



## Monitor & Control Equipment Anywhere From the M2M Web Site

*Receive Voice or E-Mail messages within seconds*

The M222 is a low cost web-to-wireless remote monitor and control system. Its internal cellular modem provides two-way communications to the automated M2M operations center and the [www.m2mcomm.com](http://www.m2mcomm.com) web site. Dual mode (analog/digital) cellular communications provides very wide spread coverage throughout North America with no requirement for a local cellular account.

The inputs and outputs of the M222 are suitable for a wide range of direct connect monitoring and control applications. A standard M222 monitors up to two digital inputs and two analog inputs, and has two remote control relays. With [wireless remote I/O options](#), the system can monitor to 8 digital and analog inputs and control up to 8 outputs.



**All New!** The M222 features automatic control features based on local and remote switches and sensors -- in addition to remote web based control

### Operation is very simple:

1. Connect the M222 to the switches, sensors, and voltages to be monitored and to the equipment to be controlled. Select the best configuration options, such as wireless remote I/O points, timer/counters, and automatic local control options. Apply power.
2. The M222 will automatically establish two-way wireless communications to the [www.m2mcomm.com](http://www.m2mcomm.com) web site.
3. Log onto your private secure page on the M2M web site to:
  - View the last reported status of your equipment – switch positions, equipment on/off status, number of pumps starts, run time...
  - Send a remote control command or request an up-to-date report from the unit
  - Configure selected alarms or events to trigger an immediate user notification
  - Configure time/date scheduled command sequences

## Digital Inputs #1 & 2

The M222 is equipped with two on-board digital status inputs. Both are protected with surge suppression circuitry per ANSI C37.90.1-2002 to minimize the effect of external transient voltages. In the standard product configuration, the inputs can be configured to report (or not report) all state changes

The standard product is configured to monitor dry contact inputs. A 12 VDC wetting voltage is supplied to the two common terminal points. No external voltage is required.

*The digital inputs of the model M202HV can directly monitor the presence or absence of 120, 240, and 480 VAC. This model is ideal for use in industrial load shedding (demand side management) applications.*

The M222 can report the state of all inputs when any input changes state in either direction (open-closed or closed-open) for longer than the programmable trigger time. The trigger time of each input is set by the user through a local programming utility and can be varied from a minimum of 1 second to a maximum of 240 seconds. Any change that does not remain stable for the specified trigger time will be ignored.

## Counter / Timer Options

The digital inputs can also be individually configured as counter / timers. There are two counter reporting options:

1. Report the counts since the last report -- plus the time the input was closed. This is useful for time scheduled reports such as “The pump turned on 8 times today and ran for 4 hours and 12 minutes.”
2. Delta or “Flow Meter” mode – reports the number of counts per minute. The value is updated every minute. In this mode, the timer isn’t relevant and is reported as 0.

Counter inputs will count all state changes that are stable for at least 10mS. The timer function tests the input once per second and increments the run-time timer if the input is closed.

## Two Analog Inputs

Two analog inputs are configured to monitor 0-10 VDC or 0-20 mA input signals (jumper selectable). Other values can be ordered as factory options.

Two programmable set points and one trigger time can be locally programmed for each input. When the monitored signal crosses a set point for the specified trigger timer, a range change report may be sent. The A-D converter has 10-bit resolution, so the analog report sends the measured signal(s) as a number from 0-1023.

At the M2M web server, offsets, scalars and lookup tables are available to convert the raw numbers into meaningful values such as temperature, tank level, pressure, etc. These flexible conversion options allow the system to monitor and accurately interpret many types of sensors. The analog report also includes the present range (such as low, medium, high) of the monitored signal.

Analog inputs are protected with surge suppression circuitry per ANSI C37.90.1

## Remote Control Outputs #1 & 2

Two on-board Form C mechanical relays have the capability to switch up to 8 Amps at up to 250 VAC (or 8 Amps at up to 30 VDC).

Remote control commands from the web server can set either output relay to a continuing state of closed (on) or open (off), or can initiate a temporary open or closed condition. The length of the temporarily controlled output changes can be selected from the web site in increments of 1 to 9999 seconds, or 1 to 9999 minutes (over 6 days).

