DVSS-100 Installation Manual and Users Guide

This is the Installation Manual and Users Guide for the SpeedInfo DVSS-100 Doppler Speed Sensor

February 18, 2004

Rev. 2.0

Revision History

ECN/ECO	Rev.	Date	Author	Page	Description
N/A	1.0	12/15/04	MD, RG, JB	All	First Draft
N/A	2.0	1/20/05	RG	All	Format, grammatical, spelling
N/A	2.1	2/18/05	JB	11	Deleted Reference to Canadian certification

Table of Contents

Figures

1. Introduction

This document covers the pole-mounted installation and activation of the SpeedInfo DVSS-100 Doppler speed sensor using standard, factory supplied mounting hardware. These instructions will guide the installer in most cases. However, the sensor is extremely flexible and suited to a broad range of mounting options. The DVSS-100 is installed and operated only by SpeedInfo and/or SpeedInfo trained personnel.

Note: Appropriate structural and encroachment permits may be required prior to installation.

2. Sensor Functional Overview

The SpeedInfo DVSS-100 Doppler Speed Sensor is an autonomous, remotely operated traffic speed sensor. It is battery powered and solar-recharged. It uses Doppler radar technology to measure the speed of vehicles in its field of view, calculates the requested traffic information, and other relevant data, and transmits that data back to the SpeedInfo server using a wireless GPRS communications link.

Figure 1 - Installed Sensor

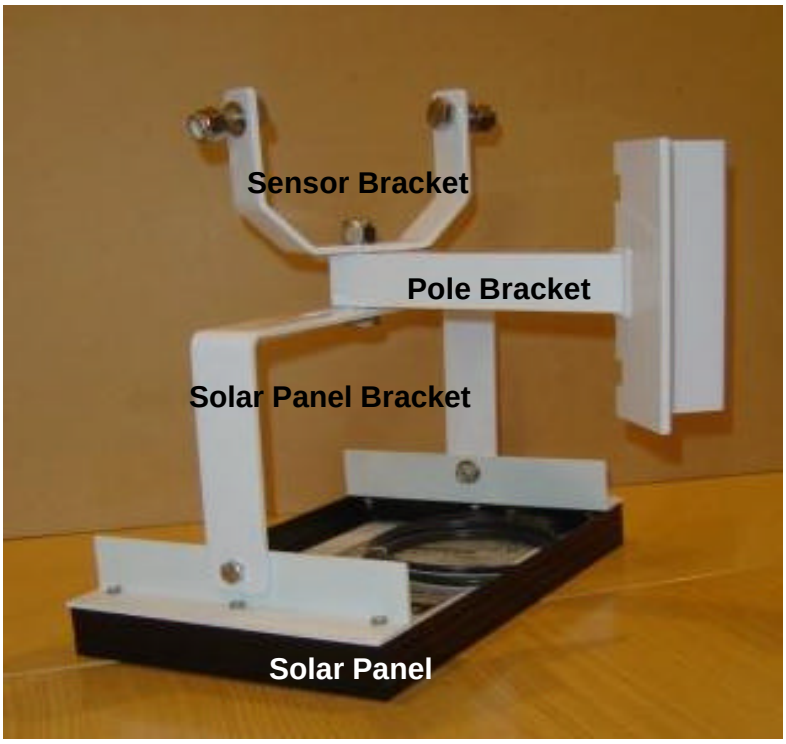
The unit is controlled and operated remotely from the SpeedInfo server using the GPRS data link to send commands and receive data. Placement of the unit is critical to insure accurate targeting of the radar system and accurate positioning of the solar panel. The sensor must be installed by qualified contractors and SpeedInfo-trained personnel.

3. Description

The DVSS-100 is shown in Figure 1 and includes the following components:

1. The DVSS sensor – this is an aluminum cylinder about 4.4 inches in diameter and about 14.4 inches long. It contains a radar element with integrated horn antenna, a 12V sealed lead-acid battery, associated DC-DC power converters, and electronics that perform signal processing, control and communications.
2. Mounting bracket assembly shown in Figure 2 attaches directly to an existing pole and supports the sensor and solar panel.

