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Procurement

Budgeting

Accounts Receivable

Accounts Payable

Solicitation Response(SR) Dept: 0803 ID: ESR07191600000000240 Ver.: 1 Function: New Phase: Final Modified by batch , 08/03/2016

Header

List View

General Information

Contact

Default Values

Discount

Document Information

Procurement Folder: 227911

Procurement Type: Central Master Agreement

Vendor ID:

Legal Name: Thunderbolt Veracity LLC

Alias/DBA: JACK EDWARD SHAFFER

Total Bid: \$41,000.00

Response Date:

Response Time:

SO Doc Code: CRFQ

SO Dept: 0803

SO Doc ID: DOT1600000108

Published Date: 7/25/16

Close Date: 8/3/16

Close Time: 13:30

Status: Closed

Solicitation Description:

Addendum 1 SOLAR POWERED
ARROW BOARD

Total of Header Attachments: 0

Total of All Attachments: 0



Purchasing Division
2019 Washington Street East
Post Office Box 50130
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State of West Virginia
Solicitation Response

Proc Folder : 227911

Solicitation Description : Addendum 1 SOLAR POWERED ARROW BOARD

Proc Type : Central Master Agreement

Date issued	Solicitation Closes	Solicitation No	Version
	2016-08-03 13:30:00	SR 0803 ESR07191600000000240	1

VENDOR
VS0000003892 Thunderbolt Veracity LLC JACK EDWARD SHAFFER

FOR INFORMATION CONTACT THE BUYER Misty DeLong (304) 558-8802 misty.m.delong@wv.gov
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Signature X	FEIN #	DATE
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All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	TRAILER MOUNTED SOLAR POWERED ARROW BOARD	10.00000	EA	\$4,100.000000	\$41,000.00

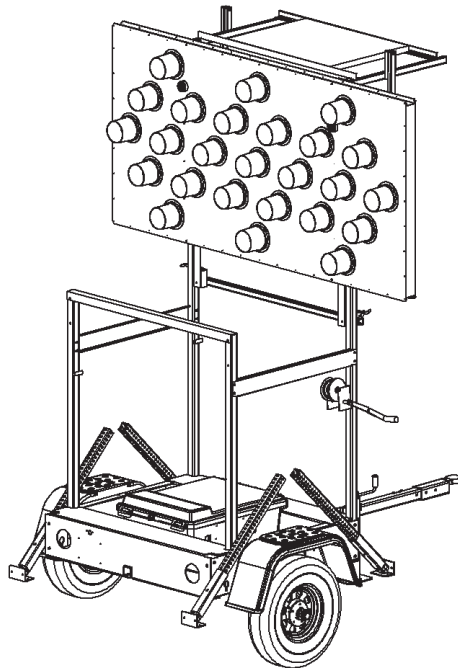
Comm Code	Manufacturer	Specification	Model #
44111501			

Extended Description :	CONTRACT TO PROVIDE CLASS 839 TRAILER MOUNTED SOLAR POWERED ARROW BOARD.
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Silent Sentinel
Solar Powered Advanced Warning

Arrow Panels

Procurement Specifications



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This document presents a detailed specification for a type-C advance warning (flashing) arrow panel. 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.

P/N 500-525-120

Eleventh Edition: 01 January 2012

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1. General

1.1 Product Description

The **SILENT SENTINEL** is a solar powered advance warning (flashing) arrow panel (FAP). The **SILENT SENTINEL** consists of an arrow display panel, a supporting structure for the display panel, a photovoltaic array, a battery power supply 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 high contrast arrow display panel with long-life expectancy, high-reliability LED lamp technology

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

1.3 Performance Objectives

1.3.1 Visibility greater than 1 mile.

1.3.2 Legibility at 1 mile.

1.3.3 Minimal glare from sunlight and headlights.

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 9001:2008 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

2.1.1 Length

2.1.1.1 Overall - 100 in. (254 cm)

2.1.1.2 Without tongue - 53 in. (135 cm)

2.1.2 Width

2.1.2.1 Overall - 96 in. (244 cm)

2.1.2.2 Across fenders - 74 in. (188 cm)

2.1.3 Height

2.1.3.1 Sign in transport position - 92 in. (234 cm)

2.1.3.2 Sign in operating position - 134 in. (340 cm)

2.1.4 Ground Clearance, minimum - 13 1/2 in. (34 cm)

2.1.5 Weight - 1,180 lbs. (535 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 towing speed - 70 MPH (12 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 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 crossmember.

