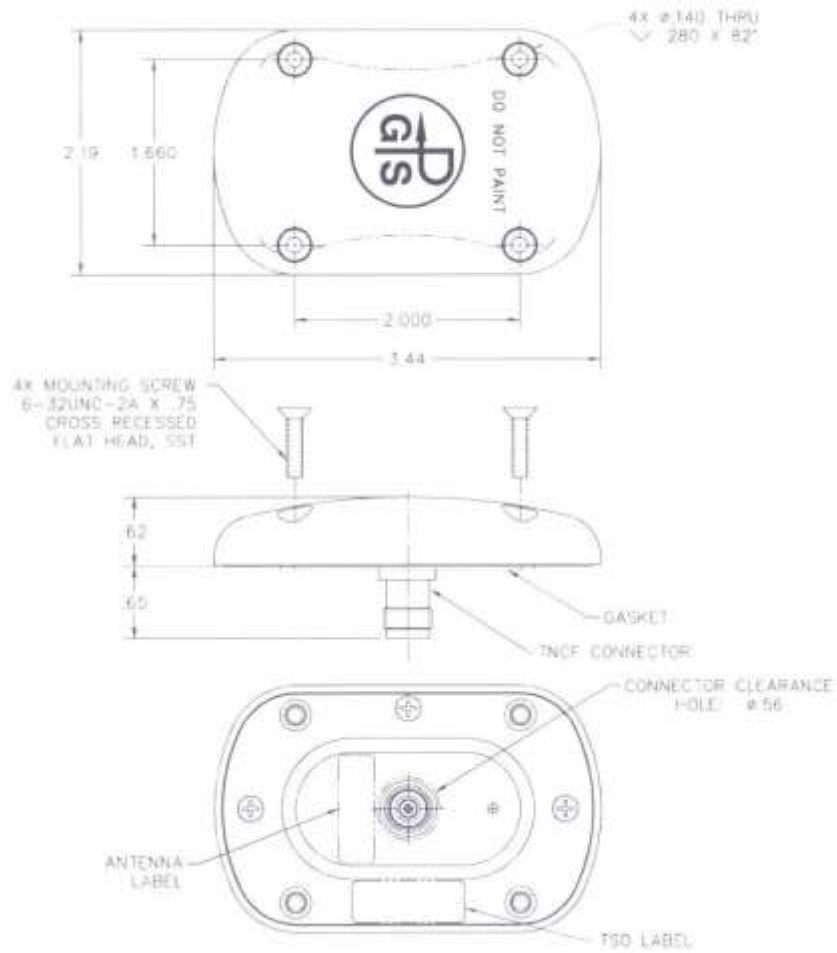


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Apollo[®] A-33 GPS Antenna Installation Manual

September 2002
560-0949-01 Rev A

UPS Aviation Technologies



1. Antenna Installation Considerations:
 - a. GPS signals are received by line of sight. The location chosen on the aircraft for placement of the GPS antenna will have a lot to do with the overall performance of the GPS sensor. The antenna MUST be located on the top of the aircraft. Typically, the best location is centerline as high and far forward as possible, just aft the windscreen.
 - b. Any 'shadowing' or signal shading from the aircraft will degrade the performance of the GPS receiver. Ideally, the antenna should have an unobstructed view of the sky from the horizon up. However, some shading is inevitable in most installations.
 - c. Choose a location to minimize the length of coax. Shorter coax length provides better signal strength available to the receiver. Coax cable loss not to exceed 7 dB. If SATCOM is installed, the GPS cable loss should be between 3 to 7 dB to insure proper interference rejection.
 - d. Avoid locations that would subject the antenna to build up of contamination from exhaust.
 - e. Install the antenna symmetrically on the airframe. This is especially important on metallic aircraft, as this affects the gain pattern of the antenna.
 - f. Select location to minimize effect from other antennas. Mount at least 2 feet from VHF Com transmitter antennas, at least 6 inches from other antennas emitting less than 25 watts, and at least 2 feet from higher power radio transmitting antennas. Follow installation spacing guidelines from other near by antennas.
 - g. Installation on helicopters can present unique installation problems. When selecting antenna placement, avoid exhaust areas, consider shadowing. One method to select antenna location is to compare signal strength between various locations by temporarily attaching antenna to various locations and compare signal strength. It is important to check with the rotors turning, as they can be a source of shadowing.
2. Coax Cable Selection Considerations
 - a. Because of high frequency and sensitivity to cable losses, use high quality coax and coax connectors, and minimize quantity of connectors and splices.
 - b. The type of coaxial cable is dependent on length required for installation. Select cable type so as not to exceed 7 dB cable loss. If SATCOM is installed, the GPS cable loss should be between 3 to 7 dB to insure proper interference rejection.
3. Installation Procedures:
 - a. Follow good avionics installation practices per FAA Advisory Circulars AC 43.13-1B, AC43.13-2A, and AC20-138, or later FAA approved revisions of these documents.
 - b. Supplies required for installation, but not provided:
 - (4) 5 flat washer
 - (4) 6-32 locking nuts (may be part of doubler plate or backing plate)
 - Silicone sealer or other aviation type sealer
 - c. Provide a stable mounting base for the antenna and provide clearance for the connector. Use a backing plate or doubler plate as required by the installation.
 - d. Insure a continuous contact between the antenna O ring seal and aircraft skin.
 - e. Use silicone sealer between the antenna and the aircraft skin. Use supplied four 6 stainless screws to secure antenna to aircraft, using silicone sealer to seal the screws.
 - f. When routing the coax, avoid sharp bends, kinking or placement near aircraft control, power DME, transponder or radio communications cables. Careful attention must be given when securing the coax to the airframe. Do not allow cable ties to crimp or crush the coax.
 - g. Check the antenna installation using the GPS receiver to insure adequate signal strength. Refer to GPS receiver installation manual.
4. Maintenance and Cleaning:
 - a. Occasionally clean and inspect the antenna. No other maintenance is required. Use mild detergent and water to clean antenna. Never use abrasive materials or harsh chemicals.
 - b. Do not apply paint to the antenna.
 - c. Occasionally inspect the antenna to ensure that the installation remains well sealed against moisture and the TNC connector remains free of corrosion.
 - d. If antenna should sustain damage, it cannot be repaired. Replace the antenna.
5. Limitations:

The conditions and test required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article either on or within a specific type or class of aircraft to determine that the article, when installed, performs in accordance with the design specifications that meet this TSO. The article may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the Administrator.

Environmental Qualifications

The A-33 antenna has been tested in the following environmental categories per procedures defined in RTCA DO-160D.

Environmental Qualification Form	
Manufacturer: Patch Antenna	Manufacturer: Aero Antenna Technology
Model No: A-33	Chatsworth, CA USA
Part No: 575-5 (990-1104)	
Conditions	Description of Conducted Tests
Temperature and Altitude	4.0 Equipment tested to Category F2
In-Flight Lines of Cooling	4.5.4 No cooling required
Temperature Variation	5.0 Equipment tested to Category A
Humidity	6.0 Equipment tested to Category B severe humidity environment, (more stringent than Category C)
Shock	7.0 Equipment tested to Category B
Operational Crash Safety	7.2
	7.3
Vibration	8.0 Equipment tested without shock mounts to Categories C, L, M, and Y
Exposure Processes	9.0 Equipment to Category X, no test required
Waterproofness	10.0 Equipment tested to Category S
Fluids Susceptibility	11.0 Equipment spray tested to Category F, with Trichloroethane (cleaning solvent), and Ethylene Glycol (ice-cing fluid)
Sand and Dust	12.0 Equipment identified as Category D, Blowing sand and dust
Fungus Resistance	13.0 Equipment identified as Category F, severe fungus resistance
Salt Spray	14.0 Equipment identified as Category Z, normal salt atmosphere
Magnetic Effect	15.0 Equipment is Class X, no test required
Power Input	16.0 Equipment is Category X, no test required. Antenna power supplied directly from GPS receiver
Voltage Spikes	17.0 Equipment is Category X, no test required. Antenna power supplied directly from GPS receiver
Audio Frequency Conducted Susceptibility- Power Input	18.0 Equipment is Category X, no test required. Antenna power supplied directly from GPS receiver
Induced Signal Susceptibility	19.0 Equipment is Category X, no test required
Radio Frequency Susceptibility	20.0 Equipment tested to Category P
Emission of Radio Frequency Energy	21.0 Equipment is Category X, no test required
Lightning Induced Transient Susceptibility	22.0 Equipment tested to Category A3
Lightning Direct Effects	23.0 Equipment identified as Category 2A
Iceing	24.0 Equipment tested to Category C with an ice thickness of 0.090 inch
Electrostatic Discharge	25.0 Equipment is Category X, no test required

Specifications

Frequency:	1575 MHz
Polarization:	Right Hand Circular
Axial Ratio:	3 dB Max at bore site
Radiation Coverage:	Elevation Angle
	>15° -2.0 dBic
	10° -3.0 dBic
	5° -4.5 dBic
	0° -7.5 dBic
Minimum Gain	
Finish:	Polyurethane Enamel
Weight:	3.9 oz. (0.11 kg)
Height:	0.61 inches (1.55 cm)
Operating Temperature:	55°C to +85°C
Operating Altitude:	55,000 feet (16,764m) max.
Amplifier:	
Noise Figure:	2.5 dB Max
Impedance:	50 ohms
VSWR (Dry):	< 1.5:1
VSWR (Rain):	< 2.0:1
Band Rejection:	35 dB
Power Handling:	1 Watt
Voltage:	5 VDC ±10%
Current:	35 mA nominal, 40 mA max.
TSO:	TSO-C144