

## Monitor Equipment Anywhere in North America from Your Web Site

*Receive Voice or E-Mail messages within seconds*

The M3000 is a web-to-wireless remote monitor and control system. Its internal GSM cellular modem provides two-way communications to the automated M2M operations center and the [www.m2mcomm.com](http://www.m2mcomm.com) web site. GSM cellular communication provides very wide spread coverage throughout North America with no requirement for a local cellular account.

The inputs and outputs of the M3000 are suitable for a wide range of direct connect monitoring and control applications. The standard M3000 monitors up to 10 digital inputs, which can be can be dry contacts or 120 VAC inputs. These inputs can be configured as alarms or counters. It can also monitor up to 3 analog inputs and it has 3 remote control relays.



### Operation is very simple:

1. Connect the M3000 to the switches, voltages, and sensors to be monitored and to the equipment to be controlled.
2. The M3000 will automatically establish 2 way communications over the cellular network to the [www.m2mcomm.com](http://www.m2mcomm.com) web site.
3. Log onto your private page to:
  - View the last reported status of your equipment – switch positions, equipment on/off status, tank levels, temperature, pressure, flow rate, number of pulses received...
  - Send a remote control command or request an up-to-date report from the unit.
  - Configure selected events to trigger an immediate user notification.



IEDs communicate with the M2000 using Modbus protocol

Data is wirelessly transmitted through the cellular network through a cellular control channel...



...to the M2M Network Operations Center and intelligent web site



Data can be viewed on the secure web site or passed to other locations



M2M Communications Process Diagram

## Ten Digital Inputs

The M3000 is equipped with 10 digital status inputs. All inputs are opto-isolated and 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 are defined as follows:

1. Monitors a digital, dry contact. Can either count state changes or report state changes
2. Monitors a digital, dry contact. Can either count state changes or report state changes
3. Monitors a digital, dry contact, and reports all state changes
4. Monitors the presence or absence of 120 VAC, and can report state changes
5. Monitors the presence or absence of 120 VAC, and can report state changes
6. Monitors the presence or absence of 120 VAC, and can report state changes
7. Monitors the presence or absence of 120 VAC, and can report state changes
8. Monitors the presence or absence of 120 VAC, and can report state changes
9. Monitors the presence or absence of 120 VAC, and can report state changes
10. Monitors the presence or absence of 120 VAC, and can report state changes

- *Any of the inputs can be modified in the factory to monitor dry contacts or different voltages.*
- *Inputs 4 & 5 can be configured counter / timers.*

Inputs 1-3 include an LED for each input that will be lit if the monitored contact is closed  
Inputs 4-10 include an LED for each input that will be lit if 120 VAC is present.

The unit will report the state of all 10 inputs when any “alarm style” input changes state in either direction (open-closed or closed-open) for longer than the programmable trigger time. The trigger time of each alarm style input is set by the user through the local programming utility and can be varied from a minimum of 1 second to a maximum of 30 minutes and 59 seconds. A different time can be specified for each input and each direction (open-closed and closed-open). Any change that does not remain stable for the specified trigger time will be ignored. The factory default trigger time is 5 seconds for both directions.

## Three Analog Inputs

Three analog inputs are configured to monitor a 4-20 mA input signal.

- *A factory hardware change can be made to measure other types of signals such as 0-10 VDC.*

Three 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 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 web server, offsets, scalars and lookup tables are available to convert the three raw numbers into meaningful values such as temperature, tank level, pressure, etc. These flexible conversions allow the unit to monitor and accurately interpret many types of sensors. The analog report also includes the present range (1-4) of the monitored signal.

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

### Three Remote Control Outputs

Two mechanical relays have the capability to switch up to 8 Amps each at up to 250 VAC (or 8 Amps at up to 30 VDC).

One solid-state relay is designed to switch up to 3 Amps at up to 240VAC.

Remote control commands from the web server can set each output to a steady state ON or OFF, or can initiate a momentary (10 second) ON condition.

