

# **GA 35S Antenna Installation Manual**



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### **AVIATION LIMITED WARRANTY**

GA 35S warranty information is available at [garmin.com/aviationwarranty](http://garmin.com/aviationwarranty).

### **RECORD OF REVISIONS**

Revision	Revision Date	Description
1	01/30/23	Initial Release
2	04/02/24	Updated Mounting Requirements info
3	07/16/24	Added Antenna Specifications section

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## CURRENT REVISION DESCRIPTION

Revision	Page Number	Section Number	Description of Change
3	1-7	<a href="#">1.5.4</a>	Added Antenna Specifications section

## DEFINITIONS OF WARNINGS, CAUTIONS, AND NOTES



### **WARNING**

*A warning means injury or death is possible if the instructions are not obeyed.*



### **CAUTION**

*A caution means that damage to the equipment is possible.*



### **NOTE**

*A note gives more information.*



### **WARNING**

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## TABLE OF CONTENTS

PARAGRAPH	PAGE
<b>Section 1 Declaration of Design and Performance .....</b>	<b>1-1</b>
1.1 Introduction.....	1-1
1.2 Description and Identification .....	1-1
1.3 Certification Statement .....	1-3
1.4 Interface Summary.....	1-5
1.5 Performance Technical Specifications.....	1-6
1.6 Limitations .....	1-7
1.7 Operating Instructions.....	1-7
1.8 License Requirements .....	1-7
 <b>Section 2 Installation Overview .....</b>	 <b>2-1</b>
2.1 Introduction.....	2-1
2.2 Special Tools Required .....	2-1
2.3 Cabling and Wiring.....	2-1
2.4 Shielding and Electrical Bonding Considerations .....	2-1
2.5 Cooling Requirements or Considerations .....	2-1
2.6 Mounting Requirements .....	2-1
 <b>Section 3 Installation Procedure.....</b>	 <b>3-1</b>
3.1 Unpacking Unit.....	3-1
3.2 Wiring Harness Installation .....	3-1
3.3 Backshell Assemblies .....	3-1
3.4 Coax Cable Installation.....	3-1
3.5 Antenna Installation.....	3-1
3.6 Antenna Doubler .....	3-5
3.7 Antenna Grounding.....	3-5
3.8 Antenna Installation.....	3-6
3.9 Installation Approval .....	3-6
 <b>Section 4 Post Installation Configuration &amp; Checkout.....</b>	 <b>4-1</b>
4.1 Mounting, Wiring, and Power Checks.....	4-1
4.2 Configuration Setup .....	4-1
4.3 Diagnostic Information .....	4-1
4.4 Ground Checks .....	4-1
4.5 Software Loading Procedure .....	4-1
 <b>Section 5 Continued Airworthiness.....</b>	 <b>5-1</b>

<b>Section 6 Connector Pinout Information.....</b>	<b>6-1</b>
6.1 Pin Function List.....	6-1
<b>Appendix A Outline and Installation Drawings .....</b>	<b>A-1</b>
<b>Appendix B Interconnect Drawings.....</b>	<b>B-1</b>

# 1 DECLARATION OF DESIGN AND PERFORMANCE

## 1.1 Introduction

This manual is intended to provide mechanical and electrical information for use in the planning and design of an installation of the GA 35S into an aircraft. This manual is not a substitute for an approved airframe-specific maintenance manual, installation design drawing, or complete installation data package. Attempting to install equipment by reference to this manual alone and without first planning or designing an installation specific to your aircraft may compromise your safety and is not recommended. The content of this manual assumes use by competent and qualified avionics engineering personnel and/or avionics installation specialists using standard aviation maintenance practices in accordance with Title 14 of the Code of Federal Regulations and other relevant accepted practices. This manual is not intended for use by individuals who do not possess the competencies and abilities set forth above.



### NOTE

*Garmin recommends installation of the GA 35S by a Garmin-authorized installer. To the extent allowable by law, Garmin will not be liable for damages resulting from improper or negligent installation of the GA 35S. For questions, please contact Garmin Aviation Product Support at 1-888-606-5482.*

## 1.2 Description and Identification

The GA 35S antenna includes a GPS/WAAS antenna. The coax cable interface to the receiving equipment provides both power to the antenna preamp from the receiving equipment and signal back to the receiving equipment. For receiving equipment compatibility, refer to the receiving equipment installation manual.

Figure 1-1 is an outline drawing of the GA 35S.



