MODEL 100 RTU
INSTALLATION AND USER'S GUIDE

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M100-A-IMUG
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Table of Contents

1 INTRODUCTION

MISSION's core service is to monitor remote equipment site, and to quickly and reliably notify repair personnel when a problem is detected. Unlike traditional Remote Terminal Unit (RTU) autodialers, the Model 100 uses cellular control channel technology and therefore does not require a telephone line.

Over one million field-unit-hours of operation has proven that MISSION technology can quickly sense, transmit, notify multiple people, and log the results unlike any other autodialer on the market today.

1.1 System Overview

Like traditional autodialers, the MISSION Model 100 RTU has digital and analog interfaces and can interface to a wide range of equipment such as pumps, float switches, rain gauges and 4-20 mA sensors. It comes complete with a power supply and 40-hour backup battery.

Unlike traditional dialers though, notifications do not come directly from the unit to the notification destination. When the Model 100 RTU senses an alarm condition, it transmits a short, error- corrected message to the nearest cellular tower. This transmission is carried not on a voice channel, but on a cellular frequency reserved for call setup and billing information data exchange. Within a fraction of a second this highly reliable message is relayed to MISSION's Operations Center by the cellular carrier. Simultaneously, a transmission is made from the local cellular tower back to the RTU to acknowledge the message.

MISSION decodes the received data message and stores it in a database. Based on the type of message, the time of day, and other parameters, MISSION equipment initiates voice phone calls, sends pages, e-mails or faxes multiple people simultaneously. Because MISSION maintains multiple outbound notification lines, it can call maintenance people during the day, fax the alarm to a control room, then call or notify an entirely different group of people if there is no response after a certain period of time. It can even be set up to call a different set of people depending upon the type of alarm detected.

The diagram on the next page shows how this works.

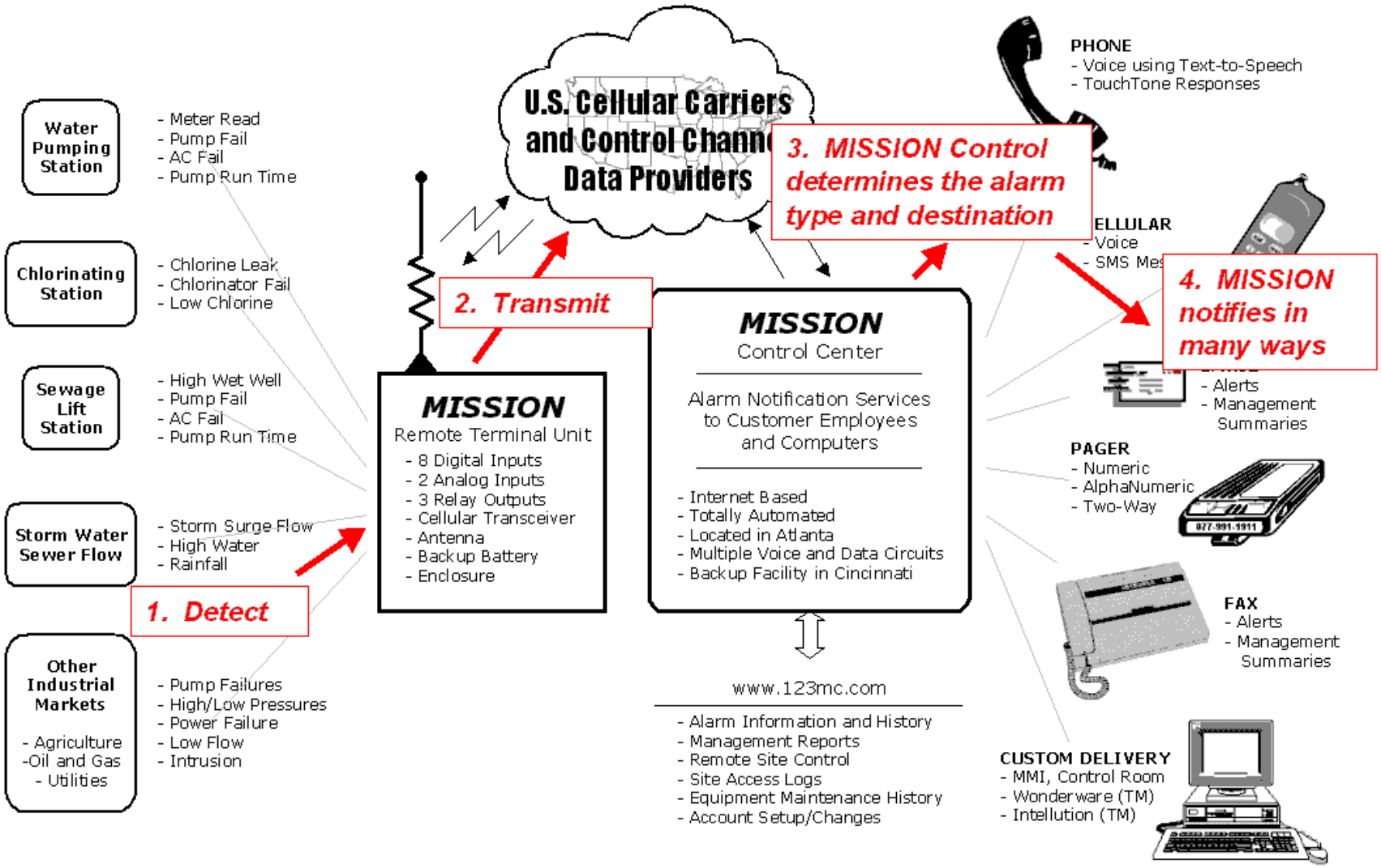


Figure 1 - Mission Data Flow Diagram - How Notifications Are Generated

In addition to the eight digital inputs, MISSION RTUs are also capable of reporting pump run times, meter readings, and 4-20mA current loop sensor values. Using the included electronic key reader, service personnel can easily put the unit in service mode while they work at the site. Not only does this reduces false alarms, it tracks who was at the site, and how long it took to fix the problem.

Every self-test and alarm transmission report from the RTU is logged at your personal password protected web site. This data can be viewed from any computer with web access. The system will even automatically e-mail or fax you (and others) a weekly summary report detailing everything that happened at your remote sites the previous week. This includes alarms (including who responded and when), site visits, pump run times (up to 3 pumps per RTU) and daily system test results.

The default settings and automatic cellular system detection scheme means that 98% of the installations can use the factory setup. However, some sites are different, and a simple ASCII serial port connection is provides which allows the installed to customize many parameters.

Once the unit is installed, input labeling and selection of notification destinations can be accomplished via the secure MISSION web site.

Alarm notification schedules (alarm call lists) are also set up and may be modified at any time via the web site. Simple changes on the web site can remove a lost pager or remove someone's notification when they're on vacation.

2 SPECIFICATIONS

2.1 Power Supply Specifications

Input Voltage	12-18VAC OR 12-18VDC
Step Down Transformer	120VAC to 12.0 VAC, 1.2 Amps (Supplied With M100)
Current	70 mA Typical, 1.2A Transmit (200 mSec) 1mA (Solar Mode, Solar Cell Optional)
Supervision	AC and Battery Charging Built in
Back Up Battery	4 Amp Hours (40 hours Typical, Supplied With M100)
Low Battery Report	Below 11.5 VDC
Operating Temperature	-30 to +60C
Storage Temperature	-40 to +70C

2.2 Physical

M100 enclosure (NEMA 1)	11.3″ x 11.3″ x 3.3″, 19 Gauge Powder Coated Steel
M102 enclosure (NEMA 4)	
-No Sun Shields	13.5″ x 11.5″ x 5.5″, Fiberglass
-W/ Sun Shields	13.5″ x 14.0″ x 6.5″, Fiberglass
M103 “FlatPak” (NEMA 1)	8.0″ x 10.5″ x 1.4″, Aluminum
Antenna, NMO Base ¾’ Hole	14.5″ Height
Weight	3 lbs. Typical

2.3 RS-232 Interface

Connector	DB-9 Female (DCE)
Levels	RS-232
Baud Rate	19200 bps (N81)
Protocol	Standard ASCII (sending '?' char lists commands)

2.4 Transceiver

Transmit Frequency Range	834.390 to 835.620 MHz
Number of Channels	42
Antenna Impedance	50 ohms
Transmit Power Levels	8 (6mW to 3W, controlled by cell site)
Receive Frequency Range	879.390 to 880.620 MHz
Sensitivity	-115 dBm

2.5 I/O Specifications

Digital	
Quantity	8
Default configuration	3 pump run time accumulators 1 high wet well float alarm 4 general alarm
Type	Dry contact closure
Supervision	1Kohm end-of-loop resistor required
Analog	
Quantity	2
Modes	0-5VDC, -or- 4-20mA with jumperable 250 ohm resistor
Resolution	10 bits
Thresholds	Low Alarm, Low Restore, High Restore, High Alarm Independently set for each channel
Relays *	
Quantity	3
Contacts	Both NO and NC
Relay Rating	12V @ 1A
Electronic Key Reader *	Stainless Steel, Weather Proof

* Relays and Electronic Key Reader not active in Solar Mode

3 MODEL 100 CONFIGURATION

All factory programming may be changed in the field by the installer using the serial port -- these defaults simply represent the most common configuration. Instructions are presented in Chapter 5 ("Serial Programming") on how to modify the default configuration.

3.1 Daily Self Test

Each unit comes from the factory pre-programmed to perform a daily or weekly self-test and transmit the results. Contents of this test include operation of the PCB components, site temperature, as well as data concerning the quality of the cellular radio link. Several other parameters are sampled and compared to fixed limits (such as backup battery voltage) and these may also be transmitted nightly as required to ensure optimum system performance.

