METEOROLOGICAL INSTRUMENTS

INSTRUCTIONS

COMPACT ASPIRATED RADIATION SHIELD

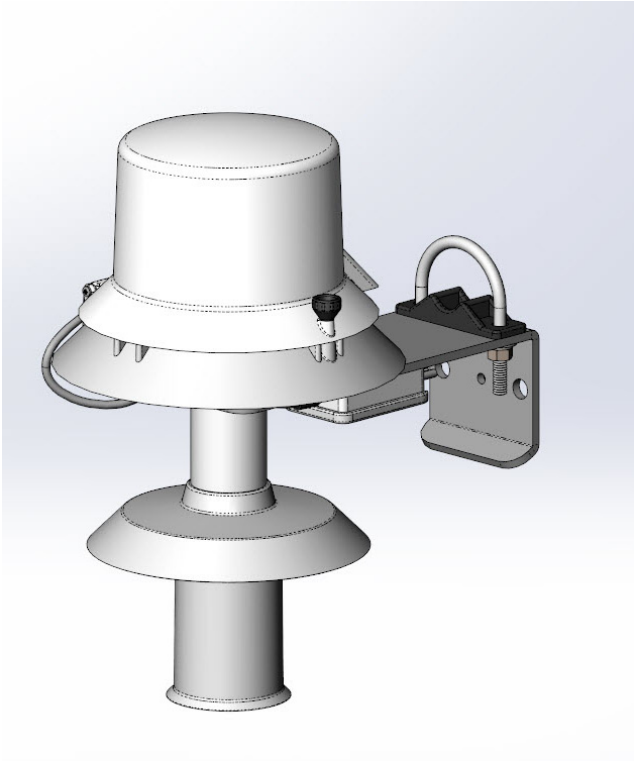
MODEL 43502-5

CE

R.M. YOUNG COMPANY 2801 AERO PARK DRIVE, TRAVERSE CITY, MICHIGAN 49686, USA
TEL: (231) 946-3980 FAX: (231) 946-4772 WEB: www.youngusa.com

PN: 43502-5-90
REV: F082117

MODEL 43502-5
COMPACT ASPIRATED RADIATION SHIELD



SPECIFICATIONS:

Sensor Types:	Accommodates temperature and humidity sensors up to 24mm (0.9 in) diameter
Radiation Error	
Ambient Temp:	<0.2°C (0.4°F) RMS (@1000 W/m² intensity)
Delta T:	<0.05°C (0.1°F) RMS with like shields equally exposed
Aspriation Rate:	5 to 11 m/s (16-36 fps) depending on sensor size
Power Reqmt:	12-13.8 VDC@500 mA for blower
Tachometer Output:	135-150 Hz Nominal (With 41342 Temp Sensor Installed)
Operating Temp Range:	-50° to +60° C. (-58° to +140° F.)

DIMENSIONS

Overall Height:	33 cm (13 in)
Overall Diameter:	20 cm (8 in)
Shield:	7 cm (2.7 in) dia. x 12 cm (4.7 in)
Blower Housing:	17 cm (6.7 in) dia. x 11 cm (4.3 in)
Mounting:	V-Block and U-Bolt for vertical post or tower member 25-50 mm (1.0-2.0 in) dia.

INTRODUCTION

Model 43502-5 Aspirated Radiation Shield provides accurate ambient air temperature measurements in a unique low cost, small size, and conservatively rated instrument. Radiation errors are less than 0.2° C RMS with the shield exposed to solar radiation of 1000 W/m2. The triple wall shield employs three concentric downward facing intake tubes and a canopy shade to isolate the temperature sensor from direct and indirect radiation. The temperature sensor mounts vertically in the center of the intake tubes.

Model 41342 Temperature Probe and Model 41382 RH/Temperature Probe fit directly in a mounting ring within the shield. The convenient Model 41390 Junction Box, which is available separately, will accept other RTD, thermocouple, or thermistor type sensors with sheath diameters up to 10 mm (0.4 in) and 150 mm (6.0 in) in length. Other types of sensors up to 20 mm diameter can also be accommodated in the shield. Longer probes may be used with the optional Model 43476 Extender Tube.

