

# SmartSensor HD™ SS 125

## User's Manual



**Version 1.0**

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## Product Notifications

### **FCC Part 15 Compliance**



*This equipment complies with Part 15 of the FCC (Federal Communications Commission) rules. Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.*

**Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.**

### **Risk of Electrical Shock**



An authorized electrical technician should perform installation and operation of this unit. Persons other than authorized and approved electrical technicians should NOT attempt to connect this unit to a power supply and/or traffic control cabinet, as there is a serious risk of electrical shock through unsafe handling of the power source. Extreme caution should be used when connecting this unit to an active power supply.

### **Technical Service**



Do not attempt to service or repair this unit. This unit does not contain any components and/or parts serviceable in the field. Any attempt to open this unit, except as expressly written and directed by Wavetronix will void the customer Warranty. Any visible damage to exterior seal labels will void the Warranty. Wavetronix is not liable for any bodily harm or damage caused if unqualified persons attempt service or open the back cover of this unit. Refer all service questions to Wavetronix or an authorized distributor.

### **Installation Safety Precaution**

Caution should be used when installing any sensor on or around active roadways. Serious injury can result when installation is performed using methods that are not in accordance with authorized local safety policy and procedures. Always maintain an appropriate awareness of the traffic conditions



and safety procedures as they relate to specific locations and installations.

## Symbol Legend



The lightning bolt within an equilateral triangle symbol is intended to alert the user to the risk of electric shock.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important installation, operating, and maintenance instructions.



## **Introduction**

The Wavetronix SmartSensor HD traffic sensor utilizes the latest technology to collect and deliver traffic statistics. Capable of measuring traffic volume, average speed, individual vehicle speed, lane occupancy and presence, the SmartSensor HD collects information through the use of a 24.125 GHz (K band) operating radio frequency. Classified as Frequency Modulated Continuous Wave (FMCW) radar, the SmartSensor HD detects and reports traffic conditions simultaneously over as many as ten lanes of traffic. Once SmartSensor HD is installed, the configuration process is quick and easy. After installation, this unit will require little or no on-site maintenance, and can be remotely reconfigured for optimal performance. The following pages detail the easy step-by-step process of getting started with the SmartSensor HD.



## **Unpacking**

A typical sensor packages contains the following items:

- SmartSensor HD SS-125 detector
- Stainless steel mounting plate
- Mounting fasteners
- Sensor mount bracket
- Sensor cable
- User's Manual
- CD and/or diskette with software

If any of these items are missing, note the serial number located on the side of the sensor and contact the Wavetronix support. Additional products may be purchased through your distributor; software and firmware may be obtained through Wavetronix sales.

## Installing the SmartSensor

The installation of the SmartSensor HD is a process that involves five simple steps:

- (1) Assemble the mounting bracket.
- (2) Attach the SmartSensor HD to the mounting bracket.
- (3) Mount the SmartSensor HD to a pole.
- (4) Connect SmartSensor cable.
- (5) Configure the SmartSensor HD.

Each step is described in detail in this section.

### Step 1 – Assemble the Mounting Bracket

Secure stainless steel mounting plate (item 1) to sensor mount bracket (item 2) with enclosed tapered mounting fasteners (item 3) as shown in Figure 1.

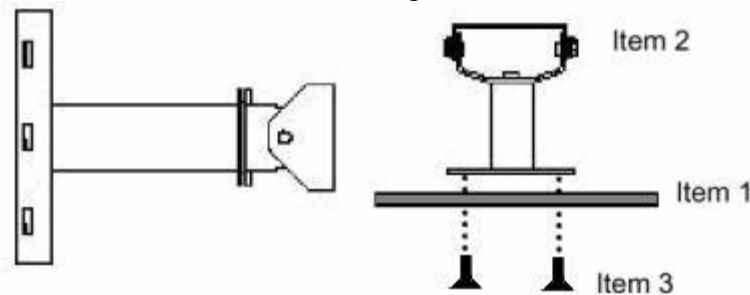


Figure 1 Bracket Assembly

### Step 2 – Attach the SmartSensor HD to the Mounting Bracket

Take assembled sensor mount bracket from step 1 and align stainless steel mounting plate to the threaded holes on the back of the SmartSensor. Using the remaining fasteners, attach the assembled bracket mount to the SmartSensor. (Figure 2) Tighten until firm. **DO NOT OVERTIGHTEN FASTENERS.**