Figure 2 – Mounting Bracket Sub-assembly



3. Solar Panel – This provides power for charging the internal battery, attaches to the solar panel bracket, and connects electrically to the sensor via a three-pin connector on the backend of the sensor.
4. GPRS antenna – This is a dual mode 850MHz/1900MHz omni-directional antenna for the integrated GPRS radio. The antenna attaches to the sensor via an SMA bulkhead connector on the top of the sensor enclosure. More difficult installations where radio coverage may be limited, the solution may include a directional GPRS antenna with higher gain. Use only antennas supplied by SpeedInfo specifically for use with the DVSS-100.
5. Pole mounting straps – these are steel bands that wrap around the pole and capture the pole bracket.

4. Installation Procedure

The DVSS-100 is to be installed only by professional installation personnel who have been trained by SpeedInfo.

4.1 Introduction

1. The sensor is typically pole-mounted on existing roadside or median infrastructure (e.g. light standard, sign post, CCTV pole).
2. The sensor uses Doppler radar to detect the speed and direction (approaching and receding) of each vehicle within a capture zone.
3. The typical capture zone is an oval-shaped area. The area will be larger if the sensor is pointed only a short distance down the road and will be smaller as range in increased. For example, for a range of 400 feet the capture zone will be about 90' wide and 75' long (six traffic lanes X five car lengths).
4. If required, the capture zone may be adjusted through mounting geometry (height and tilt angle) and lens selection.

4.2 Site Selection

Site selection will normally be determined prior to installation. If not use the guidelines below.

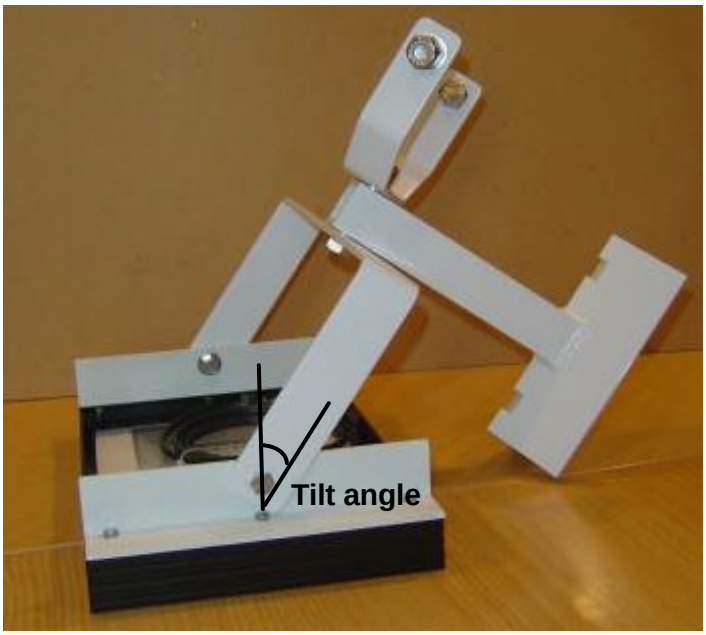
1. Spacing between sensors is typically about one mile on freeways and ½-mile on arterials.
2. Avoid curved road segments.
3. Avoid locations where on/off ramps will be in the capture zone, or where they will affect speed measurements.
4. Confirm GPRS communications coverage prior to install if possible.
5. The pole should be within 100' of the traffic lanes.
6. The pole should be tall enough to support a sensor mounted within the recommended range:
    a. Freeways: 18' to 30'
    b. Arterials: 14' to 20'
7. The sensor must have unobstructed "line-of-sight" to the capture zone.
8. The sensor may be aimed in either direction from the pole
9. The distance between the sensor and the capture zone may range from 200 to 1000 feet, upstream or downstream from the pole location.
10. The solar panel must have unobstructed exposure to the sun for as much of the day as possible. Avoid locations where the solar panel could become shadowed during any part of the day or year. Keep in mind that the sun's east-to-west track through the sky will be directly overhead in the summer, and move southward through the winter months.
11. At the mounting location, the pole diameter should range between:
    c. One pole strap: 3 ¾ in. – 6 in.
    d. Two pole straps: 7 ¼ in. – 14 in.

12. The sensor should never be mounted where it is accessible to the public.

4.3 Sub-Assembly

Prior to ascending pole, complete the following sub-assembly. Refer to Figure 3 below.

Figure 3 - Sensor Sub-assembly showing solar panel tilt angle



1. Attach solar panel to the solar panel bracket.
2. Lay solar panel flat (do not scratch panel surface) and attach pole bracket and sensor bracket with large bolt. (The pole bracket arm is between the sensor bracket and the solar panel bracket.) Tighten bolt to prevent free movement of the assembly but allow for final adjustment and tightening after the assembly is attached to the pole. (see Figure xx)
3. Position solar panel bracket at the proper angle (see Figure 4 below) and tighten small solar panel bolts.

