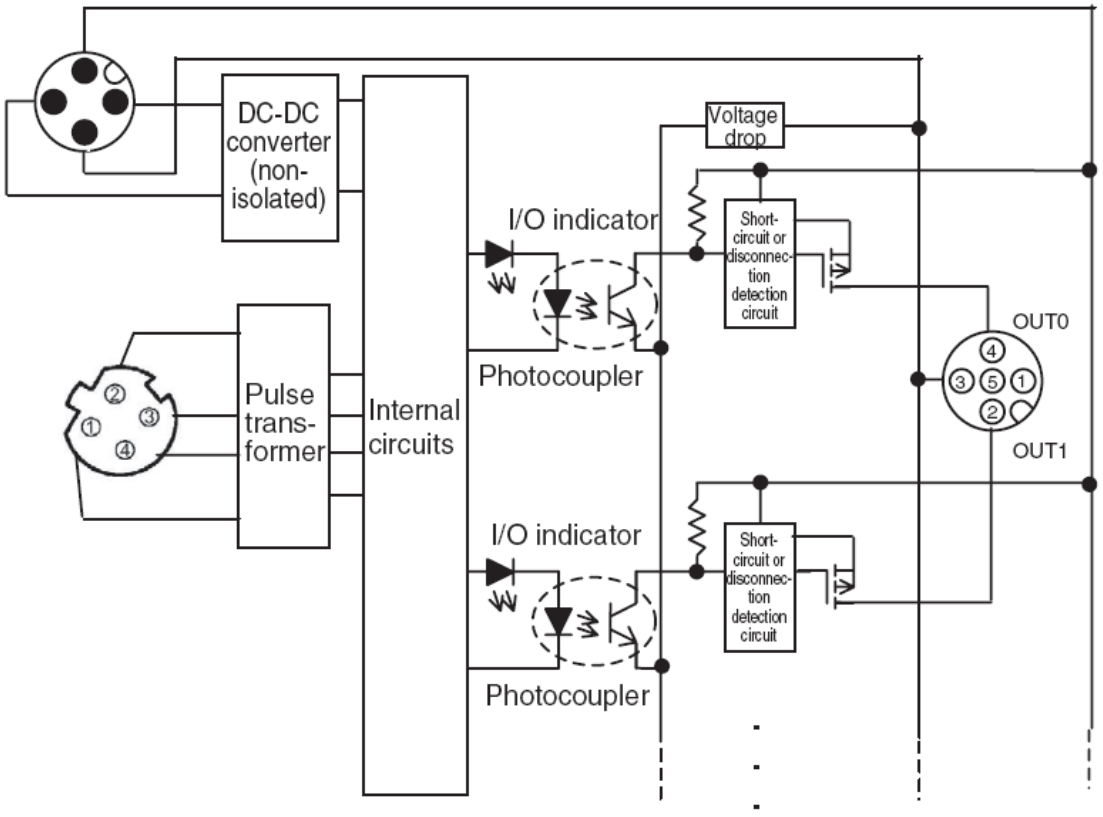
(To restore the default setting, set the switches to FF hex, cycle the power supply, and then set the switches to 00 hex.)

