# GTX™ 3X5 Transponder TSO Installation Manual


190-01499-02 October 2024 Revision 25

For information about the Aviation Limited Warranty refer to Garmin's website.

For product support, visit Garmin's aviation support center. (https://support.garmin.com/en-US/aviation/)

## RECORD OF REVISIONS

| Revision | Revision Date | Subject |
|---|---|---|
| 25 | 10/01/24 | Added main board software v2.90 and ADS-B board software v3.60 functionality. Also added GA 35S antenna information. |
| 24 | 01/04/24 | Update for main software v2.85. Expanded guidance for use of ARINC 743A position sources. |
| 23 | 09/14/23 | Update for ADS-B software v3.51. |
| 22 | 06/13/23 | Added TSO deviation information. |
| 21 | 08/10/22 | New device part numbers added to tables. |
| 20 | 06/08/22 | Added support for GTX 3X5 main/ADS-B software v2.70/v3.40. |
| 19 | 12/06/21 | Added v2.65 functionality. |
| 18 | 09/23/21 | Added TSO-C145e information. |
| 17 | 05/21/21 | Added information concerning GTX 3X5(R) and other minor edits. |
| 16 | 07/02/20 | Added information concerning main board v2.60 and ADS-B board v3.20. |
| 15 | 04/14/20 | Updated weights and added mechanical drawings for GTX 335DR/345DR. |
| 14 | 07/02/19 | Updated aircraft category descriptions and selections. |
| 13 | 04/01/19 | Added pressure sensor module information, available backplate assemblies, and TAS/TCAS information. Refer to the change description. |
| 12 | 02/08/19 | Added information about diversity units. |
| 11 | 07/10/18 | Updated software of unit main board to v2.50 and updated ADS-B board to v3.00. |
| 10 | 12/15/17 | Added GTX 325 information and other minor edits. |
| 9 | 06/29/17 | Added NV unit part numbers, updated unit weights, and other minor edits. |
| 8 | 06/12/17 | Added v2.11 functionality. |
| 7 | 10/13/16 | Added v2.10 functionality. |
| 6 | 08/04/16 | Updated for v2.05 and changed standard rack P/N. |
| 5 | 03/07/16 | Updated part numbers in figure B-1 "GTX 3X5 GPS Panel Mount Assembly." |
| 4 | 02/26/16 | Added information for vertical remote mount and other minor edits. Refer to current revision description. |
| 3 | 02/11/16 | Removed GTX 325. |
| 2 | 12/14/15 | Reorganized manual. |
| 1 | 05/08/15 | Experimental release. |

## CHANGE DESCRIPTION

| SECTION | DESCRIPTION |
|---|---|
| 1.16 | Added *GTN Xi Series TSO Installation Manual* to table 1-19 "Garmin Reference Documents." |
| 3.4.8 | Added "GA 35S Antenna" section. |
| 3.8 | Added information regarding GA 35S antenna to table 3-14 "GNSS Receiver Antennas." |
| 3.8 | Updated note 1 on table 3-14 "GNSS Receiver Antennas" to include GA 35S antenna. |
| 3.8 | Added table 3-15 "GA 35S P/N 010-02639-00." |
| 3.10 | Updated note 1, added Priority 6, and Priority 7, to table 3-47 "ADAHRS HSDB Source Priority." |
| 3.10 | Added note 1 to table 3-48 "Flight Control Source Priority." |
| 3.11 | Rewrote third paragraph of "ADS-B In Considerations" section for clarity. |
| 3.11.1 | Rewrote first paragraph of "TAS/TCAS I Considerations" section for clarity. |
| 6.8.4 | Updated note and added "/GPS" to GIA selections for primary GPS sources. |
| 6.8.9 | Added note and "/GPS" to GIA selections for secondary GPS sources. |
| 6.14 | Rewrote "Ground Check - Transponder" section for clarity. |
| 6.15 | Added "Ground Check - Traffic" section. |
| Appendix D | Updated connector labels in figure D-12 "GTX 345 - Traffic Sensory Interconnect." |

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# 1 System Overview



## 1.1 Scope

**NOTE**

Garmin recommends installation of the GTX 3X5 by a Garmin–authorized installer. Garmin will not be liable for damages that result from improper or negligent installation of the GTX 3X5 to the extent permitted by law.

Mechanical and electrical information to install the GTX 3X5 into an aircraft is provided in this manual. It is not equivalent to an approved airframe-specific maintenance manual, installation design drawing, or installation data package. The content of this manual assumes use by competent and qualified avionics engineering personnel and/or avionics installation specialist using standard maintenance procedures in accordance with Title 14 of the Code of Federal Regulation and other related accepted procedures.

# 1.2 Equipment Description

The GTX 3X5 models include Mode S/ES transponders. Mode S/ES models have an optional internal GPS/SBAS receiver. Model names with an R indicate remote mount units that do not include a display or keypad. An X indicates an included feature, and an O indicates an optional feature.

**Table 1-1 GTX 3X5 Units**

| Feature | GTX 325 | GTX 335 | GTX 335 w/GPS | GTX 335R | GTX 335R w/GPS | GTX 345 | GTX 345 w/GPS | GTX 345R | GTX 345R w/GPS |
|---|---|---|---|---|---|---|---|---|---|
| Panel mount | X | X | X | | | X | X | | |
| Remote mount | | | | X | X | | | X | X |
| Diversity [1] | | O | | O | | O | | O | |
| Pressure sensor module [3] | O | O | O | O | O | O | O | O | O |
| Night vision goggle compatibility [1] [2] | | O | | | | O | O | | |
| ATCRBS Mode A/C | X | X | X | X | X | X | X | X | X |
| Mode S/ES | | X | X | X | X | X | X | X | X |
| ARINC 429 data concentrator | X | X | X | X | X | X | X | X | X |
| ADS-B In with alerting (UAT and 1090 MHz) | | | | | | X | X | X | X |
| Connext (via Bluetooth) [4] | | | | | | X | X | X | X |
| FIS-B | | | | | | X | X | X | X |
| TIS traffic | | X | X | X | X | | | | |
| ADS-B In and TAS/TCAS I/TCAS II traffic integration | | | | | | X | X | X | X |
| HSDB forwarding | | | | | | X | X | X | X |
| Flight timers | X | X | X | | | X | X | | |
| Audio output | X | X | X | X | X | X | X | X | X |
| Interface to Garmin display products | X | X | X | X | X | X | X | X | X |
| Displays pressure altitude, outside air temperature, and density altitude | X | X | X | | | X | X | | |
| Altitude monitor | X | X | X | | | X | X | | |

[1] Unit ordered with this option included.
[2] Night vision option is not available on diversity units.
[3] The pressure sensor module is a separate item.
[4] Supports Bluetooth Low Energy (BLE) ADS-B software v3.00 and later.

# 1.3 Definitions and Abbreviations

## Definitions

References to GTX 3X5 apply to all GTX 3X5 models, except when noted.

References to GTX 335 and GTX 345 also applies to remote and diversity models, unless otherwise noted.

References to GTX 3X5(R) refer to both the panel mount and remote mount variation.

References to G1000 apply to G950/G1000 systems running software v15.xx and earlier.

The term squitter refers to a burst or broadcast of aircraft-tracking data that is periodically transmitted by a Mode S transponder without radar interrogation. The GTX 3X5 Mode S/ES models transmit ADS-B Out ES. These transmissions contain additional aircraft information that includes GPS based location information.

## Abbreviations

These abbreviations and acronyms are used in this document.

| | |
|---|---|
| AC | Advisory Circular |
| ADF | Automatic Direction Finder |
| ADS-B | Automatic Dependent Surveillance-Broadcast |
| ADS-R | Automatic Dependent Surveillance-Rebroadcast |
| AFMS | Aircraft Flight Manual Supplement |
| AGL | Above Ground Level |
| AHRS | Attitude and Heading Reference System |
| AIRMET | Airmen Meteorological Information |
| API | Appliance Project Identifier |
| ATAS | ADS-B Traffic Advisory System |
| ATCRBS | Air Traffic Control Radar Beacon System |
| BDS | Comm-B Data Selector |
| BLE | Bluetooth Low Energy |
| CAVS | CDTI Assisted Visual Separation |
| CDTI | Cockpit Display of Traffic Information |
| CFR | Code of Federal Regulations |
| CG | Center of Gravity |
| CONUS | Continental United States |
| CS-ACNS | Certification Specification and Acceptable Means of Compliance for Airborne Communication, Navigation and Surveillance |
| DC | Direct Current |
| DME | Distance Measuring Equipment |
| ELS | Elementary Surveillance |
| EHS | Enhanced Surveillance |
| EQF | Environmental Qualification Form |
| ES | Extended Squitter |
| FAA | Federal Aviation Administration |
| FCC | Federal Communications Commission |
| FCU | Flight Control Unit |
| FIS-B | Flight Information Services-Broadcast |
| FMS | Flight Manual Supplement |
| GAE | Garmin Altitude Encoder |
| GNSS | Global Navigation Satellite System |
| GPS | Global Positioning System |
| GTX | Garmin Transponder |
| HAE | Height Above Ellipsoid |
| HSDB | High Speed Data Bus |
| LAT | Latitude |
| LON | Longitude |

