SILENT INFORMER

Solar Powered Portable

FLASHING BEACON TRAILER

Procurement Specifications

(FBT-2000)
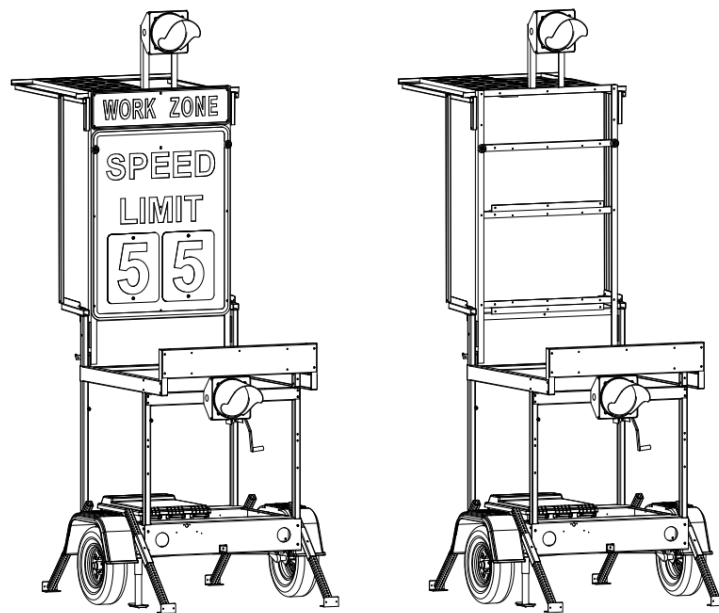
SOLARTECH ®

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This document presents a detailed specification for a Solar Powered Portable Flashing Beacon Trailer. This specification typically requires additions and/or modifications to meet a user's specific requirements.

This specification is subject to periodic revisions as required without notice.

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1.   General

1.1   Product Description

The **SILENT INFORMER** is a Solar Powered Portable Flashing Beacon Trailer. The **SILENT INFORMER** consists of a supporting structure for customizable signage, two (2) flashing beacons, a photovoltaic array, a battery power supply, an energy management system control unit, and an electronic control console, all mounted on a heavy duty trailer frame.

1.2   Design Objectives

1.2.1   Maximize reliability by using generally accepted design techniques for outdoor-use electrical and electronic equipment.

1.2.2   Minimize operating cost by using a renewable energy source, requiring minimal maintenance.

1.2.3   Maximize safety and effectiveness by using a non-glare, high contrast display panel with long- life expectancy, high-reliability display technology.

1.2.4   Meet or exceed the standards listed in the U.S. Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD).

1.3   Performance Objectives

1.3.1   Beacon visibility up to 1 mile.

1.3.2   Legibility up to 1 mile

1.3.3   Minimal glare from sunlight and head lights.

1.3.4   Continuous, uninterrupted operation on solar power

1.3.5   One (1) month minimum, three (3) month typical maintenance interval.

1.4   Quality Assurance Objectives

1.4.1   All manufacturing shall be carried out in a facility with a completely implemented and properly maintained ISO 9001:2015 certified quality management system.

1.4.2   All units shall be tested to ensure that they are neither susceptible to nor produce any electromagnetic interference.

2.   Physical

2.1   Dimensions

2.1.1   Length Overall

2.1.1.1 Transport position   – 159 in. (404 cm)

2.1.1.2 Storage/Operational position   – 122 in. (310 cm)

2.1.2   Width

2.1.2.1 Width Overall   – 56 in (142 cm)

2.1.2.2 Width Across Fenders   – 56 in. (142 cm)

2.1.3   Height

2.1.3.1 Transport position   – 95 in. (241 cm)

2.1.3.2 Operational position   – 180 in. (457 cm)

2.1.4   Ground Clearance   – 13 in. (33 cm) (minimum)

2.1.5   Weight   – 1600 lbs (726 kg)

2.2   Environmental

2.2.1   Temperature, operating and storage - -40 to +185 °F (-40 to +85 °C)

2.2.2   Relative Humidity - 20% to 98%, non-condensing

2.2.3   Wind

2.2.3.1 Transport position, maximum trailering speed - 70 MPH (112 KPH)

2.2.3.2 Operating position, max. height, outriggers in place - 80 MPH (128 KPH) sustained

2.2.4   Electrical Interference - Unaffected by RFI (Radio Frequency Interference) and EMI.

3.   Trailer Chassis and Sign Support

3.1   Trailer Chassis

3.1.1.1 Frame Construction

3.1.1.2 Trailer frame shall be constructed of welded 7 Gauge (3/16-inch) CNC formed steel plate and structural steel tubing with 3 x 3 x 3/16 inch structural steel tubing receiver for the tongue, reinforced and welded to the front cross member.

