1   Using the SVeeEight Plus GPS Receiver

The SVeeEight Plus GPS receiver delivers an unmatched level of performance for your GPS application. This device uses Trimble's 8-channel GPS architecture based on two ASICs, the Colossus RF ASIC and the Scorpion DSP encased in a rugged metal enclosure. The receiver features two full-duplex RS-232 serial ports and is powered by 9-32 volts DC.

The Colossus RF ASIC features:

- Double down-conversion process

- Higher sensitivity

The double down-conversion process improves immunity to in-band jammers. The system provides a higher sensitivity which allows the SVeeEight Plus GPS receiver to track weak satellites and improves position availability in environments with obscured coverage.

The Scorpion DSP ASIC provides the following features in a single package:

- 8-channel DSP with 4 correlators per channel

- 32 bit microprocessor

- Real-time clock

- DUART

The 8-channel, 32-correlator design provides extremely fast cold starts while delivering 2 meter DGPS performance. The high level of integration contributes to fast GPS signal acquisition. The product is very easy to integrate, being a plug and play device.

1.1   SVeeEight Plus GPS Overview

The SVeeEight Plus GPS receiver is a complete 8-channel parallel tracking GPS receiver designed to operate with the L1 frequency, Standard Position Service, Coarse Acquisition code. Using two highly integrated Trimble custom integrated circuits, the receiver is housed in a rugged metal enclosure especially suited for plug and play applications. The SVeeEight Plus GPS receiver features Trimble's latest signal processing code, a high-gain RF section for compatibility with standard 25 dB active gain GPS antennas, and an open collector pulse-per-second (PPS) output for timing applications or as a general purpose synchronization signal.

The SVeeEight Plus GPS receiver acquires a position fix with minimal delay after power cycling. The information necessary to help track satellites is stored in RAM using backup power for the following:

- Almanac

- Ephemeris

- Real-time clock

- Last position

User settings, including port parameters and receiver processing options, can be stored in a non-volatile electrically erasable ROM (EEROM) that does not require backup power.

The SVeeEight Plus GPS receiver has two independently configurable serial I/O communication ports. The dual data I/O port characteristics and other options are user programmable and can be stored in non-volatile memory.

Warning – When customizing port assignments or characteristics, confirm that your changes do not affect the ability to communicate with the receiver, see Chapter 3, Software Interface.

1.1.1   Interface Protocols

The SVeeEight Plus GPS receiver operates using either of three protocols — Trimble Standard Interface Protocol (TSIP), Trimble ASCII Interface Protocol (TAIP), and NMEA 0183. The SVeeEight Plus GPS receiver also supports RTCM SC-104 for DGPS. The factory default settings are listed inTable 1-1 and Table 1-2.

Table 1-1   -61 and -62 Receiver Interface Protocols

Port	Setting
Port 1	NMEA 0183 out/RTCM SC-104 V2.1 in
Port 2	TSIP bi-directional

Table 1-2   -63 Reciever Interface Protocols

Port	Setting
Port 1	RTCM SC-104 V2.1 in
Port 2	TAIP bi-directional

Protocol selection and port assignments are user configurable.

TSIP

TSIP is a powerful binary packet protocol that allows the system designer maximum configuration control over the GPS receiver for optimum performance in any number of applications. TSIP supports over 40 commands and their associated response packets for use in configuring the SVeeEight Plus GPS receiver to meet user requirements.

TAIP

TAIP is a powerful, easy-to-use ASCII protocol developed by Trimble for vehicle tracking. The user can set up polling schemes and mark GPS messages with unique identifiers. The TAIP messages and output rates are user selectable and can be configured to operate on either Port 1 or Port 2.

NMEA 0183

NMEA 0183 is an industry standard protocol common to marine applications. NMEA provides direct compatibility with other NMEA-capable devices such as chart plotters, radars, etc. The SVeeEight Plus GPS receiver supports most NMEA messages for GPS navigation. NMEA messages and output rates can be user selected as required.

DGPS

The SVeeEight Plus GPS receiver can be configured for RTCM SC-104 input which is the GPS industry standard for differential correction data. The receive side of port 1 is factory configured to accept RTCM data.