3.2 AC Fail/Restore

In general the operating status is transmitted late at night, but several other parameters are monitored and may generate immediate alarms – one such example is an AC Failure. The RTU is programmed to report an AC failure three minutes after the power fails, and send another message indicating power restored one minute after power is returns. The Model 100 is supplied with a backup battery capable of powering the RTU for up to 40 hours in the event of an AC failure.

3.3 Digital Inputs

The Model 100 is most often used to monitor a pumping site, and therefore the digital inputs come from the factory pre-programmed as follows:

INPUT	Default Configuration
1	Pump 1 Running Monitor
2	Pump 2 Running Monitor
3	Pump 3 Running Monitor
4	Alarm, High Wet Well
5	Alarm, Low Wet Well
6	Alarm, Pump 1 Trouble
7	Alarm, Pump 2 Trouble
8	Alarm, General

All digital alarm inputs are pre-programmed for a 60-second "debounce" time. This means the input must be closed/opened for at least 60 seconds before the alarm to be sent. This value can be changed in the field, from 0 to 90 seconds in ten second increments.

The inputs are expecting normally open relay contacts that close on alarm or a pump running. If the alarm inputs are wired to normally closed relays, then the installer must simply notify MISSION tech support of the change. However "pump running" inputs are normally open, as normally closed pump run relays will report inaccurate pump times.

3.4 Analog Inputs

Two inputs are provided to sample 0-5VDC or 4-20mA current loop sensors. The 10 bit resolution is between 0 – 5VDC. Moving a jumper on the board selects a 250 ohm shunt resistor to change the mode of either input. Setting the High/Low, Alarm/Restore thresholds is done through serial programming. Scaling and labeling of the analog values is done at the MISSION customer web site.

3.5 Relays

The Model 100 RTU has three dry-contact outputs with a rating 1 amp at 12 volts DC. These outputs may not be used for ongoing control of a device or pump, such as daily control of a well pumping station feeding an elevated tank. They should be used for the occasional control of a device, such as closing a valve during an emergency or forcing a pump to run beyond its normal duty cycle. Mission only allocates 2 such uses per month in the normal monthly service fee.

Remotely commanding a relay to close takes about 2 minutes from the time the command is issued at the web site to the return of the acknowledgment. Command compliance is received and logged at the web site.

At this time there is no local (RTU based) logic to turn relays on/off given a certain set of input activity. Contact Mission for more about output relay use.

3.6 Pulse Counting Board (M420)

The optional pulse counting module allows the M100 to count the dry contact closures of up to two inputs. These can be from rainfall tipping buckets, flow meters or commercial water meters. The pulse totals from these two counters are transmitted nightly. The pulse board connects to the M100 via the expansion socket found on the upper right hand corner of the M100 board.

In “Rain Alert” more, if more than three “tips” (0.03 inches of rain) is received within a 15 minute period, an alarm message is transmitted.

3.7 Optional Wet Well Alarm Module Board (M421)

The site control panel is frequently not powered by an UPS, but is wired to deliver pump and float status information to the M100. Mission’s optional M421 Wet Well Alarm Module allows the Model 100 to monitor the pump station’s existing high level float contacts when the main control panel has shut down due to an AC power failure. This enables the Model 100 to detect and report high wet well level when the site's power is off but the Model 100 is running on backup battery power.

The M421 can also sense Pump 1 and 2 running via a single, AC sensing connection to the pump 1 and 2 hour meters or motor starters. The M421 not only improves the M100’s monitoring capabilities but also substantially reduces headaches such as mandatory interposing relays or the addition of auxiliary contacts on motor starters. The wet well alarm module connects to the M100 via the 8-position telephone style jack on the left-hand side of the M100 board. A 12 foot Category 5 cable is supplied with the M421 to connect it to the M100. Installation instructions are provided with the board.

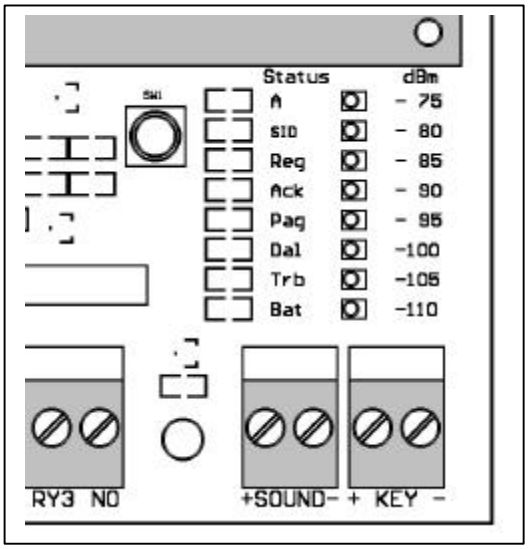
4 INSTALLATION

4.1 Pre-Installation Familiarization

Mission recommends installers familiarize themselves with the diagnostic LED display. Testing the Model 100 transmission performance from at proposed installation site before permanently mounting it is recommended.

Sixteen LEDs are used to display the status of the RTU.

STATUS LEDs
Eight LEDs are located near the right hand edge of the board. These LEDs can display two different sets of information: in the normal mode, these LEDs will be displaying the state of the RTU processor, but they can also be switched (by pressing and releasing the small pushbutton located nearby) to a real-time signal strength meter. Descriptions of what each LED represents is given in the next section.



DIGITAL INPUT LEDs
Eight additional LEDs are located above the digital input connectors. Each represents the current state of the associated digital input. An LED on indicates the contacts are closed, off means the contacts are open. "Open" actually means that the 1000 ohm end-of-line (EOL) resistor is detected. If a fault condition occurs (the loop becomes disconnected, or either end gets shorted to ground) the LED will flash. LEDs associated with software-disabled inputs will always be off.

4.1.1 LED Status Mode Display

In Status Mode, each LED indicates a different ongoing function, or problem detected with the hardware. Labels to the left of the LED indicate the following:

LABEL	DESCRIPTION
A	Two or more different SIDs cover the location where the device is installed. Historically, the FCC identified these carriers by being either the "A" side carrier or the "B" side carrier. In the unlikely event of transmission difficulties, the state of this LED will indicate to Mission Technical Support personnel which service (such as Verizon, GTE, AT&T, Sprint, etc.) needs to be contacted to resolve the problem.
SID	This LED indicates the cellular signals currently being received and decoded by the radio supports the special control channel signaling technology required to transmit Mission messages. **This LED MUST be on continuously or the MISSION service is NOT working.**
Reg	The Reg LED indicates that the RTU is in the process of transmitting a message. When the M100 is transmitting you will hear 3 short beeps. Though the

transmission (or "registration") only lasts 1/5th of a second, several things go on before and after the transmission so this LED will stay on longer than just a short strobe. First, the transceiver scans all available channels from the selected SID to find the strongest channel. Once the channel is selected, the transmission is made. Five copies of the same message are contained within the 200mSec transmission. If at least three of the five copies received at the tower match, an response will be coded into the data stream transmitted from the tower back to the RTU indicating the message was received.

Ack — This LED comes on briefly when a transceiver decodes the acknowledge message from the tower and completes the transmission cycle. When the M100 gets a “tower ACK” you will here a long beep. Typically this acknowledge message happens about five seconds after the transmission. If either part of the link fails to work (the tower does not properly decode the messages, or the RTU receiver does not decode the tower's response) the message will be retransmitted up to 7 more times.

Pag — Commands can be sent to the RTU from the web site to perform tasks such as reporting the battery voltage or controlling the state of the relay. These are referred to as "pages" to the unit. This LED indicates that the unit has been paged within the last two minutes.

Dal — This LED has two states. When flashing, it indicates that the Dallas Key reader input is being sampled for a key (this happens about 3 times per second). Once a valid key is detected, this light will stay on continuously for about a minute.

Trb — This yellow LED indicates a fault has been detected. If it is flashing, that indicates that one (or more) of the digital input EOL resistors is not installed properly. If it is on solid (not flashing), that indicates that no AC power is present and the unit is running on batteries. Because of the large amount of filter capacitors on the AC input, it may take up to 15 seconds from when power is removed until the LED actually goes on.

Bat — When the red Bat LED is on, it means that the backup battery is low or not connected. If it is flashing, the battery charger is operating. The charger should come on for about five minutes every hour. The charger will operate longer than five minutes if the battery is not holding a charge properly, and information about this condition will be transmitted during the nightly self-test.

4.1.2 LED Signal Strength Mode

Pressing and releasing the small pushbutton near the LEDs will change the LED mode (switch from Status Mode to Signal Strength Mode and back).

In Signal Strength Mode, the labels to the right of the LEDs indicate the approximate received signal strength, in dBm, of the cellsite's transmit power. If any of the green LEDs are lit, the site should not have any difficulties communicating. At sites with yellow (-105-110) or red (-110-115) signal strength readings, outdoor or elevated antennas may be considered. Because of the short wavelength of cellular frequencies, moving the mounting location just a few inches can sometimes dramatically improve the signal reading. The antenna should be mounted vertically and *NEVER* mounted inside a metal control cabinet.

4.1.3 Audible Transmission Indication

Each Model 100 is equipped with a sound-making device. Three short beeps indicate the device is beginning the transmission process (outlined above in the Reg LED description). One long beep indicates the RTU has received a tower acknowledgment of the transmission. The unit will also beep when an electronic key is touched to the key reader.

4.2 Pre-Installation Site Test

This is primarily a radio signal strength test to determine if the antenna should be mounted on an elevated mast. ***The Model 100's included antenna cannot be mounted inside an existing metal PLC or control panel NEMA enclosure***. Place the Model 100 RTU on or near the intended permanent installation site (indoors or outdoors). Using the included backup battery, power up the Model 100 RTU. Ensure the red battery lead connects to the red terminal on the battery and the black lead to the black terminal. The diagnostic LED's should all illuminate and then turn off from top to bottom.