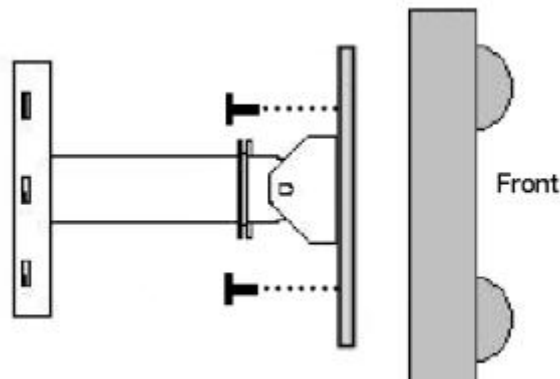


Figure 2 Sensor Attachment



### Step 3 - Mount SmartSensor HD on a Pole

Firmly secure the SmartSensor to a pole or fixed location at a height between 4 and 10 m from the desired monitoring surface. Firmly secure the mounting bracket on a vertical or horizontal pole using the ½ inch band straps included in shipment. The bracket is adjustable and has 70° of tilt adjustability. Aim the front of sensor at the center of the detection area. If the SmartSensor is installed closer than 5 m to the first lane of traffic, point the sensor up (smaller tilt angle) and choose a lower mounting position as shown in table 3.1. Adjust the side-to-side angle to within 2° of perpendicular to the flow of traffic. Connect the power/communication cable to the SmartSensor and attach the modem antenna if applicable. Attention should be given to securing the loose cable to the pole with minimum slack, to avoid undue movement from wind.