3.1.1.2 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!

3.1.1.3 The 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 to facilitate easy removal of the tongue for repair, transportation, or security purposes. The trailer tongue shall be equipped with a 2,000-pound minimum capacity swivel-type top-wind screw jack with a formed steel footpad.

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.

3.1.2 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 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 (2-inch ball coupler & 2 1/2-inch pintle ring), or an optional adjustable height coupler (2-inch ball coupler and/or 2 1/2-inch pintle ring).

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 1.5 mils.

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

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 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 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.

3.1.7.3 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.

3.1.7.4 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.

3.1.7.5 Jack stands shall be configured such that, when in the operating position, they create a footprint of at least 93 inches, front to rear, and 56 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 Arrow Panel Support

3.2.1 Trailer superstructure shall provide complete support of the arrow panel in the transport (down) position. Cantilevered support of arrow 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 either all metal (stover) or nylon lock stop-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 Arrow Panel Lifting Mechanism

3.2.5.1 Arrow panel lifting mechanism shall consist of a minimum 1,000-pound capacity, automatic brake type winch with 1/4-inch wire rope capable of holding the arrow 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 Arrow panel shall be secured in the operating (up) position by two stainless steel, spring-loaded, locking pins. Locking of the arrow panel in the down position shall not be required; however, available as an field installable option.

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 arrow panel when arrow 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 crossmember and formed steel upper side members to reinforce the arrow 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 arrow panel with oncoming traffic, during setup.

4. Arrow Panel

4.1 Dimensions

4.1.1 Width Overall - 96 in. (244 cm)

4.1.2 Height Overall - 48 in. (122 cm)

4.1.3 Depth Overall - 3 in. (7.6 cm)

4.2 Construction

4.2.1 Arrow panel frame, including internal braces, shall consist of 3 x 1 x 1/8 inch extruded aluminum alloy channel, pulse MIG welded at corners and at internal braces.

4.2.2 Front and rear surfaces shall consist of .063 inch aluminum alloy sheet with a baked matte black enamel finish.

4.2.3 Front and rear panels shall be attached to welded aluminum frame with 8-32 x 3/8-inch, black-finish, stainless steel, torx-head, thread-rolling screws located on 6-inch centers. In order to facilitate simple repair, rivets or any other form of non-removable fastener shall not be permitted.

4.2.4 Arrow panel shall be equipped with 2 1/2-inch diameter by 1-inch thick rubber bumpers to support panel when in the transport (down) position.

4.2.5 Arrow panel shall be equipped with a light sensing device to monitor ambient light and provide information to the control module to regulate the intensity of the arrow panel lamps.

4.3 Lamps

4.3.1 Arrow panel shall be equipped with 15 or 25 lamps, approximately five (5) inches in diameter.

4.3.2 Arrow panel lamps shall consist of an array of at least 21 LEDs mounted in a weather resistant high impact polycarbonate housing.

4.3.3 The arrow panel lamp housing shall be completely sealed to protect the internal components from corrosion caused by harsh environmental conditions.

4.3.4 The outer surface of the lamp shall be convex (diverging) to minimize reflection of incident light and to maximize the contrast of the arrow panel display.

4.3.5 The lamps shall provide an approximate initial maximum beam candlepower of 1000 candela typical, 750 candela minimum, over an operating voltage range of 10.7 to 16.0 VDC. The lamp intensity shall remain constant over the entire operating voltage range.