3.1.1.3 Trailer shall be equipped with a 2 1/2 x 2 1/2 x 3/16 inch structural steel tubing receiver capable of accepting a standard Class II (2) drawbar and hitch pin to accommodate tandem towing. The rear hitch receiver shall be reinforced and welded to a 7 Gauge (3/16-inch) CNC formed steel plate rear cross member. Tandem trailer towing using rear hitch receiver is intended for off road use only and is subject to local laws and regulations!

3.1.1.4 Trailer frame shall be equipped with tie down points to facilitate securing unit to utility trailer or truck deck for transport.

3.1.1.5 Trailer tongue shall consist of 2 1/2 x 2 1/2 x 3/16 inch structural steel tubing. The tongue shall bolt into the tongue receiver tube to facilitate easy removal of the tongue for repair, transportation, or security purposes. The trailer tongue shall be equipped with a 2,000-pound capacity swivel-type top-wind screw jack with a formed steel footpad.

3.1.1.6 Suspension

3.1.1.7 Trailer shall be equipped with an independent suspension, torsion-type axle with a 2,200 pound overall capacity. Axle load capacity shall be set at 1,400 pounds.

3.1.1.8 Axle wheel spindles shall be equipped with grease fittings to accommodate wheel bearing lubrication.

3.1.2   Coupler

3.1.2.1 Trailer tongue shall be capable of accepting an adjustable height coupler that includes either a 2-inch ball or a 3-inch pintle coupler as standard.

3.1.2.2 Adjustable height coupler shall accommodate 6-position hitch heights ranging from 18 to 28 inches.

3.1.2.3 Adjustable height coupler shall install on front of trailer tongue, secured with 1/2-inch diameter, grade 8 bolts and all metal (stover) lock nuts.

3.1.2.4 Tongue length shall be approximately 61.5 inches (measured from centerline of 2-inch ball).

3.1.2.5 Trailer shall be equipped with 1/4-inch safety chains with snap-type hooks for secure attachment to tow vehicle hitch.

3.1.2.6 All coupler and safety chain configurations shall comply with SAE J684 standards for

Class II (2) trailers.

3.1.3   Surface Preparation and Finishing

3.1.3.1 Trailer chassis and superstructure shall be completely cleaned and deburred prior to finishing. All metal surfaces shall be prepared for finishing using an iron phosphate wash-down process.

3.1.3.2 A polyamide epoxy primer shall be applied to a dry film thickness of 1.5 mils.

3.1.3.3 A high gloss federal safety orange aliphatic acrylic urethane finish shall be applied to a dry film thickness of 1.25 mils.

3.1.4   Lighting

3.1.4.1 Trailer shall be equipped with sealed flush-mounted combination stop, tail and turn lights.

3.1.4.2 Trailer shall be equipped with a lighted license plate holder.

3.1.4.3 Trailer wiring harness shall be completely sealed and water resistant.

3.1.5   Fenders

3.1.5.1 Trailer shall be equipped with unbreakable, molded, solid color, UV-stabilized HDPE (High Density Polyethylene) fenders completely closed on the inner side to protect trailer frame.

3.1.5.2 Fenders shall be secured to trailer frame with zinc-plated steel thread forming screws and fender washers to facilitate easy repair or replacement.

3.1.6   Leveling Jacks

3.1.6.1 Trailer shall be equipped with four (4) telescoping jacks consisting of 2" x 2" x 12 Gauge perforated galvanized steel tubing equipped with a 3 x 3 x 3/16 inch x 6 inch wide steel foot plate.

3.1.6.2 Jack stands shall be inserted into 2 ¼" x 2 ¼"x 12 Gauge galvanized steel tubing, welded to the trailer frame at a 45 degree angle.