Internal Circuits

ERT1-HD16CH-1 - 16-point Transistor Input Unit, IP67 Environmental Resistance

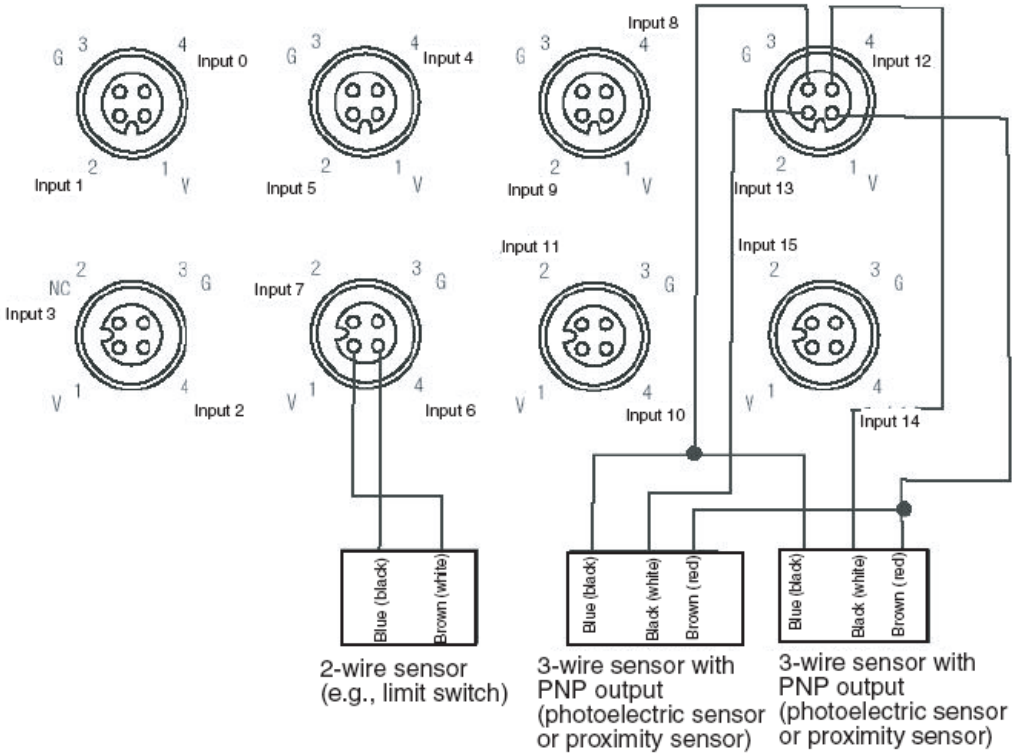


ERT1-WD16CH-1 - 16-point Transistor Output Unit, IP67 Environmental Resistance

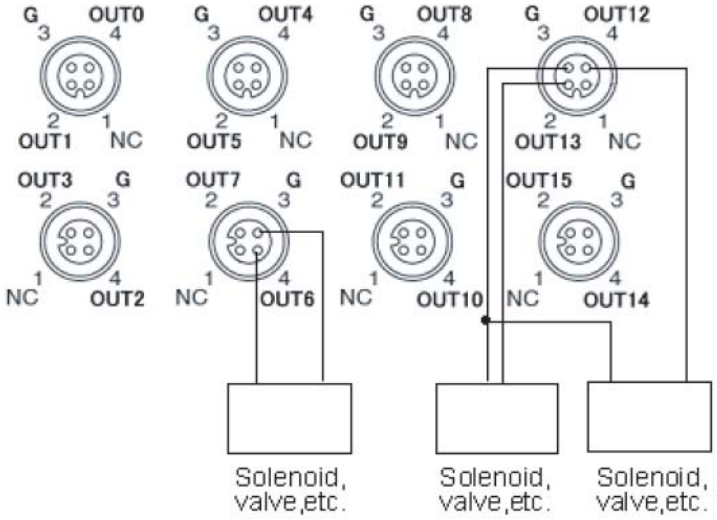


Wiring

ERT1-HD16CH-1 - 16-point Transistor Input Unit, IP67 Environmental Resistance

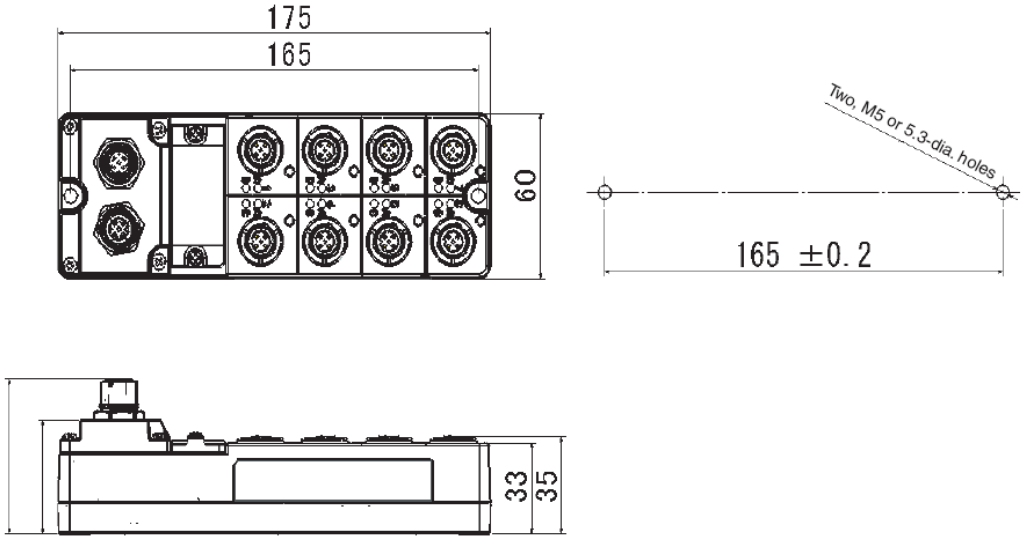


ERT1-WD16CH-1 - 16-point Transistor Output Unit, IP67 Environmental Resistance



Dimensions

(Unit: mm)



Features

These functions are common to all EtherNet/IP Slave Units as are the procedures for using these functions.