4.3.6 The lamps shall produce a field spread (angularity) of 30 degrees horizontal by 6 degrees vertical.

4.3.7 The color of the light produced by the lamps shall be amber (approximate wavelength of 592 nanometers).

4.3.8 The lamps shall have a minimum life expectancy of 100,000 hours (200,000 hours typical).

4.3.9 The lamps shall be equipped with quick disconnect terminals to accommodate quick, easy replacement of lamps without regard to polarity. The lamps shall not be polarity sensitive (i.e. capable of connection and operation without concern for polarity).

4.3.10 Arrow panel lamps shall be equipped with a automatic polarity detection circuit to enable operators to connect quick disconnect terminals to lamp without regard to polarity (i.e. either orientation) and ensure proper operation.

4.3.11 Arrow panel lamps shall be secured to the arrow panel by a black, molded, impact-resistant shroud, approximately five (5) inches in diameter and approximately four (4) inches high. Lamp shroud shall mount to panel with stainless steel screws through keyholes such that the shroud and lamp can be removed from the panel without the need to remove the screws from the panel.

4.3.12 Arrow panel lamps shall be keyed to the shroud and the shroud shall be keyed to the front panel so the lamps are secured to the front panel with proper lamp beam orientation.

4.3.13 The rear of the arrow panel shall be equipped with three (3) ultra-bright LEDs, in watertight housings, to indicate the arrow panel pattern currently being displayed. This provides a visual indication to individuals in the work zone that the arrow panel is functioning properly.

4.4 Connectors and Wiring

4.4.1 Arrow panel shall be equipped with a watertight connector AMP CPC Series 2 Receptacle P/N 205843-1 with Peripheral Seal P/N 206403-3, or equivalent, to permit arrow panel to be removed quickly and easily for repair. Arrow panel control cable connector shall be suitable for outdoor use and completely sealed against moisture. Arrow panel control cable connector shall be equipped with gold flashed pins to provide maximum electrical contact reliability.

4.4.2 All internal wiring pass throughs shall be fitted with plastic grommets to prevent wire damage and/or failure.

4.4.3 All internal wiring shall be secured to inside of front panel to prevent wire damage and/or failure.

5. Main Control Module

5.1 Physical

5.1.1 Control module shall consist of a totally solid state fully integrated device which provides for control of the arrow sign panel, lamp pattern generation, battery status monitoring and indication, solar electric charge control, low battery voltage disconnect, high battery voltage disconnect, reverse battery polarity and surge protection.

5.1.2 Control module shall be enclosed in a weather resistant, lockable, molded HDPE (High Density Polyethylene) enclosure secured to the trailer chassis or enclosed in a weather resistant enclosure mounted inside the arrow panel with a lockable aluminum cover to prevent tampering while in service (*specify desired controller location*).

5.1.3 Control module front panel shall be completely sealed to accommodate operation in all types of weather.

5.1.4 Control module shall be constructed of all industrial temperature range components to insure reliable operation under all outdoor environmental conditions.

5.1.5 Control module power and control cables shall be equipped with locking type connectors to provide secure reliable operation while permitting quick, easy removal of the control module for maintenance and repair.

5.2 General Operation

5.2.1 Control module shall be equipped with an array of membrane push buttons to enable an operator to select the desired arrow panel pattern with the push of a single button.

5.2.2 Control module shall be equipped with multicolored LED indicators for monitoring battery voltage (charge) level, solar charger activity and lamp intensity control settings.

5.2.3 Control module shall employ lamp power drivers that provide completely automatic short circuit and over temperature protection. If lamp wire leads are shorted together or to the chassis or if the wrong type of lamp is connected to the lamp wire leads no damage should occur to the lamp power drivers.

5.2.4 Control module shall be completely protected against reverse battery and solar array connections.

5.2.5 Integrated charge control circuit shall provide for dual slope, temperature compensated control so as to maximize transfer of energy into the battery while protecting batteries from overcharging, minimizing outgassing and minimizing loss of electrolyte.

