GTX 335 w/GPS

Installation Guidance
From STC SA01714WI

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DEFINITIONS OF WARNINGS, CAUTIONS, AND NOTES

WARNING

*A **Warning** means that injury or death is possible if the instructions are not followed.*

CAUTION

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

NOTE

*A **Note** provides more information.*

WARNING

This product, its packaging, and its components contain chemicals known to the State of California to cause cancer, birth defects, or reproductive harm. This notice is being provided in accordance with California's Proposition 65. If you have any questions or would like more information, please refer to our website at www.garmin.com/prop65.

WARNING

Perchlorate Material – special handling may apply.
Refer to www.dtsc.ca.gov/hazardouswaste/perchlorate.

CAUTION

The GTX 335 has a special anti-reflective coated display that is sensitive to waxes and abrasive cleaners. CLEANERS THAT HAVE AMMONIA WILL CAUSE DAMAGE TO THE ANTI-REFLECTIVE COATING. Clean the display with a clean, lint-free cloth and a cleaner that is safe for anti-reflective coatings.

NOTE

All screen shots used in this document are current at the time of publication. Screen shots are intended to provide visual reference only. All information depicted in screen shots, such as software file names, versions, and part numbers, is subject to change and may not be up to date.

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1 GENERAL DESCRIPTION

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1.1 Introduction

Install the panel mount GTX 335 with GPS as a minor alteration in accordance with FAA Memorandum Installation Approval for ADS-B OUT Systems or FAA Notice 8900.362 *Policy for Installation of ADS-B OUT Systems* using the data in this installation guidance manual. Installation in accordance with the FAA Policy Memo only pertains to the GTX 335 with GPS and limited interfaces contained herein.

This installation guidance is comprised of excerpts from the FAA approved GTX 3XX Part 23 AML STC. If you choose to apply the STC to the aircraft or cover additional interfaces other than the data provided herein, the panel mount GTX 335 with GPS must be installed in accordance with the complete version of the Part 23 AML STC installation manual. The additional data must be requested through the Garmin dealer supplying the equipment.

STC SA01714WI approves a Version 2 (RTCA DO-260B) ADS-B Out compliant solution, meeting equipment requirements defined in 14 CFR 91.227, using GTX 335 transponders for the Part 23 aircraft listed on the STC Approved Model List (AML).

Refer to the GTX 33X and GTX 3X5 ADS-B AML STC Equipment List for required hardware and software configuration.

1.2 Terminology

ADS-B refers to Version 2 ADS-B Out.

References to metallic aircraft in this manual are those with an aluminum skin. Nonmetallic aircraft refers to all other aircraft (e.g., wooden aircraft, aircraft with composite skin, or aircraft with tube and fabric construction).

The term squitter refers to a broadcast of aircraft-tracking data that is transmitted periodically by a Mode S transponder without interrogation from a controller's radar.

Installation Guidance Abbreviations

AC	Advisory Circular
ADC	Air Data Computer
ADLP	Airborne Data Link Processor
ADS-B	Automatic Dependent Surveillance - Broadcast
AFM	Airplane Flight Manual
AFMS	Airplane Flight Manual Supplement
AHRS	Attitude Heading Reference System
AML	Approved Model List
ATC	Air Traffic Control
ATCRBS	Air Traffic Control Radar Beacon System
CFR	Code of Federal Regulations
CSA	Conflict Situational Awareness
EFIS	Electronic Flight Instrument System
EGNOS	European Geostationary Navigation Overlay Service
EGPWS	Enhanced Ground-Proximity Warning System
ELA	Electrical Load Analysis
ELT	Emergency Locator Transmitter
EMC	Electromagnetic Compatibility

EMI	Electromagnetic Interference
ES	Extended Squitter
EQF	Environmental Qualification Form
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
GAE	Garmin Altitude Encoder
GDU	Garmin Display Unit
GNS	Garmin Navigation System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GTN	Garmin Touch Navigator
GTX	Garmin Transponder
HIRF	High Intensity Radio Field
IEL	Indirect Effects of Lightning
IM	Installation Manual
LRU	Line Replaceable Unit
MM	Maintenance Manual
OAT	Outside Air Temperature
OEM	Original Equipment Manufacturer
PED	Portable Electronic Device
POH	Pilot Operating Handbook
RF	Radio Frequency
RTCA	Radio Technical Commission for Aeronautics
SBAS	Satellite Based Augmentation Systems
SPI	Special Position Identification
SRM	Structural Repair Manual
STC	Supplemental Type Certificate
TAS	Traffic Advisory System
TC	Type Certificate
TCAS	Traffic Alert and Collision Avoidance System
TIS	Traffic Information Service
TSO	Technical Standard Order
UAT	Universal Access Transceiver
USB	Universal Serial Bus
WAAS	Wide Area Augmentation System

1.3 Scope

This installation manual provides information for installing a panel mount GTX 335 with GPS unit with ADS-B Out. Interfaces not required for ADS-B functionality, do not require STC approval such as optional discrete inputs. These parts are included in this manual as reference only.

All makes and models of airplanes on the AML are applicable. The installer must determine aircraft applicability before modifying any Type Certified aircraft to make sure this STC is met.

1.3.1 Approved Aircraft, Systems, and Equipment

This installation guidance manual is applicable to the modification of an aircraft in the Part 23 AML STC SA01714WI to install the equipment in table 1-1.

Table 1-1 GTX 335 Unit List

Unit	Description	P/N
GTX 335 GPS	Black front, panel mounted, extended squitter with internal GPS source	011-03300-40
GAE	Altitude Encoder, Garmin (GAE)	011-03080-00

1.4 System Overview

ADS-B technology improves situational awareness and flight safety. A Garmin transponder with ADS-B Out functions automatically transmit position, velocity, and heading information to other aircraft and ground stations. The air traffic control system uses transponder requests for appropriate aircraft information. ADS-B Out gives automatic transmission of aircraft information without a request.

The GTX 335 transponders have an optional Garmin Altitude Encoder (GAE) to meet the required barometric pressure altitude source and the internal GPS/SBAS source that meets the required GNSS position source integrity for ADS-B Out.

The GTX 335 transponders have a radio transmitter/receiver that operates on L-Band radio frequencies. These transponders receive ground radar or TCAS interrogations and transmit a coded response of pulses to ground based radar on a frequency of 1090 MHz. Each unit has IDENT capability and replies to ATCRBS Mode A, Mode C, and Mode S All-Call interrogations.

Consider the following if installing a GTX 335 in an aircraft with an existing ADS-B Out source.

1. Current FAA guidance allows multiple ADS-B Out transmissions on both links if the ICAO aircraft identifier is provided on both systems.
2. Garmin recommends all ADS-B out systems be fully compliant at the time the aircraft is equipped with any fully complaint ADS-B out system. This can be accomplished by either disabling the earlier version of ADS-B out, or upgrading it to also meet full compliance requirements. Refer to section 3 for additional details.

1.4.1 GTX 335 Interface

The GTX 335 units are panel mounted units that have Mode S with ADS-B Out extended squitter capability. The GTX 335 units contain an integrated display for normal operation and functionality. It is recommended to wire uninterrupted aircraft battery power to the GPS keep alive input for the GTX 335 with SBAS/GPS receivers. This preserves internal SBAS/GPS data between unit power cycles and minimizes the time required to obtain an initial position fix.

GTX 335 features:

- Mode S transponder
- ADS-B Out capability
- Internal GNSS receiver
- Optional GAE pressure sensor module
- Entry of squawk code and flight ID
- Show squawk code and flight ID
- Show pressure altitude
- Show outside air temp
- Show density altitude
- Show flight timers
- Audio output
- TIS-A traffic output to a compatible display

The transponder provides an ADS-B Out failure message to alert that the unit has a degraded ADS-B system. Refer to figure 1-1 for GTX 335 interfaces.

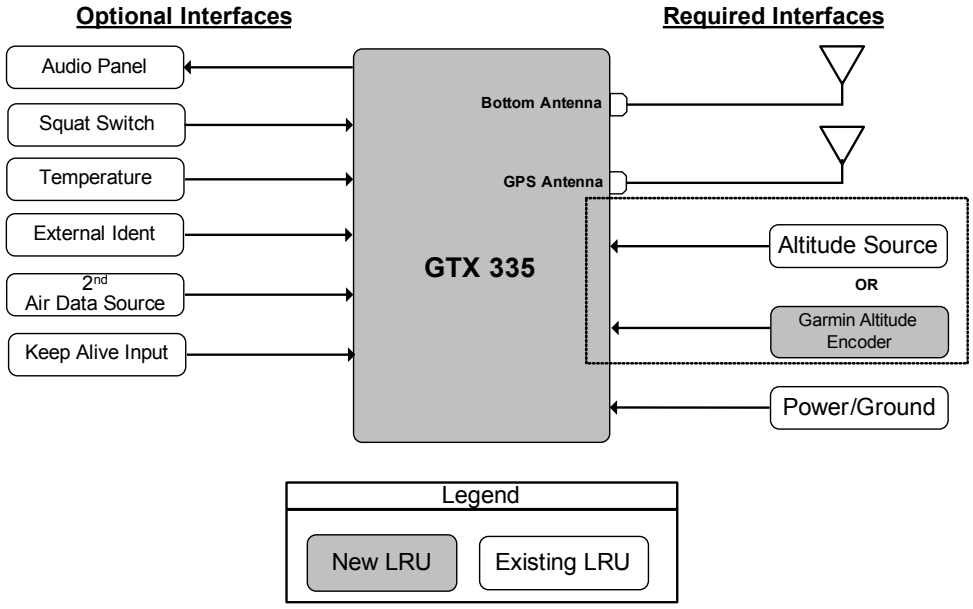

Figure 1-1 GTX 335 Interface Summary

The following provides detail regarding the panel function of the GTX 335. Refer to *GTX 3X5 Pilot's Guide* or *GTX 33X and GTX 3X5 ADS-B Maintenance Manual* for more information about the controls and their functions.

Figure 1-2 GTX 335 Front Panel

NOTE

If the transponder is in the ON or ALT operating mode, the transponder becomes an active part of the Air Traffic Control Radar Beacon System (ATCRBS). The transponder will reply to interrogations from aircraft with TCAS installed.

Key Selection Functions for GTX 335:

OFF	Turn off the GTX 335.
SBY	Selects the Standby mode. Push the **STBY** key when the GTX 335 is powered off to automatically energize the unit on in standby mode. When in standby mode, the transponder does not reply to any interrogations but new codes can be put in and a SBY indication will show on the display.
ON	Selects the On mode, which gives Mode A and Mode S replies, but Mode C altitude reporting is prevented. Push the **ON** key when the GTX 335 is powered off to automatically energize the unit in Mode A, and transmit a squawk code when interrogated. ADS-B Out will not return barometric altitude as it switches to GPS altitude while in this mode. Interrogations are shown by the reply symbol (R). For On mode, the replies do not include altitude information.
ALT	Altitude mode is automatically selected when the aircraft becomes airborne, using the units air/ground logic, or when the **ALT** key is pushed. Push the **ALT** key when the GTX 335 is powered off to automatically energize the unit in altitude reporting mode. While the aircraft is on the ground and in ALT mode, the transponder does not give Mode A and Mode C replies, but it does give acquisition squitter and replies to discretely addressed Mode S interrogations. While the aircraft is in ALT mode and airborne it will give Mode A, Mode C, and Mode S replies and give transmissions of acquisition and extended squitter, to include ADS-B Out. All transponder interrogation replies are shown by the Reply symbol (R). **VFR** Sets the transponder code to the pre-programmed VFR code selected in Configuration mode (set to 1200 at the factory). Push the

	VFR key again to restore the identification code used before.
FUNC	In normal mode, push the **FUNC** key to change the subpage group shown on the right side of the display. Sub-pages include: Flight ID, Pressure Altitude, Flight Time, Altitude Monitor, System Count Up, and Count Down Timers. In the Configuration mode, moves through the function pages.
ENT	Accepts entry for selected item and moves the cursor to the next changeable item, or function selection, in configuration and normal operation. Starts and stops the Altitude Monitor, Count Up, Count Down, and Flight timers.
CRSR	Selects changeable fields in configuration and normal operation. Starts entry of the start time for the Count Down timer and cancels transponder code entry. Hold the **CRSR** key to put the unit into a Ground Test mode that forces the aircraft into an airborne status for tests.
CLR	Resets the Count Up, Count Down, and Flight timers. Cancels the key pushed before during code selection, Count Down entry, or flight ID entry. Used in Configuration mode to scroll through the function pages.
8	Used as a scroll-up key to move through page groups in normal and configuration mode.
9	Used as a scroll-down key to move through page groups in normal and configuration mode.

Display Functions:

FLIGHT ID	If the system is configured to ALLOW PILOT TO EDIT FLT ID in configuration mode to YES, the FLIGHT ID can be changed by the pilot at any time in normal mode. This lets the pilot/crew to put in the specific Flight ID for transmission to ATC interrogations.
UP COUNTER	Timer controlled by **ENT** and **CLR** keys.
DOWN COUNTER	Timer controlled by **ENT**, **CLR**, and **CRSR** keys. The initial Count Down time is put in with the **0** - **9** keys.
FLIGHT TIMER	Shows the Flight Time, controlled by the **ENT** key or by one of four airborne sources (squat switch, GPS ground speed recognition, air data airspeed recognition or altitude increase) as configured during installation. The timer starts when the GTX 335 finds that the aircraft is airborne.
TRIP TIMER	Timer controlled by **ENT** and **CLR** keys.
PRESSURE ALT	Shows the altitude data supplied to the GTX 335 in feet, hundreds of feet (i.e., flight level), or meters, selected at configuration.
ALT MONITOR	Controlled by **ENT** key. Operates a voice alarm and warning annunciator when above altitude limit.

SAT/DALT	Shows when the GTX 335 is configured with temperature input. Shows Static Air Temperature and Density Altitude.
CONTRAST/OFFSET	Contrast is controlled by the **8** and **9** keys.
BACKLIGHT/OFFSET	This page is displays when photocell backlighting mode is selected in Configuration mode. Backlighting is controlled by the **8** and **9** keys.
MESSAGES	Alerts user of transponder faults, fails and advisory messages. MSG displays when a message is generated. **CRSR** and **ENT** keys access messages to view and acknowledgment.
1090ES TX CTRL	This is only shown when the unit is configured for 1090ES OUT CONTROL in Configuration mode to be PILOT SET. When configured, this can be highlighted by the **CRSR** key, changed by the **8** and **9** keys, and selected by **ENT** key. Sets the extended squitter function on or off.

1.4.2 GAE

The GAE module supplies the required barometric altitude source for ADS-B Out compliance. The sensor module has an orifice that allows the module to be connected to the static system. The GAE attaches to the rear connector plate with two screws, and has short, unshielded wires to connect to the GTX 335 unit through the rear D-sub connector with the same connection as the configuration module. The GAE contains the configuration module. If the GAE is used, a separate configuration module is not required. Refer to section 4 for installation guidance.

Figure 1-3 GAE

1.5 System Installation

This section gives equipment information to install the GTX system and related hardware. For interconnect diagrams, refer to section B.

1.5.1 Pre-Installation Checklist

Before beginning a GTX system installation the installer must make sure the aircraft meets the prerequisites for the installation of the GTX system under this STC. Use the checklists from table 1-2 to determine the necessary requirements that must be met before the installation of the GTX is started in a specific aircraft. Make sure each of the items are completed as necessary before modifying.

Table 1-2 GTX 335 Pre-Installation Checklist

Prerequisite	Reference	GTX 335 with GPS	Complete
Aircraft is on AML	AML	❑	❑
Approved uncorrected pressure altitude source or GAE option installed	Appendix C	❑	❑
Satisfactory SBAS/GPS antenna installed	Appendix C	❑	❑
Satisfactory transponder antenna installed	Section 3.11	❑	❑
Satisfactory attachment provisions have been identified		❑	❑
Satisfactory electrical bonding provisions have been identified	Section 3.15	❑	❑
Planned equipment interfaces are approved under the STC or have other FAA approval	Appendix C	❑	❑
Installation/operational limitations reviewed to make sure no adverse impact to installation	Section 2	❑	❑
Aircraft electrical system is sufficient for the installation	Section 3.16	❑	❑
Aircraft does not have a TCAS II system	Section 2	❑	❑

1.6 Technical Specifications

1.6.1 Power Requirements

The GTX 335 units operate at 14 or 28 VDC. Refer to table 1-3 for electrical load lists current draw specifications.

Table 1-3 Electrical Load

Unit	Characteristic	Specification	
		14 VDC	28 VDC
GTX 335 w/ GPS	Input current, typical	0.72 A	0.36 A
	Input current, maximum	1.22 A	0.61 A
GTX 335 w/ GPS	KEEP ALIVE input current	65 µA typical	20 µA typical
		85 µA maximum	40 µA maximum

1.6.2 Environmental Qualification Form

The installer must obtain the latest revision of the GTX Environmental Qualification Form (EQF). A copy of the EQF is obtained through the single-use registration code process. For the applicable GTX EQF part number, refer to table 1-4.

1.7 Reference Documentation

Table 1-4 Garmin Documents

Document	P/N
GTX 3X5 Environmental Qualification Form	005-00752-02
GTX 335 Setup Wizard Guide	190-01499-40
Master Drawing List, GTX 33X and GTX 3X5 ADS-B AML STC	005-00734-04
GTX 33X and GTX 3X5 ADS-B AML STC Equipment List	005-00734-05
GTX 33X and GTX 3X5 ADS-B Maintenance Manual	190-00734-11
AFMS, GTX 33X and GTX 3X5 AML STC	190-00734-15
GTX 3X5 Series Transponder Pilot's Guide	190-01499-00

Table 1-5 Garmin Documents Available Upon Request

Document	P/N
GTX 3XX Part 23 AML STC Installation Manual	190-00734-10
GTX 3X5 TSO Installation Manual	190-01499-02

Table 1-6 Federal Aviation Administration Documents

Document	P/N
FAA Advisory Circular, Airworthiness Approval of Automatic Dependent Surveillance-Broadcast (ADS-B) Out Systems	AC 20-165( )
FAA Advisory Circular, Guide for Obtaining a Supplemental Type Certificate	AC 21-40A
FAA Advisory Circular, System Safety Analysis and Assessment for Part 23 Airplanes	AC 23.1309-1E
FAA Advisory Circular, Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair	AC 43.13-1B
FAA Advisory Circular, Acceptable Methods, Techniques, and Practices - Aircraft Alterations	AC 43.13-2B
FAA Order, Type Certification	Order 8110.4C
Major Repair and Alteration (Airframe, Powerplant, Propeller, or Appliance)	Form 337

Table 1-7 Industry Standards

Document	P/N
Standard Guide for Aircraft Electrical Load and Power Source Capacity Analysis	ASTM F2490-05
Aerospace Systems Electrical Bonding and Grounding for Electromagnetic Compatibility and Safety	SAE ARP1870

1.8 STC Permission

Consistent with FAA Order 8110.4C and FAA AC 21-40A, a permission letter to use this STC data is available for download.

2 LIMITATIONS

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2.1 Operational Limitations

Refer to the AFMS for operational limitations. It is available through the single-use registration code process. All functions of the GTX 335 transponders meet the applicable design assurance qualifications for airplane Class I, Class II, Class III, and Class IV in accordance with AC 23.1309-1E figure 2.

2.2 Installation Limitations

GTX 335 panel mounted units must be installed within reach of the pilot and the display must be viewable by the pilot with minimal head movement. If replacing a transponder with the GTX 335, the unit can be installed in the same location as a previously installed transponder.

The Air Tractor AT-401 series, AT-402 series, and AT-502 series aircraft specified on the AML must have the optional avionics mounting installation (P/N 61337-X) installed as a prerequisite for the installation of a panel mount transponder. The Air Tractor AT-504 aircraft specified on the AML must have the optional avionics mounting installation (P/N 13750-X) installed as a prerequisite for the installation of a panel mount transponder.

The GAE should not be used as the altitude source in aircraft certified to fly above 30,000 feet. The GTX should be installed in temperature controlled environments in aircraft certified to fly above 25,000 feet. Refer to the applicable environmental qualification form to identify more GTX installation limitations for the possible LRU installation.

The GTX 335 units with main software version 2.03 and prior do not allow TIS-A display using the ARINC-429 interface.

2.2.1 Equipment Interfaced to the GTX

The interface connections between the GTX 335 and other aircraft systems as specified in this manual are approved in the GTX 33/330 and GTX 3X5 AML STC. If the GNS 430W/530W and GTN 6XX/7XX are both interfaced to a GTX 335 unit for TIS-A traffic, the GNS 430W/530W must be the TIS-A on/off control source and the GTN 6XX/7XX TIS-A control must be off.

The GTX 335 is not approved to interface with TCAS II traffic systems. Additional interfaces not supported by this STC for the GTX 3X5 are as follows.

- Installation of switches.
- Installation of outside air temperature probes.

2.2.2 Preservation of Certified Systems

It is the responsibility of the installer using the data provided in this STC to preserve the essential characteristics of the aircraft in accordance with the aircraft manufacturer's original design and the requirements of 14 CFR Part 23.

2.2.3 Major Alterations

The installation of the GTX 335 system is a major alteration to the aircraft type design. After a major alteration, the aircraft must be returned to service in a procedure satisfactory to the applicable aviation authority. An example would be a completed FAA Form 337 submitted to the applicable FAA office. This form must have the major alteration to include the equipment and systems the GTX is interfaced to.

2.2.4 Antennas

The GTX 335 units can only use transponder and SBAS/GPS antennas that comply with the requirements as specified in section 3. Installation of antennas are not provided in this STC and separate approval is necessary. Antennas, cables, and wiring interfaced to the GTX transponder system must not be installed in fuel bays.

2.2.5 Pressurized Aircraft

Changes to the pressure vessel are not part of the GTX 33/330 and GTX 3X5 Part 23 AML STC. More data from the aircraft manufacturer or other FAA approved data is necessary.

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3.1 Pre-Installation Information

NOTE

Always use common avionics installation practices. Refer to FAA Advisory Circulars (ACs) AC 43.13-1B, AC 43.13-2B, or later approved revisions.

Complete the applicable pre-installation checklist in section 1.5.

Installation planning steps:

1. Complete an electrical load analysis on the aircraft to make sure that the aircraft electrical system can carry the GTX electrical load.
2. Determine the installation location for the GTX.
3. Make sure that the mounting rack is sufficient for the selected location.
4. Complete a weight and balance to make sure that the location is in permitted limits. Refer to section 4.
5. Determine cable routing.
6. Make sure that the interfaced equipment is sufficient and that correct approval is possible.
7. Any other necessary modifications.
8. Prepare the mounting rack for installation. Refer to section 4
9. Plan the post-installation checkout prior to closing out the work area. Refer to section 7.

3.2 Garmin Available Installation Materials

Refer to the tables below for a list of available Garmin standard kit items.

Table 3-1 GTX 335 Connector Kit Options

Unit	Item	P/N
GTX 335	Connector Kit	011-02977-00

Table 3-2 GTX 335 Backplate Assembly Options

Unit	Item	P/N
GTX 335 standard mount with GPS	Backplate assembly	011-02976-01

Table 3-3 GTS 335 Mount Rack Options

Unit	Item	P/N
GTX 3X5 standard mount	Install Rack	115-01771-01

Table 3-4 GTX 335 Configuration Module

Unit	Item	P/N
GTX 335	Configuration Module	011-00979-03
GTX 335	Garmin altitude encoder with configuration module	011-03080-00

3.3 Installation Materials Not Supplied

NOTE

The GTX series models are used with standard aviation accessories. Refer to the Acceptable Hardware appendix for permitted installation hardware that can be necessary but not supplied. Refer to AC 43.13-1B, Chapter 11, sections 5 through 7 for wire selection and sizing information.

These items are necessary for installation, but are not supplied:

- Insulated stranded wire (MIL-W-22759/16 or equivalent)
- Shielded wire (MIL-C-27500 cable that uses M22759/18 wire (TG) or ETFE jacket (14), or equivalent)
- Coaxial cable
- Aircraft hardware for installation, which includes screws, nuts/nutplates, washers, and rivets (*Refer to the Acceptable Hardware appendix*)
- Circuit breaker
- Tie wraps or lacing cord
- Ring terminals
- Shield terminators (MS83519/2-X or equivalent)
- Silicone fusion tape, A-A-59163 (MIL-I-46852C), or equivalent
- USB A-to-B cable (for interface between a laptop computer and the GTX 335)

3.4 Installation Considerations

NOTE

Installation instructions are for use in synchronization with the avionics installation practices in AC 43.13-1B, AC 43.13-2B, and FAA approved revisions.

Installation considerations:

- Installation of a GTX 335 system may require the avionics shelves to be changed, or require a new structure.
- A new wiring harness is required.
- A change of the static pressure system may be necessary if a compatible altitude encoder is not installed. Refer to the minimum system configurations for additional considerations.

3.5 GTX Series Minimum System Configurations

The minimum system required items for GTX 335 ADS-B Out (only) installation:

- GTX 335 transponder with the USB dongle cable provided
- Transponder antenna
- Approved GPS/SBAS antenna
- Approved altitude source
  - Optional GAE

3.6 Crimping Tools

Connectors used for the GTX series transponders use crimp contacts. Refer to table 3-5 for the recommended contact crimping tools for D-Sub connectors.

Table 3-5 Recommended Crimping Tools

Manufacturer	Hand Crimping Tool	High Density 22-28 AWG	
		Positioner	Insertion/ Extraction Tool
Military Spec.	M22520/2-01	M22520/2-09	M81969/14-01 M81969/1-04
Positronic	9507-0-0-0	9502-4-0-0	4811-2-0-0
AMP	601966-1	601966-6	91067-1
Daniels	AFM8	K42	M81969/1-04
Astro	615717	615725	M81969/1-04

3.7 Test Equipment

This test equipment is required for the installation:

- Ramp tester with traffic (e.g., IFR 6000 or equivalent for system performance and checkout).
- Pitot/static test set for system performance and checkout for altitude reporting verification.
- To measure the electrical bonding between system components and aircraft ground, a milliohm meter with a precision of ±0.1 mΩ or better is required.
- An ammeter with a precision of ±0.5 amps and a current capacity sufficient for the total aircraft
- load for the ELA.