3.1.6.3 Jack stands shall be locked into position by 3/8-inch zinc-plated steel tab lock pins secured to trailer frame by nylon-coated stainless steel lanyards.

3.1.6.4 Jack stands and tongue jack shall be configured such that unit can be set up on jack stands, level, in operating position, with the trailer wheels raised completely off the ground, permitting removal of wheels and tires for additional security.

3.1.6.5 Jack stands shall be configured such that, when in the operating position, they create a footprint of at least 93 inches (236 cm), front to rear, and 61 inches (155 cm), side to side, to provide adequate stability of unit in high winds.

3.1.7   Tires and Wheels

3.1.7.1 Tires shall be ST175/80 R13 Load Range C.

3.1.7.2 Wheels shall be 13-inch x 4 1/2-inch, 5-lug pattern (4 1/2-inch bolt circle), white steel wheel.

3.1.7.3 Wheels and tires shall be sized according to load requirements of trailer and axle.

4. Sign Panels and Flashing Beacons

4.1 Dimensions

4.1.1 Static Sign Panel:

4.1.1.1 Maximum Width — 75 in. (190 cm)

4.1.1.2 Maximum Height — 75 in. (190 cm)

4.1.1.3 Height Above Ground (to bottom of sign panel) — 84 in (214 cm) minimum

4.1.2 Flashing Beacon Lamps:

4.1.2.1 Lamp Diameter: Circular — 12 in (30 cm)

4.2 Construction

4.2.1 Static Sign Panel(s)

4.2.2 All sign panels shall be constructed from Type III coated aluminum.

4.2.3 Flashing Beacon Lamps

4.2.4 Each trailer shall have two (2) securely mounted 12-inch diameter, circular, LED beacon lamps.

4.2.5 Lamp color shall be amber (592 nanometer wavelength).

4.2.6 Beacon Lamp Configuration

Standard – One lamp mounted horizontally-centered below the lowest installed static sign and one lamp mounted horizontally-centered above the highest installed static sign panel.

Alternative – One lamp mounted to the left side of the static sign and one lamp mounted to the right side of the static sign.

4.2.6.1 The distance between the nearest edge of any sign or plaque and the flashing beacons shall be no less than twelve (12) inches.

4.2.7 The flashing beacons shall be wired so that they can be activated and deactivated via power switch, short range radio or integrated control console.

4.2.8 The flash interval for the flashing beacon lamps shall be 50-60 flashes per minute.

4.2.9 Beacons shall be equipped with automatic dimming feature (via flasher module or integrated control console) that automatically adjusts the lamp brightness under varying light conditions.

4.3 Cables and Wiring

4.3.1 Flasher module or integrated control module wiring and cables shall be equipped with modular power and signal connectors to permit repairs without the need for any tools.

4.3.2 All power circuit connectors shall use tin or silver plated contacts.

4.3.3   All signal circuit connectors shall use gold plated or gold flashed contacts.

4.3.4   All system wiring, power and signal, shall consist of marine grade wire and cable, with multi-strand, aluminum or tin-plated conductors.

4.3.5   All cable fittings shall be installed with rubber sealing rings to maintain liquid-tight characteristics.

5.   Main Control Console

5.1 Physical

5.1.1   Control console or Flasher module shall be enclosed in a weather resistant, lockable, molded HDPE (High Density Polyethylene) enclosure secured to the trailer chassis.

5.1.2   Control console shall be sealed to accommodate operation in all types of weather.

5.1.3   MegaTech: Control console shall be mounted on heavy duty slides which allow the control console to slide up and pivot into a position enabling the operator to program the unit while facing traffic from a comfortable standing position. A controller location which requires the operator to stoop, bend or kneel for operation such that the operator cannot see approaching traffic shall not be permitted. Slide mechanism shall permit quick, easy removal of control console without the need for any tools.

MicroTech: Control console shall be secured to a fixed mount using wing head fasteners to permit quick, easy removal of control console without the need for any tools. The controller shall be mounted in a position which enables the operator to program the unit while facing traffic from a comfortable standing position. A controller location which requires the operator to stoop, bend or kneel for operation such that the operator cannot see approaching traffic shall not be permitted.

5.1.4   Control console or Flasher module power and control cables shall include sealed, locking-type connectors to permit quick, easy removal of control console without the need for any tools.