5.2.6 Control module shall be equipped with a lamp intensity control circuit to automatically adjust arrow panel lamp intensity to suit changing ambient lighting conditions and to maintain consistent lamp intensity over a wide operating voltage range. A manual override shall be provided for the automatic intensity control circuit so that minimum or maximum lamp intensity can be manually selected. In the event that the lamp intensity control function is inadvertently left in the High or Low setting, the lamp intensity control circuit shall return to the Auto setting upon the occurrence of the first day/night cycle sensed by the light sensing device in the arrow panel. This feature prevents the use of potentially hazardous lamp intensities, i.e. low intensity during daylight hours and high intensity at night, and unexpected excess energy consumption.

5.2.7 Control module shall provide for the following display patterns:

1. Right Arrow - 10 lamps flashing in unison, forming an arrow.
2. Left Arrow - 10 lamps flashing in unison, forming an arrow.
3. Double Arrow - 5 lamps in each arrow head, 3 in center of shaft, flashing in unison.
4. Caution Bar - 7 lamps in center horizontal bar, flashing in unison.
5. Four-Corner Caution - 4 lamps in outer most corners, flashing in unison.
6. Sequential Right Arrow - 2 lamps in left side of center bar in first phase, plus 3 lamps in middle of center bar in second phase, plus 5 lamps in arrow head in third phase flashing in sequence.
7. Sequential Left Arrow - 2 lamps in right side of center bar in first phase, plus 3 lamps in middle of center bar in second phase, plus 5 lamps in arrow head in third phase flashing in sequence.

25 Lamp Panels only:

8. Right Sequential Chevron - 5 lamps on left side of the panel forming a right-hand arrow head in the first phase, plus 5 lamps in the center forming a second right-hand arrow head in the second phase, plus 5 lamps forming a third right-hand arrow head on the right side of the panel in the third and final phase.
9. Left Sequential Chevron - 5 lamps on the right side of the panel forming a left-hand arrow head in the first phase, plus 5 lamps in the center forming a second left-hand arrowhead in the second phase, plus 5 lamps forming a third left-hand arrow head on the left side of the panel in the third and final phase.
10. Sequential Double Arrow - 1 lamp in the center of the panel in the first phase, plus the two lamps adjacent to the center lamp forming a bar in the center of the panel in the second phase, plus 5 lamps in each arrow head (total 10 lamps) in the third phase.
11. Alternating Double Diamonds - 8 lamps in the center of the panel forming a diamond shape in the first phase, dark in the second phase, 16 lamps forming diamond shapes at each end of the panel in the third phase, and dark in the fourth phase.

5.2.8 Control module power consumption, not including lamps, shall be less than 0.5 Watts so as to optimize overall energy consumption.

5.2.9 Control module operating firmware shall be field upgradeable.

5.2.10 Control module shall be equipped with positive locking connectors to provide for reliable operation and easy removal for maintenance and repair. Battery bank and solar array power connector shall be AMP CPC, or equivalent, with a 20-Amp per contact minimum current rating to insure minimum voltage drop and

maximum energy transfer. Arrow panel control connector shall be AMP D-subminiature 37-pin right angle female header AMP P/N 747847-5, or equivalent, with gold flashed pins for optimum reliability

6. Power System

6.1 General

6.1.1 Operating Voltage - 12 Volts DC nominal

6.1.2 Operating Energy Requirement - Single Flashing Arrow, <6 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 unnecessary. When arrow panel pattern selection switch is in the OFF position, control module shall automatically shut down all unnecessary operations to reduce energy consumption to less than 0.05 Watts. Solar generator charge controller shall operate automatically, as required, during daylight hours and shut down completely at night.

6.2 Battery Bank

6.2.1 Number of batteries - 2 std. - upgradeable to 4

6.2.2 Battery type - 6-Volt, heavy duty, deep cycle (Flooded Lead Acid, Gel-Cell or AGM - Specify)

6.2.3 Energy capacity - 260 Amp-Hours nominal - upgradeable to 520 Amp-Hours. Sufficient energy capacity to operate the arrow panel, displaying a single flashing arrow for more than 30 days, without any energy input from the solar array

6.2.4 Battery / Equipment Compartments

6.2.4.1 Battery / Equipment Compartments 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 Compartments shall be designed to completely contain spills from a failed or damaged battery case.

