### Products Introduced in Case Examples

<table>
<thead>
<tr>
<th><strong>Web-enabled Power Demand Monitor</strong></th>
<th><strong>Head-mounted Signal Conditioners 20-UNIT Series</strong></th>
<th><strong>Tower Lights</strong></th>
<th><strong>Communication Adaptor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>See Case 1</td>
<td>Model: IT409RE</td>
<td>Model: GR8-EM</td>
<td>Model: GR8-EM</td>
</tr>
<tr>
<td>See Case 1</td>
<td>See Case 3</td>
<td>See Case 4</td>
<td>See Case 4</td>
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</table>

<table>
<thead>
<tr>
<th><strong>LED Tubes</strong></th>
<th><strong>D3 Series</strong></th>
<th><strong>Multiplex Transmission System</strong></th>
<th><strong>Remote I/O R3 Series</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>An LED tube that can easily replace a fluorescent lamp without wiring work.</td>
<td>A telemetering system that can be used on a variety of communications lines, ranging analog leased lines to radio links.</td>
<td>A multiplex transmission device with ease of separation.</td>
<td>The Multi-channel, Mixed Signal Remote I/O R3 Series supports a wide variety of network types and I/O module types.</td>
</tr>
<tr>
<td>Model: LS Series</td>
<td>Model: D3-LTS</td>
<td>Model: DLA1</td>
<td>Model: R3-Nx</td>
</tr>
<tr>
<td>See Cases 5 and 6</td>
<td>See Cases 7 and 15</td>
<td>See Case 9</td>
<td>See Case 11</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Remote I/O R7 Series</strong></th>
<th><strong>Lightning Surge Protector for Ethernet</strong></th>
<th><strong>Lightning Surge Protector for Three-phase Power Supply</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>A compact remote I/O of all-in-one construction.</td>
<td>A lighting surge protector that can be connected to Ethernet cable.</td>
<td>A lighting surge protector that complies with IEC 61643-11 Class II.</td>
</tr>
<tr>
<td>Model: R7 Series</td>
<td>Model: MDCAT (Category C1, C2) compliant</td>
<td>IEC 61643-11 Class II compliant Model: MAT3</td>
</tr>
<tr>
<td>See Case 12</td>
<td>See Case 12</td>
<td>See Case 14</td>
</tr>
</tbody>
</table>

For details of the products introduced here, please visit M-System’s website.

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**M-System’s IoT devices support the safe operation and energy saving of Road facilities.**

- **The maintenance interval of service vehicles has become longer.**
- **The period of closing roads under construction has become short.**
- **The snowplow can now be mobilized quickly.**

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**Your local representative:**

Your local representative:
## Introduction

The road network covered throughout the country supports people’s lives. Many stakeholders are working in the background to maintain and manage the road network. M-System utilizes the latest IoT technology to contribute to the safe operation and energy conservation of road facilities. The 16 Cases Examples arranged on pages 4 to 7 have been selected from our past achievements. We hope that these examples are informative to users.

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<table>
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<tr>
<th>Case</th>
<th>Description</th>
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<td>Power Demand Monitoring</td>
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<td>1</td>
<td>Temperature Management of Asphalt Finisher</td>
</tr>
<tr>
<td>1</td>
<td>Alarm Display of Construction Survey on Bridge Girders</td>
</tr>
<tr>
<td>2</td>
<td>Data Logging of In-tunnel Fire Point Position Detector</td>
</tr>
<tr>
<td>2</td>
<td>LED Replacement for Toll Booth Indication Board</td>
</tr>
<tr>
<td>2</td>
<td>LED Replacement for On-vehicle Bulletin Board</td>
</tr>
<tr>
<td>3</td>
<td>Tunnel Traffic Management</td>
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<tr>
<td>3</td>
<td>Tunnel Gas Concentration Record</td>
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<tr>
<td>3</td>
<td>Tunnel Disaster Prevention Equipment</td>
</tr>
<tr>
<td>3</td>
<td>E-mail Report on Flood Warning</td>
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<tr>
<td>4</td>
<td>Monitoring of Snow on Roads</td>
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<td>4</td>
<td>Measures to Protect Meteorological Observation Equipment against Lightning</td>
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<tr>
<td>5</td>
<td>Remote Monitoring and Operation of Water Supply Facilities</td>
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<tr>
<td>5</td>
<td>Measures to Protect Lighting Distribution Board against Lightning</td>
</tr>
<tr>
<td>5</td>
<td>Service Area (SA) Power Monitoring</td>
</tr>
<tr>
<td>5</td>
<td>Service Area (SA) Drainage Management</td>
</tr>
</tbody>
</table>

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[Products Introduced in Case Examples]

### Web Data Logger

**Model: DL8**

The **Web Data Logger** is an Internet-of-things (IoT) terminal incorporating versatile functions, including a remote monitoring function, data logging function, and event reporting function, available through a website screen.

