Remote I/O Series

24 years of successful sales, more than 1200 thousand units sold!

Freely communicates with host devices **without needing extra programming.**

Network redundancy selectable.

Compliant with major open networks regularly used around the world.

See list on pages 6 and 7.

Feel free to contact us about customized **customer specifications.**

Line up of **10 series available**. Choose based on installation location and specific network needs.

Isolation applied to all input signals.

Great variety in supported input and output signals.
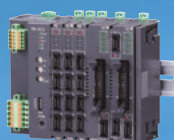
See page 8.

Multi-point Remote I/O
R9 Series

Multi-channel, Scalable Remote I/O
R3 Series

Compact, Scalable Remote I/O
R30 Series

Expandable, Compact Remote I/O
R7 Series

Slice Type, Scalable Remote I/O
R8 Series

Slice Type, Scalable Remote I/O
R80 Series

Compact, Multi-point Remote I/O
R1 Series

Compact, Scalable Remote I/O
R5 Series

Ultra-slim, Scalable Remote I/O
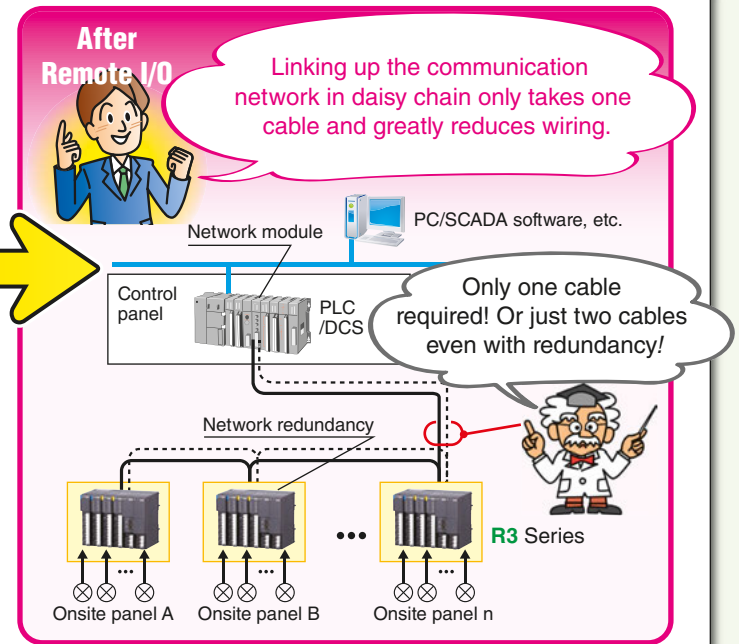**R6** Series

Plug-in Remote I/O
R10 Series

What is Remote I/O?

Remote I/O, otherwise called distributed I/O, refers to electronic devices that use transmission technology to send and receive input and output signals to/from master electronics like DCS, PLC and PCs often in the fields of process or factory automation. Remote I/O communication uses open networks with open communication protocols. We support our customers with a line up of Remote I/O solutions that use globally accepted major open networks like Modbus, CC-Link, MECHATROLINK, PROFIBUS, etc.