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

6.2.4.4 Compartments shall be designed such that the lid automatically latches in the closed position and holds the batteries in place. Lid shall be equipped with a locking hasp 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 hinge that permits the lid to be completely removed from the compartment for service.

6.2.4.6 Compartments 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 Compartments shall be capable of housing four (4) BCI Group GC-2 batteries.

6.3 Solar Array

6.3.1 Solar array shall remain horizontal in both the travel (down) and the operating (up) positions. Solar array shall erect automatically when arrow panel is raised to operating position.

6.3.2 Photovoltaic module type - Single crystal (monocrystalline) silicon

6.3.3 Number of solar cells per module - 36

6.3.4 Solar array power output - 40 Watts std. - upgradeable to 80 Watts (peak)

6.3.5 Entire unit shall tilt back and rest on jack stands for fast, easy cleaning and maintenance.

6.3.6 Solar array energy output shall be sufficient to operate the arrow sign, 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 arrow panel continuously.

6.3.7 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 external wire and cable shall be covered with a weatherproof jacket, rated for outdoor use, and secured to trailer frame or superstructure with UV resistant cable ties and anchors.

6.4.2 All wire and cable 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 16AWG minimum.

6.4.6 Battery power and solar array power cables shall be equipped with AMP CPC connectors to mate with the connectors specified in Section 5, Main Control Module.

6.5 Charge Controller

6.5.1 Solar power system shall include a solid state charge controller.

6.5.2 Charge controller shall monitor battery voltage and ambient temperature.

6.5.3 Charge controller shall regulate energy flow from the solar array into the battery bank so as to avoid overcharging of the batteries and minimize the consumption of electrolyte.

7. Documentation

7.1 Operation and Maintenance Manual (Available on CD-ROM and Website)

7.1.1 Installation and Operation

7.1.2 Maintenance

7.1.3 Service, Repair & Troubleshooting

7.1.4 Wiring Diagrams

7.1.5 Parts Lists & Assembly Drawings

7.1.6 Specifications

7.3 User Guide

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 nylon-coated stainless steel lanyard.

8. Maintenance

8.1 Scheduled Maintenance

8.1.1 SolarArray - 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 Battery Bank - Clean and tighten battery electrical terminals.

9. Warranty

9.1 Standard Warranty

9.1.1 Bumper to Bumper - Five (5) full years

9.1.3 LED Lamps - Ten (10) years

9.1.4 Solar Panels - Ten (10) 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 45-Amp - 13 hours

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

10.2 Combination Coupler

10.2.1 Combination coupler shall provide for quick easy selection of a 2-inch ball coupler or a 2 1/2-inch pintle ring.

10.2.2 Combination coupler shall provide for the quick, easy removal of coupler and safety chains for additional security.

10.2.3 Combination coupler shall install on front of tongue, secured with 1/2-inch diameter hitch pins locked into place with locking-type (rue ring) pins for maximum safety and reliability .

10.2.4 Combination coupler shall comply with SAE J684 standards for Class II (2) trailers.

10.3 Adjustable Height Coupler

10.3.1 Adjustable height coupler shall accommodate hitch heights ranging from 18 to 28 inches.

10.3.2 Adjustable height coupler shall accept a 2-inch ball coupler or a 3-inch pintle ring.

10.3.3 Adjustable height coupler shall install on front of trailer tongue, secured with 1/2-inch diameter hitch pins locked into place with locking-type (rue ring) pins or with 1/2-inch diameter , grade 8 bolts and all metal (stover) lock nuts.