<table>
<thead>
<tr>
<th>Basic functions</th>
<th>Simple web server</th>
<th>FTP function (e.g., for a trend screen)</th>
<th>Modbus/TCP communications function</th>
<th>Data logging</th>
<th>Email notification function</th>
</tr>
</thead>
</table>

**See**: Cases 4, 10 to 13

### Tablet Recorder

**Model: TR30-G**

The **Tablet Recorder** is a data recorder that displays collected and accumulated trend data on a website screen using a tablet or PC via an IP network, such as a Wireless LAN network.

<table>
<thead>
<tr>
<th>Basic functions</th>
<th>Trend data/Event data recording</th>
<th>Simple web server (e.g., for a trend screen)</th>
<th>FTP function</th>
<th>Modbus/TCP communications function</th>
<th>Email notification function</th>
</tr>
</thead>
</table>

**See**: Case 8

### Web Data Logger

**Model: DL30**

The **Web Data Logger** is a data logger of on-site-installation type incorporating versatile functions, including a remote monitoring function, data logging function, and event reporting function, available through a website screen as well as a report creation function.

<table>
<thead>
<tr>
<th>Basic functions</th>
<th>Simple web server (e.g., for a trend screen)</th>
<th>Data logging</th>
<th>Email notification function</th>
<th>FTP function</th>
<th>Modbus/TCP communications function</th>
<th>Email notification function</th>
</tr>
</thead>
</table>

**See**: Case 10

### 900 MHz ISM Band Multi-hop Wireless System WL40F Series

**Model: WL40F Series**

The **900 MHz ISM Band Multi-hop Wireless System WL40F Series** is a wireless communication system that can send and receive data via a wide area network using a multi-hop system (in relay mode). It can reach long-distance transmission characteristics with long-distance reachability, transmitted in a multi-hop system (in relay mode via child units).

- **Feature**: Free communication charges.
- **Feature**: No license fees.
- **Feature**: Reaching a long-line-of-sight distance, up to 1 km (0.62 mile) (*2).

<table>
<thead>
<tr>
<th>Model</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>WL40F</td>
<td>I/O mapping</td>
</tr>
<tr>
<td>TR30-G</td>
<td>Scheduling</td>
</tr>
</tbody>
</table>

**See**: Case 16

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[See page 8]
Case 1: Power Demand Monitoring
Road Construction

The construction site had a contract electric power limitation. We were afraid of the penalty for the power consumption exceeding the contract power. We introduced the EDMC to monitor the electric power demand on a tablet at the construction site. An alarm turns ON when the power consumption is likely to exceed the limitation.

Case 2: Temperature Management of Asphalt Finisher
Road Construction

We wanted to control the temperature of the screed (9) of the asphalt finisher (14), and we were looking for a compact temperature transducer with a wide operating temperature range. We introduced the 2ETS1, a compact model with an operating temperature range of -40°C to 85°C. It has the ideal specifications for use on the asphalt finisher.

Case 3: Alarm Display of Construction Survey on Bridge Girders
Road Construction

We wanted to use a PC to judge the measured values of the laser rangefinder and to output the anomalies, if any, to the LAN for display, and we were looking for an effortless method. We introduced the IT40SRE to a PC over the LAN. Since then, we have been able to display alarms with ease.

Case 4: Data Logging of In-tunnel Fire Point Position Detector
Road Maintenance

We wanted to make an accident analysis by adding a function of temperature logging to an existing fire point position detector (15), and we were looking for an inexpensive, effortless method. We introduced the DLT and we succeeded in temperature data retrieval and logging. The DLT incorporates communications and logging functions as standard features. We succeeded in solving the problem inexpensively and easily.

Case 5: LED Replacement for Toll Booth Indication Board
Road Maintenance

We wanted to replace existing fluorescent lamps for information boards of toll booths on an expressway. We were looking for long-life lighting that could replace the existing lighting within a short time. We replaced the fluorescent lamps with LS1200. The LS1200 has a long life. It is effectively bright because it allows lighting angle adjustments.

Case 6: LED Replacement for On-vehicle Bulletin Board
Road Maintenance

We were troubled when we missed gas concentration data at the time of an abnormality because we could not trace the problem. We were looking for a way to record and track data. We introduced the TR30-G that can store data in SD cards and view the data on tablets. We can now track the occurrences of abnormalities.

