

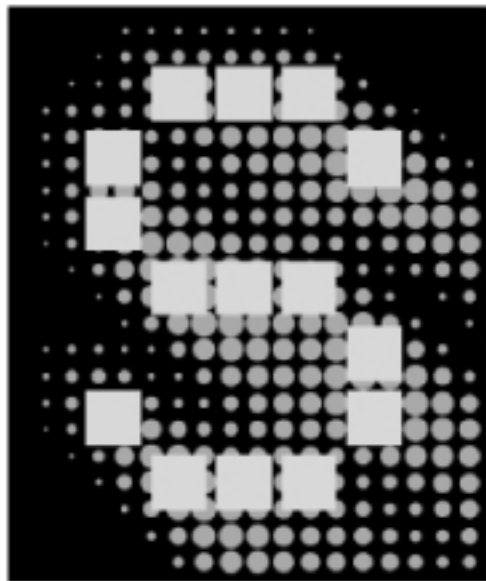
SILENT ADVISOR

SOLAR POWERED

PORTABLE RADAR SPEED TRAILERS

(RST-1000 and RST-2000)

PROCUREMENT SPECIFICATION



LED Solutions

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This document presents a detailed specification for a Solar Powered Portable Radar Speed 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.

1. General

1.1 Product Description

The **SILENT ADVISOR** is a Solar Powered Portable Radar Speed Trailer. The **SILENT ADVISOR** consists of an LED speed display panel, a radar speed monitor, a supporting structure for the LED speed display panel and legal speed limit sign, 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.

1.3 Performance Objectives

1.3.1 Visibility up to 1 mile.

1.3.2 Legibility up to 1/4 mile.

1.3.3 Minimal glare from sunlight and head lights.

1.3.4 Continuous, uninterrupted operation on solar power.

1.3.5 One month minimum, three 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 9001:2000 certified quality management system.

1.4.2 All units shall bear the CE Mark indicating acceptable EMC (Electromagnetic Compatibility) to insure that the units are neither susceptible to nor produce any electromagnetic interference.

1.4.3 Manufacturer shall have a factory authorized service center located within 150 miles of point of delivery. Authorized service center shall receive all units from factory in order to inspect for any shipping damage and verify proper operation prior to final delivery. Delivery directly from manufacturer's facility without inspection by an authorized service center shall not be permitted. Additionally, authorized service center shall be capable of performing warranty service and repairs, and shall provide on-site training on the proper use and maintenance of all equipment delivered.

2. Physical

2.1 Dimensions

	RST-1000	RST-2000
2.1.1 Length Overall:		
2.1.1.1 Tongue ,Towing:	117 in. (298 cm)	112 in. (284 cm)
2.1.1.2 Tongue, Stowed:	75 in. (191 cm)	N/A
2.1.2 Width:		
2.1.2.1 Overall:	56 in. (142 cm)	75 in. (190 cm)
2.1.2.2 Across fenders:	56 in. (142 cm)	75 in. (190 cm)
2.1.3 Height		
2.1.3.1 Sign, transport position:	90 in. (229 cm)	92 in. (234 cm)
2.1.3.2 Sign, operating position:	129 in. (328 cm)	142 in. (360 cm)
2.1.4 Ground Clearance, minimum:		13 in. (33 cm)
2.1.5 Weight:		1,160 lbs. (526 kg) (maximum)

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 (Electromagnetic Interference).	

3. Trailer Chassis and Sign Support

3.1 Trailer Chassis

3.1.1 Frame Construction

3.1.1.1 Trailer Frame

RST-1000: Trailer frame shall be constructed of welded 7 gauge (3/16-inch) CNC formed steel plate and structural steel tubing with 7 gauge welded plate assembly for attachment of pivoting tongue.

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

RST-2000: 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.

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 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!

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

3.1.1.2 Trailer Tongue

RST-1000: Trailer tongue shall consist of 2 1/2 x 2 1/2 x 3/16 inch structural steel tubing. The tongue shall be bolted and pinned, with a 1/2" standard hitch pin, to the trailer frame in a manner that allows for easy positioning by an operator between the towing and storage positions.

RST-2000: 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.

3.1.2 Suspension

3.1.2.1 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.

3.1.2.2 Axle wheel spindles shall be equipped with spindle bearing caps with grease fittings to accommodate wheel bearing lubrication.