Automatic Baud Rate Detection

The EtherNet/IP Slave Units are automatically set to the same baud rate as the hub. It is not necessary to set the baud rate separately for any Slave Unit. The baud rate is set when communications is established with the hub after the power is turned ON. The baud rate setting is stored in memory until the power is turned ON again or until the Master Unit baud rate setting is changed.

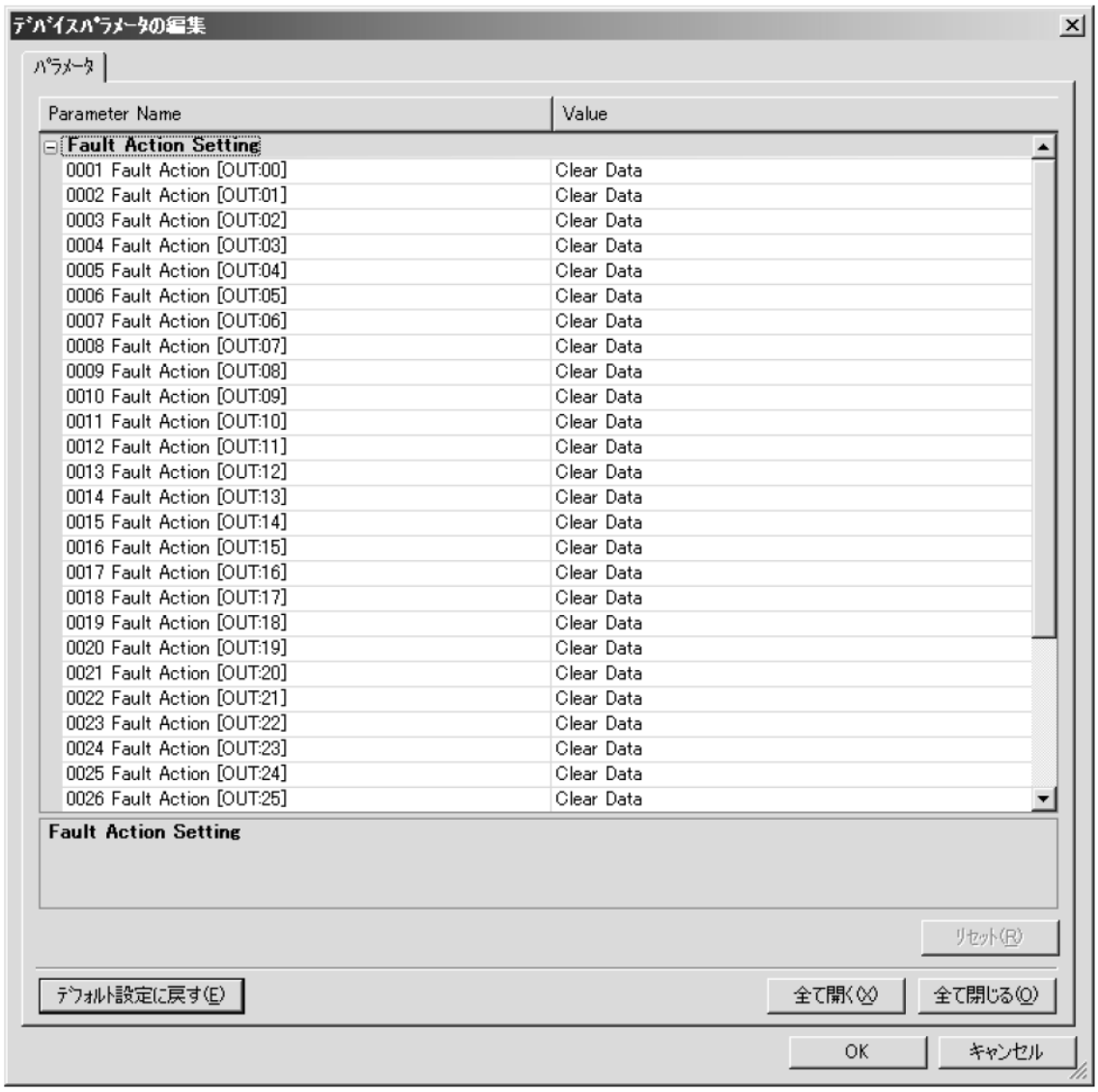
Hold/Clear Outputs

Output Units can be set to hold or clear outputs when an error occurs.

