MODULUS
900 MHz 1/4W Radio Module 2110

Modulus 1/4W Spread Spectrum Radio modules wirelessly interconnect Modulus SCADA controllers with 900MHz 1/4 watt license-free spread spectrum radios. Every module can serve as a repeater for extended radio system coverage. These modules also support standard wired communications with Modbus, DF1, SDI-12 and Ethernet IP, as well as Ethernet-Serial bridging and Ethernet Routing.

Modulus 1/4W Spread Spectrum Radio modules have built-in analog and digital I/O for tank level monitoring, and pump control applications such as wells, lift stations and booster pumping stations. They can also serve as communications concentrators with intelligent links to smart monitoring and control devices such as variable frequency drives and power meters.

Modulus 1/4W Spread Spectrum Radio modules have a general purpose serial port that supports multiple types of interfaces; RS-232, RS-485 (2-wire), RS-422 (4-wire), and SDI-12. The buss port may also be used as a general purpose RS-485 serial port if not used for high-speed bus communications with other Modulus I/O modules.

STANDALONE OPERATION
Modulus 1/4W Spread Spectrum Radio modules can serve as standalone devices with SCADA communications, local and web human machine interfaces (HMIs), historical trending and data logging, alarming, reporting, and programmable logic.

COMMUNICATIONS
Modulus 1/4W Spread Spectrum Radio modules have an Ethernet port and a general purpose serial port to communicate with Modbus devices and Allen Bradley PLCs. The module can serve as a communications concentrator or master controller. Ethernet to Serial bridging, and Ethernet routing to other Modulus modules’ Ethernet ports, is also supported.

GRAPHICAL, MOBILE, AND LOCAL HMIs
Configurable graphical web and mobile device interfaces are built into the 1/4W Spread Spectrum Radio modules. The front panel display can also be customized to show live process values and states, and make setting changes.

HISTORICAL TRENDING AND EVENT LOGGING
Modulus 1/4W Spread Spectrum Radio modules have an internal solid state flash disk, as well as a micro SD memory card slot to record over 100 years of data! Use built-in web tools to retrieve and display historical trend and event data and extract it as spreadsheet files.

REPORTING
Reports can be created in minutes showing live values, production totals, trend and event data, alarm summaries, etc. Customize reports with your own logos and graphics. Call up reports on demand, or have them automatically transferred to your computer.

ALARMING
A 1/4W Spread Spectrum Radio module can manage alarm conditions on any of its local inputs, as well as over 500 conditions monitored by communications with other devices. Alarm conditions can be displayed locally and annunciated with its discrete output, as well as with a Modulus Cellular Communications module for text message and e-mail alerts. The module maintains a journal spreadsheet file of when alarms occurred, when they were acknowledged, by whom, and when the alarm conditions cleared.

PROGRAMMABLE LOGIC
1/4W Spread Spectrum Radio modules support programmable logic written in ladder logic, function block and text languages; all with 32-bit and floating point math. Programmable logic can supplement the built-in functions of the module.

PID & PUMP CONTROL
1/4W Spread Spectrum Radio modules have a quad PID controller and a triplex pump controller (float or level control) with error detection and alarming. Without requiring any additional modules, the 1/4W Spread Spectrum Radio Module is an ideal solution for SCADA operation of wells, lift stations, and booster pump stations.

REDUNDANCY
1/4W Spread Spectrum Radio modules support redundancy for enhanced reliability. If a module goes off-line, a designated backup can take over automatically.
**FIELD I/O**

| Digital Inputs: | 2 Non-isolated DC or contact closure, DC to 20kHz maximum |
| Digital Outputs: | 1 Solid-state Protected FET high-side driver (switches to input power when ON) |
| Analog Inputs: | 1 16-bit, Delta Sigma, selectable input ranges |

**Filtering**
- Individually configurable: 5Hz, 10Hz, 20Hz, 50Hz, 100Hz, 1kHz, 2kHz, 5kHz, 10kHz+

**Input Range:**
- Contact closure/open collector driver to ground, or 0 to 30Vdc (ON= <1.5V, OFF > 2.5V), 60Vdc absolute maximum
- Software selectable:
  - 20mA (minimum input for full accuracy is 0.5mA)
  - 5V and +/- 5V, 10V and +/- 10V, 30V
  - 35Vdc on any range, 40Vdc absolute maximum