3.8 External Sensors, Devices, and Interface Considerations

Install sensors in accordance with the sensor manufacturer's data. This manual does not give data for the installation of any external sensors or devices. Refer to appendix C for a list of the permitted types of inputs available. Refer to section 6 for possible GTX configuration selections.

The GTX accepts data from many sources. If more than one source is used, the GTX will accept data as given in this section. The input priority of each external data source cannot be changed.

3.8.1 Mutual Suppression Bus

Other equipment on the aircraft can transmit and receive in the same frequency band as the GTX transponder system, such as DME, TAS/TCAS system, or another transponder. Mutual Suppression is a synchronous pulse which is sent to the other equipment to suppress transmission of a different transmitter/receiver during the pulse train transmission. The GTX transmission can be suppressed by an external source and other equipment on board can be suppressed by the GTX system. This feature is designed to reduce mutual interference.

If a transponder, DME, TAS/TCAS system, or other equipment using the L-band is installed on the aircraft, make sure a suppression line is connected between the GTX transponder system and the other equipment in order to prevent mutual interference. For the GTX 335 series transponder system, and other equipment I/O interconnect drawings, refer to appendix B.

I/O pulses may not be compatible with all models of DME. Known incompatible units include the Bendix/King KN 62, KN 64, and KNS 80. These models have an output-only suppression and may damage the GTX mutual suppression output. In this case, leave the suppression pin open.

3.8.2 Altitude Source (Required)

For ADS-B operation, an altitude encoder, air data computer, or other source that supplies uncorrected pressure altitude information must be installed. The GTX 335 series transponders can acquire altitude information from a GAE attached to the rear of the back plate. The GAE has a configuration module.

The GTX units accept altitude information from an altitude encoder, air data computer, EFIS, or encoding altimeter. Refer to table 3-6 for more information.

Table 3-6 Altitude Source Options

Priority	Altitude Source
1	ARINC 429 Label 203 from an ADC
2	ARINC 429 Label 203 from an EFIS/ADC
3	RS-232 from an ADC
4	RS-232 from a 25ft-resolution altitude source
5	RS-232 from a remote control panel
6	GAE
7	Gray code altitude
8	RS-232 from a 100ft-resolution altitude source

3.8.3 GPS Source

The GTX 335 has an internal GPS/SBAS source for ADS-B Out. The GTX 3X5 receives data from the internal GPS receiver:

- Latitude
- Longitude
- Height above ellipsoid
- Horizontal and vertical position accuracy data
- Horizontal position integrity data
- North/south velocity
- East/west velocity
- Up/down velocity
- Ground speed
- Horizontal velocity accuracy
- Ground track
- Geometric vertical rate
- SIL and SIL supplement
- RAIM alarm
- Geoid altitude
- Time
- Date

3.8.4 Installation with Other ADS-B Out Systems

If the GTX 335 transponder is being installed in an aircraft with other ADS-B Out capable equipment, the other ADS-B Out equipment should be Version 2 compliant (TSO-C166b/RTCA DO-260B or TSO-C154c/DO-282B). The UAT or 1090 ES transmit functionality of a Version 1 compliant system should be disabled if it is not upgraded to be Version 2 compliant. Refer to table 3-7 to identify actions that should be taken to make sure only Version 2 compliant ADS-B and UAT systems can transmit.

Table 3-7 Version 2 Compliance w/ Multiple ADS-B Out Equipment Installation

	If the other ADS-B Out System is:	Action
GTX 335 with ADS-B Out (TSO-C166b / DO-260B) (ADS-B Version 2 Compliant)	TSO-C154c / DO-282B UAT equipment (UAT Version 2 Compliant)	None. Both systems are Version 2 compliant.
	TSO-C154b / DO-282A UAT equipment (UAT Version 1 Compliant)	Option 1: Upgrade UAT equipment to be Version 2 compliant. Contact equipment manufacturer for possible upgrade selections.
		Option 2: Disable transmit functionality of Version 1 compliant equipment. Refer to equipment manufacturer's installation manual for instructions.
	TSO-C166a / DO-260A 1090ES equipment (ADS-B Version 1 Compliant)	Two ADS-B Out systems on the same link should not be operated at the same time. Disable transmit functionality of other ADS-B equipment. Refer to equipment manufacturer's installation manual for instructions.
	TSO-C166b / DO-260B 1090ES equipment (ADS-B Version 2 Compliant)	

3.9 Placards/Labels

New circuit breakers, switches, and annunciators installed for the GTX 335 unit must be labeled. Refer to the applicable interconnect drawings in appendix B. In order to prepare and install placards or labels:

- Put the placard or label in a location adjacent to the switch, annunciator, circuit breaker, etc.
- Make sure the placard or label is readable in all cockpit lighting conditions.
  - Ambient flood lighting is satisfactory.
- Make sure the placard or label is not easily erased, damaged, or obscured.
- Text color should be black or white.
  - Do not use amber, red, or green.
- Font size should be 10 or 12 pt (minimum 0.10 in.).
- Font weight should be normal or bold with a solid color.
- Font style should be regular, non-italic, and easy to read.

3.10 Switches

The GTX 335 can be connected to external switches for the usual functions. Momentary switches for TRAFFIC MUTE and IDENT are optional and should be connected as shown in the interconnection diagrams. As required, toggle switches for other functions can be attached to discrete inputs to set system parameters. Refer to section 8 for GTX 335 available discrete outputs and inputs.

3.11 Antenna Considerations

This section contains general installation guidance to make sure the installed antennas meet the GTX transponder and ADS-B requirements. The approval of antenna installations is outside the scope of this STC.

3.11.1 Transponder Antenna

This STC does not install the transponder antenna. The transponder antenna(s) is existing equipment.If an existing GTX transponder is already installed, no changes to the antenna or coax are required.

When upgrading from a non-Garmin transponder, the existing approved transponder antenna should be verified to meet these requirements:

- Be approved to TSO-C66( ) or C74( ), and
- The aircraft ground plane should be electrically bonded to the antenna baseplate, which should achieve direct current (DC) resistance less than or equal to 2.5 milliohms.

The installer should determine if the aircraft's current antenna and installation meets the above requirements. If the antenna does not meet these requirements, the installer is responsible for obtaining FAA approval for the installation of compliant equipment.

3.11.2 Transponder Antenna Location

For the most optimum transponder antenna location installation:

- The transponder antenna should be located away from major protrusions (i.e., engine(s), propeller(s), and antenna masts).
  - It should be as far as practical from landing gear doors, access doors, or other openings that can affect its radiation pattern.
- The transponder antenna must be attached vertically on the bottom of the aircraft.
- The transponder antenna must be installed at least 20 inches from any FADEC (Full Authority Digital Engine Control).
- The transponder antenna must be installed at least 20 inches from any transponder, TAS/TCAS, DME, or other L-Band antenna.

Table 3-8 Maximum dB loss allowed From Transponder to Antenna

GTX 335
2.0 dB

3.11.3 Transponder Antenna Installation

NOTE

Installation approval for the transponder antenna is not supplied through this STC. Refer to the antenna manufacturer's installation guidance for the particular model antenna for minimum performance specifications.

Refer to the aircraft manufacturer's data and the antenna manufacturer's installation instructions for attaching the transponder antenna. The installer can use other FAA approved data to gain a separate antenna installation approval.

Refer to table 3-9 for examples of the recommended antenna cable vendors and the type of cable used for specific lengths of cable. Any cable that meets the minimum specifications is satisfactory for the installation.

Refer to table 3-10 for reference only and shows some applicable cable types. Any 50 Ω, double-shielded coaxial cable assembly that meets airworthiness requirements and the permitted attenuation requirements (with connectors) can be used. When cable loss is calculated, a loss of 0.2 dB can be used for each connection.

Table 3-9 Coaxial Cable Specifications

Insertion Loss (dB/100ft) [1]	Carlisle IT Typ	MIL-C-17 Type [3]	RG Type [4]
18.5	N/A	M17/128-RG400	RG-400
11.1	N/A	M17/112-RG304	RG-304
9.2	N/A	M17/127-RG393	RG-393
15.2	3C142B	N/A	N/A
9.2	311601	N/A	N/A
7.5	311501	N/A	N/A
5.8	311201	N/A	N/A
3.8	310801	N/A	N/A

[1] RG type coaxial cable insertion loss can change significantly between manufacturers. The insertion loss for RG type cables shown in this column is considered the worst case scenario. Refer to the cable manufacturer's specification sheet for actual attenuation (insertion loss) for the cable being used.

[2] Supplier information (for reference only): Carlisle IT: 5300 W. Franklin Drive Franklin, WI 53132 Tel: 800-327-9473 www.carlisle.com

[3] Supplier information: Refer to current issue of Qualified Products List QPL-17.

[4] RG types are obsolete and are reference only and replaced by M17 type numbers.

Table 3-10 Typical Cable Connector Loss

Connector Type	Approximate dB Loss
TNC	0.08 dB
BNC	0.20 dB
C	0.15 dB

3.11.4 GPS Antenna (GTX 335 with SBAS/GPS)

Installation approval for the GPS antenna is not provided through this STC. The installer can use other FAA approved data to gain a separate antenna installation approval. Antenna performance is very important to successful operation with the internal GPS/SBAS receiver.

Refer to table 3-11 for approved SBAS/GPS antennas that meet Garmin's minimum performance specifications. Refer to table 3.11.2 for antenna location information to verify an existing antenna location is satisfactory for use with the GTX 335 transponder. Refer to the antenna manufacturer’s installation guidance for installation of GPS antennas.

Table 3-11 GTX 335 GPS Antennas

Model Description	Connector Type	Manufacturer	Part Number
GA 35, GPS/SBAS	TNC	Garmin	013-00235-( )
GA 36, GPS/SBAS	TNC	Garmin	013-00244-( )
GA 37, GPS/SBAS/XM	TNC	Garmin	013-00245-( )
A33W, WAAS	TNC	Garmin	013-00261-( )
GPS / VHF	TNC / BNC	Comant	CI-2580-200
GPS / VHF	TNC / BNC	Comant	CI-2728-200
GPS / XM / VHF	TNC / TNC / BNC	Comant	CI-2580-410
GPS / XM / VHF	TNC / TNC / BNC	Comant	CI-2728-410
GPS / WAAS	TNC	Comant	CI-428-200
GPS / XM	TNC / TNC	Comant	CI-428-410

3.11.5 GPS Antenna Location

When a combination antenna is attached, the recommended distance of two feet or more is not applicable to the distance between the antenna elements (e.g., GPS and COM, GPS and SiriusXM). This is provided that the combination antenna is TSO authorized and has been tested to meet Garmin's minimum performance standards.

These installation guidelines meet the intent of AC 20-138B Chapter 12, Section 12-1. Meeting all of the installation guidelines is not possible on some aircraft. These guidelines are listed in order of importance to achieve optimum performance. The installer should use their best judgment to balance the installation guidelines.

GPS antennas should be installed as follows:

- As close to level as possible. If the normal flight attitude is not known, substitute with the waterline, which is typically referenced as level while a weight and balance check is done.
- Mount in a location to minimize the effects of airframe shadowing during typical maneuvers. Mounting farther away from the tail section decreases signal blockage.
- Mounted no closer than two feet from any VHF COM antenna.
- Mounted no closer than two feet from any antennas emitting more than 25 watts of power.
- Mounted no closer than nine inches (center to center) from other antennas.
- Maintain a constant gain pattern and limit degradation by the windscreen, avoid attaching the antenna closer than 3 inches from the windscreen.
- For installations with more than one antenna, the antennas should not be attached in a straight line from the front to the rear of the fuselage. This is so a single lightning strike does not damage all antennas.

When possible, 12-inch center-to-center spacing between GPS antennas must be used. If 12-inch spacing is not possible, the maximum center-to-center spacing possible must be used, but never less than 9-inch center-to-center spacing.

An aircraft EMC check can show if there is a degradation of GPS in the presence of interference signals. Refer to section 7. If an EMC check reveals unsatisfactory interference, select a different GPS Antenna location or insert a GPS notch filter in line with the VHF COM or the (re-radiating) ELT transmitter that is causing interference.

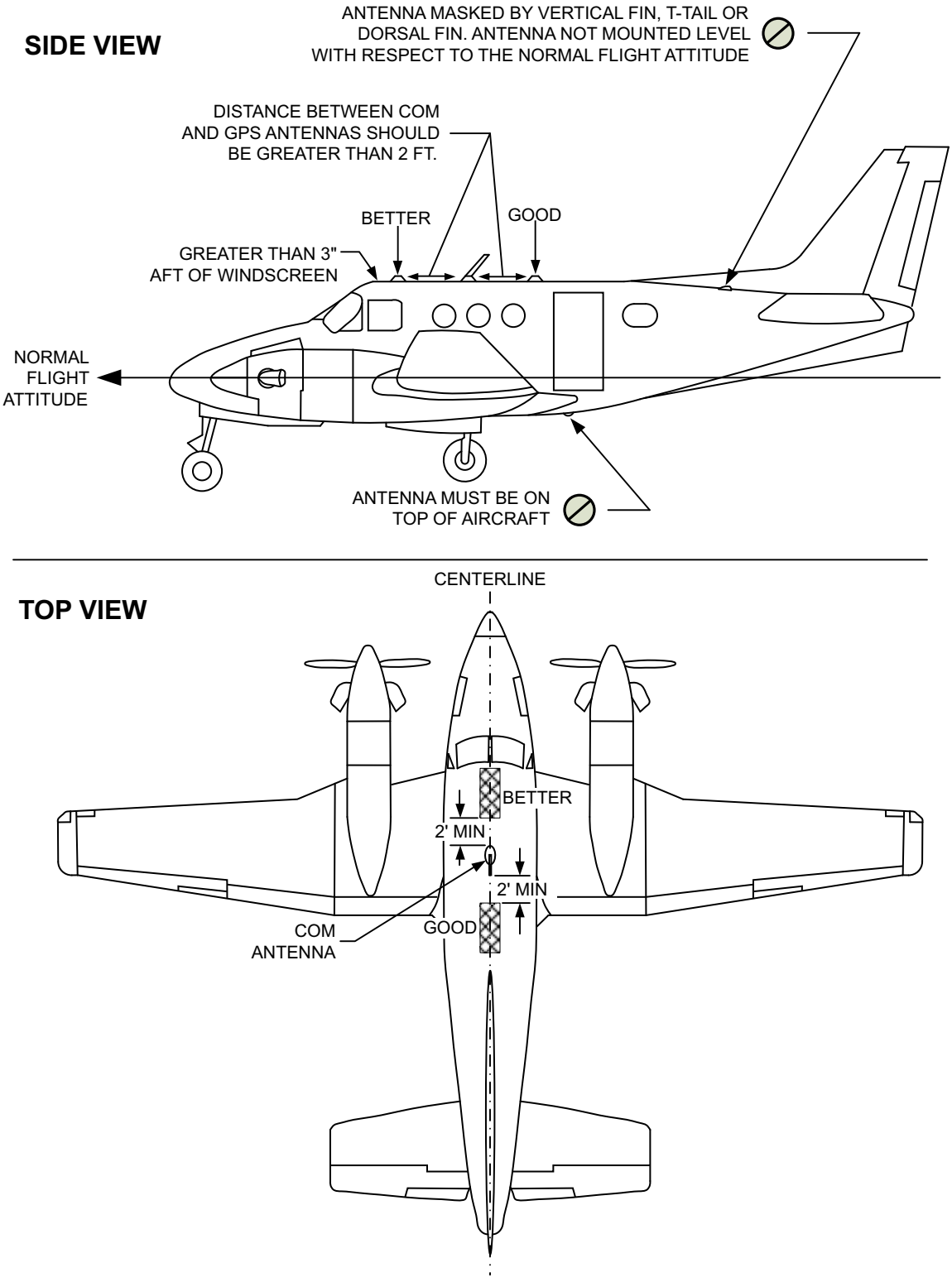

Figure 3-1 GPS Antenna Location (GTX 335 with SBAS/GPS)

3.12 GPS Coaxial Cable Requirements (GTX 335 with SBAS/GPS)

This section supplies information on the GPS antenna cable requirements. The location of the GTX 335 unit GPS Antenna compared to other COM transceivers and antennas is very important. During the post-installation checkout, susceptibility to harmonics of VHF COM transmitters is analyzed. If problems occur, better isolation or distance can be required between the GPS and COM antennas. A 1575.42 MHz notch filter can be installed in series with the antenna coaxial of the VHF COM transceiver to decrease or eliminate the harmonic interference. A notch filter for this use (P/N 330-00067-00) is available from Garmin.

Table 3-12 GPS dB Loss Allowance

Unit	Minimum	Maximum
GTX 3X5 Internal GPS	1.5 dB	6.5 dB

To reduce or stop signal interference, the GPS antenna cable assembly loss must be in accordance with table 3-12. Think about additional loss from coaxial connectors and adapters (e.g., TNC to BNC) when cable loss is calculated. A typical loss of 0.2 dB can be used for each connection. To keep integrity of the WAAS signal, the GPS Antenna coaxial cable must have a minimum of two shields (e.g., RG-400 or RG-142B).

GPS antennas listed in Table 3-11 require a cable loss between 1.5 dB and 6.5 dB. If RG-142B or RG-400 is used, then 1.5 dB is equal to a length of approximately 6.5 feet of cable with a connector on each end.

RG-142B or RG-400 cable can be used if the length is less than 35 feet. For longer lengths, use low-loss, double- or triple-shielded, 50Ω coaxial cable.

For very short cables where the loss is less than 1.5 dB, add more cable to increase the loss to within 1.5 dB and 6.5 dB. This cable can be coiled, taking into account the minimum bend radius of the cable.

When the antenna position is selected, make sure that the routing of the coaxial cable from the antenna to the GTX 335 Internal GPS is correct. Correct selection of coaxial cable and installation of connectors is very important to GPS signal performance.

If a VHF COM transmitter causes problems with the GPS on the selected frequencies as listed in the post installation checkout, the problem can be because of the ELT. To find out if the ELT is a problem, disconnect the ELT antenna coaxial at the ELT unit. If the ELT is found to cause the problem, contact the ELT manufacturer.

3.13 General Installation Practices

3.13.1 Circuit Protection and Power Distribution

The circuit protection device for the GTX units must be a push-pull manually resettable circuit breaker (e.g., Klixon 7274 series circuit breakers). A single circuit breaker must be used by the GTX unit. Do not try to put together more than one unit or system on the same circuit breaker unless specifically approved by the manufacturer. The GTX should be connected to an avionics bus (non-essential bus) so power is supplied when the avionics master switch is energized. If not reusing an existing circuit breaker location, the circuit breaker should be located so it can be readily reset in flight.

3.13.2 Audio Interference

Take care to keep effects from coupled interference and ground loops to a minimum. Coupled interference can be caused in audio system cables when they are put near large AC electric fields, AC voltage sources and pulse equipment (e.g., strobes, spark plugs, magnetos, EL displays, CRTs, etc.). Interference can also get into audio system cables by magnetic induction when they are put near large AC current conductors or switched DC equipment (e.g., heaters, solenoids, fans, autopilot servos, etc.).

Ground loops are caused when there is more than one path in which return currents flow or when signal returns have the same path as large currents from other equipment. These large currents make differences in ground potential between the different equipment operating in the aircraft. These differences in potential can produce an additive effect on audio panel input signals. The audio panel can receive the input signal plus an unwanted component injected by ground differentials, a common cause of alternator-related interference. Terminating audio shields at one end eliminates a potential ground loop injection point. The interconnect diagrams and accompanying notes in appendix B should be followed closely to minimize interference effects.

3.14 Cable and Wiring Considerations

NOTE

Care must be taken to sufficiently support and protect the wiring because of its thinner insulation if MIL-W-22759/18 wire is used.

Wire selection should be in accordance with AC 43.13-1B Chapter 11, Sections 5 through 7. Wiring should be installed in accordance with AC 43.13-1B Chapter 11, Sections 8 through 13. Follow these guidelines to prevent damage to the aircraft and systems.

- The wire harness should not be located near flight control cables, high electrical capacity lines or fuel/oil lines.
- The wire harness should be located in a protected area of the aircraft.
- Do not route the wire harness or cables near high-energy sources.
- Make sure the routing of the wire harness does not come in contact with sources of high heat, EMI or RF interference.
- Make sure there is ample space for the wire harness and mating connectors. Avoid sharp bends.
- Do a visual inspection to make sure all coaxial cables are connected before trying to operate the equipment.

3.14.1 Pressurized Aircraft Considerations

Wiring that penetrates the pressure vessel must be installed in accordance with the Type Design Data for the aircraft. Use existing provisions for any wires that penetrate the pressure bulkhead (e.g., existing bulkhead connectors or existing sealed wire through-holes). Additional holes in the pressure vessel are beyond the scope of the GTX 33/330 and GTX 3X5 Part 23 AML STC and require more data from the aircraft manufacturer or other FAA approved data.

3.14.2 Shield Termination Considerations

Shield termination at non-Garmin equipment end must be as short as possible and must not exceed three inches in length unless the manufacturer's installation requirements specify differently. When there are no requirements given by the manufacturer's installation manual, the shields can be connected to the metal connector backshell when the backshell is grounded to airframe chassis ground. Alternatively, the shield termination can be directly connected to airframe chassis ground.

All shields must have continuity at any intermediate connectors used unless specified differently. Audio line shields should be continuous from end-to-end and be grounded at only one end to prevent ground loops. The interconnect diagrams, and accompanying notes in appendix B, should be closely followed to minimize interference effects.

If wiring from the GTX goes to a unit that uses overbraided wires then the new wiring at the unit must also be overbraided. If the wiring passes through bulkhead connectors then each segment must be overbraided and the overbraid must be grounded at both ends unless instructed differently in the equipment's installation manual. The overbraid must be terminated as close to the connector as possible and in accordance with manufacturer's installation requirements

3.15 General Electrical Bonding

NOTE

The reconditioned value in table 3-13 is for installation. During service life checks, the periodic test value is used. If the maintenance check shows resistance above the periodic test value, the bonding must be improved to reach the reconditioned value.

Electrical equipment chassis, shield/ground terminations, antennas, supporting brackets, and racks must be electrically bonded to the aircraft's ground reference as shown in table 3-13. Refer to section 5 of SAE ARP1870 when surface preparation is required to achieve electrical bond. The electrical bond must achieve direct current (DC) resistance less than or equal to the reconditioned value shown in table 3-13 for the aircraft type and model.

For some aircraft the instrument panel is attached with vibration mounts. For these aircraft it must be verified that the vibration-isolated instrument panel is grounded to the airframe metallic structure with a bonding jumper the same or equivalent to the specification below. If a jumper is not installed, a bonding strap with this criteria must be installed:

- The cross sectional area of the strap must be greater than 0.016 sq inches (approx 20800 circular mils). A 7/16-inch or wider tubular braid (QQB575R30T437, 24120 circular mils) or a ¾-inch or wider flat braid (QQB575F36T781, 20,800 circular mils) must be used.
- The strap length should be as short as possible and must not exceed six inches in length. Detailed design of a bonding strap meeting these requirements is shown in section 3.

Electrical bonding must be verified by inspection using a calibrated milliohm meter. Refer to section 3. An equivalent OEM procedure can also be substituted.

Brackets installed to the main aircraft metallic structure with four or more rivets can provide sufficient electrical bond to allow equipment chassis or install rack to be bonded to the bracket.

The correct material finish is important when mating untreated or bare dissimilar metals. Materials should be galvanically-compatible. When corrosion protection is removed to make an electrical bond, any exposed area after the bond should be protected again.

Additional guidance is found in AC 43.13-1B and SAE ARP 1870. Refer to figure 3-3, figure 3-4, and figure 3-5 for typical electrical bonding preparation examples.

Table 3-13 Ground Plane Definitions and Ground Path Resistance Requirements

Aircraft Type/Model		Ground Reference	Maximum Resistance Between GTX Chasis and Ground Reference (mΩ)		Notes
			Periodic	Reconditioned	
Metal airframe		Nearby Metal Structure	10.0	2.5	
Tube and fabric airframe		Nearby Metal Structure	10.0	2.5	
Composite VFR-only Models					
Aermacchi	S.211A	Instrument Panel	50.0	25.0	
Diamond	DA20-A1 DA20-C1	Instrument Panel	50.0	25.0	
	DA 40 DA 40 NG				
GROB	G115 G115A G115B	Instrument Panel	50.0	25.0	
	G115C G115C2 G115D G115D2 G115EG	Instrument Panel	50.0	25.0	[2]
	G120A	Instrument Panel	50.0	25.0	[2]
Triton	A500	Instrument Panel	50.0	25.0	[2]
Composite IFR-Models					
Beech	390	Nearby structure lightning ground foil	10.0	5.0	
Cessna	LC40-550FG LC41-550FG LC42-550FG	Nearby aluminum lightning ground strip/bar	10.0	5.0	
Cirrus	SR20 SR22 SR22T	Local grounded structure (i.e., seat support structure, entry step)	10.0	5.0	
Diamond	DA 40 DA 40 F DA 40 NG	Nearby structure lightning ground tube	10.0	5.0	[1]
	DA 42 DA 42 NG	Remote avionic box or local grounded structure	10.0	5.0	
Liberty	XL-2	Local grounded structure	10.0	5.0	
Triton	A500	Local grounded structure	10.0	5.0	

[1] Diamond DA 40 and DA 40 F with Diamond OSB 40-004/3 incorporated, or aircraft with similar factory-installed lightning protection supporting IFR operation.

[2] IFR models must use values of 10.0, and 5.0 for bonding tests and use aircraft lightning ground per the aircraft SRM or other manufacturer-approved data as ground reference instead of the instrument panel.