5.1.5   MegaTech: Control console front panel shall consist of a backlit full color 10.4 inch LCD (Liquid Crystal Display) with integrated industrial grade touch-screen, sealed and waterproof, to provide a reliable and user-friendly interface for the operator under any weather condition.

MicroTech: Control console front panel shall consist of a backlit 4 row, 20 characters per row, LCD screen with a five (5) button touchpad, sealed and waterproof, to provide a reliable and user-friendly interface for the operator under any weather condition.

5.2   General Operation

NOTE: Cellular/GPS connection is an optional upgrade

5.2.1   Control consoles shall provide for full local and remote (via integrated cellular transceiver module and antenna) control of the flashing beacons including unit geographic location monitoring (when optional integrated GPS module and antenna connected) and sign panel orientation monitoring (when equipped with optional digital flux-gate compass), without the need for additional hardware, software, external computers or hand-held control devices.

5.2.2   Control consoles shall include all necessary hardware and software to operate flashing beacons locally (via integrated control console) and remotely (optional, via integrated cellular transceiver and antenna. Full remote control (including GPS mapping) via

internet accessible server based remote control software shall be included free of charge for life of the unit from date of purchase (i.e. cellular service shall be included from date of original purchase).

5.2.3   Control console embedded CPU shall incorporate an ARM based microprocessor design to ensure future hardware and software compatibility through upgrades provided by manufacturer free for life of the machine. Operating system shall be Linux based and include multiple watchdog timers to ensure automatic system restarts in the event that any critical function stops working properly or communication with remote control servers is interrupted.

5.2.4   Control console shall be capable of connection to any standard IBM or compatible desktop or laptop computer via a standard serial interface (COM) or Ethernet port to facilitate routine service or repair, extensive diagnostics, and the analysis of user files or operating programs.

5.2.5   Control console shall be equipped with at least one USB port, one Ethernet port, two (2) serial ports (DB-9 connector), two (2) digital outputs, and one (1) digital input.

5.2.6   Control console operating processor, firmware and software shall be field (locally) upgradeable with a standard USB flash-drive (memory key) or remotely upgradeable over an IP addressable network connection - wire-line or wireless via IP addressable modem. Additionally, upgrades shall be provided by manufacturer free of charge for life of machine and automatically applied via integrated cellular transceiver and included remote control service from date of original purchase.

5.2.7   (MegaTech Only) Full color LCD display shall be equipped with an automatic backlight with automatic dimming capability to accommodate both direct sunlight daytime and low ambient light level night time operation. Backlighting shall automatically activate upon any touch-screen activity and remain on for five minutes following the last touch-screen activity. Additionally, an automatic log-out feature shall be incorporated to insure security of the unit when left unattended. Automatic log-out feature shall be capable of being disabled by the operator as desired.

5.2.8   (MegaTech and Flasher Module Only) Main power to the beacons and the control console/flasher module shall be controlled by a combination switch and circuit breaker in order to provide electrical protection without the need for fuses. All connections to controller and Energy Management System shall be made with locking type quick disconnect connectors. The use of fuses and/or terminal strips for connections shall be strictly forbidden.

5.3 Programming

5.3.1   Control console shall provide an intuitive icon-driven graphical user interface (GUI) along with step by step instructions to the operator, via the LCD display, as the various programming functions are performed, for simple easy programming and operation.

5.3.1.1 (MegaTech Only) On-screen help files shall be included in all languages. Control console shall support a minimum of six (6) standard operating languages (English, Spanish, French, Dutch, German and Portuguese) and four (4) standard keyboards (English, French, Portuguese/Spanish, and Arabic) along with associated font sets.

5.3.1.2 Controller shall be capable of quickly and easily enabling an operator to setup, and select between, two (2) operational speed limits (in 1 MPH or KPH increments): one that is displayed with the flashing beacons activated for when a work-zone is active and one that is displayed without the flashing beacons for when a work-zone is inactive.