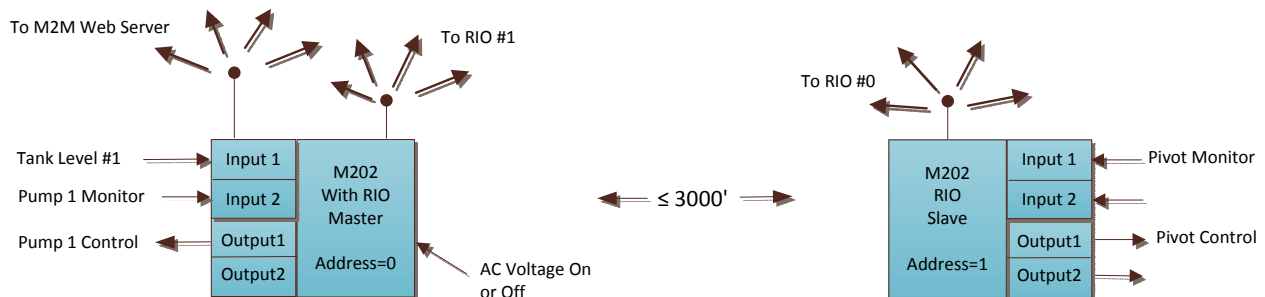
Time scheduled or “as-needed” commands from the web server can control any of the output relays at a variety of user defined times and frequencies.

## Optional - Wireless Remote Inputs & Outputs (RIO)

Up to six wireless RIO slave units can be assigned to each M222 RIO master. A RIO slave is the same product as the standard M222 except that it has no cellular modem and it reports to the web site through the M222 master device. Each slave also has up to 2 on-board digital inputs, 2 analog inputs and 2 relay outputs. The remote slave inputs and outputs operate the same as the M222 master’s on-board inputs and outputs.

The maximum system configuration is 8 digital inputs, 8 analog inputs, and 8 outputs. These I/O points can be distributed among the master unit and up to 6 slaves.

*An Example Configuration with one RIO Master and one Slave (with no analog inputs being used):*



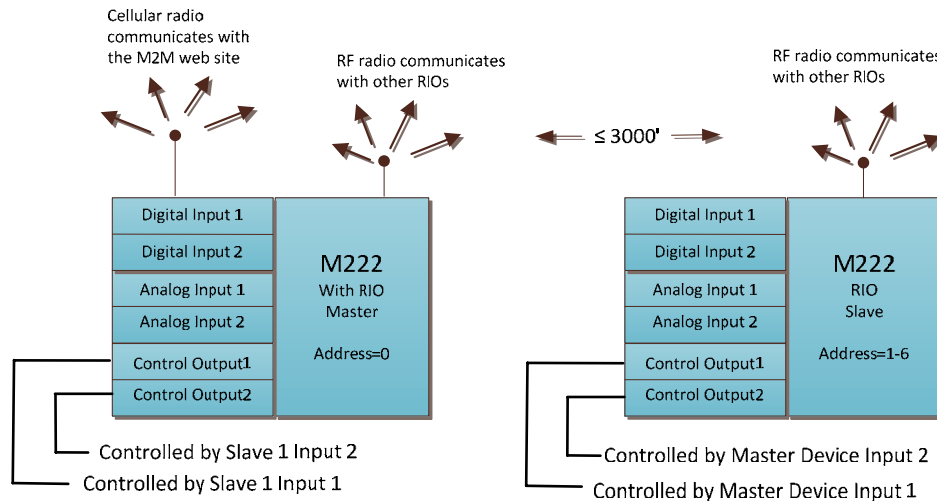
## Automatic Output Controls

All (eight) outputs can be individually configured as:

- (1) Remotely controlled from the M2M web site or
- (2) Automatic

In the remote control configuration, any output relay can be closed (turned on) or opened (turned off), either permanently or for a specified period of time, from 1-9999 seconds or 1-9999 minutes. In the automatic mode, each output relay can be locally controlled based on the state of monitored switches and/or sensors. More specifically, the outputs can be configured to “follow” any of 8 analog or digital inputs. This control option can be changed from the web site at any time. For example, any output

may normally be controlled based on local conditions, but can be individually overridden at any time by a command from the web site. Each output can be locally controlled based on any user-assigned analog or digital input. The following diagram is an example:



#### Following a digital input:

If the corresponding input is closed (on), then the control relay will be energized. The normally open (NO) point will be closed and the normally closed (NC) point will be opened. If the corresponding input is open (off), then the control relay will be de-energized.