Procedure Using Network Configurator

1. Turn ON the power to the EtherNet/IP Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Edit Device Parameters Window to open the Configuration Window.
   (Alternatively, rightclick the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. The fault action (holding or clearing an output for a communications error) will be displayed for each output in the *Fault Action Setting* Group. Select *Hold Last State* or *Clear Data* for the terminals and then click the **OK** Button.

Clear	Clears all output data from the Master Unit to 0 when a communications error occurs.
Hold	Holds all output data from the Master Unit at its current status when a communications error occurs.



I/O Power Status Monitor

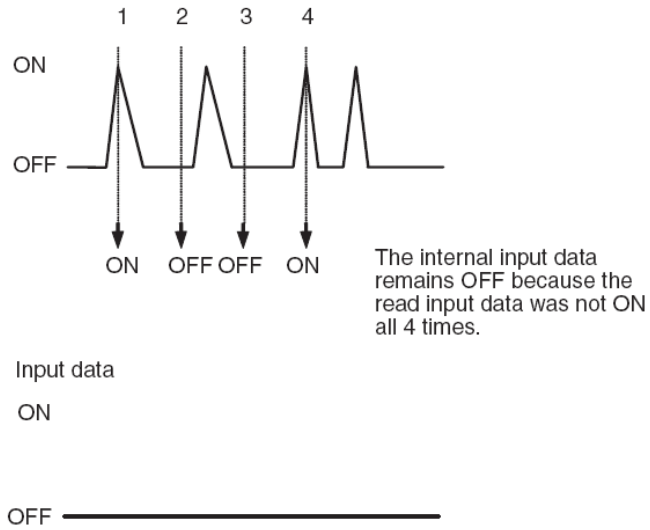
Outputs can be set to be held or cleared when an error occurs in the Output Unit.

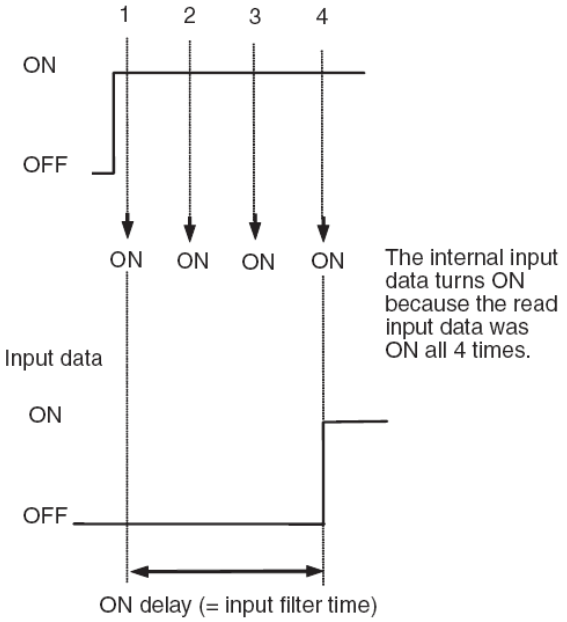
Input Filter (Input Units Only)

An input value is read more than once during a set time interval. The input value can be set to be enabled only when all the read values are the same. This function operates for all input points in one Slave Unit. The following settings are possible: No delay (no filter), or 4, 8, 16, 32, 64, 128, or 256 ms.

OFF-ON Delay

When the input data turns ON, the input data is read 4 times at a set time (1/4 of the time setting). The internal input data turns ON only when all four values are ON. The ON timing is delayed by the value of the input time constant.