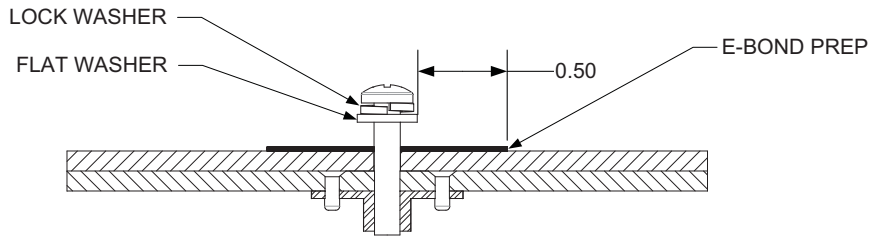

Figure 3-2 Electrical Bond Preparation - Nut Plate

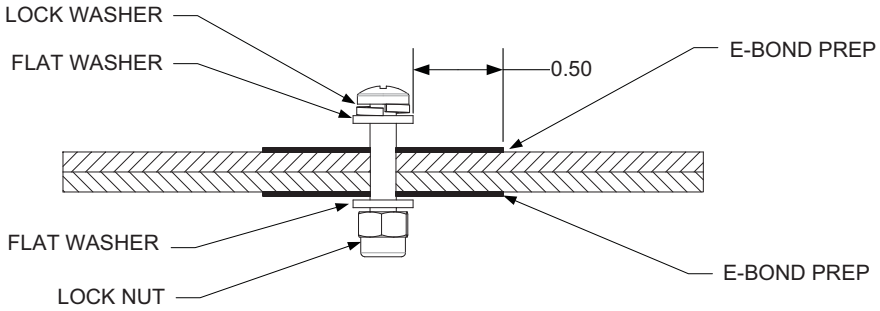

Figure 3-3 Electrical Bond Preparation - Bolt/Nut Joint

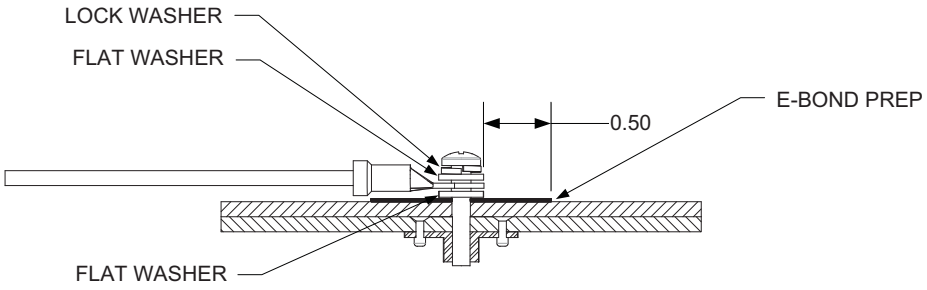

Figure 3-4 Electrical Bond Preparation - Terminal Lug

3.15.1 Aluminum Surface Preparation

This general procedure is recommended to prepare an aluminum surface for correct electrical bonding.

1. Clean grounding location with solvent.
2. Remove non-conductive films or coatings from the grounding location.
3. Apply a chemical conversion coat such as Alodine 1200 to the bare metal.
4. When the chemical conversion coat is dry, clean the area.
5. Install bonding equipment at grounding location.
6. After the bond is complete, if any films or coatings were removed from the surface, reapply a film or coating to the surrounding area.

Refer to SAE ARP1870 Sections 5.1 and 5.5 for a more detailed procedure.

3.15.2 Bonding Jumper

A bonding strap can be fabricated and installed to make sure the vibration-isolated instrument panel is grounded to metallic structure.

- The bonding strap length must not exceed six inches in length.
- The bonding strap must not loop back on itself. The strap must not bend more than 45 degrees.
- Refer to Bonding Jumper Installations in AC 43.13-1B Chapter 11 for guidance on attaching the bonding strap to structure.

Install the bonding jumper with this procedure. Refer to figure 3-5 and table 3-14. Assemble a bonding strap by securely attaching terminal lugs (item 2) to each end of the overbraid.

1. Select a location to minimize the presence of moisture and allow for easy inspection.
2. Make sure all surface preparation material (e.g., primer, paint, etc.) is removed between the large diameter flat washer (item 6) under the terminal lug and metallic surface on the aircraft (instrument panel and aircraft metallic structure or aircraft ground).
3. After assembly and bonding check, prime the airframe structure or instrument panel in accordance with one of these:
    - The approved aircraft maintenance manual
    - MIL-PRF-85285 Type I, Color to suit (36081 Flat Gray Preferable) Coating: Polyurethane, Aircraft and Support Equipment
    - MIL-PRF-23377 Type I, Class N, Primer Coatings: Epoxy, High-Solids
4. Install one end of the bonding strap to the instrument panel and the other end to aircraft metallic structure (or aircraft ground).

Table 3-14 Airframe Bonding Hardware

Item Number Refer to Figure 3-5	Description
1	Tinned copper flat braid, 3/4", QQB575F36T781, or Tinned copper tubular braid, 7/16", QQB575R30T437
2	Terminal lug, 5/16-inch, uninsulated, MS20659-131
3	Bolt, 5/16-inch, AN5-XA
4	Lock washer, 5/16-inch, NASM35338-45
5	Flat washer, 5/16-inch, NAS1149F0563P
6	Flat washer, 0.063-inch thick, NASM970-5 (AN970-5)
7	Locknut, 5/16-inch, AN363-524

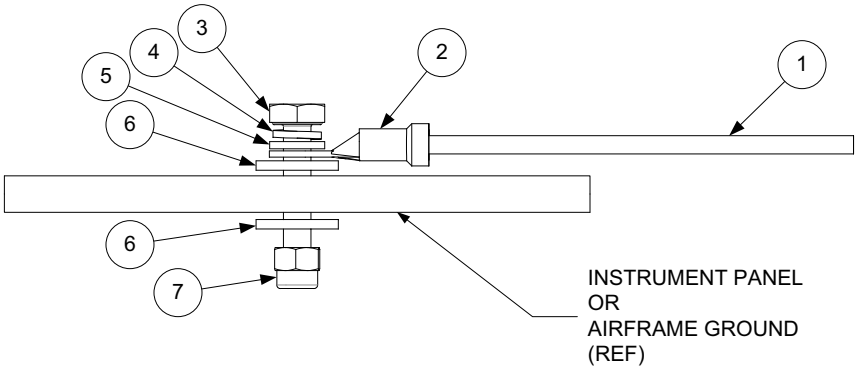

Figure 3-5 Bonding Strap

3.15.3 Transponder Antenna Bonding

CAUTION

If the antenna is struck by lightning, the foil by itself may not be sufficient to dissipate lightning currents. Additional protection may be needed depending on the construction of the structure to which the antenna is attached. Refer to aircraft SRM for more information.

NOTE

For nonmetallic aircraft, the ground plane can be composed of heavy duty aluminum foil tape, such as 3M P/N 438, 3M P/N 436, or other adhesive backed dead soft foil with aluminum 7.2 mils or greater.

Follow these precautions when planning installation of the antenna:

1. The ground plane should be 12 inches minimum radius around the perimeter of the antenna. Refer to figure 3-6. For metallic aircraft, the surrounding metal skin that the antenna is attached supplies the ground plane.
2. The antenna baseplate must be electrically bonded to the ground plane.
3. The electrical bond must achieve direct current (DC) resistance less than or equal to 2.5 mΩ.
4. The paint on the outer skin of the aircraft, under the footprint of the antenna baseplate should not be removed unless it is necessary to meet bonding requirements.

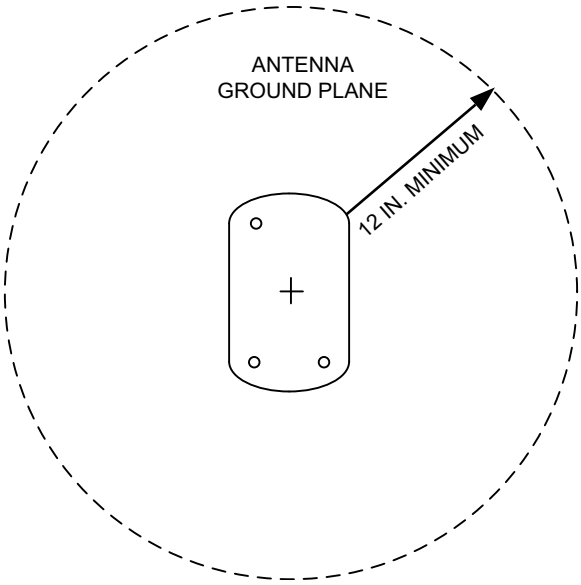

Figure 3-6 Transponder Antenna Minimum Ground Plane Radius

3.15.4 GPS Antenna Bonding

CAUTION

If the antenna is struck by lightning, the foil by itself may not be sufficient to dissipate lightning currents. Additional protection may be needed depending on the construction of the structure to which the antenna is attached. Refer to aircraft SRM for more information.

NOTE

For non-metallic aircraft, the ground plane can be composed of heavy duty aluminum foil tape, such as 3M P/N 438, 3M P/N 436, or other adhesive backed dead soft foil with aluminum 7.2 mils or greater.

Follow these precautions when planning installation of the antenna:

1. The ground plane should be 7.5 inches minimum radius around the perimeter of the antenna. Refer to figure 3-7. For metallic aircraft, the surrounding metal skin on which the antenna is attached supplies the ground plane.
2. The antenna baseplate must be electrically bonded to the ground plane.
3. The electrical bond must achieve direct current (DC) resistance less than or equal to 2.5 milliohms.
4. The paint on the outer skin of the aircraft, under the footprint of the antenna baseplate, should not be removed unless it is necessary to meet bonding requirements.

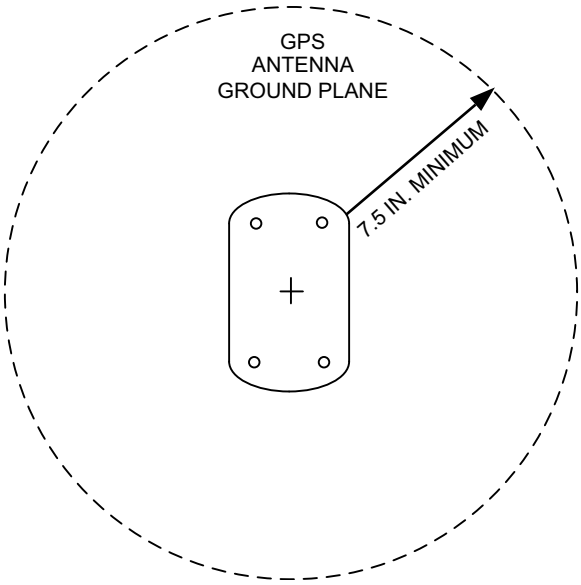

Figure 3-7 GPS/SBAS Antenna Minimum Ground Plane Radius

3.16 Electrical Load Analysis

NOTE

Circuits should be protected in accordance with the approved data in this document. Refer to the guidelines in AC 43.13-1B, Chapter 11, Section 4 and to appendix B for recommended circuit breaker ratings.

An electrical load analysis (ELA) must be completed on each aircraft prior to installation to make sure the aircraft electrical system is capable of supporting the GTX. The purpose of the ELA is to show compliance with 14 CFR 23.1351. As part of the installation it must be shown that the maximum electrical system demand does not exceed 80% of the alternator data plate rating. Satisfactory completion of the ELA should be recorded on FAA Form 337. For Commuter Category aircraft, an electrical load analysis that accounts for the electrical loads applied to the electrical system in typical combinations and for probable durations is required. There are several approaches that can be taken as given in this section. For each approach use the GTX 335 current draw values listed in table 1-3.

3.16.1 Aircraft Without Existing Electrical Load Analysis

Prior to undertaking a complete ELA, the net change to the electrical load resulting from the GTX installation should be found. The results of this analysis determine how to proceed. If there is a net decrease in electrical load because of the installation of the GTX (i.e., removal of existing equipment), no more electrical load analysis is required. If there is a net increase in electrical load because of the installation of the GTX, proceed to section 3.16.3.

3.16.2 Electrical Load is Decreased After Modification

In instances when older systems are replaced with newer equipment, the electrical load presented to the power system may be decreased. If the overall load on the electrical system is decreased because of the GTX installation, no more analysis is required. This assumes that the electrical system was within all limits prior to the GTX installation. The amended electrical load calculation should be added to the aircraft permanent records to document the electrical load reduction.

3.16.3 Electrical Load is Increased After Modification

If it is found that the electrical load has increased, then a complete electrical load analysis must be done to show that the capacity of the alternator/generator is sufficient for the electrical load. For guidance on preparing an ELA, refer to ASTM F 2490-05, Standard Guide for Aircraft Electrical Load and Power Source Capacity Analysis. Alternatively, the loads under different operating conditions can be measured. Refer to section 3.16.4 for more information.

3.16.4 Performing an Electrical Load Analysis by Measurement

This section describes how to do an ELA for a single alternator/single battery electrical system. This should be modified accordingly for aircraft with multiple batteries or alternators. For Commuter Category aircraft, the electrical load analysis cannot be conducted by measurement. Refer to section 3.16.3 for details. It must be shown that the maximum electrical demand for each alternator does not exceed 80% of the alternator data plate rating.

Section Definitions

- Normal operation: the primary electrical power generating system is operating normally.
- Emergency operation: the primary electrical power generating system is inoperative.

If the installation of the GTX increases the overall load, an electrical load analysis must be done. Because of the age of some equipment, there is not always sufficient information about the current draw of this equipment. One permitted method of doing an electrical load analysis is to determine the electrical loads by measurement. The measurements must account for loads applied to the electrical system in probable combinations and durations for aircraft operation.

An in-circuit or clamp-on, calibrated ammeter with 0.5 A or better precision can be used for current measurement. Record the continuous (data plate/nameplate) rate for the alternator and battery.

CAUTION

To avoid damage to equipment, make sure the ammeter can handle the anticipated load.

CAUTION

The Pitot heat should only be switched on long enough to take the current measurement and then switched off. The Pitot probe can get hot so care should be exercised to avoid burns or damaging the unit.

1. Use the blank electrical load tabulation form provided in figure 3-9 to compile a list of electrical loads on the aircraft (generally, this is a list of circuit breakers and circuit breaker switches). Refer to the example in figure 3-10.
2. Identify whether each load is continuous (e.g., GPS) or intermittent (e.g., stall warning horn, landing gear).
3. Use the worst-case flight condition to identify whether each load is used in phase of flight for normal operation. If some loads are mutually exclusive and will not be energized simultaneously (e.g., Pitot heat and air conditioning), use only those loads for the worst-case condition.

4. Identify whether each load is used in phase of flight for emergency operation. As a minimum these systems include:
    - COM radio #1
    - NAV radio #1
    - Transponder and associated altitude source
    - Audio panel
    - Stall warning system (if applicable)
    - Pitot heat
    - Landing light (switched on during landing only)
    - Instrument panel dimming
5. Connect the calibrated ammeter in line between the external power source and the master relay circuit as shown in figure 3-8. This will eliminate errors because of the charging current drawn by the battery.

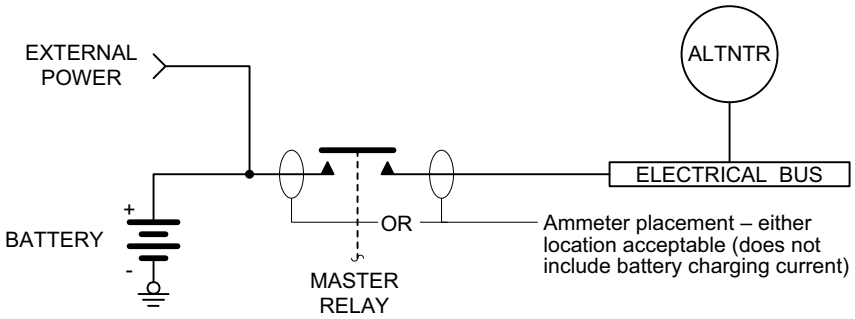

Figure 3-8 Ammeter Placement for Current Measurements

6. Make sure all circuit breakers are closed.
7. Apply external power to the aircraft. Power source voltage should be set to nominal alternator voltage (usually 13.8 VDC or 27.5 VDC).
8. Turn on the battery master switch.
    - Intermittent electrical loads are not measured. It is assumed that if more current is required beyond what the alternator can supply, this short-duration demand is supplied by the battery.
9. Set the lighting as given below. These settings will be used for every current measurement that follows:
    - All instrument panel and flood lights should be set to maximum brightness.
    - Any other displays with a backlight should be set to 50% brightness.
10. Use the tabulation completed above and switch on all continuous electrical loads used in the taxiing phase. Record ammeter current reading (measurement (a) in figure 3-9). Follow these precautions for this measurement:
    - The autopilot circuit breaker should be closed.
    - The autopilot should not be engaged.

11. Use the tabulation completed above and switch on all continuous electrical loads used in the normal takeoff/landing phase. Record ammeter current reading. Measurements must be taken with the landing lights ON and OFF (measurements (b1) and (b2) in figure 3-9). Follow these precautions for this measurement:
    - The autopilot circuit breaker should be closed, and the autopilot should be engaged.
    - Use the tabulation completed above and switch on all continuous electrical loads used in the normal cruise phase. Record the ammeter current reading (measurement (c) in figure 3-9).
12. Use the tabulation completed above and switch on all continuous electrical loads used in the emergency cruise phase. Record the ammeter current reading. Record the current drawn with the landing light switched OFF and again with the landing light switched ON.
13. Use the tabulation completed above and switch on all continuous electrical loads that are used for the emergency landing phase. Record the ammeter current reading.
14. Use the values measured and recorded. Complete the ELA using the blank electrical load tabulation form in figure 3-9. Make sure the maximum demand does not exceed 80% of the alternator data plate rating.

Electrical Load Tabulation

When the Pitot heat and landing light are switched on simultaneously it is permissible for electrical load to exceed 80% of the alternator data plate rating during the takeoff/landing phase of flight.

Electrical load should:

- Not exceed 95% of the alternator data plate rating
- Not exceed 80% of the alternator data plate rating with the Pitot heat on and the landing light off

ELECTRICAL LOAD TABULATION FORM

Date: ________ Tail Number: ________

			Phase(s) of flight during which circuit/system is used				
			Normal Operation			Emergency Operation	
Circuit/System	Circuit Breaker Number	Operating Time	Taxiing 10 min	TO/Land 10 min	Cruise 60 min	Cruise (*Calculated*)	Land 10 min
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
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			☐	☐	☐	☐	☐

Figure 3-9 GTX Electrical Load Tabulation Form
Sheet 1 of 2

ELECTRICAL LOAD TABULATION FORM (CONTINUED)

Date: __________ **Tail Number:** __________

Circuit/System	Circuit Breaker Number	Operating Time	Phase(s) of flight during which circuit/system is used: Normal Operation			Emergency Operation	
			Taxiing 10 min	TO/Land 10 min	Cruise 60 min	Cruise (*Calculated*)	Land 10 min
______	______	______	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐
______	______	______	☐	☐	☐	☐	☐

	Taxiing	TO/Land	Cruise	Cruise (Calculated)	Land
Total current used (amps):	______ (a)	______ Ldg Lt ON (b1) ______ Ldg Lt OFF (b2)	______ (c)	______ (d)	______ (e)
÷ Alternator rating (amps): ____					
x 100% = Percent of alternator capacity used:	______% (< 80%)	______% Ldg Lt ON (< 95%) ______% Ldg Lt OFF (< 80%)	______% (< 80%)	**N/A**	**N/A**
Pass/Fail:	______	______	______		

Notes:

Figure 3-10 GTX Electrical Load Tabulation Form
Sheet 2 of 2

ELECTRICAL LOAD TABULATION FORM

Date: _____ **Tail Number:** NXMPL1

Circuit/System	Circuit Breaker Number	Operating Time	Phase(s) of flight during which circuit/system is used				
			Normal Operation			Emergency Operation	
			Taxiing 10 min	TO/Land 10 min	Cruise 60 min	Cruise (*Calculated*)	Land 10 min
Alternator Field	A1	Continuous	☒	☒	☒	☐	☐
Annunciator Panel	C1	Continuous	☒	☒	☒	☒	☒
Vacuum Warning	C2	Intermittent	☐	☐	☐	☐	☐
Stall Warning	C3	Intermittent	☐	☐	☐	☐	☐
Gear Warning	C4	Intermittent	☐	☐	☐	☐	☐
Gear Actuator	C5	Intermittent	☐	☐	☐	☐	☐
Cluster Gauge	D1	Continuous	☒	☒	☒	☒	☒
Ignition	D2	Intermittent	☐	☐	☐	☐	☐
PFD	D3	Continuous	☒	☒	☒	☒	☒
Turn Coordinator	D4	Continuous	☒	☒	☒	☐	☐
Gear Relay	D5	Intermittent	☐	☐	☐	☐	☐
ADC	E1	Continuous	☒	☒	☒	☒	☒
Panel Lights	E2	Continuous	☒	☒	☒	☒	☒
Glareshield Lights	E3	Continuous	☒	☒	☒	☒	☒
AHRS	E4	Continuous	☒	☒	☒	☒	☒
Flap Actuator	E5	Intermittent	☐	☐	☐	☐	☐
COM 1	F1	Continuous	☒	☒	☒	☒	☒
GPS/NAV 1	F2	Continuous	☒	☒	☒	☒	☒
COM 2	F3	Continuous	☒	☒	☒	☐	☐
GPS/NAV 2	F4	Continuous	☒	☒	☒	☐	☐
Autopilot	F5	Continuous [1]	☒	☒	☒	☐	☐
Audio Panel	G1	Conts.	☒	☒	☒	☒	☒
Radio Blower	G2	Continuous	☒	☒	☒	☐	☐
ADF	G3	Continuous	☒	☒	☒	☐	☐
Transponder	G4	Continuous	☒	☒	☒	☒	☒
GDL 69	H1	Continuous	☒	☒	☒	☐	☐
TCAD	H2	Continuous	☒	☒	☒	☐	☐
JPI Engine Monitor	H3	Continuous	☒	☒	☒	☒	☒
Bose Headsets	H5	Continuous	☒	☒	☒	☒	☒
Altitude Encoder	J1	Continuous	☒	☒	☒	☒	☒
Strobe Light	SW1	Continuous	☒	☒	☒	☒	☒
Navigation Lights	SW2	Continuous	☒	☒	☒	☒	☒
Recognition Lights	SW3	Continuous	×	☒	☒	☒	☒
Landing Light	SW4	Continuous	☒	☒	☐	☐	☐
Pitot Heat	SW5	Continuous	☐	☒	☒	☒	☒

Figure 3-10 GTX Electrical Load Tabulation Form (Sample)
Sheet 1 of 2

ELECTRICAL LOAD TABULATION FORM (CONTINUED)

Date: _____ **Tail Number:** NXMPL1

Circuit/System	Circuit Breaker Number	Operating Time	Phase(s) of flight during which circuit/system is used: Normal Operation – Taxiing 10 min	Normal Operation – TO/Land 10 min	Normal Operation – Cruise 60 min	Emergency Operation – Cruise (*Calculated*)	Emergency Operation – Land 10 min
Elevator Trim	SW6	Intermittent	☐	☐	☐	☐	☐
Boost Pump	SW7	Intermittent	☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐
Total current used (amps):			47.5 (a)	60.0 Ldg Lt ON (b1) 44.7 Ldg Lt OFF (b2)	43.5 (c)	34.0 (d)	48.1 (e)
÷ Alternator rating (amps): 68							
x 100% = Percent of alternator capacity used:			68 % (< 80%)	86 % Ldg Lt ON (< 95%) 64 % Ldg Lt OFF (< 80%)	62 % (< 80%)	N/A	N/A
Pass/Fail:			Pass	Pass	Pass		

Notes:

[1] During taxi phase, the Autopilot circuit breaker is closed but the autopilot is not engaged.

Figure 3-11 GTX Electrical Load Tabulation Form (Sample)
Sheet 2 of 2

3.16.5 Battery Capacity Analysis

If it is determined that the modification results in an increase in electrical load then it must be further verified that the aircraft electrical system remains in compliance which includes both electrical generation capacity and if loads have been increased, that reserve battery capacity remains adequate to support loads essential to continued safe flight and landing. If the existing battery does not meet the battery capacity requirements, a battery that has sufficient capacity must be installed.

Refer to ASTM document F 2490 - 05, Standard Guide for Aircraft Electrical Load and Power Source Capacity Analysis for more information.

1. Examine the nameplate capacity of the battery and assume 75% is available.
   For example, 12A-h = 720A-min, therefore 720 A-min X 75% = 540 A-min.
2. Estimate the normal or pre-loadshed cruise condition (assume worst case cruise at night).
   For example, 15 A X 5 min = 75 A-min. This assumes 5 minutes for the pilot to shed non-essential loads. Any automatic load shedding can be assumed to be immediate and need not be considered in the pre-loadshed calculations.
3. Determine the minimum cruise load necessary to maintain flight after the generator/alternator has failed. For example, 10 A.
4. Determine the consumption required during the landing approach.
   For example, 20 A for 5 min = 100 A-min. The cruise duration is therefore:

$$\frac{\text{Battery Capacity} - \text{Pre-loadshed} + \text{Landing Load}}{\text{Cruise Load}} = \frac{(a) - ((b) + (d))}{(c)}$$

$$= \frac{540\ \text{A-min} - (75\ \text{A-min} + 100\ \text{A-min})}{10\ \text{A}}$$

$$= \frac{365\ \text{A-min}}{10\ \text{A}}$$

$$= 36.5\ \text{min}$$

Figure 3-11 Battery Capacity Analysis Example

4 INSTALLATION PROCEDURE

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The general requirements in this section apply to the GTX 335 transponder installation.

For more mechanical drawings and validation of structure information, refer to appendix A.

4.1 Structural Installation

NOTE

Existing transponder installations may not meet the requirements in this section. Make sure the installation location for the GTX meets the requirements before the aircraft is modified.

4.1.1 Location and Mounting

The following conditions must be met for installation of the transponder.

- Maintain a minimum of three inches between the edge of the mounting rack nearest the connector and any nearby objects to provide clearance for the connectors, wire harness and antenna cables.
- Use hardware listed in appendix D, unless indicated differently.
- Electrical bond requirements can limit possible installation locations:
  - For metal aircraft, the unit must be electrically bonded to the aircraft metallic structure. Refer to section 3.15 and table 3-13.
  - For nonmetallic aircraft, the unit must be electrically bonded to the aircraft ground plane. Refer to section 3.15 and table 3-13.

4.1.2 GTX 335 Panel Mount Installations

This information affects panel mount installations of the transponder:

- Panel mount transponders can be installed in existing avionics stack with a minimum width of 6.30 in. and at least 1.68 in. of vertical space.
- A minimum distance is required forward of the instrument panel to accommodate the length of the transponder, connectors, and the wire harness:
  - At least 13.10 in. is required for the GTX 335.
- Modification to the instrument panel mounting rails for the avionics stack may be necessary for the transponder mounting rack.
- Support of the forward end of the transponder mounting rack to other avionics racks or an aircraft structure is required.

