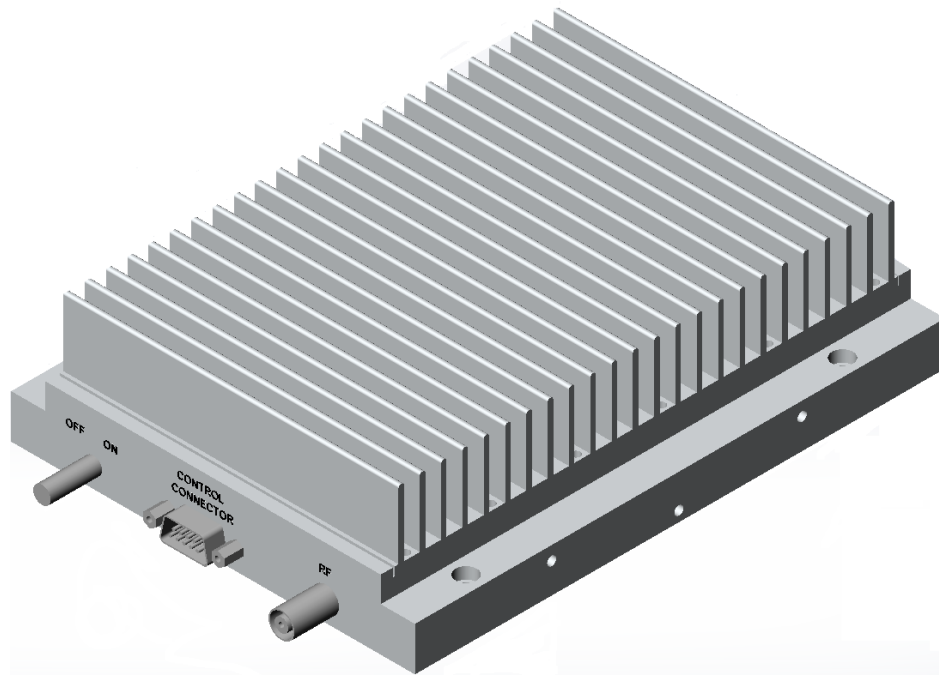


Model 1793

VHF Radio



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User's Manual

Rev. A



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1. INTRODUCTION

This publication provides general information on the Model 1793 VHF Radio. The Model 1793 VHF Radio is a single channel, fixed frequency Amplitude Modulated (AM) transmitter operating over the frequency range of 118.000 to 136.975 MHz. The transmitter is intended for base station operation in an air traffic environment. The Model 1793 operates on DC voltage in the range of 11.25 to 16.25 volts.

1.1 DESCRIPTION

Each Model 1793 VHF Radio consists of a transmitter board mounted in a heat sink as shown in Figure 1. The transmitter is a low power VHF AM transmitter which can transmit on a single programmable synthesized frequency, with 25 kHz channel spacing in the frequency range of 118.000 to 136.975 MHz. The channel selection switches are accessible below the heatsink. The transmitter requires a DC Power input that supplies voltage to the transmitter and linear amplifier.

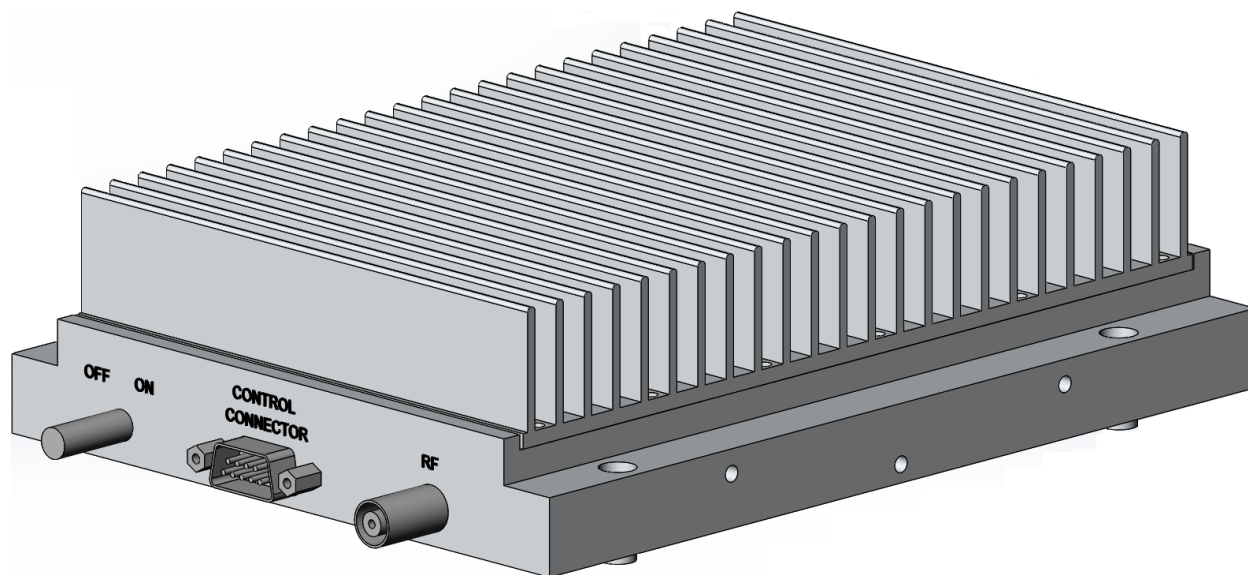


Figure 1. VHF/AM Single Channel Transmitter

2. INSTALLATION AND CHECKOUT

Before using the VHF Radio, it is necessary to set the operating frequency.