**Figure 1-1 GA 35S**

### 1.2.1 Unit Identification

The GA 35S can be identified by the part numbers listed in Table 1-1.

**Table 1-1 GA 35S Unit Identification**

API	Marketing Label	Garmin P/N (Unit Only)	Garmin P/N (Shipping Level)
GMN-12853	GA 35S	011-05754-00	010-02639-00

### 1.2.2 Accessories

Each of the following accessories are provided separately from the GA 35S.

**Table 1-2 Equipment Available**

Item	Garmin P/N
Install Kit, GA 35S	011-05759-00

**Table 1-3 Contents of GA 35S Installation Kit (011-05759-00)**

Item	Garmin P/N	Quantity
Screw, 8-32x1.00, PHP, SS/P	211-60209-20	4
O-ring, AS568-118, 70 Durometer, Nitrile	251-20118-00	1

### 1.2.3 Physical Characteristics

**Table 1-4 GA 35S Unit (see [Figure A-1](#))**

Characteristic	Specification
Width	3.34 inches (84.8 mm)
Height (above mounting surface)	1.00 inches (25.4 mm)
Depth	4.71 inches (119.6 mm)
Weight	0.52 lbs (0.24 kg)



## 1.2.4 Mod Level History

Table 1-5 identifies hardware modification (Mod) Levels for the GA 35S. Mod Levels are listed with the associated service bulletin number, service bulletin date, and the purpose of the modification. The table is current at the time of publication of this manual (see date on front cover) and is subject to change without notice. Authorized Garmin Sales and Service Centers are encouraged to access the most up-to-date bulletin and advisory information on the Garmin Dealer Resource web site at [www.garmin.com](http://www.garmin.com) using their Garmin-provided user name and password.

**Table 1-5 MOD Level History**

Applicable LRU Part Number	MOD Level	Service Bulletin Number & Date	Purpose of Modification
011-05754-00	N/A	N/A	N/A

## 1.3 Certification Statement

The GA 35S has been shown to meet compliance with the claimed TSO(s) when interfaced with the equipment defined in this installation manual, and installed in accordance with the requirements and limitations as defined in this installation manual.

The installer must verify that non-Garmin devices to be interfaced meet the installation requirements identified in this manual to assure the installed system will comply with the Garmin TSO/ETSO Authorization. Garmin installation requirements will usually specify the interfaced device has appropriate TSO/ETSO authorization, and in some cases, such as for TSO-C190 antennas, may also require the non-Garmin device meet additional Garmin specifications.

The conditions and tests required for TSO approval of this article are minimum performance standards. Those installing this article either on or within a specific type or class of aircraft must verify that aircraft installation conditions are within the TSO standards which include any accepted integrated non-TSO functions. TSO articles and any accepted integrated non-TSO function(s) must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR part 43 or the applicable airworthiness requirements. This is an incomplete system intended to provide GPS/WAAS data functions.

In accordance with the Bilateral Oversight Board, Decision 006, for the Agreement Between the United States of America and the European Union on Cooperation in the Regulation of Civil Aviation Safety, the FAA TSO authorization makes this an approved article within the respective EASA system. This article was tested to additional standards (see [Section 1.3.4](#)) that may demonstrate additional airworthiness specification performance standards required by the European Aviation Safety Agency (EASA).

The Appliance Project Identifier (API) for the GA 35S is GMN-12853. The API has been used for project identification with the FAA and EASA.

### 1.3.1 GA 35S TSO Compliance



#### NOTE

*The availability of some TSO functions listed below depends on configuration. Refer to [Section 4](#) for instructions on configuration. TSOs listed in this section may require configuration. Coordinate with the applicable Garmin Program Manager to make sure the TSO functionality appropriate to your installation is enabled.*

**Table 1-6 GA 35S (011-05754-00) TSO Compliance**

TSO/MOPS*	Function Design	Class/Type	System SW Part Numbers	Boot Block SW Part Numbers	CLD Part Numbers
TSO-C190	Active GNSS Antenna	N/A	N/A	N/A	N/A

\*The Minimum Performance Standards in this table are the conditions and tests used to achieve FAA TSO authorization. See [Section 1.3.4](#) for additional standards.

### 1.3.2 TSO/ETSO Deviations

**Table 1-7 GA 35S (011-05754-00) Standard TSO Deviations**

TSO	Deviation
TSO-C190	Garmin has been granted a deviation to use RTCA/DO-160F as the standard for Environmental Qualification and Test Procedures of Airborne Equipment.