10.3.4 Combination coupler shall comply with SAE J684 standards for Class II (2) trailers.



Harness the Power of the Sun

SOLAR TECHNOLOGY, INC
Comprehensive 5-Year Limited Warranty

Welcome to the SOLAR TECHNOLOGY family! Your purchase represents the very finest in traffic control devices. To insure the quality that goes into the design and manufacturing of every new SOLAR TECHNOLOGY product, we offer a Comprehensive Protection Program (CPP) which provides for a five-year limited warranty covering all Silent Messenger changeable message signs (message boards), Silent Sentinel advanced warning arrow panels (arrow boards) and Silent Advisor radar speed trailers (radar speed displays) purchased for U.S. Domestic and Canadian use. Additionally, Solar Technology, Inc. provides a ten-year limited warranty on all LED lamps used in its Silent Sentinel line of advanced warning arrow panels.

LIMITED WARRANTY

SOLAR TECHNOLOGY, INC. (STI) warrants that this product will conform to the manufacturer's standard specifications without defects in materials or workmanship for a period of five years. This is a "bumper to bumper" warranty that covers repair or replacement of all components, on an exchange basis, with the exception of vendor supplied items and consumables, including, but not limited to modems, radar guns, tires, batteries and battery chargers. Other components may be warranted for an extended period of time. Components, sub-assemblies, and devices produced by other manufacturers not covered under this warranty are covered separately and individually under warranties provided by the specified manufacturer.

This warranty is granted to the original end-user of the product and is not assignable to any subsequent purchaser or user. Any leasing or borrowing of these goods or other use beyond normal demonstration of the same shall be deemed to be a use by the original end-user. The period of this warranty shall commence on the date of delivery to the first original end user. Proof of purchase and delivery date may be required when warranty service is requested. The sole remedy under this warranty shall be the repair or replacement of parts which have been determined to be defective after inspection by an approved representative of STI. STI reserves the right to demand the return of parts replaced under this warranty or in disputable fitness and must be consulted for authorization before any such return. All defective parts replaced under this warranty shall become the property of STI. If a claimed defect cannot be identified or reproduced in service, the end-user will be held responsible for the costs incurred.

The cost of shipping of parts to be repaired to STI shall be the responsibility of the user, while the cost of shipping replacement or re-manufactured parts to the user shall be the responsibility of STI. Under no circumstances shall STI be responsible for duties, customs, or import fees associated with repair or replacement of warranted products or parts. Under no circumstances shall STI be responsible for transportation or mileage costs associated with repair or replacement of warranted products or parts. Tampering with the serial number, STI logo and graphics, or posted safety and operating instructions may constitute a breach of and voids this warranty.

This warranty shall not extend to any goods or parts which have been altered, repaired, operated, or maintained outside of approved STI procedures or directives. This warranty does not cover damage resulting from causes beyond the control of STI, including without limitation: misuse, abuse, neglect, or accident; external electrical faults, power surges, or power failure; damage occurring in shipment or from improper transportation, installation, operation or application; or damage resulting from improper usage or use of the product with components, accessories or expansion items not supplied by STI. The end-user is responsible for the selection, use and results obtained from the product. This warranty does not apply to any product which has not been paid for according to the terms under which the product has been invoiced.

This warranty is exclusive and in lieu of all other warranties, express or implied including warranties of merchantability or of fitness for purpose, and there are no other warranties which extend beyond the descriptions on the face hereof. The remedies set forth herein are exclusive and manufacturer shall not be liable for special, indirect or consequential damages. The obligations of STI hereunder shall in no way exceed the cost of the equipment or part upon which such liability is based.

"On the leading edge of quality design and manufacturing - now and always"

Byron Zerphy
President, CEO

Eric Zerphy
VP, COO

Solar Technology, Inc.
7620 Cetronia Road
Allentown, PA
Phone (610) 391-8600
Toll Free (800) 475-5442
www.solartechology.com

Request for Taxpayer Identification Number and Certification

Give Form to the
requester. Do not
send to the IRS.

Print or type
See Specific Instructions on page 2.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.