Figure 4 - Solar panel angle table

Latitude	Tilt angle
0 – 15 deg	15 deg
15 – 25 deg	same as lat
25 – 30 deg	lat + 5deg
30 – 35 deg	lat + 10 deg
35 – 40 deg	lat +15 deg
> 40 deg	lat +20 deg
Examples	
Miami	25 degrees
San Diego	42 degrees
San Francisco	52 degrees
DC	54 degrees
New York	65 degrees
Seattle	68 degrees

4. Install medium sensor bolts on the sensor bracket. Position bolt head on the inside of the bracket and washer and nut on the outside of the bracket.

Note: To prevent damage to the GPRS antenna, do not install the antenna until the sensor is mounted on the pole.

4.4 Mounting

1. Prior to ascending the pole, identify the southern exposure (solar panel should face geographic south), and identify the general area of the capture zone.
2. Ascend the pole with the following items:
    a. Sensor
    b. GPRS antenna
    c. Solar panel and bracket subassembly
    d. Pole Clamps (2 or 4 depending on pole diameter)
    e. Hand tools
3. Using the pole clamps, attach the solar panel/bracket sub-assembly to the pole. Rotate and position the sub assembly such that:
    a. The solar panel should be on the south side of the pole and face south, with unobstructed exposure to the sun. Make sure that the shadow of the pole will never pass over the face of the solar panel.
    b. The sensor bracket is positioned so that the sensor can be attached with a direct line-of-sight to the capture zone.

4. Starting at the rear of the sensor, slide sensor side channels over the sensor bolt heads approximately 1/3 the length of the sensor.
5. Rotate and tilt the sensor such that the front end is aimed directly at the center of the capture zone. The grooves on the top of the sensor body can be used as aiming sights.
6. Confirm direction and tilt angles of sensor and solar panel.
7. Tighten all hardware being sure to maintain the correct aim of both the sensor and solar panel while doing so.
8. Install GPRS antenna.
9. Dress the solar panel cable around the bracket to insure that it cannot interfere with the Doppler beam, and that it cannot cast a shadow on the face of the solar panel.
10. Connect solar panel cable to sensor. The connector is "keyed" – align, press and twist. There should be a firm snap when the connector is fully seated.

Once the solar panel cable is connected, the sensor is automatically activated and will automatically sign on to the SpeedInfo server. After signing on it will immediately begin taking Doppler samples and transmitting them to the SpeedInfo server.

4.5 Network Attachment and Aim Verification

1. Contact SpeedInfo Operations to verify:
    a. The unit has signed on successfully.
    b. The Doppler power levels are acceptable.
    c. The returns and speeds match current road conditions.
    d. Solar panel voltage, current and battery voltage are acceptable.
2. Do not leave the install site without clearance from SpeedInfo Operations.

4.6 Record Keeping

Record the following data:

1. Sensor location Lat/long coordinates
2. D.O.T. pole number
3. Street name, highway number, mile marker, cross street as appropriate
4. Sensor position:
    a. Side of roadway, i.e., north, south, east, or west
    b. Distance from fog-line
    c. Sensor attachment height
    d. Sensor aiming direction
    e. Approaching and receding lane direction
5. Capture zone description (location of center of target zone on roadway) including:

a. Sensor distance along center line from the sensor

b. Lane number that is at the center of the target zone

c. Distance from sensor to centerline measured perpendicular to centerline

5. Operation and Maintenance

The DVSS-100 is normally operated and maintained by SpeedInfo. Control of the sensor requires access to the SpeedInfo server installed at a secure, managed, co-location site.

Typical operations activities include, but are not limited too:

1. Collecting regular data transmissions that contain speed, vehicle counts, system status, and diagnostic data.
2. Adjusting measurement and reporting schedules.
3. Downloading new operating code.
4. Its not normally operated by

Maintenance activity is expected to be minimal. Other than repair or replacement of failed components, there is normally no maintenance activity required. The batteries are zero-maintenance sealed lead-acid and will normally require replacement only once every 5-7 years. All other components are expected to last the lifetime of the product and require no on-going maintenance.

6. FCC Notice

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device , pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or locate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC ID: SVL-DVSS100

Changes or modifications not expressly approved by SpeedInfo could void the user's authority to operate the equipment.