| | |
|---|---|
| MCP | Mode Control Panel |
| METAR | Meteorological Aviation Report |
| MFD | Multifunction Display |
| MSR | Message Success Rate |
| NOTAM | Notice to Airmen |
| NEXRAD | Next Generation Radar |
| OAT | Outside Air Temperature |
| PED | Portable Electronic Device |
| PIREP | Pilot Weather Report |
| POH | Pilot Operating Handbook |
| RAIM | Receiver Autonomous Integrity Monitoring |
| RFMS | Rotorcraft Flight Manual Supplement |
| SATCOM | Satellite Communications |
| SBAS | Satellite-Based Augmentation System |
| SFD | Secondary Flight Display |
| SIGMET | Significant Meteorological Information |
| SIL | Source Integrity Level |
| SPI | Special Position Indicator |
| TAF | Terminal Area Forecast |
| TAS | Traffic Advisory System |
| TCAS | Traffic Collision Avoidance System |
| TIS | Traffic Information Service |
| TIS-B | Traffic Information Service-Broadcast |
| TSO | Technical Standard Order |
| UAT | Universal Access Transceiver |
| UHF | Ultra-High Frequency |
| USB | Universal Serial Bus |
| VHF | Very High Frequency |
| VSWR | Voltage Standing Wave Ratio |
| WAAS | Wide Area Augmentation System |

# 1.4 ADS-B Capabilities

## 1.4.1 ADS-B Out

The GTX 335 and GTX 345 include ADS-B Out capabilities when installed with an approved internal or external GPS position source.

## 1.4.2 ADS-B In

For all ADS-B In data reception capabilities, the GTX 345 includes receivers for both the 978 MHz (UAT) and the 1090 MHz frequency bands. The GTX 345 receives ADS-B transmissions from other ADS-B Out equipped aircraft, ADS-R, and TIS-B information from ground stations. ADS-B In information received from these transmissions supply traffic data to compatible CDTIs.

### 1.4.3 Installation Approval for ADS-B Systems

It is the installer's responsibility to ensure the ADS-B Out system installation is compliant with 14 CFR 91.227 and to make sure compatibility between the GTX 3X5 and the ADS-B Out position source. For compatible equipment that is applicable for 14 CFR 91.227-compliant installations in accordance with AC 20-165B refer to Garmin document *ADS-B Out Compatible Equipment*.

## 1.5 FIS-B Capabilities

The GTX 345 receives FIS-B information from ground stations in the United States. A direct line-of-sight between the ground station and aircraft is necessary to receive FIS-B data. The data may not be available at ground level in some locations. The GTX 345 supplies data to compatible displays. Depending on the display capability, the following may display.

- NOTAMs (includes TFRs, Ds, and FDCs)
- AIRMETs
- SIGMETs
- METARs
- TAFs
- PIREPs
- Winds/Temps Aloft
- Regional NEXRAD
- CONUS NEXRAD
- Lightning
- Cloud tops
- Icing
- Turbulence
- CWAs
- G-AIRMETs

## 1.6 TIS System Capabilities

The GTX 335 supplies information about nearby traffic through the FAA provided radar based TIS. Advisory traffic information is shown on a compatible Garmin display. Garmin units capable to show TIS traffic include:

- GNS 480 (CNX80)
- GTN 6XX/7XX
- GMX 200
- MX20 MFD
- GNS 400W/500W Series
- GDU 620
- GDU 1040
- GDU 700( )/1060
- GI 275

# 1.7 Interface Summary

**Table 1-2 Interface Summary**

| Interface Description | Input/ Output | GTX 325 | GTX 335 Qty | GTX 345 Qty |
|---|---|---|---|---|
| RS-232 | I/O | 3 | 3 | 4 |
| ARINC 429 | O | 1 | 1 | 1 |
| | I | 2 | 2 | 2 |
| HSDB | I/O | N/A | N/A | 2 |
| RS-422 | O | N/A | N/A | 1 |
| Discrete I/O | I [3] | 15 | 15 | 15 |
| | O | 1 | 1 | 1 |
| | I/O [1] | 2 | 2 | 4 |
| Gray code altitude input [3] | I [3] | 1 | 1 | 1 |
| Suppression bus | I/O | 1 | 1 | 1 |
| 1PPS | O [4] | N/A | 1 | 1 |
| OAT input | I | 1 | 1 | 1 |
| Audio output | O | 1 | 1 | 1 |
| Configuration module, GAE module interface [2] | I/O | 1 | 1 | 1 |
| USB interface | I/O | 1 | 1 | 1 |
| Lighting bus input | I | 1 | 1 | 1 |
| Switched power output | O | 1 | 1 | 1 |

[1] Can be configured to be either input or output on a per-discrete basis.

[2] Use for either the configuration module or combination configuration module/GAE.

[3] The Gray code altitude input pins can be used for other functions when not used for Gray code.

[4] 1PPS is an output if equipped with an internal GPS.

**Table 1-3 GTX 335 and GTX 345 BDS Registers**

| BDS | Description | Extended Squitter | Enhanced Surveillance | General Transponder/ Elementary Surveillance |
|---|---|---|---|---|
| 0, 0 | Comm-B Broadcasts | | | X |
| 0, 5 | Airborne Position Message | X | | |
| 0, 6 | Surface Position Message | X | | |
| 0, 7 | Extended Squitter Status | X | | |
| 0, 8 | Airborne Identification Message | X | | |
| 0, 9 | Airborne Velocity Message | X | | |
| 1, 0 | Data Link Capability Report | | | X |
| 1, 7 | Common Usage GICB Capability Report | | | X |
| 1, 8 | MSSS GICB Capability Report (1 of 5) | | | X |
| 1, 9 | MSSS GICB Capability Report (2 of 5) | | | X |
| 1, A | MSSS GICB Capability Report (3 of 5) | | | X |
| 1, B | MSSS GICB Capability Report (4 of 5) | | | X |
| 1, C | MSSS GICB Capability Report (5 of 5) | | | X |
| 1, D | MSSS MSP Capability | | | X |
| 2, 0 | Aircraft Identification | | | X |
| 2, 1 | Aircraft Registration | | | X |
| 4, 0 | Selected Vertical Intention | | X | |
| 5, 0 | Track and Turn Report | | X | |
| 6, 0 | Heading and Speed Report | | X | |
| 6, 1 | Aircraft Status Message, Subtype 1 | X | | |
| 6, 2 | Target State and Status Message | X | | |
| 6, 5 | Operational Status Message [1] | X | | |
| E, 3 | Transponder Type/Part Number | | | X |
| E, 4 | Transponder Software Revision Number | | | X |

[1] Regardless of diversity or non-diversity operations, the ADS-B single antenna subfield is set to 1. The single antenna subfield will be set to 1 if both antenna channels cannot be guaranteed to be functional. The transponder cannot ensure that both channels are functional. Reference DO-260B, section 2.2.3.2.7.2.4.5.

# 1.8 General Specifications

It is the responsibility of the installing agency to obtain the necessary EQF. Forms are available at the Dealer Resource Center.

**Table 1-4 Physical Characteristics - Panel Mount Units**

| Characteristic | Specification |
|---|---|
| Bezel height | 1.65 in. (42 mm) |
| Bezel width | 6.25 in. (159 mm) |
| Rack height (dimple to dimple) | 1.68 in. (43 mm) |
| Rack width | 6.30 in. (160 mm) |
| Depth behind panel with connectors (measured from face of aircraft panel to rear of connector backshells) | 10.07 inches (256 mm) |
| GTX 325 weight (unit only) | 2.1 lb (0.95 kg) |
| GTX 325 with rack, backplate, and connectors | 2.9 lb (1.32 kg) |
| GTX 335 weight (unit only) | 2.1 lb (0.95 kg) |
| GTX 335 with GPS weight (unit only) | 2.2 lb (1.00 kg) |
| GTX 335 with rack, backplate, and connectors | 2.9 lb (1.32 kg) |
| GTX 335 with GPS with rack, backplate, and connectors | 3.0 lb (1.36 kg) |
| GTX 335D weight (unit only) | 2.3 lb (1.04 kg) |
| GTX 335D with rack, backplate, and connectors | 3.1 lb (1.41. kg) |
| GTX 345 weight (unit only) | 2.3 lb (1.04 kg) |
| GTX 345 with GPS weight (unit only) | 2.5 lb (1.13 kg) |
| GTX 345 with rack, backplate, and connectors | 3.2 lb (1.45 kg) |
| GTX 345 with GPS with rack, backplate, and connectors | 3.4 lb (1.54 kg) |
| GTX 345D weight (unit only) | 2.5 lb (1.13 kg) |
| GTX 345D with rack, backplate, and connectors | 3.5 lb (1.59 kg) |
| Operating temperature range | -40°F to 158°F (-40°C to +70°C)<br>For additional details, refer to the EQF. |
| Maximum operating altitude | 55,000 feet |
| Humidity | 95% non-condensing |
| Cooling | External cooling not necessary |
| Maximum days of continuous operation | 46 days |

