

# MODULUS

## Mesh Radio Communications Module 2110

Modulus Mesh Communications modules have built-in 1/4W 900MHz Meshing Radios compatible with Scadaflex II controllers, and Scadaflex II battery powered and distributed Remote I/O modules. Meshing radios automatically form self-healing repeater links to get messages through the network, even when an intermediate node becomes unavailable. They also support **wired** communications with Modbus, DF1, Ethernet IP, SDX, MQTT, and SDI-12.

The Mesh Communications modules have built-in analog and digital I/O for tank level and process monitoring, and pump control applications such as wells, lift stations and booster pumping stations. The modules have an analog input supporting both mA and voltage measurement. In addition, they have six discrete inputs (two high-speed and four optically isolated), three discrete outputs, and two analog outputs.

Modulus Mesh Communications modules have two serial ports (bus port plus one general purpose port). The bus port may also be used for general purpose RS-485 communications when not bussed with other Modulus I/O modules.

### STANDALONE OPERATION

Modulus Mesh Radio Communications 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 Mesh Radio Communications modules have a built-in 1/4W 900MHz license-free spread spectrum radios that can form a self-healing high-reliability wireless network between controllers and remote I/O. They also have an Ethernet port and two serial ports to communicate with Modbus devices and Allen Bradley PLCs. They can serve as communications concentrators or master controllers, as well as providing web and data access to any other Modulus modules on the high-speed bus. They support Ethernet to Serial bridging, and routing through Ethernet ports in other Modulus modules on the bus.

### GRAPHICAL, MOBILE, AND LOCAL HMIs

Configurable graphical and mobile device web interfaces, including the tools and libraries to build custom screens, are built in. 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 Mesh Radio Communications modules have an internal 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 with custom graphics and logos can be created in minutes, showing live values, totals, trend/event data, alarm summaries, etc. They can be called up on demand, or sent out automatically.

Mesh Radio Communications Module 2110 - Mini I/O  
8x-5001 2DI/PI, 1DO, 1AI (20mA/V)



Optional Field Wiring Panel

Modulus Mesh Radio Communications Module

- 1 ETHERNET PORT
- 1 1/4W 900MHZ LICENSE-FREE MESH SPREAD SPECTRUM RADIO
- 2 SERIAL PORTS (BUS PORT PLUS A GENERAL PURPOSE PORT)
- 2 DISCRETE/HIGH-SPEED PULSE INPUTS
- 1 DISCRETE OUTPUT (PROTECTED FET)
- 1 ANALOG INPUT (mA / V)

### ALARMING

A Modulus Mesh Radio Communications module can manage alarm conditions on any of its local inputs and other Modulus I/O on the bus, as well as external devices via communications. Alarms conditions can be displayed locally and annunciated by text message and e-mail alerts. Alarms can be acknowledged by text message or e-mail, discrete input, or local HMI button. The module maintains a journal spreadsheet file of when alarms occurred, when they were acknowledged, by whom, and when the alarm conditions clear.

### PROGRAMMABLE LOGIC

Modulus Mesh Radio Communications modules support programmable logic written in ladder logic, function block and text languages; all with 32-bit integer and floating point math. Programmable logic can supplement the built-in functions of the module.

### PID & PUMP CONTROL

Modulus Mesh Radio Communications modules have a quad PID controller and a triplex pump controller (float or level control) with error detection and alarming. The Mesh Communications Module is an ideal solution for SCADA operation of wells, lift stations, and booster pump stations.

### REDUNDANCY

Modulus Mesh Radio Communications modules support redundancy for enhanced reliability. If a module goes off-line, a designated backup can take over automatically.

# Modulus Mesh Radio Communications Module - Type 2110 - Specifications

## FIELD I/O

<b>Discrete Inputs:</b>	2	High-speed, non-isolated DC or contact closure, DC to 20KHz maximum
Input Range:		Contact closure/open collector driver to ground, or 0 to 30Vdc (ON=<1.5V, OFF > 2.5V)
Input Current:		Approximately 0.5mA (internal current source)
Filtering:		Individually configurable: 5Hz, 10Hz, 20Hz, 50Hz, 100Hz, 500Hz, 1KHz, 2KHz, 5KHz, 10KHz+
<b>Discrete Outputs:</b>	1	Solid-state Protected FET high-side drivers (switch to input power when ON)
Output Rating:		30Vdc, 2A maximum, current limited to approximately 2.25A.
<b>Analog Inputs:</b>	1	16-bit, Delta Sigma, individually software configurable ranges
Input Range:		• 20mA (minimum input for full accuracy is 0.5mA) • 5V, +/-5V, 10V, +/-10V, 30V