MG CO., LTD.
www.mgco.jp
Make Greener automation

Applications of Remote I/O

1. Replacing I/O modules of PLC and DCS
Reduce system wiring

Before Remote I/O

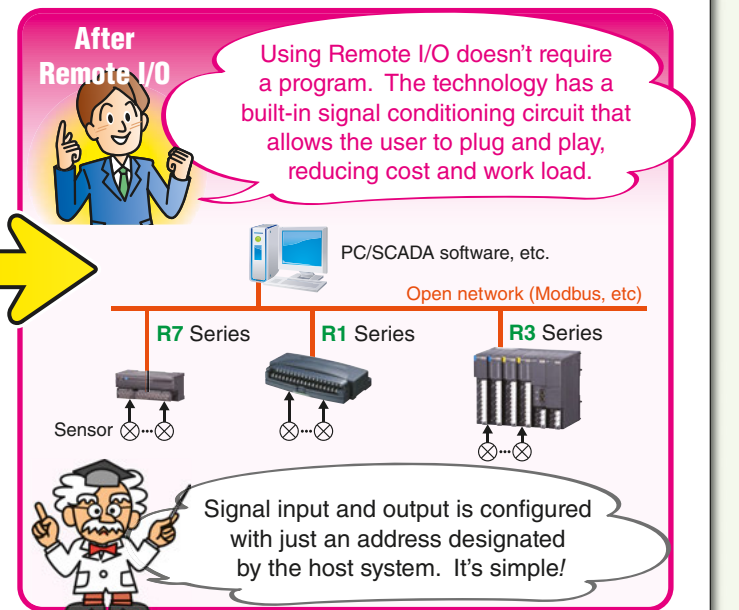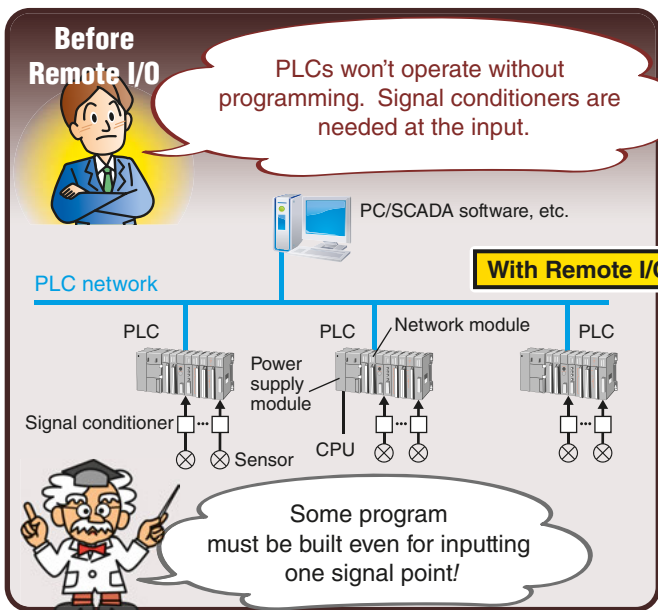Wiring each and every sensor and actuator from the onsite panel to a control panel requires an enormous amount of cables!

PC/SCADA software, etc.

Control panel

PLC /DCS

Cable after cable!

...   .

Wires

Signal conditioner

Sensor

I/O I/O ... I/O   I/O I/O ... I/O   ...   I/O I/O ... I/O

Onsite panel A   Onsite panel B   Onsite panel n

After Remote I/O

Linking up the communication network in daisy chain only takes one cable and greatly reduces wiring.

Network module

PC/SCADA software, etc.

Control panel

PLC /DCS

Only one cable required! Or just two cables even with redundancy!

Network redundancy

R3 Series

...

Onsite panel A   Onsite panel B   Onsite panel n

---

2. I/O for PC based SCADA systems
No programming required. Reduced costs.

Before Remote I/O

PLCs won't operate without programming. Signal conditioners are needed at the input.

PC/SCADA software, etc.

PLC network

PLC   PLC   Network module   PLC

Power supply module

Signal conditioner

CPU   Sensor

Some program must be built even for inputting one signal point!

After Remote I/O

Using Remote I/O doesn't require a program. The technology has a built-in signal conditioning circuit that allows the user to plug and play, reducing cost and work load.

PC/SCADA software, etc.

Open network (Modbus, etc)

R7 Series   R1 Series   R3 Series

Sensor

Signal input and output is configured with just an address designated by the host system. It's simple!

---

3. As I/O solution for IoT terminals

Using Remote I/O as an I/O interface for IoT terminal devices like **Web Data Logger** and **Tablet Recorder** has the advantages listed in **A** through **C**.

A. Compatible with many types of input/output
B. Reduces system wiring needs
C. Reduces internet connectivity costs by collecting all the signals from various I/O devices throughout a site into a single network connection point.

It's the IoT!

PC/SCADA software, etc.

Smartphone   Tablet

Router

Internet   Cloud

Router   Ethernet(Modbus/TCP)

Web Data Logger DL30-G

R3 Series

I/O signal   I/O signal

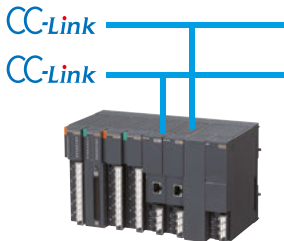## Structure of Remote I/O R3 Series — Redundant or two independent communication and power supply systems

As shown in the following image, the **R3** Series is made from the combination of a power supply module, network module and input/output modules. The modules are inserted onto the base in basically any combination, with redundant or two independent power/network system a standard feature of the series.
The input/output modules and network module can be replaced with the power turned ON. This replacement method is called "hot swap."
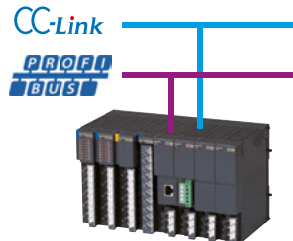
Network A
Network B

Network A
Network B

Structure diagram

Base

| I/O module n | I/O module 2 | I/O module 1 | Network module B | Network module A | Power supply module 2 | Power supply module 1 |

Internal bus A
Internal bus B

Conversion circuit | Conversion circuit | Conversion circuit | Network circuit | Network circuit | Power supply circuit | Power supply circuit

Power line bus

I/O signal

Power supply 1
Power supply 2

I/O signal

Power supply 2
Power supply 1

Dotted line shows configuration for redundancy.