### 1.3.3 Non-TSO Functions

The GA 35S has no non-TSO functions.

### 1.3.4 Additional Standards

The GA 35S has no Additional Standards.

The conditions and tests required for approval of this article are minimum performance standards. Those installing this article either on or within a specific type or class of aircraft must verify that aircraft installation conditions are within the standards which include any accepted integrated functions not specified by the standard. Articles approved with 14 CFR part 21.8(d) and any accepted integrated function(s) not specified in the standard must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR part 43 or the applicable airworthiness requirements.

### 1.3.5 Design Assurance Levels

**Table 1-8 Design Assurance Levels**

Characteristic	Specification
Environmental	RTCA/DO-160F (for more details refer to the Environmental Qualification Form)

### 1.3.6 Database

For information on certification compliance for databases, refer to Garmin Document P/N 190-01999-00 posted at [flyGarmin.com](http://flyGarmin.com)®.

## 1.4 Interface Summary

The GA 35S antenna interfaces through a single TNC connector.

## 1.5 Performance Technical Specifications

### 1.5.1 Environmental Qualification Form Reference

It is the responsibility of the installing agency to obtain the latest revision of the GA 35S Environmental Qualification Form. This form is available directly from Garmin under the following part number:

GA 3XS Environmental Qualification Form, Garmin part number 005-01217-00

To obtain a copy of this form, see the dealer/OEM portion of the Garmin web site ([www.garmin.com](http://www.garmin.com)).

### 1.5.2 General Specifications

Table 1-9 contains general specifications. For detailed environmental specifications, see the Environmental Qualification Form (Section 1.5.1).

**Table 1-9 General Specifications**

Characteristics	Specifications
Operating Temperature Range	-55°C to +70°C
Humidity	DO-160F, Section 6, Cat B
Altitude Range	55,000 ft
Environmental Compliance	DO-160F

### 1.5.3 Power Specifications

**Table 1-10 Input Voltage**

Characteristic	Specification
Input Voltage	4.5-14.4 Vdc See the Environmental Qualification Form for details on surge ratings and minimum/maximum operating voltages.

**Table 1-11 Current Specifications**

Unit Status	Max Current @ 5 Vdc
Off	0.01 A
On	0.06 A

### 1.5.4 Antenna Specifications

The GA 35S meets Garmin's GPS/WAAS antenna specifications as documented in *"Antenna Minimum Performance Specifications for Garmin's GPS/WAAS Receiver system"* (004-00287-00, rev 8 or later).



#### NOTE

*004-00287-00 is an internal Garmin document that is not available from the Garmin Dealer Resource Center; contact Garmin for special circumstances regarding distribution.*

### 1.6 Limitations

This article meets the minimum performance and quality control standards required by a technical standard order (TSO). Installation of this article requires separate approval.

### 1.7 Operating Instructions

The GA 35S is a remote-mount antenna with no user controls or indicators. All user interface is accomplished through a compatible display and/or interface device. Loss of antenna function is communicated to the pilot by system messages. Upon system start, the absence of GPS system failure messages indicate the GA 35S is fully operational. There are no further GA 35S specific operational procedures.

For GX000 installations, refer to the applicable airframe specific pilot documentation for instructions on [www.garmin.com](http://www.garmin.com).

### 1.8 License Requirements

There are no license requirements applicable to the GA 35S.

## 2 INSTALLATION OVERVIEW

### 2.1 Introduction

This section provides the equipment information for installing the GA 35S and related optional accessories. Installation of the GA 35S must follow the data detailed in this manual. Cabling is typically fabricated by the installing agency to fit each particular aircraft. Always follow acceptable avionics installation practices per advisory circulars AC 43.13-1B and AC 43.13-2B or later FAA approved revisions.

### 2.2 Special Tools Required

No special tools are required for the GA 35S installation.

### 2.3 Cabling and Wiring

Wiring must be installed in accordance with AC 43.13-1B Chapter 11, Sections 8 through 13. The following issues must be addressed:

- Do not expose cabling and wiring to chafing
- Do not route cabling and wiring harnesses near flight cables
- Do not route cabling and wiring near high-energy sources. (e.g. DC motors, high heat sources)
- Wiring indicated as shielded in Appendix B must be shielded
- Pigtail lengths must be less than 3.0 inches.

### 2.4 Shielding and Electrical Bonding Considerations

See notes in [Figure A-1](#).

### 2.5 Cooling Requirements or Considerations

The GA 35S has no cooling requirements or considerations.