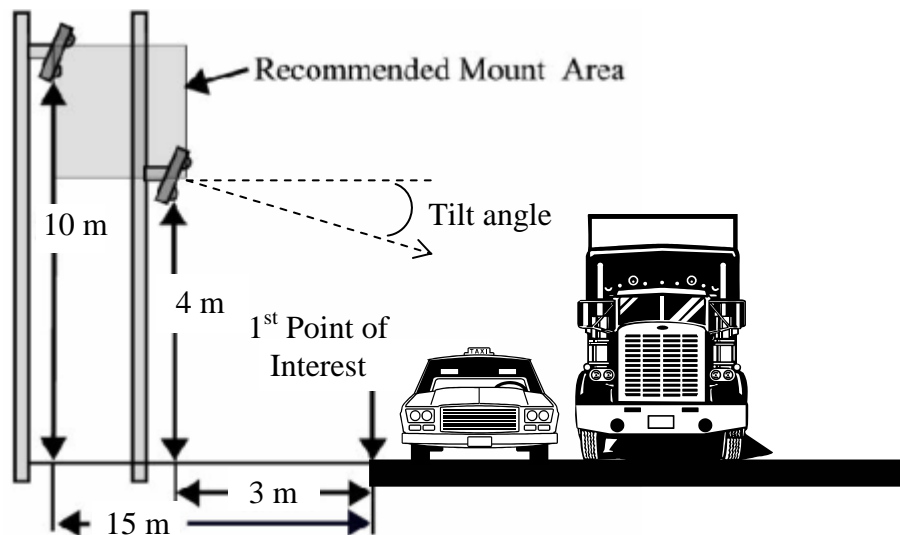


Figure 3 Installation Diagram

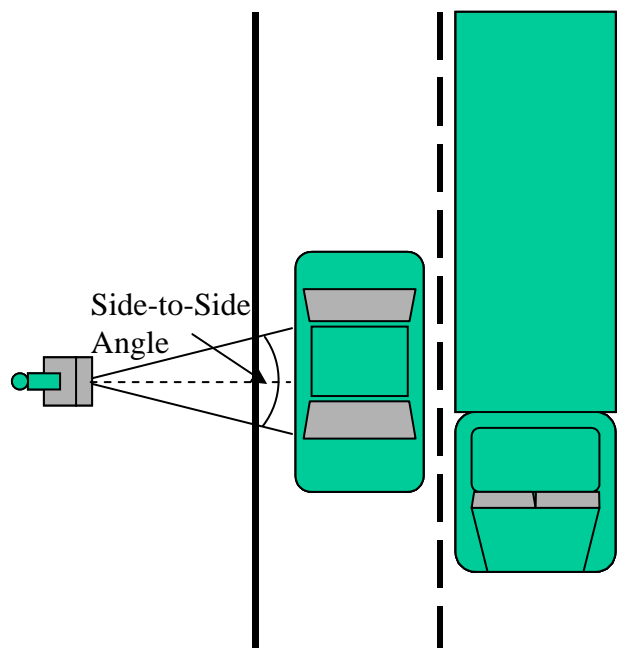


Figure 4

## Step 4 – Connect SmartSensor Cable

The sensor connector as shown in Figure 5 a. is keyed such that it can only fit one way. Attach it to the coupling at the base of the sensor. The cable should be strapped to the pole or run through conduit to reduce the strain on the cable.

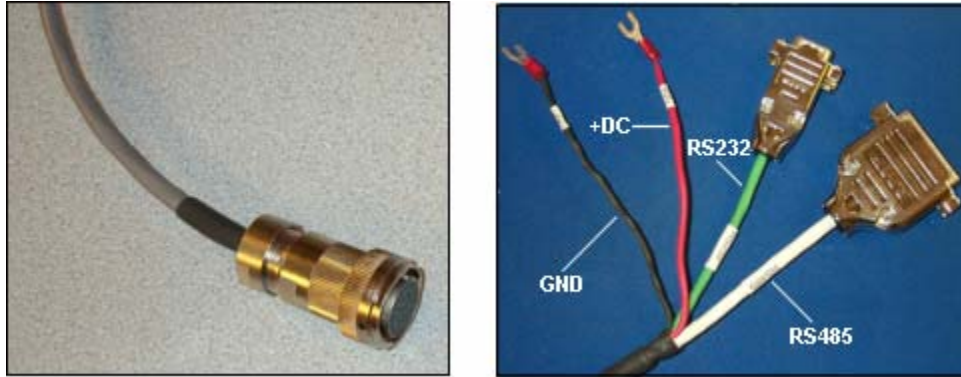


Figure 5

a. Sensor Connector

b. Service End

The service end of the cable (Figure 5 b.) has a +DC and GND for a power supply of 12 to 24 VDC. Up to three communication ports (either RS-232 or RS-485) are available to connect the SmartSensor to a modem or other communication device. Typically one RS-485 port is available plus one or two RS-232 ports. Figure 5 shows 2 communication ports. Refer to the appendix for pin assignments.

## **Step 5 – Configure the SmartSensor HD**

To confirm the configuration of lanes (detection zones) on the SmartSensor HD connect to the SmartSensor HD through a serial, Internet, or modem connection. To do this you must first install the SmartSensor Manager CE on a pocket PC or laptop; second, connect the SmartSensor HD to your pocket PC or laptop; third, use the Lane Configuration utility under Lane Setup in SmartSensor Manager CE to confirm and save the configuration of lanes in the sensor.

### **Step 5.1 - Installing the SmartSensor Manager Software**

SmartSensor Manager CE 1.0 is the software that enables users to configure and interact with the unit. This software is contained on the compact disc that is shipped with each sensor. Before installing SmartSensor Manager CE 1.0 you must install the .Net framework which is included in the setup CD. To install SmartSensor Manager CE, place the CD in the CDR drive and double click the icon labeled Setup.exe listed in the contents of the CD. This executes the setup program that will copy all the necessary files to the hard drive and create icons for the start menu and desktop on the PC or laptop.