3.1.3 Coupler

3.1.3.1 Trailer tongue shall be capable of accepting a 2-inch ball coupler, a 2-1/2- inch pintle ring, an optional removable combination coupler, or an optional adjustable height coupler.

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

3.1.3.3 All coupler and safety chain configurations shall comply with SAE J684 standards for Class II (2) trailers.

3.1.4 Surface Preparation and Finishing

3.1.4.1 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.

3.1.4.2 A polyamide epoxy primer shall be applied to a dry film thickness of 2.5 mils.

3.1.4.3 A high gloss federal safety orange aliphatic acrylic urethane finish shall be applied to a dry film thickness of 2.5 mils.

3.1.5 Lighting

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

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

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

3.1.6 Fenders

3.1.6.1 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.

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

3.1.7 Leveling Jacks

3.1.7.1 **RST-1000:**

3.1.7.1.1 Trailer shall be equipped with four swivel type screw jacks, minimum capacity rating of 2,000 pounds, mounted on each corner of the trailer frame.

3.1.7.1.2 The screw jacks shall be capable of lifting the trailer frame so trailer wheels and tires can be removed for additional security.

3.1.7.2 **RST-2000:**

3.1.7.2.1 Trailer shall be equipped with four telescoping jacks consisting of 2 x 2 inch x 12 gauge perforated galvanized steel tubing equipped with a 3 x 3 x 3/16 inch x 6 inch wide steel foot plate.

3.1.7.2.2 Jack stands shall be inserted into 2 1/4 x 2 1/4 inch x 12 gauge galvanized steel tubing, welded to the trailer frame at a 45 degree angle.

3.1.7.2.3 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.

3.1.7.2.4 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.

3.1.7.2.5 Jack stands shall be configured such that, when in the operating position, they create a footprint of at least 74 inches, front to rear, and 44 inches, side to side, to provide adequate stability of unit in high winds.

3.1.8 Tires and Wheels

3.1.8.1 Tires shall be B78-13 Load Range C.

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

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

3.2 Sign Panel Support

3.2.1 Trailer superstructure shall provide complete support of the sign panel in the transport (down) position. Cantilevered support of sign panel is not acceptable!

3.2.2 Trailer superstructure shall be completely assembled with removable fasteners to accommodate quick, easy maintenance and repair.

3.2.3 All fasteners shall be rust resistant and equipped with all metal (stover) or nylon-stop type lock nuts to prevent loosening of fasteners during normal transportation and operation.

3.2.4 All aluminum to steel attachments shall be made with stainless steel hardware and stainless steel or nylon spacers so as to minimize galvanic corrosion.

3.2.5 Sign Panel Lifting Mechanism

3.2.5.1 Sign panel lifting mechanism shall consist of a 1,000-pound capacity, automatic brake type winch with 1/4-inch wire rope capable of holding the sign panel in any position from full upright to the travel (down) position.

3.2.5.2 Winch shall be zinc-plated to minimize rust and corrosion.

3.2.5.3 Winch shall be designed such that the handle can be removed, for added security, without interfering with the operation of the automatic brake.

3.2.5.4 Sign panel shall be secured in the operating (up) position by two stainless steel, spring-loaded, locking safety pins.

3.2.6 Trailer superstructure shall provide for support and operation of solar array, with solar array positioned to accommodate charging in both the operating and the traveling positions.

3.2.7 Solar array shall fold flat and flush onto back of sign panel when sign panel is in the transport (down) position so as to minimize wind resistance without the need for an air deflector or spoiler.

3.2.8 Trailer superstructure shall be equipped with a formed steel upper rear cross-member and formed steel upper side members to reinforce the sign panel and solar array support frame.

3.2.9 Trailer superstructure shall be equipped with an integral sighting device, welded in place, to accommodate proper alignment of the sign panel with oncoming traffic, during setup.

4. Message Display Panel and Speed Limit Sign

4.1 Dimensions

4.1.1 Message Display Panel:

4.1.1.1 Width Overall - 36 in. (92 cm)

4.1.1.2 Height Overall - 29 in. (74 cm)

4.1.1.3 Depth Overall - 6 in. (15 cm)

4.1.2 Speed Limit Sign:

4.1.1.1 Width Overall - 30 in. (77 cm)

4.1.1.2 Height Overall - 36 in. (92 cm)

4.2 Construction

4.2.1 Message Display Panel Case

4.2.1.1 The message display panel case shall be constructed of heavy duty aluminum extrusion secured at each corner by a molded, fiberglass-reinforced plastic corner and black powered coated stainless steel torx head screws and nylon insert locknuts.