### 2.6 Mounting Requirements

The GA 35S mounting surface should be capable of providing a sufficient electrical bond to the aircraft to minimize radiated EMI and provide protection from High-Intensity Radiation Fields (HIRF).

The antenna should be attached to a metal ground plane (aircraft skin or fine conductive mesh) with conductive surface to a minimum radius of 7.5 inches [190.5 mm] from antenna. All other transmit antennas, in particular L-band and UHF, should be located at least 22.5 inches [571 mm] from antenna to avoid coupling.

Fabricate and install a doubler plate as required to comply with applicable airworthiness regulations.

GA 35S mounting holes for #8 Panhead screw (4 places).

## **3 INSTALLATION PROCEDURE**

### **3.1 Unpacking Unit**

Carefully unpack the equipment and make a visual inspection of the unit for evidence of damage incurred during shipment. If the unit is damaged, notify the carrier and file a claim. To justify a claim, save the original shipping container and all packing materials. Do not return the unit to Garmin until the carrier has authorized the claim. Retain the original shipping containers for storage. If the original containers are not available, a separate cardboard container should be prepared that is large enough to accommodate sufficient packing material to prevent movement.

### **3.2 Wiring Harness Installation**

This document does not include installation instructions for the antenna coax cable or troubleshooting information. Refer to the receiving equipment installation manual for antenna coax installation considerations and troubleshooting information.

### **3.3 Backshell Assemblies**

No backshell assemblies are used or needed for GA 35S antenna installation.

### **3.4 Coax Cable Installation**

Refer to the TNC connector manufacturer for assembly installations.

### **3.5 Antenna Installation**

#### **3.5.1 Introduction**

This section provides equipment and hardware information for installing the desired antenna. Installation of any antenna should follow the aircraft TC or STC requirements. For technical information on a specific antenna, refer to the respective drawings as listed in [Figure A-1](#).

#### **3.5.2 Antenna Mounting Location**

When choosing a location for the antenna, the coax routing distance from the existing or planned location of the receiver to the proposed antenna location should be considered. The receiver installation manual should include information that can be used to check whether the planned coax routing distance will support intended receiver signal gain and loss requirements.

#### **3.5.3 Placement of Antenna for Lightning Protection**

Antennas should be installed in an aircraft lightning zone that matches their qualifications. The DO-160 Section 23 qualifications of the antennas support installation in Lightning Zones 1B, 1C, 2A or 3. This typically places the antenna at least 51.2 inches (1.3 meters) aft of the aircraft nose. The exact distances are provided by the lightning zones identified for each aircraft. Antennas should not be installed in fuel bay areas where the fasteners or antenna stud penetrate the wet or dry fuel bay.

### 3.5.4 GPS/WAAS Antennas

The GPS antenna is a key element in the overall system performance and integrity for a GPS/WAAS navigation system. The mounting location, geometry, and surroundings of the antenna can affect the system performance and/or availability. The following guidance provides information to aid the installer in ensuring the optimum location is selected for the installation of the GPS antenna. The installation guidelines presented here meet the intent of AC 20-138A section 16. The greater the variance from these guidelines, the greater the chance of decreased antenna performance. Approach procedures with vertical guidance are the most sensitive to these effects. LNAV only approaches, terminal operations, and enroute operations may also be affected. Because meeting all of these installations guidelines may not be possible on all aircraft, these guidelines are listed in order of importance to achieve optimum performance. Items 3a, 3b, and 3c below are of equal importance and their significance may depend on the aircraft installation. The installer should use their best judgment to balance the installation guidelines. [Figure 3-1](#) shows the recommended placement of antennas.

1. Mount the antenna as close to level as possible with respect to the normal cruise flight attitude of the aircraft. If the normal flight attitude is not known, substitute with the waterline, which is typically referenced as level while performing a weight and balance check.
2. The GPS antenna should be mounted in a location to minimize the effects of airframe shadowing during typical maneuvers. Typically mounting farther away from the tail section reduces signal blockage seen by the GPS antenna
3. Mounting location considerations in regard to proximity of other antenna(s):
  - a) The GPS antenna should be mounted no closer than two feet from any VHF COM antenna or any other antenna which may emit harmonic interference at the L1 frequency of 1575.42 MHz. An aircraft EMC check (reference VHF COM interference check in Post Installation Checkout procedures for the GPS receiver installation) can verify the degradation of GPS in the presence of interference signals. If an EMC check reveals unacceptable interference, insert a GPS notch filter in line with the offending VHF COM or the (re-radiating) ELT transmitter.