#### **Step 5.1.1 Installing the SeaLink™ Serial Communication Drivers (Optional)**

**(IMPORTANT NOTE:** it is only necessary to install the SeaLink drivers if you are going to use the SeaLink USB/RS-485 adapter (see Figure 6) to connect to the SmartSensor HD)



**Figure 6**

Once the InstallShield setup program has finished installing the SmartSensor HD Manager software it may be necessary to install the SeaLink serial communication drivers so that you can connect to the sensor using the USB/RS-485 serial cable. To do this simply click on the Start icon, choose Programs, SmartSensor HD Manager v1.0, then click on the SeaLink setup.exe icon that was placed there for you when the SmartSensor HD manager Software was installed. This will run another InstallShield wizard, which will guide you through the install process. When this wizard is finished reboot your computer. However, before rebooting, connect the USB to RS-485 serial cable to a USB port on your computer as described below.

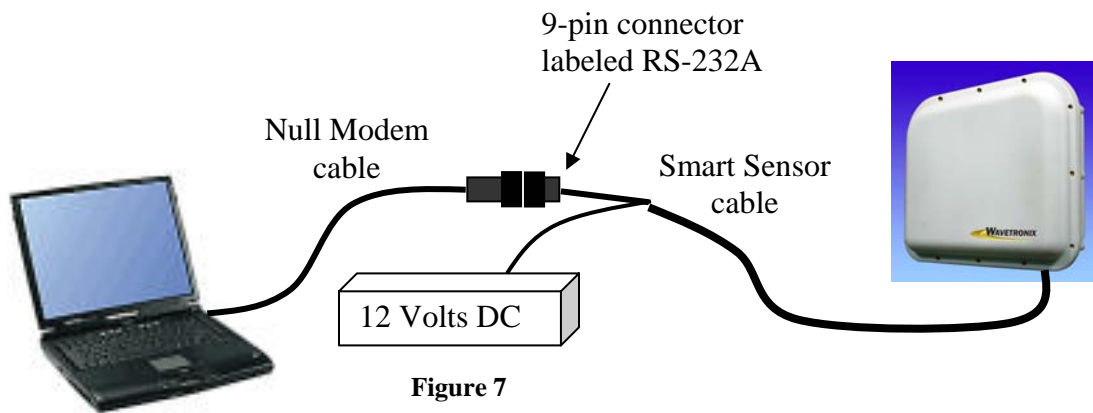
## Step 5.2 - Connecting Your Computer to the SmartSensor HD

There are several ways to connect your computer to the SmartSensor HD as listed below.

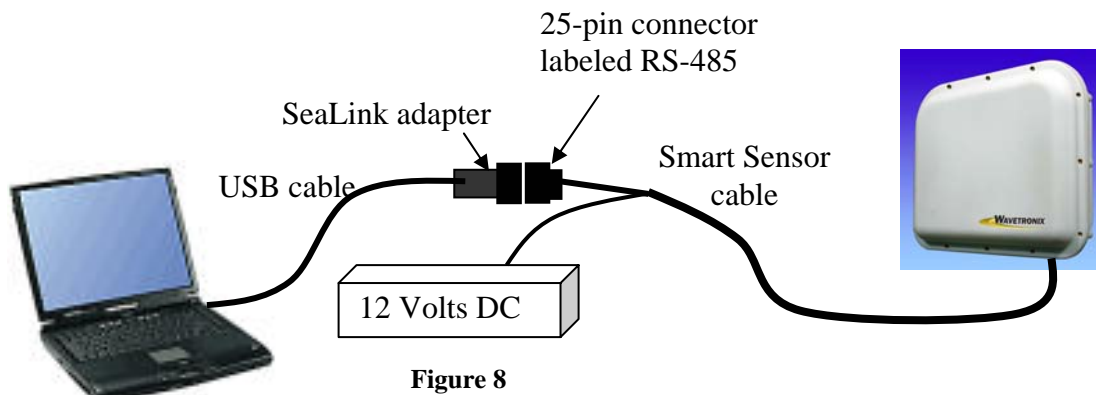
### Step 5.2.1 – Physically Connecting the SmartSensor HD to your Computer

**Serial Cable** – there are two serial options available for connecting to the SmartSensor HD:

1. RS-232 using a 9-pin null modem serial cable connected to the standard RS-232 serial port on your PC. This configuration is shown in Figure 7 below.