4.2.1.2 The back of the message display panel case shall be constructed of aluminum sheet bonded and riveted to the case frame.

4.2.1.3 Interior of message display panel case shall be equipped with formed aluminum channels to reinforce the display case and to support internal wiring and cables.

4.2.1.4 The display panel case shall be equipped with four breather filter vents, designed to allow the flow of vapor but not fluid, located at the top and bottom of the case frame to provide adequate ventilation to minimize condensation and fogging of the display panel door.

4.2.2 Message Display Panel Door

4.2.2.1 The display panel door shall be constructed of heavy duty extruded aluminum secured at the corners with glass fiber reinforced molded plastic inserts and black powered coated stainless steel torx-head screws and nuts.

4.2.2.2 The door shall fit within a flange around the perimeter of the message display panel case frame to provide for a secure weatherproof enclosure.

4.2.2.3 A rubber seal shall be located inside of the flange on the case frame to provide a water tight, dust tight closure.

4.2.2.4 The message display panel shall be enclosed over the display area by a 3/16-inch thick clear UV resistant, scratch resistant, acrylic coated polycarbonate material with a non-glare outer surface to reduce reflection of ambient light and oncoming vehicle head lamps.

4.2.2.5 The polycarbonate material shall be secured in the door frame with an extruded rubber u-channel to provide a cushioned, weatherproof seal.

4.2.2.6 The message display panel door shall be hinged for ease of servicing. The door hinges shall be of a corrosion-resistant material, for maximum protection from the weather.

4.2.2.7 The display panel door shall be secured in the closed position with adjustable, positive locking, stainless steel draw latches.

4.2.2.8 The message display panel door and case shall be equipped with stainless steel locking hasps capable of accepting standard padlocks to secure the door in the closed position.

4.2.3 Speed Limit Sign

4.2.3.1 The speed limit sign shall be of all aluminum, Type III coated construction with interchangeable numerals. The interchangeable numerals shall consist of 1 through 7 for the first digit of the speed and 0 or 5 for the second digit of the speed. These numerals shall be supplied with the unit and fastened with stainless steel torx-head screws and nuts - tool included.

4.2.4 Surface Preparation and Finishing

4.2.4.1 Message display panel case and door shall be completely cleaned and deburred prior to finishing.

4.2.4.2 A wash primer shall be applied to all prepared metal surfaces prior to applying final finish.

4.2.4.3 A matte black acrylic urethane finish shall be applied to a dry film thickness of 2.5 mils.

4.5 Display Characteristics

4.5.1 The message display area shall be approximately 30 inches in width by 23 inches in height.

4.5.2 The display area shall consist of a continuous (full) matrix of 12 pixels or dots in width by 9 pixels in height.

4.5.3 The pixels or dots shall consist of three (3) LEDs (Light Emitting Diodes) arranged in a close-spaced pattern so as to produce the appearance of a round image or dot at normal viewing distances.

4.5.4 The display shall color shall be amber (592 nanometer wavelength).

4.5.5 The display shall produce a brightness greater than 10,000 candela per square meter at maximum intensity.

4.5.6 The display shall produce a minimum viewing angle of 24 degrees, with consistent intensity and color across the entire display panel.

4.5.7 The message display shall be capable of displaying alphanumeric characters with a nominal character height of 18 inches (46 cm).

4.6 Display Modules

4.6.1 Display modules shall be mounted in the sign panel using captive 1/4-turn wing-head fasteners to permit quick, easy module replacement without the need for any tools.

4.6.2 Display modules shall be mounted on rubber cushions to provide shock absorption during transport and to accommodate thermally-induced expansion and contraction of message display panel during operation.

4.6.3 Display module control circuitry shall include a fail-safe device, also known as a watchdog timer, to automatically monitor the performance of the display module and provide a reset / restart command to the on-board microcontroller in the event of any disruption of normal operation.

4.6.4 Display module control circuitry shall be designed to accommodate "hot swapping" - exchange of display modules while sign is operating.

4.6.5 The message display shall consist of an array of identical display modules capable of functioning in any position without the need for switch or jumper setup or special programming.

4.6.6 Display modules and message display panel shall accommodate complete service and exchange of display modules without the need for any tools.