Case 7: Tunnel Traffic Management
Road Disaster Prevention

We had to provide a bus service to pass through a railroad tunnel that became abolished due to an earthquake disaster, and we were looking for a device to transmit a safety confirmation signal. It was a temporary service to be constructed within a short time on a low budget.

Case 8: Tunnel Gas Concentration Record
Road Disaster Prevention

We were troubled when we missed gas concentration data at the time of an abnormality because we could not trace the problem. We were looking for a way to record and track data. We introduced the TR30-G that can store data in SD cards and view the data on tablets. We can now track the occurrences of abnormalities.

(*3) Fire point position detector: A device of cable structure that detects fire by temperature.

(*4) Asphalt finisher: A piece of construction equipment used to lay asphalt on roads.

(*5) Asphal finisher: A piece of construction equipment used to lay asphalt on roads.
**E-mail Report on Flood Warning**

DISP

**Ethernet**

**Remote I/O**

- Temperature
- Humidity

**MDCAT**

(*6)

**Case**

11

**Monitoring of Snow on Roads**

**Road Meteorology**

- Before
  - We introduced the DL1, which does not require programming. Moreover, the production of the DL1 will be continued and we do not have to worry about that anymore.

- After
  - Our snow monitoring system updated data at one-hour intervals, which often delayed our response. We wanted to shorten the cycle of data updating. Furthermore, the snow gauge uses BCD signals.

We introduced the DL1, which sends us flood warning email, so we can respond quickly.

**Case**

12

**Measures to Protect Meteorological Observation Equipment against Lightning**

**Road Meteorology**

- Before
  - We were planning to a LAN update for weather observation facilities and looking for a lightning surge protector for Ethernet as a lightning countermeasure.

- After
  - We found the MDCAT as a lightning surge protector for Ethernet.

We successfully replaced the system with the DLS in combination with a mobile router for smooth communication. Because it is wireless, there is no worry about cable deterioration.

**Case**

13

**Remote Monitoring and Operation of Water Supply Facilities**

**Road Facility Management**

- Before
  - We had trouble with our self-managed line for the remote monitoring and control of water supply facilities in the mountain due to its aged deterioration, and it sometimes caused communication failures.

- After
  - We introduced the DLS, which can transmit up to 10 km (6.2 mi) over the existing Modbus/TCP line.

We transmitted the amount of drainage and pH wirelessly over the WL40F Series to the DLS. Then we were able to see the daily and monthly reports on PCs and smartphones. We have been freed from patrolling work.

**Case**

14

**Measures to Protect Lighting Distribution Board against Lightning**

**Road Facility Management**

- Before
  - As SA users increased, the power consumption increased. We wanted to visualize the power consumption, but the SAs on the inbound-lane side and the outbound-lane side are far from each other.

- After
  - We introduced the D3 Series, which can transmit up to 10 km (6.2 mi) over the existing self-managed line. We will find an excess usage of electric power from now on.

We transmitted the amount of drainage and pH wirelessly over the WL40F Series to the DLS. Then we were able to see the daily and monthly reports on PCs and smartphones. We have been freed from patrolling work.

**Case**

15

**Service Area (SA) Power Monitoring**

**Road Facility Management**

- Before
  - To renew the drainage facilities in the SAs on the inbound-lane side and the outbound-lane side, but we thought it was hard to go round and check the amount of drainage at the inbound and outbound lanes.

- After
  - We introduced the D3 Series, which can transmit up to 10 km (6.2 mi) over the existing self-managed line. We will find an excess usage of electric power from now on.

We transmitted the amount of drainage and pH wirelessly over the WL40F Series to the DLS. Then we were able to see the daily and monthly reports on PCs and smartphones. We have been freed from patrolling work.

**Case**

16

**Service Area (SA) Drainage Management**

**Road Facility Management**

- Before
  - We wanted to take preventive measures against lightning for lighting equipment, and we were looking for a lightning surge protector conforming to the national specifications (*7) and fitting in the switchboard.

- After
  - We introduced the MAT3, which fulfills the national specifications. Because the depth is 60 mm (2.36 in), it fitted into the lighting distribution board perfectly.

We introduced the MAT3, which fulfills the national specifications. Because the depth is 60 mm (2.36 in), it fitted into the lighting distribution board perfectly.

(*6) The R3 Series BCD Input Module with special specifications.

(*7) Public Work Standard Specifications of the Ministry of Land, Infrastructure and Transport Complies with IEC 61643-11 Class II.