2.1 SETTING THE TRANSMITTER FREQUENCY

The operating frequency may be programmed over the frequency range of 118.000 to 136.975 MHz with 25 kHz channel spacing. To access the frequency jumper settings access the bottom of the radio, opposite side of the heat sink see Figure 3. The operating frequency is selected by setting the eleven switches on DS401 and DS402 shown in **Error! Reference source not found.** and Figure 3. Refer to Figure 4 for the frequency selection switch settings. Fine-tuning the frequency is achieved by adjusting C427.

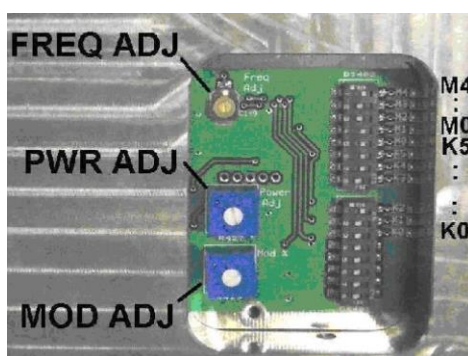


Figure 2. Adjustments and Frequency Setting Jumpers

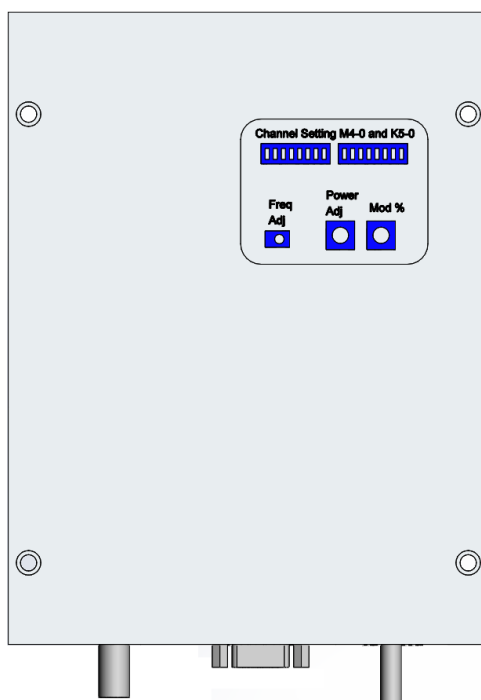


Figure 3. Model 1793 Bottom View

	M4	M3	M2	M1	M0		K5	K4	K3	K2		K1	K0
118.XXX	0	1	0	1	1	XXX.0XX	0	1	1	0	XXX.X00	0	0
119.XXX	0	1	1	0	0	XXX.1XX	0	1	1	1	XXX.X25	0	1
120.XXX	0	1	1	0	1	XXX.2XX	1	0	0	0	XXX.X50	1	0
121.XXX	0	1	1	1	0	XXX.3XX	1	0	0	1	XXX.X75	1	1
122.XXX	0	1	1	1	1	XXX.4XX	1	0	1	0			
123.XXX	1	0	0	0	0	XXX.5XX	1	0	1	1			
124.XXX	1	0	0	0	1	XXX.6XX	1	1	0	0			
125.XXX	1	0	0	1	0	XXX.7XX	1	1	0	1			
126.XXX	1	0	0	1	1	XXX.8XX	1	1	1	0			
127.XXX	1	0	1	0	0	XXX.9XX	1	1	1	1			
128.XXX	1	0	1	0	1								
129.XXX	1	0	1	1	0								
130.XXX	1	0	1	1	1								
131.XXX	1	1	0	0	0								
132.XXX	1	1	0	0	1								
133.XXX	1	1	0	1	0								
134.XXX	1	1	0	1	1								
135.XXX	1	1	1	0	0								
136.XXX	1	1	1	0	1								

Figure 4. Frequency Selection Switch Map

2.2 MOUNTING BRACKET

The CDP rack's bottom shelf (Figure 5) is fixed in place. Components are accessible through the rack's front or side doors. The VHF radio is secured to the bottom side of the sliding top shelf using four wing knobs facing up when the VHF radio is viewed from the front end of the CDP rack.