Refer to figure 4-1 and figure 4-2 for illustrations of avionics rack mounting rails used in GTX 335 installations. In order to satisfy the structural requirements for the installation of GTX 335 transponders, the following conditions must be met:

1. If support brackets or rails need to be fabricated for this installation, they should be fabricated and attached to the aircraft instrument panel structure in accordance with the methods outlined in FAA AC 43.13-2B Chapter 2, AC 43.13-1B Chapter 4, and the following requirements:
   a. Use 2024-T3 sheet aluminum (bare or Clad), minimum of 0.032 in. thick.
   b. Use sheet metal techniques (bend radius, fillets, etc.) applicable to material type and thickness.
   c. Secure the GTX 335 mounting rack with two #6 flat head screws on each instrument panel rail (figure 4-1 and figure 4-2). Nuts, nutplates, or clipnuts can be used to secure the #6 screws.
   d. Verify the fabricated parts are protected from corrosion. Apply epoxy primer that meets MIL-P-23377 Class N, or other corrosion protection methods listed in the aircraft's maintenance manual.
   e. Fabricate and install support straps at the forward end of the mounting rack to attach to existing racks as given in FAA AC 43.13-2B, Chapter 2.

NOTE

Verify the straps or other means of support do not obstruct the vent on the side of the unit (refer to figure A-1) if forced air cooling is desired.

2. Make sure no screw heads or other obstructions prevent the transponder from fully engaging in the rack.
3. Exercise caution during installation of the rack to the instrument panel. Deformation of the rack can make it difficult to install and remove the transponder.

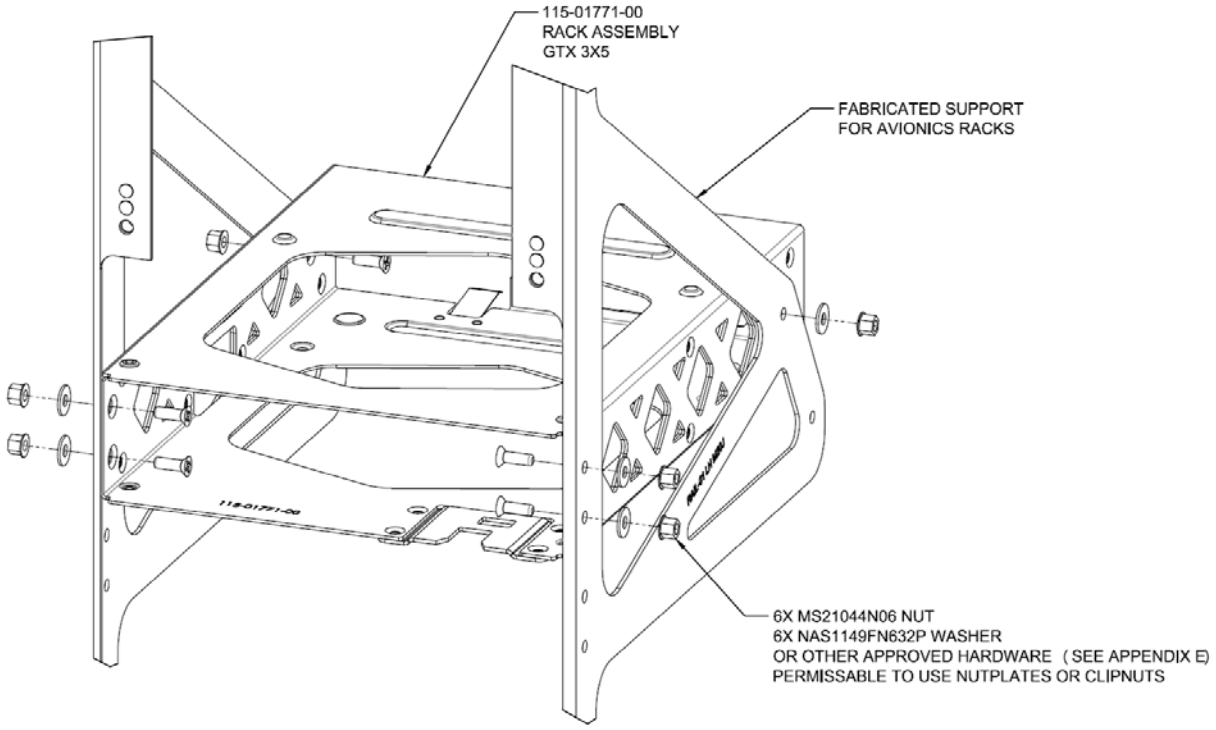


Figure 4-1 GTX 335 Installation

Avionics Stack Cutout

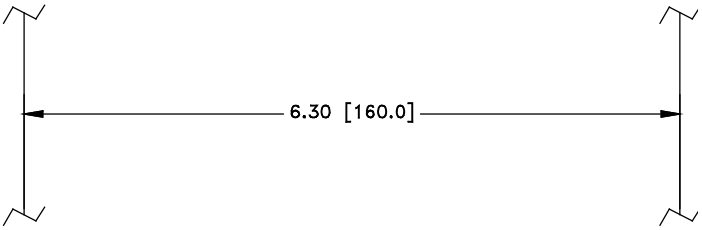
Some instrument panels can require minor modifications to increase width or height of the avionics stack cutout to accommodate installation of the GTX 335.

To satisfy the structural requirements for the installation of the panel mount transponders, the following conditions must be met:

- A cutout cannot be made into aircraft primary structure.
- Cutout area must not affect any subpanel structure.
- Refer to figure 4-2 for dimensions of cutouts.
- Radius corners and remove burrs from cut edges. Apply corrosion protection or finish paint to the cut edge.

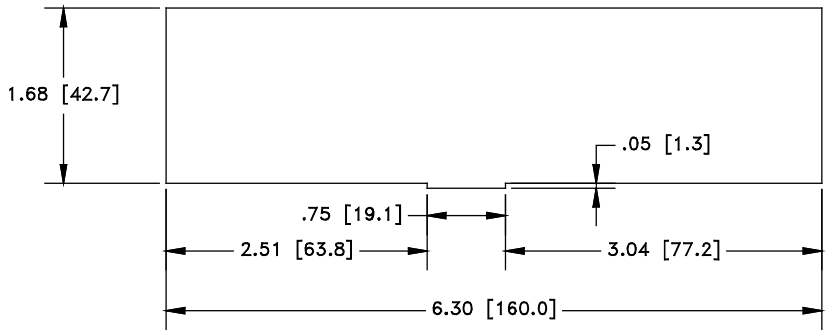
OPTION 1:

STACK CUTOUT (RACK INSTALLED FROM FRONT OF AIRCRAFT PANEL)



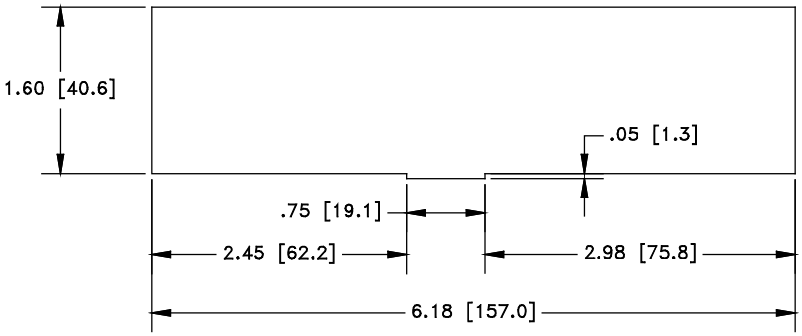
OPTION 2:

RADIO CUTOUT (RACK INSTALLED FROM FRONT OF AIRCRAFT PANEL)



OPTION 3:

RADIO CUTOUT (RACK INSTALLED FROM BACK OF AIRCRAFT PANEL ONLY) MAXIMUM AIRCRAFT PANEL THICKNESS IS .125 INCH [3.2 mm]



NOTES:

1. DIMENSIONS: INCH [mm].
2. IF THE FRONT LIP OF THE MOUNTING RACK IS BEHIND THE SURFACE OF THE AIRCRAFT PANEL, THE UNIT CONNECTORS MAY NOT FULLY ENGAGE.

Figure 4-2 Panel Cutout Detail for GTX 335

Modification of Avionics Stack Mounting Rails

Existing mounting rails can contain holes from previously installed equipment. If existing rail holes do not match holes in the GTX 335 mounting rack, it is permitted to modify the rails through the addition of fastener holes to accept installation of the mounting rack. If more fastener holes are required, the following conditions should be adhered to:

- Maintain a distance at least 2 X D from the edge of the rail for the other fastener holes.
- Maintain at least 3 X D distance between holes when adding holes among the existing holes.

If existing brackets or mounting rails are found to be incorrect for installation of the GTX 335, new parts need to be fabricated. In some cases, there can be too many holes from previous avionics mounting tray installations. If new parts are to be fabricated, adhere to the following conditions:

- Remove existing mounting rails or brackets from instrument panel. Avoid enlargement of existing rivet holes.
- Fabricate new parts as close to the original design as possible (extrusion or sheet metal). Use the same material thickness and type with only the holes necessary for the planned avionics stack.
- If material type of the original rails or brackets is unknown, replace with 2024-T3 (bare or Clad) aluminum of the same thickness as the original part. Use sheet metal techniques (bend radius, fillets, etc.) applicable to material type and thickness.
- Make sure fabricated parts are protected from corrosion. Apply epoxy primer that meets MIL-P-23377 Class N, or other corrosion protection methods listed in the aircraft's maintenance manual. Area around the fastener holes on the side of the fabricated rail that attaches to the GTX mounting rack must be cleaned and prepared for electrical bond per section 3.15.1.
- Install fabricated mounting rails to instrument panel. Use the same number and size of rivets as original rivets removed.

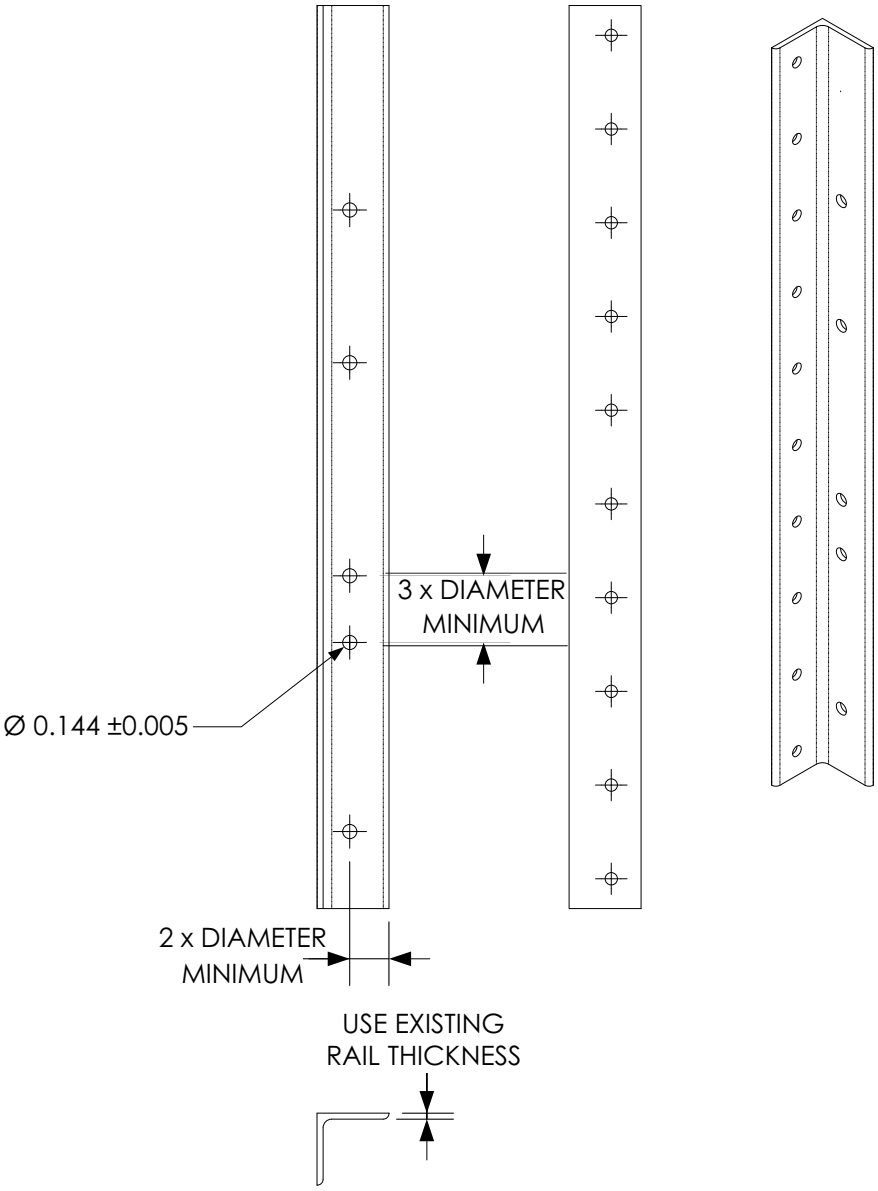


Figure 4-3 Avionics Rack Mounting Rail Considerations

4.1.3 General Requirements for Installation in Composite Aircraft

Follow general installation guidance provided in section 4.1.2. Installations of fabricated brackets or shelves in composite aircraft must be completed in accordance with guidance provided by the aircraft manufacturer, such as the aircraft's maintenance manual (MM) and/or structural repair manual (SRM). Repair procedures contained in the MM or SRM can be used to support the installation of new brackets or shelves fabricated for installation of the GTX 335. The MM or SRM provides the following information:

- Materials generally used for structural repair, including but not limited to adhesives, resins, pre-preg tape and broad goods, core material, etc.
- Fabrication and processing procedures for structural repair
- Number of plies and stacking orientation/sequence
- Shape of repair
- Applicable dimensions and tolerances
- Protective coatings and sealants needed for the repair

Fabricated brackets or shelves can be metallic or composite structure as recommended in the MM or SRM. Use guidance from the aircraft's MM or SRM to do this procedure:

1. Pre-fit fabricated part(s) to make sure the installation location is correct.
2. Clean and dry the fabricated part(s) and the aircraft structure the part(s) will be attached to.
3. Prepare attachment surfaces on the fabricated part and the aircraft's installation location for application of adhesive.
4. Prepare composite plies considering orientation, stacking sequence, and size.
5. Reference the method of layup defined in the document.
6. Inspect the installed parts for flaws.
7. Make sure parts and joints have fully cured before installation of equipment.

Aircraft constructed out of non-metallic materials such as fiberglass, carbon composite material, or fabric must take special precautions to protect the GTX 335 equipment from HIRF and indirect effects of lightning (IEL).

If applicable bonding structure is not immediately accessible, bonding can be achieved using aluminum tape (3M P/N 436, 438 or other adhesive-backed dead soft aluminum foil with minimum 7.2 mils metal thickness). A tape maximum length-to-width ratio of 7:1 must be maintained (i.e., up to seven inches in length for every one inch in width). Additional guidance can be found in AC43.13-1B and SAE ARP1870, Sections 5.1 and 5.5.

The following procedure is recommended for implementation of the guidance above.

1. If the aluminum tape must be isolated from carbon composite material, secure a thin layer of fiberglass cloth to the carbon fiber with fiberglass resin as shown in figure 4-4.
2. Prepare the aluminum surface at the ground location per figure 3.15.1.

OR

Identify or install a ground stud to which the bonding strap can be attached. Any new or existing ground stud shall be prepared for electrical bonding in accordance with section 3.15.

3. Route the aluminum tape between the transponder mounting rack and the grounding location. If needed to maintain the length-to-width ratio, the tape width can be overlapped in more than one strip. If two or more pieces of tape must be joined end-to-end, they can be joined as illustrated in figure 4-5.

4. Fold the end of the tape over twice for added thickness at the prepared grounding location.
5. If a bonding strap will be used to reach the grounding location, secure the end of the tape to the composite surface with an 0.063 in.-thick aluminum strip and three bolts and nuts, as shown in figure 4-10.
6. Make sure that the resistance between tape and the local grounding location does not exceed 2.5mΩ.
7. Attach the aluminum tape to the transponder mounting rack.
8. Verify that the resistance between the mating surfaces does not exceed 2.5 mΩ. Verify the total resistance from transponder chassis to instrument panel or aircraft ground reference does not exceed the reconditioned value shown in table 3-13.

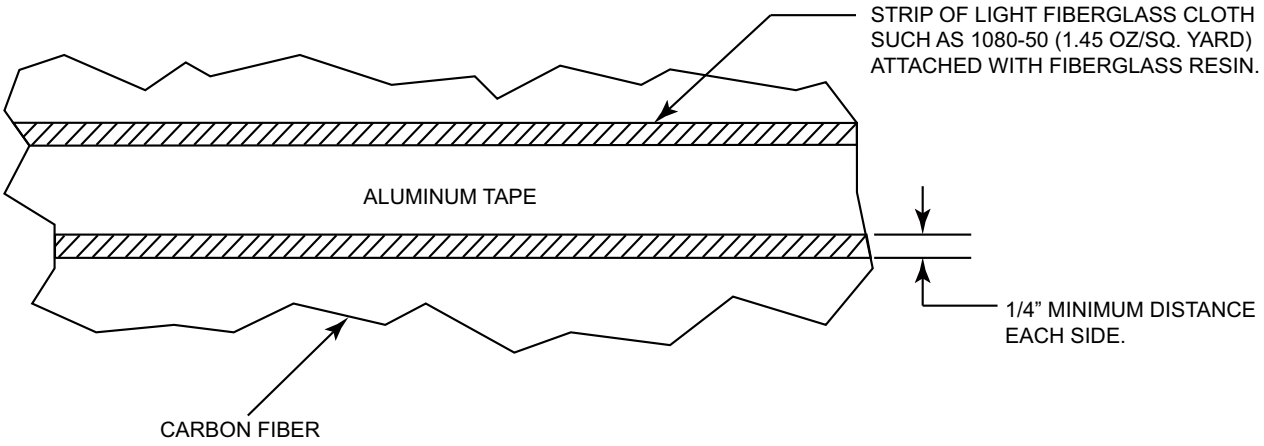


Figure 4-4 Fiberglass Insulation for Carbon Fiber Material

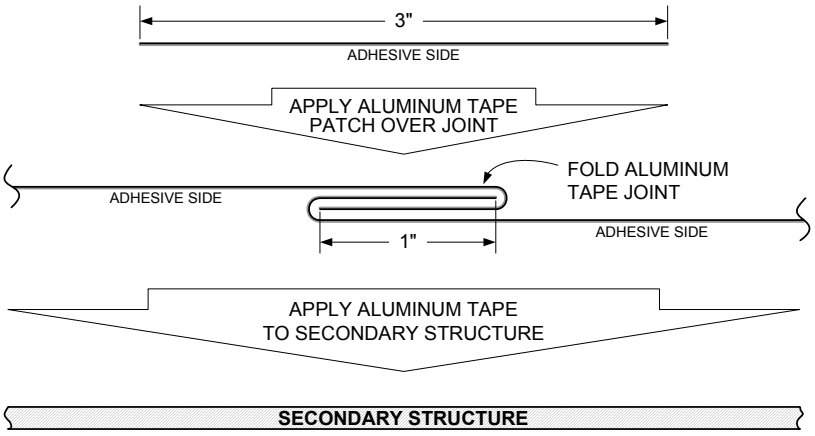


Figure 4-5 Aluminum Tape Joint

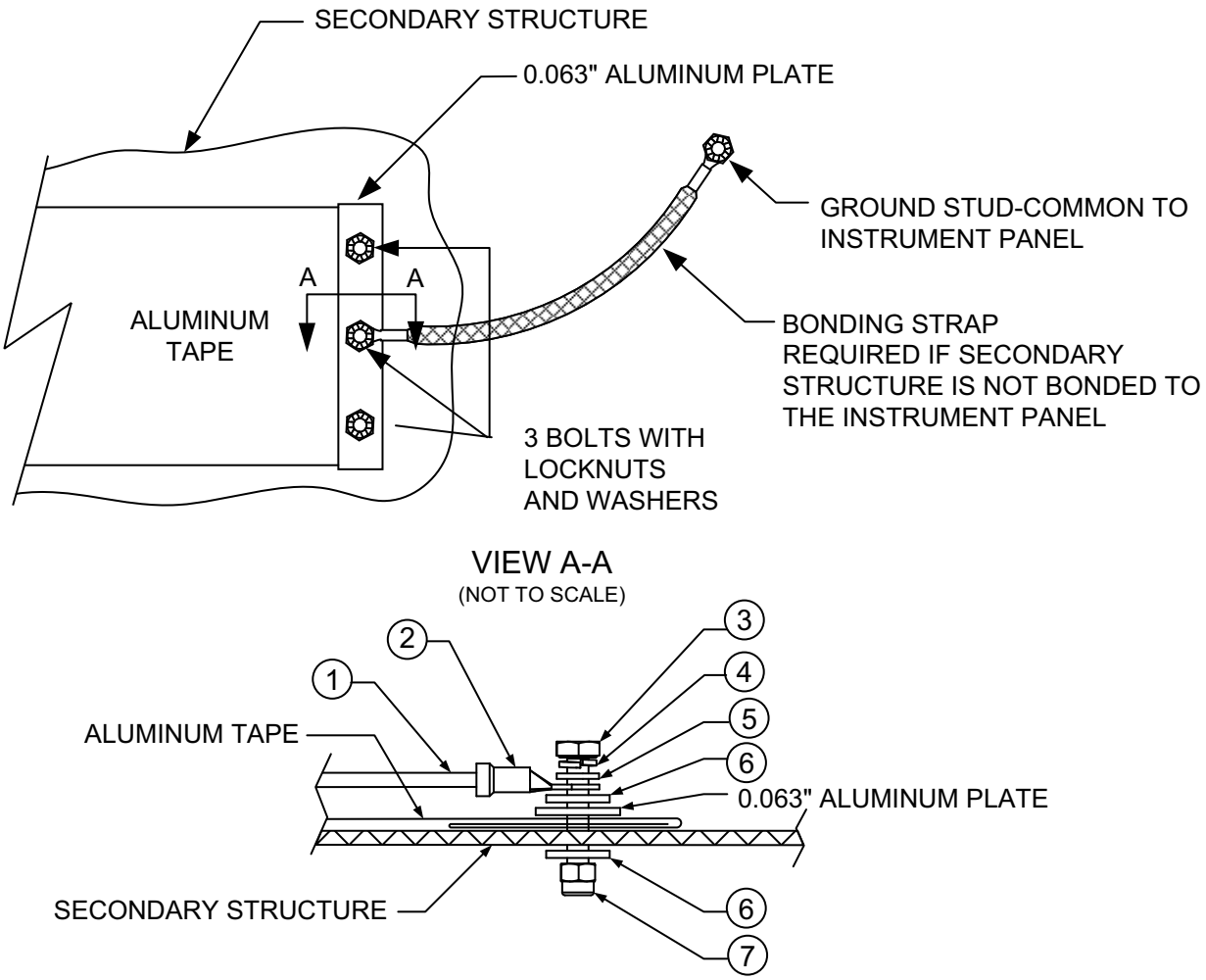


Figure 4-6 Grounding to Instrument Panel with Aluminum Tape and Grounding Strap

Table 4-1 Instrument Grounding Parts

Item Number Refer to Figure 4-6	Description
1	Tinned copper flat braid, 3/4", QQB575F36T781 Or Tinned copper tubular braid, 7/16", QQB575R30T437
2	Terminal lug, 5/16-inch, uninsulated, MS20659-131
3	Bolt, 5/16-inch, AN5-XA
4	Lock washer, 5/16-inch, NASM35338-45
5	Flat washer, 5/16-inch, NAS1149F0563P
6	Flat washer, 0.063-inch thick, NASM970-5 (AN970-5)
7	Locknut, 5/16-inch, AN363-524

4.2 GTX 335 Weight and Balance

After the installation, a weight and balance computation is required. Follow the guidelines as established in AC 43.13-1B, Chapter 10, Section 2, as applicable. Make entries in the equipment list indicating items added, removed or relocated along with the date accomplished. Include your name and certificate number in the aircraft records.

Table 4-2 identifies the installed weight of the equipment. Refer to appendix A for equipment center of gravity (CG) dimensions. For example weight and balance data, refer to table 4-3. Weights shown include the unit, mounting rack, backplate, and connector.

Table 4-2 Weight of GTX Configurations

Items	Weight		Dimensions and CG
	lbs	kg	
GTX 335, GPS panel mount	2.87	1.30	Refer to figure A-1

Table 4-3 Example Weight and Balance Calculation

Previous Aircraft Weight and Balance Calculated (date)	Useful Load (lbs.)	Empty Weight (lbs.)	C.G. (in)	Moment
	1093.30	2306.70	138.83	320,239
Description of items removed from aircraft		Weight (lbs.)	Arm (in)	Moment
KT 76C Unit/Rack		2.61	55.00	143.55
Total removed		-2.61	55.00	-143.55
Description of items added to aircraft		**Weight (lbs.)**	**Arm (in)**	**Moment**
GTX 335 Unit/Rack/Connector		2.87	55.00	157.85
Total added		2.87	55.00	157.85
Change		0.26	55.00	14.3
New Aircraft Weight and Balance (date)	**Useful Load (lbs.)**	**Weight (lbs.)**	**C.G. (in)**	**Moment**
	1092.74	2306.96	138.77	320,253

4.3 Electrical Installation

4.3.1 Wiring (Addition/Change)

The modifications contained in this section are mandatory and applicable for all installations to meet the requirements of this STC.

- Refer to appendix C for equipment compatibility and configuration.
- Refer to appendix B for the approved interface diagrams.

4.3.2 Special Tools Required

A crimp tool meeting MIL specification M22520/2-01 and a positioner/locator are required to make sure there are consistent, reliable crimp contact connections for the D-sub connector.

- Refer to table 3-5 for a list of recommended crimp tools.

4.3.3 Power Distribution

Circuit protection for the GTX must be a push-pull manually resettable circuit breaker (e.g., Klixon 7274 Series circuit breakers). The circuit breaker must be labeled as specified in figure B-1 and readily accessible to the pilot.

4.3.4 Wire and Cable Considerations

Make sure damage does not occur to the wiring and cables during installation.

- Reference FAA AC 43.13-1B for installation guidance for wire routing and installation.

4.3.5 Coaxial Cable Preparation

Follow the manufacturer's instructions for coaxial cable preparation.