The components and part numbers are listed in Table 1-3, Table 1-4, and Table 1-5.

Table 1-3   SVeeEight Plus GPS Receiver

Receiver Reference	Part Number
SVeeEight Plus GPS	39902-61; -62; -63

Table 1-4   SVeeEight Plus GPS Receiver Optional Antennas

Antenna Reference	Part Number
Hard Mount GPS Antenna	28367-70
Rooftop Antenna Kit with 75 foot cable	23726-00
Magnetic Mount GPS Antenna with 5 meter cable	28367-00

Table 1-5   SVeeEight Plus GPS Receiver Accessories

Accessories Reference	Part Number
Power Cable	20260
SVeeEight Plus GPS Tool Kit Disk	
System Designer Reference Manual	

Note – Part numbers are subject to change. Confirm part numbers with your Trimble representative when placing your order.

1.2   GPS Receiver

Removing the bottom flange plate from the SVeeEight Plus GPS receiver, allows you to see the SVeeEight board mounted in the enclosure, Figure 1-1. This packaging simplifies using the receiver by providing an RS-232 serial interface that is compatible with most PC communication ports, and by providing a DC power supply that uses a 9 to 32 VDC input. The DB9 connectors provide an easy connection to a PC's serial port using a standard serial cable. The metal enclosure protects the internal GPS board, see Figure 1-2.
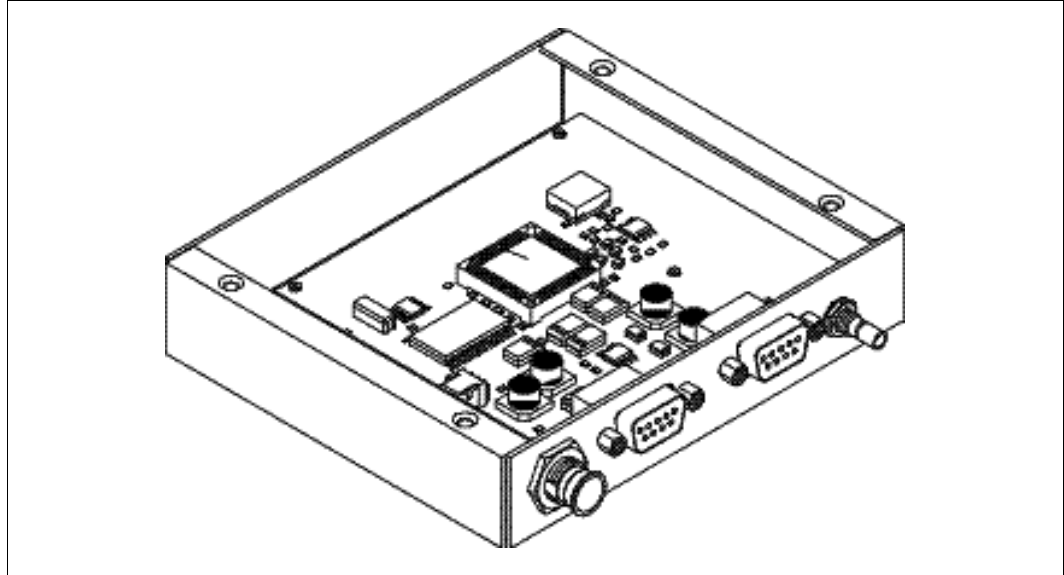
**Figure 1-1   The SVeeEight Plus GPS with Bottom Flange Plate Removed
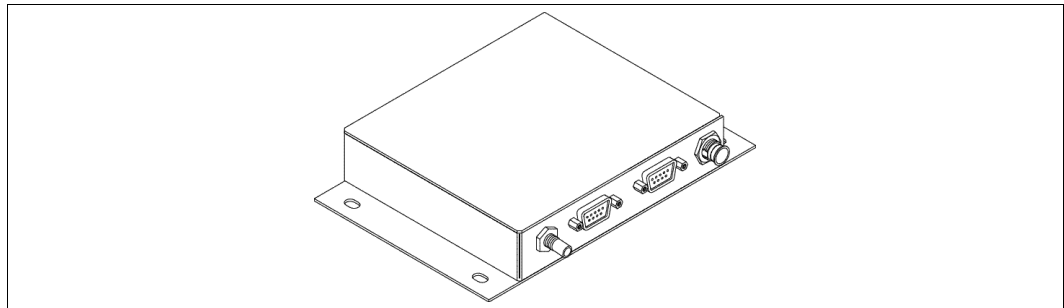Showing the Internal SVeeEight Board**

