



User Manual

Air & Road (ARC) Sensor

TS-01

Easily view and collect data critical with a wired sensor designed to provide accurate air and road conditions to a remote in-cab display.

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Introduction

The PreCise ARC System, TS-01, is a wired sensor designed to provide accurate air and road conditions information to a remote in-cab display. The TS-01 provides easy data collection and viewing critical to decision making while on the road, including relative humidity, dew point, air temperature, and road temperature.



Features

The TS-01 has the following features:

- Air Temp: $\pm 0.5^{\circ}\text{C}$ ($\pm 1.0^{\circ}\text{F}$) typical
- Relative Humidity: $\pm 4\%$ typical
- Dew Point/Frost Point: $\pm 2.0^{\circ}\text{C}$ ($\pm 4.0^{\circ}\text{F}$) typical
- Road Temp: $\pm 1.0^{\circ}\text{C}$ ($\pm 2.0^{\circ}\text{F}$) typical
- Emissivity: calibrated to 0.95
- Field of View: 10°
- Operating Temp: -40°C to 85°C (-40°F to 185°F)
- Communications:
 - IEEE 802.15.4
 - SAE J-1708
- Range: 10m (33ft) typical
- Power: 6.5V-32V vehicle power

Warnings & Cautions

Read and follow all safety rules and instructions before installing or operating this equipment. Warnings here.

- Never operate a vehicle within a closed area. Always ensure proper ventilation before starting the engine.
- Always use eye protection. Use goggles that are ANSI-approved against impacts and shattering.
- Before wiring, disconnect the negative cable from the battery terminal. Failure to do so may result in electric shock or injury due to electrical shorts. Batteries can generate explosive gases. Keep sparks, flames, and smoking materials away from batteries. Always wear eye protection around batteries.
- Do not damage pipe or wiring when drilling holes. When drilling holes in the chassis for installation, take precautions so as not to contact, damage, or obstruct pipes, fuel lines, tanks, or electrical wiring. Failure to take such precautions may result in fire.
- Do not use bolts or nuts in the brake or steering systems to make ground connections. Bolts or nuts used for the brake or steering systems (or any other safety-related system) or tanks should NEVER be used for installations or ground connections. Using such parts could disable control of the vehicle and cause fire.
- Arrange the wiring so that it is not crimped or pinched by a sharp edge. Route the cables and wiring away from moving parts (like the seat rails) or sharp or pointed edges. This will prevent crimping and damage to the wiring. If wiring passes through a hole in metal, use a rubber grommet to prevent the wire insulation from being cut by the metal edge of the hole.
- When making connections to the vehicle's electrical system, be aware of the factory-installed components (e.g. on-board computer). Do not tap into these leads to provide power for this unit. When connecting the unit to the fuse box, make sure the fuse for the intended circuit has the appropriate amperage. Failure to do so may result in damage to the unit and/or the vehicle.
- Be sure to connect the color-coded leads according to the diagram provided. Incorrect connections may cause the unit to malfunction or damage the vehicle's electrical system.
- To avoid property damage, personal injury, or death, park the vehicle on a flat, level surface, set the parking brake, turn the engine off, and chock the wheels before beginning installation.
- Do not mount the module in a location that could interfere with the proper operation of the vehicle, such as behind the gas or brake pedals.
- Avoid any circuits associated with the airbag system. Inadvertent airbag deployment may cause personal injury or death.

Installation Instructions

Before You Start

Before installing the PreCise TS-01 temperature sensor and display, take time to familiarize yourself with the installation instructions, theory of operation, and system components. Check the contents of the shipping package to verify the following items are included:

Included Items

Item	Quantity	Supply
1	1	PreCise TS-01 Module
2	1	TS-01 Installation and Operation Manual
3	2	#10-32x3/4" socket-head cap screws
4	2	#10-32x1/4" socket-head cap screws

Recommended Tools

Item	Tool
1	5/32" Allen wrench

Mounting Information

Two sets of #10-32 socket-head cap screws are included with the WTS-01: #10-32x3/4" and #10-32x1/4". The #10-32x3/4" screws are suitable for mounting to tubes between 5/8" and 3/4" in diameter. The #10-32x1/4" screws are suitable for mounting to tubes between 15/16" and 1-1/8" in diameter. The screws are driven with a 5/32" Allen wrench.

The sensor needs good clearance from the ground. Do not let any part of the vehicle obstruct the WTS-01's field of view. The closer to the ground the WTS-01 is, the smaller the sample area for road temperature.

The WTS-01 can be mounted at less than 1 foot; however, it is not recommended because the sample size will be small. In addition, if the sensor is mounted this low, snow, ice, salt, and dirt that may be present on the road can be thrown up and cover the distal end of the sensor. The WTS-01 can be mounted as high as 8 feet. Figure 1 shows the clearance from the vehicle versus the height of the sensor above the road surface. Note that the higher the sensor is mounted, the greater distance from the vehicle is needed to ensure the sensor is only measuring road temperatures and not a combination of the road and vehicle temperatures. For every foot of height, the width of the area measured widens by approximately 2.1 inches.