**Table 1-5 Physical Characteristics - Remote Mount Units**

| Characteristic | Specification |
|---|---|
| Height, standard mount | 1.7 inches (43 mm) |
| Width, standard mount | 6.3 inches (160 mm) |
| Length, standard mount (unit, mount, and connector backshells) | 9.9 inches (252 mm) |
| Height, unit and vertical remote mount | 6.6 inches (167 mm) |
| Width, unit and vertical remote mount | 1.8 inches (46 mm) |
| Length, unit and vertical remote mount (unit, mount, and connector backshell(s)) | 12.7 inches (321 mm) |
| GTX 335R weight (unit only) | 1.9 lb (0.86 kg) |
| GTX 335R with GPS weight (unit only) | 2.0 lb (0.91 kg) |
| GTX 335R weight with standard mounting tray, backplate, and connectors | 2.7 lb (1.22 kg) |
| GTX 335R with GPS weight with standard mounting tray, backplate, and connectors | 2.8 lb (1.27 kg) |
| GTX 335R weight with vertical remote mount, backplate, and connectors | 3.1 lb (1.41 kg) |
| GTX 335R with GPS weight with vertical remote mount, backplate, and connectors | 3.3 lb (1.50 kg) |
| GTX 335R weight with GX000 remote mount, nut plates, backplate, and connectors | 2.7 lb (1.22 kg) |
| GTX 335R with GPS weight with GX000 remote mount, nut plates, backplate, and connectors | 2.9 lb (1.32 kg) |
| GTX 335DR weight (unit only) | 2.1 lb (0.95 kg) |
| GTX 335DR with standard rack, backplate, and connectors | 2.9 lb (1.32 kg) |
| GTX 335DR with vertical remote mount (011-03762-00), backplate, and connectors | 3.4 lb (1.54 kg) |
| GTX 335DR with GX000 remote mount, nut plates, backplate, and connectors | 3.0 lb (1.36 kg) |
| GTX 335DR with vertical mount (011-04431-01), backplate, connectors | 3.5 lb (1.59 kg) |
| GTX 345R weight (unit only) | 2.2 lb (1.00 kg) |
| GTX 345R with GPS (unit only) | 2.3 lb (1.04 kg) |
| GTX 345R weight with standard mounting tray, backplate, and connectors | 3.0 lb (1.36 kg) |
| GTX 345R with GPS with standard mounting tray, backplate, and connectors | 3.2 lb (1.45 kg) |
| GTX 345R weight with vertical remote mount, connector backplate, and connectors | 3.5 lb (1.59 kg) |
| GTX 345R with GPS weight with vertical remote mount, connector backplate, and connectors | 3.6 lb (1.63 kg) |
| GTX 345R weight with GX000 remote mount, nut plates, backplate, and connectors | 3.1 lb (1.41 kg) |
| GTX 345R with GPS weight with GX000 remote mount, nut plates, backplate, and connectors | 3.2 lb (1.45 kg) |
| GTX 345DR weight (unit only) | 2.4 lb (1.09 kg) |
| GTX 345DR with standard rack, backplate, and connectors | 3.3 lb (1.50 kg) |
| GTX 345DR with vertical remote mount (011-03762-00), backplate, and connectors | 3.8 lb (1.72 kg) |
| GTX 345DR with GX000 remote mount, nut plates, backplate, and connectors | 3.4 lb (1.54 kg) |

| Characteristic | Specification |
|---|---|
| GTX 345DR with vertical mount (011-04431-01), backplate, connectors | 3.8 lb (1.72 kg) |
| Operating temperature range | -49°F to 158°F (-45°C to +70°C)<br>For additional details, refer to the EQF. |
| Maximum operating altitude | 55,000 feet |
| Humidity | 95% non-condensing |
| Cooling | External cooling not necessary |

The GTX 3X5 display is a sunlight readable LCD display.

**Table 1-6 Display Specifications**

| Characteristic | Specification |
|---|---|
| Display size | Width: 3.46 inches (87.88 mm)<br>Height: 0.843 inches (21.4 mm) |
| Active area | Width: 2.95 inches (74.98 mm)<br>Height: 0.486 inches (12.36 mm) |
| Resolution | 200 x 33 pixels |
| Viewing angle | Left: 45°<br>Right: 45°<br>From top: 30°<br>From bottom: 10° |

**Table 1-7 GAE Specifications**

| Characteristic | Specification |
|---|---|
| Dimensions | 1.12 x 0.62 x 0.57 inches (28.4 x 15.7 x 14.5 mm) |
| Weight | 0.8 ounces (with mounting hardware and harness) |
| Operating Temperature | -40°F to +158°F (-40°C to +70°C) |
| Altitude | 30,000 feet maximum |
| Voltage | Supplied by GTX 3X5 transponder |
| Current | Supplied by GTX 3X5 transponder |
| Resolution | 1 foot |

# 1.9 Transponder Specifications

**Table 1-8 Transponder Specifications**

| Characteristic | Specification |
|---|---|
| Transmitter frequency | 1090 MHz ± 1 MHz |
| Transmitter power | 125 W min at antenna, with max 2dB cable loss<br>250 W nominal at unit |
| Receiver frequency | 1030 MHz ± 0.01 MHz |
| Receiver sensitivity | -74 dBm nominal for 90% replies |
| External suppression input | ≥ 10 VDC to suppress |
| External suppression output | ≥ 18 VDC with 300 ohm load, 28 VDC typical with no load |

# 1.10 UAT Receiver Specifications (GTX 345 Only)

**Table 1-9 UAT Receiver Specifications**

| Characteristic | Specification |
|---|---|
| Frequency | 978 MHz ± 20 ppm |
| Modulation | Continuous phase FSK, h = 0.6, raised cosine shaping, a = 0.5 |
| Data rate | 1.04 Mbps |
| Sensitivity | -96 dBm for 90% MSR |

# 1.11 GTX 345 1090 MHz Receiver Specifications

**Table 1-10 GTX 345 1090 MHz Receiver Specifications**

| Characteristic | Specification |
|---|---|
| Frequency | 1090 MHz ± 1 MHz |
| Modulation | Binary pulse-position |
| Data rate | 1 Mbps |
| Sensitivity | -81 dBm for 90% MSR |

# 1.12 GPS Specifications (Units with Internal GPS Only)

**Table 1-11 GPS Receiver Specifications**

| Characteristic | Specification |
|---|---|
| Number of channels | 15 (12 GPS and 3 GPS/SBAS) |
| Frequency | 1575.42 MHz L1, C/A code |
| Sensitivity (acquisition, no interference) | -134.5 dBm GPS<br>-135.5 dBm SBAS |
| Sensitivity (drop lock) | -144 dBm |
| Dynamic range | >20 dB |
| LAT/LON position accuracy | <1.25 meter RMS horizontal, <2 meter vertical, with SBAS |
| Velocity | 1000 knots maximum (above 60,000 ft) |
| TTFF (Time To First Fix) | 1:45 min. typical with current almanac, position, and time |
| Reacquisition | 10 seconds typical |
| Position update interval | 0.2 sec (5 Hz) |
| 1PPS (Pulse Per Second) | ± 275 nsec of UTC second |
| Datum | WGS-84 |
| SATCOM compatibility | SATCOM compatibility is dependent on antenna selection |
| Antenna power supply | 35 mA typical, 40 mA max at 4.7 VDC |

# 1.13 Power Specifications

GTX 3X5 units require an input voltage of between 9 VDC and 33 VDC. The maximum input power and current is based upon maximum reply rates. Input power and current does not include the switched power output.

**Table 1-12 Power Specifications**

| Unit | Characteristic | Specification | |
|---|---|---|---|
| | | 14 VDC | 28 VDC |
| GTX 325 | Power input | 7 W typical, 14 W maximum | |
| | Input current, typical | 0.50 A | 0.25 A |
| | Input current, maximum | 1.00 A | 0.50 A |
| GTX 335 | Power input | 8 W typical, 15 W maximum | |
| | Input current, typical | 0.57 A | 0.29 A |
| | Input current, maximum | 0.86 A | 0.43 A |
| GTX 335D | Power input | 8 W typical, 15 W maximum | |
| | Input current, typical | 0.57 A | 0.29 A |
| | Input current, maximum | 0.86 A | 0.43 A |
| GTX 335, GPS | Power input | 10 W typical, 17 W maximum | |
| | Input current, typical | 0.72 A | 0.36 A |
| | Input current, maximum | 1.22 A | 0.61 A |
| GTX 345 | Power input | 10 W typical, 18 W maximum | |
| | Input current, typical | 0.72 A | 0.36 A |
| | Input current, maximum | 1.30 A | 0.65 A |
| GTX 345D | Power input | 10 W typical, 18 W maximum | |
| | Input current, typical | 0.72 A | 0.36 A |
| | Input current, maximum | 1.30 A | 0.65 A |
| GTX 345, GPS | Power input | 12 W typical, 20 W maximum | |
| | Input current, typical | 1.07 A | 0.54 A |
| | Input current, maximum | 1.43 A | 0.72 A |
| GTX 3X5, GPS [1] | KEEP ALIVE input current, typical | 65 uA | 20 uA |
| | KEEP ALIVE input current, maximum | 85 uA | 40 uA |

[1] KEEP ALIVE input only applies to units that have an internal GPS.