4.3.6 Wire Harness Construction

The GTX 335 units use a single 62 pin D-Sub connector.

Except for the antenna(s) and shield ground, all electrical connections are made through these D-Sub connectors. Shield grounds are terminated to the shield ground block attached to the backshell of the D-Sub connectors.

- Refer to section 8 for connector pinout information.
- Refer to appendix B for interconnect wiring diagrams and cable requirements for each signal.

4.3.7 Shielded Cable Preparation

NOTE

Solder sleeves with pre-installed shield drains should be used instead of separate shield terminators and individual wires. Although separate shield terminators and individual wires can be used, a preferred solder sleeve is the Raychem S02 Series with the thermochromic temperature indicator. These solder sleeves come with a pre-installed lead and effectively take the place of items 2 and 3 in figure 4-7. For detailed instructions on use, refer to the Raychem installation procedure.

Prepare all of the shielded cables using one of the methods shown in figure 4-7.

Keep shield drain components as short as practical with a maximum length of 3".

- Refer to section 4.3.8 for information on shield termination to the connector backshell.

The procedures in this section provide an outline for all shield wiring preparations (existing wiring included) terminated at the GTX connectors.

1. At the end of the shielded cable (3), strip back a 2.5" maximum length of the jacket to expose the braid.
2. Remove this exposed braid.
3. Carefully score the jacket 1/4" to 5/16" from the end.
4. Remove the jacket to leave the braid exposed.
5. Connect a 20 or 22 AWG wire (1) to the exposed shield of the prepared cable assembly.
    - Refer to figure 4-7.
    - Refer to AC 43.13-1B Chapter 11 for termination techniques.
6. Slide a shield terminator (3) onto the prepared cable assembly and connect the wire (2) to the shield using a heat gun approved for use with solder sleeves.
    - The chosen size of solder sleeve must accommodate both the number of conductors present in the cable and the wire (2) to be attached.
    - Repeat steps 1 through 3 as needed for the remaining shielded cables.
7. Strip the exposed twisted wire 0.17" from the end.
8. Crimp pins (4) onto the wires.
9. Crimp a correctly sized ring terminal (5) onto the end of each shield drain (2).
10. Repeat steps 4 – 6 for the remaining wires/shields.
11. Using the interconnect diagrams in appendix B, for the applicable connections and pinouts, insert the pin into the connector housing location. Refer to figure 4-7.
12. Make sure the pin is engaged into the connector by gently tugging on the wire.
13. Wrap the cable bundle with silicone fusion tape at the point where the backshell strain relief and cast housing contact the cable bundle.

Table 4-4 Shield Wire Assembly

Refer to figure 4-7	Description	Garmin P/N	Notes
1	Multiple conductor shielded cable (Refer to appendix B for interconnect diagrams)	As required	[1] [2]
2	Wire, insulated (20-22 AWG), 3” max length	As required	[1] [2]
3	Shield terminator	As required	[1] [2]
4	Pin contacts, #22D	336-00021-00	[4] [5]
5	Ring terminal, #8, insulated, 18-22 AWG,14-16 AWG, 12–10 AWG	MS25036-149 MS25036-153 MS25036-156	[1] [2] [3] [5]

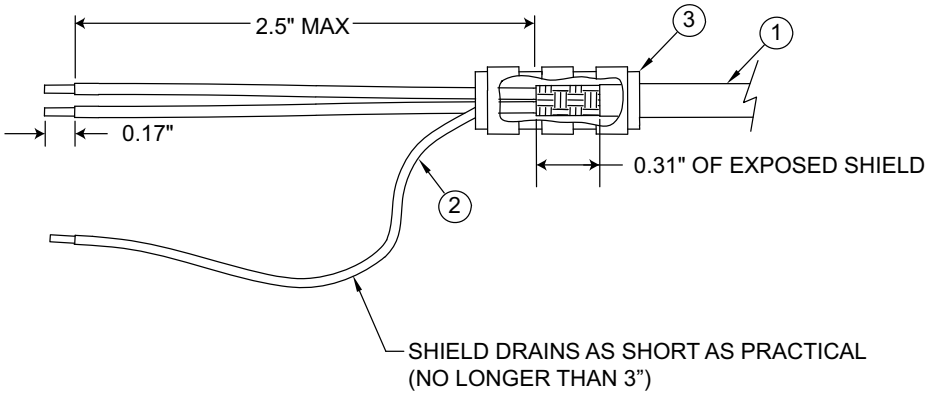
[1] Item not supplied in connector kits and must be purchased separately.

[2] Solder sleeve with pre-installed lead can be used instead of items 1 and 2.

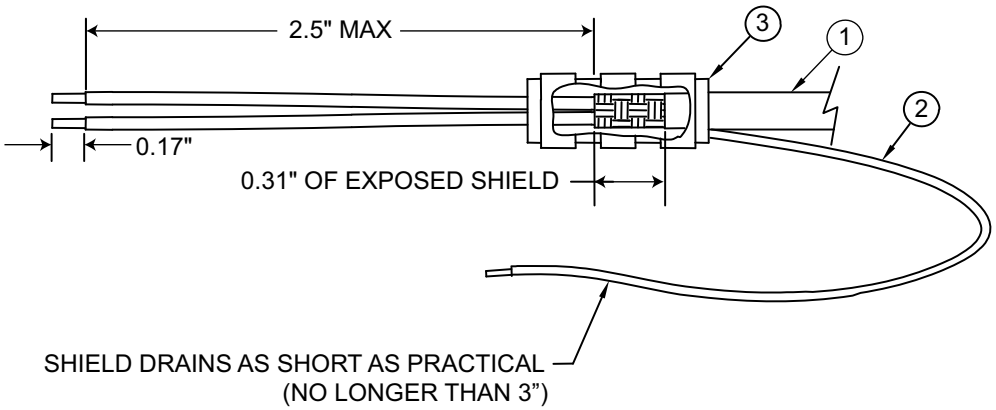
[3] Not a Garmin part number.

[4] Supplied as part of Sub Assy Connector Kits for GTX 335.

[5] Part not shown in figure 4-7.



PREFERRED METHOD



ALTERNATE METHOD

Figure 4-7 Shielded Wire Preparation

4.3.8 Cable Bundle Termination on Backshell Assembly

CAUTION

Do not put the concave side of the strain relief clamp across the cable bundle. Placing the concave side of the strain relief clamp across the cable bundle will damage the cable bundle.

Terminate the cables to the backshell assembly after all shielded cables are prepared in accordance with section 4.3.7.

1. Terminate the crimped cable bundle contacts in the D-sub connector using the interconnect diagrams in appendix B for the correct connections and pinouts.
2. Make sure the pin is engaged into the connector by gently tugging on the wire.
3. For the GTX 3X5 units, install the configuration module wires into the connector.
   - Refer to section 4.4 for configuration module installation instructions.
4. Wrap the cable bundle with silicone fusion tape at the point where the backshell strain relief and cast housing will contact the cable bundle.
5. Place the smooth side of the backshell strain relief clamp across the cable bundle. Secure using three 4-40 x 0.375" pan head screws.
6. Terminate the ring terminals to the tapped holes on the backshell by placing ring terminal on the 8-32 x 0.312" pan head shield terminal screw in this order before finally inserting the screw into the tapped holes on the shield block:
   a. Split washer
   b. Flat washer
   c. First ring terminal
   d. Second ring terminal (if needed)

4.3.9 Connector and Backplate Assembly for GTX 335

CAUTION

Damage can occur to the wiring if the screws used to ground the shields to the shield block are too long. Make sure a sufficient length is present without protruding into the wire bundle.

Refer to table 4-5 for GTX 335 connector kit hardware.

The backplate varies depending on the possible unit and mount selections. Backshell connectors give the installer the ability to terminate shield grounds at the backshell housing using the Shield Block ground kit.

1. For all 22 gauge and smaller unshielded wiring, strip wire 0.17” from the end and crimp pins (P/N 336-00021-00) onto the wires.
2. Insert all (shielded and unshielded) terminated wires into the connector(s) in accordance with the aircraft wiring diagrams.
3. Attach the Shield Block to the backshell(s) by inserting the flathead screws through the holes on the Shield Block and threading into the tapped holes on the backshell.
4. Wrap the cable bundle with Silicone Fusion Tape at the point where the backshell strain relief and cast housing will contact the cable bundle.
5. Place the smooth side of the backshell strain relief across the cable bundle and secure using the three screws. Make sure each half of the strain relief bar is supporting half of the cable bundle.
6. Attach the cover(s) to the backshell(s) using two each screws.
7. Terminate the ring terminals to the shield block by placing items on the pan head screw in this order:
    a. lock washer
    a. flat washer
    a. first ring terminal
    a. second ring terminal, if needed before finally inserting the screw into the tapped holes on the shield block.
8. Insert the assembled connector into the backplate.

Refer to table 4-5 for the list of connector kit items, dependent on which unit is used.

Refer to figure 4-8 for the connector kit assemblies.

Table 4-5 GTX 335 Connector Kit Hardware

Item	Description	P/N	QTY
1	Connector, hi-density, D-sub, mil crimp 62 ckt	330-00185-62	1
2	Sub-assembly, bkshl with hardware, 37/62 pin	011-00950-03	1
3	Sub-assembly, ground, adapter shell, 4&5	011-01169-01	1
4	Screw, 4-40x.250, FLHP 100, SS/P, w/nylon	211-63234-06	2 ea connector

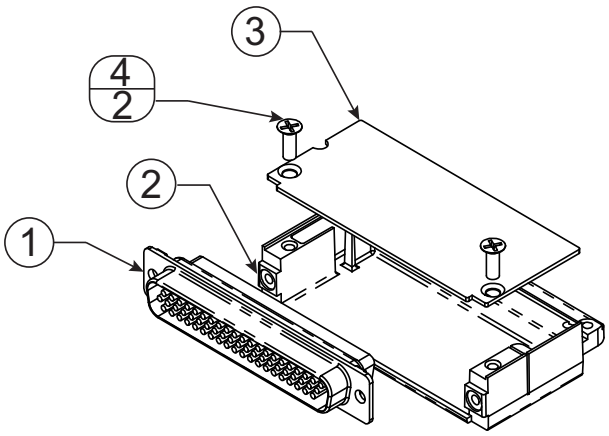


Figure 4-8 GTX 335 Connector Kit

Refer to table 4-6 for back plate items for the standard mounting assembly. Refer to figure 4-9 for the back plate assembly.

Table 4-6 Standard Mount Backplate Hardware

Item	Description	P/N	QTY
1	DCP, connector plate, GTX 3X5, with secondaries	125-00307-10	1
2	Conn, male/female special BNC	330-00053-01	1
3	Washer, shoulder, GNC400	212-00022-00	2
4	Conn, M/F, spec, BNC/TNC	330-00053-02	1
5	Screw, 4-40x.250, PHP, SS/P, w/nylon	211-60234-08	4

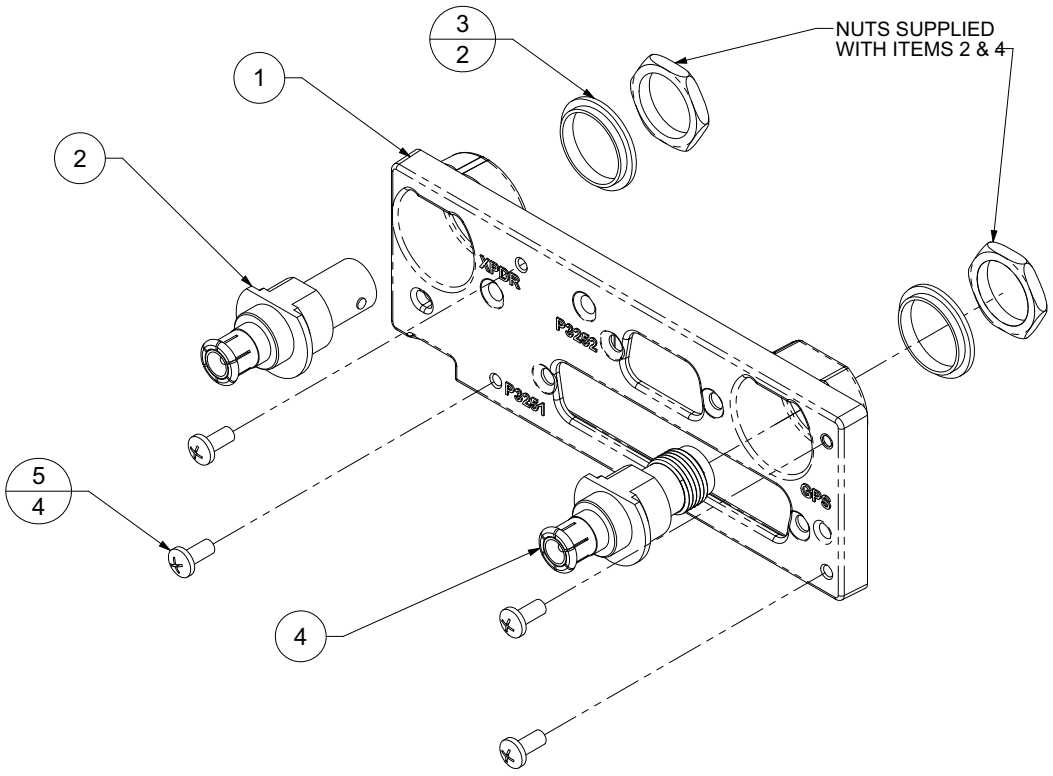


Figure 4-9 GTX 3X5 with GPS Backplate Assembly P/N 011-02976-01

4.4 GAE and Configuration Module Installation

The GTX 335 series transponders require the installation of a configuration module or the GAE with an integrated configuration module. Refer to section 4.5.1 for aircraft guidance.

The GAE is installed on the backplate as shown in figure 4-10.

The configuration module is installed in the connector assembly as shown in figure 4-11.

4.4.1 GAE

1. Crimp pin contacts onto each wire of the four-conductor wire harness. Strip 0.17" of insulation from each wire prior to crimping.
2. Insert newly crimped pin contacts and wires into the correct locations in the connector housing as shown in appendix B.
3. Mount the GAE to the backplate using 2 each countersunk screws as shown in figure 4-10. Torque screws to 8 in-lbs.
4. Plug the four-conductor wire harness into the connector on the GAE. Make sure there are no pneumatic leaks or sealant in the lines and fittings.

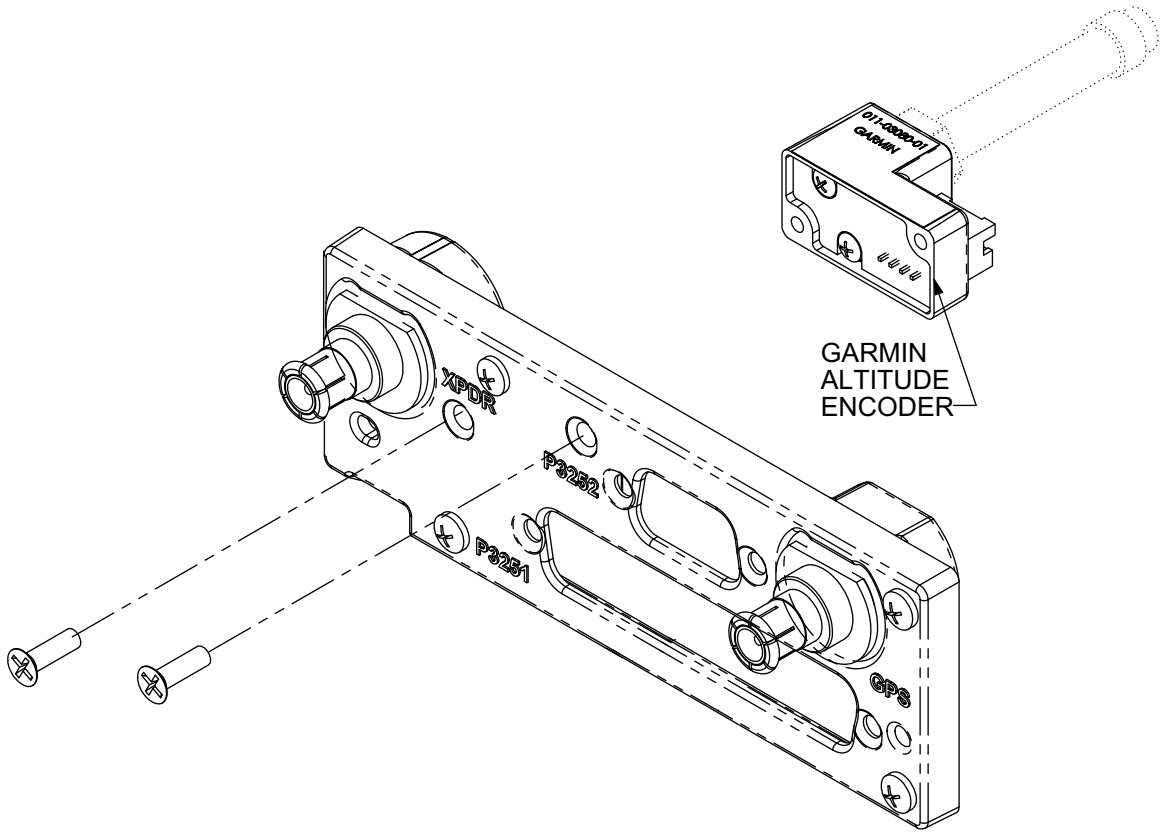


Figure 4-10 GAE Assembly

The static port is 1/8-27 ANPT female threads. The mating fitting must have 1/8-27 ANPT male threads. Refer to the aircraft manufacturer's documentation for pneumatic tubing and fitting part numbers.

4.4.2 Configuration Module Installation

1. Crimp pin contacts (3) onto each wire of the four-conductor wire harness (2). Strip 0.17" of insulation from each wire prior to crimping.
2. Insert newly crimped pin contacts and wires (2, 3) into the correct locations in the connector housing as shown in figure 4-11.
3. Plug the four-conductor wire harness (2) into the connector on the PCB board (1).
4. Insert PCB board (1) into the backshell recess.
5. Orient the connector housing so that the inserted four-conductor wire harness (2) is on the same side of the backshell, as the inserted PCB board (1), as shown in figure 4-11.

Table 4-7 Configuration Module Kit, P/N 011-00979-03

Item	Description	P/N	QTY
1	Configuration module, PCB board assembly w/EEPROM	011-02178-00	1
2	4-conductor harness	325-00122-00	1
3	Pin contact, crimp, #22D	336-00021-00	4

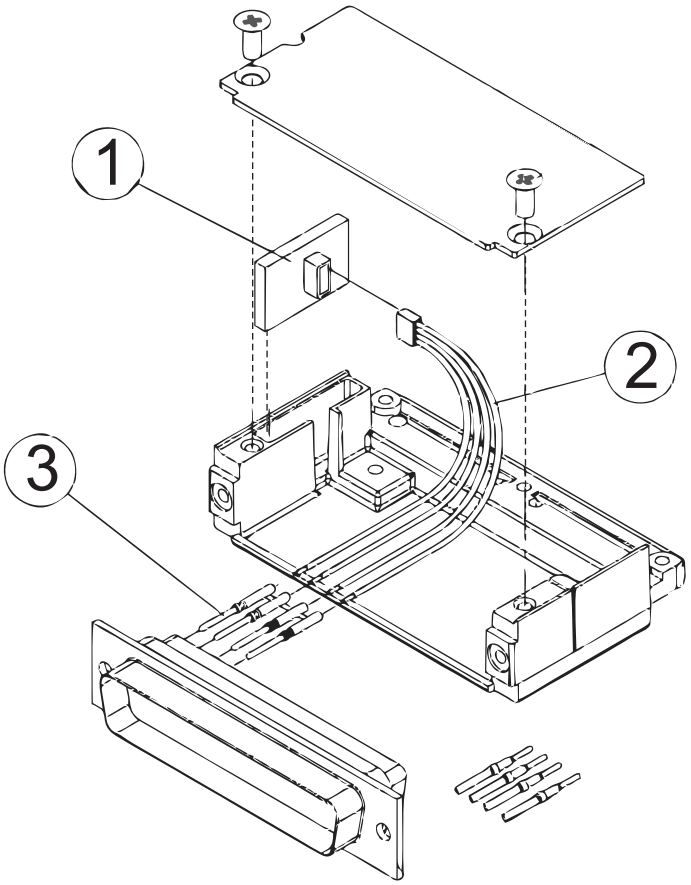


Figure 4-11 Configuration Module Assembly

4.5 GTX Installation

Install the GTX after completion of the continuity and power checks. The GTX should be installed into the rack and secured correctly. The GTX backplate must be connected to the wiring harness and antenna coaxial cables.

CAUTION

Do not to over-tighten the unit into the rack. Torque exceeding 8 in-lbs can damage the locking mechanism.

NOTE

It may be necessary to insert the hex drive tool into the access hole and rotate the cam mechanism 90 degrees counterclockwise to make sure the cam mechanism is in the correct position before placing the unit into the rack.

1. Slide the GTX 3X5 straight in the rack until it stops, about one inch short of the final position.
2. Insert a 3/32-inch hex drive tool into the access hole at the bottom of the unit face.
3. Turn the hex tool clockwise while the left side of the bezel is pushed until the unit is firmly seated in the rack.
4. Make sure nothing obstructs the unit from fully seating in the rack. The mounting rack may need to be moved aft (toward the pilot) so that the aircraft panel does not obstruct the unit from engaging in the rack. Torque to 8 in-lbs.
5. Refer to section 6 and section 7 for system configuration, calibration and checkout.

4.5.1 GAE Installation

CAUTION

Make sure there are no pneumatic leaks. Make sure there is no fluid, sealant, or particles inside the lines and fittings.

The installer is required to:

- Fabricate static hose connections.
- Label the hose near the unit.
- Attach the aircraft static pressure source to the GAE.

Refer to section 3-1 for general guidance and installation information.

1. Secure the GAE to the GTX 335 back plate assembly with two screws.
2. Connect the wiring harness to the GAE.
3. Static System Connection
    a. For aircraft with independent static systems and two transponders, the transponders should be installed on different static systems. If no second static system is available, then it is satisfactory to install transponders on the same static system.
    a. Refer to the aircraft manufacturer's documentation for pneumatic tubing and fitting part numbers that can be used to connect the static system to the GAE female 1/8-27 ANPT. Refer to 14 CFR Part 43 appendix E for approved practices to connect the GAE to the aircraft static system.
    a. Do not exceed the aircraft manufacturer's minimum bend radius. Avoid routing near aircraft control cables, structure, or high temperature lines, tubing, and components. The GAE must not be the low point of the static plumbing lines, to avoid moisture or debris collecting at or near the unit. The static line must be labeled near the unit.
    a. Modifications must not interfere with the previously approved effectiveness of the static system drains, the effectiveness of the alternate static source selector switch (if applicable), or the independence of dual static systems (if applicable).
    a. Modifications to the static port surface, aircraft surface near the static port, or other changes that would affect the relationship between measured static air pressure and true ambient static air pressure are outside the scope of this STC.
4. Refer to section 6 and section 7 for system configuration, calibration and checkout.

4.6 AFMS Completion

Section 1.4 of the GTX 33/330 and GTX 3X5 AFMS is intended to specify the installation configuration for the GTX system. It is the responsibility of the installer to mark in the appropriate boxes in the AFMS with indelible ink using the following guidance.

Equipment Installed

The Equipment Installed subsection indicates the type of GTX transponder installed. Mark the boxes as described for Transponder #1.

[5] GTX 335

Mark box [5] for the installed GTX 335 with GPS transponder, part number 011-03300-40.

Interfaced GPS/SBAS Position Source

The Interfaced GPS/SBAS Position Source subsection describes the GPS position source(s) used by the GTX transponder(s). Mark the boxes as described for GPS #1, and for GPS #2 if dual GPS sources are interfaced to the transponder(s).

[1] Internal

Mark box [1] for the installed GTX 335 with GPS transponder, part number is 011-03300-40 and the Internal GPS source is configured.

Interfaced Pressure Altitude Source

The Interfaced Pressure Altitude Source subsection describes the Altitude source(s) used by the GTX transponder(s). Mark the boxes as described for Pressure Altitude Source #1.

[1] _____

[2] Garmin Altitude Encoder

Mark box [1] if the installed transponder(s) is interfaced with an external Pressure Altitude Source input per appendix B and appendix C of this manual. Write the Manufacturer and Model of the interfaced source in the space provided.

Mark box [2] if the installed transponder(s) is configured to utilize Pressure Altitude from the optional Garmin Altitude Encoder.

5 SOFTWARE UPDATE

5.1 Software Check 5-2
5.1.1 GTX 335 Software Version Check 5-2

CAUTION

If the unit is removed from the aircraft and operated, connect the transponder antenna connection to a 50 ohm 5 watt load. The GTX transmits Mode S acquisition squitter pulses once per second whether interrogations are received or not. Failure to connect a dummy load or antenna during this procedure will cause the transponder to fail and possibly damage the unit.

CAUTION

Do not turn off the unit until "Update Complete" is shown next to all selected items. Failure to do so could result in equipment damage.

NOTE

The modifications in this section are mandatory to meet the requirements of AC 20-165A and this STC. These modifications are applicable for ALL installations associated with this STC.

NOTE

Screen shots in this section are provided for reference only. For current approved GTX software versions, refer to GTX 33X and GTX 3X5 ADS-B AML STC Equipment List.

5.1 Software Check

5.1.1 GTX 335 Software Version Check

1. Power on the GTX 335 in normal mode.
2. Observe the start-up screen until "PRESS ENT FOR PRODUCT DATA" displays.

Figure 5-1 GTX 335 Start-Up Screen

3. Push the **ENT** key to go to the software version screen.
4. Verify that the version number matches the approved version as specified in *GTX 33X and GTX 3X5 ADS-B AML STC Equipment List.*

Figure 5-2 GTX 335 Product Data Page

6 POST INSTALLATION CONFIGURATION

6.1 System Configuration Overview 6-1
6.2 Mounting, Wiring, and Power Checks 6-1
6.3 GTX 335 Remote Unit Configuration (Wizard Tool) 6-2
6.4 GTN 6XX/7XX Configuration with GTX 6-2
6.5 GNS 400W/500W Series Configuration 6-3

6.1 System Configuration Overview

This section contains instructions for configuring each installation.