Redundant network or two independent network protocols

Redundant network (example)

CC-Link
CC-Link

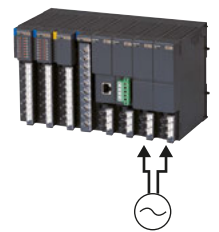Redundancy with two same network modules

Two network protocols (example)

CC-Link
PROFIBUS

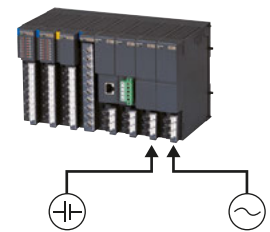Two independent network modules communicating with each master at once

Redundant power supply or two independent power sources

Redundant power supply (example)

AC Power supply

Redundancy with two power supply modules

Two power sources (example)

DC Power supply 2   AC Power supply 1

Two independent power sources

Many types of input/output modules are available

Analog I/O module
64ch discrete I/O module
32ch discrete I/O module
CT input module
Multi-power monitoring module

Hot-swappable I/O modules

A line up of over 50 signal types and 120 models is available, which can be switched out even while the power is still on (hot swap).

Analog input
· Universal
· DC voltage
· DC current
· Thermocouple
· RTD
· Thermistor
· Potentiometer
· 4-20 mA input with 2-wire transmitter excitation supply
· Strain gauge

Analog output
· DC voltage
· DC current

AC power input
· CT
· AC voltage
· AC current
· Zero-phase current transformer
· Multi-power monitoring
· AC power

Pulse input
· Speed/position
· High speed pulse
· High speed totalized pulse
· Low speed totalized pulse
· Totalized pulse

Pulse output
· Pulse output
· One-shot pulse output

Discrete input
· Discrete input
· AC contact input

Discrete output
· Discrete output
· Remote control relay

Discrete input/output

BCD input/output
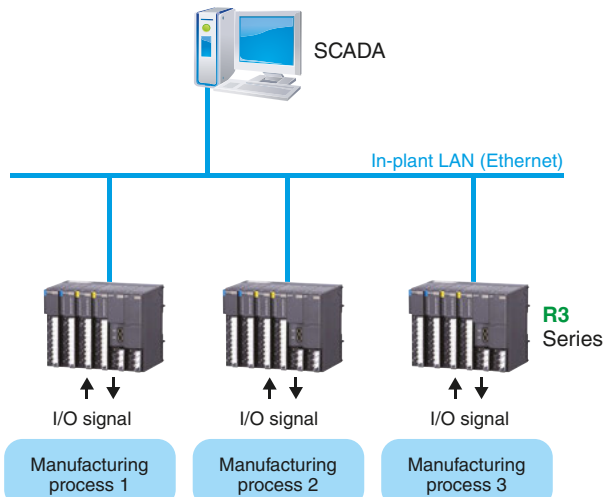· BCD input
· BCD output

Air conditioning
· I/I positioner
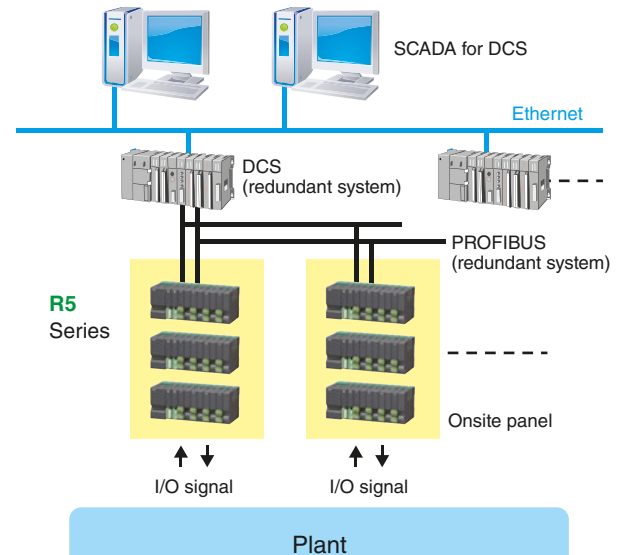· Heat meter

Examples of Remote I/O Applications

In-plant LAN (PC SCADA)

Remote I/O system is used for SCADA to monitor signals from a manufacturing process. Cost per data input is still low even with hundreds of data inputs using **R3** Series, and reductions in wiring needs also helps push down costs.