# 1.14 Certification

The conditions and tests required for approval of this article are minimum performance standards. Those installing this article either on or within a specific type or class of aircraft must determine that the aircraft installation conditions are within the standards which include any accepted integrated functions not specified by the standards. TSO articles and any accepted integrated function(s) not specified in the standards, must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR part 43 or the applicable airworthiness requirements. This is an incomplete system intended to provide the functions in table 1-13, and when installed according to the installation manual.

All GTX 3X5 unit functions are design-approved under the TSO. Changes or modifications to any unit that are not approved can void the compliance to necessary regulations and authorization for continued equipment usage.

The installer must verify that non-Garmin devices to be interfaced meet the installation requirements identified in this manual to ensure the installed system will comply with the Garmin TSO/ETSO Authorization. Garmin installation requirements will usually specify that the interfaced device has appropriate TSO/ETSO authorization, and in some cases, such as for TSO-C144 antennas, may also require that the non-Garmin device meet additional Garmin specifications.

FIS-B information, including weather information, NOTAMs, and TFR areas, are intended to assist in long- and near-term planning decision making. The system lacks sufficient resolution and updating capability necessary for aerial maneuvering associated with immediate decisions.

The Appliance Project Identifier (API) for the GTX 3X5 is GMN-01216. The API is used for project identification with the FAA. To identify appliance approvals refer to applicable hardware and software part numbers.

**Table 1-13 TSO Compliance**

| GTX 325 | GTX 335(R) | GTX 345(R) | GTX 335D(R) | GTX 345D(R) | TSO | Class and Level | Function |
|---|---|---|---|---|---|---|---|
| X | | | | | TSO-C74d | Class A | Airborne ATC Transponder Equipment |
| X [2] | X [2] | X [2] | X [2] | X [2] | TSO-C88b | -- | Automatic Pressure Altitude Reporting Code-Generating Equipment |
| | X | X | | | TSO-C112e | Class 1 Level 2ens [3] | Air Traffic Control Radar Beacon System/ Mode Select (ATCRBS/Mode S) Airborne Equipment |
| | | | X | X | | Class 1 Level 2dens | |
| | X [1] | X [1] | | | TSO-C145d [6] | Class B2 | Airborne Navigation Sensors Using the Global Positioning System Augmented by the Satellite Based Augmentation System |
| | X [1] | X [1] | | | TSO-C145e [7] | Class B2 | Airborne Navigation Sensors Using the Global Positioning System Augmented by the Satellite Based Augmentation System |
| | | X | | | TSO-C154c | Class A1S | Universal Access Transceiver (UAT) Automatic Dependent Surveillance – Broadcast (ADS-B) Equipment Operating on Frequency of 978 MHz |
| | | | | X | | Class A1H | |

| GTX 325 | GTX 335(R) | GTX 345(R) | GTX 335D(R) | GTX 345D(R) | TSO | Class and Level | Function |
|---|---|---|---|---|---|---|---|
| | | X | | | TSO-C157a [4] | Class 1 | Aircraft Flight Information Services – Broadcast (FIS-B) Data Link System and Equipment |
| | | X | | X | TSO-C157b [5] | Class 1 | Aircraft Flight Information Services – Broadcast (FIS-B) Data Link System and Equipment |
| | X | | | | TSO-C166b | Class B1S | Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Service – Broadcast (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz) |
| | | X | | | | Class A1S | |
| | | | X | | | Class B1 | |
| | | | | X | | Class A1 | |
| | | X | | | TSO-C195a [4] | Class C1, C2, C3, C5 | Avionics Supporting Automatic Dependent Surveillance – Broadcast (ADS-B) Aircraft Surveillance Applications (ASA) |
| | | X | | X | TSO-C195b [5] | Class C1, C2, C3, C5, C7, C8, D7 | Avionics Supporting Automatic Dependent Surveillance – Broadcast (ADS-B) Aircraft Surveillance Applications (ASA) |

[1] With internal GPS.
[2] With optional GAE module.
[3] For main software v2.05 or earlier, the units are Level 2 els.
[4] For ADS-B software v2.xx.
[5] For ADS-B software v3.00 and later.
[6] For GPS software v6.x and v7.x.
[7] For GPS software v8.2 and later.

**Table 1-14 Applicable P/Ns**

| Description | P/Ns |
|---|---|
| Main software [1] | 006-B1607-0( ) |
| v2.xx ADS-B software [1] | 006-B1797-0( ) |
| v3.xx ADS-B software [1] | 006-B1797-1( ) |
| GPS software | 006-B1827-0( ) |
| | 006-B1827-1( ) |
| | 006-B1827-22 through -2( ) |
| Main boot block [1] | 006-B1607-BA through -B( ) |
| ADS-B boot block [1] | 006-B1797-BA through -B( ) |
| GPS boot block | 006-B1827-B( ) |
| Transponder main CLD [2] | 006-C0153-22 through -2( ) |
| Diversity main CLD [3] | 006-C0184-22 through -2( ) |
| ADS-B CLD | 006-C0157-21 through -2( ) |
| Main region list [2] | 006-D7109-0( ) |
| Diversity main region list [3] | 006-D7402-0( ) |
| Main public key region | 006-D7109-K( ) |
| ADS-B public key region | 006-D7336-K( ) |
| Main audio | 006-D4910-0( ) |
| GPS/GBAS Download Tool | 006-B2349-0( ) |

[1] GTX 3X5D units require main software/boot block v2.50 and later, and ADS-B software/boot block v3.00 and later.

[2] GTX 3X5 non-diversity units.

[3] GTX 3X5D diversity units.

**Table 1-15 TSO Deviations**

| TSO | Deviation |
|---|---|
| TSO-C88b | 1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit. |
| | 2. Garmin is granted a deviation from the TSO to use RTCA DO-160G instead of earlier versions of RTCA/DO-160 as the standard for Environmental Conditions and Test Procedures for Airborne Equipment. |
| TSO-C112e [1] | 1. Garmin was granted a deviation from DO-181E to not generate replies to ATCRBS/Mode S All-Call interrogations. Processing of ATCRBS-Only All-Call interrogations reflected in the upcoming DO-181F are implemented. |
| TSO-C145d | 1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit. |
| | 2. Garmin is granted a deviation from TSO-C145d section 7.a that requires "…provide one copy or on-line access to the data in paragraphs…5.f through 5.h of this TSO." |
| | 3. Garmin is granted a deviation from RTCA/DO-229D Change 1 section 2.1.1.10 to use GPS antennas that meet Garmin Minimum Performance Specifications (Document No. 004-00287-00). |
| TSO-C145e | 1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit. |
| | 2. Garmin is granted a deviation from TSO-C145e section 7.a that requires "…provide one copy or on-line access to the data in paragraphs…5.f through 5.h of this TSO." |
| | 3. Garmin is granted a deviation from RTCA/DO-229E section 2.1.1.10 to use GPS antennas that meet Garmin Minimum Performance Specifications (Document No. 004-00287-00). |
| TSO-C154c | 1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit. |
| TSO-C157a | 1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit. |
| | 2. Garmin is granted a deviation from RTCA DO-267A section 3.6.2.3 to use Product File Identifier in addition to APDU Number when reconstructing a Product File from linked APDUs as specified by Aerodrome and Airspace FIS-B Product Definitions, v4.00, dated May 2009. |
| TSO-C157b | 1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit. |
| TSO-C166b | 1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit. |
| | 2. Garmin is granted a deviation from the TSO-C166b not to process ADS-R as required by RTCA/DO-260B section 2.2.18. |
| | 3. Garmin is granted a deviation from RTCA/DO-260B section 2.1.10 to meet the transponder function requirements of RTCA/DO-181E instead of RTCA/DO-181D. |
| TSO-C195a | 1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit. |
| | 2. Garmin was granted a deviation from RTCA/DO-317A Section 2.2.2.1.5.1.7 item e to always consider track angle to be valid when reported as valid by an on-ground tracked target. |
| TSO-C195b | 1. Garmin is granted a deviation from the TSO for marking the TSO number, Type/Class and Date of Manufacture, Deviation and Software Part Number on the exterior of the unit. |
| | 2. Garmin was granted a deviation from RTCA/DO-317B Section 2.2.2.1.5.1.6 item e to always consider track angle to be valid when reported as valid by an on-ground tracked target. |

[1] Refer to *GTX 3X5 Extended Modes Enablement Guide* for applicability.