The first time the unit is powered up, it does a "ping" of the cellular system to check whether it supports control channel operation. A registration (transmission) is sent, and if it is received by Mission's Control Center, a Page is sent back. When the page is received, the RTU "locks on" to that SID (cellular system). This process can take several minutes. While this “pinging” process is under way the green SID and yellow LEDs will blink. When it is complete, the "SID" light will turn on steady, the Dal LED will start flashing rapidly and the input LEDs will start operating. This indicates that the unit is now in normal operating mode and is ready to process alarms.

Although the ping process "got through" from the test location, it is possible that a better location is available just a few inches away. Press and release the status/signal strength toggle button (located just to the left of the LEDs on the PCB) for one second. The LEDs will now display a received cellular signal strength bar graph - the more LEDs lit, the better. If only the lowest red LED is on, or intermittently on, then move the Model 100 RTU and/or antenna to various other possible installation sites to see if better signal strength can be obtained. If the yellow LED (labeled "-105") or any green LEDs above it are on, then the site has sufficient cellular signal strength to proceed with installation. Moving the antenna just a few inches can make a big difference. The LED's rescan for signal strength changes every second.

!!! NOTE !!!
Do not touch or position your hands close to the antenna, as this will interfere with an accurate reading.

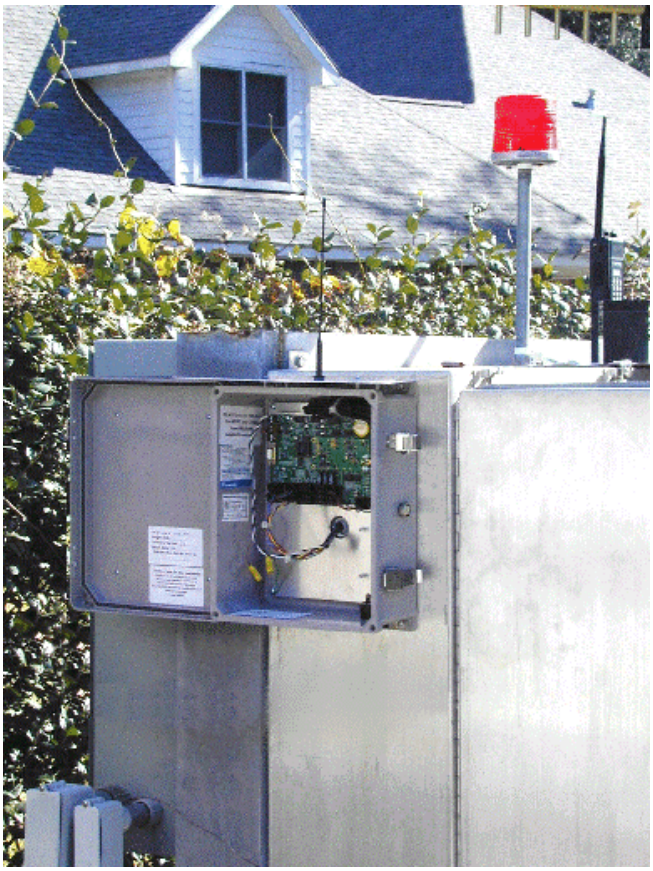
If you cannot get the yellow or green LEDs to illuminate in any position then you may need to remotely mount the Model 100 antenna outside the building or higher on a mast.

Approximately 97% of the time the Model 100 will be successful communicating with the tower on the first transmit attempt. On rare occasions, the tower will not properly decode the Model 100's transmission due to static, or collisions with other transmitters. It is also possible that the Model 100's receiver could have difficulty when decoding the tower's message acknowledgement. If an acknowledgement (Ack LED) is not received for either reason, the Model 100 will retransmit the message up to 7 times. It happens occasionally, but definitely IS NOT the norm. If the Model 100 being installed makes repeated transmit attempts (3 short beeps) with no long acknowledgment beep, then

the antenna may need to be moved, raised or changed. If the Model 100 appears to have transmission difficulties, call MISSION technical support.

Once adequate signal strength has been confirmed and messages have been successfully sent and acknowledged, the Model 100 may be powered down and installation may proceed.

4.3 Mounting the Enclosure



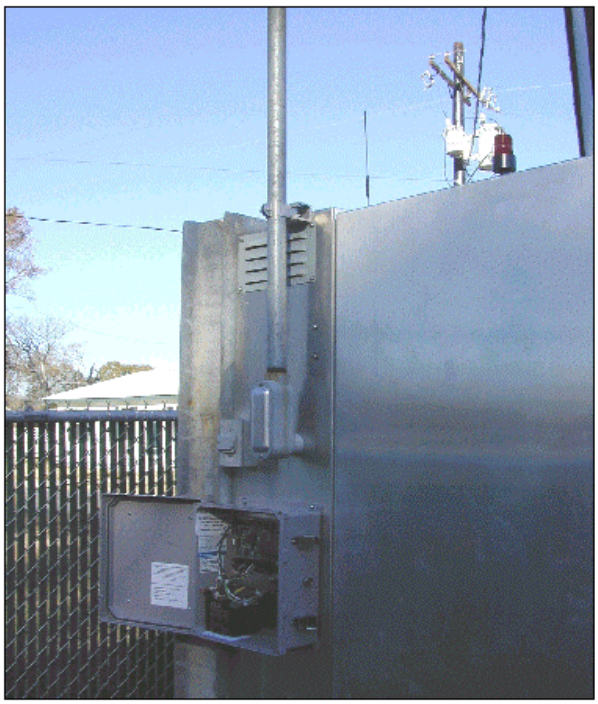
The Model 100 is housed in either a NEMA 1 painted metal enclosure, a NEMA 1 aluminum enclosure (FlatPak) or a NEMA 4 fiberglass enclosure (pictured at right). The NEMA 4 enclosure has custom sun shields on the top and front to keep internal temperatures down. The top sun shield is also "tuned" to allow the antenna to perform properly (see "securing the sun shield" installation flyer attached to the sun shield).

There are no special mounting requirements for either NEMA enclosure except to ensure that the antenna is pointed up and is not "blocked" by, or adjacent to, another metal enclosure. The antenna base should be equal to or higher than the top of the relay enclosure/control panel that the Model 100 is attaching to. If the standard antenna position is not able to "see" in all directions, then MISSION strongly suggests remotely mounting the antenna to the top of a piece of standard galvanized metal conduit attached to the installation site. The antenna may be remotely mounted up to 50 feet away from the RTU. Call MISSION for extension cables. ***Do NOT cut and extend the antenna cable your self!*** Remember to seal/plug the antenna's mounting hole on the top of the Model 100 enclosure.

Mount the RTU as close as reasonably possible to the monitored relays or switches. Take into consideration the conduit (typically “flex” conduit) and connector needs between the Model 100 and the monitored relays enclosure. The Model 100 can be located up to 200 feet from the monitored relay enclosure. The enclosures can be mounted directly on a non-metallic wall or onto the side of a metal NEMA 4 enclosure (provided the antenna base is at least as high as the top of the enclosure) or inside the control panel door (FlatPak installation shown). Use appropriate screws or bolts to mount/secure the Model 100. Wires with AC can be run in the

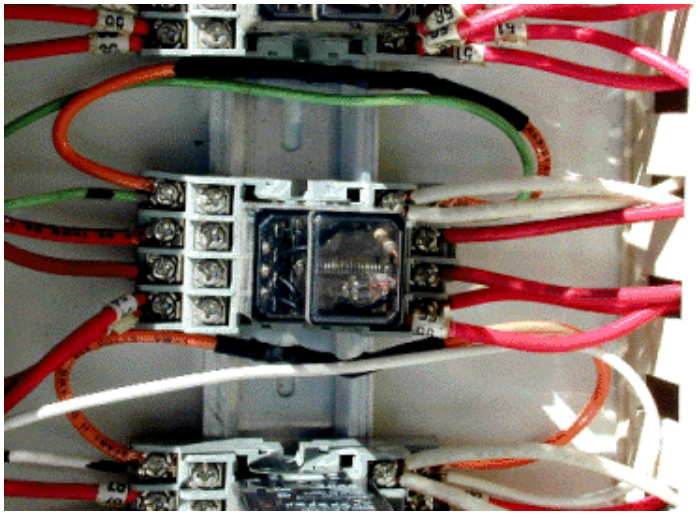
same conduit as the input wires but longer runs could cause problems. Try and mount the supplied AC transformer outside the MISSION enclosure in the control panel near the 120VAC source. This way only low voltage AC is fed inside the MISSION enclosure. Sometimes this is not possible and the transformer must be mounted inside the MISSION enclosure. This is acceptable, but severe voltage spikes could now be introduced inside the enclosure.

These pictures show a Model 100 mounted on the side of a pump station control panel. Due to the vent and conduit this unit could not be mounted so the antenna would be at or above the top of the pump station enclosure.



The antenna cable (coax) runs through the pump station enclosure into the Model 100 enclosure which is mounted on the side of the pump station.

The antenna was removed from the Model 100 and remoted to the top of the pump station enclosure for best performance.

