Remote I/O Series
17 years of successful sales, 480,000 total 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.
- Line up of 8 series available. Choose based on installation location and specific network needs.
- Great variety in supported input and output signals. (Choose from 172 types and 504 devices). See page 8.

Multi-point Remote I/O
R9 Series

Compact, Multi-point Remote I/O
R1 Series

Multi-channel, Mixed Signal Remote I/O
R3 Series

Slice Type, Mixed Signal Remote I/O
R8 Series

Compact, Mixed Signal Remote I/O
R5 Series

Compact, Mixed Signal Remote I/O
R30 Series

Expandable, Compact Remote I/O
R7 Series

Ultra-Slim, Mixed Signal Remote I/O
R6 Series

CE/UL for selected models. Please refer to the data sheets for Standards & Approvals.

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. M-System supports 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.
Applications of Remote I/O

1. Replacing I/O modules of PLC and DCS

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.

With Remote I/O...

Cable after cable!

After Remote I/O

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

Network module

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

2. I/O for PC based SCADA systems

Before Remote I/O

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

PC/SCADA software, etc.

With Remote I/O...

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)

3. As I/O solution for IoT terminals

Using Remote I/O as an I/O interface for IoT terminal devices like Web Logger and Tablet Recorder has the advantages listed in A thru 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!
Remote I/O Features Explained Using R3 Series

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 dual 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.”

Dual redundant network or two independent network protocols

| Dual redundant network (example) | Two network protocols (example) |
| CC-Link | CC-Link |

Dual redundancy with two same network modules

Two independent network modules communicating with each master at once

Dual redundant supply or two independent power sources

| Dual redundant network (example) | Two power sources (example) |
| CC-Link | CC-Link |

Dual redundancy with two power supply modules

Two independent power sources

Many types of input/output modules are available

Analog input (52 modules)

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

Analog output (7 modules)

- DC voltage
- DC current

AC power input (17 modules)

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

Pulse input (8 modules)

- Speed/position
- High speed pulse
- High speed totalized pulse
- Low speed totalized pulse
- Totalized pulse

Pulse output (5 modules)

- Pulse output module
- One-shot pulse output module

Discrete input (10 modules)

- Discrete input
- AC contact input

Discrete output (14 modules)

- Discrete output
- Remote control relay
- BCD input/output (2 modules)

Hot-swappable I/O modules

A line up of over 48 types and 115 modules is available, which can be switched out even while the power is still on (hot swap).

Structure of Remote I/O R3 Series

Dual 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 dual 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.”
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.

I/O for DCS (dual redundant communication network)
The made-in-Japan products comply with the international PROFINET-DP standard and can be used in dual redundant network configurations.

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.

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.
**Process input/output MCC modules**

- DCS
- I/O signal
- I/O for Tablet Recorder

**DCS for DCS**

- Wireless remote I/O
- Onsite panel

**Examples of Remote I/O Applications**

- Wireless I/O
- Slave unit

**Temperature Monitoring**

- High speed scan
- I/O for high speed data logger

**Super high speed I/O for motion control**

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

**Internet connection**

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

**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.
Open networks in terms of communication

**EtherCAT**
- **Origins**: Bechhoff Automation GmbH
- **Main sponsor**: EtherCAT® Technology Group
- **Remote I/O**: R3 Series, R6 Series
- **Number of nodes**: 254 nodes
- **Number of participants**: 4,000
- **Transmission speed**: Full duplex, 100 Mbps
- **Network configuration and total length**: Up to 100 m, STP cable 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.

**Ethernet/IP**
- **Origins**: Control equipment manufacturers
- **Main sponsor**: ODVA Inc.
- **Remote I/O**: R3 Series
- **Number of nodes**: 871
- **Number of participants**: No limitations
- **Transmission speed**: 10 / 100 Mbps
- **Network configuration and total length**: Distance between nodes: up to 100 m, STP cable 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
- **Main sponsor**: MECHATROLINK Members Association
- **Remote I/O**: R3 Series, R7 Series
- **Number of nodes**: Maximum 62 stations
- **Number of participants**: 2,148
- **Transmission speed**: 100 Mbps
- **Network configuration and total length**: Cascade / star configurations, Maximum 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
- **Main sponsor**: PROFINET International
- **Remote I/O**: Please contact us for further details
- **Number of nodes**: No limitations
- **Number of participants**: 1,400
- **Transmission speed**: 100 Mbits/s with copper wires. 1 Gbits/s (Option)
- **Network configuration and total length**: With 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.
- **Main sponsor**: Modbus-IDA
- **Remote I/O**: R3 Series, R6 Series, R7 Series
- **Number of nodes**: Maximum 1024 (Maximum number of numbered nodes supported: 248)
- **Number of participants**: 332
- **Transmission speed**: 10 Mbps / 100 Mbps / 1000 Mbps
- **Network configuration and total length**: Line / star configurations, Maximum 500 m (depends on cable type)