The checkout log contained in Appendix A of *GTX 33X and GTX 3X5 ADS-B Maintenance Manual* must be filled out during the checkout procedures. The completed checkout log sheet must be maintained with the aircraft permanent records to document the configuration of the installation.

6.2 Mounting, Wiring, and Power Checks

CAUTION

Make sure there are no pins misaligned or bent before inserting the GTX into the mounting rack. Bent or misaligned pins will result in damage to the GTX or failed procedures.

CAUTION

Make sure the wire harness does not touch any moving part.

CAUTION

Make sure all lighting buses are set to their lowest adjustment before the unit is energized. The lowest adjustment prevents damage to the unit in case of any wiring errors. Incorrect lighting bus wiring could cause damage to the GTX.

The wiring harness must be examined for correct connections to the aircraft systems and other avionics equipment before the unit is installed and energized. Point-to-point continuity must be completed to expose any faults such as shorting to ground or wiring discrepancies. All faults or discrepancies must be corrected before proceeding.

Before and during the installation make sure:

1. All cables are secured.
2. Shields are connected to shield blocks of the connectors.
3. Movement of the flight and engine controls do not interfere with cabling and control systems.
4. Wire is installed as described in section 4.3.

After the installation and continuity check make sure these items are completed:

1. Power and ground check.
2. Faults and discrepancies are corrected.
3. GTX installation rack and unit are correctly secured.

6.3 GTX 335 Remote Unit Configuration (Wizard Tool)

The GTX 335 should be configured using the GTX 335 Setup Wizard. Document guide is 190-01499-40.

The latest GTX 335 Setup Wizard Tool (P/N 006-A0284-( )) is obtained through the single-use registration code process. A USB-A plug to USB-B plug cable (not provided) is needed.

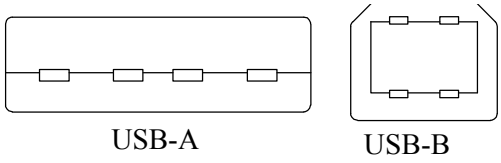


Figure 6-1 USB-A and USB-B Connectors

To use the GTX 335 Wizard:

1. Power off the unit.
2. Connect the USB-A to USB-B cable between the computer and the USB-B receptacle installed in the aircraft wire harness.
3. Power on the unit.
4. Launch the GTX 335 Setup Wizard Tool.
5. Follow guided instructions.

6.4 GTN 6XX/7XX Configuration with GTX

This section gives details for configuring the GTN 6XX/7XX to provide TIS-A display functions when interfaced to a GTX Transponder.

To configure the GTN 6XX/7XX:

1. Push and hold the **HOME** key of the GTN 6XX/7XX unit.
2. Power on the GTN 6XX/7XX unit.
3. Release the **HOME** key when the displayed.
4. Select the GTN Setup page.

To configure the GTN 6XX/7XX, refer to appendix C.

6.5 GNS 400W/500W Series Configuration

NOTE

Refer to the aircraft specific wiring diagrams for the correct port connections in use.

For all GTX installations, refer to appendix C for GNS configuration.

1. Push and hold the **ENT** key of the GNS 400W/500W Series unit.
2. Power on the GNS 400W/500W unit.
3. Release the **ENT** key when the display activates.

While in configuration mode, rotate small right knob to select pages. Change data on the configuration page:

1. Push the small right knob to select the cursor.
2. Rotate the large right knob to move between data fields.
3. Rotate the small right knob to change a highlighted field.
4. Push the **ENT** key to accept the entry.

To configure the GNS 400W/500W, refer to appendix C.

7 OPERATION/PERFORMANCE CHECKOUT

7.1 Ground Checks - Interfaces (Configuration Mode) 7-2
7.1.1 Airborne/Ground Test mode 7-2
7.1.2 Audio Panel Interface 7-2
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7.1 Ground Checks - Interfaces (Configuration Mode)

The performance and checkout procedures contained in this section must be completed for each installed transponder.

Certain test procedures require the use of a Mode S transponder ramp tester such as an Aeroflex IFR-6000 or TIC TR-220. Specific instructions for operating the ramp tester are contained in the applicable operator's manual.

7.1.1 Airborne/Ground Test mode

Certain test procedures require the transponder to be placed in an airborne state to reply to any Mode A or Mode C interrogations. The GTX uses advanced Air/Ground logic to determine the state of the transponder. This logic must be temporarily bypassed in order to place the transponder in an airborne state. To place the transponder into an airborne state, perform the following procedure.

Using the Wizard Tool to place the transponder in Ground Test:

Refer to the GTX 335 Wizard Guide (190-01499-40) for Instructions on how to place the transponder in Ground Test mode.

For panel mounted GTX 335 transponders:

1. Start the GTX in Ground Test mode (hold the **CRSR** key and press the **ON** key).
2. "GROUND TEST MODE" alert message will be displayed on the GTX 335 message screen.

7.1.2 Audio Panel Interface

The audio alert volume checkout can be performed from the Wizard tool or through the GTX 335 display panel.

Using the Wizard Tool to conduct the audio Test:

Refer to section 4.3 of the Wizard Tool to conduct an audio test.

For panel mount Test:

1. Start the GTX 335 in configuration mode (hold the **OFF** key to power down the unit, then hold the **ENT** key and push the **ON** key).
2. Navigate to the AUD page (push the **FUNC** key to cycle through pages).
3. Choose each selection of the TEST AUDIO item to play the test audio.
4. Make sure the aural messages/tones will be heard under all anticipated cockpit noise conditions. cockpit noise conditions.

7.1.3 Discrete Switch Interfaces

Perform the following procedure for each optional remote switch interfaced to the GTX transponder.

For panel mounted GTX 335 transponders:

1. Start the GTX 335 in configuration mode (hold the **OFF** key to power down the unit, then hold the **ENT** key and push the **ON** key).
2. Navigate to the DIAG page (push the **FUNC** key to cycle through pages).
3. Set the Discrete Inputs that are interfaced and configured for the GTX.
4. Observe the Discrete Input States while activating each optional switch (for the squat switch this may require the switch to be manually pulled LOW or HIGH, depending on configuration).
5. Verify Discrete Input State indicates when each optional switch is activated.

7.2 Ground Checks - Interfaces (Normal Mode)

The performance and checkout procedures contained in this section must be completed for each installed transponder. Certain test procedures require the use of a Mode S transponder ramp tester such as an Aeroflex IFR-6000 or TIC TR-220. Specific instructions for operating the ramp tester are contained in the applicable operator's manual.

7.2.1 Air Data Interface

The GTX receives altitude data from an external source or internally from the optional GAE. If a GAE is included in the installation along with a second air data source, it must be configured OFF for portions of the following procedure. Refer to section 6 for configuration instructions.

If the following steps do not perform correctly, check the electrical connections and configuration setup for the interfaced data source.

NOTE

After applying power to an altitude source it may take several minutes to warm up. During the warm-up period the Altitude display on the GTX will be dashed out.

1. If there are multiple air data sources, configure the GAE OFF if it is included in the installation.
2. Power up the GTX in Normal Mode.
3. If there are multiple sources providing air data to the GTX, remove power from all but one source.
4. For panel mounted GTX 335 transponders: make sure that the appropriate data on the GTX is displayed and agrees with the active source.
5. If there are multiple sources, remove power from the currently active source and apply power to another source that has not been checked.
6. Repeat steps 3 and 4 until all available sources have been checked.
7. Configure the GAE ON if it is included in the installation.
8. Remove power from all external air data sources.
9. Repeat step 4 to check the GAE.

7.2.2 Temperature Interface GTX 335

To verify OAT:

1. Press the FUNC key to cycle through pages until OAT is displayed.
2. Remove power from all Air Data sources interfaced to the GTX.
3. Verify the OAT is provided and is correct.

To verify SAT:

1. Navigate to the ALT page (press the FUNC key to cycle through pages).
2. Use the 8/9 keys to scroll until SAT is displayed.
3. Remove power from all Air Data sources interfaced to the GTX.
4. Verify the SAT is provided and is correct.

7.2.3 TIS-A Interface GTX 335

The traffic interface must be verified if a GTX installation includes a TIS-A display interface.

1. Select the Traffic Map on the display.
2. Verify the TIS FAIL is not displayed and that NO DATA (yellow) is not displayed.
3. On the Traffic Map page, make sure that the status of the traffic system is either TIS Standby or TIS Operating/Unavailable (i.e., TAS should not be displayed).

7.3 Ground Checks - Performance

Certain test procedures require the use of a Mode S transponder ramp tester such as an Aeroflex IFR-6000 or TIC TR-220. Specific instructions for operating the ramp tester are contained in the applicable operator's manual.

7.3.1 GPS Reception (Internal GPS Receiver)

NOTE

GPS reception checks are not necessary if an external GPS source is in use.

The GPS reception check is applicable to GTX 335 units with the internal GPS receiver.

1. Verify the LAT/LON on the ADS-B Out page matches a known reference.
2. Select 121.150 MHz on the COM transceiver to be tested.
3. Transmit for a period of 35 seconds.
4. Verify the GPS position remains valid.
5. Repeat steps 3 and 4 for these frequencies:

• 121.15 MHz	• 121.22 MHz	• 131.22 MHz	• 131.30 MHz
• 121.17 MHz	• 121.25 MHz	• 131.25 MHz	• 131.32 MHz
• 121.20 MHz	• 131.20 MHz	• 131.27 MHz	• 131.35 MHz

6. For VHF radios that include 8.33 kHz channel spacing, include the following frequencies in addition to those in step 5.

• 121.185 MHz	• 121.190 MHz	• 130.285 MHz	• 131.290 MHz

7. Repeat steps 2 through 6 for all remaining COM transceivers in the aircraft.
8. Turn on the TCAS system and make sure the GPS position remains valid if the aircraft is TCAS equipped.
9. Use the SATCOM system to make sure the GPS position remains valid if the aircraft is SATCOM equipped.

7.3.2 Regulatory Tests

With the transponder operating in normal mode and in an airborne state (refer to section 7.1.1), the following regulatory tests are required to be performed. The Altitude Reporting Equipment Test is required to be performed for each altitude source interfaced to the transponder, including the GAE.

These regulatory tests require the use of a Mode S transponder ramp tester such as an Aeroflex IFR-6000 or TIC TR-220. Specific instructions for operating the ramp tester are contained in the applicable operator's manual.

1. Altitude Reporting Equipment Tests in accordance with 14 CFR Part 91.411 and Part 43 Appendix E.
2. ATC Transponder Tests and Inspections in accordance with 14 CFR Part 91.413 and Part 43 Appendix F.

7.3.3 ADS-B Out Test

The ADS-B Out test procedure requires the use of a Mode S transponder ramp tester such as an Aeroflex IFR-6000 or TIC TR-220. Specific instructions for operating the ramp tester are contained in the applicable operator's manual.

1. Verify the aircraft is in a location where a GPS signal is receivable (e.g., outdoors with a clear view of the sky).
2. Power on the aircraft/avionics.
3. Verify the GPS source has acquired a position.
4. Verify the GTX transponder is in ADS-B TX mode.
5. Using the transponder test set, make sure the following ADS-B Out parameters are being transmitted:
    - Aircraft emitter category is Light Airplane < 15,500 pounds (On the TR-220 this is indicated as “A1”).
    - Aircraft Length documented in the aircraft checkout log.
    - Aircraft Width documented in aircraft checkout log.
    - 1090 ADS-B In Capability matches the configuration setting documented in the aircraft checkout log.
    - UAT (978) ADS-B In Capability matches the configuration setting documented in the aircraft checkout log.
6. Place the GTX transponder into airborne state (refer to section 7.1.1).
7. Select ALT mode on the GTX.
8. Using the transponder test set, verify the following ADS-B Out parameters are being transmitted:

    • NACv $\geq$ 1 • SDA $\geq$ 2 • SIL $\geq$ 3 • NACp $\geq$ 8 • NIC $\geq$ 7

7.3.4 EMC Check

An EMC check must be conducted for each GTX after it is installed and all interfaces to external equipment are verified to be correctly working. The EMC check verifies that the GTX is not producing unacceptable interference in other avionics systems and that other avionics systems are not producing unacceptable interference in the GTX. An example EMC Source/Victim matrix is shown in figure 7-1.

1. Enter equipment installed in the aircraft into the Source row and Victim column of the fillable form.
2. Apply power to all avionics systems except the GTX.
3. Verify all existing avionics systems are properly functioning.
4. Apply power to the GTX. (Connect a computer to the GTX 335 via USB before applying power to the unit. Apply power to the GTX 335, then run the Install Tool.)
5. Remove power from all other avionics systems.
6. Apply power and/or operate the systems listed on the fillable form, one system at a time.
7. For panel mounted GTX 335 transponders: make sure there are not any active faults on the GTX.
8. Verify that each system functions properly.

For VHF COM radios:

   a. Monitor one local frequency, one remote (far field) frequency, and one unused frequency.
   b. Verify no unintended squelch breaks or audio tones interfere with communications

For VHF NAV radios:

   a. Monitor one local frequency, one remote (far field) frequency, and one unused frequency.
   b. Verify there are no guidance errors.
   c. Verify no audio tones interfere with the station ID.

9. Repeat steps 6 through 8 until every system listed on the fillable form has been checked.

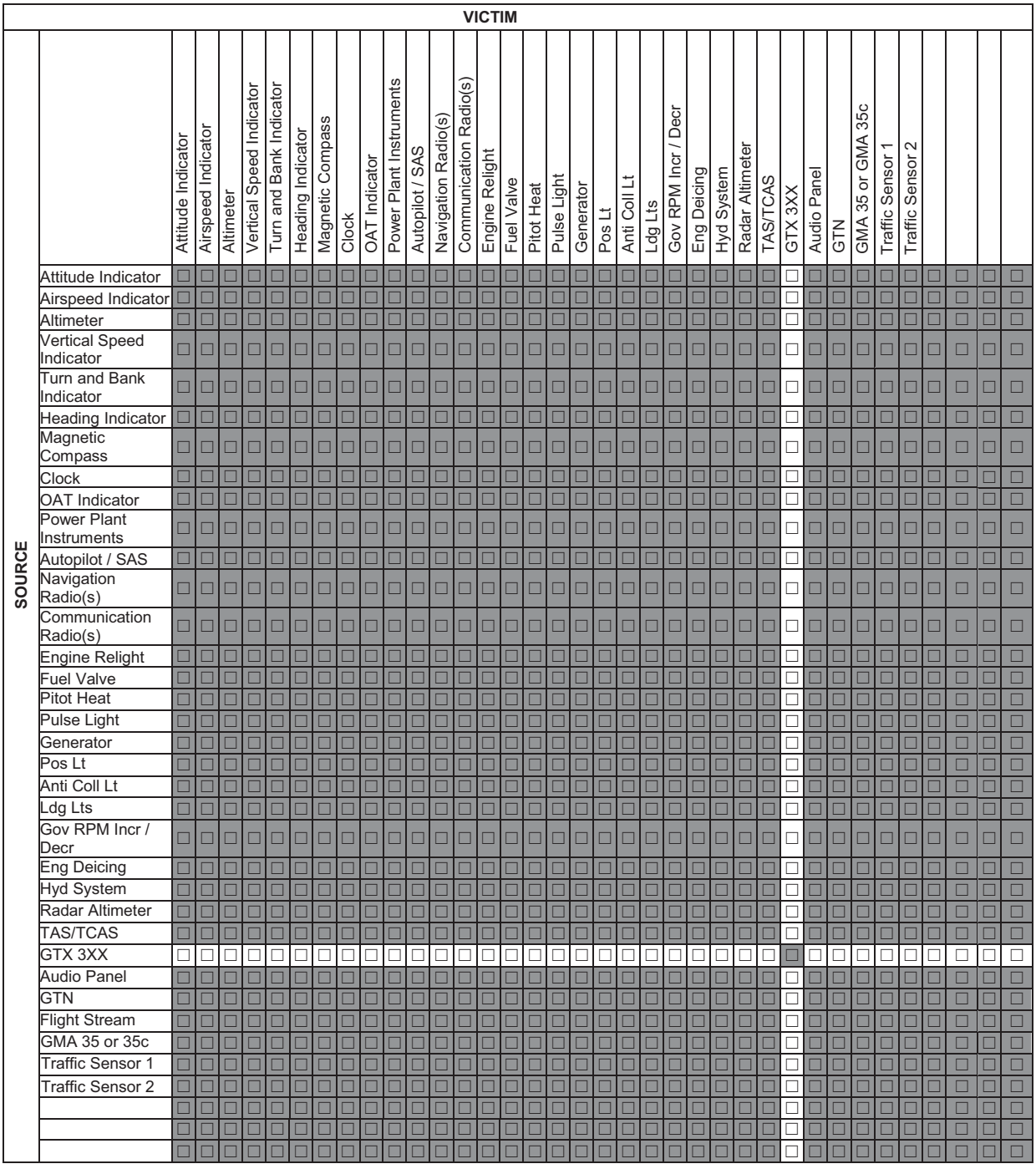


Figure 7-1 Example EMC Source/Victim Matrix

7.4 Documentation Checks

7.4.1 Airplane Flight Manual Supplement

Ensure that the Airplane Flight Manual Supplement (AFMS) is completed and inserted in the Airplane Flight Manual (AFM) or Pilot's Operating Handbook (POH).

1. Fill in the required airplane information in the AFMS.
2. Fill in the appropriate check boxes in the Installation Configuration section of the AFMS as described in section 4.6.
3. Insert the completed AFMS into the AFM or POH.

7.4.2 Configuration and Checkout Log

NOTE

A checkout log must be completed for each unit in a dual GTX installation.

The configuration log sheet contained in Appendix A of *GTX 33X and GTX 3X5 ADS-B Maintenance Manual* should be completed during the initial installation and maintained with the aircraft permanent records.

1. Fill in the General Information for the aircraft and GTX transponders.
2. Calculate and record the change in electrical load.
3. List the equipment interfaced to the GTX transponder.
4. Complete the wire routing diagram that is appropriate for the type of aircraft.
5. Complete the Post Installation Configuration Log that is appropriate for the GTX transponder type.
6. Create new wiring diagrams indicative of the installation. Or markup the interconnect diagrams from the Installation Manual detailing which equipment was installed and how it was connected.

7.4.3 Instructions for Continued Airworthiness

Make sure that the appropriate information is filled in on the Instructions for Continued Airworthiness (ICA), in the GTX 33/330 and GTX 3X5 ADS-B Out Maintenance Manual, and ensure it is completed and inserted in the aircraft permanent records.

1. Fill out the Configuration and Checkout Log provided in Appendix A of the Maintenance Manual as described in Section 7.4.2.
2. Insert the Instructions for Continued Airworthiness (section 4 of the Maintenance Manual) and the completed Appendix A of the Maintenance Manual into the aircraft permanent records.

8 CONNECTOR PINOUT

8.1 GTX 335 8-1
8.1.1 GTX 335 (J3251) 8-1
8.1.2 GTX 335 Power and Lighting Inputs 8-4
8.1.3 GTX 335 Power Control Input 8-4
8.1.4 GTX 335 Encoded Altitude Inputs 8-4
8.1.5 GTX 335 Discrete Outputs 8-6
8.1.6 GTX 335 Discrete Inputs 8-6

NOTE

The information in this section is to select interfaces and function capabilities. It is not to be used to find other manufacturer's interfaced component requirements. Refer to interfaced equipment manufacturer's installation manuals for equipment specific requirements.

8.1 GTX 335

This section gives the pin functions, inputs, and outputs of the GTX 335 transponder.

8.1.1 GTX 335 (J3251)

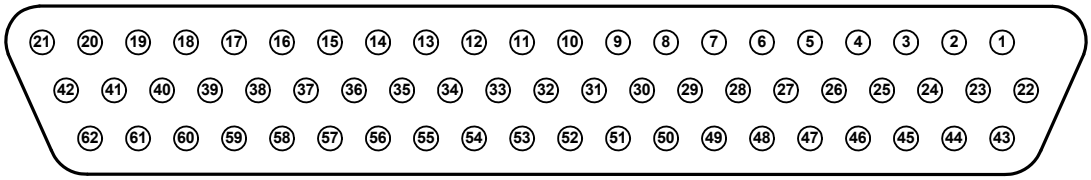


Figure 8-1 Rear View, Connector J3251

Table 8-1 GTX 335 J3251 Pin Assignments

Pin	Pin Name	I/O
1	ALT ENCODER/CONFIG MODULE CLOCK	In/Out
2	USB DATA HI	In/Out
3	TEMP PROBE IN	In
4	TIME MARK A	Out
5	ARINC 429 OUT A	Out
6	ARINC 429 OUT B	Out
7	RS-232 OUT 3	Out
8	RS-232 OUT 2	Out
9	RS-232 OUT 1	Out
10	ALTITUDE A1	In
11	ALTITUDE B1	In
12	ALTITUDE C1	In
13	ALTITUDE D4	In
14	EXTERNAL STANDBY SELECT	In
15	CONFIGURABLE DISCRETE 1	In/Out
16	CONFIGURABLE DISCRETE 2	In/Out
17	XPDR FAIL 1	Out
18	EXTERNAL SUPPRESSION	In/Out
19	LIGHTING BUS HI	In
20	AIRCRAFT GROUND	--
21	AIRCRAFT POWER 1	In
22	ALT ENCODER/CONFIG MODULE DATA	In/Out
23	ALT ENCODER/CONFIG MODULE GND	--
24	USB DATA LO	In/Out
25	TEMP PROBE OUT	Out
26	TIME MARK B	Out
27	ARINC 429 IN 1A	In
28	ARINC 429 IN 1B	In
29	RS-232 IN 3	In
30	RS-232 IN 2	In
31	RS-232 IN 1	In

Pin	Pin Name	I/O
32	ALTITUDE A2	In
33	ALTITUDE B2	In
34	ALTITUDE C2	In
35	RESERVED	In
36	EXTERNAL IDENT SELECT	In
37	AUDIO INHIBIT 2	In
38	POWER CONTROL	In
39	SWITCHED POWER OUT	Out
40	LIGHTING BUS LO	In
41	AIRCRAFT GROUND	In
42	AIRCRAFT POWER 1	In
43	ALT ENCODER/CONFIG MODULE POWER	In
44	USB VBUS POWER	In/Out
45	USB GND	--
46	AUDIO OUT HI	Out
47	AUDIO OUT LO	Out
48	ARINC 429 IN 2A	In
49	ARINC 429 IN 2B	In
50	RS-232 GND 3	--
51	RS-232 GND 2	--
52	RS-232 GND 1	--
53	ALTITUDE A4	In
54	ALTITUDE B4	In
55	ALTITUDE C4	In
56	ALTITUDE GROUND	--
57	SQUAT SWITCH	In
58	AIR DATA SELECT	In
59	POWER CONFIG	In
60	GPS KEEP ALIVE	In
61	AIRCRAFT POWER 2	In
62	AIRCRAFT POWER 2	In

* Shows an Active Low (ground to operate)

8.1.2 GTX 335 Power and Lighting Inputs

Power and lighting input requirements are recorded in this section. Refer to appendix B for power and lighting interconnections.

- The power input pins accept 14/28 VDC.
- AIRCRAFT POWER 2 is used to connect to an alternate power source.
- Switched Power Out is a power source available for a remote digital altitude encoder device.
- The GTX 335 unit can adjust to a 28 VDC, 14 VDC, or 5 VDC lighting bus.
- The GTX 335 automatically adjust for ambient lighting conditions because of the photocell.

Table 8-2 Lighting/Power Pin Assignments

Pin Name	P3251 Pin Number	I/O	GTX Unit
AV PWR 1	21	I	ALL
AV PWR 1	42	I	ALL
AV PWR 2	61	I	ALL
AV PWR 2	62	I	ALL
GROUND (power ground)	20	I	ALL
GROUND (power ground)	41	I	ALL
SW PWR OUT	39	O	ALL
GPS KEEP ALIVE	60	I	ALL
LTNG HI	19	I	Panel Mount
LTNG LO	40	I	Panel Mount

8.1.3 GTX 335 Power Control Input

The PWR CONFIG input sets the remote on/off feature. This is connected to ground for a remote unit installation and not connected for a panel mount unit installation.

The PWR CONTROL input is dependent on the PWR CONFIG connection. This is used as a remote power on/off control or to use the power auto on feature when the avionics master is energized.

Table 8-3 GTX 335 Power Control Inputs

Pin Name	Pin Number	I/O	Unit
PWR CONFIG	59	I	P3251
PWR CONTROL	38	I	P3251

8.1.4 GTX 335 Encoded Altitude Inputs

- Parallel Gray code altitude inputs are active if the voltage to ground is < 1.9 V or the resistance to ground is < 375 Ω.
- These inputs are inactive if the voltage to ground is 11-33 VDC.

- The GTX 335 discrete I/O pins are configurable.
- If the Gillham input is not used in the configuration menu, then the Gillham code altitude pins can be used for other discrete input functions.
- If the Gillham input is used these pins will not be available for selection on other discrete inputs in the configuration menu.

Table 8-4 GTX 335 Encoded Altitude Inputs

Pin Name	Pin Number	I/O	Connector
ALTITUDE A1	10	In	J3251
ALTITUDE A2	32	In	J3251
ALTITUDE A4	53	In	J3251
ALTITUDE B1	11	In	J3251
ALTITUDE B2	33	In	J3251
ALTITUDE B4	54	In	J3251
ALTITUDE C1	12	In	J3251
ALTITUDE C2	34	In	J3251
ALTITUDE C4	55	In	J3251
ALTITUDE D4	13	In	J3251
ALTITUDE COMMON	56	--	J3251

8.1.5 GTX 335 Discrete Outputs

Table 8-5 GTX 335 Discrete Outputs

Pin Name	Pin Number	I/O	Connector
EXTERNAL SUPPRESSION I/O	18	In/Out	J3251

8.1.6 GTX 335 Discrete Inputs

Table 8-6 GTX 335 Discrete Inputs

Pin Name	Pin Number	I/O	Connector
TIS-A SELECT*	15	In	J3251
AUDIO Mute	16	In	J3251
AUDIO Cancel	37	In	J3251
SQUAT SWITCH	57	In	J3251
EXTERNAL IDENT*	36	In	J3251
EXTERNAL STANDBY*	14	In	J3251
EXTERNAL SUPPRESSION I/O	18	In/Out	J3251
* INACTIVE: 10 ≤ Vin ≤ 33 VDC or Rin ≥ 100 KΩ (open) ACTIVE: Vin ≤ 1.9 VDC with ≥75 µA sink current or Rin ≤ 375 Ω (grounded) Sink current is internally limited to 200 µA max for grounded pin.			