2. Universal Serial Bus (USB) to RS-485 using a SeaLink adapter shown in Figure 8, that plugs directly into the 25-pin connector on the Sensor cable.



**Analog Modem** – the SmartSensor HD can be connected directly to an external analog modem through which your PC’s modem can then dial-up to establish a connection. For example, this



could be a regular POTS analog modem or a wireless modem (GSM, etc.) if service is available in your area.

**Internet** – the SmartSensor HD can be connected to the Internet allowing access to the sensor from anywhere with Internet access. There are two ways to connect the Smart Sensor to the Internet:

1. CDMA modem – Code Division Multiple Access (CDMA) is a wireless Internet service available in most metropolitan areas in the United States and coverage continues to expand. The SmartSensor HD can be equipped with an optional external CDMA modem and assigned an Internet address.
2. Ethernet to serial converter – the SmartSensor HD can be connected to a local area network (LAN) by using an Ethernet-to-serial adapter. As an option, the SmartSensor HD can be shipped with a Click! 301 serial to Ethernet adapter that is Internet addressable making it possible to connect to the sensor from anywhere the adapter’s address is accessible.

## Step 5.2.2 - Establishing a Connection Using SmartSensor Manager CE 1.0

Once your computer is physically connected to the SmartSensor HD by one of the methods described above, use SmartSensor Manager CE to visually configure and interact with it. To begin, either click on the icon that was placed on your desktop screen or click the icon found on the start menu. The Homepage screen should appear as shown below:



Figure 9

### Serial Connection

Click on the icon next to “Communication” to bring up the communication screen as shown in Figure 10. Set the connection to Serial and the Port and Baud rate to the appropriate settings. If you do not know the baud rate, set the baud to auto-baud. Set the appropriate Subnet and ID if you know the sensor ID. If you do not know the sensor ID, set it to its maximum value of 65535.

This can easily be done by highlighting the most significant digit (10,000) and scrolling it up past 60,000. Next click connect and you should be connected.

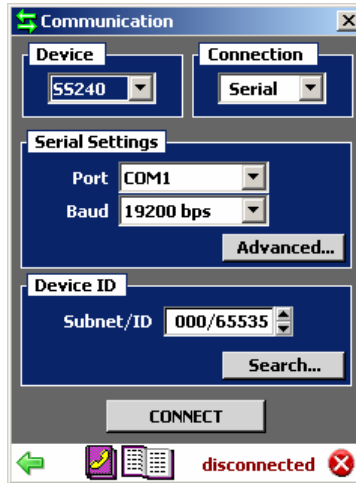


Figure 10

## Internet Connection

If you chose “Internet” under Connection, in the communication dialog window (Figure 10) you must then enter the Internet address (IP address & TCP port number) of the sensor of interest. The first box is used for the IP address, which consists of four numbers ranging from 0-255 separated by dots (‘.’). Enter the IP address assigned to either the CDMA modem or the Click! 301 Ethernet-to-Serial adapter. The second box expects an integer value in the range of 0-65536, which is the port number also assigned to the CDMA modem or the Ethernet-to-Serial adapter.

Once an IP address and port number are input, set the subnet and sensor ID to the correct values or their maximum values (255 and 65535) to search for the correct values. You can then press the Connect button to connect to the sensor.

When the connection is completed, the message “Remote connection established!” is displayed and “Disconnect” and “Continue” buttons appear. Pressing “Continue” takes you to a screen that displays a view of the current sensor configuration. Connection failure can occur for various reasons, if failure occurs repeatedly call Wavetronix for assistance.

## Step 5.2.3 - Using SmartSensor Manager CE's Lane Configuration Utility

After a connection is made to the SmartSensor the home page as shown in Figure 11 appears. To configure lanes click on Lane Setup.



Figure 11

The lane setup options window then appears as shown in Figure 12. To start the lane configuration process the Lane Configuration button.

