Model 5190-F

Temperature/Humidity Probe

PRODUCT MANUAL

5190-F/Rev F

ADB SAFEGATE

A.0 Disclaimer / Standard Warranty

CE certification

The equipment listed as CE certified means that the product complies with the essential requirements concerning safety and hygiene. The European directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

ETL certification

The equipment listed as ETL certified means that the product complies with the essential requirements concerning safety and C22.2 No.180:13 (R2018) regulations. The CSA directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

All Products Guarantee

ADB SAFEGATE will correct by repair or replacement per the applicable guarantee below, at its option, equipment or parts which fail because of mechanical, electrical or physical defects, provided that the goods have been properly handled and stored prior to installation, properly installed and properly operated after installation, and provided further that Buyer gives ADB SAFEGATE written notice of such defects after delivery of the goods to Buyer. Refer to the Safety section for more information on Material Handling Precautions and Storage precautions that must be followed.

ADB SAFEGATE reserves the right to examine goods upon which a claim is made. Said goods must be presented in the same condition as when the defect therein was discovered. ADB SAFEGATE furthers reserves the right to require the return of such goods to establish any claim.

ADB SAFEGATE's obligation under this guarantee is limited to making repair or replacement within a reasonable time after receipt of such written notice and does not include any other costs such as the cost of removal of defective part, installation of repaired product, labor or consequential damages of any kind, the exclusive remedy being to require such new parts to be furnished.

ADB SAFEGATE's liability under no circumstances will exceed the contract price of goods claimed to be defective. Any returns under this guarantee are to be on a transportation charges prepaid basis. For products not manufactured by, but sold by ADB SAFEGATE, warranty is limited to that extended by the original manufacturer. This is ADB SAFEGATE's sole guarantee and warranty with respect to the goods; there are no express warranties or warranties of fitness for any particular purpose or any implied warranties of fitness for any particular purpose or any implied warranties other than those made expressly herein. All such warranties being expressly disclaimed.

Standard Products Guarantee

Products manufactured by ADB SAFEGATE are guaranteed against mechanical, electrical, and physical defects (excluding lamps) which may occur during proper and normal use for a period of two years from the date of ex-works delivery, and are guaranteed to be merchantable and fit for the ordinary purposes for which such products are made.

NOTE

See your applicable sales agreement for a complete warranty description.

Replaced or repaired equipment under warranty falls into the warranty of the original delivery. No new warranty period is started for these replaced or repaired products.

FAA Certified products manufactured by ADB SAFEGATE

ADB SAFEGATE L858 Airfield Guidance Signs are warranted against mechanical and physical defects in design or manufacture for a period of 2 years from date of installation, per FAA AC 150/5345-44 (applicable edition).

ADB SAFEGATE LED products (with the exception of obstruction lighting) are warranted against electrical defects in design or manufacture of the LED or LED specific circuitry for a period of 4 years from date of installation, per FAA EB67 (applicable edition). These FAA certified constant current (series) powered LED products must be installed, interfaced and powered with and through products certified under the FAA Airfield Lighting Equipment Program (ALECP) to be included in this 4 (four) year warranty. This includes, but is not limited to, interface with products such as Base Cans, Isolation Transformers, Connectors, Wiring, and Constant Current Regulators.

Revision History

Revision	Date	Summary of Changes
C	2017 Jan 12	Updated Section 3.2 to say return probe to AWI if it fails validation checks only if it is under warranty, removed AWOS warranty chapter.
D	2022 Apr 12	Updated Specifications to match updated probe, updated triannual maintenance to reflect using a reference probe instead of a psychrometer, added details for 1192 DCP
E	2022 Dec 13	Added note to Section 2.2 table about jumpering power and signal connections for connections to 1192 DCP
F	2025	ADB SAFEGATE (ECP#ADBSG-0001)

Contents

1. Theory Of Operation

The Model 5190-F Temperature/Humidity Probe is designed for a variety of environmental monitoring applications, including ADB Safegate's Automated Weather Observing Systems (AWOS). The 5190-F operates with a DC supply voltage and has a low current draw. Relative humidity is measured with a thin-film capacitor sensor, and temperature is measured using a Pt100 RTD with an accuracy of ±0.1°C. The signals from the sensors are converted into two linearized voltage output signals.