### 1.14.1 Non-TSO Functions

The following are declared non-TSO functions, these non-TSO functions as defined in this manual have been evaluated with the TSO functions. The design data for these non-TSO functions has been accepted by the FAA when these non-TSO functions are installed in accordance with the guidance and limitations provided in this manual.

The GTX 3X5 includes the following non-TSO functions.

- TIS-A (GTX 335)
- Wireless data conversion (Bluetooth interface) (GTX 345)

### 1.14.2 Design Assurance Levels

**Table 1-16 Software Design Assurance Levels**

| System Function | DO-178B Level |
|---|---|
| Mode S transponder functionality | C |
| ATCRBS transponder functionality | C |
| TIS-A traffic output to a display | C |
| FIS-B aeronautical and meteorological data output to a display | D |
| Outside air temperature (static) | C |
| Flight timers | C |
| 1090ES ADS-B transmission | C |
| 1090ES/UAT ADS-B reception | B |
| Correlation of TCAS traffic with ADS-B, ADS-R, and TIS-B traffic | B |
| ADS-B Traffic Advisory System (ATAS) including visual and aural alerts | B |
| CDTI Assisted Visual Separation (CAVS) including aural alerting | B |
| External UAT ADS-B control | C |
| Internal GPS/SBAS | B |
| Pressure sensor module | C |
| Altitude monitor/alerting | C |
| Bluetooth output to Portable Electronic Device (PED) | E |
| HSDB packet forwarding | B |
| A429 data concentrator | C |

**Table 1-17 Complex Hardware Design Assurance Levels**

| Function | DO-254 |
|---|---|
| Transponder main CLD [2] | C |
| Diversity main CLD [3] | C |
| ADS-B CLD | C |
| GPS receiver | B [1] |

[1] Developed to DO-178B level B equivalent process.

[2] GTX 3X5 non-diversity units.

[3] GTX 3X5D diversity units.

## 1.14.3 Transmitter Grant of Equipment Authorization

**Table 1-18 Equipment Authorization**

| Model | FCC ID |
|---|---|
| GTX 325 | IPH-02133 |
| GTX 335 | |
| GTX 335R | |
| GTX 345 (-00, -20, -40, and -60 units) | IPH-02256 |
| GTX 345R (-00 and -40 units) | |
| GTX 345 (-01, -02, -21, -41, and -61 units) | IPH-0225611 |
| GTX 345R (-01, -02, and -41 units) | |
| GTX 335D | IPH-03253 |
| GTX 335DR | |
| GTX 345D | IPH-0225612 |
| GTX 345DR | |

# 1.15 License Requirements

**CAUTION**

*THE UHF TRANSMITTER IN THIS EQUIPMENT IS GUARANTEED TO MEET FEDERAL COMMUNICATIONS COMMISSION ACCEPTANCE OVER THE OPERATING TEMPERATURE RANGE. MODIFICATIONS NOT EXPRESSLY APPROVED BY GARMIN COULD INVALIDATE THE LICENSE AND MAKE IT UNLAWFUL TO OPERATE THE EQUIPMENT.*

**NOTE**

For non-US installations consult the local spectrum management agency for requirements.

The Telecommunications Act of 1996, effective February 8, 1996, provides the FCC discretion to eliminate radio station license requirements for aircraft and ships. The GTX 3X5 installation must obey current transmitter licensing requirements. In the US, to find out the specific details on whether a particular installation is exempt from licensing, visit the FCC website http://wireless.fcc.gov/aviation.

If an aircraft license is necessary, apply for a license on FCC Form 404, Application for Aircraft Radio Station License. The FCC also has a fax-on-demand service to supply forms by fax. The GTX 3X5 owner accepts all responsibility for obtaining the proper licensing before using the transponder.

# 1.16 Reference Documents

These documents are additional sources of information to install the GTX 3X5. The technician should read all related reference materials along with this manual before unit installation. The documents in table 1-19 are found at Garmin's Dealer Resource Center.

**Table 1-19 Garmin Reference Documents**

| Document | P/N |
|---|---|
| *14 CFR 91.227 ADS-B Out Compatible Equipment* | 190-01533-00 |
| *Antenna Minimum Performance Specification for Garmin's GPS/WAAS Receiver System* | 004-00287-00 |
| *G1000 System Installation Manual* | 190-00303-00 |
| *GTN Xi Series TSO Installation Manual* | 190-02327-02 |
| *GTS 8X0/GPA 65 Installation Manual* | 190-00587-00 |
| *GTS Processor GTS 825/855/8000 Installation Manual* | 190-00587-50 |
| *GTX 3X5 Environmental Qualification Form* | 005-00752-02 |
| *GTX 3X5D Environmental Qualification Form* | 005-01133-02 |
| *GTX 3X5 Mode A/C Lock Enablement Guide* | 190-01499-21 |
| *GTX 3X5 Extended Modes Enablement Guide* | 190-01499-23 |
| *GTX 3X5 Pilot's Guide* | 190-01499-00 |
| *GTX 3X5 Series Transponder G1000 Pilot's Guide* | 190-01499-01 |
| *GTX 3X5 Transponder Control Enablement Guide* | 190-01499-22 |
| *GTX 3X5 Installation Tool Guide* | 190-01499-30 |
| *GTX 3X5 Installation Tool Guide Version 2* | 190-01499-33 |

**Table 1-20 Additional Reference Documents**

| Document | P/N |
|---|---|
| *Aerospace Systems Electrical Bonding and Grounding for Electromagnetic Compatibility and Safety* | SAE ARP 1870 |
| *Application for Aircraft Radio Station License* | FCC Form 404 |
| FAA Advisory Circular, *Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair* | FAA AC 43.13-1B |
| FAA Advisory Circular, *Acceptable Methods, Techniques, and Practices – Aircraft Alterations* | FAA AC 43.13-2B |

# 2 Limitations

The GTX 3X5 meets the minimum performance and quality control standards that are necessary by the TSOs in section 1.14. Installation of the GTX 3X5 requires separate approval.

# 3 Installation Overview



## 3.1 Introduction

Equipment information to install the GTX 3X5 and optional accessories is in this section. Cabling is made by the installing agency to fit each particular aircraft. Always follow permitted avionics installation procedures as outlined in AC 43.13-1B and AC 43.13-2B and later FAA approved revisions.

## 3.2 Unit Configurations

**Table 3-1 GTX 3X5 Configurations**

| Model | Mount | GPS | ADS-B In | Diversity | Unit P/N | Unit Only Kit | Standard Kit [1] | Mount Type |
|---|---|---|---|---|---|---|---|---|
| GTX 325 | Panel | | | | 011-02974-00 | 010-01083-00 | 010-01083-01 | |
| GTX 335 | Panel | | | | 011-03300-00 | 010-01214-00 | 010-01214-01 | |
| GTX 335D | Panel | | | X | 011-04331-00 [2] | 010-01773-00 | 010-01773-01 | |
| GTX 335 NV | Panel | | | | 011-03300-20 | 010-01214-20 | 010-01214-21 | |
| GTX 335, GPS | Panel | X | | | 011-03300-40 | 010-01214-40 | 010-01214-41 | |
| GTX 335, GPS | Panel | X | | | 011-03300-41 [3] | 010-01214-42 | 010-01214-43 | |
| GTX 335R | Remote | | | | 011-03301-00 | 010-01215-00 | 010-01215-01 | Standard |
| GTX 335R | Remote | | | | 011-03301-00 | 010-01215-00 | 010-01215-02 | Vertical |
| GTX 335R | Remote | | | | 011-03301-00 | 010-01215-00 | 010-01215-03 | G1000 |
| GTX 335R | Remote | | | | 011-03301-01 [3] | 010-01215-05 | 010-01215-06 | |
| GTX 335R, GPS | Remote | X | | | 011-03301-40 | 010-01215-40 | 010-01215-41 | Standard |
| GTX 335R, GPS | Remote | X | | | 011-03301-40 | 010-01215-40 | 010-01215-42 | Vertical |
| GTX 335R, GPS | Remote | X | | | 011-03301-40 | 010-01215-40 | 010-01215-43 | G1000 |
| GTX 335DR | Remote | | | X | 011-04332-00 [2] | 010-01774-00 | 010-01774-01 | Standard |
| GTX 335DR | Remote | | | X | 011-04332-00 [2] | 010-01774-00 | 010-01774-02 | Vertical |
| GTX 335DR | Remote | | | X | 011-04332-00 [2] | 010-01774-00 | 010-01774-03 | G1000 |
| GTX 335DR | Remote | | | X | 011-04332-00 [2] | 010-01774-00 | 010-01774-04 | Vertical |
| GTX 345 | Panel | | X | | 011-03302-00 | 010-01216-00 | 010-01216-01 | |
| GTX 345 | Panel | | X | | 011-03302-01 [2] | 010-01216-05 | 010-01216-06 | |
| GTX 345 | Panel | | X | | 011-03302-02 [4] | 010-01216-07 | 010-01216-08 | |
| GTX 345D | Panel | | X | X | 011-04333-00 [2] | 010-01775-00 | 010-01775-01 | |
| GTX 345 NV | Panel | | X | | 011-03302-20 | 010-01216-20 | 010-01216-21 | |
| GTX 345 NV | Panel | | X | | 011-03302-21 [2] | 010-01216-25 | 010-01216-26 | |
| GTX 345, GPS | Panel | X | X | | 011-03302-40 | 010-01216-40 | 010-01216-41 | |
| GTX 345, GPS | Panel | X | X | | 011-03302-41 [2] | 010-01216-45 | 010-01216-46 | |
| GTX 345 NV, GPS | Panel | X | X | | 011-03302-60 | 010-01216-60 | 010-01216-61 | |
| GTX 345 NV, GPS | Panel | X | X | | 011-03302-61 [2] | 010-01216-65 | 010-01216-66 | |
| GTX 345R | Remote | | X | | 011-03303-00 | 010-01217-00 | 010-01217-01 | Standard |
| GTX 345R | Remote | | X | | 011-03303-00 | 010-01217-00 | 010-01217-02 | Vertical |
| GTX 345R | Remote | | X | | 011-03303-00 | 010-01217-00 | 010-01217-03 | G1000 |
| GTX 345R | Remote | | X | | 011-03303-01 [2] | 010-01217-05 | 010-01217-06 | Standard |
| GTX 345R | Remote | | X | | 011-03303-01 [2] | 010-01217-05 | 010-01217-07 | Vertical |