SCADA

In-plant LAN (Ethernet)

R3 Series

I/O signal | I/O signal | I/O signal

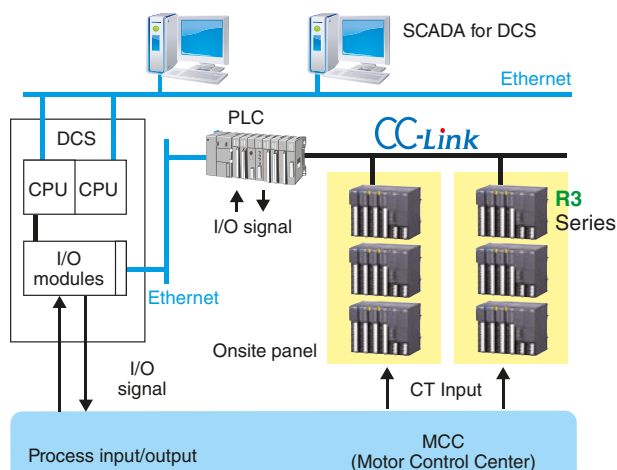| Manufacturing process 1 | Manufacturing process 2 | Manufacturing process 3 |

I/O for DCS (redundant communication network)

The made-in-Japan products comply with the international PROFIBUS-DP standard and can be used in redundant network configurations.

SCADA for DCS

Ethernet

DCS (redundant system)

PROFIBUS (redundant system)

R5 Series

Onsite panel

I/O signal | I/O signal

Plant

I/O for DCS/PLC

Here's an example of using our **R3** Series for providing PLC I/O for a motor control application. The **R3** Series allows direct CT input which eliminates the need for a converter. In addition, using CC-Link reduces the costs associated wiring needs.

SCADA for DCS

Ethernet

DCS

PLC

CC-Link

CPU | CPU

I/O signal

R3 Series

I/O modules

Ethernet

Onsite panel

I/O signal

CT Input

Process input/output

MCC (Motor Control Center)

Wireless remote I/O

Device sensor signals are collected using a multi-hop wireless system using 920 MHz band and the data then sent to a PLC.

PLC Machine numbers control command

Ethernet

Parent
Wireless gateway

Child
Plug-in type wireless I/O

900-920 MHz ISM Band Multi-hop Wireless System

For limited markets

Modbus-RTU

Child
Wireless I/O

I/O signal

Device 1

Child
R3 Series

I/O signal

Device 2

I/O signal | I/O signal

Device 3

4
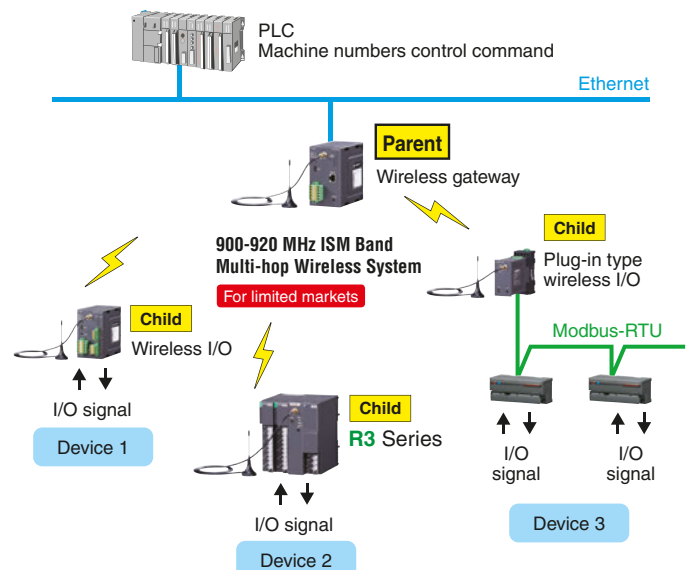
I/O for Tablet Recorder

Here's an example of using a remote I/O for several testing devices distributed in different locations to collect measurement data by **Tablet Recorder** over a LAN line.