5.3.2 MegaTech control console shall accommodate a minimum of fifty (50) full alphanumeric passwords each providing levels of access to various control console functions. Each password shall allow access to only the functions required by that particular dynamic message sign operator. The levels of access are as follows:

User Menu	Create, Edit, Delete, Save, Display, and Schedule messages. Create, Assign, and Edit Quick Picks. Check System Status and perform basic diagnostics.
Supervisor Menu	All User Menu Functions. Create and Delete Quick-Picks and User passwords. Set system operating parameters.
Administrator Menu	All Supervisor Functions. Create and Delete Administrator and Supervisor passwords. Set Controller operating parameters.

5.3.3 MicroTech control console shall accommodate a 4 digit pin passcode which provides access to all control console functions.

5.3.4 Control console shall be equipped with a Scheduler that utilizes a real time clock and calendar feature to accommodate automatic, unattended changing of beacon activation at predetermined dates and times. Scheduler shall support unique, single event schedules along with recurrent schedules. Recurrent schedules shall be capable of incorporating a start and stop date as desired.

5.3.4.1 Scheduler shall also be capable of displaying messages based upon data driven events such as input from a radar gun, photocell, battery voltage, temperature and/or switch closures (up to six (6), MegaTech Only). Data driven events shall also be capable of being restricted to specific dates and times. Scheduler shall incorporate a priority system for resolution of conflicting schedules and/or events to permit one schedule/event to override another based upon level of importance.

5.3.5 Control console shall provide a system status page that enables an operator to quickly and easily determine the unit's current time, date, photocell reading, photocell set-points, battery bank voltage, battery bank current, solar array voltage, solar array current, temperature, MAC address, IP address, run-time since last re-boot, current run-

time (resettable timer), lifetime run-time, and serial modem type along with modem signal strength and quality, latitude & longitude and sign panel heading.

5.3.6   Control console shall provide the capability to display Battery Bank Voltage to 0.1 Volt accuracy, Battery Bank Current to 0.1 Amp accuracy, Solar Array Voltage to 0.1 Volt accuracy and Solar Array Current to 0.1 Amp accuracy directly on the control console display. Additionally, control console shall have the capability to calculate and display an estimated run-time (autonomy) based on current battery bank status and historical system energy (generation vs. consumption) trends to provide the operator with an estimated number of days system is capable of operating prior to shutting down on a low-battery condition.

5.3.7   Control console shall be equipped with three (3) Run-Time counters: an Up-Time counter that indicates total number of days, hours and minutes since last re-boot, a Current Run-Time counter that indicates total hours of operation since last reset of the counter (resettable run-time counter), and a Lifetime Run-Time counter that indicates total hours of control console operation (non-resettable).

5.3.8   Control console shall include the ability to reset the Current Run-Time counter, Message Library, Scheduler, and all Factory Settings automatically, individually or all at once through performing a variety of Master Resets which will clear all memory and reset all settings to original factory set-points to various levels.

5.3.9   Control console, in addition to an integrated LTE Cat M1 transceiver, shall support both dynamic and static IP address network connections along with direct serial communications to support legacy NTCIP installations.

5.3.10   Control console shall provide a method for setting a battery offset and temperature offset to calibrate battery voltage and temperature readings.

5.3.11   Control console shall provide a method for switching radar gun output from MPH to KPH directly from control console GUI or remotely via remote control software.

5.3.12   Control console shall be NTCIP compatible. The following NTCIP standards must be supported:

NTCIP 1201 (v3.15r) - Global Object Definitions
NTCIP 1203 (v2.39b) - Object Definitions for Dynamic Message Signs
NTCIP 2101 (v1.19) - Subnetwork Profile: PMPP over RS232
NTCIP 2104 (v1.11) - Subnetwork Profile: Internet
NTCIP 2201 (v1.15) - Transport Profile: Transportation
NTCIP 2202 (v1.05) - Transport Profile: Internet

⸻ Unit shall support an administrator community string along with 255 other communities. Each community shall be capable of being assigned read-only or read-write access.

⸻ Unit shall support up to 65,535 user-defined permanent messages.

⎯ Unit shall support a configurable number of changeable (persistent) messages. This number shall be configurable between 1 and 65,535, and shall default to 32.

⎯ Unit shall support a configurable number of volatile (non-persistent) messages. This number shall be configurable between 1 and 65,535, and shall default to 32.

⎯ Each message shall support at least 16 pages.

⎯ Unit shall support a scheduler with support for up to 16 schedule, 16 day plans, and 96 day plan events.

