

MODULUS

Cellular Communications Module 1120 with Extended I/O

Modulus Cellular Communications modules have a built-in 4G LTE cellular modem for data exchange over the Internet, alarming/notifications by e-mail and text message, and remote access. They also support **wired** communications with Modbus, DF1, Ethernet IP, SDX, MQTT, and SDI-12.

The Cellular Communications modules have built-in analog and digital I/O for tank level and process monitoring, and pump control applications such as lift stations and booster pumping stations. The base modules have a choice of analog inputs supporting either mA, voltage or resistance/temperature measurement, along with a high-speed discrete input and a FET discrete output. Additional I/O, consisting of 16 discrete inputs, 5 relay outputs, a couple more 20mA analog inputs, and 4 analog outputs, is brought out on an external field wiring panel.

Modulus Cellular 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.

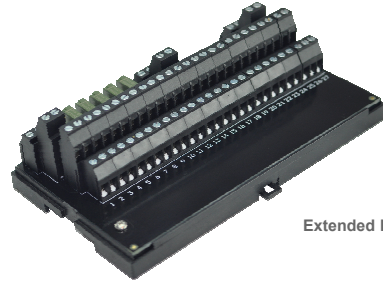


Verizon Cellular—Extended I/O

8x-5191 1DI/PI, 16DI, 6DO, 4AI (20mA), 4AO
8x-5291 1DI/PI, 16DI, 6DO, 2AI (V), 2AI (20mA), 4AO
8x-5391 1DI/PI, 16DI, 6DO, 2AI (ohms), 2AI (20mA), 4AO

AT&T & International Cellular—Extended I/O

8x-5192 1DI/PI, 16DI, 6DO, 4AI (20mA), 4AO
8x-5292 1DI/PI, 16DI, 6DO, 2AI (V), 2AI (20mA), 4AO
8x-5392 1DI/PI, 16DI, 6DO, 2AI (ohms), 2AI (20mA), 4AO



Extended I/O Field Wiring Panel

Modulus Cellular Communications Modules—Extended I/O

- 1 ETHERNET PORT
- 1 4G LTE CELLULAR MODEM (VERIZON OR AT&T / INT'L)
- 2 SERIAL PORTS (1 GENERAL PURPOSE AND 1 BUS PORT)
- 1 DISCRETE/HIGH-SPEED PULSE INPUT
- 16 DISCRETE INPUTS (OPTICALLY ISOLATED)
- 6 DISCRETE OUTPUTS (1 PROTECTED FET, 5 RELAY)
- 2 ANALOG INPUTS (8X-519X-mA, 8X-529X-V, 8X-539X-ohms/temp)
- 2 ISOLATED ANALOG INPUTS (20mA)
- 4 ANALOG OUTPUTS (20mA)

STANDALONE OPERATION

Modulus Cellular Communications modules can serve as standalone devices with SCADA communications, local and web human machine interfaces (HMI), historical trending and data logging, alarming, reporting, and programmable logic.

COMMUNICATIONS

Modulus Cellular Communications modules have a built-in 4G LTE cellular modem that can be ordered to support either Verizon or AT&T / international cellular networks. They also have an Ethernet port and one or 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 Cellular 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.

ALARMING

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

REDUNDANCY

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

Modulus Cellular Communications Module with Extended I/O - Type 1120 - Specifications

FIELD I/O

Discrete Inputs:

- | | |
|----------------|--|
| 1 | 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+ |
| 16 | Optically Isolated, bipolar (AC/DC, not polarity sensitive) |
| Input Range: | 0 to 30V (OFF < 6V, ON>9V) |
| Input Current: | 1.2mA @ 12V, 3mA @ 24V |
| Filtering | Individually configurable: 20Hz or 100Hz |

Discrete Outputs:

- | | |
|----------------|--|
| Output Rating: | 1 Solid-state Protected FET high-side drivers (switch to input power when ON)
30Vdc, 2A maximum, current limited to approximately 2.25A. |
| Output Rating: | 5 Relays, Form A (normally open), individually isolated (no shared common)
240/277 Vac, 30Vdc, 3A maximum per output (resistive load).
A snubber diode (DC) or RC snubber (AC) must be used across the relay contacts or load connections for any inductive load. |

Analog Inputs:

- | | |
|--------------|--|
| Input Range: | 2 16-bit, Delta Sigma, individually software configurable ranges <ul style="list-style-type: none">• [8X-519X] 20mA (Minimum input for full accuracy is 0.5mA)• [8X-529X] 5V, +/-5V, 10V, +/-10V, 30V• [8X-539X] 50K ohms, temperature using 2.2K, 10K (type II, III and w/11.K shunt) thermistors |
| | 2 16-bit, Delta Sigma, 20mA (Minimum input for full accuracy is 0.5mA), with shared isolated common between both channels |

Analog Outputs:

- | | |
|----------------|--|
| Output Ranges: | 4 12-bit <ul style="list-style-type: none">• 0- 20mA, 4-20mA |
|----------------|--|

COMMUNICATIONS

Ethernet:

- | | |
|--------------------|--|
| SCADA Protocols | 1 10/100mb/s (10/100 Base-T) |
| Internet Protocols | Modbus TCP & UDP (master/slave), Ethernet IP (master/slave PLC5 & SLC5/05 emulation), SDX (AES-128 Encryption), MQTT, Ethernet to Serial bridging
HTTP (server), FTP (server & client), E-mail (SMTP and POP3), ICMP (ping; server & client), NTP (client), DHCP (server & client), DNS, DDNS |

Cellular:

- | | |
|--------------------|---|
| SCADA Protocols | 1 4G LTE: [8x-5x91] 700(B13)/AWS1700(B4)/1900(B2) (Verizon) |
| Internet Protocols | 4G LTE: [8x-5x92] 700(B12/B13)/850(B5)/AWS1700(B4)/1900(B2) (AT&T, T-Mobile, International)
Modbus TCP & UDP (master/slave), MQTT
HTTP (server), FTP (server & client), E-mail (SMTP and POP3), ICMP (ping; server and client), DNS, DDNS |

Serial:

- | | |
|------------------------|--|
| Baud Rates (all ports) | 1 RS-232, RS-485, RS-422, SDI-12 (for general purpose communications) |
| Protocols | 1 RS-485 Bus port (this port is available for general purpose communications if not used for high-speed bus communications with other modules)
115K, 38.4K, 19.2K, 9600, 4800, 2400, 1200 baud.
Modbus RTU (master/slave), DF1 (slave), SDI-12 (general purpose port only) |

HMIs

Local:

128x32 graphical, wide temperature range yellow OLED and single pushbutton

Graphical:

Web based, graphic library included. Compatible with most browsers, including Internet Explorer, Firefox, Chrome, Safari, Android

Mobile:

Web based, text only, up to 50 registers. Compatible with most browsers, including Internet Explorer, Firefox, Chrome, Safari, Android

PROGRAMMING

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 including analog output current)

Not using Ethernet 68mA @ 12Vdc / 40mA @ 24Vdc (Ethernet power saver enabled)

Using Ethernet 108mA @ 12Vdc / 60mA @ 24Vdc

Add current per on relay 10mA @ 12Vdc / 5mA @ 24Vdc

Field Wiring Termination:

[81-5x9x] screw terminal blocks [82-5x9x] lever terminal blocks, 3.5mm, 22 to 14GA wires

Antenna Connector:

SMA female (female 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)

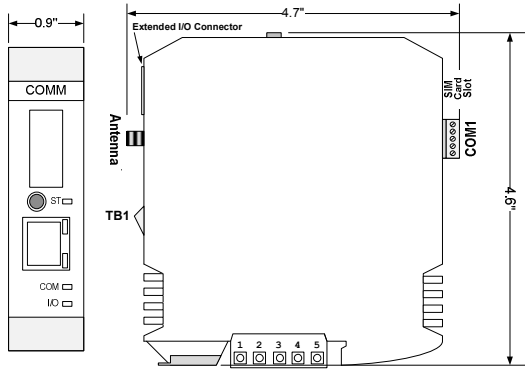
Mounting:

35mm DIN rail with bus connector block



Modulus Cellular Communications Module with Extended I/O - Type 1120—Antenna Wiring

