

# SPECTRACOM MODEL 8165 DISCIPLINED OSCILLATOR ANTENNA INSTALLATION

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This manual supplements information in the Spectracom Model 8165 WWVB Disciplined Oscillator Instruction Manual, Revision 2.2.

The section numbers in this document correspond to those in the original document.

## 1.0 INTRODUCTION

The Spectracom Model 8165 WWVB Disciplined Oscillator™ is a frequency standard with accuracy directly traceable to the National Institute of Standards and Technology. The Spectracom Model 8206A Loop Antenna or Model 8208 Whip Antenna (see Figure 1-5) receives the 60-kHz carrier of WWVB. **The WWVB/8165 receiver is very important to the performance of an Ericsson EDACS Simulcast or Multisite system.**

The Model 8165 is continuously monitored against WWVB and kept on frequency by a microprocessor. The oscillator outputs can be used as a precise reference input for transmitters, receivers, counters, synthesizers, and other electronic equipment.

## 1.3 MODEL 8206A LOOP ANTENNA

The Model 8206A Loop Antenna reliably receives the 60-kHz WWVB transmission in field strengths of 50  $\mu\text{V}/\text{meter}$  or greater. The majority of the United States exceeds 50  $\mu\text{V}/\text{meter}$  as shown in Figure 1-2, Measured

Field Intensity Contours. In locations having less than 50  $\mu\text{V}/\text{meter}$  field strength, the Model 8207 Preamplifier is required. The equivalent electrical height of the Model 8206A is 5.0 cm. Refer to Section 1.7 of the Model 8165 manual for additional information.

The Model 8206A consists of a wound ferrite core surrounded by a Faraday shield which aids in noise rejection. The received signal is amplified by an internal preamplifier and output to the receiver. The preamp is powered by the receiver over the antenna coax. The antenna is packaged in a PVC housing measuring 10 inches long and 2.8 inches in diameter. The assembled antenna weighs 2.5 pounds.

Use the great circle map shown as Figure 1-3 in the Model 8165 manual to determine the correct antenna orientation per receiver location. The antenna position may be optimized using the AGC measurement described in Section 2.4 of the Model 8165 manual.

The tubular housing of the Model 82060A antenna must be positioned broadside to Fort Collins, Colorado, (See Figure 1-4 great circle map) and horizontal to the ground to allow maximum signal reception. No signal will be received if the tube points directly toward the transmitter site, as the antenna pattern nulls are located off the ends of the tube.

**Correct orientation of the WWVB/8165 antenna is very important to the performance of an Ericsson EDACS Simulcast or Multisite system.**