⎯ Unit shall support at least 255 graphics via the monochrome 1 bit color scheme.

⎯ Unit shall support a configurable number of user-definable fonts. This number shall be configurable between 1 and 127, and shall default to 32.

5.3.13 Web-Interface (Smart-Phone Control): Control console shall function as a Web-Server which enables an operator (via user name and password access) through any standard Web-Browser to:

⎯ Create a unique Web-Name for the unit for browser ID

⎯ View the current status of the unit to include current message displayed on sign panel, battery voltage, photocell reading, date & time, and NTCIP control status

⎯ Blank the unit's sign panel

⎯ Select, preview, edit and activate any message from the unit's message library

⎯ Create, edit, preview and activate a new multi-page text message (up to 6 pages)

⎯ Turn NTCIP control on/off if NTCIP control is enabled on control console

Access to the Web-Server shall be though any standard web browser over a standard network connection and/or public IP address (i.e. IP addressable modem). Access shall be protected by a user name and password created by the operator through the manufacturer's proprietary remote control software to ensure security is maintained at all times. The Web-Server shall be capable of being controlled (i.e. turned on and off) via manufacturer's proprietary remote control software. Web-Access to the control console shall not require access to a central server. All access to the Web-Server shall be logged and recorded.

6.   Power System

6.1   General

6.1.1   Operating Voltage - 12 Volts DC nominal

6.1.2   Operating Energy Requirement – less than 9 Amp Hours per day at Spring or Fall Equinox (12 hours of daylight, 12 hours of darkness) with flashing beacons operating continuously.

6.1.3   (MegaTech and Flasher Module Only) Main Power Switch - Main power switch shall be a combination switch and electromagnetic, thermal circuit breaker to provide compete electrical system protection without the inconvenience of conventional fuses. Main power switch shall be splash proof and weather resistant.

6.2   Battery Bank

6.2.1   Number of batteries – Specify Two (2), Four (4). Six (6) or Eight (8)

6.2.2   Battery type - 6-Volt, heavy duty, deep cycle – specify Flooded Lead-Acid, Gel-Cell or AGM

6.2.3   Energy capacity – 260 Amp-Hours nominal (2 batteries). Sufficient energy capacity to operate the unit without any energy input from the solar array for more than 30 days.

6.2.4   Battery / Equipment Compartment

6.2.5   Battery / Equipment Compartment shall be constructed of molded HMWPE (High Molecular Weight Polyethylene), color impregnated with Federal Safety Orange with 0.5% UV stabilizer added to prevent fading.

6.2.6   Compartment shall be designed to completely contain spills from a failed or damaged battery case.

6.2.7   Compartment shall be capable of supporting an operator standing on top of the battery equipment compartment to service unit.

6.2.8   Compartment shall be designed such that the lid automatically latches in the closed position and holds the batteries in place. Lid shall be capable of being locked in the closed position with a standard padlock.

6.2.9   Lid shall be secured to compartment by an integral plastic hinge that permits the lid to be completely removed from the compartment for service. Lid on the compartment containing the control console shall be automatically supported in the open position by a telescoping lid support.

6.2.10 Compartment shall be designed to provide adequate ventilation for the batteries during charging yet prevent the ingress of water during use or transport.

6.2.11 Compartment shall be capable of housing up to four (4) BCI Group GC-2 batteries.

6.3   Solar Array

6.3.1   Photovoltaic module type - Single crystal (mono-crystalline) silicon

6.3.2   Number of solar cells per module - 36

6.3.3   Solar array power output – 110 Watts (peak), upgradable to 160 or 220 Watts

NOTE: Solar energy system performance charts are available to assist in selection of appropriate solar array power output requirements

6.3.4   Trailer shall tilt to the rear, with sign panel in the down or transport position to allow for fast, easy cleaning and maintenance of the solar array.

6.3.5   Solar array energy output shall be sufficient to operate the flashing beacons, under normal operating conditions, with the solar array in a flat, horizontal position. It shall not be necessary to tilt or rotate the solar array to provide sufficient energy output from the solar array to operate the beacons continuously.