Jack E Shaffer

2 Business name/disregarded entity name, if different from above

Thunderbolt Veracity LLC/ dba Thunderbolt Electronics

3 Check appropriate box for federal tax classification; check only **one** of the following seven boxes:

- ☒ Individual/sole proprietor or single-member LLC
☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶
Note. For a single-member LLC that is disregarded, do not check LLC; check the appropriate box in the line above for the tax classification of the single-member owner.
☐ Other (see instructions) ▶
- ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any) _____

Exemption from FATCA reporting code (if any) _____

(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.)

469 Horizon Ridge Rd.

6 City, state, and ZIP code

Belington, WV 26250

Requester's name and address (optional)

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the instructions for line 1 and the chart on page 4 for guidelines on whose number to enter.

Social security number

			-			-				
--	--	--	---	--	--	---	--	--	--	--

or

Employer identification number

4	7	-	1	1	0	9	1	2	3
---	---	---	---	---	---	---	---	---	---

Part II Certification

Under penalties of perjury, I certify that:

- The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
- I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
- I am a U.S. citizen or other U.S. person (defined below); and
- The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 3.

Sign
Here

Signature of
U.S. person ▶

Jack E. Shaffer

Date ▶

1/28/2016

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. Information about developments affecting Form W-9 (such as legislation enacted after we release it) is at www.irs.gov/fw9.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following:

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)

- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See *What is backup withholding?* on page 2.

By signing the filled-out form, you:

- Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
- Certify that you are not subject to backup withholding, or
- Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and
- Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting?* on page 2 for further information.

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

MANDATE: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceeds five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (W. Va. Code §61-5-3) that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Thunderbolt Veracity LLC / dba Thunderbolt Electronics

Authorized Signature: Jack E. Stoff Date: 1/14/2016

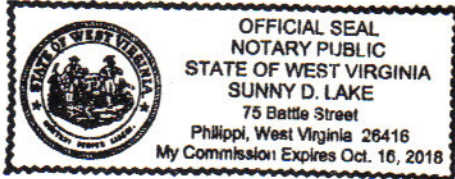
State of West Virginia

County of Barbour, to-wit:

Taken, subscribed, and sworn to before me this 14th day of January, 2016.

My Commission expires Oct. 16, 2018.

AFFIX SEAL HERE



NOTARY PUBLIC

Sunny D Lake

Purchasing Affidavit (Revised 08/01/2015)

VENDOR PREFERENCE CERTIFICATE

Certification and application is hereby made for Preference in accordance with **West Virginia Code**, §5A-3-37. (Does not apply to construction contracts). **West Virginia Code**, §5A-3-37, provides an opportunity for qualifying vendors to request (at the time of bid) preference for their residency status. Such preference is an evaluation method only and will be applied only to the cost bid in accordance with the **West Virginia Code**. This certificate for application is to be used to request such preference. The Purchasing Division will make the determination of the Vendor Preference, if applicable.

1. Application is made for 2.5% vendor preference for the reason checked:

- ____ Bidder is an individual resident vendor and has resided continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or**,
 ____ Bidder is a partnership, association or corporation resident vendor and has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; or 80% of the ownership interest of Bidder is held by another individual, partnership, association or corporation resident vendor who has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or**,
 ____ Bidder is a nonresident vendor which has an affiliate or subsidiary which employs a minimum of one hundred state residents and which has maintained its headquarters or principal place of business within West Virginia continuously for the four (4) years immediately preceding the date of this certification; **or**,

2. Application is made for 2.5% vendor preference for the reason checked:

- ____ Bidder is a resident vendor who certifies that, during the life of the contract, on average at least 75% of the employees working on the project being bid are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or**,

3. Application is made for 2.5% vendor preference for the reason checked:

- ____ Bidder is a nonresident vendor employing a minimum of one hundred state residents or is a nonresident vendor with an affiliate or subsidiary which maintains its headquarters or principal place of business within West Virginia employing a minimum of one hundred state residents who certifies that, during the life of the contract, on average at least 75% of the employees or Bidder's affiliate's or subsidiary's employees are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or**,

4. Application is made for 5% vendor preference for the reason checked:

- ____ Bidder meets either the requirement of both subdivisions (1) and (2) or subdivision (1) and (3) as stated above; **or**,

