

Special Specification 4018

Solar Powered Driver Feedback Speed Sign Assembly (Ped Pole Mount)



1. DESCRIPTION

Furnishing and install Solar Powered Driver Feedback Speed Sign Assembly. The Driver Feedback Speed Sign (DFSS) is a dynamic numeric sign that gives motorists real time feedback as to their vehicle's speed via radar speed detection.

2. MATERIALS

2.1. DFSS Display

- 2.1.1. (1) Furnish displays that flash the LEDs, when the detected vehicle speed exceeds the posted speed. The display shall be selectable and capable of displaying "Your Speed" or "Slow Down" in two lines of 4 in. high letters (Min). Furnish yellow numeric displays that utilize replaceable modules, capable of displaying the approaching vehicle speed. The sign back ground shall be black. Numeric speed display characters shall be 10 inches in height. (Min) Supply either a clear or a tinted UV-stabilized acrylic on the DFSS Display non-reflective surface.
- 2.1.2. (2) Provide LEDs that have 1.4 candela luminous intensity and 22 degrees viewing angle. The lighting system will be controlled automatically by a photocell, utilizing pulse width modulation. This system adjusts the lighting intensity, for daytime, nighttime and adverse weather conditions.
- 2.1.3. (3) Furnish (DFSS) signs that have fluorescent yellow reflective pixels and have a viewing angle of at least 160° in daylight. At night, when measured at 1.0° observation in accordance with ASTM E 810, the pixels will have a minimum viewing angle of 30° and a minimum Coefficient of Retroreflection of 8.0 cd/lx/m² at 45° entrance.
- 2.1.4 (4) Provide display pixels that are impregnated with Poly Tetra Fluoroethylene (PTFE). The self-lubricating, PTFE impregnated bearing will have a Mean Time Before Failure (MTBF) of 300 million cycles @ 4 Hz, which equates to 200,000 hours (typical message cycle of 3 seconds, 2 seconds ON; 1 second OFF/CHANGE).

2.2. Solar Generator / Photovoltaic Modules / Power / Battery / Wiring / Housing

The system shall be capable of operating the unit without the aid of recharging from an external power source.

- 2.2.1. **Solar Generator.** The Driver Feedback Speed Sign Assembly shall be sized for 24/7/365 solar operation. Size the system solar generator to provide an array-to-load ratio of 1:1 or greater. Provide a system-average state of charge 90% or greater throughout the entire year. The system-loss of-load probability must remain 0% throughout the entire year.

Provide a system-sizing report detailing the photovoltaic array, battery bank, array-to-load ratio analysis, system availability analysis, battery state-of-charge report, battery depth of discharge, for the County of Texas noted in the plans.

- 2.2.2. **Photovoltaic Modules.** The photovoltaic (PV) module must provide 12V DC and be capable of recharging the system to full capacity in 3 hr. ± 0.5 hr. during optimum sun conditions. Supply industrial-grade,

polycrystalline-type solar modules. Consumer grade modules are not acceptable. Solar modules must have a power output rating of $\pm 5\%$ or better. Ensure PV modules are available to the Department in a graduated product line from 40 to 120 W per module. Each solar module, regardless of wattage, must share common mounting holes for mountings so that a single mounting structure that will accommodate the entire module line. Incorporate a 6-in. square polycrystalline cell and at least 2 bypass diodes installed at the factory into each solar module. Construct PV module with a low-iron tempered glass surface and an industrial grade anodized aluminum frame that completely surrounds and seals the module laminate. Ensure construction is consistent with the demands of installation near humid salt air environments. Provide an ultraviolet resistant, weather proof junction box providing wire termination for up to No. 8 AWG wiring with the PV module.

Design and construct the photovoltaic module mounting assembly of galvanized steel (ASTM A-153 Class A) or aluminum. The mounting assembly must provide a means of securely attaching the PV module frame to a pole ranging from a minimum 2.875 inch outside diameter steel or aluminum pole at a permanent angle of 45 degrees to 50 degrees. Provide stainless steel bolts, lock washers, and hex head nuts with the mounting assembly to secure the PV module to the frame. Provide a mounting assembly capable of 360 degree horizontal orientation with a means of locking the bracket at an angular position about the pole.

The PV wiring harness must not exceed 2% total voltage drop between the PV solar module and the charge control circuit.

- 2.2.3. **Battery.** Provide group-27 gel batteries specified in the system sizing report. Use valve-regulated, gelled-electrolyte batteries rated for a minimum of 2000 cycles with 10% capacity withdraw. Provide 12 V DC batteries. Use lead-calcium for the plate alloy. Use a T881-type terminal element post designed for 1/4-in. bolt termination. Use a polypropylene container or cover. The gelled electrolyte must contain sulfuric acid, fumed silica, pure de-mineralized and de-ionized water, and a phosphoric-acid additive. Provide a spill-proof gel cell battery to allow installation in any position. Size the batteries to allow 12 days autonomy. Depth of Discharge (DOD) for the system must not exceed 80%.

Provide an on-board, solid state charge-control unit to ensure proper charging on the system battery bank. Incorporate a blocking diode for reverse-current protection of the charging circuit. Provide an LED or LCD to indicate solar-panel charging.

Provide a user-adjustable low-voltage disconnect circuit in the controller. This circuit must disconnect the battery bank when the battery voltage reaches a voltage deemed critical by the manufacturer of the batteries. Provide an LED indication for the low-voltage disconnect circuit.