#### NOTE

*This check can only be performed if a GPS receiver exists on the aircraft or one is being installed.*



#### NOTE

*When mounting a combination antenna, the recommended distance of two feet or more is not applicable to the distance between the antenna elements in a combination antenna (ex. GPS and SiriusXM) provided the combination antenna is TSO authorized and has been tested to meet Garmin's minimum performance standards.*

- b) The GPS antenna should be mounted no closer than two feet from any antennas emitting more than 25 watts of power. An aircraft EMC check can verify the degradation of GPS in the presence of interference signals.
  - c) To achieve the best possible low-elevation antenna gain (by minimizing pattern degradation due to shadowing and near-field interaction), the GPS antenna shall be mounted with clearance from other antennas, including passive antennas such as another GPS antenna or SiriusXM antenna. When practical, installers should use 12 inch center-to-center spacing between antennas. If 12 inch spacing is not practical use a maximum center-to-center



spacing from adjacent antennas, but never less than 9 inch center-to-center spacing. Spacing less than 9 inches center-to-center results in unacceptable GPS/WAAS antenna pattern degradation.

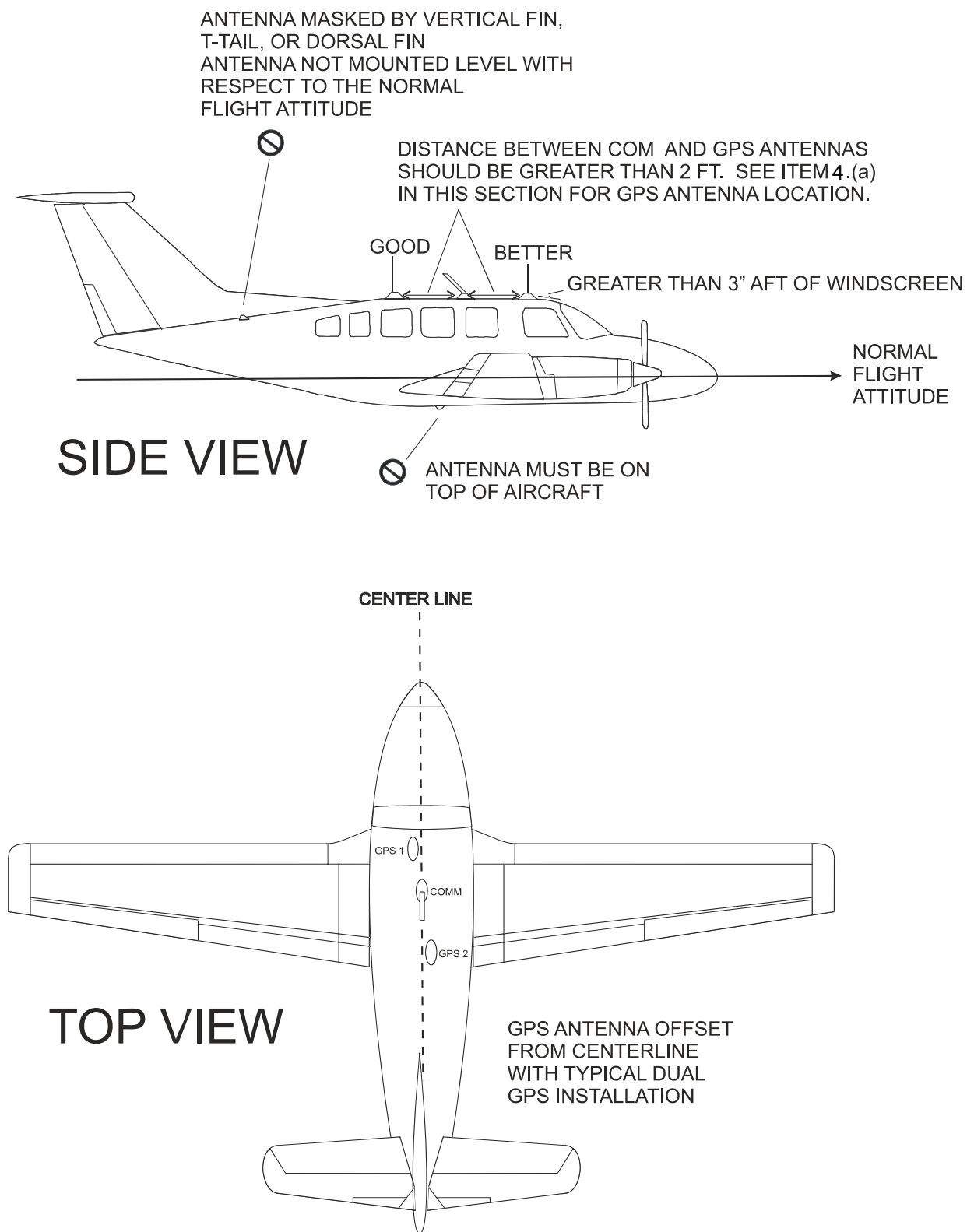
4. To limit degradation by windscreen effects, avoid mounting the antenna closer than 3 inches from the windscreen.