Tablet

Tablet Recorder
TR30

WLAN router

Ethernet

R7
Series

R3
Series

I/O signal

I/O signal

I/O signal

Device 1
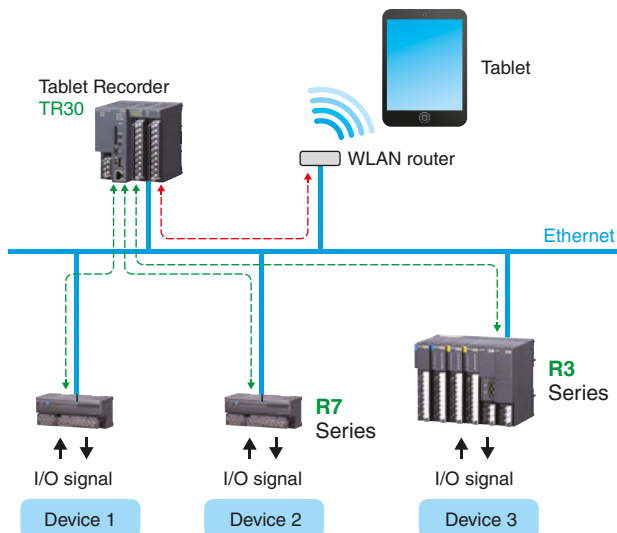
Device 2

Device 3

Super high speed I/O for motion control

Here's an example of using remote I/O for MECHATROLINK-III, network for motion control.

Controller

MECHATROLINK

R7
Series

Temperature
(thermocouple)

Rotary
encoder

Contact input
for control

Contact output
for control

Bread Bread

Internet connection

R3 Series or **R7** Series can be used as a remote I/O device for **Web Data Logger**.
Data saved on **Web Data Logger** can be viewed remotely from a PC or mobile device over the internet.

Smartphone

PC

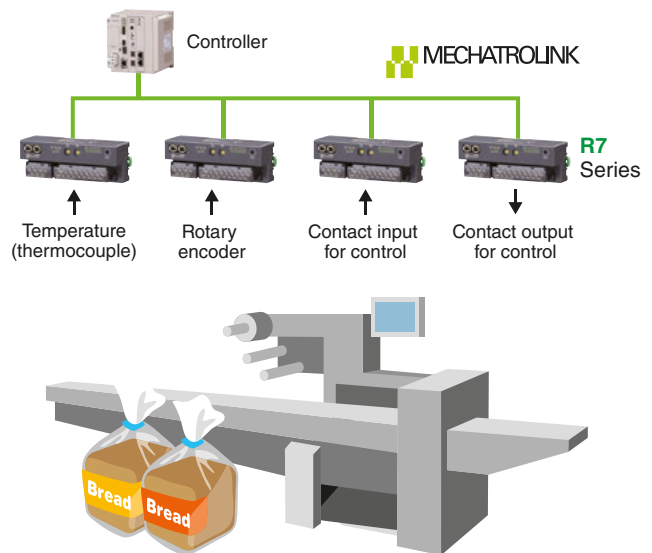Router

ISP

Internet

ISP

Router

Plant A

Plant B

Ethernet

R7
Series

Web Data
Logger
DL30-G

R3
Series

I/O
signal

I/O
signal

I/O signal
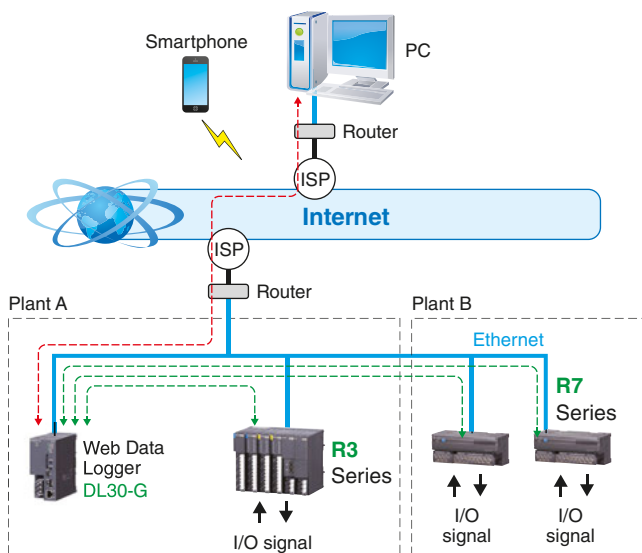
I/O for high speed data logger
(two independent communication networks)

Remote I/O data can be interfaced with two network systems, CC-Link and Modbus/TCP.

High speed data logger

SCADA

High speed scan

PLC

Ethernet

CC-Link

R3
Series

I/O
signal

I/O
signal

I/O
signal

Testing equipment

EtherCAT

Origins	Bechoff Automation GmbH
Main sponsor	EtherCAT® Technology Group
Number of participants	5,920
Transmission speed	Full duplex, 100 Mbps
Number of nodes	65,535
Network configuration, total length	Up to 100 m STP cables category 5/5e Star / line / tree

Open network that leverages the super high speed of Ethernet and has functionality for high-precision synchronization between nodes, as well as simple wiring configurations.