1.1 Power Supply

The 5190-F requires a voltage source in the range of 5–24 V DC, capable of providing 4 mA.

In the case of data logger applications, battery power can be conserved by energizing the probe for only 15 seconds during each measurement.

1.2 Output Signals

The 5190-F provides two linearized voltage signals as shown below.

Parameter	Output Voltage	Range
RH	0–1.0 V DC	0–100% RH
Temperature	0–1.0 V DC	-40°C to +60°C

NOTE

Do not connect a load to the outputs with an impedance of less than 10 kΩ.

1.3 Environmental Limits

1.3.1 Temperature L imits

The 5190-F was designed to operate from -40°C to +60°C.

1.3.2 Humidity Limits

The probe can operate with the RH between 0 and 100%. Direct condensation does not damage the sensors. However, the humidity sensor will not provide correct readings when condensation is present, and neither of the sensors will operate if the sensor leads are short-circuited by condensation. The probe provides a humidity output that is referenced to the saturated water vapor pressure above liquid water. With this reference, the maximum humidity readings at temperatures below freezing are as follows.

Maximum RH	Temperature	Maximum RH	Temperature
100%	0°C	81%	-20°C
95%	-5°C	78%	-25°C
91%	-10°C	75%	-30°C
87%	-15°C		

1.4 Temperature Compensation

Practically every make of relative humidity sensor requires a compensation for the effect of temperature on the humidity output signal in order to measure accurately over a wide range of temperature conditions. In the specific case of an instrument using a capacitive sensor, compensation is required because the dielectric characteristics of both the water molecule and the hygroscopic polymer used in the sensor vary with temperature. The electronic circuit of the 5190-F probe uses data from the Pt100 temperature sensor to automatically compensate the effect of temperature on the accuracy of the humidity measurement.

1.5 Sensor Protection

Always use the dust filter provided with the probe to protect the sensors. The standard wire mesh filter is sufficient for most applications. For applications that involve direct spraying of water and/or a lot of dust, use the optional foam filter.

2. Installation & Checkout

2.1 Probe Location

Install the probe so that the local conditions at the sensors are typical of the environment to be measured.

In an outdoor environment:

- Use either a shield or a shelter to protect the probe and sensors from direct exposure to solar radiation and precipitation. Several shields are available from ADB Safegate., including the Model 8190 Motor Aspirated Radiation Shield (MARS).
- In an open field, install the probe at least 5 feet (1.5 m) above ground. Increase this distance if the ground surface is concrete or blacktop (such as above a roof).

2.2 Wiring Connections

The 5190-F is supplied with a 5-meter cable (about 16 ft) terminated with tinned ends. Some slack should be left in the cable to allow for a drip loop and to facilitate access to the probe for cleaning and replacement, otherwise any excess length may be trimmed. When a longer cable is required, consider using an extension cable for distances up to 30 m (100 ft).

Connect the wires as shown below.

Wire	Color	1190 DCP	1190 DCP
		TB2	J11 (TEMP/RH ANALOG)
Temperature	Brown	1	1
RH	White	2	2
Supply Voltage (+)	Green	3	3
Power Ground / –	Yellow	4	4*
Signal Ground	Gray		5*
Shield	Shield		6

*Power Ground and Signal Ground must be jumpered when connecting the Model 5190-F Temperature/Relative Humidity Probe to the Model 1192 DCP. The yellow and grey wires on the cable are connected together at the factory for this reason.

NOTE

Any other wires colors from the sensor should be covered and insulated so they do not make electrical contact.

Check for wiring errors before powering the probe. Improper wiring may damage the probe.

NOTE

Whenever possible, ADB Safegate recommends grounding the (-) side of the probe supply voltage.

2.3 MARS Installation

If the Model 8190 Motor Aspirated Radiation Shield (MARS) is used with the 5190-F probe, refer to the 8190 MARS User's Manual (8190-001) for installation instructions.

NOTE

In AWOS installations where a 5190-F is installed in a MARS, if the MARS fan fails, temperature and dew point will both be reported as missing.

3. Maintenance

3.1 Cleaning or Replacing the Dust Filter

The dust filter should be cleaned annually, depending on the conditions of measurement. Whenever possible, cleaning should be done without removing the filter from the probe. Clean the filter with a small brush to remove any debris that may have accumulated on the filter.

