MACHINE TO MACHINE | WEB TO WIRELESS

M2M communications

K322

Fuel Selection Module / Automated Meter Reading (FSM/AMR) System

The model K322 is a secure 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 web site. Cellular communication provides very wide spread coverage throughout North America.

The K322 collects and reports two hourly meter readings with an internal memory capable of storing one month of hourly data. It also provides dry contact outputs that can be used to remotely select alternate fuel supplies, such as oil or gas.

A digital display on the cover displays the current site temperature and the system status.

The K322 has the ability to automatically switch the controlled site to an oil or gas fuel source based on the measured site temperature. If enabled, the K322 will switch to oil when the temperature drops below a programmable setpoint and back to gas when the temperature rises above a second setpoint.

If an AC power outage occurs, a report will be sent to the M2M Network Operations Center (NOC) and web server. The report will include the current status of the K322, date and time, currently selected fuel, temperature, and the AC power on/off status. During the outage, the K322 will operate from an internal battery and will continue to accumulate meter counts for at least 3 months.

Operation is very simple

1. Connect the K322 to the corrected and uncorrected meter outputs to be monitored and the heating system to be controlled.
2. The unit will automatically establish two way communications over the GSM/GPRS cellular network to the www.m2mcomm.com web site.
3. Log onto a secure private page to:
   - View the last reported status of your equipment – hourly meter readings, fuel usage reports, fuel source selected, AC power on/off status, temperature and current cellular signal strength.
   - Send a remote control command or request an up-to-date report from the unit.
   - Configure selected events to trigger an immediate user notification.

Meter Reading

The K322 meter reading system is designed to ensure that fuel usage will be recorded locally at all times, even during long term power outages and communication problems.

The standard K322 is designed to count open/close transitions from either one or two dry contact or electronic gas meter encoders. The low voltage, low current circuit between the meter encoder and the K322 FSM/AMR device is a nonincendive circuit as defined by Article 500 of the National Electric Code. The two inputs can be used to simultaneously monitor both the corrected and uncorrected meter pulse outputs.

The unit will maintain a record, in non-volatile memory, of all meter pulses counted each hour. Hourly readings are stored at the top of each hour based on an on-board crystal controlled real time clock. After one month of operation, each day's new readings will replace the oldest day's readings, so that readings from the last month, plus the current day are always available for download to the M2M web server. In addition, the site temperature and oil / gas /override status is recorded and reported for each hour.

The K322 is programmed to automatically report the hourly meter data on a time scheduled basis. The default configuration is for the unit to automatically report the 24 accumulated meter readings for the prior day each night between 12 midnight and 1 AM.

In addition, the following data can be requested at any time from the web server:
- The current day's hourly consumption since midnight
- Any prior day's hourly meter readings and system status, for the previous month
- The current status of the K322 including the time & date, fuel selection, AC power on/off status, temperature, cellular signal strength (RSSI), and last transmission attempts counter.

Raw pulse counts can be converted into custom engineering units at the web server based on user selected parameters.

During an AC Power Outage

When an AC power outage occurs and lasts for more than one minute, a Power Outage report will be sent to the M2M NOC and web server. The report will include the current status of the K322,

date and time, currently selected fuel source, temperature, AC power on/off status, RSSI, and the last transmission attempts counter.

After the Power Outage report has been sent, the K322 will turn off its radio and enter a low power mode. During this time, it will not respond to commands from the web server. When power is restored, the same report will be sent, except that the call reason will be 'Power On'.

During the outage, the K322 will operate from an internal battery and will continue to accumulate hourly meter counts for at least 3 months. When power is restored, the total meter count as well as hourly readings for the last month can be reported to the web server.

Remote Switching of Fuels

The K322 provides two dry contact outputs that can be used to remotely select alternate fuel supplies, such as oil or gas. Dry contacts for individual gas and oil selection are supplied as normally open relays. Either output can be remotely activated to initiate changeover.

When a control signal is sent to the K322, an acknowledgement message confirming that the requested contact change has occurred will be returned to the M2M web server. At the web server, both the command and the ACK will be logged in the permanent history log.

The standard K322 can directly switch 120 VAC or can be used to switch a 12 to 24 VAC signal that controls an external relay that will then switch 120 VAC. The external relay can be used to provide a high voltage / low voltage demarcation point for the site.

Real Time Clock

An independent on-board real time clock provides an accurate time base for all meter reading activities. The crystal controlled clock can be initially programmed with the current year, month, date, hour, minute, and second using the local configuration utility program. The correct time is maintained during all power outages for at least 3 months. In addition, it is automatically adjusted by the web server, based on the U.S. national atomic clock.