6.3.6   Photovoltaic module junction boxes shall be equipped with watertight strain reliefs at all cable entry points.

6.4   Wiring and Cabling

6.4.1   All conduit fittings shall be sealed at bulkheads or enclosure entry points.

6.4.2   All wiring shall be marine grade, multi-strand, tin-plated copper with PVC insulation rated for outdoor use.

6.4.3   All power system wire terminals shall be tin-plated copper to minimize the effects of galvanic corrosion.

6.4.4   Main power wiring shall be 10 AWG minimum.

6.4.5   Battery terminations shall consist of 5/16-18 UNC marine stud with stainless steel split lock washer and hex nut with 5/16 tin-plated copper ring terminal.

6.4.6   Solar panel terminations shall consist of stainless steel screws with #8 tin-plated copper snap spade terminals.

6.4.7   All other terminations shall consist of locking-type quick-disconnect connectors with tin-plated terminals for power connections and gold-plated terminals for signal connections. Terminal strips, screw or compression type, shall not be permitted.

6.5   Energy Management System

6.5.1   Solar energy management system control unit shall include a completely solid state charge controller capable of operating in an outdoor environment. No mechanical or electromechanical switching to control charging current is permitted.

6.5.2   All wiring connections to the energy management system control unit shall be made with locking- type multi-pin connectors to facility quick, easy servicing of the control unit without the need of any tools. Electrical connections shall include an auxiliary 12-Volt power connection to provide power for accessory devices.

6.5.3   Energy management system control unit shall monitor solar array voltage, solar array current, battery voltage, battery current and ambient temperature and use a MPPT

(Maximum Power Point Tracking) algorithm based on the monitored inputs to ensure maximum energy transfer from solar array to batteries under all operating conditions.

6.5.4   Energy management system control unit shall regulate energy flow from the solar array into the battery bank based on ambient temperature to avoid over charging of the batteries and minimize the consumption of electrolyte.

6.5.5   Energy management system control unit shall provide for the controlled periodic pulsing of the solar array current to assist in minimizing sulfate deposit buildup on the battery plates.

6.5.6   Energy management system control unit shall provide for remote monitoring of the battery bank voltage, at the terminals of one of the batteries, to assist in optimizing the transfer of power into the battery bank.

6.5.7   (MegaTech only) Energy management system control unit shall be equipped with a 2-line by 16-character LCD (Liquid Crystal Display) displaying sequentially, solar array voltage, solar array current, battery voltage, and battery current. Energy management system control unit shall display a low battery voltage-warning message whenever the battery bank voltage drops below 10.9 Volts.

6.5.8   Energy management system control unit shall automatically switch current to the message sign off whenever the battery bank voltage drops below 10.7 Volts to prevent damage to the battery bank due to over-discharging the batteries.

6.5.9   Energy management system control unit shall provide for automatic reverse polarity protection.

6.5.10 Energy management system shall monitor and report to control console battery bank voltage, battery bank load current, solar array voltage and solar array charge current.

6.5.11 (MegaTech only) Energy management system shall have an integrated watchdog timer that is continuously reset by the console during normal operations such that if the control console were to become unresponsive due to a software failure/lockup, upon expiration of the timer the energy management system will completely power down and re-start the entire system from a temporary software failure/lockup.

7.   Documentation

7.1   Operation and Maintenance Manual - available online at www.solartechnology.com

7.1.1   Setup and Operation

7.1.2   Programming

7.1.3   Maintenance

7.1.4   Troubleshooting and Repair

7.1.5   Assembly Diagrams and Parts Lists

7.1.6   Specifications

7.1.7   Appendix

7.2   Command Center - User's Manual - available online at www.solartechnology.com

7.2.1   Installation and Setup

7.2.2   Command Center Operation

7.2.3   Appendix

7.3   User Guide - Hard Copy - attached to unit with nylon lanyard

7.3.1   Pre-transport checklist.

7.3.2   Job site setup checklist.

7.3.3   Basic programming instructions.

7.3.4   Basic system status evaluation.

7.3.5   Weatherproof card attached to unit with a 5/32 inch diameter nylon lanyard.

7.4   Integration Support Documentation - Per request from customer support (1-800-475-5442)

7.4.1   Proprietary Protocol Documentation for Custom System Integrators

7.4.2   NTCIP Support Documentation for NTCIP System Integrators

7.4.3   Web-Server Protocol Documentation for Web Based Application System Integrators

8.   Maintenance

8.1   Scheduled Maintenance

8.1.1   Solar Array - Clean with water and mild detergent as needed.

8.1.2   Battery Bank - Check electrolyte level once each month and add distilled water as needed. (NOTE: Not required with AGM or Gel-Cell batteries.)