| Model | Mount | GPS | ADS-B In | Diversity | Unit P/N | Unit Only Kit | Standard Kit [1] | Mount Type |
|---|---|---|---|---|---|---|---|---|
| GTX 345R | Remote | | X | | 011-03303-01 [2] | 010-01217-05 | 010-01217-08 | G1000 |
| GTX 345R | Remote | | X | | 011-03303-02 [4] | 010-01217-0A | 010-01217-0B | |
| GTX 345R, GPS | Remote | X | X | | 011-03303-40 | 010-01217-40 | 010-01217-41 | Standard |
| GTX 345R, GPS | Remote | X | X | | 011-03303-40 | 010-01217-40 | 010-01217-42 | Vertical |
| GTX 345R, GPS | Remote | X | X | | 011-03303-40 | 010-01217-40 | 010-01217-43 | G1000 |
| GTX 345R, GPS | Remote | X | X | | 011-03303-41 [2] | 010-01217-45 | 010-01217-46 | Standard |
| GTX 345R, GPS | Remote | X | X | | 011-03303-41 [2] | 010-01217-45 | 010-01217-47 | Vertical |
| GTX 345R, GPS | Remote | X | X | | 011-03303-41 [2] | 010-01217-45 | 010-01217-48 | G1000 |
| GTX 345DR | Remote | | X | X | 011-04334-00 [2] | 010-01776-00 | 010-01776-01 | Standard |
| GTX 345DR | Remote | | X | X | 011-04334-00 [2] | 010-01776-00 | 010-01776-02 | Vertical |
| GTX 345DR | Remote | | X | X | 011-04334-00 [2] | 010-01776-00 | 010-01776-03 | G1000 |
| GTX 345DR | Remote | | X | X | 011-04334-00 [2] | 010-01776-00 | 010-01776-04 | Vertical |

[1] Includes unit, install rack, connector backplate, connector kit, and configuration module (GTX 325 standard kit does not include configuration module).

[2] Requires main software v2.50 or later and ADS-B software v3.00 or later.

[3] Requires main software v2.80 or later and main FPGA v2.80 or later.

[4] Requires main software v2.80 or later, main FPGA v2.80 or later, ADS-B software v3.40 or later, and ADS-B FPGA v2.60 or later.

## 3.3 Accessories Supplied

**Table 3-2 Accessories Supplied**

| Unit | Kit P/N | Item | P/N | Notes |
|---|---|---|---|---|
| GTX 325 | 010-01083-01 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-00 | |
| | | Product information kit | K00-00598-00 | |
| GTX 335 | 010-01214-01 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-01 | |

| Unit | Kit P/N | Item | P/N | Notes |
|---|---|---|---|---|
| GTX 335NV | 010-01214-21 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-01 | |
| GTX 335 w/GPS | 010-01214-41 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-01 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-01 | |
| GTX 335 w/GPS | 010-01214-43 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-01 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-01 | |
| GTX 335R, standard mount | 010-01215-01 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-02 | |
| GTX 335R, standard mount | 010-01215-06 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-02 | |
| GTX 335R, vertical mount | 010-01215-02 | Install rack, vertical | 011-03762-00 | |
| | | Backplate assembly | 011-02976-10 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-02 | |

| Unit | Kit P/N | Item | P/N | Notes |
|---|---|---|---|---|
| GTX 335R, G1000 mount | 010-01215-03 | Install rack, G1000 | 115-02250-00 | |
| | | Install rack nut plate | 011-00915-01 | |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-05 | |
| GTX 335R w/GPS, standard mount | 010-01215-41 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-01 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-02 | |
| GTX 335R w/GPS, vertical mount | 010-01215-42 | Install rack, vertical | 011-03762-00 | |
| | | Backplate assembly | 011-02976-11 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-02 | |
| GTX 335R w/GPS, G1000 mount | 010-01215-43 | Install rack, G1000 | 115-02250-00 | |
| | | Install rack nut plate | 011-00915-01 | |
| | | Backplate assembly | 011-02976-01 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-05 | |
| GTX 335D | 010-01773-01 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-04340-00 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-01 | |
| GTX 335DR, standard mount | 010-01774-01 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-04340-00 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-02 | |

| Unit | Kit P/N | Item | P/N | Notes |
|---|---|---|---|---|
| GTX 335DR, vertical mount | 010-01774-02 | Install rack | 011-03762-00 | |
| | | Backplate assembly | 011-04340-10 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-02 | |
| GTX 335DR, G1000 mount | 010-01774-03 | Install rack, G1000 | 115-02250-00 | |
| | | Install rack nut plate | 011-00915-01 | |
| | | Backplate assembly | 011-04340-00 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-05 | |
| GTX 335DR, vertical mount | 010-01774-04 | Install rack | 011-04431-01 | |
| | | Backplate assembly | 011-04340-04 | |
| | | Connector kit | 011-02977-00 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-02 | |
| GTX 345 | 010-01216-01 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-03 | |
| GTX 345 | 010-01216-06 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-03 | |
| GTX 345 | 010-01216-08 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-03 | |

| Unit | Kit P/N | Item | P/N | Notes |
|---|---|---|---|---|
| GTX 345 w/GPS | 010-01216-41 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-01 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-03 | |
| GTX 345 w/GPS | 010-01216-46 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-01 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-03 | |
| GTX 345R, standard mount | 010-01217-01 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-04 | |
| GTX 345R, standard mount | 010-01217-06 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-04 | |
| GTX 345R, standard mount | 010-01217-0B | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-04 | |
| GTX 345R, vertical mount | 010-01217-02 | Install rack, vertical | 011-03762-00 | |
| | | Backplate assembly | 011-02976-10 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-04 | |

| Unit | Kit P/N | Item | P/N | Notes |
|---|---|---|---|---|
| GTX 345R, vertical mount | 010-01217-07 | Install rack, vertical | 011-03762-00 | |
| | | Backplate assembly | 011-02976-10 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-04 | |
| GTX 345R, G1000 mount | 010-01217-03 | Install rack, G1000 | 115-02250-00 | |
| | | Install rack nut plate | 011-00915-01 | |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-06 | |
| GTX 345R, G1000 mount | 010-01217-08 | Install rack, G1000 | 115-02250-00 | |
| | | Install rack nut plate | 011-00915-01 | |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-06 | |
| GTX 345R w/GPS, standard mount | 010-01217-41 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-01 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-04 | |
| GTX 345R w/GPS, standard mount | 010-01217-46 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-01 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-04 | |
| GTX 345R w/GPS, vertical mount | 010-01217-42 | Install rack, vertical | 011-03762-00 | |
| | | Backplate assembly | 011-02976-11 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-04 | |