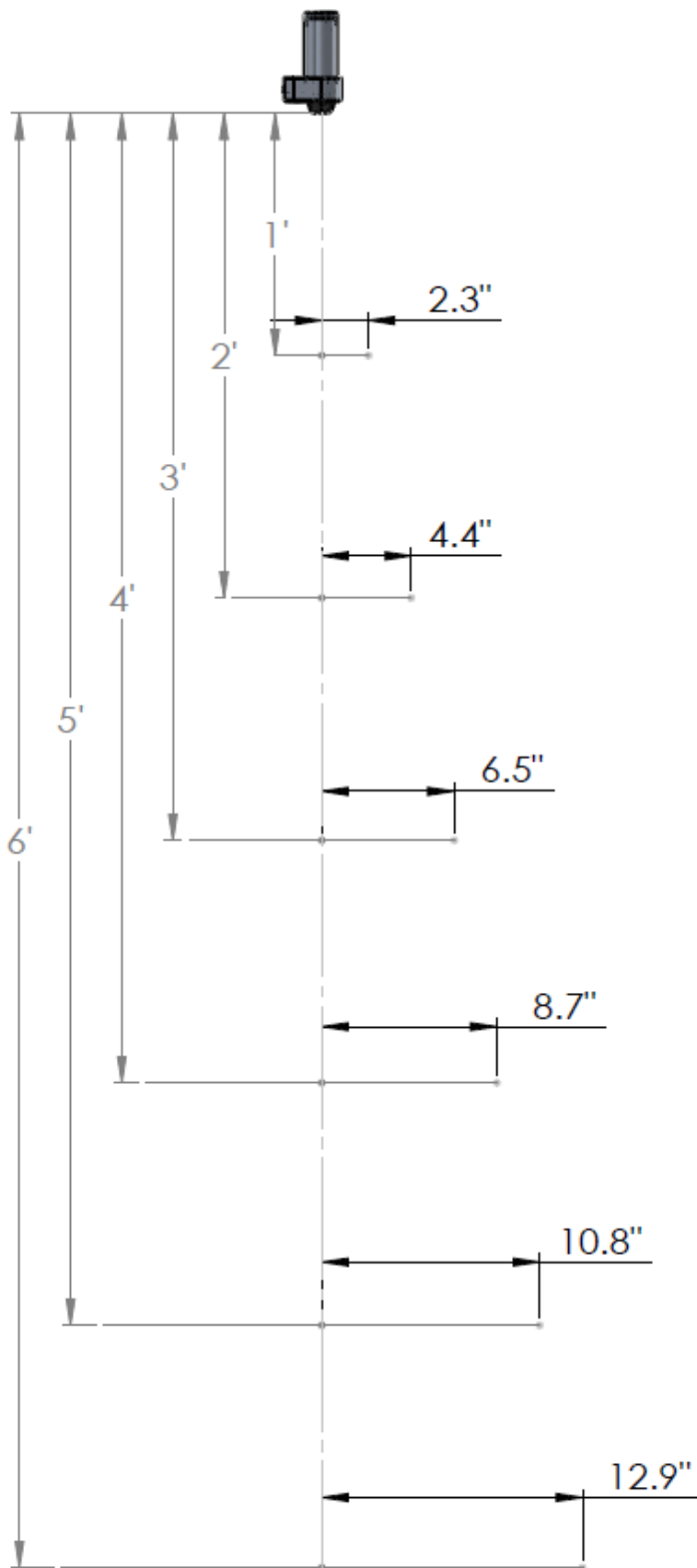


Figure 1: Vehicle Clearance versus Height Above Surface

Electrical Connections

If the TS-01 will be used with the WCM-02 display, connect according to Figure 2.