- 2.2.4. **Wiring.** Supply a colored-coded wiring harness. Use connectors to terminate the harness wiring to all components of the assembly. Supply male and female connectors for each harness. Use housing chassis tie-downs on the wiring harnesses and protect with spiral tubing. Provide a total voltage drop no greater than 5% of any branch of the wiring harness.

- 2.2.5. **Housing.** Provide a cast-aluminum housing or aluminum housing with a minimum thickness of 1/8 inch. Size the housing to provide adequate space for the control electronics, radar unit, and the required number of batteries. Install rubber mats in the bottom of the housing. Provide a gasket between the door and housing. Supply a stainless-steel door hinge and a stainless-steel hinge pin. Spot weld the hinge pin at the top of the hinge. Weather proof the housing to prevent the entry of water. Seal un-welded seams with a clear or aluminum colored weather-seal compound.

Provide vent openings in the housing to allow adequate convection cooling of the electronic component and prevention of accumulation of gasses. Design and locate vents to prevent the entry of water. Screen the vents to minimize the infiltration of dust and insects. Screen material must have openings no larger than 0.0125 square inches.

Provide a lock with a metal keyhole cover as an integral part of each door. Provide three (3) keys with each unit. Provide tamper-resistant exposed hardware including screws, bolts, rivets, hubs, etc. Provide two (2) 3/4 inch stainless steel brackets for strap-type mounting to a pole ranging from a minimum 2.875 inch outside diameter steel or aluminum pole.

The housing shall have a back panel inside the housing. Mount wiring and accessory equipment on the back panel. Equip the housing with a barrier terminal block with double (8-32x 5/16 inch) binder head screws terminals or larger.

2.3. DFSS Controller

- 2.3.1. (1) Furnish a radar controller that is FCC compliant K band radar microwave vehicle detector integrated in the sign with a factory preset range of 600 feet. Speed range of at least 5 to 99 miles per hour. 12 degree beam accuracy +/-1 unit of measure. The unit shall be field replaceable. The radar generated speed shall be displayed on the DFSS sign. The radar controller shall be able to be field calibrated. The trigger speed shall be adjustable from the DFSS control.
- 2.3.2. (2) The controller must incorporate automatic luminosity control to suit ambient light conditions. Calibrate the night-dim level to reduce the power of the LED Lamps when the ambient light levels are five (5) foot-candles or less.
- 2.3.3. (3) Furnish controllers that are capable of providing local control of the unit. The local control will be a lockable, vandal resistant. The controller shall provide: on/off toggle control of the sign, and a changeable message that reads: "Your Speed" or "Slow Down" which shall be toggle switchable or keypad adjustable.
- 2.3.4. (4) Supply a solid-state flasher that operates on 12 V DC with no electro-mechanical devices. The solid-state flasher must provide a flash rate in accordance with the Texas MUTCD standards.
- 2.3.5. (5) Covert Mode / Data Logging. The DFSS Controller shall be capable of working in covert mode to obtain speed data while the display remains blank. The DFSS controller shall be equipped with data logging collection. The log shall track the date, time, speed of vehicles and store the data on a standard SD Card that is capable of being opened by Microsoft Excel. Other file formats or Bluetooth communication upon approval of the project engineer.
- 2.3.6. **Shop Drawings.** Shop drawings and product documentation shall be submitted to the project engineer prior to ordering materials and equipment. The project engineer will review the submittal and notify the contractor of the project engineer comments concerning the shop drawings.

3. DOCUMENTATION REQUIREMENTS

Supply two (2) copies of the following documentation with each solar-powered flashing assembly: complete and accurate schematic diagrams, complete parts list, including names of vendors for parts not identified by universal part numbers, full report on system analysis, including all manufacturing supporting documentation, complete user's manual for the system.

4. CONSTRUCTION

Install DFSS unit, flashing beacon assemblies, sign and solar powered panel assembly as shown on the plans, or as directed.

5. MEASUREMENT

This Item will be measured by each complete system which includes but is not limited to all DFSS Control equipment, DFSS flashing display assemblies, and solar powered panel assembly; furnished, installed, make fully operational, and tested in accordance with these specifications.

6. WARRANTY

All equipment must have no less than 95% of the manufacturer's standard warranty remaining on the date that the contractor submits equipment invoices for payment. The Department will not accept any equipment with less than 95% of its warranty remaining.

Provide warranties in accordance with the following table, "Required Warranties":

REQUIRED WARRANTIES

Item	Warranty (Type & Time Period)
Photovoltaic Module	Limited – 10 years
Batteries	Prorated – 5 years
Display Unit	Limited – 5 years
Radar Unit	Limited – 5 years
All other Equipment	Limited – 3 years

7. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Driver Feedback Speed Sign Assembly (solar)" each. This price will be full compensation for furnishing, fabricating, galvanizing, assembling, and erecting the roadside DFSS Control Unit, DFSS Sign Assembly, and solar powered panel assemblies; Pedestal Pole Assemblies and foundations pole per the plans, furnishing and placing anchor bolts, nuts, washers, and templates; controllers; all material testing and equipment; and equipment hardware; operational software package(s); supplies; support; personnel training; shop drawings; documentation; incidental materials, and for all tools and labor.