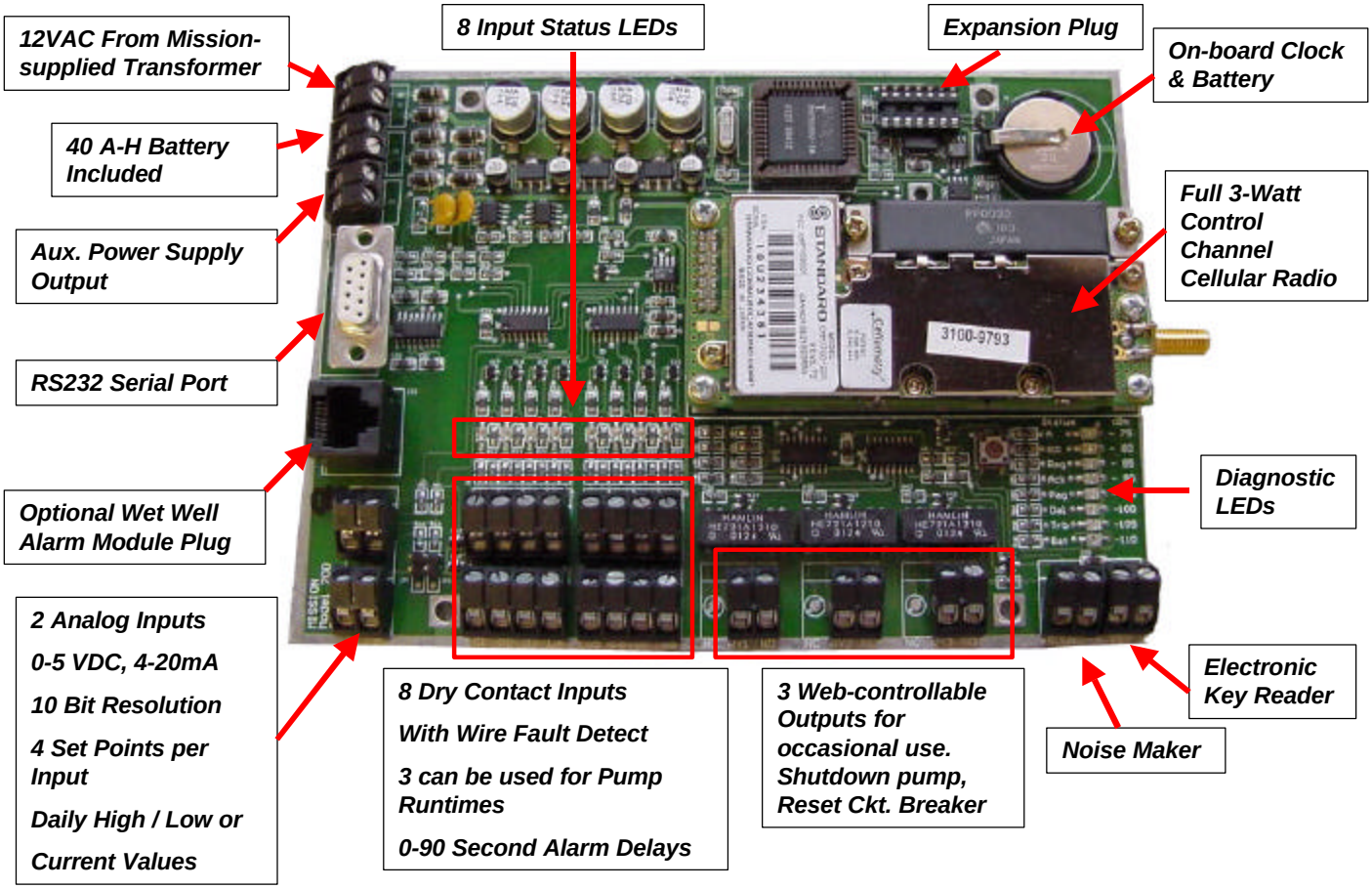


To the left is a picture of a monitored relay with the End of Line resistor (EOL) installed (included). The input wires from the Model 100 are wired to the relay terminals on the far right. The EOL (orange wire with the black shrink wrap in the middle) bridges the relay contact.

EOL Resistors are included with the M100.

4.4 Equipment Interface

The following diagram shows the connections to the Model 100 PCB:



4.4.1 Model 100 Connections

The installer must first decide what is to be monitored by the MISSION RTU and then ensure that the site has the proper relay outputs set up to give the MISSION RTU the appropriate information. AC power and low battery are automatically monitored by the Model 100 RTU and need no special connections. The Model 100 RTU digital inputs typically come pre-programmed from the factory. Inputs 1,2 and 3 are configured to monitor pump run-time and to indicate pump-running status at the time of alarm. Input four is programmed for high wet well alarm. Digital inputs 5 through 8 are configured for general alarms. MISSION or the customer can set up their specific alarm meaning at the MISSION web site at a later time.

MISSION digital inputs are to be connected to relay contact outputs from the monitored site. The MISSION RTU and system are set up to accept NORMALLY OPEN relays that close upon alarm or event detection. If you desire a normally closed relay that opens upon alarm, you must notify MISSION technical support to reverse the alarm logic in the central computer for that input number. No field modifications are necessary.

Remember… The M100 must “see” the monitored relay open or close for 60 seconds continuously before it will send an alarm or return to normal signal.

4.4.2 Power

The MISSION RTU is powered by 12 Volts AC. This is provided to the RTU by the MISSION supplied wall socket transformer or flying lead transformer included with the Model 100 RTU. A 12 Volt AC transformer must be used.

!!! NOTE !!!

DO NOT connect 120 volts AC directly to the MISSION RTU power connector! DO NOT apply 120 Volts AC to any MISSION input! Permanent damage will occur to the RTU!

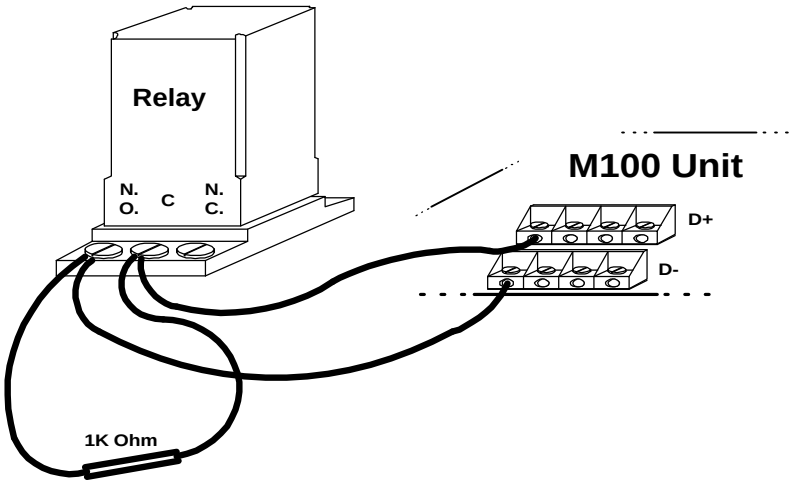
If the flying lead transformer is used, connect L1 and neutral to the primary side (black wires) of the transformer and the secondary (yellow) wires to the MISSION RTU 12VAC terminals (upper left-hand corner of the RTU circuit board). Try and mount the AC transformer in the host control panel enclosure near the 120VAC source. This way only 12VAC runs into the M100 enclosure.

4.4.3 Ground

If the NEMA 4 fiberglass enclosure is used, it is recommended that an additional ground wire be used. Connect a wire from either bottom back plate securing screws inside the NEMA 4 enclosure to a grounding block inside the pump station control panel enclosure. The NEMA 1 (black metal) enclosed Model 100 typically will be grounded by the installation method (bolts to metal pipes, etc.). The M103 “FlatPak” enclosure will be grounded by virtue of its mounting to the control panel enclosure.

4.4.4 Input Wiring and End of Line Resistors

This diagram illustrates the typical method of connecting the unit to a monitored pump-run or fault relay. The installer may use any type of wire from 14 to 24 AWG. Stranded wire is recommended to ensure good connections to the relay terminals. Mission can provide a precut and stripped length of 24 gauge, 8-conductor Category 5 cable. This speeds and standardizes the installation, as the wire is color coded and easier to pull through conduit. A single cable can accommodate the wiring of AC, 2 pump run relays, and a high-wet-well relay alarm. Order MISSION part number M460, wiring harness assembly.



The Model 100 digital inputs require the use of 1000-ohm end of line resistors for each digital input used for alarm/event reporting. These resistors are connected/placed in parallel with the monitored relay contacts and allow the Model 100 circuitry to monitor the integrity of the connection.

!!! NOTE !!!
Other RTUs manufacturers do not monitor the integrity of the line. Because MISSION does, you CANNOT use a common wire for multiple inputs! Each input MUST have its own two wires to provide the circuit supervision.

The Model 100 digital inputs expect to "see" 1000 ohms if the monitored relay is open and a short (0 ohms) if the relay contacts are closed. If the wire from the monitored sites relay to the Model 100 is cut or comes loose, then the Model 100 will see an open circuit and send a wiring fault alert message to Mission.

Digital inputs 1,2 and 3 are programmed from the factory as pump run inputs. If these inputs are used to monitor pump run relays then they must also have the 1000-ohm EOL resistors in parallel across the pump run relay. If the pump run input(s) are not used then you do not need to "tie off" the input with an EOL resistor as with the alarm/event inputs. A special case in the software detects two pump-run inputs, and a third without an EOL resistor and accumulates the simultaneous run time in the third accumulator.

Make sure that the wiring that the Model 100 input is connected to *does not* have any voltage/current running through it -- *many* wet well and pump run circuits do. Additionally, check to see if the wet well alarm trips if power to the site fails -- many do. This will cause false wet well alarms to be sent when the power flickers or fails. The best solution is to contact Mission and purchase the Wet Well Alarm option, it resolves this and other installation issues. Alternatively, the Model 100 can monitor a second, dry relay from a separate wet well float.

From the factory, inputs 4 through 8 are enabled as alarm/event inputs with 60 second “debounce” delays. These inputs must see the 1000-ohm resistor or the Model 100 will consider the input(s) to be in a "trouble" state and will turn flash the yellow trouble LED. If a digital input is not used to monitor an alarm/event relay then you must connect ("tie off") an EOL resistor across the unused input terminal connectors or disable the input in software.