The small shield size reduces the surface area exposed to incoming radiation during the day, significantly reducing the amount of heat that needs to be washed away from the intake tubes. Errors from outgoing radiation at night are similarly reduced. A continuous duty brushless DC blower pulls ambient air into the shield and across the temperature sensor. Flow rate at the sensor is 5 to 11 m/s, depending upon sensor size. Brush-less electronic commutation of the blower motor is achieved using dependable solid-state circuitry. The blower is designed for continuous duty of more than 80,000 hours (9 years) at 25° C (77° F).

The blower housing and shield assembly are made from white UV stable plastic, which provides high reflectivity, low heat conduction, and maximum weatherability. The mounting bracket with a plastic v-block and stainless steel U-bolt will accommodate a vertical or horizontal mounting post of 25 to 50 mm (1 to 2 in) diameter and allows easy height adjustment.

The Model 43502-5 is ideally suited for lapse rate measurements. With identical shields and sensors at 2 m and 10 m levels, the temperature difference (delta T) can be measured with a relative accuracy of 0.05° C RMS under conditions of maximum solar radiation.

EXPOSURE

The ideal shield location is over dry, flat terrain with a grass surface. Avoid locations near large buildings, paved areas, rooftops, tunnels, or other structures, which may exhaust warm air or radiate heat. Give careful consideration to the effects of lakes or ponds which can modify air temperature dramatically, low areas that hold standing water after rains, sheltered hollows, high vegetation, and steep slopes and valleys which are subject to air drainage from remote locations.

As a general rule, locate the shield downwind at a distance at least four times the height of any nearby obstructions and at least 30 m (100 ft) from paved areas.

Mount the shield on a tower or other supporting structure on the side of the prevailing wind or direction of primary interest. This will reduce the chance for errors introduced by air warmed by the supporting structure itself.

For more detailed information about siting refer to the *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV - Meteorological Measurements* (U.S. Environmental Protection Agency, Atmospheric Research and Exposure Assessment Laboratory, Research Triangle Park, NC 27711).

INITIAL CHECKOUT

The mounting bracket attaches to a vertical or horizontal mounting post up to 5 cm (2 in) in diameter. The mounting post should be of sufficient length to allow the shield intake to be adjusted to the desired height above the ground. Tighten the U-bolt sufficiently for a secure hold without distorting the plastic V-block.

See the accompanying section view drawings for reference to names and locations of shield components and position of sensor within the shield. The tip of the sensor should be positioned 60mm (2.4 in) to 90mm (3.5 in) from the shield intake. The blower cover is hinged to allow easy access for sensor installation and cable connections. Loosen the captive screw in the blower cover to open.

The standard Model 43502-5 Aspirated Radiation Shield is supplied with a mounting bushing which fits YOUNG sensors. An additional blank bushing is also supplied which can be drilled to fit sensors up to 20 mm (0.8 in.) Diameter. YOUNG Temperature Probes and Relative Humidity/Temperature Probes are supplied with a junction box and cable bushing. The junction box provides terminals for cable connections and properly positions the sensor within the shield assembly.

Temperature sensors from other suppliers can also be used with the Model 41390 Junction Box, which is available separately. It can be drilled to fit sensor diameters up to 10 mm (0.4 in). For the sensor to be properly positioned when the junction box is placed in the shield, mount the sensor so its tip projects approximately 60 mm (2.4 in.) beyond the end of the junction box. For temperature probes too long to meet this requirement, use the optional Model 43476 Extender Tube to increase the distance between the shield assembly and the blower assembly. When installing the shield assembly in the blower assembly hand tighten only being very careful to avoid cross-threading or over tightening.