Integrated Power Supply & Battery Backup

The standard unit is a 12 VAC powered unit. This configuration includes an on-board 12 VAC to DC power supply and a 1.2 Amp Hr battery.

The internal K322 circuit board includes an on-board voltage regulator that is used to continually charge a backup battery while AC power is present.

On-Board Radio Signal Strength Indicator & Status Messages

A small pushbutton switch can be pressed to initiate a simple test in which LEDs are used to indicate the signal strength being received by the radio and also to trigger a test report to the web server. This is used to facilitate installation, antenna selection and orientation, and troubleshooting.

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

Wireless Communications

The standard communication technology for the K322 is GSM / GPRS. The K322 includes an embedded GSM/GPRS module with a SIM card configured on the AT&T GSM network. All data is transferred using GPRS packet data over TCP/IP. IP addresses are dynamically assigned using DHCP. The connection to AT&T is made over a dedicated Virtual Private Network (VPN) connection using a custom Access Point Name (APN) provided by AT&T.

All device IP addresses are tracked and managed by M2M Communications using a device assigned host name. Dynamic DNS lookups are used to resolve the IP address of any device at any time to enable forward command communications.

WWW.M2MCOMM.COM

At the M2MComm data 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 unit.

The central web server records and displays all incoming status messages and depending on the customer's instructions can notify the customer of an 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. Data transfer options are described in a separate document.

After entering a unique user ID and password:

- All hourly metering 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.
- Current status reports and comprehensive usage reports can be requested.
- A detailed history log of all device activity can be reviewed

Reporting Options

Reports are triggered for three reasons: (1) a specified alarm condition occurs such as an AC power outage or local temperature based control action, (2) a time scheduled report is due, or (3) a report is requested from the web site.

Metering reports have been pre-defined to optimize the available data packet and can be scheduled at a predefined frequency such as once every 24 hours. Reports can be individually requested at any time from the web site.

Digital Display

A digital display on the cover displays the site temperature in degrees. The gas-oil fuel selection and Auto-Override mode are also displayed.

Automatic Control Based on Local Site Temperature

The K322 can automatically switch the controlled site to oil or gas based on the measured site temperature. This option can be enabled or disabled, either locally or remotely from the web server. If enabled, the K322 will switch to oil when the temperature drops below a programmable setpoint (default is 15 degrees F). It will switch to gas when the temperature rises above a second programmable setpoint (default is 20 degrees F). Both setpoints can be adjusted and saved either locally or remotely from the web server. All local control actions will be reported to the web server. Local decisions can be overridden at any time by remote commands.

FSM / AMR Hardware Specifications

- Consumption Data: Two counting nonincendive circuits for input of dry contact or compatible electronic meter read data.
- Memory for a minimum of one month of rolling hourly data for two meter inputs
- Battery backup to allow hourly meter counts to be continued for at least 3 months during a power outage. Battery backup for communication is not provided.
- Permanent FLASH or EEPROM memory protects stored data for at least 10 years without power.
- Control Outputs: Normally open output relays can switch up to 8 Amps at 250 VAC for over-ride of a local controller/switch for remote fuel source switching.
- ‘Signal Received/ Action Completed’ acknowledgement for all commands
- Operating Temperature Ranges: -40 to 140F (-40 to 60C) +-10%
- Storage Temperature Ranges: -40 to 160F (-40 to 70C) +-10%
- Enclosure is UV resistant, suitable for outdoor mounting. Lockable
- Radio: GSM/GPRS standard. CDMA /1XRTT optional
- Antenna: ‘Rubber duck’ antenna can be mounted inside the box or remotely with one or more extension cables.
- Manufacturer warranty on parts for three years
- Remote diagnostics include signal strength (RSSI) and Transmission Attempts Counter
- Remote and local download capability for firmware programming updates and site commissioning
- Communication error checking, including comprehensive ‘full-circle’ test utility
- Conversion of gas consumption data into custom engineering units
- One spare digital input
- One spare analog input (in addition to the temperature input). 4-20 mA DC is standard.
- 12 Volt AC power supply

- Digital display of site temperature in degrees F on cover
- Gas-Oil fuel select indicator on cover
- Auto-Override mode select indicator on cover
- Programmable temperature set-point operating controller
- Signal strength meter or LEDs powered by internal battery
- RS-232 communication port for site commissioning

Cellular Radio Operating Specifications

The cellular modem module has the following specifications:

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

Enclosure

The components are assembled in a polycarbonate weatherproof enclosure with a gasketed hinged lid. The standard external option is pictured on the front page of this spec sheet.

K322 Model Number and Ordering Information

Model Number: **K322 12VAC_EXT**

Weatherproof enclosure, Includes a 1.2 A-Hr Battery. Powered by 12 VAC

Please call to discuss any desired options. *Last update November 2007*