5. Application is made for 3.5% vendor preference who is a veteran for the reason checked:

- ____ Bidder is an individual resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard and has resided in West Virginia continuously for the four years immediately preceding the date on which the bid is submitted; **or**,

6. Application is made for 3.5% vendor preference who is a veteran for the reason checked:

- ____ Bidder is a resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard, if, for purposes of producing or distributing the commodities or completing the project which is the subject of the vendor's bid and continuously over the entire term of the project, on average at least seventy-five percent of the vendor's employees are residents of West Virginia who have resided in the state continuously for the two immediately preceding years.

7. Application is made for preference as a non-resident small, women- and minority-owned business, in accordance with West Virginia Code §5A-3-59 and West Virginia Code of State Rules.

- ____ Bidder has been or expects to be approved prior to contract award by the Purchasing Division as a certified small, women- and minority-owned business.

Bidder understands if the Secretary of Revenue determines that a Bidder receiving preference has failed to continue to meet the requirements for such preference, the Secretary may order the Director of Purchasing to: (a) reject the bid; or (b) assess a penalty against such Bidder in an amount not to exceed 5% of the bid amount and that such penalty will be paid to the contracting agency or deducted from any unpaid balance on the contract or purchase order.

By submission of this certificate, Bidder agrees to disclose any reasonably requested information to the Purchasing Division and authorizes the Department of Revenue to disclose to the Director of Purchasing appropriate information verifying that Bidder has paid the required business taxes, provided that such information does not contain the amounts of taxes paid nor any other information deemed by the Tax Commissioner to be confidential.

Under penalty of law for false swearing (West Virginia Code, §61-5-3), Bidder hereby certifies that this certificate is true and accurate in all respects; and that if a contract is issued to Bidder and if anything contained within this certificate changes during the term of the contract, Bidder will notify the Purchasing Division in writing immediately.

Bidder: _____

Signed: Jack Shaffer

Date: _____

Title: _____



QUOTE

Thunderbolt Veracity LLC d/b/a Thunderbolt Electronics
469 Horizon Ridge Rd.
Belington, WV 26250
304 444 5614

DATE: JULY 20, 2016
ORDER # 16-2621

EXPIRATION DATE September 20, 2016

TO WVDOH
Department of Transportation
83 Brushy Fork Road Crossing
Buckhannon, WV 26201
304 558 8802
Customer ID 227911 Equipment

SALESPERSON	JOB	SHIPPING METHOD	SHIPPING TERMS	DELIVERY DATE	PAYMENT TERMS	DUE DATE
Jack E Shaffer	ArrowBoards	Truck			Due on receipt	

QTY	ITEM #	DESCRIPTION	UNIT PRICE	DISCOUNT	LINE TOTAL
10	ArrowBoards	SILENT SENTINEL SOLAR POWERED ARROW BOARD 15 Lamp Arrow Panel, 40 Watt Solar Array, 2 Standard Batteries, Battery Charger 45amp 115 VAC 50/60 Hz 2 1/2" Pintle Ring Coupler	\$4100.00		\$41,000.00
		OP-00045 Upgrade AB/MB2/3 LED TailLight	0		
		OP-1125 No STI Decals (Small Trailer) AB Trailer No STI Decals Trailer & Sign No Reflective Tape	0		
		COMMENTS: 3.1.3 POWER SOURCE 3.1.3.6 THE UNIT DOES NOT GO TO FOUR (4) CORNER CAUTION WHEN CHARGING IS REQUIRED.			

			TOTAL DISCOUNT		
				SUBTOTAL	\$41,000.00
				SALES TAX	\$0.0
				TOTAL	\$41,000.00

Quotation prepared by: Jack E Shaffer

This is a quotation on the goods named, subject to the conditions noted below: [Describe any conditions pertaining to these prices and any additional terms of the agreement. You may want to include contingencies that will affect the quotation.]

To accept this quotation, sign here and return:

Thank you for your business!