Figure 1-2   SVeeEight Plus GPS Receiver

1.2.1   SVeeEight Plus GPS Serial Port Interface

The GPS receiver is a DCE (Data Communication Equipment) device. To connect to a host computer, or DTE (Data Terminal Equipment) device, use a straight through cable. To connect a Differential Radio (DCE device) to the receiver (DCE Device) use a cross over cable or null modem cable. See Table 1-6.

Table 1-6   Serial Port Pinouts

Port 1		Port 2	
Pin	Description	Pin	Description
1	NC	1	NC
2	TX	2	TX
3	RX	3	RX
4	NC	4	NC
5	GND	5	GND
6	NC	6	NC
7	NC	7	NC
8	NC	8	NC
9	PPS Out	9	PPS Out

The 1PPS signal is an open collector interface on pin 9 of Ports 1 and 2. The polarity of the PPS signal is an inverted, 10µs negative going pulse with the falling edge synchronized to UTC.To pull up the 1PPS, use a 10K pull up resistor as illustrated in Figure 1-3.
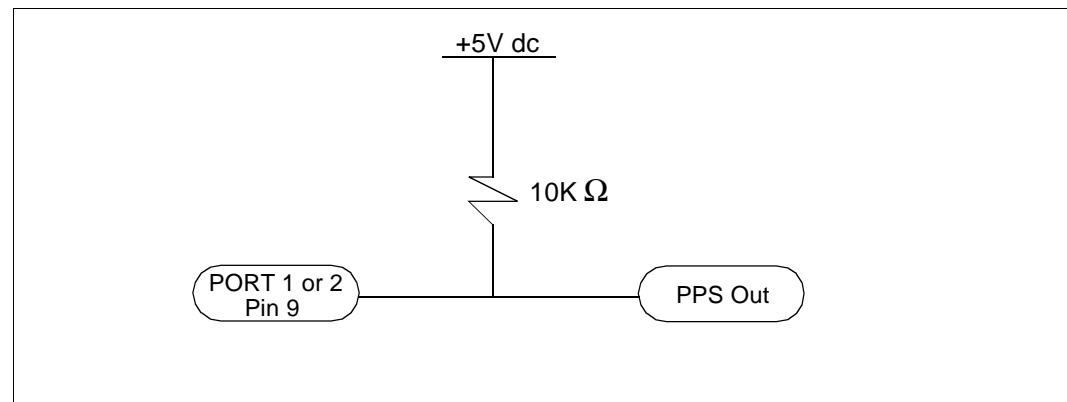
.

Figure 1-3   Open Collector PPS

1.3   Antenna

The GPS antenna receives the GPS satellite signals and passes them to the receiver. Because the GPS signals are spread spectrum signals in the 1575 MHz range and do not penetrate conductive or opaque surfaces, the GPS antenna must be located outdoors with a clear view of the sky. The SVeeEight Plus GPS receiver requires an *active* antenna. The received GPS signals are very low power, approximately -140 dB, at the surface of the earth. Trimble's active antennas include a preamplifier that filters and amplifies the GPS signals before delivery to the receiver.

Trimble offers a variety of antennas for use with the SVeeEight Plus GPS receiver. The compact magnetic mount GPS antenna and integral cable supplied with the Starter Kit is ideal for portable and mobile applications. A permanent, bulkhead mount antenna is also available. A compact, pole-mount rooftop antenna is available for fixed-site installations. See Appendix F, SVeeEight Plus GPS Specifications and Mechanical Drawings, for drawings of the GPS antennas.