## COMMUNICATIONS

<b>Ethernet:</b>	1	10/100mb/s (10/100 Base-T)
SCADA Protocols		Modbus TCP & UDP (master/slave), Ethernet IP (master/slave PLC5 & SLC5/05 emulation), SDX (AES-128 Encryption), MQTT, Ethernet to Serial bridging
Internet Protocols		HTTP (server), FTP (server & client), E-mail (SMTP and POP3), ICMP (ping; server & client), NTP (client), DHCP (server & client), DNS, DDNS
<b>Wireless:</b>	1	900MHz 1/4W (24dBm) Frequency Hopping Spread Spectrum meshing radio, -101 dBm sensitivity @ 200kbps, up to 64 remote nodes
<b>Serial:</b>	1	RS-232, RS-485, RS-422, SDI-12 (for general purpose communications)
	1	RS-485 Bus port (this port is available for general purpose communications if not used for high-speed bus communications with other modules)
Baud Rates (all ports)		115K, 38.4K, 19.2K, 9600, 4800, 2400, 1200 baud.
Protocols		Modbus RTU (master/slave), DF1 (slave), SDX (AES-128 Encryption), SDI-12 (general purpose port only)

## HMIs

<b>Local:</b>	128x32 graphical, wide temperature range yellow OLED and single pushbutton
<b>Graphical:</b>	Web based, graphic library included. Compatible with most browsers, including Internet Explorer, Firefox, Chrome, Safari, Android
<b>Mobile:</b>	Web based, text only, up to 50 registers. Compatible with most browsers, including Internet Explorer, Firefox, Chrome, Safari, Android

## PROGRAMMING

<b>Languages:</b>	Ladder Logic, Function Block, Text—built-in web based graphical and text editor and debugger
<b>Capacity:</b>	64KB logic, 2MB source code, 32-bit integer and floating point math

## STORAGE

<b>Registers:</b>	504 Numeric registers, 504 Boolean registers
<b>Internal Flash disk:</b>	32MB
<b>Removable disk:</b>	Micro SD Card (up to 256GB, supplied by customer)

## CLOCK

<b>Real Time Clock:</b>	Temperature compensated with lithium battery backup power
Stability	+/- 3ppm from -30°C to 70°C

## GENERAL

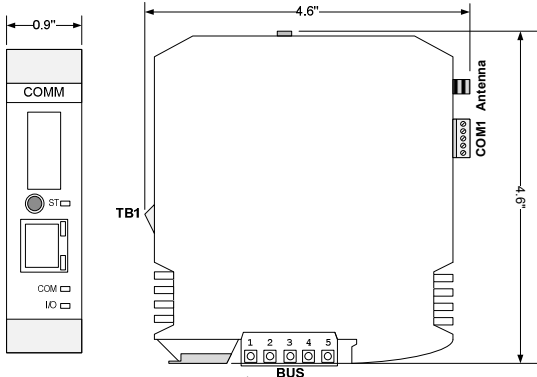
<b>Input Power:</b>	10Vdc to 30Vdc
<b>Power Consumption</b>	
Not using Ethernet	68mA @ 12Vdc / 40mA @ 24Vdc (Ethernet power saver enabled)
Using Ethernet	108mA @ 12Vdc / 60mA @ 24Vdc
Radio Transmitting	Add 100mA @ 12Vdc 50mA @ 24Vdc in short transmit bursts

<b>Field Wiring Termination:</b>	[81-5001] screw terminal blocks [82-5001] lever terminal blocks, 3.5mm, 22 to 14GA wires
<b>Antenna Connector:</b>	SMA female (female pin center conductor)
<b>Temperature:</b>	-40°C to 70°C (operating), -40°C to 85°C (storage)
<b>Humidity:</b>	<95% RH (non-condensing)
<b>Enclosure:</b>	Polyamide, light gray (RAL 7035)
<b>Mounting:</b>	35mm DIN rail with bus connector block