CONNECTIONS

With the junction box cover on the bottom of the bracket slid open, remove the black grommet and install it on the power cable. Connect blower power (12-14 VDC unless otherwise noted) to the terminals on the circuit board. Terminal designations positive (POS), negative (NEG), and tachometer (TACH), are marked on the printed circuit board. Blower power is normally provided by the plug-in power supply adapter included. BE SURE TO OBSERVE CORRECT POLARITY. Red is positive, black is negative. The blower motor draws approximately 420mA-480mA. Use sufficiently heavy gauge wire between the power supply adapter and the blower motor terminals to avoid significant voltage drop. Clamp the blower power cable with the cable clamp provided at the edge of the printed circuit card. Install power cable and black grommet in wire slot on junction box. Slide cover over grommet making sure that it is positioned correctly. Tie the power cable to the mounting structure to provide a sufficient strain relief. Transient protection is provided on the printed circuit card and in the blower motor. Refer to following wiring diagram for specifications of the tachometer output.

With the blower cover open, unthread and remove the cover from the sensor junction box. Insert the sensor cable through the packing nut in the side of the junction box. Attach sensor conductors to the appropriate terminals on the circuit card inside and replace the junction box cover. The sensor cable exits the side of the blower housing at the notches provided using the black grommet to provide a seal. Clamp the cable to the lower flange of the housing to keep it in proper position when the cover is closed.

MAINTENANCE

Depending on conditions, the blower should provide trouble-free operation for several years. It is designed for continuous duty life of 80,000 hours at 25 C°. Blower life is somewhat reduced at higher temperature but it will perform satisfactorily at temperatures as high as 70 C°. The blower assembly (43550-5) is easily replaced if necessary and includes DC Blower, mount adapter, circuit board assembly, cable (pre-soldered to PCB), and J-Box. Detailed instructions for the installation is included with the kit.

Inspect and clean the shield at regular intervals to maintain optimum performance. When the shield becomes dirty wash it thoroughly inside and out with mild soap and warm water. If necessary, use alcohol to remove any oil film. Do not use any other type of solvent.

Check the mounting bolt and cable clamps periodically to for possible loosening from vibration.

EMC COMPLIANCE

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.

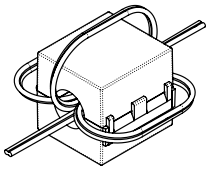
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, 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.

This ISM device complies with Canadian ICES-001.

Cet appareil ISM est conforme à la norme NMB-001 du Canada.
EN55011/CISPR 11, Group 1, Class B device.

Class B equipment is suitable for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

To meet EMC Compliance, a YOUNG 18500 ferrite choke must be installed on the DC power cable. The cable must pass through the center hole of the choke at least 4 times, creating 3 loops around the outside as shown below.