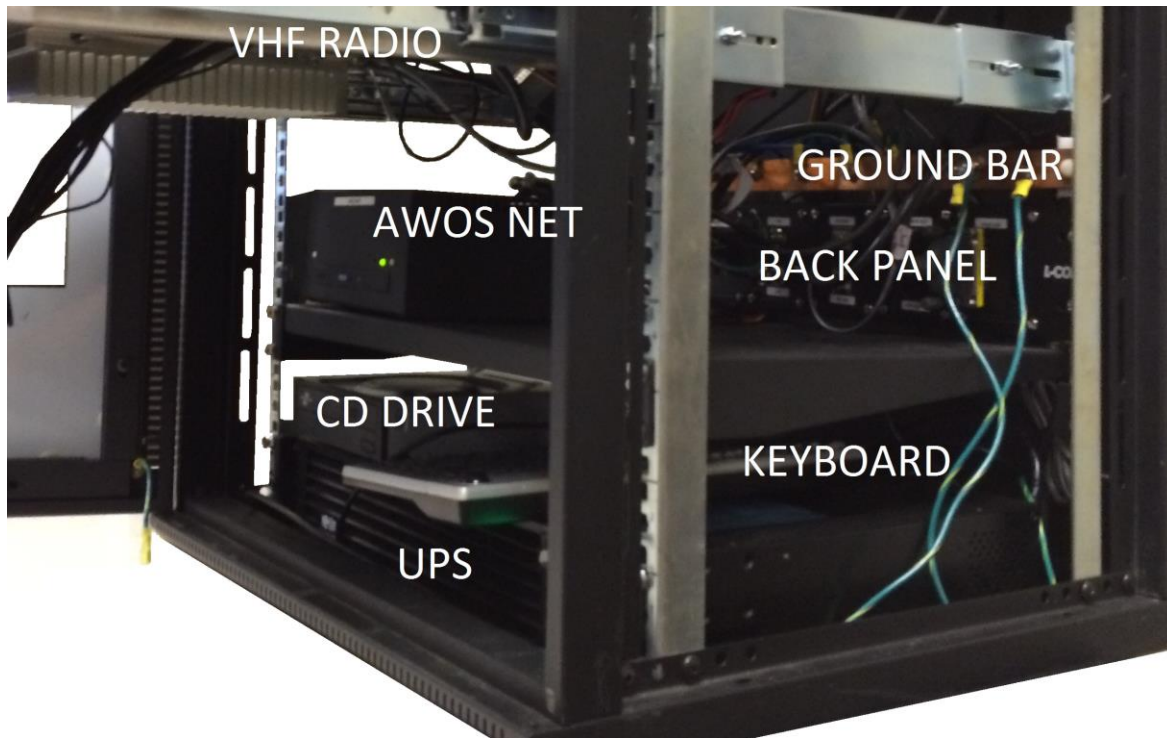


Figure 5. CDP Bottom-Shelf Components

The mounting bracket and the VHF radio are installed at the factory. Should the need arise to remove the radio, undo the four wing knobs on either side of the radio. Because of the tight space inside the CDP rack, it is recommended that any connecting cables remain in place until the VHF radio is removed from the siding shelf. Any cables that have been removed should be reattached before mounting the VHF radio back in the mounting bracket. Figure 6 shows how the VHF radio is secured to the siding shelf.