**Input Current:**
- Approximately 0.5mA (internal current source)

**Output Rating:**
- 30Vdc, 2A maximum, current limited to approximately 2.25A.

**Filtering**
- Filter Individually configurable: 5Hz, 10Hz, 20Hz, 50Hz, 100Hz, 1kHz, 2kHz, 5kHz, 10kHz+

**Digital Outputs:**
- 1 Solid-state Protected FET high-side driver (switches to input power when ON)

**Output Rating:**
- 30Vdc, 2A maximum, current limited to approximately 2.25A.

**Analog Inputs:**
- 1 16-bit, Delta Sigma, selectable input ranges

**Input Ranges:**
- Software selectable:
  - 20mA (minimum input for full accuracy is 0.5mA)
  - 5V and +/- 5V, 10V and +/- 10V, 30V
  - 35Vdc on any range, 40Vdc absolute maximum

**COMMUNICATIONS**

**Ethernet:**
- 1 10/100mb/s (10/100 Base-T)

**SCADA Protocols**

**Internet Protocols**

**Wireless:**

**Protocols**
- Modbus RTU (master/slave), DF1 (slave)

**Serial:**

**Protocols**
- Modbus RTU (master/slave), DF1 (slave), SDI-12 (general purpose port only)

**HMIs**

**Graphical:**

**Mobile:**

**PROGRMING**

**Languages:**
- Ladder Logic, Function Block, Text—built-in web based graphical and text editor and debugger

**Capacity:**
- 64KB logic, 2MB source code, 32-bit integer and floating point math

**STORAGE**

**Registers:**
- 504 Numeric registers, 504 Boolean registers

**Internal Flash disk:**
- 32MB

**Removable disk:**
- Micro SD Card (up to 256GB, supplied by customer)

**CLOCK**

**Real Time Clock:**
- Temperature compensated with lithium battery backup power

**Stability**
- +/- 3ppm from –30°C to 70°C

**GENERAL**

**Input Power:**
- 10Vdc to 30Vdc

**Power Consumption**
- Not using Ethernet: 18mA @ 12Vdc / 13mA @ 24Vdc (Ethernet power saver enabled)
- Using Ethernet: 78mA @ 12Vdc / 43mA @ 24Vdc
- radio transmitting: 60mA @ 12Vdc 30mA @ 24Vdc in short transmit bursts

**Field Wiring Termination:**
- RP-SMA female (male pin center conductor)

**Temperature:**
- -40°C to 70°C (operating), -40°C to 85°C (storage)

**Humidity:**
- <95% RH (non-condensing)

**Enclosure:**
- Polyamide, light gray (RAL 7035)

**Mounting:**
- 35mm DIN rail with bus connector block

Specifications subject to change without notice. Consult factory to ensure that you are working with current information.
Refer to the installation manual for additional installation details and precautions.

All discrete and analog inputs/outputs are referenced to the ground terminal (5). This terminal is connected internally to the module's power supply ground.

Discrete Inputs accept a contact closure or open-collector ("NPN" style) input signal. An external pull-up resistor is not required.

The Discrete Output sources current ("PNP" style) from the module's input power.

The Analog Input may be software configured to accept either current or voltage signals. In low power applications, the analog sensor may be powered from the Discrete Output, configured to power the sensor on only when needed to take an analog reading (with configurable "warmup" time).

Contact ICL Customer Service for available pre-wired Field Wiring Panels

Modulus 1/4W Spread Spectrum Radio Module - 2110 DIMENSIONS and WIRING

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+485</td>
</tr>
<tr>
<td>2</td>
<td>+485</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
</tr>
<tr>
<td>5</td>
<td>+V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TB1 terminals</th>
<th>Inputs/Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DI1</td>
</tr>
<tr>
<td>2</td>
<td>DI2</td>
</tr>
<tr>
<td>3</td>
<td>AI1</td>
</tr>
<tr>
<td>4</td>
<td>DO1</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
</tr>
</tbody>
</table>

General Purpose Communications Port COM1
(modes are software configured)

Typical COM1 RS-232 Wiring to Modem/Radio