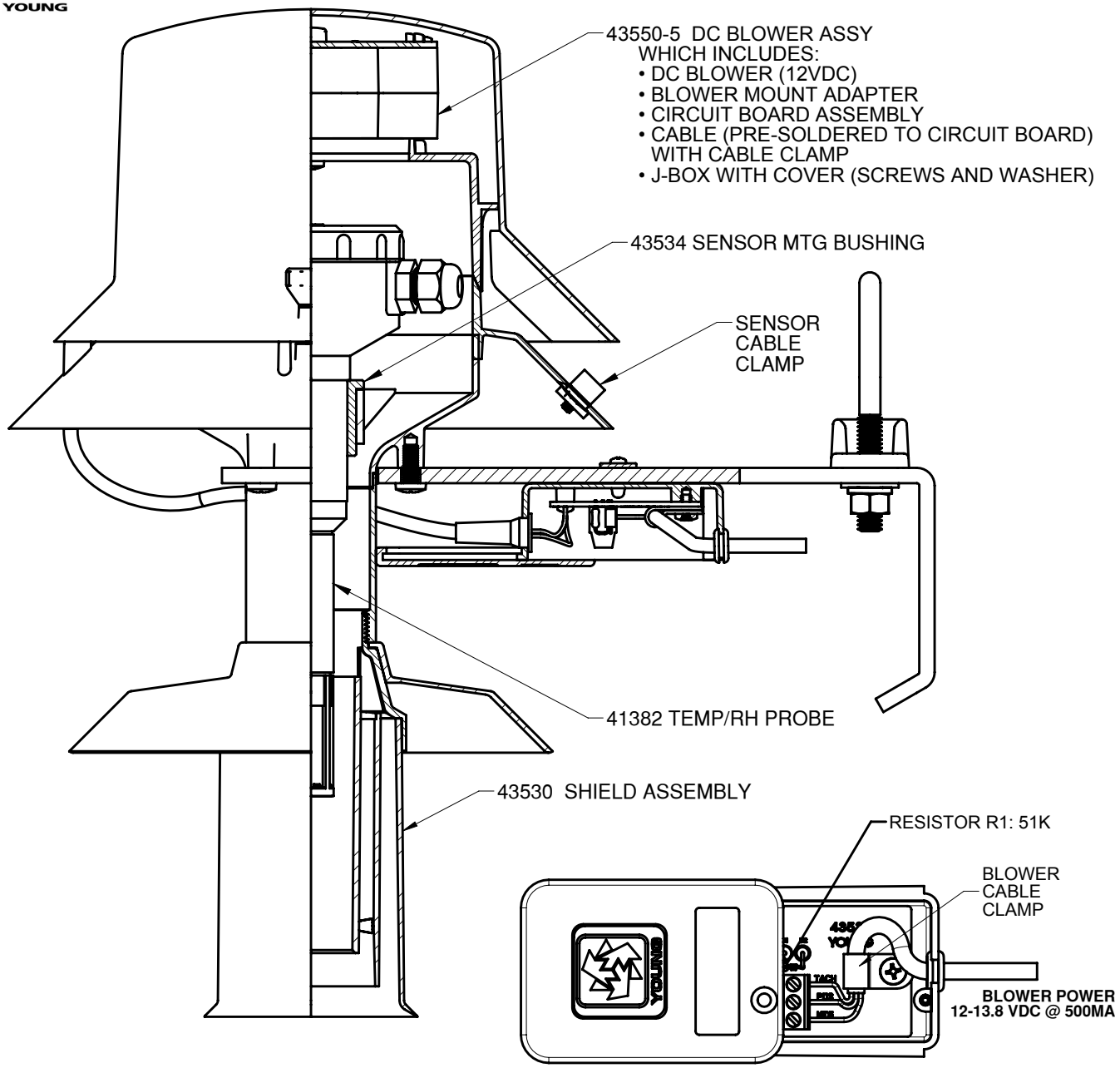
WARRANTY

This product is warranted to be free of defects in materials and construction for a period of 12 months from date of initial purchase. Liability is limited to repair or replacement of defective item. A copy of the warranty policy may be obtained from R. M. Young Company.

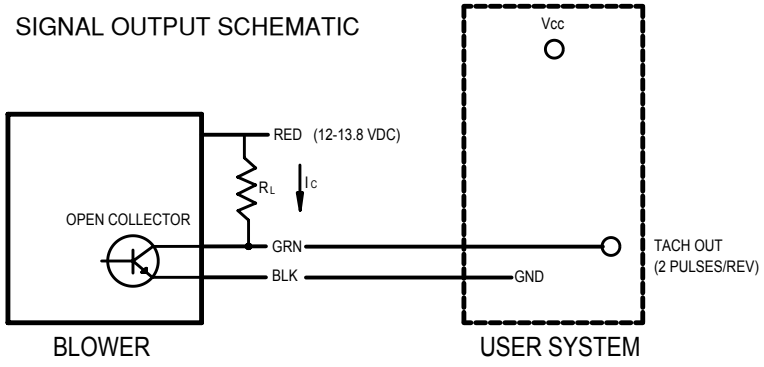
CE COMPLIANCE

This product has been tested and complies with European CE requirements for the EMC Directive. Please note that shielded cable must be used.

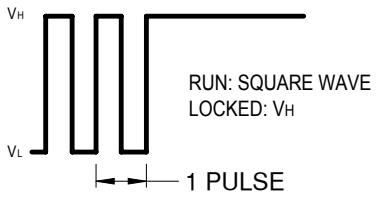
43502-5 with 41382 TEMP/RH PROBE

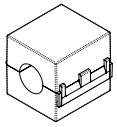


SIGNAL OUTPUT SCHEMATIC



Vcc = + 30V max
Ic = 10mA max
Ic = Vcc / RL





18500 FERRITE CHOKE
(SEE EMC SECTION FOR USAGE)

43502-5-90(F)