APPENDIX A MECHANICAL DRAWINGS

Figure A-1 GTX 335 Panel Mount Dimensions and Center of Gravity A-1
Figure A-2 GTX 3X5 Panel Mount Rack Assembly A-2
Figure A-3 GTX 335 Connector and Vent Location A-3
Figure A-4 Optional Altitude Sensor A-3

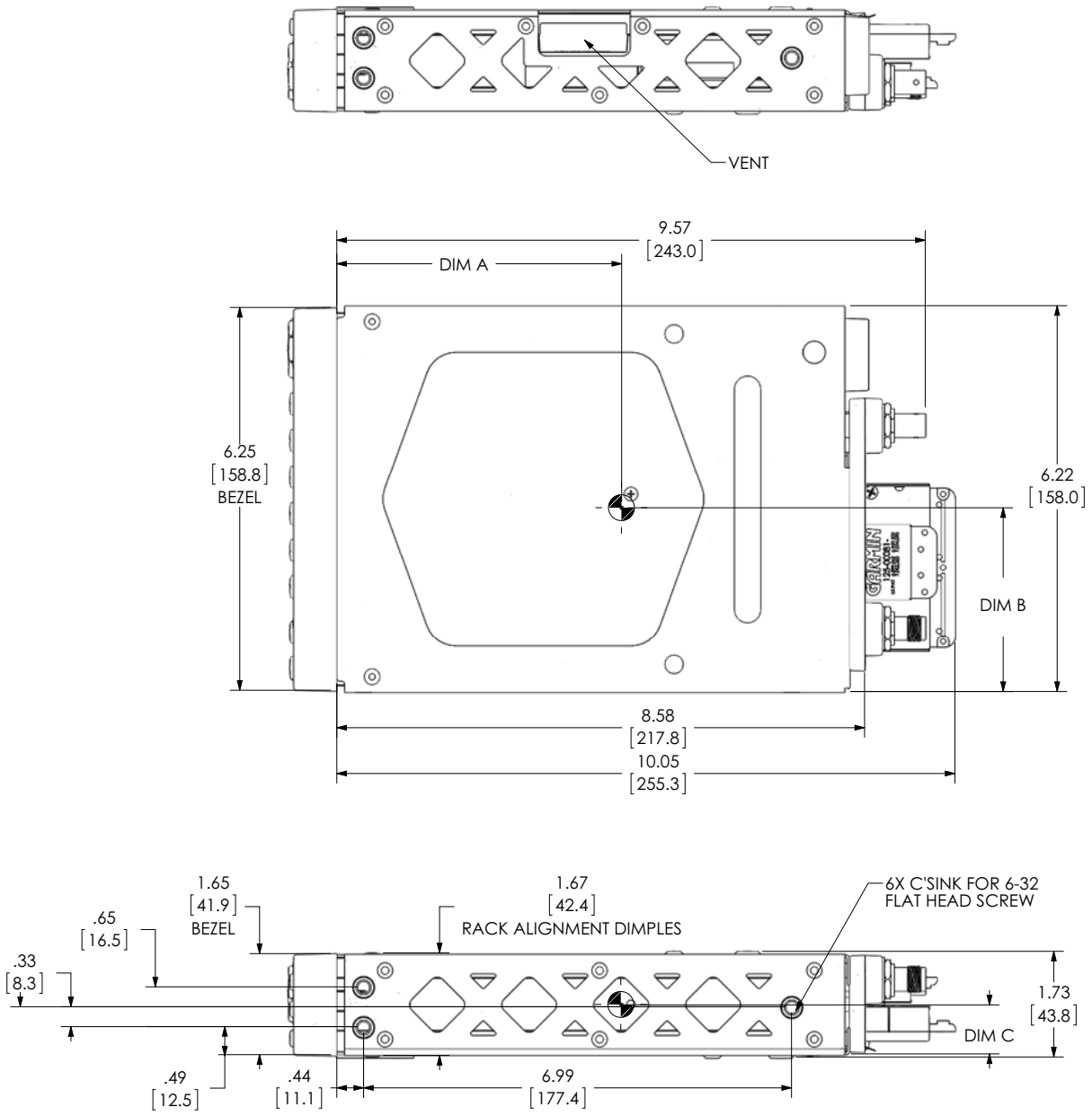


Figure A-1 GTX 335 Panel Mount Dimensions and Center of Gravity

STANDARD KIT	UNIT PN	UNIT DESCRIPTION	CONNECTOR KIT	CONFIG MODULE	RACK	Back Plate Assy	Mount Type	Dim A - inch (mm)	Dim B - inch (mm)	Dim C - inch (mm)
010-01214-41	011-03300-40	Sub-Assy,GTX335,GPS	011-02977-00	011-00979-03	115-01771-01	011-02976-01	Panel	4.5 (114)	3.2 (81)	0.8 (20)

Note: The standard rack, P/N 115-01771-01, is the functional equivalent of P/N 115-01771-00.

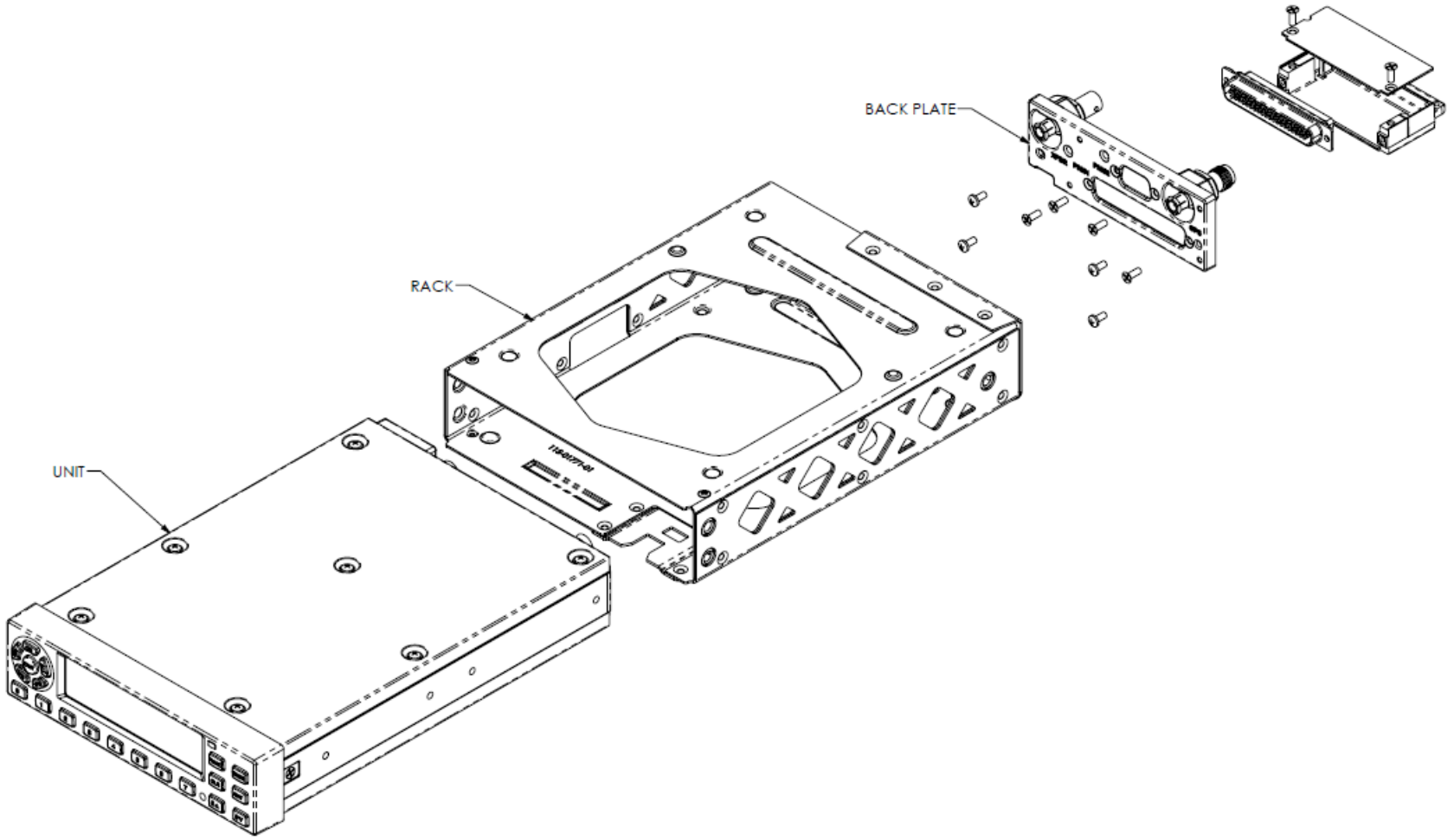


Figure A-2 GTX 3X5 Panel Mount Rack Assembly

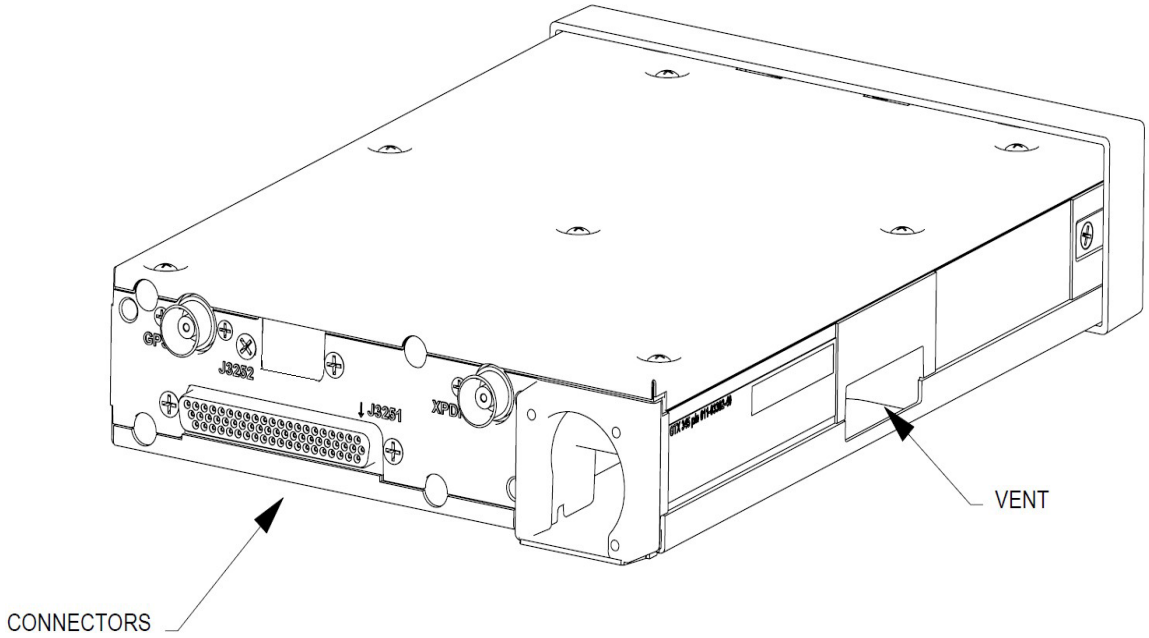


Figure A-3 GTX 335 Connector and Vent Location

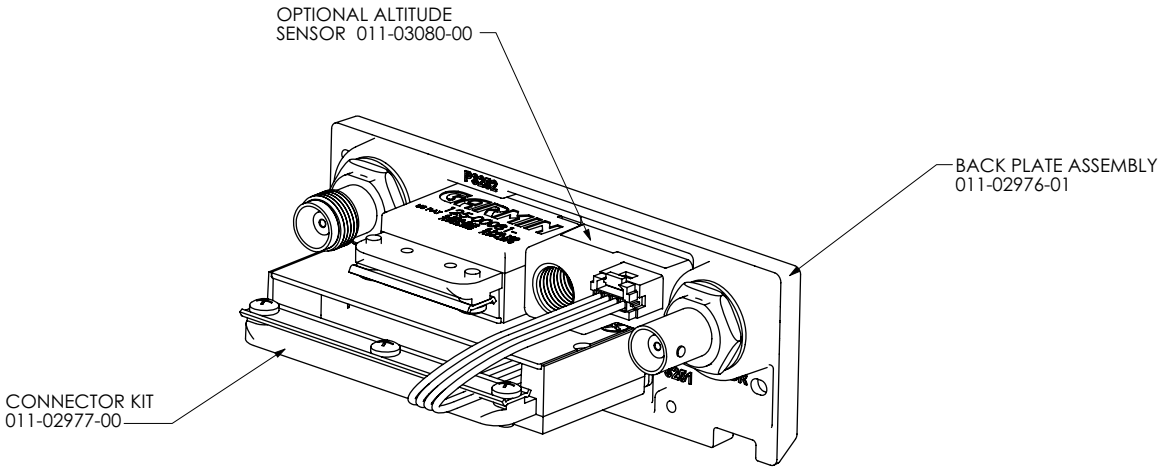


Figure A-4 Optional Altitude Sensor

APPENDIX B INTERCONNECT DRAWINGS

Figure B-1 GTX 335 - Power, Ground, and Configuration Module Interconnect B-3
Figure B-2 GTX 335 Switches Interconnect B-5
Figure B-3 GTX 335 - GNS 400W/500W Series Interconnect B-6
Figure B-4 GTX 335 - GTN 6XX/7XX Interconnect B-7
Figure B-5 GTX 335 - Altitude Data Source Interconnect B-8
Figure B-6 GTX 335 - Audio Interconnect B-10
Figure B-7 GTX 335 - GTS 8XX B-11

This section contains wiring interconnect information and examples for the connections necessary for the installation of the GTX 335 transponder.

GENERAL NOTES

Each figure contained in this section has notes that must be followed. These general notes apply to all of the figures in this section:

- Unless specified differently, all wires are 24 AWG or larger.
- Antennas and associated cabling are shown for reference only.
- In dual GTX transponder installations, each transponder must be grounded separately using separate ground terminal/stud locations on the aircraft.
- If practical, power and ground wiring should be routed separately for each transponder.
- Route grounds and wire separately to improve safety if there is a wiring or grounding system failure.
- Designations for ground connections are as follows.

  Shield Block Ground

  Airframe Ground
- Shield ground terminations to the connector backshell must be 3.0 inches or less in length.
- Ground terminations of interfaced equipment can vary. Refer to the manufacturer's installation manual for information.
- RS-232 and ARINC 429 ports shown are suggested port configurations unless specifically noted.
- Installations can require alternate port configurations and are permitted provided the equipment interfaces and data formats are available on alternate ports.

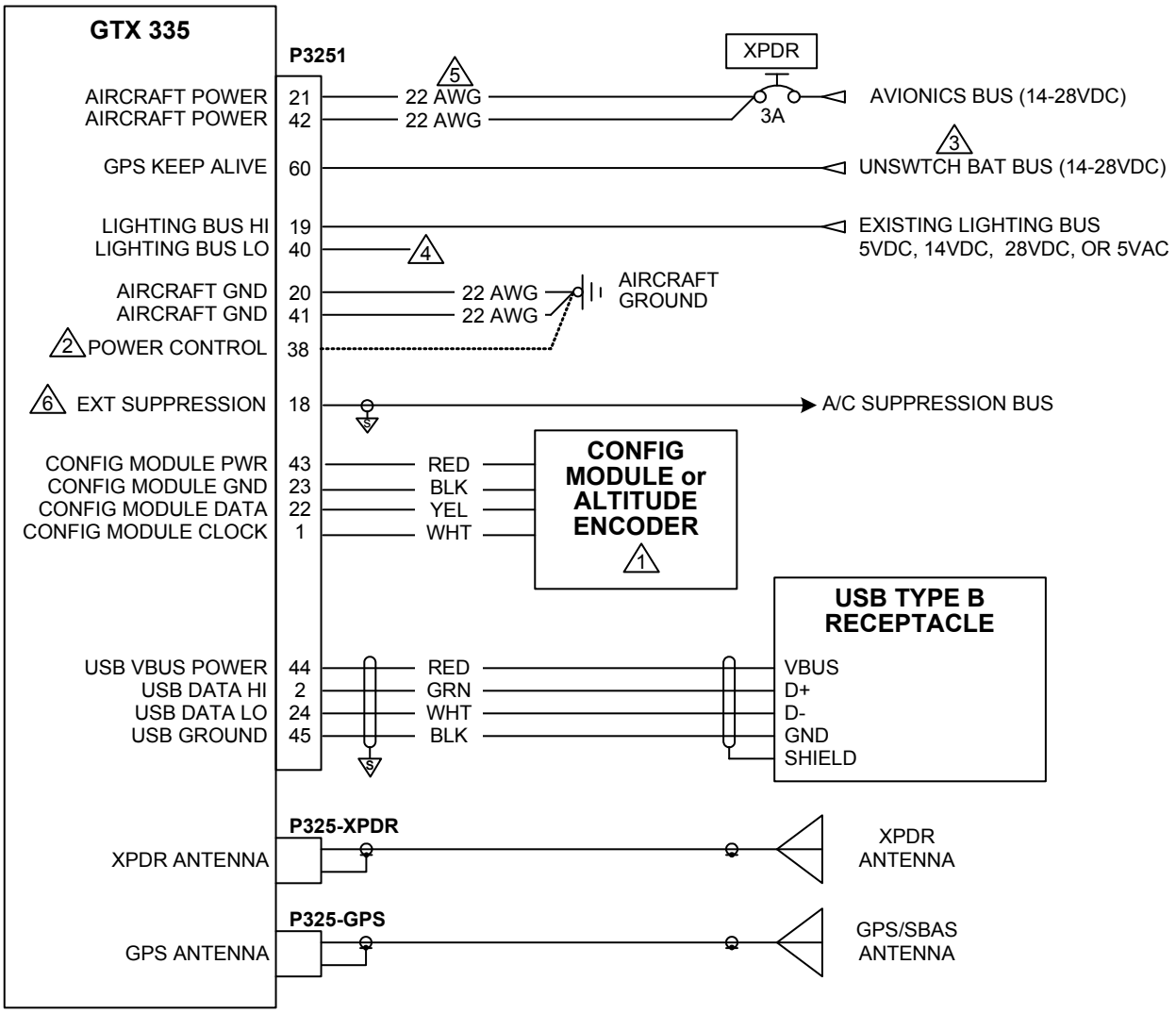


Figure B-1 GTX 335 - Power, Ground, and Configuration Module Interconnect
Sheet 1 of 2

NOTES

1. CONFIG MODULE REQUIRES WIRING HARNESS P/N: 325-00122-00. GAE PRESSURE/CONFIG MODULE REQUIRES WIRING HARNESS P/N: 325-00421-00. MODULE WIRING HARNESSES ARE NOT INTERCHANGEABLE. WIRE COLOR IN MODULE WIRING HARNESS DESIGNATES FUNCTION. CONNECT MODULE WIRING HARNESS TO GTX 3X5 ACCORDING TO WIRE COLOR..

2. GROUND PIN 38 FOR REMOTE POWER ON/OFF OPERATION. FOR MORE INFORMATION REFER TO SECTION 8.1.3

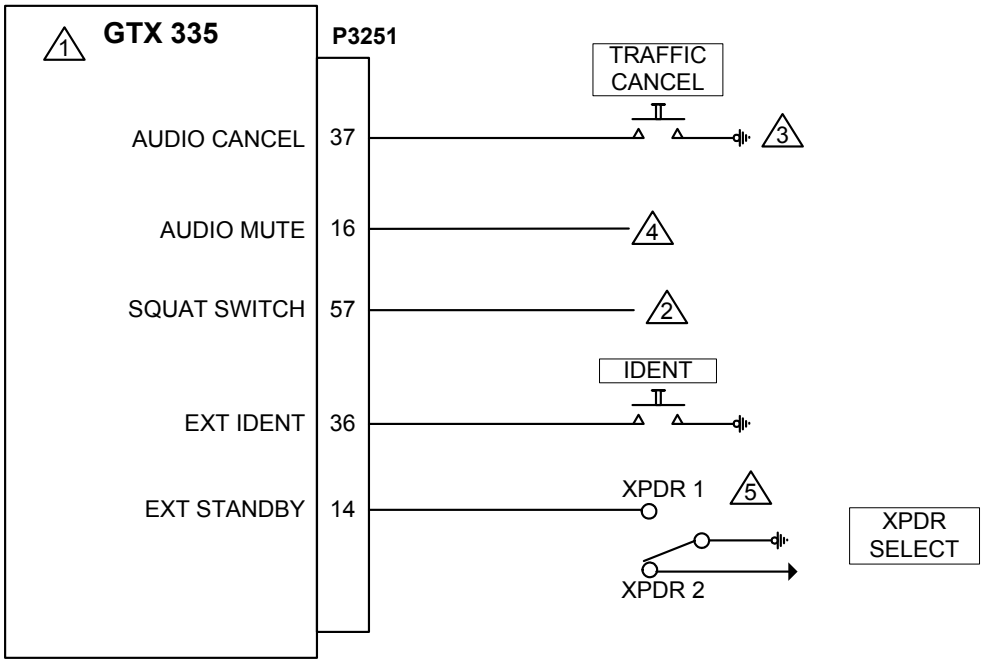
3. S KEEP ALIVE IS RECOMMENDED FOR GPS INSTALLS. IF CONNECTED, GPS KEEP ALIVE MUST BE CONNECTED TO THE UNSWITCHABLE BATTERY BUS. IF NOT CONNECTED, THE GPS ACQUISITION MAY TAKE LONGER.

4. FOR LIGHTING BUS CONNECTIONS REFER TO SECTION 8.1.2 FOR LIGHTING BUS CONNECTIONS

5. SINGLE 22 AWG WIRE WITH 3A CIRCUIT BREAKER IS ALLOWED WITH WIRE RUNS LESS THAN 20 FT. SINGLE 20 AWG WIRE WITH 5A CIRCUIT BREAKER IS ALLOWED WITH WIRE RUNS GREATER THAN 20 FT.

6. I/O PULSES MAY NOT BE COMPATIBLE WITH ALL MODELS OF DME. THE BENDIX/KING KN 62, KN 64, AND KNS 80 HAVE AN OUTPUT-ONLY SUPPRESSION AND MAY DAMAGE THE GTX MUTUAL SUPPRESSION OUTPUT. DO NOT CONNECT THE GTX MUTUAL SUPPRESSION PIN.

Figure B-1 GTX 335 - Power, Ground, and Configuration Module Interconnect
Sheet 2 of 2



NOTES

1. CERTAIN DISCRETE I/O PINS ARE CONFIGURABLE. REFER TO PIN FUNCTION LIST FOR CONFIGURATION SELECTIONS.

2. THE SQUAT SWITCH INPUT CAN BE USED TO CONTROL AIR/GROUND STATUS.

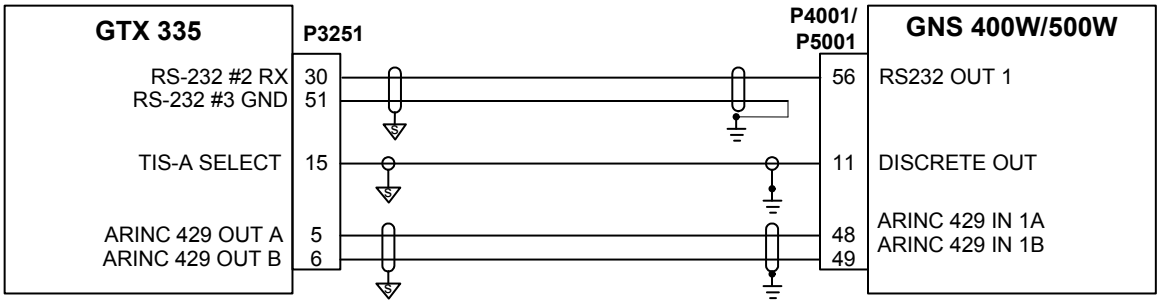
3. AUDIO CANCEL WILL REMOVE THE AUDIO ALERT WHEN ACTIVE.

4. THIS IS A CONFIGURABLE DISCRETE. AUDIO MUTE MUST BE WIRED TO HIGHER PRIORITY AUDIO ALERT DEVICES SUCH AS A TAWS ENABLED DEVICE. AUDIO MUTE WILL PAUSE THE AUDIO ALERT UNTIL INACTIVE.

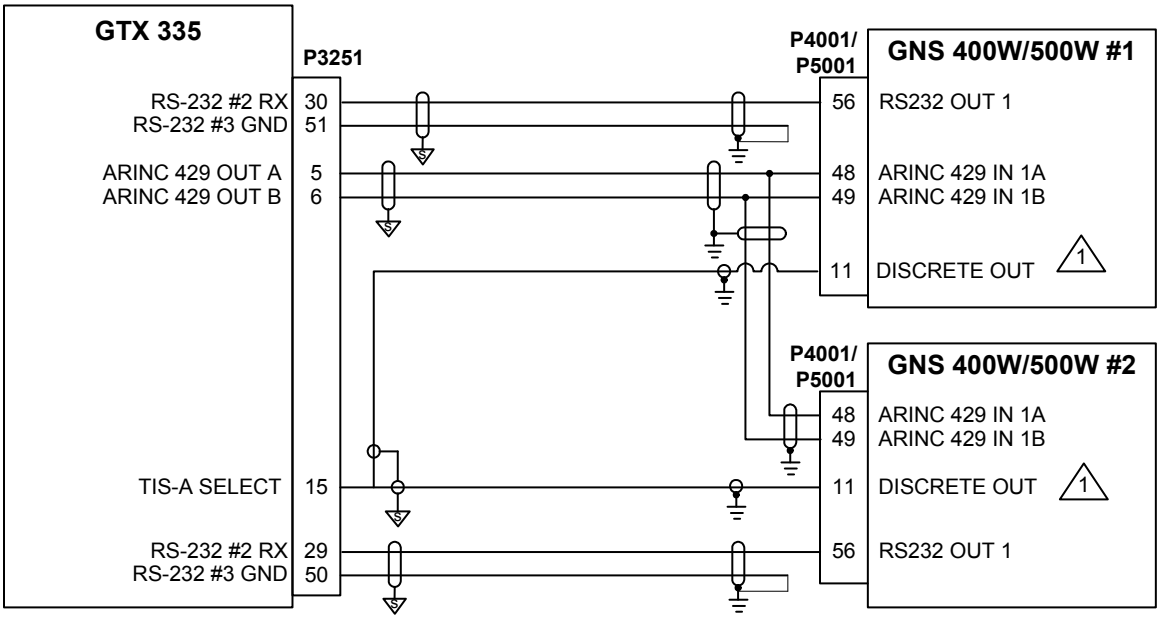
5. EXTERNAL STANDBY SWITCH CANNOT BE CONNECTED WHILE INTERFACED TO THE GTN FOR TRANSPONDER CONTROLS.