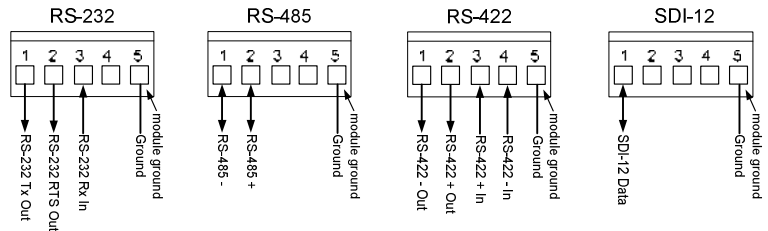
DIMENSIONS and CONNECTIONS



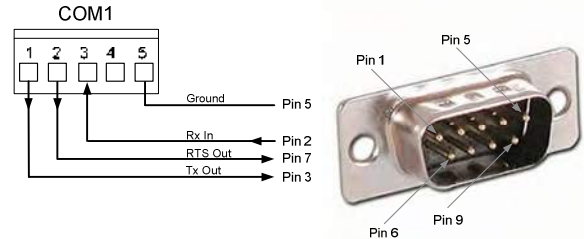
Terminal	Function
1	-485
2	+485
3	RESET#
4	GND
5	+V

Terminals	TB1
1	DI1
2	AI1
3	AI2
4	DO1
5	GND

General Purpose Communications Port COM1 (modes are software configured)



Typical COM1 RS-232 Wiring to Modem/Radio



Antenna System Options

Most cellular based systems typically have less costly and complex antenna system requirements. The choice of antenna components depends on the type of enclosure housing the enclosure (metallic or non-metallic) and the proximity to the nearest cellular tower.

Non-metallic Enclosure

When installed in a non-metallic enclosure, the simplest and lowest cost antenna solution is a whip antenna screwed directly into the SMA antenna connector on the module. The part number is **98-3411**.



Metallic enclosure—standard.

If the module is installed in a metallic enclosure, many applications can use a low-cost "salt-shaker" style antenna (part number **98-3402**), mounted on the enclosure. The antenna is connected to the communications module with a short internal antenna cable (part number **98-6136**).



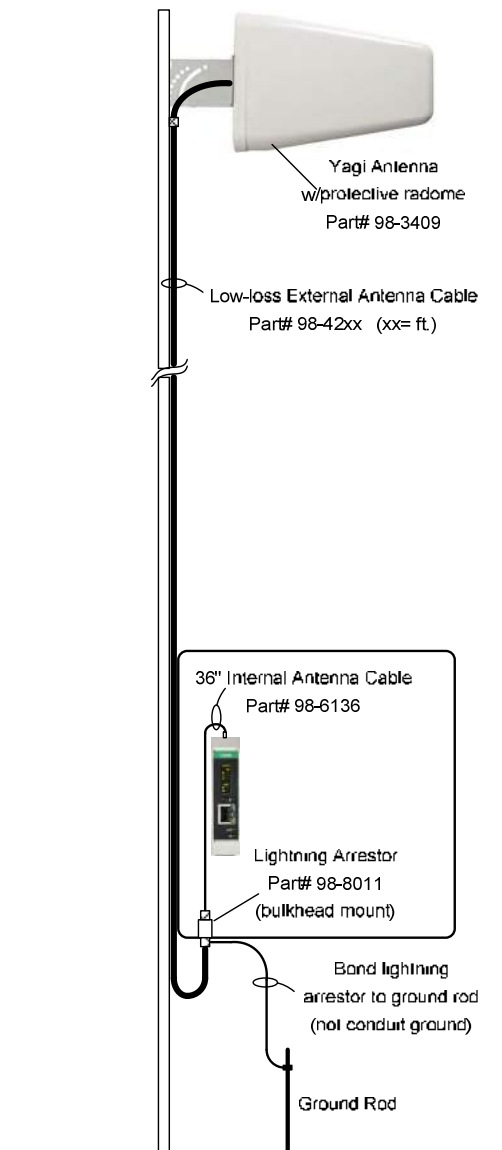
"salt shaker" antenna

Metallic enclosure—difficult reception areas.


Sometimes, the site location may not be close to the carriers cellular tower. This may require a higher performance antenna system using a Yagi directional antenna elevated on a support pole or structure.. You will need to aim the antenna towards the desired cellular tower (the carrier can help you identify the tower location). A lightning arrestor is generally recommended since the antenna is elevated, making it a better "target" for a lightning strike. Use a dedicated grounding rod and bonding as shown for the lightning arrestor.

Antenna System BOM:

98-6136	36" Internal Antenna Cable
98-8011	Lightning Arrestor
98-42xx	Low-loss Antenna Cable (xx= length in feet)
98-3409	Cellular Yagi Antenna w/ weather radome
98-9002	Weatherproofing Kit (for external antennal connections)



Modulus Cellular Communications Module with Extended I/O - Type 1120 - Field Device Wiring

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

Discrete Input DI1, Discrete Output DO1 & Analog Inputs —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 analog inputs are referenced to the ground terminal (5). This terminal is connected internally to the power supply ground.