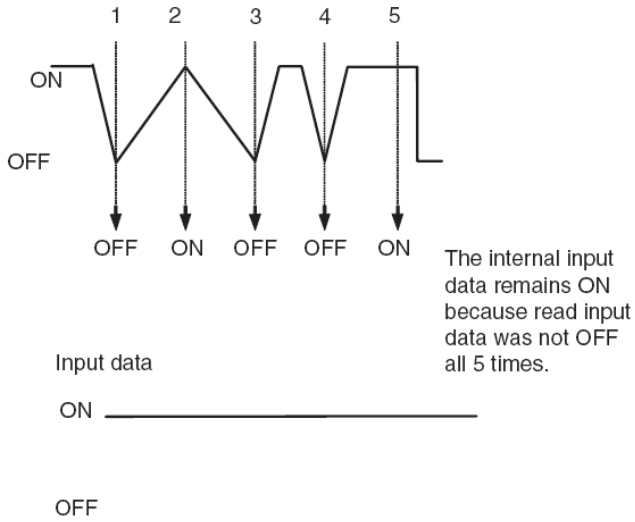


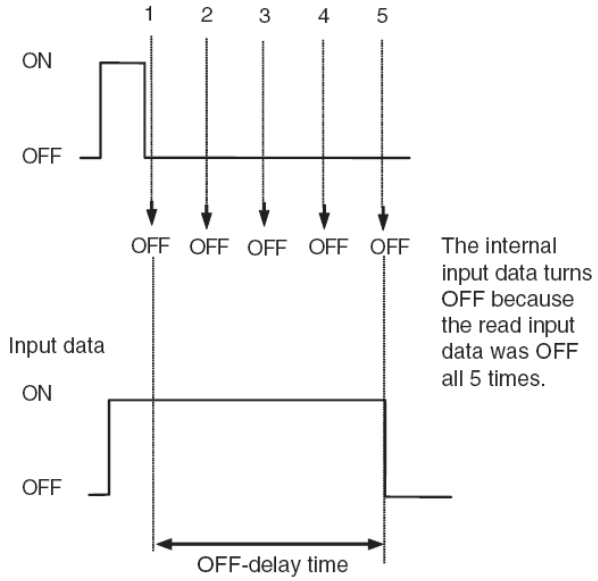
ON-OFF Delay

When the input data turns OFF, the input data is read 5 times at a set interval (1/5 of the OFF response time setting). The internal input data turns OFF only when all values are OFF. The OFF timing is delayed by the value of the OFF response time.

This function can also be used to implement an OFF delay.

To enable reading pulses shorter than the communications cycle time, set the OFF response time to a value longer than the communications cycle time. (The input may remain ON if the input pulse interval is too short.)





Settings Using the Network Configurator

1. Turn ON the power supply to the EtherNet/IP Slave Unit.
2. Double-click the icon of the Slave Unit to set in the Network Configuration Window to open the Edit Device Parameters Window. (Alternatively, rightclick the icon and select ***Parameters - Edit*** from the pop-up menu.)
3. Select an input in the *Input Point Group Setting* Group and set the Off-On Delay or On-Off delay from the pull-down menu.

Power Short-circuit Detection (Input)

This function monitors the sensor power supply current. If the current is 50 mA or higher per input contact, a power short-circuit is detected.

The Slave Unit I/O indicator can be used to check whether a power short-circuit has been detected. When a power short-circuit is detected, a flag in a status area in the Slave Unit turns ON to notify the Master Unit. When the cause of the short-circuit is removed, the Slave Unit is automatically reset, and the power output to the connector that had the short-circuit is turned ON again.

Load Short-circuit Detection (Output)

This function monitors the load current for the output section and detects an load short-circuit if the current per contact (or common) exceeds a specific value. When a load short-circuit is detected, all Unit outputs are turned OFF to prevent damage to the Unit's output circuits.

The I/O power for the Unit turns OFF if a short-circuit is detected for even just one of the contacts being used.

When a load short-circuit is detected, a flag in a status area in the Slave Unit turns ON to notify the Master Unit.

When the cause of the short-circuit is removed, the Slave Unit is automatically reset, and the power output to the connector for which the short-circuit was detected is turned ON again.

Related Products

Software

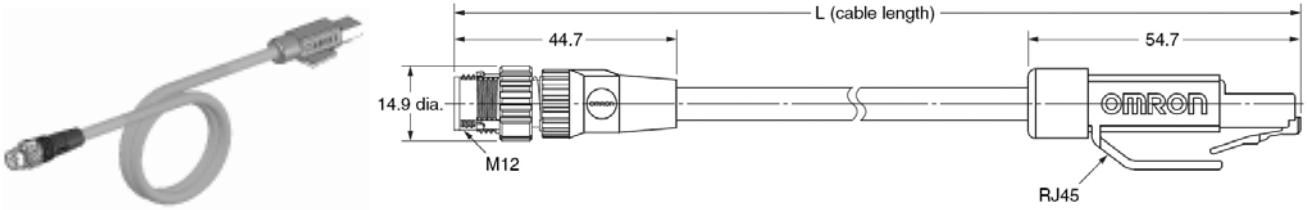
CX-One version 4 contains the Network Configurator for EtherNet/IP. CXONE-AL01C-V4 is the part number for a single license copy on CD.