Figure B-2 GTX 335 Switches Interconnect

SINGLE GNS 400W/500W SERIES



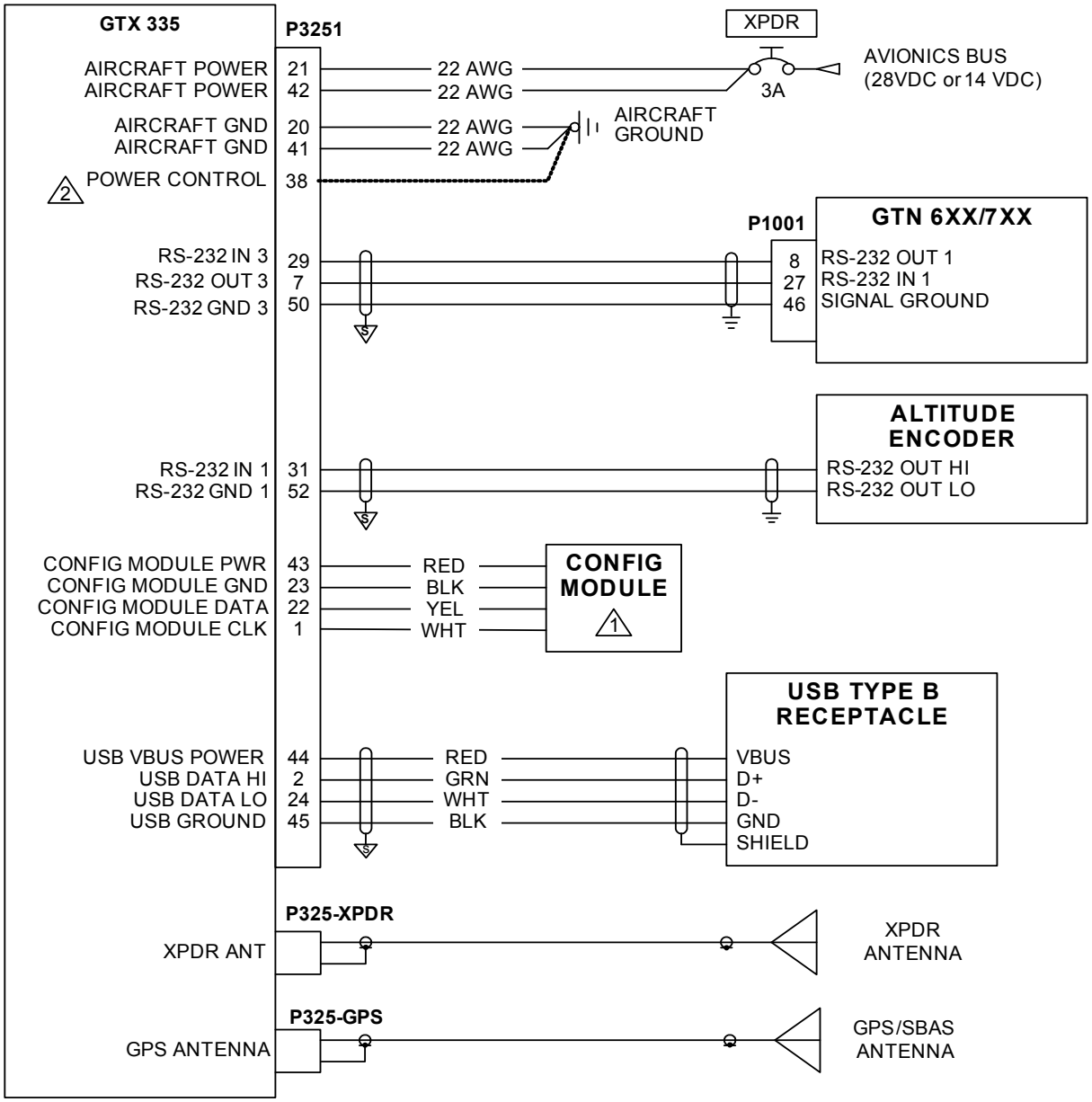
DUAL GNS 400W/500W SERIES



NOTES

1. CONNECTION SHOULD BE MADE TO BOTH NAVIGATOR #1 AND NAVIGATOR #2.

Figure B-3 GTX 335 - GNS 400W/500W Series Interconnect



NOTES

1. CONFIG MODULE REQUIRES WIRE HARNESS P/N: 325-00122-00. GAE PRESSURE/CONFIG MODULE REQUIRES WIRE HARNESS P/N: 325-00421-00. MODULE WIRE HARNESSES ARE NOT INTERCHANGEABLE. WIRE COLOR IN MODULE WIRE HARNESS DESIGNATES FUNCTION. CONNECT MODULE WIRE HARNESS TO GTX 3X5 ACCORDING TO WIRE COLOR.

2. REFER TO SECTION 8.1.3 FOR DETAILS.

Figure B-4 GTX 335 - GTN 6XX/7XX Interconnect

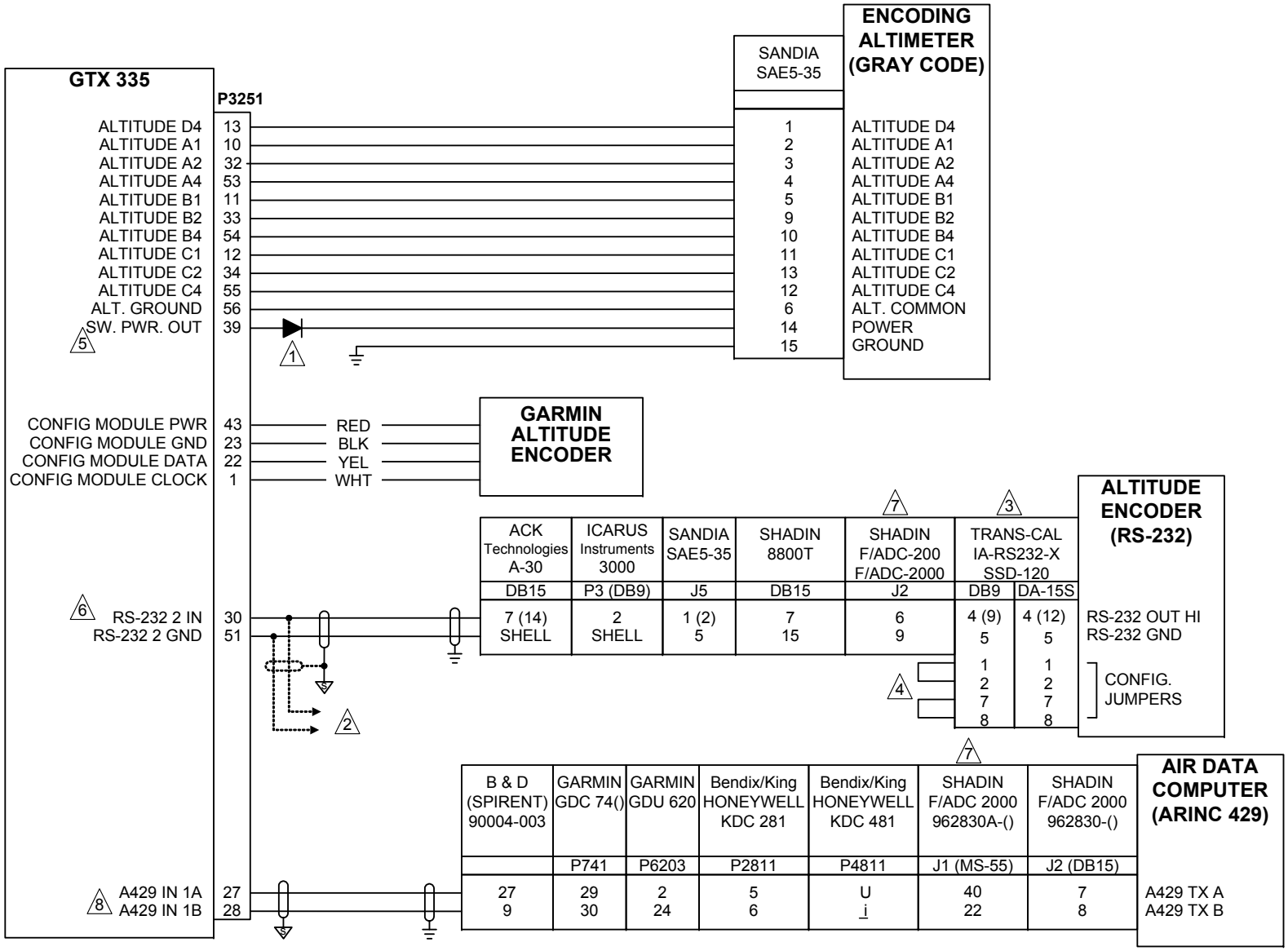


Figure B-5 GTX 335 - Altitude Data Source Interconnect
Sheet 1 of 2

NOTES

1. USE 1N4007 DIODE FOR ENCODER POWER

2. TO GTX #2 IF INSTALLED. RS-232 SPLICE MUST BE MADE ADJACENT TO GTX #1 CONNECTOR AS SHOWN.

3. CONFIGURE ENCODER OUTPUT TO “TRIMBLE/GARMIN 9600 BPS” FORMAT IF USING RS-232 SOFTWARE METHOD.

4. PN 2 CAN BE LEFT OPEN IF 100’ RESOLUTION IS DESIRED (DEFAULT).LIMIT STRAP LENGTH TO SPECIFIED LENGTH IN THE MANUFACTURERS INSTALLATION MANUAL.

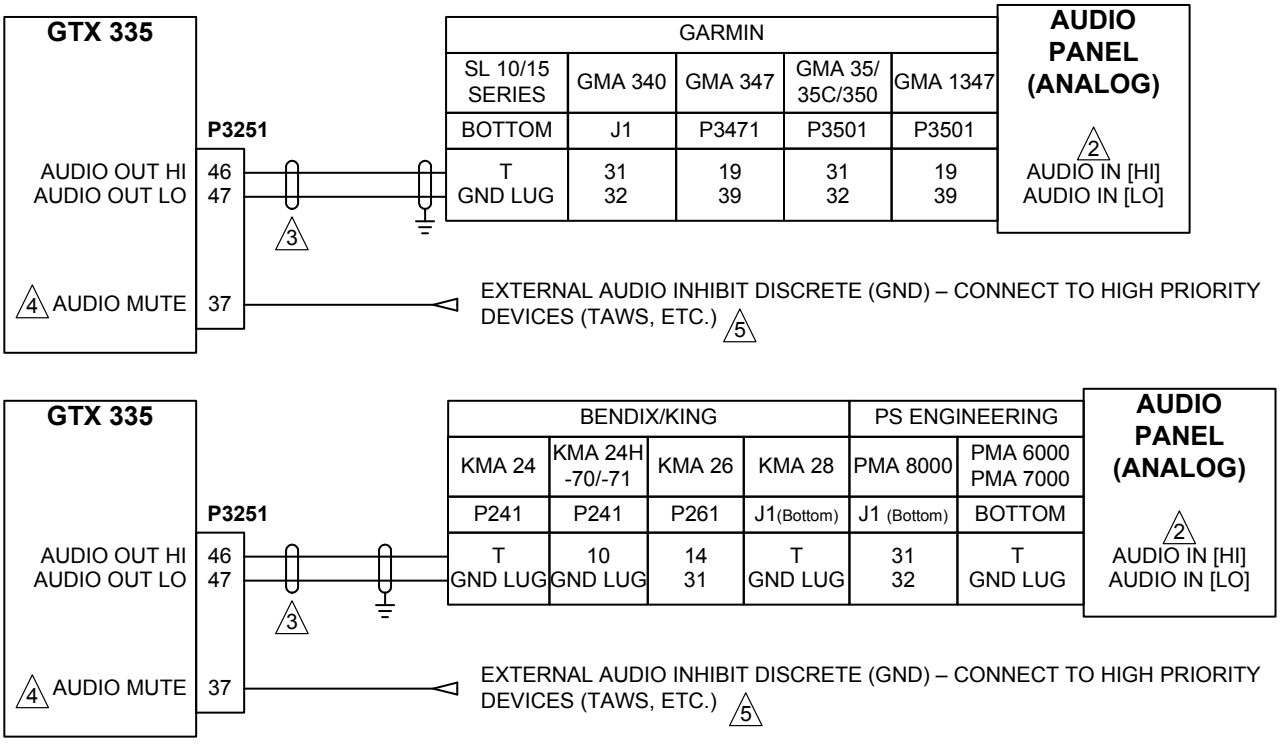
5. POWERING SAE 5-35 THROUGH THE SWITCHED OUTPUT IS OPTIONAL

6. RS-232 PORTS 1 THROUGH 3 ARE AVAILABLE.

7. FOR THE SHADIN, ONLY 1 INPUT IS NECESSARY (I.E., RS-232 OR ARINC 429, BUT NOT BOTH).

8. ARINC IN 2 CAN BE USED INSTEAD OF ARINC IN 1.

Figure B-5 GTX 335 - Altitude Data Source Interconnect
Sheet 2 of 2



NOTES

1 REFER TO THE GENERAL NOTES AT THE BEGINNING OF THIS APPENDIX FOR MORE INFORMATION AND REQUIREMENTS.

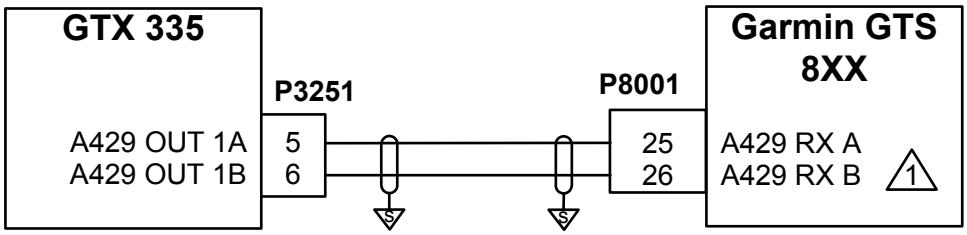
2 IT IS PERMITTED TO USE OTHER AVAILABLE UNSWITCHED, UNMUTED INPUTS. IF THE AUDIO PANEL DOES NOT HAVE AN AVAILABLE UNSWITCHED, UNMUTED INPUT, AUDIO FROM THE GTX 3X5 MUST BE MIXED WITH AN EXISTING AUDIO SOURCE USING RESISTORS TO ISOLATE THE AUDIO OUTPUT FROM EACH LRU. A TYPICAL VALUE FOR MIXING RESISTORS IS 390Ω ¼ W. THE AUDIO LEVELS OF EXISTING AUDIO SOURCES WILL HAVE TO BE RE-EVALUATED AFTER MIXING RESISTORS ARE INSTALLED.

3 SHIELDS FOR AUDIO CABLES SHOULD BE GROUNDED AT ONE END (WITH LEADS LESS THAN 3.0 INCHES) AND LEFT FLOATING AT THE OTHER END.

4 ANY AUDIO MUTE CONFIGURABLE DISCRETE CAN BE USED.

5 CAN BE CONNECTED TO MUTE SWITCH AND MUST BE CONNECTED TO HIGHER PRIORITY SYSTEMS SUCH AS TAWS.

Figure B-6 GTX 335 - Audio Interconnect



NOTES

1. THE GTS CONFIGURES AN INPUT/OUTPUT FORMAT FOR THE GTX 335. THE GTX 335 DOES NOT RECEIVE THE DATA FROM THE GTS. THE ARINC 429 FROM THE GTS SHOULD BE CONFIGURED FOR AN UNUSED PORT.

Figure B-7 GTX 335 - GTS 8XX

APPENDIX C EQUIPMENT COMPATIBILITY AND CONFIGURATION

C.1 Altitude Source C-2
C.2 Audio Panels C-4
C.3 TIS-A Traffic Display C-5
C.4 Garmin GTS Traffic Interface Configuration C-5
C.5 Discrete Configuration C-5

The equipment listed in this section is compatible with the GTX 335 series ADS-B transponders. Hardware that is not applicable to the GTX 335 is marked with N/A in the Configuration Setting.

C.1 Altitude Source

Air data computers not listed below can still be approved under this STC if all of the following conditions are met: The air data computer provides the following labels:

- 203 - Pressure Altitude
- 204 - Barometric-Corrected Altitude
- 210 - True Airspeed

The interface check for the altitude encoder described in section 7 must be successfully completed. The installation of the air data computer was previously FAA-approved. The air data computer is TSO approved. The connections to the GTX must utilize shielding wiring of the type specified in this manual. Shields must be terminated on the GTX side to connector shield block ground and on the Air Data Computer side in accordance with the Air Data Computer installation data. If the Air Data Computer installation data does not specify a shielding method then terminate the shield at the Air Data Computer using the guidelines provided in section 4.

Manufacturer	Model	Config Parameter	Interfacing Equipment Configuration	GTX 335 Config Summary Setting	GTX 335 Wizard Tool Configuration	Notes
Garmin	GDC 74( )	ARINC 429	N/A	ADC (Speed: Low)	ADC (Speed: Low)	
	GDU 620	ARINC 429	GENERAL PURPOSE 1 (Speed: HIGH)	EFIS AIR DATA (Speed: HIGH)	EFIS Air Data (Speed: Low)	This interface also provides heading data.
	GAE	Configuration Module Port	N/A	Garmin Altitude Encoder: Present	GAE-12 Installed: Yes	
ACK Tech	A-30	RS-232	N/A	ALT FMT 1 25 ft	Device: Altitude/Air Data Device Input: Sandia/Icarus/ACK Compatible Altitude Encoder Resolution: 25 foot	Mod 8 or higher.
B & D	90004-003	ARINC 429	N/A	ADC (Speed: Low)	ADC (Speed: Low)	

Manufacturer	Model	Config Parameter	Interfacing Equipment Configuration	GTX 335 Config Summary Setting	GTX 335 Wizard Tool Configuration	Notes
Honeywell (Bendix/ King)	KDC 281	ARINC 429	N/A	ADC (Speed: Low)	ADC (Speed: Low)	
	KDC 481	ARINC 429	N/A	ADC (Speed: Low)	ADC (Speed: Low)	
Icarus Instruments	3000	RS-232	N/A	ALT FMT 1 100 ft	Device: Altitude/Air Data Device Input: Sandia/Icarus/ACK Compatible Altitude Encoder Resolution: 100 foot	
Sandia	SAE 5-35	RS-232	N/A	ALT FMT 1 25ft	Device: Altitude/Air Data Device Input: Sandia/Icarus/ACK Compatible Altitude Encoder Resolution: 25 foot	Either RS-232 or Gillham Gray Code format can be used to provide altitude data
		Gillham Gray Code	N/A	Gillham Discretes ON	Gillham Altitude: Yes	
Shadin	8800T	RS-232	25ft or lower encoding	ALT FMT 3 25 ft	Device: Altitude/Air Data Device Input: Shadin Compatible Altitude Encoder Resolution: 25 foot	Applicable to installations with the 8800T unit configured for 25ft or lower encoding.
			100 ft encoding	ALT FMT 3 100 ft	Device: Altitude/Air Data Device Input: Shadin Compatible Altitude Encoder Resolution: 100 foot	Applicable to installations with the 8800T unit configured for parallel Gray source or 100 ft encoding.
	F/ADC-200	RS-232	N/A	ADC FMT 1	Device: Altitude/Air Data Device Input: Shadin Compatible Air Data Computer	
	F/ADC-2000	RS-232	N/A	ADC FMT 1	Device: Altitude/Air Data Device Input: Shadin Compatible Air Data Computer	Either the RS-232 or ARINC 429 data format can be used for the Shadin F/ADC-2000 interface to the GTX (not both).
		ARINC 429	N/A	ADC (Speed: Low)	ADC (Speed: Low)	

Manufacturer	Model	Config Parameter	Interfacing Equipment Configuration	GTX 335 Config Summary Setting	GTX 335 Wizard Tool Configuration	Notes
Trans-Cal Industries	IA-RS232-X	RS-232	N/A	ALT FMT 1 100 ft	Device: Altitude/Air Data Device Input: Sandia/Icarus/ACK Compatible Altitude Encoder Resolution: 100 foot	
	SSD120	RS-232	25ft or lower encoding	ALT FMT 1 25 ft	Device: Altitude/Air Data Device Input: Sandia/Icarus/ACK Compatible Altitude Encoder Resolution: 25 foot	Applicable to installations with the SSD120 unit configured for 25ft or lower encoding.
			100ft encoding	ALT FMT 1 100 ft	Device: Altitude/Air Data Device Input: Sandia/Icarus/ACK Compatible Altitude Encoder Resolution: 100 foot	Applicable to installations with the SSD120 unit configured for parallel Gray source or 100 ft encoding.

C.2 Audio Panels

Manufacturer	Model	Data Format	GTX 3X5 Configuration Setting
Garmin	SL10 SL10MS SL10M SL10S SL15 SL15M GMA 340 GMA 347 GMA 35 GMA 350	Analog Audio	Audio: XPDR
Honeywell (Bendix/King)	KMA 24 KMA 24H-70/71 KMA 26 DMA 28		
PS Engineering	PMA 6000 PMA 7000 Series PMA 8000 Series		

C.3 TIS-A Traffic Display

Manufacturer	Model	Data Format	Interface Config	GTX 335 Config Summary Setting	GTX 335 Wizard Tool Config	Notes
Garmin	GTN 6XX/7XX	RS-232	Panel GTX w/TIS+	REMOTE FMT 2	Device: TIS Display TIS Display: GTN	This format is for TIS-A data.
	GNS 400W/ 500W	ARINC 429	GARMIN GTX 330	FORMAT 9	Output: Garmin Concentrator, Garmin TIS (Speed: High)	Does not include controls for GTX.

C.4 Garmin GTS Traffic Interface Configuration

Manufacturer	Model	Data Format	Interface Config	GTX 335 Config Summary Setting	GTX 335 Wizard Tool Config	Notes
Garmin	GTS 8XX	ARINC 429	Transponder 1 Communication (primary RX)	FORMAT 5	Output: Garmin Concentrator, Garmin TAS, GPS	Provides transponder communication to the GTS. Not required for the GTS 800. Use interface the original transponder had to the GTS.

C.5 Discrete Configuration

For additional details on discrete options refer to section 8.

Discrete	PIN	Configuration Option	Notes
Gillham Altitude	Refer to section 8	User can Enable / Disable	Use Wizard Tool to configure
Squat Switch	57	User can Enable / Disable	Use Wizard Tool to configure
External Ident	36	Enabled	Always configured
External Standby	14	Enabled	Always configured
TIS Select	15	Enabled	Always configured
Audio Mute	16	Enabled	Always configured
Audio Cancel	37	Enabled	Always configured

APPENDIX D ACCEPTABLE HARDWARE

Table D-1 Screws D-1
Table D-2 Washer D-1
Table D-3 Nuts D-2
Table D-4 Nutplates D-2
Table D-5 Clipnut D-2
Table D-6 Rivets D-2
Table D-7 Rivets, Blind D-2

Table D-1 Screws

Size	Structural/Non-Structural	Head	Specification Numbers
6-32	Non-structural	Pan head	NASM35206 (MS35206) (AN515)
		Flat head	NASM24693 (MS24693) (AN507)
8-32	Non-structural	Pan head	NASM35206 (MS35206) (AN515)
			NAS602
		Flat head	NASM24693 (MS24693) (AN507)
			NAS514P
	Structural	Pan head	NASM27039 (MS27039) (NAS220)
		Flat head	NASM24694 (MS24694) (AN509)
10-32	Non-structural	Flat head	NASM24693 (MS24693) (AN507)
	Structural	Flat head	NASM24694 (MS24694) (AN509)

Table D-2 Washer

Size (Insider Diameter)	Thickness (inches)	Specification Numbers
#6	.016	NAS1149FN616P (AN960-6L)
	.032	NAS1149FN632P
#8	.016	NAS1149FN816P (AN960-8L)
	.032	NAS1149FN832P (AN960-8)
#10	.032	NAS1149F0332P (AN960-10L)
	.063	NAS1149F0363P (AN960-10)

Table D-3 Nuts

Size	Nut, Self-locking Metal, Hex, Thin	Nut, Self-locking Elastic, Hex, Thin	Nut, Self-locking Metal, Hex	Nut, Self-Locking Elastic, Hex
6-32 8-32 10-32	NASM21042 NAS1291 (MS21042) (AN363)	NASM21083 NAS1022N (MS21083) (MS20364) (AN364)	NASM21045 (MS21045)	NASM21044 NAS1021N (MS21044N) (MS20365) (AN365)

Table D-4 Nutplates

Type	One Lug Fixed	One Lug FLoating	Two Lug Fixed	Two Lug Floating	Corner	Side-by-side
6-32 8-32 10-32	MS21051 MS21053 MS21071	MS21061	MS21047 MS21049 MS21069	MS21059 MS21075	MS21055 MS21057 MS21073	MS21086

Table D-5 Clipnut

Type	Specification Numbers
6-32	294667 (Monadnack)

Table D-6 Rivets

Type	Nominal Diameter (0.094) [1]	Nominal Diameter (0.125) [1]
Universal	MS20470AD3-X	MS20470AD4-X
Countersunk	MS20426AD3-X	MS20426AD4-X
Reduced countersunk	--	NAS1097AD4-X

[1] Length (X) as required.

Table D-7 Rivets, Blind

Type	Nominal Diameter (0.126) [1] [2]	Oversize Diameter (0.140) [1] [2]
Universal	CR3213-4-X NAS9601B-4-X	CR3243-4-X NAS9304B-4-X
Countersunk	CR3212-4-X NAS9302B-4-X	CR3242-4-X NAS9305B-4-X
Reduced Countersunk	CR3214-4-X NAS9303B-4-X	--

[1] Length (X) as required.

[2] “CR” denotes CherryMAX rivets.


GARMIN