This document is a sample specification for an AWOS IIIP system that meets the requirements of FAA Advisory Circular No. 150/5220-16, latest edition. The features/functions marked as *optional* in this specification may be required or removed based on the specific needs of the airport.

General Performance Standards

The AWOS shall be an FAA type-certified system in accordance with Advisory Circular No. 150/5220-16, latest edition. The system shall be installed in accordance with the siting criteria in FAA JO 6560.20, latest edition.

A. Input Power

AWOS equipment shall operate from a 120/240 V (±10 percent), 60 Hz AC (±5 Hz), 3-wire single-phase service.

B. Loss of Power

The AWOS system shall return to normal operation without human intervention after a power outage. When power is restored, the system should not output erroneous data.

Operating Environment

All AWOS equipment and sensors shall meet all operating tolerances under the operational environmental conditions described in AC 150/5220-16 for a Class 1 environment.

Wind Speed and Direction Sensor

The wind speed and direction sensor may be an ultrasonic type or a mechanical type. The sensor shall meet or exceed the relevant specifications below.

Mechanical Wind Speed and Direction Sensor

A. Wind Speed (Mechanical sensor)

Range: 2 to 85 knots

Accuracy: ± 2 knots up to 40 knots. ± 5% above 40 knots.

Resolution: 1 knot

Distance constant: < 10m

Threshold: 2kts

B. Wind Direction (Mechanical sensor)

Range: 1° to 360°

Threshold: 2kts

Accuracy: ± 5°

Resolution: Nearest 1°; dead band not to exceed 7° wide

Time constant: < 2 seconds

Ultrasonic Wind Sensor

A. Wind Speed (Ultrasonic sensor)

Range: 1 to 85 knots

Accuracy: ± 1 knot up to 40 knots. ± 3% above 40 knots.

Resolution: 1 knot

B. Wind Direction (Ultrasonic sensor)

Range: 0° to 359°

Threshold: 1 knot

Accuracy: Within ± 3°

Resolution: To nearest 1°

Temperature Sensor

Range: -35° to +55°C

Accuracy: 1°F RMSE for the entire range of the sensor, with a maximum error of 2°F.

Resolution: Not greater than 1°F.

Time Constant: Not greater than 2 minutes.

Humidity Sensor

Range: -35° to +55°C

Accuracy: Less than or equal to 5% of the measured value.

Resolution: Not greater than 1%.

Time Constant: Less than 2 minutes.

Pressure Sensor

Two or three pressure sensors should be provided for each AWOS system. All pressure sensors should have provisions for venting to the outside through a pressure port.

Altitude ranges: 17.58 inHg to 31.53 inHg

Pressure range: +1.5 to -3.0 inHg from the standard atmospheric pressure at the location.

Accuracy: ±0.02 inHg

Resolution: 0.001 inHg

Differential Accuracy: Each sensor should exhibit an average differential accuracy of 0.02 inHg or less between a series of two pressure measurements taken from the same sensor 3 hours apart.

Maximum Drift with Time: Each sensor should be stable and continuously accurate within 0.02 inHg RMSE for a period of not less than 6 months.

Cloud Height Sensor

Range: The sensor should measure cloud heights and the heights of obscuring phenomena aloft to a minimum of 12,500 feet.

Accuracy: 100 feet or 5%, whichever is greater.

Resolution: Not greater than: 50-feet surface to 5,500 feet; 250 feet from 5,501 to 10,000 feet; 500 feet above 10,000 feet.

Sampling: The sensor should provide an output at least once every 30 seconds. However, to extend sensor life, this sampling rate may be reduced to provide at least one sample every 3 minutes when no cloud, obscuring phenomena aloft, or CH/VV values, i.e., hits, are detected for the preceding 15 minutes.

Eye Safety: The cloud height sensor should be designed to conform to laser radiation Class IIIb as defined in ANSI-Z 136.1, Accessible Emission Limits for Laser Radiation, with the maximum accessible emission level applied to direct viewing without optical instruments excluding ordinary eye glasses.

Laser Power Stability: The sensor should contain a self-check, self-adjusting feature that should maintain laser output power at the level necessary to sustain sensor detection and accuracy. When this adjustment can no longer provide the compensation necessary to maintain the sensor within specified operational limits, sensor operation should be terminated.

Optics Contamination: An air blower or other device should be used to reduce the contamination of the sensor optics. A signal should be generated to indicate the amount of optics contamination, thereby indicating the need for optics cleaning.

1. Snow: The ceilometer window should demonstrate an ability to remain clear of snow under the condition of snow accumulating at a rate of 2 inches per hour for 1 hour at a temperature of 20°F.
2. Ice: The ceilometer window should remain clear of ice for 60 minutes under conditions of freezing rain with a maximum accretion rate of ½-inch per hour radial thickness of clear ice.

Visibility Sensor

Range: The visibility sensor shall be capable of determining visibilities from less than 1/4 mile to 10 miles.

Resolution: Less than 1/4, 1/4, 1/2, 3/4, 1, 1-1/4, 1-1/2, 2, 2-1/2, 3, 4, 5, 7, 10 and greater than 10 miles

Accuracy: In accordance with the table below.

Reference Visibility Standard Reading	Acceptable Sensor Variance
1/4 through 1-1/4 miles	± 1/4 mile
1-1/2 through 1-3/4 miles	+ 1/4, -1/2 mile
2 through 2-1/2 miles	± 1/2 mile
3 through 3-1/2 miles	+ 1/2, -1 mile
4, and greater than 4 miles	± 1 mile

Time Constant: The time constant shall not exceed 3 minutes.