#### **NOTE**

*Antennas on certain airplanes with a maximum speed over 250 KIAS should be installed at least 24 inches aft of the windscreen, unless another location has been certified.*

5. For multiple GPS installations, the antennas should not be mounted in a straight line from the front to the rear of the fuselage to prevent a lightning strike from damaging both antennas. Also varying the mounting location will help minimize any aircraft shading by the wings or tail section (in a particular azimuth, when one antenna is blocked the other antenna may have a clear view).



**Figure 3-1 GPS Antenna Installation Considerations**

### 3.6 Antenna Doubler

The installation of an antenna doubler is essential to maintain structural integrity of the antenna installation. Some aircraft may have existing provisions for an antenna, such as a doubler (permanently attached to the skin) or backing plate (removable). If the aircraft is not equipped with antenna mounting provisions, refer to AC 43.13-2( ) for guidance on manufacturing and installing doublers. Note that design features of the aircraft, such as pressurization, may require FAA approved installation design and substantiating data.

Refer to the 'Dealer Resource Center' portion of the Garmin website, [www.garmin.com](http://www.garmin.com), to obtain a copy of STC SA02018SE-D.

### 3.7 Antenna Grounding

Antenna grounding is necessary for optimum antenna performance. The antenna performance is also dependent on the size of the ground plane. The aircraft skin provides the appropriate ground plane in metallic aircraft for antenna performance and lightning protection. Additional guidance is provided below.

#### 3.7.1 Ground Plane

For optimum antenna performance, a metallic ground plane or skin sized at least 7.5 inches beyond the perimeter of the antenna is recommended. If ground plane is added to the aircraft, round its edges to be as circular as practical for best performance.

#### 3.7.2 Electrical Bonding

It is important the antenna baseplate is electrically bonded to the aircraft ground plane. Refer to SAE ARP 1870 section 5 when surface preparation is required to achieve electrical bond. The electrical bond should achieve direct current (DC) resistance less than or equal to 2.5 milliohms to structure local to where the equipment is mounted. Measure the electrical bonding resistance using a calibrated milliohm meter. An equivalent OEM procedure may also be substituted.

Typically it is not necessary to remove paint under the footprint of the antenna on the metal skin of the aircraft to achieve a good electrical bond. The painted surface prevents corrosion and should be left intact if possible. If paint removal is necessary for bonding, be careful to avoid excessive chipping or cracking beyond the antenna baseplate, to prevent corrosion. The resistance of 2.5 milliohms can usually be achieved through the antenna mounting screws which attach to the antenna doubler.

To measure the antenna bonding resistance, perform the following steps:

1. Disconnect coaxial cable(s) from the antenna connector(s).
2. Measure the resistance between the antenna connector body and a nearby exposed portion of conductive aircraft structure (e.g. a nearby exposed rivet on fuselage stringer).
3. The measured resistance should be equal to or less than 2.5 milliohms.

### 3.8 Antenna Installation

Refer to the aircraft manufacturer's specifications and AC 43.13-2B, Chapter 3 for appropriate guidance on antenna installation.

1. Refer to Appendix A for the appropriate mounting cutout. Drill or punch the mounting holes as necessary.
2. Install a doubler plate to reinforce the aircraft skin, as necessary.
3. Secure the O-ring in the O-ring groove on the underside of the antenna.
4. Place antenna over mounting holes, using the four screw holes to align the antenna. Insert the supplied four screws.
5. Washers and locking nuts (not provided, may be part of doubler plate) are required to secure the antenna. Using the supplied screws or equivalent, torque should be evenly applied across all mounting screws to avoid deformation of the mounting area. Do not over tighten screws.