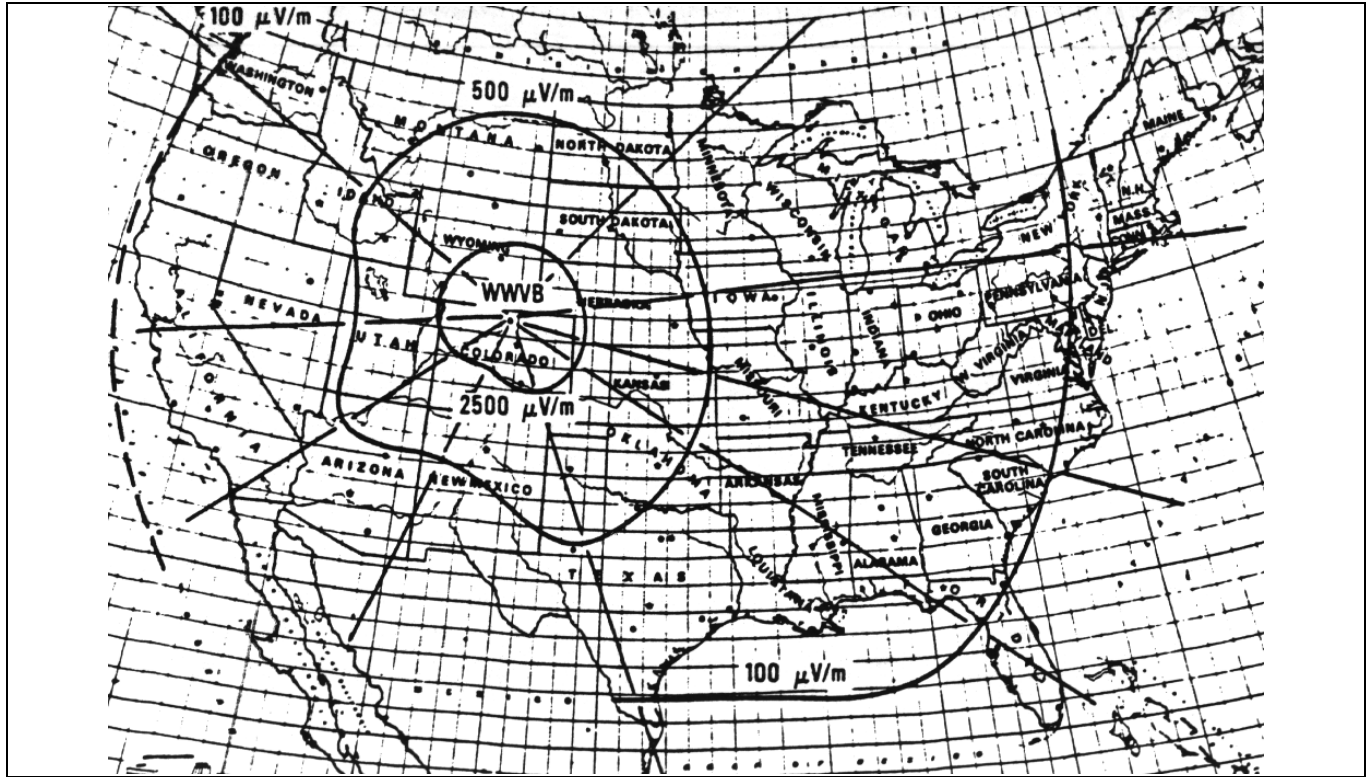


FIGURE 1-2 MEASURED FIELD INTENSITY CONTOUR WWVB @ 13 kW ERP

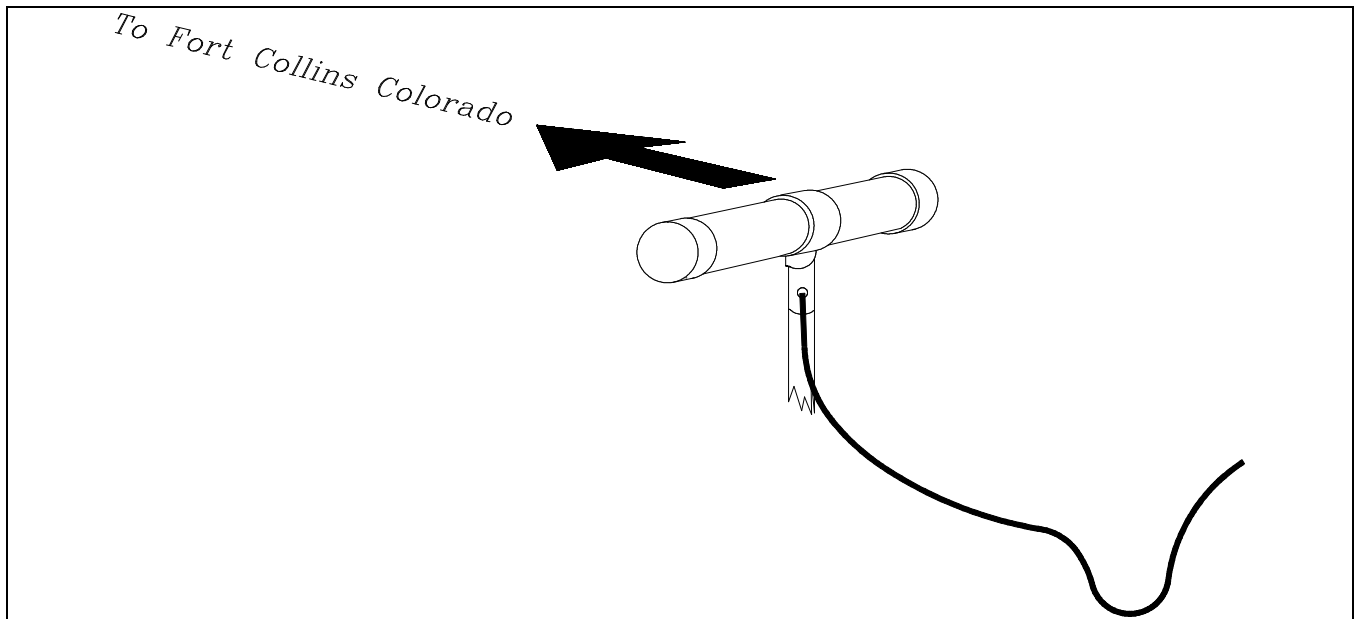


FIGURE 1-3 MODEL 8206A DIRECTIONAL ANTENNA

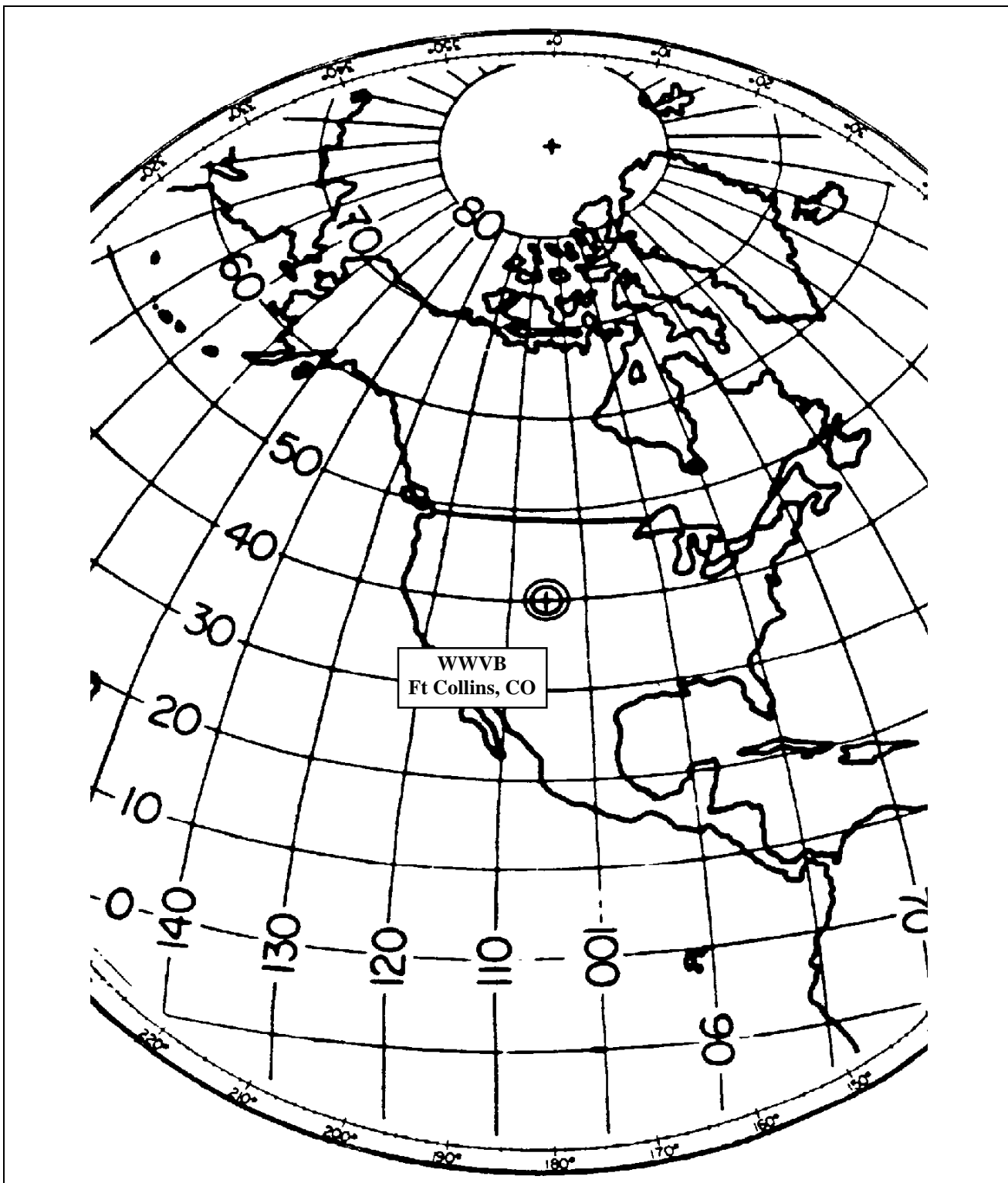


FIGURE 1-4 GREAT CIRCLE MAP CENTERED ON FORT COLLINS, COLORADO

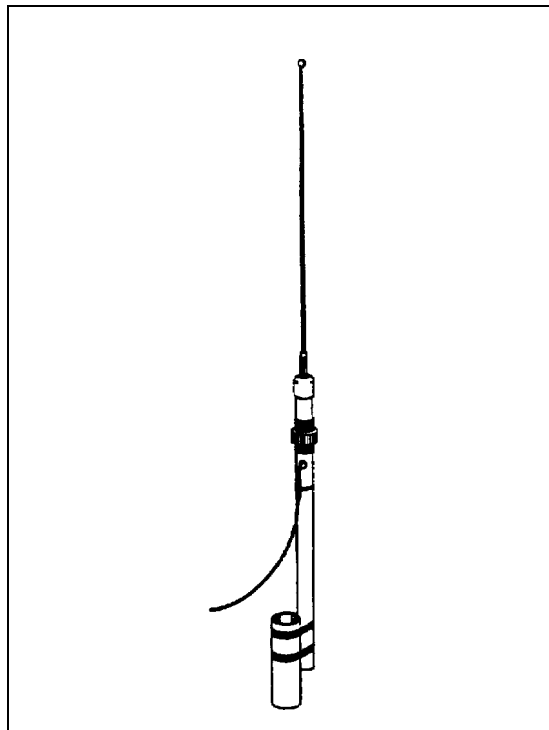


FIGURE 1-5 MODEL 8208 WHIP ANTENNA

## 1.4 MODEL 8208 WHIP ANTENNA

The Model 8208 Whip Antenna shown in Figure 1-5 provides performance equal to the Model 8206A Loop Antenna at a reduced cost. The Model 8208 may be used in field strengths of 50  $\mu\text{V}/\text{meter}$  or greater. The *Model 8208 contains a preamplifier* housed in a weather-proof enclosure. The preamplifier is powered by the receiver over the antenna coaxial cable. Model 8208 is 58.5 inches long and weighs 1.3 pounds.