4.5 Testing Inputs

4.5.1 Digital

With the M100 powered down check the pump run inputs, if connected. Make sure it is connected to the normally open (open when pump not running) relay. Force the pump being tested to run. Measure the resistance at the terminals. It should change (approx. 900 ohms not running, shorted when running). If not, check wiring and the pump run relay itself. Check all pump run inputs in a similar manner. Check all other alarm/event relays connected to the Model 100 to ensure they change state (open (900 Ohms) to close (0 Ohms) etc.) when the alarm/event occurs.

4.5.2 Analog

Analog readings can be easily checked and the thresholds set using the serial port connection. See Chapter 5 on Serial Programming, and in particular commands "T" and "V." Readings displayed in the field for readings and thresholds will be in the 0-1023 range (10 bits). The following table shows some example conversions:

A/D Reading	5V Input
0	0 V
205	1 V
409	2 V
614	3 V
818	4 V
1023	5 V

A/D Reading	4-20 mA Input
0	Open
205	4 mA
307	6 mA
409	8 mA
512	10 mA
614	12 mA
716	14 mA
818	16 mA
921	18 mA
1023	20 mA

Scaling and labeling of the analog inputs is performed on the web MISSION customer website.

Output Connections
Relay 1 terminals are on the left of the set of three output terminals, and Relay 3 is on the right. The relay terminal connections (NC / Common / NO) are on the PCB silkscreen. Typically, the M100 is stuffed with the single pole Normally Open relays and connectors. Controlling the relays is performed via the MISSION customer web site.

4.5.3 Initial Power Up

Re-check that no 120VAC is being fed to the Model 100 by any wires. Primary power should be from the Mission transformer and no AC or DC should be fed to the inputs. Connect the battery first (red is positive, black negative). The LED's will all illuminate and then turn off from top to bottom. The SID and Bat LED should turn on. The A LED may turn on if the unit is listening to an A cellular system. The Fault LED may turn on if digital inputs are active and do not have an EOL (end of line resistor) attached.

As with the battery power up when signal strength was tested, the Model 100 will send 2 messages. After this the Model 100 will send no more messages until 1) it detects an input/relay changing state (plus debounce time) or 2) primary 12 VAC is connected. Connect primary 12VAC. The red LED will extinguish; indicating primary power is being detected. The Model 100 will then send an "AC returned to normal" message. The Model 100 is now ready for final testing.

4.6 Post-Installation Testing

The best way to test an alarm/pump running input is to actually cause the monitored relay to change state (open/close). Pulling the wet well float to the alarm position to create an alarm is the best way to test all the connections and system operation. Remember the Model 100 MUST detect the alarm for at least 60 seconds (factory default) for a message to be sent.

Testing alarms will cause the Model 100 to send messages. Because the RTU transmits a maximum of one message per minute, multiple alarms/events may be sent in the same message.

If an input fails to test/send, first power the Model 100 down and check the wiring and monitored relay.

Initially all M100's are assigned to the factory account. The MISSION unit set up form must be faxed to MISSION for the unit to become active in the customers account. Many times the Model 100 will work where other pagers and cell phones do not. If the installation appears good and transmissions are getting acknowledged, but notification pages/phone calls are not received, please call MISSION technical support to ensure MISSION is receiving the alarm/event messages and that notification delivery destinations are set up correctly.

4.7 Alarm Suppression / Swinger Shutdown

MISSION employs a "runaway alarm" suppression feature at the central computer system. If a Model 100 sends an input alarm the central computer will process the alarm notifications. By default, if the same Model 100 sends the same input alarm within one half hour the central computer will not send or process alarm notifications again. This feature can be disabled at the central computer.

Therefore, at the time of testing you may only receive an alarm notification once, even though you trip the input multiple times. The multiple alarm transmissions are logged at the customer web site for reference. If you have any questions about whether the messages are getting through, call MISSION technical support toll-free. They will be happy to assist you.

5 SERIAL PROGRAMMING

Customers/Installers may change the factory programmed digital input functions and other Model 100 parameters in the field. All parameters can be checked, commands can be entered, and the performance monitored using a simple terminal program and a standard serial cable.

A laptop computer of any performance level, running Windows and HyperTerminal, can easily be used to perform the programming tasks.

The Hyperterminal setting are:

Bits per Second	19,200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

In the accompanying figures, user's input will be **underlined**.

!!! NOTE !!!

The Model 100 serial port ground pin is connected to chassis ground, which is bonded to the neutral at a nearby service junction box. Many laptops serial ports ground signal have several volts of potential between their ground pin and the neutral of the 120VAC line of their power adapter. For best results, run the laptop on batteries.

Connect the serial cable to the 9-pin connector and power the unit up.

You should see a message about with the Mission Communications name, software version, and information about the transceiver similar to that shown. If not, recheck the baud rate settings and make sure they are set to 19200,N,8,1,N.

Pressing "?" will send a list of commands. "0" is the Status command and prints out a list of parameters, values and settings.

The status readout at the left is from a typical RTU. The RTU will periodically output a message describing a function or event which will always be preceded with a time stamp.

This unit was powered up on battery power only. Note the “AC Fail” message indicating the AC Failure was detected. A “Notify AC Fail” (not shown, sent after three minutes of AC failure) indicates the RTU is transmitting the message.

Each night at midnight this until will send a Channel (Self Test) report.

```
Mission Communications Ver 2.0127
CRFM Mfr : Ericsson
CRFM ESN : 07040882
CRFM Ver : 4.00
CRFM SID : 000E

01/22/00 19:34:39 Initial SID Check
01/22/00 19:34:46 SID Signal OK
01/22/00 19:34:47 Service
01/22/00 19:34:49 AC Fail
?
0=Stat,1=SetClk,2=DigMode,3=TogRly
4=SIDs,5=Bounce,6=NtRep,7=ClrRun,8=Passwd,
F=Flow,G=Charger,L=Solar,
T=AnalogThreshs,V=ReadAnalog
0
Status: Normal
 Time : Sun 01/22/00 19:34:50
 Temp : CRFM=21C PCB=20C  (20/20)
 Volts: CRFM=11.30V  VCC=05.23V
 VAC  : 00.04V
 Batt : 12.16V Chrgr OFF
 A/D#1: 1.
 A/D#2: 0.
 Night: Chan
 Mode : RRRAADDD / 33333333
 State: FFFFFFFF
 Relay: 1:Off 2:Off 3:Off
 RTime: 1:0 2:0 3:0
 TXSeq: 2
 NoSvc: 0   (Minutes: 0)
 Queue: 053B5894, 0100FF00
 Pri  : 1110000001
 Cmd  : 0000000000
 Group: 0000000000
 Radio: SID 000E, CH 0161 Mult, RSSI 0F
```

Other indicators here may be RunTime, Solar, Flow, Analog and/or Rain, depending on the setup.

Digital input modes and debounce times are also shown, and immediately below it the current input state.

5.1 Serial Command "1" - Set Time

Enter the last two digits of the year, month, day, 24-hour hour, minute, second. The last digit is the weekday (1=Sunday, 2=Monday... 7=Saturday).

```
1
YYMMDDHHMMSSW?0112242350101
```

5.2 Serial Command "2" - Digital Input Configuration

This command let the installer change the input modes. The value entered is immediately transmitted back to Mission so that future digital transmissions can be interpreted properly.

R = Runtime
A = Alarm
D = Disabled
M = Proprietary Message
S = Shunt

```
2
Channel 1 (A/R/S/D/M)?R
Channel 2 (A/R/S/D/M)?R
Channel 3 (A/R/S/D/M)?R
Channel 4 (A/R/S/D/M)?A
Channel 5 (A/R/S/D/M)?A
Channel 6 (A/R/S/D/M)?D
Channel 7 (A/R/S/D/M)?D
Channel 8 (A/R/S/D/M)?D
OK=RRRAADDD
12/24/01 23:51:49 Send: 06491200 R..+
```

Immediately after the configuration is changed, a message is transmitted to MISSION to update the database with the new setting, as shown in this example.

5.3 Serial Command “3” – Toggle Relay Outputs

Three output relays are available on the board. This command allows the state of the relays to be toggled.

```
3
Relay (1-3)?1
```

If the AC fails, the battery will hold the relay in its set state. Should the battery power fail as well, the relays remember their state and will come back up in that state when power is restored.

Commands can be sent from the customer’s web page to change the relays’ states.

5.4 Serial Command “4” – Show SIDs

This command shows the two cellular systems “Serving System IDs” that the transceiver is currently picking up, and the signal strength of each.

```
4
A Side:SID: 0033, RSSI: 1A
B Side:SID: 000E, RSSI: 12
```

This command is primarily a diagnostic command for Mission Technical Support personnel.

5.5 Serial Command “5” – Digital Debounce Settings

This command sets the digital input channel debounce times. This is the amount of time from when a digital input changes until the processor sends a message. If the channel input value returns to the original state within the set amount of time, the transmission is cancelled. Values are in 10 second

```
5
Channel 1 (0-9)?6
Channel 2 (0-9)?6
Channel 3 (0-9)?6
Channel 4 (0-9)?6
Channel 5 (0-9)?6
Channel 6 (0-9)?6
Channel 7 (0-9)?6
Channel 8 (0-9)?6
OK
```

increments, from 0 seconds to 90 seconds. The factory default setting is 30 seconds. Current values can be displayed using the "0" command (the second parameter on the "Mode:" line.

5.6 Serial Command "6" – Nightly Reports

This command allows the user to change which reports are to be transmitted at midnight each night.

Generally these will be pre-configured at the time of order and depend on the application, level of service, and installed options.

```
6
Channel (Y/N)?Y
RunTime (Y/N)?Y
Rain/Flow (Y/N)
Daily A/D (Y/N)?N
Peak A/D#1 (Y/N)?N
Peak A/D#2 (Y/N)?N
Solar Summary (Y/N)?N
OK
```

IMPORTANT! Changing the nightly reports WILL result in an INCREASE of monthly service charges. Call MISSION prior to changing these values.