8.2   Preventive Maintenance

8.2.1   Inspect and lubricate axle hubs once per year.

9.   Warranty

9.1   Standard Warranty

9.1.1   Limited Bumper to Bumper – Five (5) years - consult factory for terms & conditions

9.1.2   Solar Panels - Ten (10) years

10. Options

10.1   Battery Charger

10.1.1 Charger type - Switching regulator, constant voltage with automatic switch to maintenance or trickle charge.

10.1.2 Input Voltage - 110 VAC 50/60 Hz (specify 220 VAC 50 Hz for international use)

10.1.3 Available models with typical recharge times.

45-Amp - 24 hours (8 batteries), 12 hours (4 batteries)

90-Amp - 16 hours (8 batteries), 8 hours (4 batteries)

10.1.4 Battery charger unit shall install in the field with minimum effort.

10.2   Remote Control

10.2.1 General

10.2.1.1 The remote control option shall provide for complete control of all dynamic message sign functions. The remote control option shall, at a minimum, provide for:

— Simultaneously geographically tracking, managing, operating and maintaining a minimum of 1,000 remotely located PCMS units including setting up automatic e-mail notifications/alerts for unit movement, change of displayed message, low estimated runtime, low battery condition, sign panel failures, and pixel failures.

— Sending a message to one or more remote PCMS for immediate display.

— Receiving the message currently displayed on all remote PCMS.

— Managing the message libraries and message schedules & events on all remote PCMS.

— Checking the operating status, including sign panel status, system date & time, battery voltage, estimated autonomy, temperature, unit Up-Time, Current Run-Time, Life-Time Run-Time, and ambient light level of all remote PCMS.

— Reporting and managing NTCIP status of all PCMS.

— Retrieve up to 30 days' worth of logged Radar Statistics

— Provide for the ability to perform various system resets including a complete re-boot/restart of the system for all PCMS.

10.2.1.2 Communication Protocol - Proprietary with complete CRC error detection and correction and full challenge-response password authentication.

10.2.1.3 Data Format - Data is encrypted and compressed for added security and reliability.

10.2.1.4 All operating software for message sign control console and host computer shall be included with basic message sign package (downloadable from www.solartechnology.com).

10.2.2 TCP/IP Network Communications (Dynamic or Static IP Address)

10.2.2.1 Data rate - 10/100 Base-T Ethernet

10.2.2.2 Remote control of any networked (IP addressable) PCMS may be achieved from any host computer with Internet connectivity (either with standard NTCIP commands via SNMP or STMP, or with Command Center). Remote control software (Command Center) shall be provided free of charge (downloadable from www.solartechnology.com) with unit and function on any host computer, independent of operating system. Control console and remote control software shall incorporate a challenge/response encrypted type password security system to prevent unauthorized access of any networked PCMS.

10.2.3 IP Addressable Cellular Transceiver Operation

10.2.3.1   Wireless modem with up to a 3-Watt cellular transceiver.

10.2.3.2   MNP 2-4 Error Control - Automatic error detection and correction.

10.2.3.3   MNP 5 Data Compression - Higher data rates, shorter connection times.

10.2.3.4   MNP 10EC - Enhanced performance over noisy cellular connections.

10.3   Cellular Transceiver & GPS Receiver Module

10.3.1   Integrated into Control Console – proprietary

10.4   Sign Panel Flux-Gate Digital Compass

10.4.1 Operating Voltage – 5-36 V_{dc}

10.4.2 Input Current – 5.7 mA @ 12 V_{dc} maximum

10.4.3 Operating Temperature Range – -40°C to +65°C (-40°F to +150°F)

10.4.4 Accuracy – ± 0.5 degrees

10.4.5 Repeatability – ± 0.2 degrees

10.4.6 Resolution – 0.1 degrees

10.4.7 Dip Angle – ± 80 degrees

10.4.8 Tilt Angle – ± 16 degrees

10.4.9 Response Time – 1 second