# Modulus Mesh Radio Communications Module - Type 2110 - Antenna Wiring

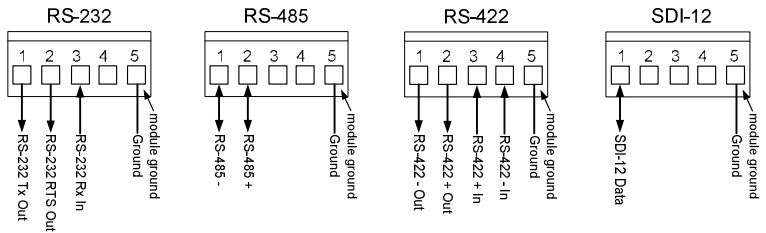
## DIMENSIONS and CONNECTIONS



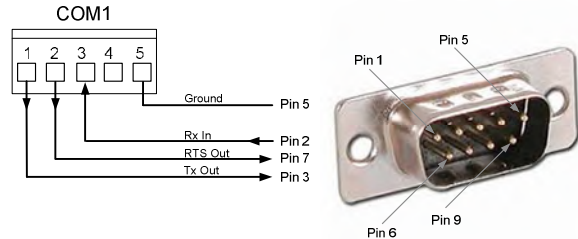
Terminal	Function
1	-485
2	+485
3	RESET#
4	GND
5	+V

Terminals	TB1
1	DI1
2	DI2
3	AI1
4	DO1
5	GND

## General Purpose Communications Port COM1 (modes are software configured)



## Typical COM1 RS-232 Wiring to Modem/Radio



## Yagi

## Omni

## Antenna System Options

Mesh Spread Spectrum radio systems use antennas mounted external to the controller. The type of antenna used depends on both the distance to be covered and the terrain between any two sites that are to be linked together. The selection of antennas, mounting height above grade, cable types, etc. should be determined by use of a radio path study to ensure reliable communications. There are three types of antennas typically used:

- ◆ "Salt Shaker" style Omni-directional for moderate distances
- ◆ 6dB Omni-directional for best performance at a Master or repeater site
- ◆ 6dB Yagi directional for best noise rejection and signal focus at remote sites

### "Salt Shaker" Style Omnidirectional for Medium Distance Communications

A "Salt Shaker" style antenna is the lowest cost, and easiest type to deploy in the field. It can be mounted on the top of the equipment panel and works well for moderate communications distance. Since it is omni-directional, there is no aiming or alignment required in the field. The antenna part number is **98-3103**, and connects to the communications module with a short internal antenna cable (part number **98-6536**).



"salt shaker" antenna

### Antenna Components for Maximum Communications Distances

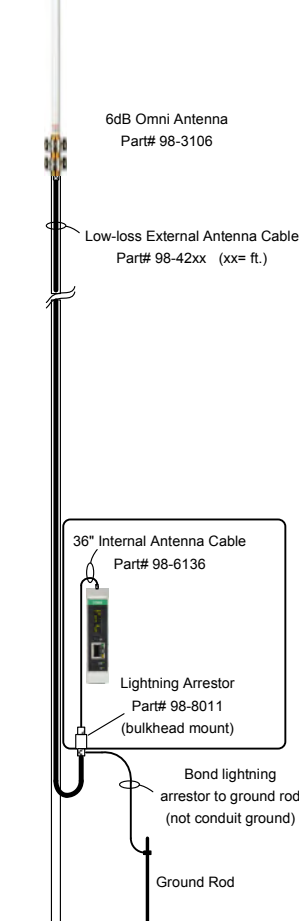
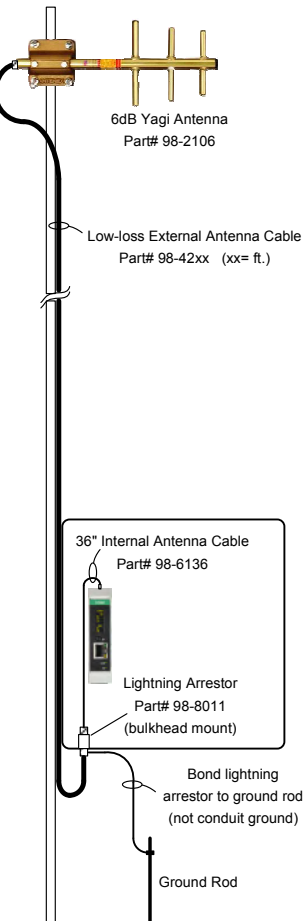
Using elevated higher gain antennas can significantly improve the performance and reliable operating distance of a radio system. Since elevating the antennas will also increase the installation and maintenance cost of the system, you should always have a radio path study done to select the antenna components and mounting arrangements. Omni-directional antennas do not need to be aimed while Yagi directional antennas will provide better off-axis noise rejection. For either type of antenna system, a lightning arrester is generally recommended since by being elevated, the antennas become a better "target" for a lightning strike. Use a dedicated grounding rod and bonding as shown for the lightning arrester.