5.7 Serial Command "7" – Clear Runtime Accumulators

The state of up to three of the "R" inputs is sampled at the top of the minute, and the resulting value transmitted at midnight.

```
7
01/20/00 15:49:08 Runtimes cleared
```

This command clears the pump run time accumulators to 0 minutes.

5.8 Serial Command "8" – Factory Password

This command allows the user to get in to "Factory Service" mode. Two or three commands not generally available to users, such as setting the serial number and making test transmissions, are available.

5.9 Serial Command "F" – Flow/Rain Mode

This command cycles through the four different flow transmission modes. "RainReport" mode simply sends the tipping-bucket rain gauge counter at midnight. "RainAlert" also sends the value at midnight, but also will transmit if the current reading has changed by more than 0.03" in 15 minutes. If flow counter(s) are attached instead of a rain gauge, select the proper flow transmission mode. FlowSingle will cause the M100 to send a single (rain/flow input) value to be sent every night. FlowDual will cause two pulse values to be sent every night.

```
F
01/20/00 15:56:21 RainReport mode selected
F
01/20/00 15:56:23 RainAlert mode selected
F
01/20/00 15:56:24 FlowSingle mode selected
F
01/20/00 15:56:26 FlowDual mode selected
```

IMPORTANT! Changing these values may cause additional messages to be sent. This will result in additional monthly service charges. Call MISSION prior to changing these values.

5.10 Serial Command "G" – Battery Charger

This command turns the battery charger on and off. Generally this is handled automatically by the processor.

```
G
01/20/00 15:59:40 Charger ON
G
01/20/00 15:59:43 Charger OFF
```

5.11 Serial Command "L" – Normal/Solar Mode Toggle

```
L
01/20/00 16:04:25 Solar mode selected
L
01/20/00 16:04:26 Regular mode selected
```

This command toggles between normal and solar modes. In normal mode, the processor is awake all the time, sampling the inputs, and takes action immediately upon sensing a problem. In solar mode, the processor is asleep 59 seconds out of every minute. During that one second, it wakes up, checks on the inputs, and if all is well it goes back to sleep. A single red LED flash indicates the wake-up time. If digital input states have changed, or a midnight check-in is required, the processor wakes up and operates as in normal mode for about five minutes, then goes back to sleep. This power saving scheme increases the detection latency by a minute or two (instead of the debounce time entered), but allows the unit to run at a remote site with only a 6" by 6" solar cell for input power.

!!! NOTE !!!

Relays are not active in Solar mode.
Also, Electronic Keys will not operate.

To use the M100 in solar mode call MISSION and order the Solar Power option (part # 461)

5.12 Serial Command "T" – Analog Thresholds

```
T
1: Ch1 Low  Alarm   :0
2: Ch1 Low  Restore :0
3: Ch1 High Restore :1023
4: Ch1 High Alarm   :1023
5: Ch2 Low  Alarm   :0
6: Ch2 Low  Restore :0
7: Ch2 High Restore :1023
8: Ch2 High Alarm   :1023
Set(1-8)?2
New Value(0-1023)?100
OK.
```

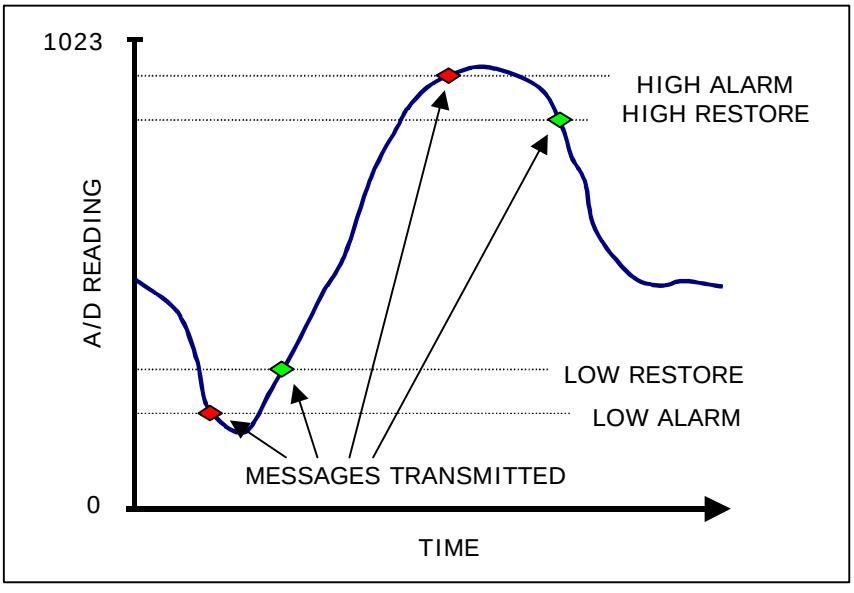
This command allows the user to set thresholds for analog alarms. All values can be set independently for each channel and are scaled on the 10-bit A/D scale.

Alarms are transmitted when the analog value exceeds the "Alarm" value, and also when the reading returns to the normal range (goes past the "Restore" value).

The diagram to the right shows how the alarm and restore values are set. The four alarm levels are set for each individual channel.

When a reading falls below the "Low Alarm" value, an alarm message is transmitted. No further message about that channel will be transmitted until the value goes back above the "Low Restore" level.

A similar operation happens when the values exceed the "High Alarm" trip point.



5.13 Serial Command "V" – Analog Values

This command repeatedly shows current A/D values for each channel.

Press any key to stop the output and return to normal mode.

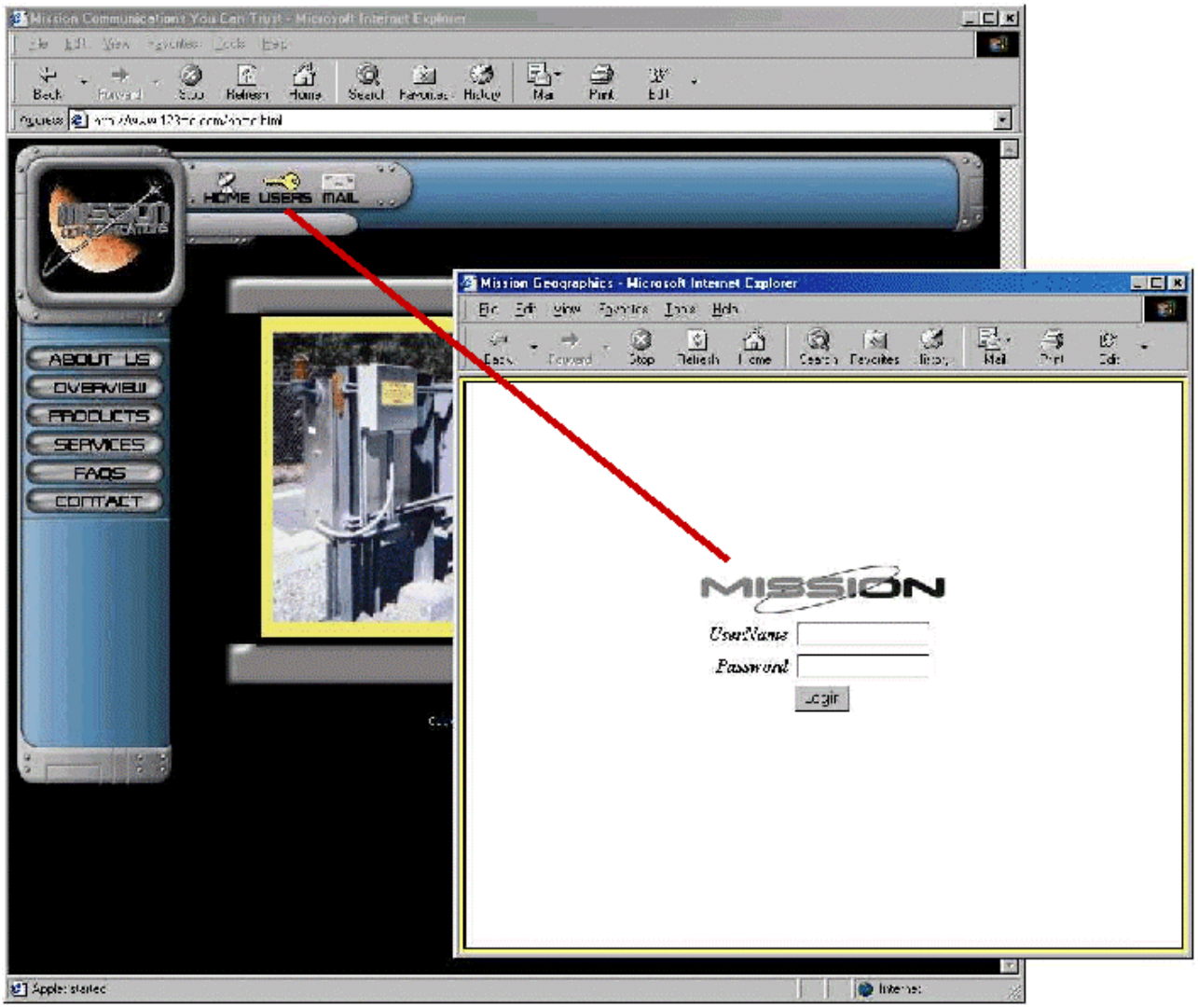
```
V
01/20/00 16:14:19 Analog: 1=0  2=195
01/20/00 16:14:19 Analog: 1=2  2=194
01/20/00 16:14:19 Analog: 1=0  2=193
01/20/00 16:14:19 Analog: 1=0  2=195
01/20/00 16:14:20 Analog: 1=1  2=194
01/20/00 16:14:20 Analog: 1=0  2=194
```