Ambient Light Sensor: The visibility sensor should contain an ambient light sensor, i.e., a photocell, to measure the ambient luminance within its field of view and generate a signal to the visibility sensor to indicate whether the ambient light level is day or night. It should indicate day for increasing illumination between 0.5 and 3 foot-candles (FC) and night for decreasing illumination between 3 and 0.5 FC.

Precipitation Accumulation Sensor

The sensor should be capable of estimating the precipitation amount with a range of 0.01 to 5-inches per hour, with a resolution of 0.01 inches and an accuracy of 0.002 inches per hour (RMSE), or 4 percent of actual, whichever is greater.

Present Weather Detector/Sensor

The precipitation type sensor should provide an indication of the type of precipitation occurring, or should output precipitation for any precipitation, e.g., liquid, freezing, frozen, or combinations thereof, when a type cannot be identified. The sensor should meet the performance requirements of Advisory Circular No. 150/5220-16, latest edition.

AWOS Data Processor

Data Reduction: The AWOS data reduction software should include quality control checks to ensure that the data received are reasonable and complete and that the associated equipment is working properly before the weather algorithms are performed. Data reduction should be performed in accordance with the requirements of Advisory Circular No. 150/5220-16, latest edition.

Weather Algorithms: The AWOS data processor should implement FAA algorithms to generate the elements of the weather observation (e.g. altimeter setting, density altitude, wind gusts, variable wind directions, variable visibility, etc.).

System Output: Using the most recent one minute observations of current weather information, the system should generate the outputs:

1. Computer-generated voice transmitted to pilots over radio, e.g., VOR, NDB, discrete frequency, etc.
2. Input/output port for an operator terminal
3. *Optional* output port for a video display.
4. *Optional* telephone port for dial-up service.
5. *Optional* output port to the national weather network

Remote Maintenance Monitoring (RMM): All systems should include a secure dial-up or Ethernet input/output port that provides the FAA authorized maintenance technician holding verification authority with remote access to locally archived and real-time operational, weather reports, and maintenance data.

Real-Time Clock: The processor should generate time as coordinated universal time (UTC). The day should be expressed in the Gregorian calendar. Hours and minutes should be indicated numerically from 0000 to 2359. The clock function should be accurate within 15 seconds each month compared to an official time source, e.g., WWV.

Power Outage: The system should return to normal operation without human intervention after a power outage. The system should not output erroneous data when power is restored, and all weather parameters should achieve normal indications or should indicate missing within 30 minutes.

Data Archiving: The processor should retain a local record of the automated weather reports, as well as the data entered through the keyboard or via RMM, for use by accident investigators. The interval between archived reports should not be more than 20 minutes, and the report should be retained for at least 96 hours. A method should be provided for the local and RMM retrieval of locally archived reports using a removable media, e.g., floppy disk, CD, DVD or similar, or a permanent record, e.g., a hard copy print out.

System Constants: The following system constants should be either permanently installed in the processor at the factory or protected from unauthorized or accidental modification so that they

may not be changed after initial adjustment at the site without proper authorization from the factory.

A. Elevation of the pressure sensors (MSL) and the ceilometer (AGL) at the installation site.
B. Magnetic variation of the installation site to the nearest degree.
C. AWOS facility identification.
D. Algorithm constants.
E. Alert criteria, including site unique criteria. The airport manager or other individual responsible to airport management may change this feature locally.
F. System and sensor software and firmware revision level identification.

Operator Terminal (OT)

The OT should include a video display terminal and keyboard, as well as a microphone and speaker that permit the manual addition of a voice message to the end of the computer generated voice message.

Product Augmentation: A specific editing password should control access to this function. Manual entries of weather phenomena not automatically observed should be placed in the remarks section of the observation. A qualified weather observer should have the capability to perform the functions required in Advisory Circular No. 150/5220-16, latest edition.

Security: If an OT is a part of the AWOS system, it should be designed to prevent unauthorized persons from entering data into the system. The system should require the operator to enter a User ID and Password or a successive series of codes prior to allowing him/her to proceed with the entry of data.

Periodic Data Validation: Where an OT is used to modify the weather report, all manually entered data should be automatically time tagged by the system. The data should be valid until the next hourly or manually input observation. In order to retain the manually entered data in the system, the operator should be required to revalidate his/her on-the-hour observation.

Voice Subsystem

The voice subsystem shall meet the performance requirements of Advisory Circular No. 150/5220-16, latest edition.

Electromagnetic Interference (EMI) Protection

The AWOS should be designed to minimize susceptibility to EMI and operate successfully in the complex electromagnetic environment of an airport. The AWOS should not cause interference to existing systems. Should interference caused by the AWOS occur, the system must be shutdown until the problem is resolved by the owner/installer/manufacturer.

Transient and Lightning Protection

AWOS equipment should be protected against damage or operational upset due to lightning-induced surges on all sensor input lines, sensor supply lines, and incoming power and data communications lines as well as audio and keying circuits when transmission of the voice message is provided by other than an integral VHF transmitter. Equipment, including the electrical circuits of fiber optics modems, and personnel should be protected from lightning currents and voltages; from power line transients and surges; and from other electromagnetic fields and charges.