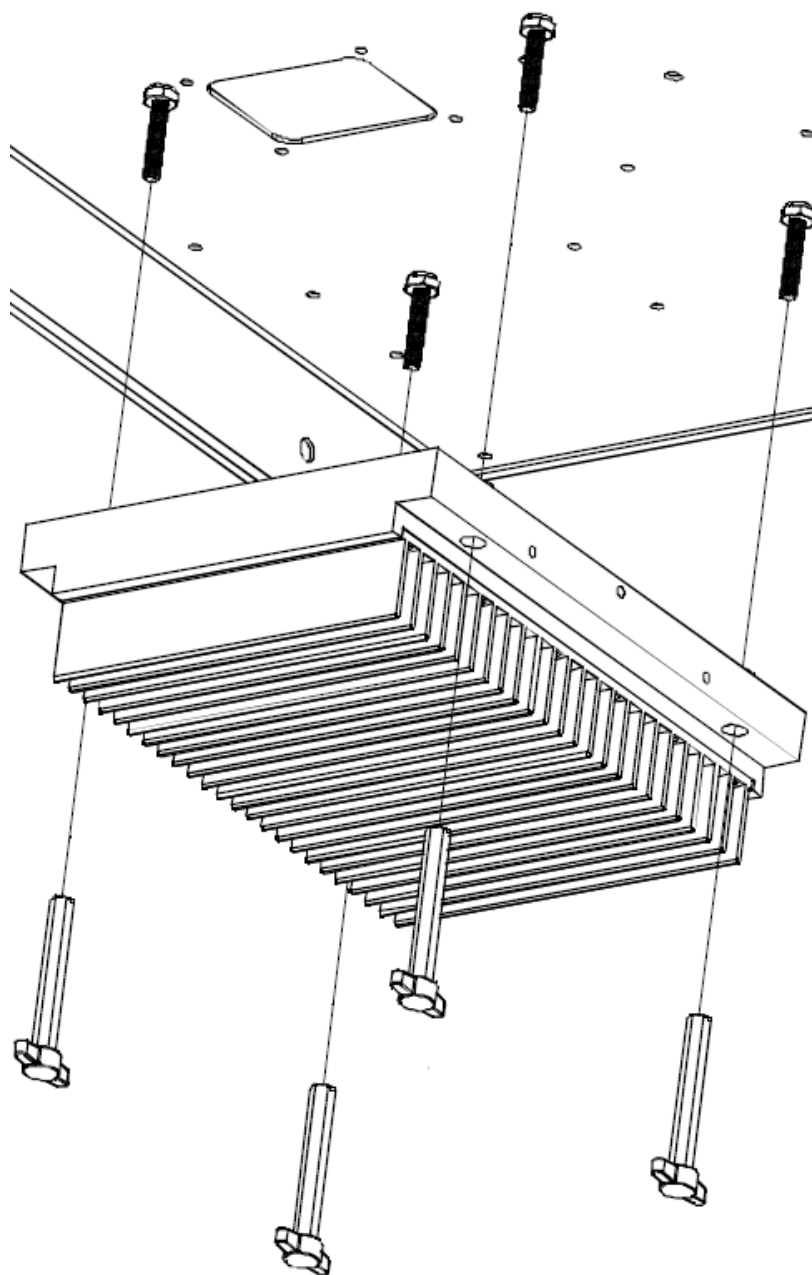


Figure 6. VHF Radio Secured in Mounting Bracket Using Four Wing Knobs

2.3 CONNECTIONS

In the All Weather, Inc. AWOS 3000 system, the 1793 VHF radio is installed at the Central Data Platform (CDP). The VHF control cable connects the VHF radio to the AWOS Peripheral Interface PCB at terminal block J2 and the AWOS computer power supply. The cable is fitted with a DB9 connector at one end for connection to the VHF radio. It has four unterminated wires at the other end for connection to the Peripheral Interface. The cable also has a four pin Molex power connector to supply power to the VHF radio from the AWOS computer power. The antenna connector is a 50 ohm "BNC" Type connector. For runs longer than 50 feet, RG-8 cable should be used.

To connect a 1793 VHF radio to an AWOS 3000 perform the following steps:

1. Ensure that the radio POWER ON/OFF switch is set to OFF.
2. Connect the antenna cable to the front panel BNC connector.
3. Connect the signal / power cable DB9 connector to the 9-pin D connector on the radio front panel.
4. Connect the unterminated end of the signal cable to terminal block J2 on the Peripheral Interface board as follows:
 - a. Signal cable WHITE wire to pin 1.
 - b. Signal cable GREEN wire to pin 2.
 - c. Signal cable RED wire to pin 3.
 - d. Signal cable BLACK wire to pin 4.
5. Connect the 4 pin connector to the AWOS computer power supply.
6. Power on the radio by switching the radio POWER ON/OFF switch to the ON position.