#### Following an analog input:

At the local board level, each analog input is measured as a value from 0-1023. Two setpoints can be entered for each analog input. These setpoints are used to categorize the measured value into one of three ranges: 0, 1, or 2. When a measured analog value crosses a setpoint and stays there for longer than the specified trigger time, then the range will change.

Outputs can be controlled when a measured value changes to range 0 or 2. For example, if a greenhouse temperature exceeds 80 degrees, a fan could be turned on. If the temperature drops below 70 degrees, the fan can be turned off. If a water tank level (or pressure) becomes low, the pump can be turned on. When the water level becomes high, the pump can be turned off.

#### Remotely Monitored - Or Not

The standard system includes a RIO master device with a connection to the M2M web site via the cellular modem. If no remote monitoring or control is desired, then a system of "slave" units can still operate as a stand-alone system.

## Long Distance Machine to Machine Controls

The RIO automated controls are ideal for systems in which the system components are in line-of-sight and in range of the RF radios. If the devices to be controlled are out of range, then the M2M NOC can be used to forward commands from one unit to another - anywhere in North America.

Control commands can be sent to any M2M unit based on input conditions reported by another unit.

## Integrated Power Supply & Battery Backup - *Power Outage Reporting*

The standard M222 operates from 120, 240, or 480 VAC. The circuit board includes an on-board voltage regulator that can be used to continually charge a small (up to 5 Amp Hr) 12 VDC battery while AC power is present.

If the AC power is lost for more than one minute, the unit will report the power outage. When power is restored, a Power On call will be made. This is the only use of the backup battery.

DC powered units are also available as a factory option. A15 VDC supply is required if the backup battery is to be used. Otherwise, 12 VDC can be used. A special low power mode can be enabled to further reduce the unit's power consumption. In this mode, the radio is powered down except when a report is being transmitted. This is useful for solar powered applications where no controls or reports-on-demand are needed.

## External Voltage Supply

As a convenient power source for low powered sensors, the M222 provides a jumper selectable 5 VDC or 12 VDC output. The current draw should be limited to 50 mA.

## Reporting Options

Reports are triggered for three reasons: (1) a specified alarm condition occurs such as a digital input change or analog range change, (2) a time scheduled report is due, or (3) a report is requested from the web site.

The status of the connected inputs and outputs are reported along with a variety of system configuration information. Reports can be time scheduled at a programmable frequency, from once every hour to once every 240 hours (10 days).

The reports can be requested at any time from the web site.

## Daily Transmission Limits

To reduce the number of transmissions that might result from over-active inputs or power cycling conditions, the number of event-based calls per "24 hours of operation" can be limited. User requested status calls will continue to be placed even after this limit has been reached. The daily limit can be set from 1 to 20. A test/demo mode allows unlimited daily calls.

## Dual Mode (Digital / Analog) Cellular Control Channel Communications

M2M cellular communication provides very wide spread coverage throughout North America with no requirement for a local cellular account. The low cost makes it suitable for a wide variety of general monitoring and control applications. The M222 will operate on the digital (CDMA) cellular network if it is available. If not, the unit will automatically switch to the analog cell network.

## Easy Installation and Test

A pushbutton switch initiates a test in which LEDs are used to indicate the signal strength being received by the radio. This is used to facilitate installation, antenna selection and orientation, and troubleshooting.

In addition, informative status messages and test functions can be displayed to a PC or Palm terminal program to help understand what the system is doing and to aid in troubleshooting.