Remote I/O	R7 Series, R8 Series, R30 Series, R80 Series, JC Series

CC-Link IE Field

Origins	Mitsubishi Electric Corporation
Main sponsor	CC-Link Partner Association
Number of participants	3,823
Transmission speed	1 Gbps
Number of nodes	254 (total number of master and slave nodes)
Network configuration, total length	Max. distance between nodes: 100 m STP cable (category 5e) Line / star / ring configurations

A comprehensive Ethernet based network that seamlessly connects an information network to production sites.

Remote I/O	R3 Series, R7 Series, R30 Series

CC-Link IE TSN

Origins	Mitsubishi Electric Co
Main sponsor	CC-Link Partner Asso
Number of participants	3,823
Transmission speed	1 Gbps / 100 Mbps
Number of nodes	64,770 (total number of
Network configuration, total length	Double shielded twist Line / star / line-star / Maximum distance be

Leading the world in combining gigabit Ethernet Networking (TSN). Multiple network protocols ensuring time-sharing, real-time communication

Remote I/O	R30 Series, R80 Series

EtherNet/IP

Origins	Control equipment manufacturers	Remote I/O
Main sponsor	ODVA, Inc.	R3 Series
Number of participants	Over 700	R7 Series
Transmission speed	10/100 Mbps	Number of nodes	No limitations

Network config., total length	Distance between nodes: up to 100 mm, STP cables category 5/5e, Star / line / tree

Network for industrial applications that has a control protocol on top of an Ethernet TCP/IP.
Other commonly available Ethernet devices can be mixed on the Ethernet network.

MECHATROLINK - III

Origins	Yaskawa Electric Corporation	Remote I/O
Main sponsor	MECHATROLINK Members Association	R3 Series
Number of participants	3,381	R7 Series
Transmission speed	100 Mbps	Number of nodes	Maximum 62 stations

Network config., total length	Cascade / star configurations, Max. transmission distance: 100 m between stations Minimum distance between stations: 20 cm

Motion network that maintains synchronization between all slaves in a system. In addition to offering complete synchronization with the servo drives, can also be used for connecting actuators for inverters, stepping motors and sliders, and peripheral devices for motion control applications such as other I/O, temperature controllers and image processing devices.

PROFINET

Origins	Control equipment manufacturers	Remote I/O
Main sponsor	PROFIBUS & PROFINET International	Please contact us for further details.
Number of participants	Over 1,400	
Transmission speed	100 Mbits/s with copper wires, 1 Gbits/s (Option)	Number of nodes	No limitations

Network config., total length	Copper wires: 100 m, Communication cables: copper wires, fiber optic cables, wireless

PROFINET is an Ethernet based network developed by PI (PROFIBUS & PROFINET International) for industrial automation that is 100 % compatible with IEEE standard IEEE802.3 defining Ethernet.

Modbus/TCP

Origins	Modicon Inc.	Remote I/O
Main sponsor	Modbus-IDA	R3 Series
Number of participants	682	R5 Series
Transmission speed	10 Mbps / 100 Mbps / 1,000 Mbps	Number of nodes	Max. 1024 (Max. numbered nodes supported: 248)	R6 Series
Network config., total length	Line / star configurations, Maximum 500 m (depends on cable type)		R7 Series R9 Series R30 Series

Modbus protocol that operates with Ethernet TCP/IP.

FL-net

Origins	Requested user specifications from Japan Automobile Manufacturing Association	Remote I/O
Main sponsor	JEMA (The Japan Electrical Manufacturers' Association)	R3 Series
Number of participants	Over 34	
Transmission speed	10 Mbps / 100 Mbps	Number of nodes	254 nodes

Network config., total length	10BASE-T: 100 m when using twisted-pair cable, 10BASE5: 500 m when using thick type coaxial cable, 10 BASE-FL: 2000 m when using fiber optic cable

Open network originating from Japan's industry for factory automation. Operates with Ethernet UDP/IP using a communications protocol with token passing methodology so no master node is required.

*Note: Communication speeds and distances are with STP cables.

● Client-Server Type Open Network

OPC UA

Origins	Industrial automation and other fields	Remote I/O
Main sponsor	OPC Foundation	R30 Series
Number of participants	Over 680	
Transmission speed	--- (depending upon the connected network communication type)	Number of nodes	No limit (depending upon the server specifications)

Network config., total length	Client-Server configurations. The server specifications determine the number of connectable nodes. Transmission distance depends upon the connected network communication type.

OPC UA (Unified Architecture) solves various issues recognized with the conventional OPC (OPC Classic).
Based on SOAP/XML/Web services, it realizes high-security data communication without depending upon the platform.

MECHATROLINK - II

Origins	Yaskawa Electric C
Main sponsor	MECHATROLINK M
Number of participants	3,381
Transmission speed	10 Mbps
Number of nodes	Maximum 30 node
Network configuration, total length	2-core STP (dedic Maximum 50 m (1

Positioned as a motion field network among control elements like I/O and actuators for a c inputting control data.