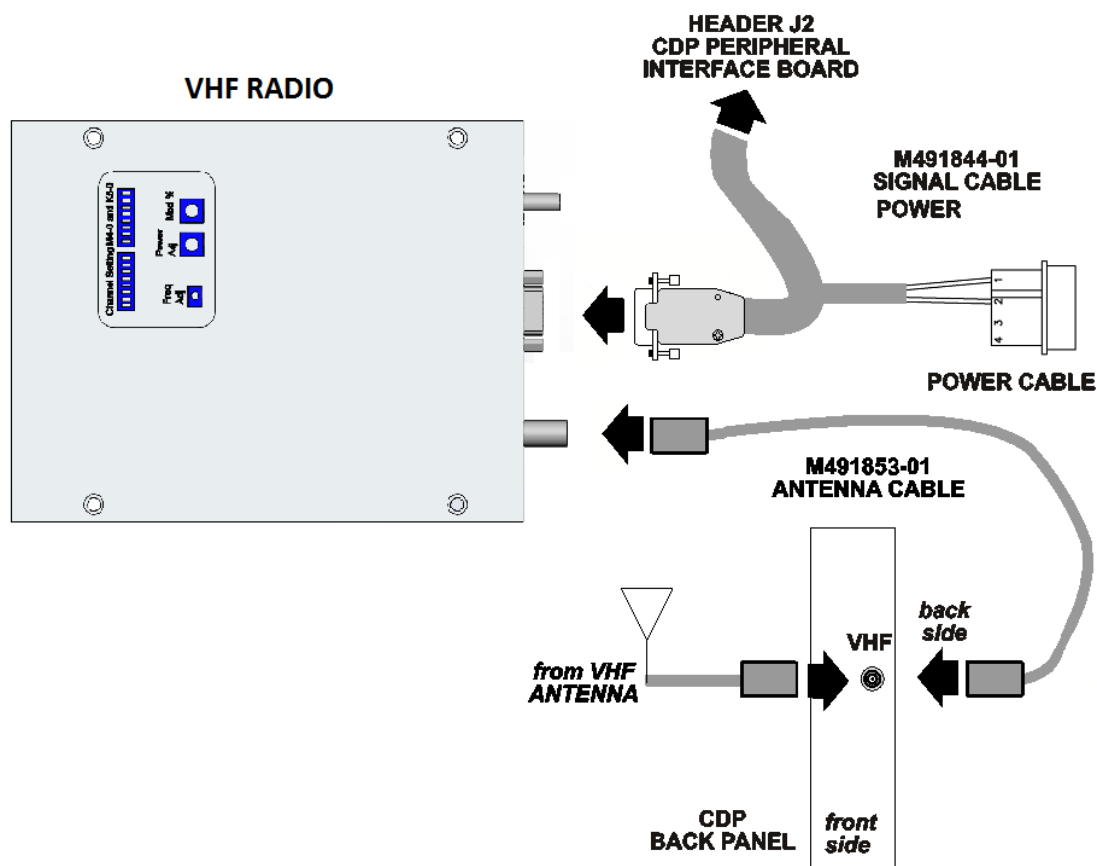


Figure 7. VHF Radio Connections

PIN	FUNCTION
1	GROUND (AUDIO RETURN)
2	POWER INPUT (9-30 VDC)
3	POWER INPUT (9-30 VDC)
4	TRANSMITTER KEY
5	GROUND
6	GROUND (KEY RETURN)
7	GROUND
8	
9	AUDIO IN

Figure 8. Connector Pinout

2.4 CALIBRATION

The Model 1793 VHF Radio is calibrated at the factory prior to shipment, and should not need to be calibrated again during installation. Power level and modulation calibration are performed as part of the annual revalidation described in the Annual Revalidation Section.

2.5 OPERATIONAL CHECK

Ensure that the transmitter operates as described in Chapter 3.

3. OPERATION

A view of the front and transmitter indicators is given in Figure 9. A functional description of the power switch, controls, and indicators is provided in Table 1.

3.1 OPERATING VHF RADIO INSTRUCTIONS

1. Ensure that the power, signal, and antenna cables are connected.
2. Set the POWER ON/OFF switch to "ON".
3. Verify that the amber POWER ON LED is ON as shown in Figure 9.
4. Verify that the AWOS station voice message is being transmitted using a VHF receiver.
5. Ensure that the Tx ON amber LED cycles ON during voice message output.
6. Verify that the Tx ON amber LED cycles OFF between voice message broadcasts.

3.2 SWITCHING VHF RADIO OFF

1. Set the POWER ON/OFF on transmitter to switch to OFF.
2. Verify that all indicator LED's on the bottom heatsink side are OFF.

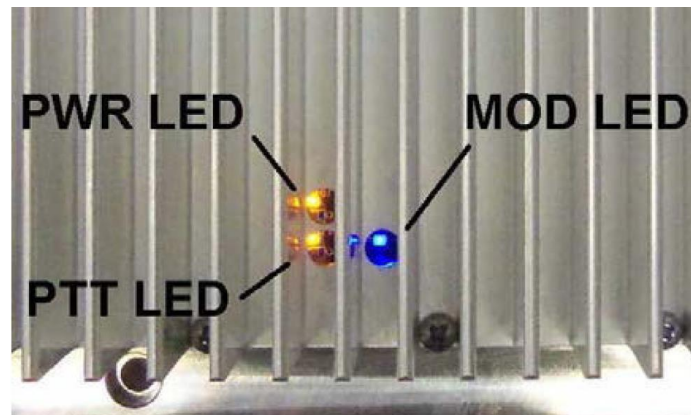


Figure 9. Transmitter Controls and Indicators

Table 1. Operator's Switches, Controls and Indicators

SWITCHES CONTROLS & INDICATORS	FUNCTIONAL DESCRIPTION
ON/OFF SWITCH	The toggle switch applies the DC power to the transmitter. The transmitter is switched to ON in the toggle LEFT position the transmitter is switched OFF in the toggle RIGHT position.
PWR LED INDICATOR	The PWR AMBER LED Indicates when the POWER ON/OFF switch is set to ON and voltage is applied to the transmitter.
PTT AMBER LED INDICATOR	The PTT AMBER LED indicates when the transmitter is in the transmit mode. The PTT AMBER LED switches OFF, when the transmitter is in the stand-by mode.
MOD BLUE LED INDICATOR	The Blue LED indicates when the transmitter is receiving audio modulation.
DB 9 PIN CONNECTOR	The 9 pin "D" connector connects the power, audio signal, and TX transmit signal.
RF OUT	A 50 ohm BNC coaxial connector provides a connection to the external antenna.

4. MAINTENANCE

The Model 1793 VHF Radio requires no maintenance, other than the recommended periodic checks outlined below. If transmission problems should arise, perform the Annual Revalidation procedures described in below. If the problem persists, contact All Weather, Inc. Customer Service.

4.1 PERIODIC MAINTENANCE

Periodic maintenance of the Model 1793 VHF Radio is divided into three categories within the maintenance cycle: monthly, triannual, and annual maintenance procedures.

4.1.1 Monthly Maintenance

Check the cabling for integrity. Verify the voice output. Verify the PTT LED indicator illuminates when voice output is activated.

4.1.2 Triannual Maintenance

Triannual maintenance of the VHF radio is identical to that specified in the monthly maintenance procedure.

4.1.3 Annual Revalidation

Annual Revalidation involves measures the Output Power, VSWR, Frequency, and Modulation of the VHF radio.

Equipment Required

The test equipment listed in Table 2 is required to perform an annual revalidation.