| Unit | Kit P/N | Item | P/N | Notes |
|---|---|---|---|---|
| GTX 345R w/GPS, vertical mount | 010-01217-47 | Install rack, vertical | 011-03762-00 | |
| | | Backplate assembly | 011-02976-11 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00594-04 | |
| GTX 345R w/GPS, G1000 mount | 010-01217-43 | Install rack, G1000 | 115-02250-00 | |
| | | Install rack nut plate | 011-00915-01 | |
| | | Backplate assembly | 011-02976-01 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-06 | |
| GTX 345R w/GPS, G1000 mount | 010-01217-48 | Install rack, G1000 | 115-02250-00 | |
| | | Install rack nut plate | 011-00915-01 | |
| | | Backplate assembly | 011-02976-01 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-06 | |
| GTX 345 NV | 010-01216-21 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-03 | |
| GTX 345 NV | 010-01216-26 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-00 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-03 | |
| GTX 345 NV w/GPS | 010-01216-61 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-01 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-03 | |

| Unit | Kit P/N | Item | P/N | Notes |
|---|---|---|---|---|
| GTX 345 NV w/GPS | 010-01216-66 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-02976-01 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-03 | |
| GTX 345D | 010-01775-01 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-04340-00 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-03 | |
| GTX 345DR, standard mount | 010-01776-01 | Install rack | 115-01771-01 | [1] |
| | | Backplate assembly | 011-04340-02 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-04 | |
| GTX 345DR, vertical mount | 010-01776-02 | Install rack | 011-03762-00 | |
| | | Backplate assembly | 011-04340-10 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-04 | |
| GTX 345DR, G1000 mount | 010-01776-03 | Install rack, G1000 | 115-02250-00 | |
| | | Install rack nut plate | 011-00915-01 | |
| | | Backplate assembly | 011-04340-02 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-06 | |
| GTX 345DR, vertical mount | 010-01776-04 | Install rack | 011-04431-01 | |
| | | Backplate assembly | 011-04340-04 | |
| | | Connector kit | 011-02977-01 | |
| | | Configuration module | 011-00979-03 | |
| | | Product information kit | K00-00598-04 | |

[1] The standard rack, P/N 115-01771-01, is the functional equivalent of P/N 115-01771-00.

# 3.4 Optional Accessories

## 3.4.1 GAE

The GTX 3X5 uses an optional GAE module as a transponder pressure altitude input. The GAE module directly attaches to the GTX 3X5 rear backplate and connects to the aircraft static pressure system. The GAE module replaces and functions the same as the configuration module. When installing the pressure sensor module, use the supplied cable assembly. Do not lengthen.

**Table 3-3 Pressure Sensor Module**

| Item | P/N |
|---|---|
| Pressure sensor module | 011-03080-00 |

## 3.4.2 GX000 System Rack

The GTX 3X5 has an optional mount and hardware for GX000 installations.

**Table 3-4 GX000 System Rack**

| Item | P/N |
|---|---|
| GTX 3X5 remote rack, G1000 | 115-02250-00 |
| G1000 nut plate kit, three-position | 011-00915-01 |

## 3.4.3 GTX 3X5 Vertical Remote Mount

The GTX 3X5 vertical remote mount is available as separate components. The base kit mounts to the aircraft. The shoe kit mounts to the GTX 3X5.

**Table 3-5 GTX 3X5 Vertical Remote Mount Kits**

| Item | P/N |
|---|---|
| GTX 3X5 vertical remote mount | 011-03762-00 |
| GTX 3X5 vertical remote mount, base kit | 011-03762-10 |
| GTX 3X5 vertical remote mount, shoe kit | 011-03762-20 |

## 3.4.4 Standard Rack, Hi-Vib

This standard rack can be used in place of P/N 115-01771-01 rack. It is functionally equivalent, but meets higher vibration levels. Refer to EQFs for vibration qualification.

**Table 3-6 Standard Rack, Hi-Vib**

| Item | P/N |
|---|---|
| GTX 3X5 standard rack, hi-vib | 115-01771-05 |

### 3.4.5 Vertical Remote Rack, Hi-Vib

The GTX 3X5D vertical remote mount is available as a kit or as separate components. Refer to the EQFs for vibration qualification.

**Table 3-7 Vertical Remote Rack, Hi-Vib**

| Item | P/N | Notes |
|---|---|---|
| GTX 3X5 vertical remote mount, hi-vib | 011-04431-01 | Includes rack and adapter |
| GTX 3X5 vertical remote mount, hi-vib, rack | 011-04321-01 | Attaches to aircraft |
| GTX 3X5 vertical remote mount, hi-vib, rack adapter | 011-04324-00 | Attaches to the unit |

### 3.4.6 Backplate Assemblies

Table 3-6 lists different backplates and intended mounting type. Some backplates are included in standard kits, while others are optional depending which coax connectors are included.

**Table 3-8 Backplate Assemblies**

| | Mounting Type | | | | Antenna Connector | | |
|---|---|---|---|---|---|---|---|
| **Backplate P/N** | **Panel** | **Std Remote** | **GX000 Remote** | **Vert Remote** | **Transponder** | **GPS** | **Use in Place of** |
| 011-02976-00 | X | X | X | | BNC | -- | |
| 011-02976-01 | X | X | X | | BNC | TNC | |
| 011-02976-02 | X | X | X | | TNC | -- | 011-02976-00 |
| 011-02976-10 | | | | X | BNC | -- | |
| 011-02976-11 | | | | X | BNC | TNC | |
| 011-02976-12 | | | | X | TNC | -- | 011-02976-10 |
| **Diversity Units** | | | | | **Transponder** | **Bluetooth** | |
| 011-04340-00 | X | X | X | | BNC | -- | |
| 011-04340-01 | X | X | X | | TNC | -- | 011-04340-00 |
| 011-04340-02 | X | X | X | | BNC | R-SMA | |
| 011-04340-03 | X | X | X | | TNC | R-SMA | 011-04340-02 |
| 011-04340-10 | | | | X | BNC | R-SMA | |
| 011-04340-04 | | | | X | TNC | R-SMA | |
| 011-04340-11 | | | | X | TNC | R-SMA | 011-04340-10 |

### 3.4.7 Remote Bluetooth Antenna

The GTX 345DR has an optional external Bluetooth antenna kit that includes connectors for assembling cable, using RG-316 coaxial cable not to exceed 12 feet in length.

**Table 3-9 Remote Bluetooth Antenna Kit**

| Item | P/N |
|---|---|
| Remote Bluetooth antenna kit | 011-04148-00 |

### 3.4.8 GPS Antenna

A GPS antenna is necessary for the GTX 335 and GTX 345 with the internal GPS option. For information about antenna selection and part numbers, refer to section 3.8.

#### GA 35S Antenna

The antenna includes four 8-32 UNC-2A x 1.00" SS 303 mounting screws and one O-ring.

If it is necessary to use an antenna doubler refer to the applicable antenna installation data.

Use four #8 washers and four #8 self-locking nuts to attach the antenna. Applicable nut plates can be attached to the doubler. Torque the four supplied 8-32 stainless steel screws 12-15 in-lbs. Apply torque equally across all mounting screws to avoid deformation of the mounting area.

Use a TNC plug to connect the GPS antenna coax cable.

**Table 3-10 GA 35S P/N 010-02639-00**

| Description | P/N | QTY |
|---|---|---|
| GA 35S antenna, white | 011-05754-00 | 1 |
| Install kit, GA 35S, thru-mount | 011-05759-00 | 1 |

**Table 3-11 GA 35S Install Kit P/N 011-05759-00**

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

#### GA 35 Antenna

The antenna includes four 8-32 UNC-2A x 1.00" SS 303 mounting screws and one O-ring.

If it is necessary to use an antenna doubler refer to the applicable antenna installation data.

Use four #8 washers and four #8 self-locking nuts to attach the antenna. Applicable nut plates can be attached to the doubler. Torque the four supplied 8-32 stainless steel screws 12-15 in-lbs. Apply torque equally across all mounting screws to avoid deformation of the mounting area. Use a TNC plug to connect the GPS antenna coax cable.

### GA 36 Antenna

The antenna includes four 10-32 UNF-2A x 1.00" SS 303 mounting screws and one O-ring.

If it is necessary to use an antenna doubler refer to the applicable antenna installation data.

Attach the antenna with four #10 washers and four #10 self-locking nuts. Applicable nut plates can be attached to the doubler. Torque the four supplied 10-32 stainless steel screws 20-25 in-lbs. Apply torque equally across all mounting screws to avoid deformation of the mounting area.

Use a TNC plug to connect the GPS antenna coax cable.

### GA 37 Antenna

The antenna includes four 10-32 UNF-2A x 1.00" SS 303 mounting screws and one O-ring.

If it is necessary to use an antenna doubler refer to the applicable antenna installation data.

Attach the antenna with four #10 washers and four #10 self-locking nuts. Applicable nut plates can be attached to the doubler. Torque the four supplied 10-32 stainless steel screws 20-25 in-lbs. Apply torque equally across all mounting screws to avoid deformation of the mounting area.

Use a TNC plug to connect the GPS antenna coax cable.

### A33W Antenna

The antenna includes four 6-32 UNC-2A x 1.00" SS 303 mounting screws and one O-ring.