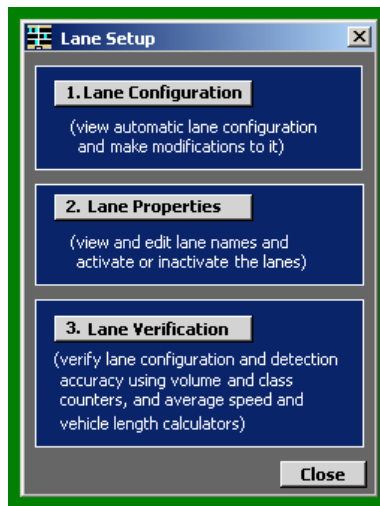


Figure 12

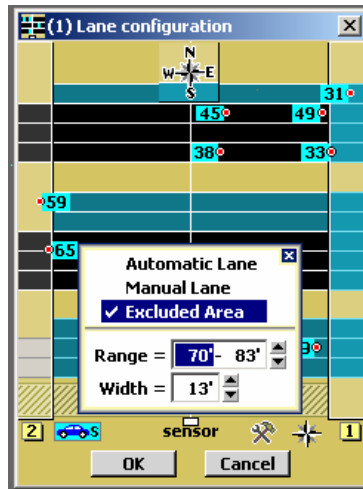


Figure 13

### Automatic Configuration

That completes the normal installation and configuration process. The remainder of this document explains some of the added features of the SmartSensor Manager software and how it allows you to manually configure lanes, monitor and record traffic data and upgrade your SmartSensor HD





## **Additional Features of SmartSensor Manager CE**

The SmartSensor Manager is designed to quickly confirm or adjust the configuration of the SmartSensor, tools to verify the performance of the SmartSensor and upgrade the SmartSensor.

### **Manual Configuration**

The newly activated buttons remain pressed when you click them to enable the drawing function of the button you press. To change the configuration, click the appropriate button and move your cursor over the window showing roads and vehicles. Then make the changes.

Figure 14

### **Saving the Configuration**

### **Undoing Manual Changes**

### **Restarting LaneSmart**

## **Using Data Viewing and Logging Tools**

### **Event Data**

### **Time-Interval Data**

## **Using the SmartSensor Manager Menu**

### **Connection**

### **LaneSmart**

### **TrafficView**



**Data Logs**

**Firmware Upload**

**Appendix**

**SmartSensor Specifications**

Operating Frequency:	24.125 GHz (K-band)
Detection Zones:	Up to 10 traffic lanes simultaneously
Detection Range:	250 ft
Measured Quantities:	Speed, occupancy, volume, presence, classification
Communications:	RS-485 or RS-232 connection
Power:	8 watts @ 9-30 VDC
Weight:	5 lbs.
Physical Dimensions:	27 cm. H x 33.5 cm W x 8.3 cm D
Zone Resolution:	3 m
Ambient Operating Temp:	-40C to +70C
Humidity:	Up to 95% RH
Shock:	10 g 10ms half sine wave
Transmitted Power at 3m:	<100dBuV/m @ 24.125Ghz



## Cable Connector Definitions

### RS-232 Communication Port

The RS-232 Communication Port is configured in a 9-pin “D” male connector with the following pin out:

#### RS-232 Pin Out

---

1: N/C	6. N/C
2: <b>Data from Modem</b>	7. N/C
3: <b>Data to Modem</b>	8. N/C
4: N/C	9. N/C
5: <b>GND</b>	

### RS-485 Communication Port

The RS-485 Communication Port is configured in a 25-pin “D” female connector that with the following pin out:

#### RS-485 Pin Out

---

1: N/C	10: N/C	18: N/C
2: <b>-RS-485</b>	11: N/C	19: N/C
3: <b>-RS-485</b>	12: N/C	20: N/C
4: N/C	13: N/C	21: N/C
5: N/C	14: <b>+RS-485</b>	22: N/C
6: N/C	15: N/C	23: N/C
7: <b>GND</b>	16: <b>+RS-485</b>	24: N/C
8: N/C	17: N/C	25: N/C
9: N/C		