Table 2. Equipment Required

Radio Test Equipment	
Power Meter	Bird Watt Meter Model 43 or equivalent
Dummy Load	50 Ohms, 10 Watts, @ 140 MHz
Various Cables	Coaxial Jumper cables, RF adapters, etc.
Forward/Reflected Power Tester	Bird Watt Meter Model 43 w/ 10C elements or equivalent
Frequency Meter	Aeroflex 3500 or equivalent
Modulation Meter	Aeroflex 3500 or equivalent
Deviation Meter	Aeroflex 3500 or equivalent

When the VHF antenna cable is longer than 50 feet, the VSWR and Power Level tests must be repeated at the antenna end of the cable.

4.1.3.1 Power Level (At Transmitter)

1. Remove power from the VHF radio by turning the power switch on the radio front panel off.
2. Disconnect the VHF antenna cable from the BNC connector on the back panel of the CDP.
3. Connect the power meter to the BNC connector on the back panel of the CDP which connects to the VHF radio internal to the AWOS 3000.
4. Connect the antenna or a 50 ohm 10 watt dummy load to the other connector on the power meter to terminate the VHF radio output. See Figure 10 for a functional connection description.



Figure 10. Insert Power Meter Between Antenna and VHF radio

5. Apply power to the VHF radio by turning the power switch on the radio front panel on.
6. Record the VHF radio output power level on the Annual Technical Performance Record.
7. Remove power from the VHF radio by turning the power switch on the radio front panel off.
8. Disconnect the power meter from the BNC connector on the back panel of the CDP and the antenna or dummy load.
9. Reconnect the antenna cable to the BNC connector on the back panel of the CDP.
10. Apply power to the VHF radio by turning the power switch on the radio front panel on.

4.1.3.2 VSWR (At Transmitter)

If the RF cables must be disconnected when switching between power level and VSWR tests, turn the radio off using the switch on the radio's front panel.

1. Remove power from the VHF radio by turning the power switch on the radio front panel off.
2. Disconnect the VHF antenna cable from the BNC connector on the back panel of the CDP.
3. Connect the forward / reflected power meter to the BNC connector on the back panel of the CDP and terminate with the antenna. See Figure 10.
4. Apply power to the VHF radio by turning the power switch on the radio front panel on.
5. Measure the Forward Power from the radio to the antenna.
6. Change the power measurement from forward to reflected by rotating the slug in the power meter see Figure 11.



Figure 11. Forward and Reflected Power meter

7. Measure the Reflected Power from the antenna to the radio.

8. Calculate the VSWR and enter the value on the Annual Technical Performance Record. If you measure forward and reflected power, calculate the VSWR using the following equation.

$$VSWR = \frac{1 + \sqrt{\frac{\text{reflected power}}{\text{forward power}}}}{1 - \sqrt{\frac{\text{reflected power}}{\text{forward power}}}}$$

Sample Calculation:
 Reflected power = 0.02 W
 Forward power = 2.5 W

$$VSWR = \frac{1 + \sqrt{\frac{\text{reflected_power}}{\text{forward_power}}}}{1 - \sqrt{\frac{\text{reflected_power}}{\text{forward_power}}}} = \frac{1 + \sqrt{\frac{0.02}{2.5}}}{1 - \sqrt{\frac{0.02}{2.5}}} = \frac{1 + \sqrt{0.008}}{1 - \sqrt{0.008}} = \frac{1 + 0.0894}{1 - 0.0894} = \frac{1.0894}{0.9106} = 1.1964$$

Figure 12. VSWR Calculation

9. Disconnect the VSWR or forward / reflected power meter from the BNC connector on the back panel of the CDP.
10. Reconnect the antenna cable to the BNC connector on the back panel of the CDP.
11. Apply power to the VHF radio by turning the power switch on the radio front panel on.

4.1.3.3 Frequency

If RF cables must be disconnected when switching between frequency and modulation tests, turn the radio off using the switch on the radio's front panel.

1. Log the assigned frequency on the Annual Technical Performance Record.
2. Remove power from the VHF radio by turning the power switch on the radio front panel off.
3. Disconnect the VHF antenna cable from the BNC connector on the back panel of the CDP.
4. Connect the frequency meter to the BNC connector on the back panel of the CDP and terminate with the antenna or a dummy load

CAUTION



Use isolators or attenuators as needed to protect the Frequency meter.

5. Apply power to the VHF radio by turning the power switch on the radio front panel on.
6. The radio transmits for approximately 30 seconds, followed by an off time of five seconds. While the radio is transmitting, measure the frequency.
7. Record the VHF radio frequency on the Annual Technical Performance Record.
8. Remove power from the VHF radio by turning the power switch on the radio front panel off.
9. Disconnect the frequency meter from the BNC connector on the back panel of the CDP and the antenna or dummy load.
10. Reconnect the antenna cable to the BNC connector on the back panel of the CDP.
11. Apply power to the VHF radio by turning the power switch on the radio front panel on.

4.1.3.4 Modulation

If RF cables must be disconnected when switching between frequency and modulation tests, turn the radio off using the switch on the radio's front panel.