4.6.7 Display modules shall be equipped with locking-type electrical / electronic connectors to provide secure, reliable operation while permitting quick, easy service and repair of message display.

4.7 Cables and Wiring

4.7.1 All message display panel wiring and cables shall be equipped with modular power and signal connectors to permit repairs without the need for any tools.

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

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

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

4.7.5 All power and sign panel signal wiring and cables shall be installed in nonmetallic, flexible, liquid-tight conduits. All conduit 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 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 completely sealed to accommodate operation in all types of weather.

5.1.3 Control console shall be mounted on heavy duty slides which allow the control console to slide up and pivot into a position convenient to the operator. Slide mechanism shall permit quick, easy removal of control console without the need for any tools.

5.1.4 Control console 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 Control console front panel shall include a backlit full color LCD (Liquid Crystal Display) with integrated industrial type touch-screen to provide a reliable, user-friendly interface for the operator under any weather conditions.

5.2 General Operation

5.2.1 Control console shall provide for the complete control of the radar speed display, including remote control and radar speed monitoring, without the need for additional external computers or hand-held control devices.

5.2.2 Control console shall include all necessary software to operate the radar speed display, including remote control and radar speed monitoring. Complete control shall consist of specifying upper and lower speed thresholds for Over-Speed, Excessive-Speed and Extreme-Speed conditions along with setting specific parameters associated with each conditional display.

5.2.3 Control console, in conjunction with the radar speed display panel, shall have the capability of monitoring and detecting display panel communication loop failures. In the event of a display panel communication loop failure, the control console, in the case of soft errors (temporary disruption of speed display), shall have the ability to correct the failure immediately and in the case of hard errors (hardware failure), shall have the ability to completely blank the display panel so as to prevent the display of incorrect, potentially misleading data.

5.2.4 Control console embedded CPU shall incorporate a soft-core micro-processor design to insure future hardware and software compatibility and upgradeability.

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

5.2.6 Control console operating firmware and software shall be field upgradeable with a standard USB flash-drive.

5.2.7 Control console shall be 100% interchangeable with any SolarTech Silent Messenger Dynamic Message Sign control console and therefore shall include all software necessary for use with a Silent Messenger Dynamic Message Sign.

5.2.8 Full color LCD display shall be equipped with backlighting to accommodate low ambient light level and night time operation. Backlighting shall activate upon any touch-screen activity and remain on for five minutes following the last touch-screen activity.

5.2.9 Main power to the sign panel and the control console shall be controlled by a combination switch and circuit breaker in order to provide electrical protection without the need for fuses.

5.3 Programming

5.3.1 Control console shall provide a graphical user interface with step by step instructions for the operator.

5.3.2 The following controls shall be provided:

- Upper and Lower Speed Thresholds for Over Speed Display: Provides for static display of detected speed.

- Upper and Lower Speed Thresholds for Excessive Speed Display: Provides for flashing display of detected speed.

- Upper and Lower Speed Thresholds for Extreme Speed Display: Operator selectable: Blank Display, Flashing of Upper Speed Threshold for Excessive Speed Display, or Rapidly Alternate Flashing (pulsating) of LED Display Panels.

5.3.3 Control console shall accommodate a minimum of fifty (50) full alphanumeric passwords for providing secure access to the graphical user interface (GUI) for control and operation and/or supervisory and administrative functions.

5.3.4 Control console shall be capable of collecting and recording basic statistical data (i.e. total number of detections, average speed detected, maximum speed detected, minimum speed detection, mode, etc.) on detected speeds in a histogram format with user selectable intervals (15 minutes minimum to 24 hours maximum) for a minimum of 30 days and provide a downloadable file suitable for manipulation and analysis in Microsoft Excel. Additional hardware or software shall not be required.

5.3.5 Control console shall be capable of monitoring ambient light conditions and making appropriate adjustments to the intensity of the speed panel display to maintain acceptable display contrast throughout changing ambient lighting conditions. The control console shall provide a minimum of ten (10) intensity levels between minimum and maximum display brightness.

5.3.6 Control console shall be equipped with a real time clock and calendar feature to accommodate automatic, unattended operation at predetermined days and times.

5.3.7 Control console shall provide the capability to display battery bank voltage to 0.1 Volt accuracy directly on the control console LCD screen.