A/D Reading	5V Input
0	0 V
205	1 V
409	2 V
614	3 V
818	4 V
1023	5 V

A/D Reading	4-20 mA Input
0	Open
205	4 mA
307	6 mA
409	8 mA
512	10 mA
614	12 mA
716	14 mA
818	16 mA
921	18 mA
1023	20 mA

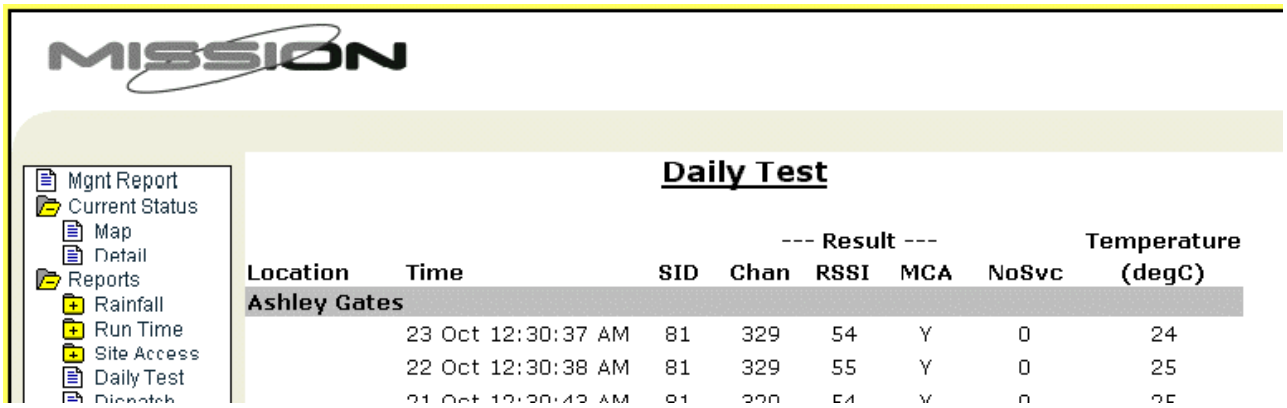
6 POST-INSTALLATION VERIFICATION

Once the unit is installed, it sends several setup and diagnostic messages. As soon as the long “beep” of the tower acknowledgement is heard, it takes only a second or two before the web site is updated. Go to the site at www.123mc.com and click on the gold key (“Users”).



Enter your username and password. This was set up when the Customer Set Up form was faxed to MISSION. If you do not have a web site username and password, call MISSION.

Open the “Data” folder by clicking on it, and select the “Daily Test” report. You should see the name (or serial number) of the unit being installed and a recent channel report. This is one of the startup messages sent by the unit.



SID is a number assigned by the FCC to your particular cellular carrier – it’ll probably be the same for all units in a given city. “Chan” is the cellular channel number (870.000 MHz + Chan * 0.03 gives the frequency in MHz). RSSI is the received signal strength – anything above 10 is plenty. MCA indicates that Multiple Channels are Available – when the radio did the scan of available channels it found more than one that it could use. NoSvc counts the number of times the cellular carrier’s signal went away and did not return (if multiple channels are available it is unlikely that this number will ever be non-zero).

7 NOTIFICATIONS

7.1 Overview of the MISSION *Alarm System*

MISSION operates a monitoring and notification system designed primarily for water, wastewater and industrial customers. MISSION units typically monitor remote pump, lift or flow stations, rainfall totals and other various remote equipment. The MISSION system works throughout North America, so the monitored equipment could be down the block or across the country. When the MISSION RTU (remote terminal unit) detects an alarm condition, it sends the alarm to the on duty personnel via phone, pager, fax, e-mail or direct to a computer. Simultaneously, the alarm is logged at the customer's web site that MISSION provides. At its core, the MISSION system is an alarm and event reporting system. Yet, the system actually performs many other functions for the customer such as personnel tracking, exception control of remote equipment and management reports.

Response personnel are the key to dealing with problems that cause an alarm. MISSION's system just brings customers the information. Please respond to all MISSION messages. They are only sent if something needs immediate attention! Always respond to a MISSION message no matter how late or old the message is. If the message recipients ignore the alarm or event messages, then the system may send the message again to the recipient or may start sending messages to others on the alarm/event call list. The system keeps track of all alarm/event notification attempts. If someone fails to respond, even if they are late, the non-response occurrences are logged and sent in a report, once a week, to customer managers or supervisors.

7.2 What Typically Happens When an Alarm Message is Sent?

On duty or backup personnel may receive a phone call (regular or cellular), a page, fax or e-mail, telling them of a problem or event. If personnel are working in the control room, they may get a message notification on their computer screen. Who gets notified and in what manner is decided by the customer. Notification changes are easily made at the customer's web site or by placing a toll free call to MISSION.

If you get a phone call, a clear computer voice will announce that a critical call is being made about a problem in your operation. The message may ask for you by name. The person who answers the phone may have the alarm message read to them immediately, or may be given three options. The options are, press 1 to listen to the alarm message, press 5 to put the message on hold in order to have time to get the called person or press 9 if the called person is unavailable. MISSION can also make a call and immediately read the message. This is typical if a cell phone is called. The computer will then read aloud the alarm/event message, including the location, and ask if the called person accepts or declines responsibility for handling the alarm/event. The called person either presses 1 to accept, 5 to repeat the message or 9 to decline responsibility. The called persons actions are recorded and, if the alarm/event is accepted, no other persons will be notified. If multiple people are called simultaneously, all who attempt to accept an alarm after the first person responding has accepted the alarm will be told that the alarm has already been accepted and by whom. The computer may then tell the called person if, and which, remote site pumps are running. The computer may then also read to the called person other alarms/events that are directed to the called person at that time.

If you get a page, e-mail or fax, the process is slightly different. On duty or backup personnel may only be reachable by pager, fax or email. The MISSION system can send a written description to these devices, with information similar to the phone call message. These messages will include a toll free telephone number (877) 991-1911 and a 5-digit event code (EC). The recipient should call the toll free number and enter the event code. The MISSION system only knows if the people sent messages have received them if those people call the toll free number and enter the event code. When the toll free number is called, a computer will answer, ask for the event code (EC) and then read the caller the alarm/event message.

As with the standard phone call message, the person will be asked if they accept or decline responsibility for responding to the alarm/event.

The system will also inform the caller if others have already accepted and responded to the alarm/event. Again, all caller responses will be recorded. If others have accepted responsibility for the alarm/event before you call you, your call will still be logged as a response.

If your pager is numeric (displays numbers) only, you will only see on the pager MISSION's toll free number (877-991-1911) and a 5 digit event code, i.e. 877-991-1911-12345. As before, the recipient should call the toll free number. The computer will answer and ask for the event code. Enter the 5-digit number (e.g. 12345) that follows the toll free number. The computer will then read the alarm/event message, ask the caller to accept or decline responsibility for the event and inform the caller if others have already accepted and responded to the alarm/event.

Pager Screen	Example Readout	Meaning
1	877-991-1911	Call This Number
2	12345	Event Code… Enter this to Hear Your Alarm Message

7.3 What If I Forget to Respond or My Phone is Turned Off?

Typically there are several people on a MISSION alarm/event call list. If a message is sent to a person and, for whatever reason, the person fails to respond (typically within 20 minutes), then others will be notified. This process will continue until the system has tried everyone on the list, usually more than once. Every time the system re-sends a message to the same person it will change the event code. When the person does calls the MISSION computer, enter ANY of the event codes sent. The system will automatically accept all outstanding event codes (notification attempts) for that person. People only need to respond once!

7.4 What is This Electronic Key I've Been Given?

All MISSION RTUs have an electronic key reader on the right side of the enclosure. It is silver, round and about the size of a nickel. The key you have been given is used to put the RTU in "service mode" so it won't send alarms while you work at the site. You should attach the key to the key ring you carry with you.

7.4.1 How Do I Use the Electronic Key?

When you first get to the remote monitored site (pump station, flow station, etc.), take the key and insert it into the key readers indent. They will easily match.

The MISSION monitoring unit will make a 1-second beep when it reads your key; you may have to move the key around the indent a little to get it to read. Your key uniquely identifies you. The MISSION monitoring unit will then transmit the key read. You will hear 3 short beeps from the MISSION unit indicting it is transmitting, followed by 1 long beep which indicates the cellular network has received the transmission. The MISSION RTU is now in service mode. Any alarms you may generate while you are on site *Will Not Be Processed,* though the MISSION monitoring unit will still be sending them. In addition, if there are any outstanding alarms/events for the site you are at they will automatically be accepted/acknowledged by the MISSION system. For example, if you were sent an alarm/event on your alphanumeric pager and could not/did not call MISSION's computer to accept it, but simply drove to the site and presented your electronic key, the system would automatically acknowledge/accept the alarm/event for you!

7.4.2 Service mode: Routine Site Visits / Inspections

During normal workdays while there are no alarms in process, use the key when you arrive at a monitored site to simply put the site in service mode so as to prevent false alarms that may be generated at the site while you are working. Using the key will also "time stamp" your arrival time, which is logged at the MISSION web site. This allows you and your utility to document all inspections and maintenance.

When you leave a site where you have used the electronic service key, use it a second time to bring the site/unit out of service mode. If you forget, the site/unit will automatically come out of service mode in one hour.

Even though the site unit has been put in service mode with the key, the MISSION monitoring unit continues to transmit any alarms/events it detects. They simply will not be processed for notification (phone calls, pages, etc.). This allows you to work at the site (and possibly create alarms) without worrying about people getting called. This is also allows you to "test" alarm points and document that they are working (the test alarms will be logged at the MISSION web site).

7.4.3 Forgetting to Put the Unit in Service Mode

If you work at a site without putting the MISSION monitoring unit in service mode, and cause an alarm to be sent, don't worry. Once you hear the MISSION unit sending the alarm (3 short beeps followed by one long one) simply use your electronic key then. The system will automatically accept the alarm. You will still be sent the alarm (by phone or pager) but it need not be responded to, as you will have already accepted it by using your key (even though it was after the alarm).