## WWW.M2MCOMM.COM

At the M2M Communications Network Operations Center, incoming data is validated and processed for distribution to the end user. In addition, configuration and control information can be sent from the M2M web site to the field module.

The central web server records and displays all incoming status messages and depending on the customer's instructions can notify the customer of the event via e-mail or telephone (using a text-to-speech voice message), and/or pass the data to the customer's designated e-mail or IP address.

After entering a unique user ID and password:

- Both current and historical data can be viewed for all units. Displays can be personalized with informative labels and units.
- Data exporting options can be defined.
- Remote control commands, reporting options and user notification messages can be created and maintained.
- Time scheduled reports and commands can be defined.
- Current status reports can be requested.
- Time/date scheduled command sequences can be set up

M2M customers can also dial in to the toll-free number of the automated M2M Network Operations Center to hear a spoken status report of their monitored equipment or facility from any telephone in North America. The text-to-speech based status message may be as complex as a listing of all monitored inputs and outputs or it may be as simple as "the pump is off". Remote control commands can also be entered directly from the telephone.

## User Notifications

Digital input changes and analog range changes can be used to trigger notifications to a list of contact people. Notifications include telephone based voice (text-to-speech), emails, and/or text messages. The call-out lists, messages, and triggers are fully definable by the user.

## Hardware Specifications

### Cellular Radio Specifications

The Kyocera M200 is a rugged dual mode cellular modem module

- Compatible with the Digital (CDMA) and AMPS analog cellular system in North America including
  - PCS CDMA Digital Cellular (1900 MHz) and
  - Cellular CDMA Digital (800 MHz)
- The standard antenna is mounted inside the enclosure. External high gain antennas are available for remote locations.

### Environmental

The components are assembled in a weatherproof polycarbonate enclosure with a hinged, gasketed lid. The recommended operating temperature range is -22 to 140 degrees F (-30 to 60 C). The recommended relative humidity range is 5 - 95% non-condensing.

## I/O Options

### Ordering Information

The standard M2xx product configuration is a single box. It includes 2 digital (dry contact) inputs, 2 analog inputs, and 2 remote control relays in a weatherproof enclosure. It is powered by 120, 240, or 480 VAC, and includes an internal battery and charger for reporting AC power outages. Several reduced I/O count options are available.

- |                                 |   |
|---------------------------------|---|
| <input type="checkbox"/> M222   | Standard unit - 2 digital inputs, 2 analog inputs, 2 control relays |
| <input type="checkbox"/> M202   | 2 digital inputs, 2 control relays                                  |
| <input type="checkbox"/> M200   | 2 digital inputs  |
| <input type="checkbox"/> M202HV | 2 high voltage inputs (120, 240 & 480 VAC), 2 control relays        |

### Model M2xx with integrated RIO Master (Remote Input Output Capability)

The M2xx can be ordered with a fully integrated RIO system. In addition to monitoring and controlling directly connected equipment, the M2xx with RIO can wirelessly communicate with up to six local remote input/output slave devices. This is very useful when the equipment is not located in one physical location. Please refer to the M2M RIO product specification for full details.

The RIO configuration normally includes one master device (with cell phone) and up to 6 slaves. The maximum system configuration is 8 digital inputs, 8 analog inputs, and 8 outputs.

- |                                     |   |
|-------------------------------------|---|
| <input type="checkbox"/> RIO Master | Includes a cellular modem - only one per system |
| <input type="checkbox"/> RIO Slave  | No cellular modem - up to six per system        |

- ✓ The RIO Master & Slaves can be ordered as M222, M202, or M200.
- ✓ For a RIO system without remote monitoring & control, order only Slave units.

#### Power Supply Options:

- |   |  |
|---|--|
| <input type="checkbox"/> 15 VDC Powered | Powered by +15VDC. This option can charge the internal battery   |
| <input type="checkbox"/> 12 VDC Powered | Powered by +12VDC. Can be used when there is no internal battery |
| <input type="checkbox"/> No battery     | Removing the internal battery disables power outage reporting    |

*Please call to discuss other options*

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