**Table 3-1 Antenna Mounting Torque Specification**

Antenna	Mounting Screws	Torque Specification
GA 35S	See <a href="#">Figure A-1</a>	12 – 15 inch-pounds

6. Make sure the antenna is electrically bonded as described in [Section 2.4](#)
7. Seal the antenna to the fuselage using a good quality electrical grade sealant. Run a bead of the sealant along the edge of the antenna where it meets the exterior aircraft skin. Use caution to make sure the antenna connector is not contaminated with sealant.



#### **CAUTION**

*Do not use construction grade RTV sealant or sealants containing acetic acid. These sealants may damage the electrical connections to the antenna. Use of these type sealants may void the antenna warranty.*

### 3.9 Installation Approval

Installation of any antenna should follow the aircraft TC or STC requirements.

## **4 POST INSTALLATION CONFIGURATION & CHECKOUT**

The PFD serves as the graphics user interface to the installer configuring the system. For actual aircraft installation/checkout, use only aircraft manufacturer approved checkout procedures.

### **4.1 Mounting, Wiring, and Power Checks**

Verify all cables are properly secured and shields are connected to the shield block of the connectors. Check the movement of the flight and engine controls to verify there is no interference between the cabling and control systems. Verify all wiring is installed as described in this manual. Before installing and applying power to the GA 35S, the wiring harness must be checked for proper connections to the aircraft systems and other avionics equipment. Point to Point continuity must be checked to expose any faults such as shorting to ground or wiring discrepancies. Any faults or discrepancies must be corrected before proceeding. After accomplishing a continuity check, perform power and ground checks to verify proper power distribution to the GA 35S. Any faults or discrepancies must be corrected at this time. The GA 35S can be installed after completion of the continuity and power checks.

### **4.2 Configuration Setup**

Refer to the applicable airframe specific maintenance manual.

### **4.3 Diagnostic Information**

Refer to the applicable airframe specific maintenance manual.

### **4.4 Ground Checks**

Refer to the applicable airframe specific maintenance manual.

### **4.5 Software Loading Procedure**

The GA 35S antenna does not use or load any operating software.

## **5 CONTINUED AIRWORTHINESS**

Maintenance of the GA 35S is “on condition” only. For regulatory periodic functional checks, refer to approved aircraft maintenance manuals or manual supplements for actual aircraft maintenance requirements.