7.5 Local Shut Down Mode

If you are planning to work on the site for longer than an hour, you don't have to keep "keying" in and out to get another hour of service mode. You can put the unit in "Local Shut Down Mode." Once you have keyed in and put the unit in service mode simply press and hold the small button next to the Status LEDS (vertical LEDs). You in about 10 seconds you will hear a long beep indicating you have put the unit in local shut down. The unit will then send a message to MISSION indicating this. Unlike Service Mode, the unit will not send any messages or alarms. When you leave you MUST bring the unit out of local shut down or no alarms will be sent in the future. To return the unit to normal mode, simply "key" the unit again or push the small button until the unit beeps (a few seconds). The unit will then send a wake up message and return it normal operating mode. If you forget to "key out" the unit will automatically wake itself up at midnight.

7.6 Why Can't I Just Unplug the Thing?

Well, you could. But, the MISSION unit will send an AC failure alarm and/or a system restart alarm. Both could cause notifications that must be responded to. If you are going to work at a site for a prolonged period of time (for a couple of hours or days), then put the MISSION unit in local shutdown mode or MISSION can put the monitoring unit in long term shutdown.

As always, call MISSION and we would be glad to help.

8 UNIT SETUP FORM

Many times the Model 100 is not installed as originally designed when the unit was shipped or initially programmed -- this is normal. For this reason, it is very important that the installer fill out, completely and accurately, how the unit was installed, including proper input descriptions.

Please fill out all items on the following form. Take the original to the main customer office and fax it to MISSION tech support. MISSION, or the customer, can then make the needed changes to MISSION's central computer database. File the original with other customer documents for the installation site.

Unit Set Up Form

Please Fax to MISSION Tech Support 678-969-0541

Please Print Clearly Save and Store in safe place for future reference.

Installer Name: _____

Contact Phone: _____

Customer Name: _____

Site Name: _____

Unit Serial #: _____

Install Date: _____

Installation Address: _____

City, State, Zip: _____

Input	Mode	State	Default (Circle) or Write in New Description
1	**R** A D	**N/O** N/C	Pump 1
2	**R** A D	**N/O** N/C	Pump 2
3	**R** A D	**N/O** N/C	Pump 3
4	R **A** D	**N/O** N/C	High Wet Well
5	R **A** D	**N/O** N/C	Low Wet Well
6	R **A** D	**N/O** N/C	Pump 1 Trouble
7	R **A** D	**N/O** N/C	Pump 2 Trouble
8	R **A** D	**N/O** N/C	

Notes: R = Runtime, A = Alarm, D = Disabled. Defaults are in **BOLD** characters. Run Times must be Normally Open or incorrect values will be accumulated.

Pump	Manufacturer	Model	GPM Rating	Install Date
1				
2				
3				

Diameter of Well _____ft._____in.

9 CUSTOMER SERVICE AGREEMENT

MISSION COMMUNICATIONS, LLC

Customer Service Agreement and Terms of Use

This agreement (hereinafter referred to as the "Agreement") is entered between MISSION COMMUNICATIONS, LLC, a Georgia Limited Liability Company, (hereinafter referred to as "Mission") and the entity and individuals utilizing Mission's products and services, including its web site and database information (hereinafter collectively referred to as the "Customer",) and is effective upon activation and use by Customer of Mission's products and services.

The Parties: Mission is engaged in the business of providing wireless communications and database systems for managing and monitoring remote equipment, including such industrial applications as water and wastewater systems. The Customer desires to use and benefit from Mission's communications and database system, which is to be installed by the Customer on-site at the Customer's premises.

Customer acknowledges and understands that by activating and utilizing Mission's products, services, web site and/or data-based information, Customer is agreeing to be bound by the following terms contained in this legal agreement.

The Terms: In consideration of the above recitals, the mutual promises contained herein, and other good and valuable consideration, including Customer's use of Mission's products and services, the parties hereby agree as follows:

A. Customer agrees to pay Mission for hardware and monthly monitoring fees as defined in Missions invoice, and Mission agrees to provide Customer with monitoring and notification services by utilizing automated calling, paging, e-mailing, faxing or TCP/IP transfer of data to an OPC compliant database to Customer's designated destinations as set forth in the Mission web site database on a best efforts basis. For additional operational and functional details, Customer should refer to the Mission product instructions.

B. Customer understands that Mission will not, with its own personnel, respond to or take action related to those events about which Mission provides monitoring and notification. Customer further understands that he/she is solely responsible for the final entries and schedules set forth in the Mission database notwithstanding the fact that Mission may have initially entered the monitoring and notification information in that database on the Customer's behalf.

C. Customer also understands that the data entries and schedules, residing in Mission's database, can be changed by the Customer. Customer furthers understands and agrees that he/she is to bear the risk of loss or damage that may result from changes to the Mission database made by, or on behalf of the Customer, and that such changes may prevent or impair the ability of the Mission monitoring and notification system from providing timely and successful notifications of detected events to Customer's designated destinations.

D. Customer further understands that Mission makes no representations, promises, warranties, or guarantees that there will be no interruptions in service or delays in performing service, or as to the quality, usefulness, completeness and reliability of such service, and further that Mission provides no assurances that such service will be free of errors. Customer acknowledges that Mission utilizes wireless data services that may be provided by Cellemetry, Aeris, Cingular Wireless, Vistar, Nextel, and various participating carriers, and that such providers disclaim any and all liability arising from the Customer's use of Mission's products and services. Customer further understands that Mission has no control of, or responsibility for, the paging, cellular, radio, telephone, internet, or other communication medium which the customer may rely upon for delivery of alarm or other messages sent by by Mission.

E. Customer also understands that in further consideration of being granted the right to utilize Mission's monitoring and notification service, the Customer, on behalf of himself/herself, and any employees, agents, personal representatives, assigns, heirs, next of kin and any third party, agrees:

   1. To indemnify, defend and hold harmless Mission, its owners, directors, officers, employees, agents, suppliers or affiliated companies, against any and all claims, demands or actions based upon any losses, liabilities, damages or costs, whether direct or indirect, special or consequential, including

attorneys' fees, that may result from the operation of Mission's products and services, or from the failure of the Mission system to report a given event or condition.

2. To release, waive, discharge and covenant not to sue Mission, its owners, directors, officers, employees, agents, suppliers or affiliated companies, for any and all liabilities potentially arising from any claim, demand or action based upon any losses, liabilities, damages or costs, whether direct or indirect, special or consequential, including attorneys' fees, that may result from operation of Mission's products and services, or from the failure of the Mission system to report a given event or condition.

3. That in the event Mission is found to be liable for any loss or damage arising out of mistakes, omissions, interruptions, delays, errors or defects in Mission's products or services, such liability shall not exceed the total amount paid by the Customer to Mission for the latter's services or $250.00, whichever is greater.

4. That the Mission hardware includes a limited warranty that the product is free from defects in materials and workmanship for a period of one year from the date of delivery. Mission's obligation under this limited warranty is limited to repairing or replacing the product, at Mission's option, unless the product has been misused or improperly repaired or serviced by any party other than authorized Mission personnel, in which case the limited warranty is voided. Other than this limited warranty, Mission's products and services are provided with no other guarantees or warranties, express or implied, including any warranties of merchantability or fitness for a particular purpose.

5. That neither Mission nor its owners, directors, officers, employees, or agents is an insurer and that the Customer is to maintain his/her own insurance coverage sufficient to provide compensation for any loss, damage, or expense that may arise in connection with the use of Mission's products or services.

F. Customer further understands and agrees that Mission's products and services are intended to monitor and notify Customer of events only relating to Customer's non-critical mechanical and electrical equipment and are not intended to be used for a primary life-safety, burglary or fire detection and reporting system.

G. Customer agrees to pay Mission for a monthly per unit monitoring fee, which is to be prepaid on an annual basis, as indicated in Customer's invoice. The first annual service fee and hardware cost are to be paid within 30 days from the date of shipment of the Mission hardware. Although the hardware cost and monitoring fees are due and payable within 30 days of shipment from Mission's factory, Customer may receive up to 90 days of service credit on the first term service, per monitored unit, for units not installed up to 90 days after shipment. Units not installed within 90 days from shipment will be billed as active, whether installed or not. Service credit will be applied to the second-year service period. After the expiration of the initial one-year term, this Agreement shall automatically renew for additional one-year periods, unless canceled by written notice to MISSION at least sixty (60) days prior to expiration date of the then current term. Mission shall not raise the price for subsequent service terms more than a percent equal to the percent increase of the annually compounded percentage increase of the generally accepted Consumer Price Index over the previous service term.

H. The Customer understands the intended uses of Mission's products and services and will ensure that they are used in an intended and safe manner. In addition, it is agreed that Mission personnel will be contacted if the Customer does not know how to install or operate Mission's products and services.

I. The Customer acknowledges that he/she has read and understands this Customer Service Agreement, and that he/she agrees to its terms and intends to be bound by them. The customer further understands that this Agreement is intended to be as broad and inclusive as is permitted by law and that if any portion thereof is held invalid, it is agreed that the balance of the agreement shall, notwithstanding, continue in full legal force and effect.

J. Regardless of the place of contracting or performance, this Agreement and all questions relating to its validity, interpretation, performance and enforcement shall be governed by and construed in accordance with the laws of the State of Georgia, and that any suit, action or other legal proceeding involving this Agreement shall be brought exclusively within the State or Federal Courts of Atlanta, Georgia.

K. The parties hereto acknowledge and agree that this Agreement contains the entire agreement between Mission and the Customer, and that there are no other representations, inducements, promises, or agreements, oral or otherwise, which are not embodied herein.