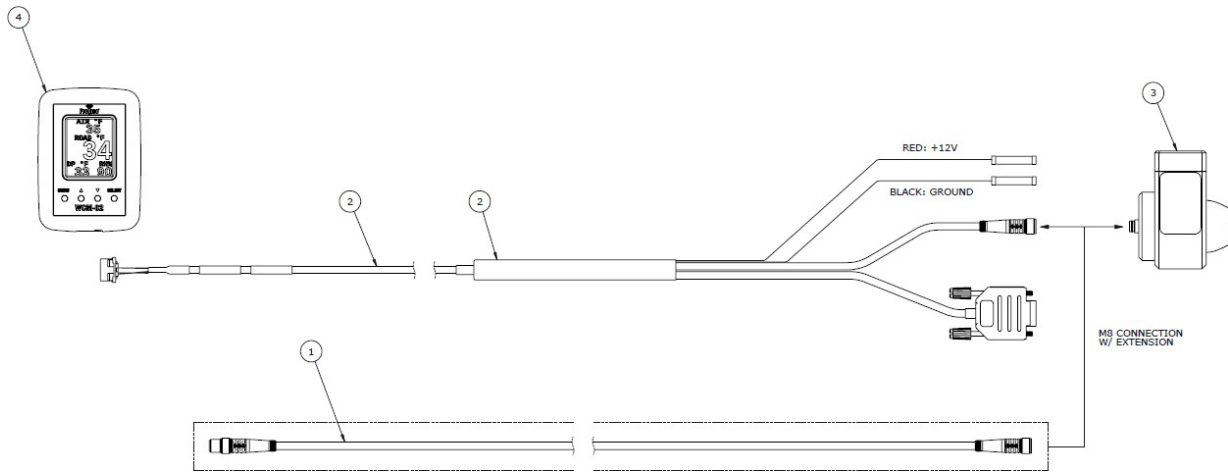


Figure 2: Wiring to WCM-02

To connect to a SSC6100 or similar device designed to interface with a RoadWatch* compatible M8 connection, follow Figure 3.

**RoadWatch is a trademark of Commercial Vehicle Group and is in no way affiliated with PreCise MRM or FORCE America, Inc.*



Figure 3: Wiring to WCM-02

TS-01 Specifications

Sensors

Parameter	Rating	Units
Air Temperature	±0.5	°C (TYP)
	±1.0	°F (TYP)
Air Temperature Response Time (1)	30	Minutes (TYP)
Relative Humidity	±4	% (TYP)
Relative Humidity Response Time (1)	30	Minutes (TYP)
Road Temperature	±1.0	°C (TYP)
	±2.0	°F (TYP)
Road Temperature Response Time	1	Second (TYP)
Emissivity	0.95	
Field of View	10	°

Notes: (1) when vehicle is moving > 5mph

802.15.4 Radio

Parameter	Subparameter	Rating	Units
Range		33	Ft (TYP)
		10	m (TYP)
Radio Type		IEEE 802.15.4	
Frequency Coverage		2.405-2.480	GHz
RF Sensitivity		-94	dBm (TYP)
Maximum RF Input		+5	dBm (TYP)
Transmitter		0	dBm (TYP)
	FCC Part 15 ETSI 300/328	FCC ID: OA3MRF24J40MA IC: 7693A-24J40MA	

Power

Parameter	Subparameter	Rating	Units
Supply Voltage		6.5	Vdc (min)
		32	Vdc (max)
Supply Current	6.5V	20	mA (TYP)
	12V	12	mA (TYP)
	32V	8	mA (TYP)

Physical

Parameter	Rating	Units
Dimensions	2.5 x 2.9 x 2.1	in
	62 x 74 x 54	mm
Weight	0.6	lbs
	0.3	kg

Environmental

Parameter	Rating
Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C
Humidity	0% to 100% RH at +40°C
Ingress Protection	IPX9K – High Pressure Steam
Vibration	MIL-STD 810G (7.7g, 20Hz-2kHz)
Shock	±30g

MANUFACTURER LIMITED WARRANTY AND LIMITATION OF LIABILITY

Manufacturer warrants that on the Date of Purchase, this Product will conform to Manufacturer's published specifications for the product, which are available from Manufacturer on request, and Manufacturer warrants that the product is free from defects in materials and workmanship. This Limited Warranty extends for twelve (12) months from the date of manufacture. Manufacturer will, at its option, repair or replace any product found by Manufacturer to be defective and subject to this Limited Warranty.

This Limited Warranty does not apply to parts or products that are misused; abused; modified; damaged by accident, fire, or other hazard; improperly installed or operated; or not maintained in accordance with the maintenance procedures set forth in Manufacturer's Installation and Operating Instructions.

To obtain warranty service, you must ship the product(s) to the specified Manufacturer location within thirty (30) days from expiration of the warranty period. Contact customer service to obtain an RMA number and write the number on the shipping container. You must prepay shipping charges and use the original shipping container or equivalent. Return shipping charges within the United States, Canada, and Puerto Rico, will be paid by Manufacturer. This Limited Warranty will apply only to a product purchased and located in the United States, Canada, or Puerto Rico.

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Manufacturer shall have no further obligation or liability with respect to the product or its sale, operation and use, and Manufacturer neither assumes nor authorizes the assumption of any other obligation or liability in connection with such product.

This Limited Warranty gives you specific legal rights, and you may also have other legal rights, which vary, from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitation may not apply to you.

Any oral statements or representations about the product, which may have been made by salesmen or Manufacturer representatives, do not constitute warranties. This Limited Warranty may not be amended, modified, or enlarged, except by a written agreement signed by an authorized official of Manufacturer that expressly refers to this Limited Warranty.

Part 15 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.