Transmission speed (bps)

1G
100M   *Note
10M
1M
100k
10k
9k 10   100

(Partial left panel — cut off)

...orporation
...ciation

...(master and slave nodes)
...ed-pair cable (category 5e)
...ring / ring-star / mesh configurations
...etween nodes: 100 m

...bandwidth with Time-Sensitive
...can be mixed on the same trunk line while
...ns.

Transmission distance (m) — axis labels: 1k, 10k

HLS (Hi-speed Link System)

Origins	Step Technica Co., Ltd.	**Remote I/O**
Main sponsor	---	R7 Series
Number of participants	---	JC Series

Transmission speed	3 Mbps / 6 Mbps / 12 Mbps	**Number of nodes**: Maximum 63 nodes
Network config., total length	Multidrop connection, Shielded twisted-pair cable (half duplex) or shielded 4-core twisted-pair cable (full duplex), Maximum 300 m (@ 3 Mbps)	

Super high-speed, highly reliable open field network offered by Step Technica. Used in various control device networks in factory automation for applications like with semiconductor manufacturing or high precision machining.

CUnet

Origins	Step Technica Co., Ltd.	**Remote I/O**
Main sponsor	---	JC Series
Number of participants	---	

Transmission speed	3 Mbps / 6 Mbps / 12 Mbps	**Number of nodes**: Maximum 64 nodes
Network config., total length	Multimaster broadcasting, Multidrop connection (RS-485). Shielded cable (cat. 3), Maximum 300 m (@ 3 Mbps)	

Multimaster remote I/O control network offered by Step Technica, which supports discrete I/O, analog I/O and positioning control.

CC-Link

Origins	Mitsubishi Electric Corporation	**Remote I/O**
Main sponsor	CC-Link Partner Association	R1 Series
Number of participants	3,823	R3 Series

Transmission speed	156 kbps / 625 kbps / 2.5 Mbps / 5 Mbps / 10 Mbps	**Number of nodes**: Maximum 64 nodes
Network config., total length	Bus type network using shielded 3-core twisted-pair cable. Maximum 1200 m (@ 156 kbps). Also has fiber optic repeater.	

Remote I/O: R5 Series, R6 Series, R7 Series, R8 Series, R9 Series

High speed network for device level and sensor level PLCs (by Mitsubishi Electric) widely used primarily for factory automation.

Modbus

Origins	Control equipment manufacturers	**Remote I/O**
Main sponsor	Modbus Organization	R1 Series
Number of participants	682	R3 Series

Transmission speed	300 - 115.2 kbps (RS-232-C), Max. 10 Mbps (RS-485)	**Number of nodes**: Maximum 247 nodes
Network config., total length	Has no physical layer standards and typically uses serial connections like RS-232-C or RS-485. Maximum length of 1200 m when using RS-485 (depends on communication speed)	

Remote I/O: R5 Series, R6 Series, R7 Series, R8 Series, R9 Series, R10 Series

A versatile open field network that uses a simple protocol and can be used on multiple levels.
Used extensively around the world.

PROFIBUS

Origins	Control equipment manufacturers	**Remote I/O**
Main sponsor	PROFIBUS & PROFINET International	R3 Series
Number of participants	Over 1,400	R5 Series

Transmission speed	9.6 k - 12 Mbps	**Number of nodes**: Maximum 126 nodes
Network config., total length	Special copper wire (STP cable) or fiber optic cable with bus / ring / tree configurations. Maximum 1200 m (@ 9.6 kbps)	

Remote I/O: R6 Series

A device level and sensor level network for PLC and DCS used around the world but heavily in Europe.
Comes in three types: DP, PA, FMS

LONWORKS

Origins	Echelon Corporation	**Remote I/O**
Main sponsor	LonMark International	R3 Series
Number of participants	Over 850	R7 Series

Transmission speed	610 - 2.5 Mbps	**Number of nodes**: 64 nodes/subsystem (FTT-10)
Network config., total length	For the network, uses media like twisted-pair cables, power line cables, coaxial cables and fiber optic cables. Free topology, bus configurations. Maximum 2700 m (twisted-pair cables)	

Remote I/O: R9 Series

An autonomous distributed network used for the controller, device and sensor levels. Comes in a wide variety of applications for building controls, factory automation and home automation.