To replace the filter, unscrew the filter from the probe, replace the filter in the housing, and reinstall the filter assembly.

NOTE

If you remove or replace the filter, make sure that the sensors do not get caught. The humidity sensor is sometimes mistaken for a "white paper tag". Do not remove the probe! Before putting on a new dust filter, check the alignment of both sensors with the probe. The wires that connect the sensors to the probe are very thin and bend easily. If this happens, correct the alignment by holding the sensor very gently with a pair of small flat nosed pliers. Do not puncture the sensor with sharp pliers or tweezers or pull too hard on the sensor.

3.2 Periodic Validation Check

Long-term stability of the humidity sensor is typically better than 1% RH per year. For maximum accuracy, the accuracy checks that are part of the triannual maintenance described below must be performed. Applications where the probe is exposed to significant pollution may require more frequent verification. Both the Pt100 RTD temperature sensor and associated electronics are very stable and should not require any calibration after the initial factory adjustment.

3.3 Periodic Maintenance (AWOS Installations)

3.3.1 Equipment Required

A Handheld Reference Temperature Probe is required for periodic maintenance.

3.3.2 Monthly Maintenance

Monthly maintenance consists of checking the 8190 MARS and cleaning it if dust or debris is observed.

3.3.3 Triannual Maintenance

Triannual maintenance consists of performing the monthly maintenance tasks, cleaning the dust filter covering the probe tip, and checking the accuracy of the probe against readings made using a reference as explained below.

1. Set the reference sensor to use the same temperature units used on the AWOS display.
2. Position the reference sensor as described below. Allow up to 20 minutes for the readings of the reference sensor and the 5190-F probe to stabilize before proceeding.
3. Record the temperature and relative humidity from both the instantaneous AWOS display and the reference sensor.
4. Calculate the difference between the instantaneous temperature from the AWOS display and the reference sensor temperature. For AWOS installations, check the pass status on the Triannual form if the result is within ±2°F (±1.1°C). If the difference exceeds 2°F (1.1°C), the 5190-F probe must be removed from service and replaced. Return the failed probe to All Weather Inc. only if it is still under warranty.
5. Calculate the difference between the dew point shown on the AWOS display data and shown on the reference sensor. Record the results on the Triannual form. If the difference exceeds 3°F (1.7°C), the 5190-F probe must be removed from service and replaced. Return the failed probe to All Weather Inc. only if it is still under warranty.

While performing the accuracy check, keep these provisions in mind.

- For both temperature and dew point, it is important that the reference probe be subject to the same conditions as the 5190-F probe. If the reference probe is in the sun, near your body, or downwind from you, it is greatly affected. This will result in the reference probe and the 5190-F probe delivering very different results. Even if the reference probe is removed from direct sun, reflected light (from snow or sand, for example) can affect the measurements.
- On cloudy, breezy days, there is usually no problem getting good reference readings. You only need to be sure to stay downwind of the MARS and the reference probe.

- You will obtain the best results if you place the sensing element of the reference probe inside the MARS intake. This ensures that both probes are sampling the same air conditions. The reference probe can be held in place using a bungee cord, wire, string, or tape. The reference probe should not touch the sides of the MARS tube or the 5190-F probe. The reference probe must not stop the MARS airflow.
- As you observe the readings, the two probes may start out several degrees apart, but will slowly approach each other. Do not take any official reading until after the temperatures have settled. This may take up to 20 minutes.
- Differences in response time between the two probes can also make field temperature comparisons difficult. As the wind changes direction, it can change humidity and temperature. One probe will always react faster than the other. Taking measurements in changing conditions is not recommended.
- If you find that the 5190-F probe is out of tolerance, it is worth double-checking your setup to be sure the probe and MARS are clean and dry, that the reference probe is properly positioned, and that the reference probe has had ample time to reach ambient temperature before replacing the 5190-F probe.

3.3.4 Annual Maintenance

Annual maintenance consists of performing the monthly maintenance tasks and checking the accuracy of the probe according to the procedure prescribed for triannual maintenance above.

4. Specifications

Please refer to the datasheet for detailed specifications.

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