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 nominal at Spring or Fall Equinox (i.e. 12 hours of daylight, 12 hours of darkness)

6.1.3 Main Power Switch - Main power switch shall be a combination switch and electromagnetic, thermal circuit breaker to provide complete 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) or four (4)

6.2.2 Battery type - 6-Volt, heavy duty, deep cycle – specify flooded lead-acid or gel-cell type

6.2.3 Energy capacity – Specify - 300 Amp-Hours nominal (2 batteries) or 600 Amp-Hours nominal (4 batteries). Sufficient energy capacity to operate the unit without any energy input from the solar array for 30 days.

6.2.4 Battery / Equipment Compartment

6.2.4.1 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.

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

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

6.2.4.4 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.

6.2.4.5 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.

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

6.2.4.7 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 (monocrystalline) silicon

6.3.2 Number of solar cells per module - 36

6.3.3 Solar array power output – 50 Watts (both) or 75 Watts (RST-2000 only) peak

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 radar speed display, 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 message sign 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 power and control wiring and cables shall be in nonmetallic, flexible, liquid tight conduits.

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

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

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

6.4.5 Main power wiring shall be 10 AWG minimum.

6.4.6 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.

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

6.4.8 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 facilitate 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.

6.5.4 Energy management system control unit shall regulate energy flow from the solar array into the battery bank based on ambient temperature so as 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 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. In addition, the 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, including reverse polarity indicator lamps, for the solar array and the battery bank.

6.5.10 Energy management system control unit shall provide for automatic fault protection without the need for fuses. The use of fuses for fault protection shall not be permitted.

7. Documentation

7.1 Operation and Maintenance Manual

- 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 Control Center 3000 for Windows - Users Manual

- 7.2.1 Installation and Setup
- 7.2.2 Control Center Operation
- 7.2.3 Appendix

7.3 User Guide

- 7.3.1 Weatherproof card attached to unit with nylon-coated stainless steel lanyard.
- 7.3.2 Pre-transport checklist.
- 7.3.3 Job site setup checklist.
- 7.3.4 Basic programming instructions.
- 7.3.5 Basic system status evaluation.
- 7.4.6 Threshold recommendations.

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.

8.2 Preventive Maintenance

8.2.1 Check and lubricate axle hubs once per year.

9. Warranty

9.1 Standard Warranty

9.1.1 Bumper to Bumper - Full warranty, parts and labor - One year

9.1.2 Electrical and Electronic Components, Control Console - Two years

9.1.3 Display Modules

9.1.3.1 Standard - Three years

9.1.3.2 Mega-Flux - Five years

9.1.4 Solar Panels - Ten years

9.2 Extended Warranty - Consult factory

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

10.1.3 Available models with typical recharge times.

10.1.3.1 30-Amp - 16 hours (4 batteries), 8 hours (2 batteries)
45-Amp - 12 hours (4 batteries), 6 hours (2 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 radar speed display functions. The remote control option shall provide for setting of:

- Upper and Lower Speed Thresholds for *Over Speed Display*: Provides for static display of detected speed.
- Upper and Lower Speed Thresholds for *Excessive Speed Display*: Provides for flashing display of detected speed.
- Upper and Lower Speed Thresholds for *Extreme Speed Display*: Operator selectable display: Blank Display, Flashing of Upper Speed Threshold for Excessive Speed Display, or Rapidly Flashing/ Alternating of LED Display Panels.

10.2.1.2 Data rate - 10/100 Base-T Ethernet

10.2.1.3 Communication Protocol - Proprietary with complete CRC error detection and correction.

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

10.2.1.5 All operating software for message sign control console and host computer shall be included with basic message sign package.

10.2.1.6 Remote control system shall install in the field with minimum effort.

10.2.2 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 Control Center 3000). Remote control software (Control Center 3000) shall be provided free of charge 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 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 Radar Speed Monitor

10.3.1 General

10.3.1.1 Operating Frequency - 24.15 GHz (K-Band)

10.3.1.2 Antenna Beamwidth - 12° (Circular Pattern)

10.3.1.3 Capture Angle - 16.5° typical (Circular Pattern)

10.3.1.4 Target Speed Range - 5 to 125 MPH (20 to 200 km/h)

10.3.1.5 Target Speed Accuracy - 1 MPH typical

10.3.1.6 Detection Distance – 1,500 Feet (Automobile-size target)

10.3.1.7 Radar unit shall be easily removable in the field with minimum effort for serviceability.