➤ *Application specific local control routines are available. Please call to discuss your needs.*

### Integrated Power Supply & Battery Backup

The M3000 circuit board operates from +15 VDC. It includes an on-board 12VDC voltage regulator that can be used to continually charge a small (up to 5 Amp Hr) battery while AC power is present.

If the AC power is lost for more than one minute, the unit will report the power outage. The Call Reason will specify that the call is being sent because of an AC power outage. After the report has been sent, the radio will be turned off to conserve the battery. If a subsequent event and report is initiated, the radio will be turned back on long enough to make the report.

The program will continue to operate normally until such time as the battery voltage drops to approximately 12 Volts. At that time, a low battery report will be made and then the battery will be disconnected to prevent an excessive battery discharge that could reduce battery life.

When power is restored, a Power On call will be made.

### Low power mode

The M1000 unit has a user-selectable low-power mode. In the low power mode, the radio is turned off to conserve power and therefore is unable to receive remote requests for input status reports. However all other functionality remains active. If an input changes or a time-scheduled report is due, the radio will be temporarily turned on to make the call.

### Daily Call Limits

To reduce the number of calls that might result from over-active inputs or power cycling conditions, the number of event-based calls per day can be limited. Time scheduled calls and user requested status calls will continue to be placed even after this limit has been reached. The "total daily call limit" should be selected so that the total number of calls is limited to no more than 20 calls per day and no more than 400 calls per month. The daily limit can be set from 1 to 20.

### On-Board Radio Signal Strength Indicator & Status Messages

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 any PC terminal program to help understand what the system is doing and to aid in troubleshooting.

## GSM Cellular Communications

The GSM cellular network provides very wide spread coverage throughout North America with no requirement for a local cellular account. The small size and low cost make it suitable for a wide variety of general monitoring and control applications.

When an M3000 module makes a call from anywhere in North America (in cellular coverage), it is recognized by the local cellular provider as a roaming cell phone. As a part of the standard roaming protocol, the local cellular network automatically passes the module's identification numbers and data to the central cellular hub and on to the M2M Network Operations Center. The M2M module passes its data in a normally non-utilized data field. This technique allows the transmission of an identification number and the time and date plus 25 digits of customer specific data, all at a very low cost.

## WWW.M2MCOMM.COM

At the M2MComm data center, the 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 customized with informative labels, scaling factors, 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 can be defined.
- Current status reports can be requested.

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 digital and analog 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.

## Reporting Options

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

Reports have been pre-defined to optimize the available data packet. The open/closed status of all direct connected inputs as well as all counters and timers can be reported. The 10 bit value and range of each analog input as well the status of all outputs are reported along with a variety of system diagnostic information.

All reports can be time scheduled, each at a predefined frequency, from once every hour to once every 240 hours (10 days).

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

## Hardware Specifications

### Cellular Radio Operating Specifications

The GSM / GPRS digital cellular modem has the following specifications:

- GPRS Class 10 operation
- Packet data up to 85.6K bps
- Embedded TCP/IP stack

The standard antenna is mounted in a rugged hard plastic case with an SMA connector

### Environmental

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.

### Power Supply / Enclosure Options

The standard configuration is a 120 VAC powered unit. This option includes an AC to DC power supply and a 0.8 Amp Hr battery. The components are assembled in a weatherproof enclosure with a gasketed screw-on lid. The external 120 VAC option is pictured on the front page of this spec sheet.

- Optional DC power supplies are available that can operate from 9 – 72 VDC.

The M3000 is also available as a plain printed circuit assembly without an enclosure, 120 VAC power supply, or battery. It operates from 15 VDC (+/- 10%, 2 Amp peak current draw). This configuration assumes that the unit will be mounted on standoffs in a weatherproof metal enclosure.

### M3000 Ordering Information

10 Digital inputs and 3 analog inputs, 3 remote control relays, No Modbus functionality

Powered by 120 VAC

- M3000 AC\_EXT    Weatherproof enclosure, Includes a 0.8 A-Hr Battery

Powered by 15 VDC

- M3000 DC\_INT    Printed Circuit Assembly only - No enclosure

*Please call to discuss any desired options.*

*Last Update November 2007*