Ethernet Switch Options

The following network devices are manufactured by OMRON for EtherNet/IP networks.

Function	Number of Ports	Error detection output	Model
Packet priority control (QoS): EtherNet/IP control data priority Failure detection: Broadcast storm, LSI error detection, 10/100Base-TX, Auto-Negotiation	3	None	**W4S1-03B**
	5	None	**W4S1-05B**
	5	Provided	**W4S1-05C**

Ethernet Cables



Description	Connector type	Cable length L	Model
Double-ended EtherCAT Cable with Straight Connectors	M12 on one end, RJ45 on the other	0.3 m	**XS5W-T421-AMC-K**
		0.5 m	**XS5W-T421-BMC-K**
		1 m	**XS5W-T421-CMC-K**
		2 m	**XS5W-T421-DMC-K**
		3 m	**XS5W-T421-EMC-K**
		5 m	**XS5W-T421-GMC-K**
		10 m	**XS5W-T421-JMC-K**
		15 m	**XS5W-T421-KMC-K**

Power and I/O Cables

Description	Model
Cable with Socket on one end – flying lead on the other, for Power Connection	
Cable, SmartClick, M12, Straight, Socket one end, 5 meter.	**XS5F-D421-G80-A**
Cable, SmartClick, M12, Straight, Socket one end, 10 meter.	**XS5F-D421-J80-A**
Cable with Sockets on both ends, for Power Connection and Sensor Connection	
Cable, SmartClick, M12, 2 meter, oil	**XS5W-D421-D81-P**
Cable, SmartClick, M12, 5 meter, standard	**XS5W-D421-G81-A**
Cable, SmartClick, M12, 10 meter, standard	**XS5W-D421-J81-A**
Y-Splitter for Power	
Y-Joint for power (all wires in parallel).	**XS5R-D426-5**
Y-Splitter for Inputs/Outputs (Two inputs or outputs per connector)	
Y-Joint for sensor (0.5 meter)	**XS5R-D426-B11-F**
Assembly Connector Plugs for Sensor Does not work if Y-Splitter used. See D36XS51208.pdf for more options	
Assembly Connector Plug, screw-on, 6 to 7mm, 5 pole	**XS5G-D5S9**
Assembly Connector Plug, screw-on, 4 to 5mm, 5 pole	**XS5G-D5S3**

Manuals

Description	Media	Publication number
ERT1 Series EtherNet/IP Slave Units Operation Manual	PDF	**W481-E1-02**
XS5 SmartClick Sensor I/O Connectors Data Sheet	PDF	**G016-E1-02**

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    a. Shipments shall be by a carrier selected by Omron; Omron will not drop ship except in "break down" situations.
    b. Such carrier shall act as the agent of Buyer and delivery to such carrier shall constitute delivery to Buyer;
    c. All sales and shipments of Products shall be FOB shipping point (unless otherwise stated in writing by Omron), at which point title and risk of loss shall pass from Omron to Buyer; provided that Omron shall retain a security interest in the Products until the full purchase price is paid;
    d. Delivery and shipping dates are estimates only; and
    e. Omron will package Products as it deems proper for protection against normal handling and extra charges apply to special conditions.
12. Claims. Any claim by Buyer against Omron for shortage or damage to the Products occurring before delivery to the carrier must be presented in writing to Omron within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products from Omron in the condition claimed.
13. Warranties. (a) Exclusive Warranty. Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied. (b) Limitations. OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) Buyer Remedy. Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty. See http://www.omron247.com or contact your Omron representative for published information.
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18. Miscellaneous. (a) Waiver. No failure or delay by Omron in exercising any right and no course of dealing between Buyer and Omron shall operate as a waiver of rights by Omron. (b) Assignment. Buyer may not assign its rights hereunder without Omron's written consent. (c) Law. These Terms are governed by the law of the jurisdiction of the home office of the Omron company from which Buyer is purchasing the Products (without regard to conflict of law principles). (d) Amendment. These Terms constitute the entire agreement between Buyer and Omron relating to the Products, and no provision may be changed or waived unless in writing signed by the parties. (e) Severability. If any provision hereof is rendered ineffective or invalid, such provision shall not invalidate any other provision. (f) Setoff. Buyer shall have no right to set off any amounts against the amount owing in respect of this invoice. (g) Definitions. As used herein, "including" means "including without limitation"; and "Omron Companies" (or similar words) mean Omron Corporation and any direct or indirect subsidiary or affiliate thereof.

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