DeviceNet

Origins	Control equipment manufacturers	**Remote I/O**
Main sponsor	ODVA, Inc.	R1 Series
Number of participants	Over 700	R3 Series

Transmission speed	125 kbp / 250 kbps / 500 kbps	**Number of nodes**: Maximum 64 nodes
Network config., total length	Bus and tree configurations made with shielded 4-core twisted-pair cables. Maximum 500 m (@ 100 kbps)	

Remote I/O: R5 Series, R6 Series, R7 Series, R8 Series, R80 Series

Widely used around the world primarily for factory automation applications as a device level network for PLC and DCS.

Number of participants as of August 2020

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...Corporation
...Members Association

...es (1-30 nodes depending on transmission cycles)
...ated cable), Bus connection,
...00 m if repeater is used)

...open field networks, this network drives final
...control system and connects various devices for

Remote I/O	R7 Series

Remote I/O Series Lineup

Dimensions in mm (inch)

Multi-channel, Scalable Remote I/O
R3 Series

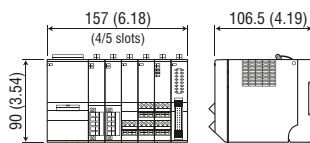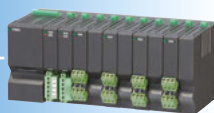224 (8.82) (6 slots)   120 (4.72)

130 (5.12)
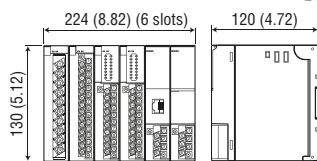
CC-Link   DeviceNet   Modbus   PROFIBUS
T-Link   FL-net   Modbus/TCP   LonWorks
EtherNet/IP   MECHATROLINK MECHATROLINK - III   CC-Link IE Field
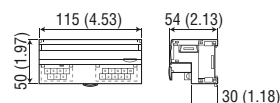EtherCAT

Compact, Scalable Remote I/O
R5 Series

157 (6.18) (4/5 slots)   106.5 (4.19)

90 (3.54)

Modbus/TCP   Modbus   DeviceNet
CC-Link   PROFIBUS   T-Link

Expandable, Compact Remote I/O
R7 Series

115 (4.53)   54 (2.13)

50 (1.97)   30 (1.18)

CC-Link   DeviceNet   T-Link   Modbus
LonWorks   Modbus/TCP   MECHATROLINK
FLEX NETWORK®   EtherNet/IP   HLS Hi-speed Link System
EtherCAT   CC-Link IE Field

Compact, Multi-point Remote I/O
R1 Series

175 (6.89)

105 (4.13)

40 (1.57)
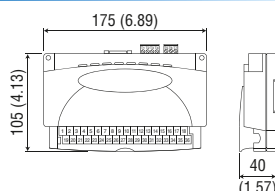
Modbus   DeviceNet   CC-Link

Ultra-slim, Scalable Remote I/O
R6 Series

72 (2.83)   116 (4.57)

99 (3.90)
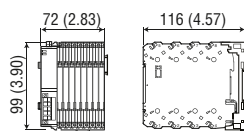
Modbus/TCP   Modbus   DeviceNet
CC-Link   PROFIBUS   T-Link

Slice Type, Scalable Remote I/O
R8 Series

152.5 (6)   55 (2.17)

115 (4.53)
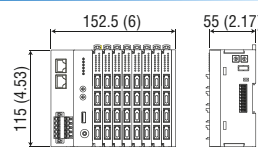
EtherCAT   Modbus   DeviceNet
CC-Link   EtherNet/IP

Multi-point Remote I/O
R9 Series

140 (5.51)   115 (4.53)

125 (4.92)   80 (3.15)
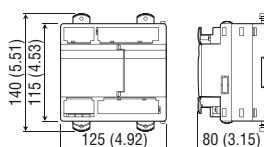
Modbus/TCP   Modbus
CC-Link   LonWorks

Compact, Scalable Remote I/O
R30 Series

100 (3.94)   110 (4.33)

110 (4.33)
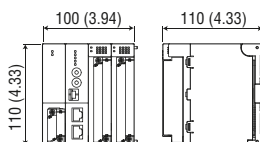
CC-Link IE Field   CC-Link IE TSN
Modbus/TCP   EtherCAT   OPC UA

Slice Type, Scalable Remote I/O
R80 Series

128.8 (5.07)   55 (2.17)

115 (4.53)
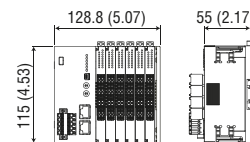
CC-Link IE TSN   EtherCAT
DeviceNet

Plug-in Remote I/O
R10 Series

36 (1.42)   80 (3.15)   45 (1.77)

72 (2.83)

Modbus

8
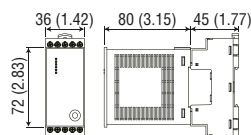
Your local representative:

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