### Antenna System BOM:


- 98-6536** 36" Internal Antenna Cable
- 98-8011** Lightning Arrester
- 98-42xx** Low-loss Antenna Cable (xx= length in feet)

- 98-2106** Spread Spectrum Yagi Directional Antenna or
- 98-3106** Spread Spectrum 6dB Omni-directional Antenna

- 98-9002** Weatherproofing Kit (for external antennal connections)



# Modulus Mesh Radio Communications Module - Type 2110 - Field Device Wiring

 Refer to the installation manual for additional installation details and precautions.

## Discrete Inputs DI1 & DI2, Discrete Output DO1 & Analog Input AI1 - TB1

The field wiring may be connected directly to the TB1 terminal block, or through a field Wiring Panel as shown in the diagrams below. All discrete inputs/outputs and the analog input are referenced to the ground terminal (5). This terminal is connected internally to the power supply ground.

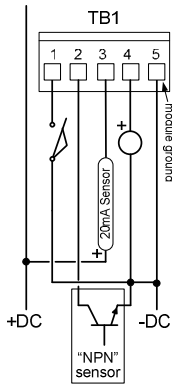
The Discrete Inputs accept contact closures or open-collector ("NPN" style) input signals. External pull-up resistors are not required.

The Discrete Output sources current by switching the module input power to the output terminal.

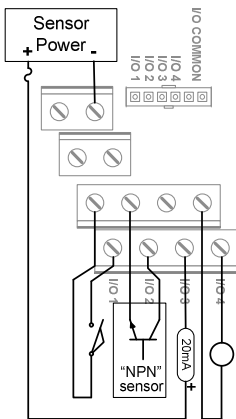
The analog Input accepts 20mA current or voltage (+/-5v, +/-10v and 30v) signals. The mode is software selectable. Sensors can be either loop powered (Figure A) or self-powered (Figure C). In power conserving applications, the analog sensor may be powered from the Discrete Output (Figure B), configured to switch power to the sensor only when needed to take an analog reading (with configurable "warmup" time (a 20mA loop powered sensor is shown below, but a voltage sensor can also be used by switching its power)).

Note that for all configurations, the model 82-00xx Field Wiring Panel is used.

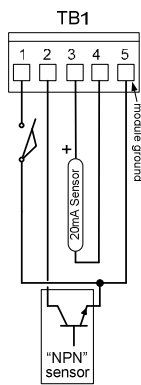
**FIGURE A**  
20mA Loop Powered Sensors  
External Loop Supply



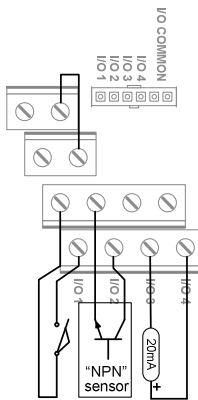
82-00xx Field  
Wiring Panel



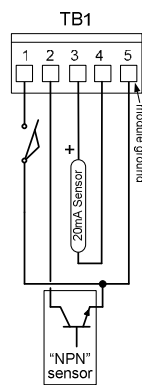
**FIGURE B**  
Analog Sensor Power  
from Discrete Output  
(power saver)



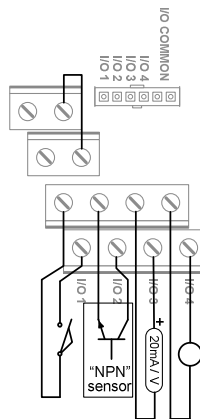
82-00xx Field  
Wiring Panel



**FIGURE C**  
Self-powered  
Sensors



82-00xx Field  
Wiring Panel



Optional Field Wiring Panel





Industrial Control Links, Inc.  
Roseville, CA 530.888.1800