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

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

The 8x-519x models have analog Inputs that accept 20mA current signals. Loop powered (Figure A) and self-powered (Figure C) devices are supported. In power conserving applications, the analog sensors may be powered from the Discrete Output (Figure B), configured to switch power to the sensors only when needed to take an analog reading (with configurable "warmup" time).

The 8x-529x models have analog Inputs that support voltage sensors (+/-5v, +/-10v and 30v) while the 8x-539x models support resistance sensors including thermistor type temperature sensors. The wiring for these sensors is shown in Figure D below.

Note that for loop powered devices, model 82-01xx Field Wiring Panels should be used. For self-powered devices, either model 82-00xx or 82-01xx Field Wiring Panels may be used.

8x-519x (20mA Analog Inputs)

FIGURE A
20mA Loop Powered Sensors
External Loop Supply

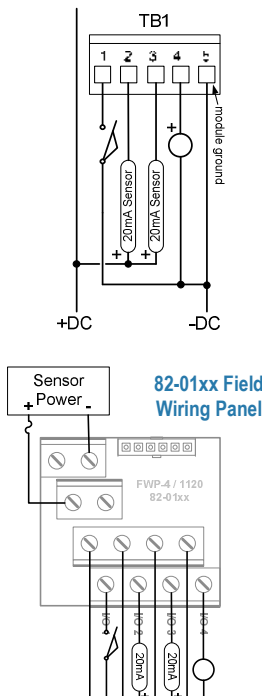


FIGURE B
Sensor Power from
Discrete Output

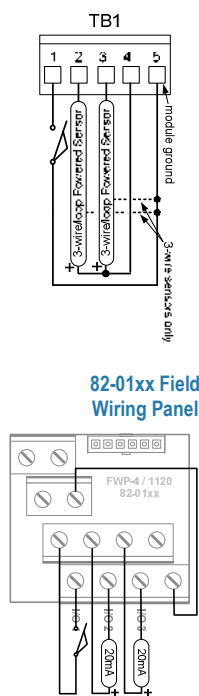
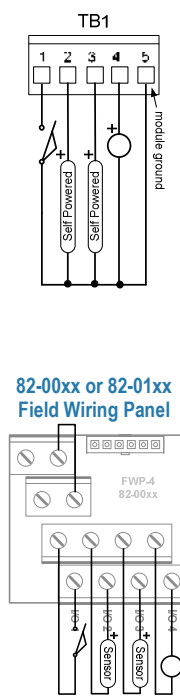


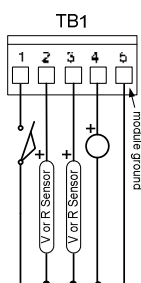
FIGURE C
Self-powered
20mA Sensors



Optional Field Wiring Panel

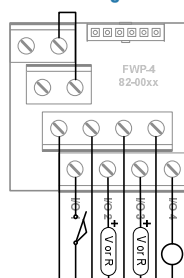
8x-529x (Voltage) and 8x-539x (Resistance/Temperature) Analog Inputs