1. Remove power from the VHF radio by turning the power switch on the radio front panel off.
2. Disconnect the VHF antenna cable from the BNC connector on the back panel of the CDP.
3. Connect the modulation meter to the BNC connector on the back panel of the CDP and terminate with the antenna or a dummy load.

CAUTION



Use isolators or attenuators as needed to protect the modulation meter.

4. Set the modulation meter to the instantaneous mode.
5. Apply power to the VHF radio by turning the power switch on the radio front panel on.
6. Log in as an administrator on the CDP display and insert an AWOS Security Key CD. You will be able to access the menus once the optical drive light stops blinking, indicating that the AWOS Security Key CD has been read.
7. Access the *Edit > Configuration > Voice* tab on the CDP display and click the **300 Hz tone** option in the **Test** panel as shown in Figure 13.
8. Click OK.



Figure 13. Tone Test Panel - AWOS 3000

9. Use the modulation adjustment potentiometer on the VHF radio to adjust the modulation depth to 90%, see Figure 3.
10. Use the VHF adjustment potentiometer (R29) on the CDP peripheral interface board to lower the signal level until the modulation decreases to 80%.

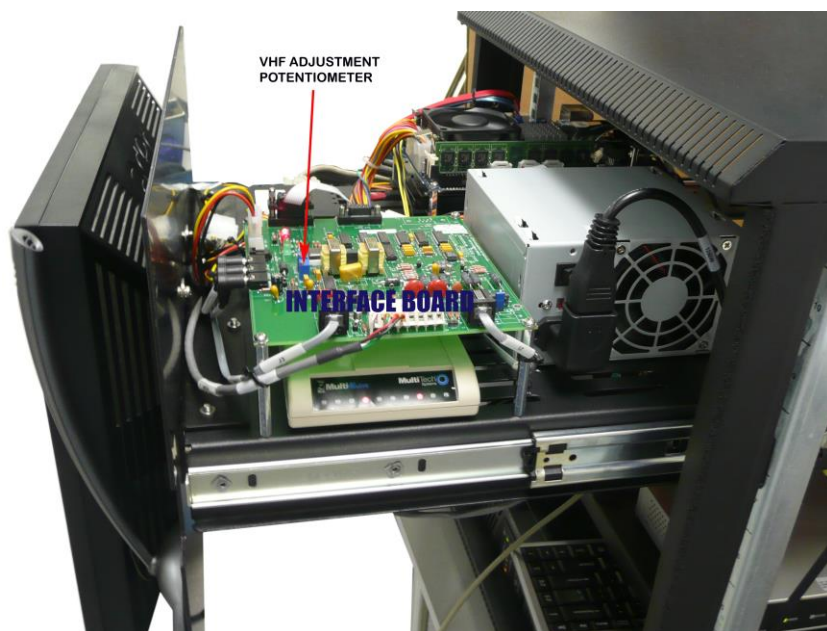


Figure 14. VHF Adjustment Potentiometer on CDP Peripheral Interface Board

11. Use the modulation adjustment potentiometer on the VHF radio to adjust the modulation depth to 60%.
12. Set the modulation meter to the “peak hold” mode.
13. Access the *Edit > Configuration > Voice* tab on the CDP display and click the **Modulated 300 Hz tone** option in the **Test** panel.
14. Reset the modulation meter and wait until the modulated tone stops.
15. Verify that the peak modulation reading does not exceed 95%. If it does, adjust the modulation adjustment potentiometer on the VHF radio and recheck the peak modulation reading.
16. Access the *Edit > Configuration > Voice* tab on the CDP display and click the **Word** option in the **Test** panel.
17. Reset the modulation meter and wait until the words stop. Verify that the peak modulation reading does not exceed 95%. If it does, adjust the modulation adjustment potentiometer on the VHF radio and recheck the peak modulation reading.
18. Enter the final modulation meter reading on the Annual Technical Performance Record.
19. Remove power from the VHF radio by turning the power switch on the radio front panel off.
20. Disconnect the Modulation meter from the BNC connector on the back panel of the CDP and the antenna or dummy load.
21. Reconnect the antenna cable to the BNC connector on the back panel of the CDP.
22. Apply power to the VHF radio by turning the power switch on the radio front panel on.
23. Remove the CD Key from the CDP optical drive.

4.1.3.5 Voice Output Static Reduction

The Model 1793 VHF Radio has been adjusted for use with the AWOS 3000 to minimize audible static on the voice transmission. The following steps described how to reduce static should additional adjustment be required.

1. Adjust the VHF voice output signal at the CDP peripheral interface board by adjusting trim potentiometer R29 (see the **Modulation** section above) until the desired reduction in static is achieved.
2. Adjusting the VHF voice output signal will also change the modulation level. Increase the modulation level as described in the **Modulation** section above.