## 6 CONNECTOR PINOUT INFORMATION

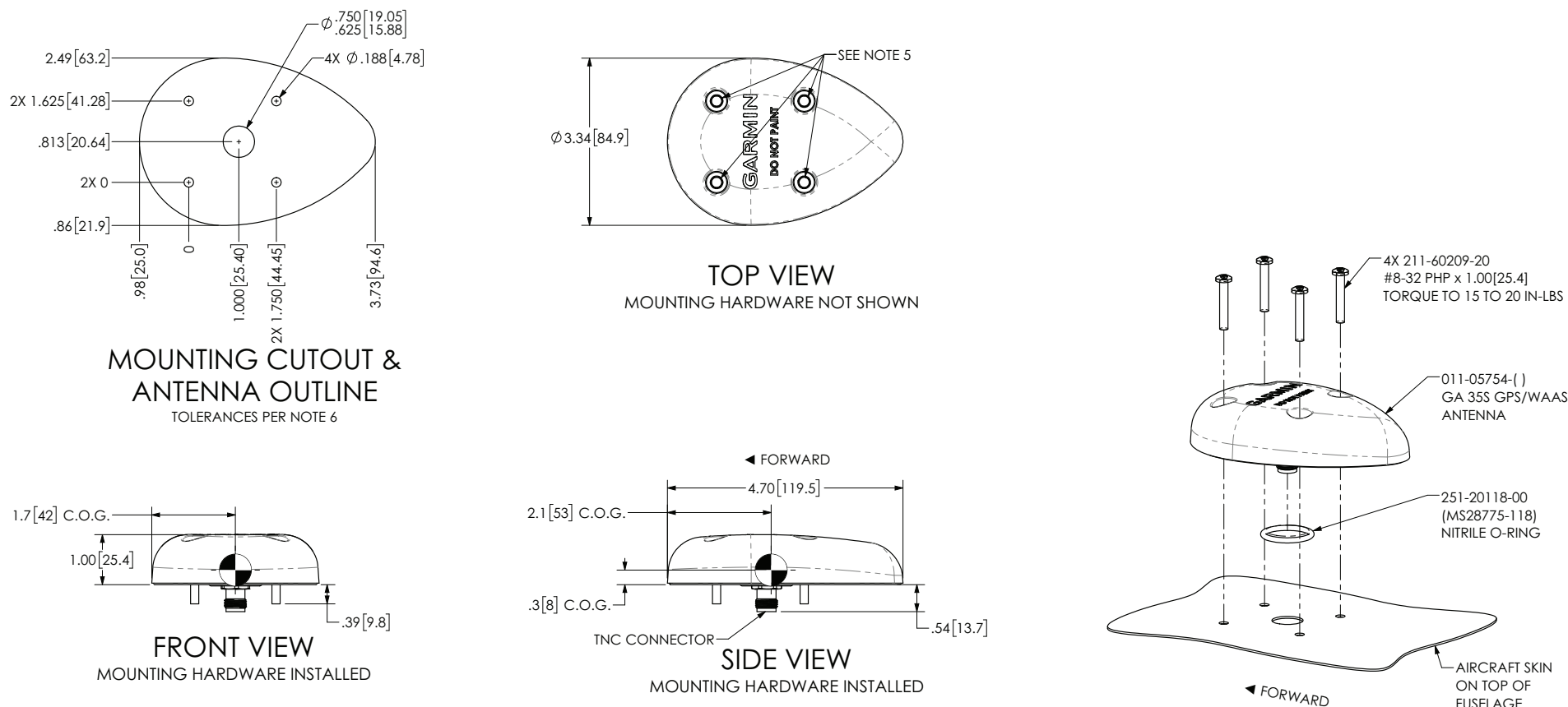
### 6.1 Pin Function List

#### 6.1.1 TNC Connector



**Figure 6-1. View of TNC Connector Looking From Front Of Antenna.**

## APPENDIX A OUTLINE AND INSTALLATION DRAWINGS



### NOTES:

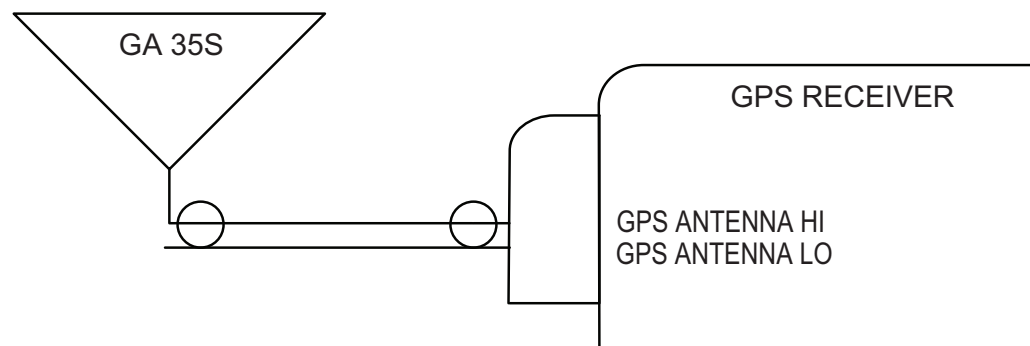
1. DIMENSIONS: INCHES [mm]. METRIC VALUES ARE FOR REFERENCE ONLY.
2. DIMENSIONS ARE NOMINAL AND TOLERANCES ARE NOT IMPLIED UNLESS SPECIFICALLY STATED.
3. THE ANTENNA SHOULD BE ATTACHED TO A METAL GROUND PLANE (AIRCRAFT SKIN OR FINE CONDUCTIVE MESH), WITH CONDUCTIVE SURFACE TO A MINIMUM RADIUS OF 7.5[191] FROM ANTENNA. ALL TRANSMIT ANTENNAS, IN PARTICULAR L-BAND AND UHF, SHOULD BE LOCATED AT LEAST 22.5[571] FROM ANTENNA TO AVOID COUPLING.
4. FABRICATE AND INSTALL A DOUBLER PLATE AS REQUIRED TO COMPLY WITH APPLICABLE AIRWORTHINESS REGULATIONS.
5. MOUNTING HOLES FOR #8 PANHEAD SCREWS (4 PLACES).
6. TOLERANCES FOR MOUNTING CUTOUT:
 

INCH	mm
.XX±.02	REFERENCE ONLY
.XXX±.010	REFERENCE ONLY

**Figure A-1 GA 35S Outline and Installation Drawing**



## APPENDIX B INTERCONNECT DRAWINGS



**Figure B-1 GA 35S Example Interconnect**

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