## 1.5 ANTENNA LOCATION

The antenna should be mounted a minimum of 25 feet from the receiver to prevent regeneration. *The antenna MUST NOT be positioned next to the receiver or on top of it.* Doing so will cause the results obtained with the equipment to be meaningless even though the green lock lamp on the receiver front panel may be illuminated.

In system installations where more than one Spectracom antenna is used, a minimum separation of 10 feet between antennas is recommended (see photo 2).

*The antenna must be at least 3 feet from any steel beams, roof decking, pipes, etc.* (see Photo 1 and the text beneath it) *because metal will detune the antenna and can*

*cause as much as 20 dB degradation of the signal-to-noise ratio.*

**The antenna must NOT be mounted under a metal roof or inside a building with heavy steel structural supports because these shield the antenna from the signal. Rooftops are generally acceptable if a clear path toward Fort Collins is available without being blocked by a large steel structure.**

Attics are ideal sites if the roof and rafters are not metallic. The signal-to-noise ratio will be optimized if the antenna is located as far as possible from local RF noise sources such as TV sets, or fluorescent or neon lamps that blink or sputter on and off. Any equipment containing a switching power supply is a probable cause of interference.

## 1.6 ANTENNA INSTALLATION

Mount the antenna where it will not be disturbed. Antenna height is not critical because the 60-kHz signal is primarily a ground wave. Positioning the antenna 2 to 3 feet off the ground or rooftop is adequate. Each antenna includes a 2-foot mast assembly and two hose clamps to simplify installation. *The antenna SHOULD NOT BE MOUNTED near or under steel ice-bridges as shown in Photos 1 and 2 on the next page.*



PHOTO 1



PHOTO 2

The 8165 antenna(s) *should be* clear of any metal objects. Install the loop and/or whip antenna(s) at least 3 feet from any metal objects. When more than one Model 8165 is employed, space the associated antenna(s) at least 10 feet apart. The arrows in Photo 2 indicate insufficient spacing between the two antennas (measured 7 ft), (see text).

Spectracom offers an aluminum base (Model 8213) for installations where vent pipe mounting is not practical or desired.

#### NOTE

The Model 8206a is a directional antenna. Follow the instructions found on Figure 1-3 of the Model 8165 Manual to aim the antenna correctly.

#### NOTE

Handle the antenna with care. Dropping or rough handling may crack the ferrite core, possibly detuning the antenna, rendering it useless.

Spectracom recommends RG-58C/U coax for the antenna cable, though any 50-ohm coax with superior specifications may be used. The antenna coax is used to provide the antenna with its DC operating voltage and the receiver with the amplified WWVB signal. Because of low attenuation characteristics at 60 kHz and the very low power requirement of the antenna (10 mW), cable lengths up to 1,500 feet are possible if care is taken to avoid paralleling noise sources.

## 1.7 MODEL 8207 PREAMPLIFIER INSTALLATION

The Spectracom Model 8207 Preamplifier is a low noise, tuned, 60-kHz line amplifier used in the antenna feed line wherever the WWVB signal strength is less than 50  $\mu\text{V}/\text{meter}$  at the Model 8206 Loop Antenna or less than 0.4  $\mu\text{V}$  at the receiver antenna terminal. Typical locations where the preamplifier is required are Hawaii, Alaska, Puerto Rico, and the Canal Zone. Figure 1-2 shows the measured average signal strength for the contiguous 48 states. Atmospheric conditions may cause short-term degradation of field intensity. The Model 8207 Preamplifier provides approximately 40 dB of gain between the antenna and receiver, increasing sensitivity to 4.0 nanovolts.

The preamplifier is connected in the antenna feed line with INPUT connected to the antenna and OUTPUT connected to the receiver. Because of the high gain of the system, it is recommended that the preamplifier be located at least 10 feet away from the receiver. ***The antenna must be least 25 feet beyond the preamplifier.*** Switch A1S1 of the receiver RF Amplifier must be set at its right-hand position, marked PREAMP or P, prior to equipment turn-on, to apply DC voltage to the Model 8207 on the antenna feed line.

***If the preamplifier is removed from the system, the switch must be placed in the left-hand position, marked ANT or A prior to turn-on.***

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Printed in U.S.A.