4.1.3.6 Transmission Line Loss

1. Remove power from the VHF radio by turning the power switch on the radio front panel off.
2. Disconnect the VHF antenna cable from the BNC connector on the back panel of the CDP.
3. Connect the power meter to the BNC connector on the back panel of the CDP and terminate with the antenna or a dummy load.
4. Apply power to the VHF radio by turning the power switch on the radio front panel on.
5. Record the VHF radio output power level for the transmitter end.
6. Remove power from the VHF radio by turning the power switch on the radio front panel off.
7. Disconnect the power meter from the BNC connector on the back panel of the CDP and the antenna or dummy load.
8. Reconnect the antenna cable to the BNC connector on the back panel of the CDP.
9. Disconnect the coax cable from the antenna.
10. Connect the power meter to the VHF antenna with a short coax cable and connect the disconnected antenna cable to the power meter. The power meter arrow should point toward the antenna.
11. Apply power to the VHF radio by turning the power switch on the radio front panel on.
12. Record the VHF radio output power level for the antenna end.
13. Remove power from the VHF radio by turning the power switch on the radio front panel off.
14. Disconnect the power meter from the VHF antenna and the antenna cable.
15. Reconnect the antenna cable to the VHF antenna.
16. Calculate the Transmission line loss using the equation in Figure 15 and record the data where required.

$$dB(Loss) = 10 \log \frac{P(transmitterend)}{P(antennaend)}$$

Figure 15. Transmission line loss (dB) Calculation

5. SPECIFICATIONS

Parameter	Specification
Frequency Range	118.000 to 136.975 MHz
Channel Spacing	25 kHz
Duty Cycle	100%
Transmitter Power Output	Adjustable (1 to 3 W)
Output Power Stability	1 W
VSWR	4:1
Carrier Stability (-40 to +55°C)	±1.000 Hz max
Audio Input	0.5 V _{rms} to 2.0 V _{rms} – Line level
Modulation Capability	Adjustable (50 to 95%)
Audio Distortion (90% modulation)	10% max
Audio Frequency Response	300 Hz to 2500 Hz (+1, -3 dB)
Spurious Emissions	60 dB below carrier
Hum and Noise Level	45 dB below carrier
Voice/Keying Connector	DB9 (female 9-pin D-sub connector)
Antenna Connector	BNC
Supply Voltage	9–30 V DC
Current Consumption	250 mA to 2.0 A
Operating Temperature	-40 to +140°F (-40 to +60°C)
Storage Temperature	-67 to +149°F (-55 to +65°C)
Humidity	up to 90% noncondensing
Enclosure	Aluminum
Dimensions	8.50" W × 2.50" H × 5.90" D (216 mm × 59 mm × 150 mm)
Weight	1.3 kg (3 lbs)
Shipping Weight	2.3 kg (5 lbs)

6. FORMS

These master forms should be copied and sufficient copies stored at a convenient location in each site's Facility Reference Data File (FRDF). The *Annual Technical Performance Record* is to be completed at system commissioning, after major repair work, and during annual revalidation.

AWOS Annual Technical Performance Record			
Site Name and Location _____		Date _____	
VHF Radio	Expected	Measured	Pass (Y/N)
Perform the following at the VHF radio			
Output Power Level	2.5 W, ± 1 W	_____	_____
Reflected Power		_____	_____
VSWR	Initial: 2.0:1 max. Operating: 3.0:1 max.	_____	_____
Frequency	assigned: ± 1.0 kHz	_____	_____
Modulation	65–95%	_____	_____
Perform the following at the VHF antenna when cable runs are longer than 50 ft			
Output Power Level	1.0 W, ± 0.5 W	_____	_____
Reflected Power		_____	_____
VSWR	Initial: 2.0:1 max. Operating: 3.0:1 max.	_____	_____
Comments/Notes:			
System Checked By: _____		Date/Time: _____	

Annual Maintenance Data Sheet

Parameter	Measured Value (A)	Standard Value (B)	Acceptable Tolerance (A-B)
Radio Power (At Xmtr)		2.5 W	± 1.0 W
Reflected Power			
VSWR		1.0:1	3.0:1
Frequency			± 1.0 kHz
Modulation		80%	65-95%
Transmission Line Loss		2.2 dB/50 ft. max.	3.2 dB/50 ft. max.

7. WARRANTY

Unless specified otherwise, All Weather Inc. (the Company) warrants its products to be free from defects in material and workmanship under normal use and service for one year from date of shipment, subject to the following conditions:

- (a) The obligation of the Company under this warranty is limited to repairing or replacing items or parts which have been returned to the Company and which upon examination are disclosed, to the Company's satisfaction, to have been defective in material or workmanship at time of manufacture.
- (b) The claimant shall pay the cost of shipping any part or instrument to the Company. If the Company determines the part to be defective in material or workmanship, the Company shall prepay the cost of shipping the repaired instrument to the claimant. Under no circumstances will the Company reimburse claimant for cost incurred in removing and/or reinstalling replacement parts.
- (c) This warranty shall not apply to any Company products which have been subjected to misuse, negligence or accident.
- (d) This warranty and the Company's obligation thereunder is in lieu of all other warranties, express or implied, including warranties of merchantability and fitness for a particular purpose, consequential damages and all other obligations or liabilities.

No other person or organization is authorized to give any other warranty or to assume any additional obligation on the Company's behalf, unless made in writing and signed by an authorized officer of the Company.



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