Modbus protocol that operates with Ethernet TCP/IP.

**FL-net**
- **Origins**: Requested user specifications from Japan Automobile Manufacturing Association
- **Main sponsor**: JEMA (The Japan Electrical Manufacturers’ Association)
- **Remote I/O**: R3 Series
- **Number of nodes**: 254 nodes
- **Number of participants**: 20
- **Transmission speed**: 10 Mbps / 100 Mbps
- **Network configuration and 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*
### Remote I/O

<table>
<thead>
<tr>
<th>Link System</th>
<th>Origins</th>
<th>Main Sponsor</th>
<th>Number of participants</th>
<th>Remote I/O</th>
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<tr>
<td><strong>CC-Link</strong></td>
<td>Mitsubishi Electric Corporation</td>
<td>CC-Link Partner Association</td>
<td>2,097</td>
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<td><strong>HLS</strong></td>
<td>Step Technica Co., Ltd.</td>
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<td>R7 Series</td>
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<td><strong>Modbus</strong></td>
<td>Control device manufacturers</td>
<td>Modbus Organization</td>
<td>332</td>
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<td><strong>PROFIBUS®</strong></td>
<td>Control device manufacturers</td>
<td>PROFIBUS &amp; PROFINET International</td>
<td>1,400</td>
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<td><strong>LONWORKS</strong></td>
<td>Echelon Corporation</td>
<td>LonMark International</td>
<td>Over 600</td>
<td>R3 Series, R7 Series, R9 Series</td>
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<tr>
<td><strong>DeviceNET</strong></td>
<td>Control device manufacturers</td>
<td>ODVA Inc</td>
<td>871</td>
<td>R1 Series, R3 Series, R5 Series, R6 Series, R7 Series, R8 Series, R9 Series</td>
</tr>
</tbody>
</table>

### Transmission Speeds and Distance

<table>
<thead>
<tr>
<th>Distance (m)</th>
<th>Transmission Speed</th>
</tr>
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<tbody>
<tr>
<td>1 k</td>
<td>9.6 k - 12 Mbps</td>
</tr>
<tr>
<td>10 k</td>
<td>156 kbps - 625 kbps, 2.5 Mbps - 10 Mbps</td>
</tr>
</tbody>
</table>

### Specifications

- **HLS** (Hi-speed Link System): 3 Mbps / 6 Mbps / 12 Mbps.
- **CC-Link**: 156 kbps / 625 kbps / 2.5 Mbps / 5 Mbps / 10 Mbps.
- **Modbus**: 300 - 115.2 kbps (RS-232-C) / Maximum 10 Mbps (RS-485).
- **PROFIBUS®**: 9.6 k - 12 Mbps.
- **LONWORKS**: 610 - 2.5 Mbps.
- **DeviceNET**: 125 kbps / 250 kbps / 500 kbps.

### Notes

- Network configuration and total length details vary based on the specific application.
- Transmission speed and distance specifications are subject to communication speed and network configuration.
- Remote I/O systems are widely used in applications for building controls, factory automation, and home automation.

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*Please contact us for further details.*
Remote I/O Series Lineup

**R3 Series**
Types and models of input/output available: 48 types / 115 device models

**R5 Series**
Types and models of input/output available: 22 types / 56 device models

**R7 Series**
Types and models of input/output available: 55 types / 248 device models

**R1 Series**
Types and models of input/output available: 7 types / 9 device models

**R6 Series**
Types and models of input/output available: 10 types / 33 device models

**R9 Series**
Types and models of input/output available: 3 types / 6 device models

**R30 Series**
Types and models of input/output available: 11 types / 13 device models