Warning – When magnetic-mount or permanent-mount GPS antennas are installed on a metal surface for prolonged periods, care must be taken to insulate the antennas to prevent galvanic corrosion.
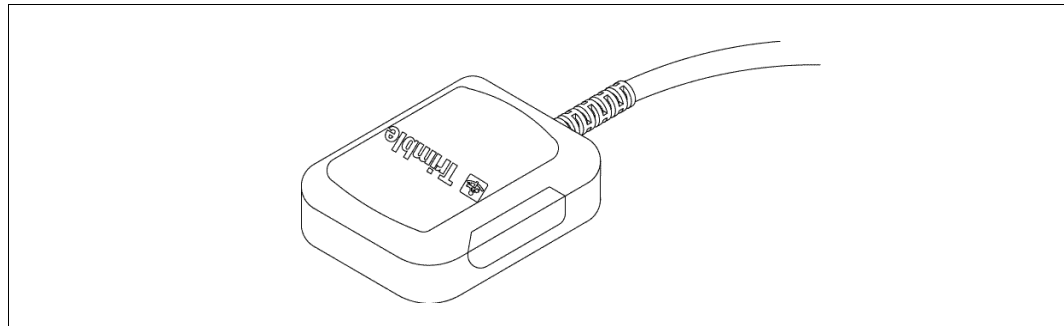

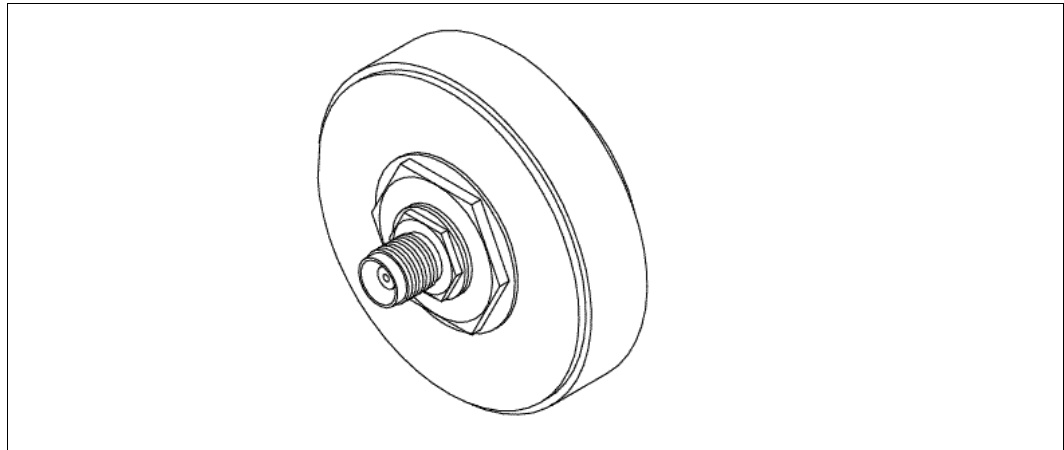**Figure 1-4   Magnetic Mount GPS Antenna**