FIGURE D
Voltage and Resistance
Sensor Wiring

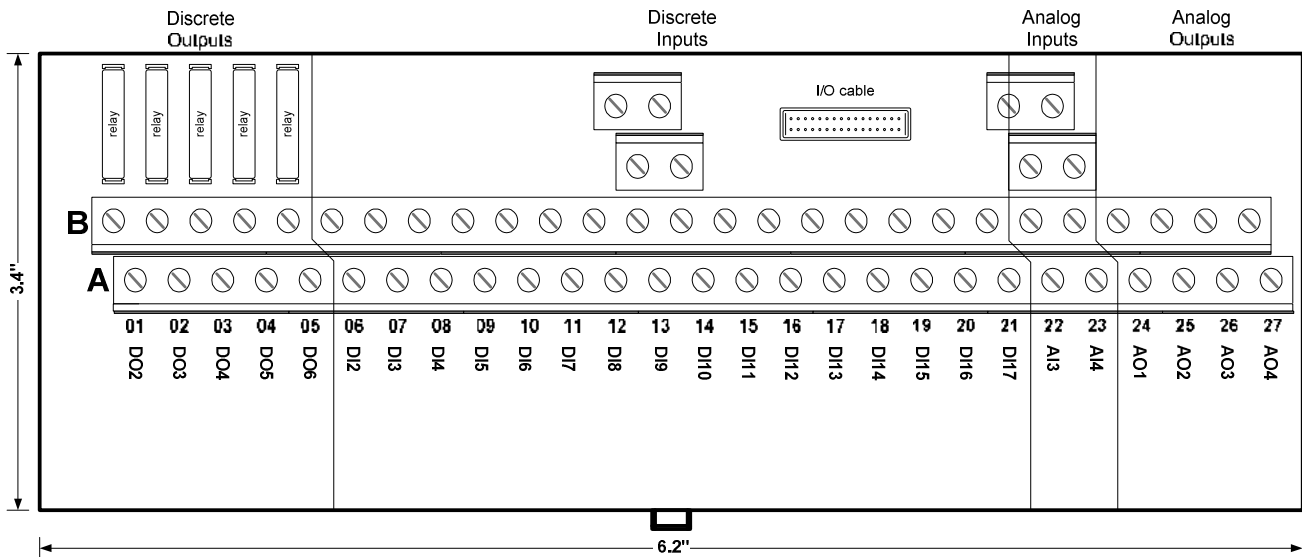


Note:
Resistance sensors
do not have a polarity

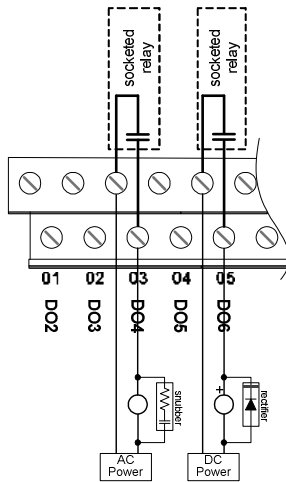
**82-00xx or 82-01xx
Field Wiring Panel**



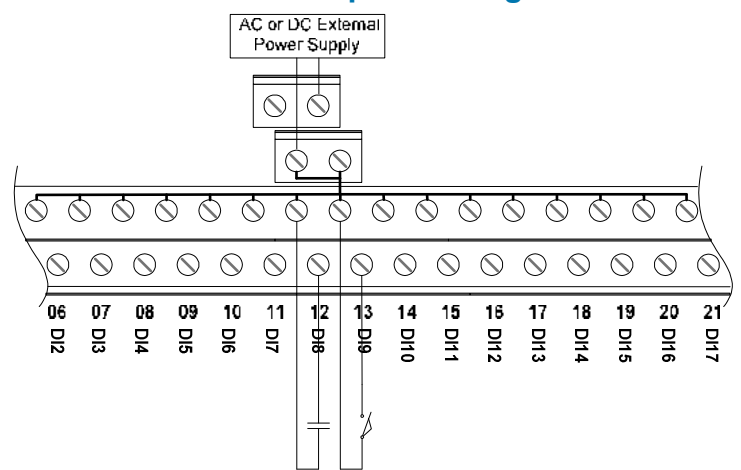
Extended I/O Field Wiring Panel 8x-5x9x



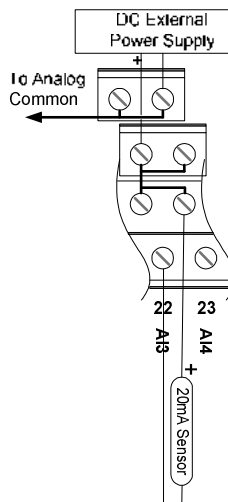
Discrete Outputs Wiring



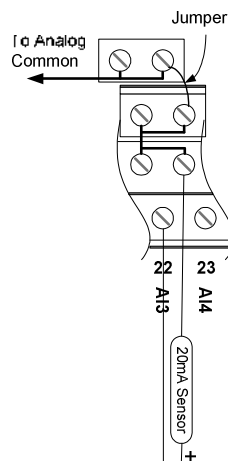
Discrete Inputs Wiring



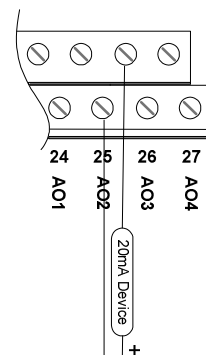
Analog Inputs Wiring Loop Powered Devices



Analog Inputs Wiring Self Powered Devices



Analog Outputs Wiring



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

www.iclinks.com



Industrial Control Links, Inc.
Roseville, CA 530.888.1800