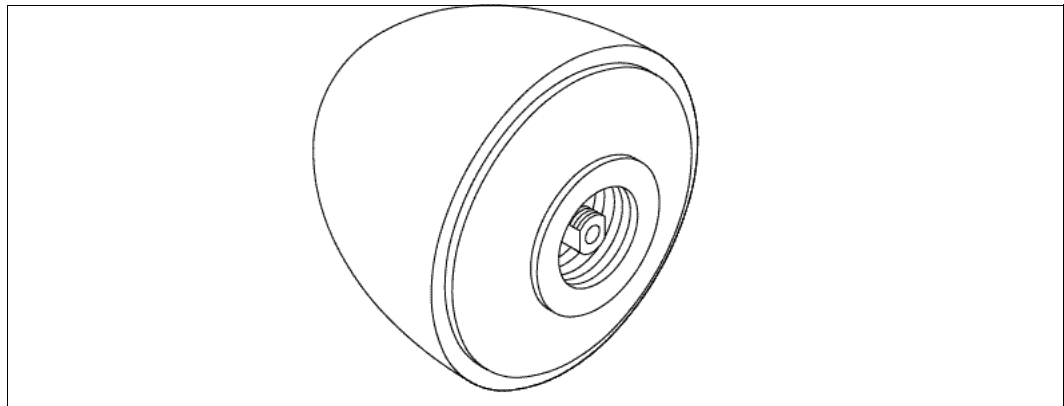**Figure 1-5   Hard Mount GPS Antenna**

Figure 1-6   Bullet II GPS Antenna

1.4   Power

The SVeeEight Plus GPS receiver is designed to be plug-and-play. The receiver requires 9 to 32 VDC. Power can be supplied to the SVeeEight Plus GPS receiver using the DC power cable, see Figure 1-7.
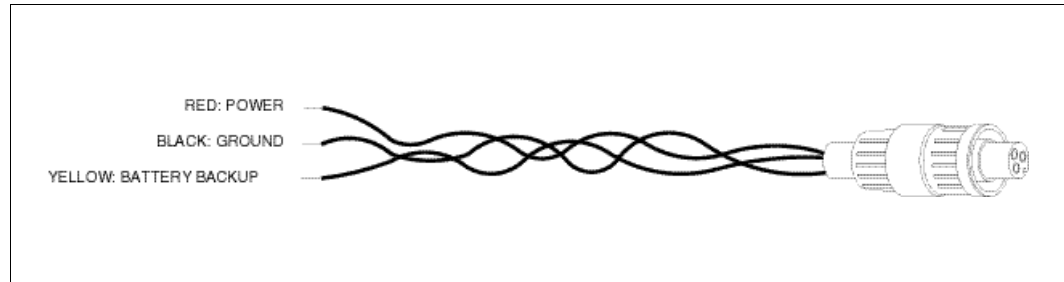

Figure 1-7   DC Power Cable

The power cable is terminated at one end with a 3-pin plastic connector which mates with the power connector on the metal enclosure. The unterminated end of the cable provides connection to a DC power supply. Connect the red power lead to a source of DC positive +9 to +32 VDC, and connect the black power lead to ground. This connection supplies power to both the receiver and the antenna. The combined power consumption of the receiver and the antenna is 80 milli-amps at 12V. The yellow wire can be used for battery backup to keep the RAM memory alive and real-time clock functioning after main power is removed. This circuit requires 3.5 to 12 VDC and draws 2.1 µA at 3.5 VDC at 20°C.

Note – For compliance with CE conducted emissions requirements when using the DC power cable, the receiver must be bonded to a groundplane.

Caution – Do not use batteries above 5 volts for battery backup. Voltages above 5 volts are shunted to ground through a 10 k resistor and a 5-volt zener diode.

1.5   Hardware Setup

The SVeeEight Plus GPS receiver supports TSIP, TAIP, and NMEA protocols. Port 2 is usually used for TSIP or TAIP I/O and Port 1 is used to input RTCM SC-104 corrections and output NMEA messages.

To set up the SVeeEight Plus GPS receiver to the following:

1. For TSIP or TAIP protocols, connect one end of the 9-pin serial interface cable to Port 2 (or Port 1 to view NMEA data) of the receiver. Connect the other end of the cable to COM1 or COM2 on a PC.

    A 9-pin-to-25-pin adapter may be required for the serial interface connection to a PC, if the PC has a 25-pin communication port.

2. Connect the antenna cable to the receiver. Push the antenna cable connector onto the SMB connector on the receiver (to remove the antenna cable, pull the antenna connector off of the SMB connector).

3. Place the antenna so that it has a clear view of the sky.

4. Using the DC power cable, connect to the 3-pin power connector on the receiver. Connect the terminated end of the power cable to the power connector on the receiver. Connect the red lead to DC positive voltage (+9 to +32 VDC) and black power lead to DC ground.

    The yellow wire is used for battery backup.

5. Switch on the DC power source.
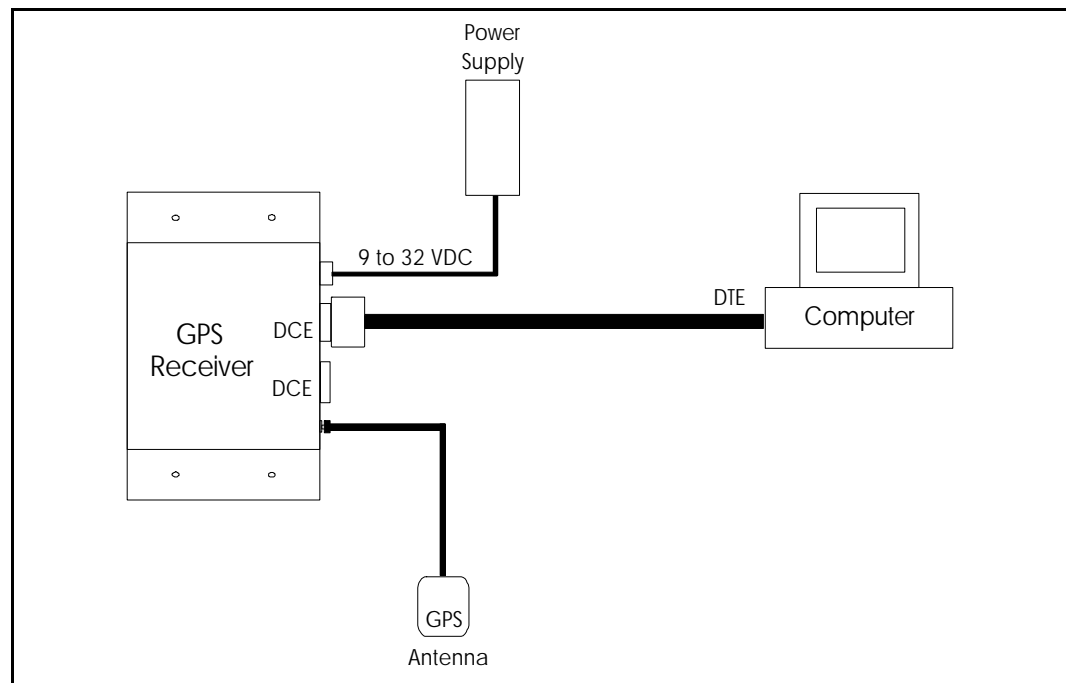
Figure 1-8 illustrates the setup.

Figure 1-8   Interconnect Diagram

Note – For conducted emission, the receiver must be bonded to ground when using the DC power cord.

1.6   Running the TSIPMonitor32 Interface Program

The SVeeEight Plus GPS Tool Kit contains a TSIP interface program which runs on a PC-DOS platform, as well as a Windows 95/NT platform. These programs aid system integrators in monitoring the receiver's performance and in developing the software interface for the GPS receiver. The TSIP programs are described in detail in Appendix B, TSIP Toolkit User's Guide.

To run the TSIP interface program do the following:

1.   Connect one end of the serial interface cable to Port 2 of the SVeeEight Plus GPS receiver. Connect the other end of the cable to the serial port of the PC.

2.   Turn on the DC power source.

3.   Insert the GPS Tool Kit disk into the disk drive.

   Refer to the Readme.txt file for complete instructions.

4.   The TSIPMonitor32 program can be run directly off the diskette or the entire contents of the diskette can be copied onto the computer's hard drive. To run the program off the diskette, type A:TSIPMonitor32.exe.

5.   Once the TSIPMonitor32 screen appears, the lower left hand screen display the TX and RX status. If the receiver is communicating to the host software, a blinking green status appears depending if the receiver is sending a command, or transmitting a report.

6.   Once a GPS antenna is connected to a receiver and the receiver has achieved a position fix, the transmitted position reports are displayed in the position field, as well as time, velocity, satellites tracked, and GPS receiver status. The receiver sends a health report every few seconds, even when no satellites are being tracked.

7.   If the TSIPMonitor32 program displays a question mark (?), the receiver has not reported a status for this field. If the ? never disappears in the data field, then the GPS receiver may not be communicating with the computer. If this occurs, re-check the interface cable connections and verify the serial port selection.

If the communication failure still occurs after checking all connections and settings, please call the Trimble Technical Assistance Center (TAC) for assistance. 1 (800) 481-8000 ext.8527.