If it is necessary to use an antenna doubler refer to the applicable antenna installation data.

Attach the antenna with four #6 washers and four self-locking nuts. Applicable nut plates can be attached to the doubler. Torque the four supplied 6-32 stainless steel screws 3-5 in-lbs. Apply torque equally across all mounting screws to avoid deformation of the mounting area.

Use a TNC plug to connect the GPS antenna coax cable.

## 3.5 Necessary Installation Materials and Accessories Not Supplied

The GTX 3X5 is installed with standard aviation materials. The following items are necessary for installation, but not supplied.

1. Wire (MIL-W-22759/16 or equivalent)
2. Shielded wire (MIL-C-27500 or equivalent)
3. Aircraft grade category 5 Ethernet cable is necessary for installations utilizing the HSDB interfaces
4. Mounting hardware
5. Circuit breaker of applicable rating
6. Tie wraps and/or lacing cord
7. Ring terminals for grounding
8. Coaxial cable (RG-400 or equivalent)
9. BNC connectors for the transponder antenna
10. TNC connectors for the GPS antenna
11. Approved pressure altitude source

# 3.6 Necessary Special Tools

**NOTE**

Insertion/extraction tools from ITT Cannon are all plastic. The others are plastic with metal tips.

Some connectors use crimp contacts. Use crimp tools in table 3-12 to make sure reliable crimp contact connections for the rear D-sub connectors are correct.

**Table 3-12 Recommended Crimp Tools**

| Manufacturer | Hand Crimping Tool | 22-28 AWG (P3251, P3252) | |
|---|---|---|---|
| | | Positioner | Insertion/Extraction Tool |
| Military PN | M22520/2-01 | M22520/2-09 | M81969/14-01<br>M81969/1-04 |
| Positronic | 9507-0-0-0 | 9502-4-0-0 | M81969/1-04 |
| ITT Cannon | 995-0001-584 | 995-0001-739 | 000849490<br>274-7048-000MIL |
| AMP | 601966-1 | 601966-6 | 91067-1<br>2031838-1 |
| Daniels | AFM8 | K42 | M81969/14-01<br>M81969/1-04 |
| Astro | 615717 | 615725 | M81969/14-01<br>M81969/1-04 |

# 3.7 Transponder Antenna

**NOTE**

For the GTX 345 some types of transponder antennas that utilize thin radiator elements are only intended for use at 1030 and 1090 MHz. These types of antennas should be evaluated on a model-by-model basis to determine their suitability for UAT receivers.

The GTX 3X5(R) must have an UHF antenna. The antennas in table 3-13 are approved for use with the GTX 3X5(R). Other antennas are permitted if they meet these specifications:

- Standard 50 ohm vertically polarized antenna with a VSWR ≤ 1.7:1 at 978 MHz and ≤ 1.5:1 at 1090 MHz
- TSO-C66( ), TSO-C74( ), or TSO-C112( ) antennas that also meet the VSWR specification

**Table 3-13 Acceptable UAT/1090 Antennas**

| Manufacturer | P/N | Model/Description | Connector Type | Notes |
|---|---|---|---|---|
| Aero Antenna | AT130-16 | DME Transponder | TNC | DC Grounded |
| Comant | CI-100 | DME Transponder | BNC | Open Circuit |
| | CI-100-2 | DME Transponder | TNC | Open Circuit |
| | CI-105 | DME Transponder | BNC | Open Circuit |
| | CI-105-3 | DME Transponder | BNC | Open Circuit |
| | CI-105-16 | DME Transponder | BNC | Open Circuit |
| | CI-110-40-30 | DME Transponder | C | Open Circuit |
| | CI-110-41-30 | DME Transponder | C | DC Grounded |
| | CI-110-60-30 | DME Transponder | C | Open Circuit |
| | CI-110-61-30 | DME Transponder | C | DC Grounded |
| Dayton-Granger | L10-611-( ) | L-Band Blade | C | DC Grounded |
| Garmin | 590-0052 or 013-00219-00 | A-40 | TNC | Open Circuit |
| | 590-0051 or 013-00174-00 | A-41 | TNC | DC Grounded |

# 3.8 GPS Antenna Requirements

Use an antenna in table 3-14 to get the best performance with the GTX 3X5 with internal GNSS receiver. The antennas in table 3-14 meet specifications in the document *Antenna Minimum Performance Specification for Garmin's GPS/WAAS Receiver System.*

**Table 3-14 GNSS Receiver Antennas**

| Model/Description | Connector Type | Manufacturer | P/N | Garmin Order Number |
|---|---|---|---|---|
| GA 35S, GPS/WAAS [1] | TNC | Garmin | 011-05754-00 | 010-02639-00 |
| GA 35, GPS/WAAS [1] | TNC | Garmin | 013-00235-( ) | 013-00235-( ) |
| | | Aero Antenna | AT575-93G( )-TNCF-000-RG-27-NM | N/A |
| GA 36, GPS/WAAS | TNC | Garmin | 013-00244-( ) | 013-00244-( ) |
| | | Aero Antenna | AT575-126G( )-TNCF-000-RG-27-NM | N/A |
| GA 37, GPS/WAAS/XM | TNC | Garmin | 013-00245-( ) | 013-00245-( ) |
| | | Aero Antenna | AT2300-126G( )-TNCF-000-RG-27-NM | N/A |
| A33W, WAAS Antenna | TNC | Garmin | 013-00261-( ) | 013-00261-( ) |
| | | Aero Antenna | AT575-332G( )-TNCF-000-RG-27-NM | N/A |
| GPS/VHF Antenna [2] | TNC/BNC | Comant | CI-2580-200 | N/A |
| GPS/VHF Antenna [2] | TNC/BNC | Comant | CI-2728-200 | N/A |
| GPS/XM/VHF Antenna [3] | TNC/TNC/BNC | Comant | CI-2580-410 | N/A |
| GPS/XM/VHF Antenna [3] | TNC/TNC/BNC | Comant | CI-2728-410 | N/A |
| GPS/WAAS Antenna | TNC | Comant | CI-428-200 | N/A |
| GPS/XM Antenna | TNC/TNC | Comant | CI-428-410 | N/A |

[1] Same mounting hole pattern as GA 56, except GA 35S and GA 35 have a physically larger footprint.

[2] The GPS antenna connector is a TNC and the VHF connector is BNC.

[3] The GPS antenna connector is a TNC connector, the XM connector is TNC, and the VHF connector is BNC.

**Table 3-15 GA 35S P/N 010-02639-00**

| Item Description | P/N | Qty |
|---|---|---|
| GA 35S antenna, white | 011-05754-00 | 1 |
| Install kit, GA 35S, thru-mount | 011-05759-00 | 1 |

# 3.9 Minimum Systems Configuration

For compatible ADS-B traffic/FIS-B displays refer to table 3-17. GTN 6XX/7XX, GNS 480 (CNX80), and G1000 displays are compatible control panels. When installing a model in table 3-16, each item marked with an X on the same row is necessary.

**Table 3-16 Minimum System Configuration**

| Model | Transponder Antenna | Altitude Source | External GPS/SBAS Position Source | GPS/SBAS Antenna | Control Panel | ADS-B Traffic/ FIS-B Display or Traffic Light | Audio Panel |
|---|---|---|---|---|---|---|---|
| GTX 325 | X | X | | | | | |
| GTX 335 | X | X | X | | | | |
| GTX 335R | X | X | X | | X | | |
| GTX 335 w/GPS | X | X | | X | | | |
| GTX 335R w/GPS | X | X | | X | X | | |
| GTX 345 | X | X | X | | | X | X |
| GTX 345R | X | X | X | | X | X | X |
| GTX 345 w/GPS | X | X | | X | | X | X |
| GTX 345R w/GPS | X | X | | X | X | X | X |

**Table 3-17 Compatible ADS-B Traffic/FIS-B Displays**

| Display | FIS-B Source Format | ADS-B Traffic Source Format |
|---|---|---|
| GTN 6XX/7XX | HSDB | HSDB |
| GDU 620 | HSDB | HSDB |
| GMX 200 | RS-422: MX Format 1 | MX Format 1 |
| GNS 400W/500W Series | RS-232: GNS | ARINC 429: Traffic |
| G1000 | RS-422: MX Format 1 or MX Format 3[1] | RS-232: Legacy Traffic |
| MX20 | RS-422: MX Format 2 | RS-422 MX Format 2 |
| G1000 NXi | HSDB | HSDB |
| GX000 | HSDB | HSDB |
| GDU 700( )/1060 | HSDB | HSDB |
| GI 275 | HSDB | HSDB |
| GPS 175 | HSDB | HSDB |
| GNC 355 | HSDB | HSDB |

[1] When using software v2.65 or later, MX Format 3 should be used.

# 3.10 GTX Input Source Priority

The GTX 3X5 accepts data from multiple sources. If multiple sources supply data to the unit, only valid data from the highest priority source is used. Source priorities are shown from highest to the lowest.

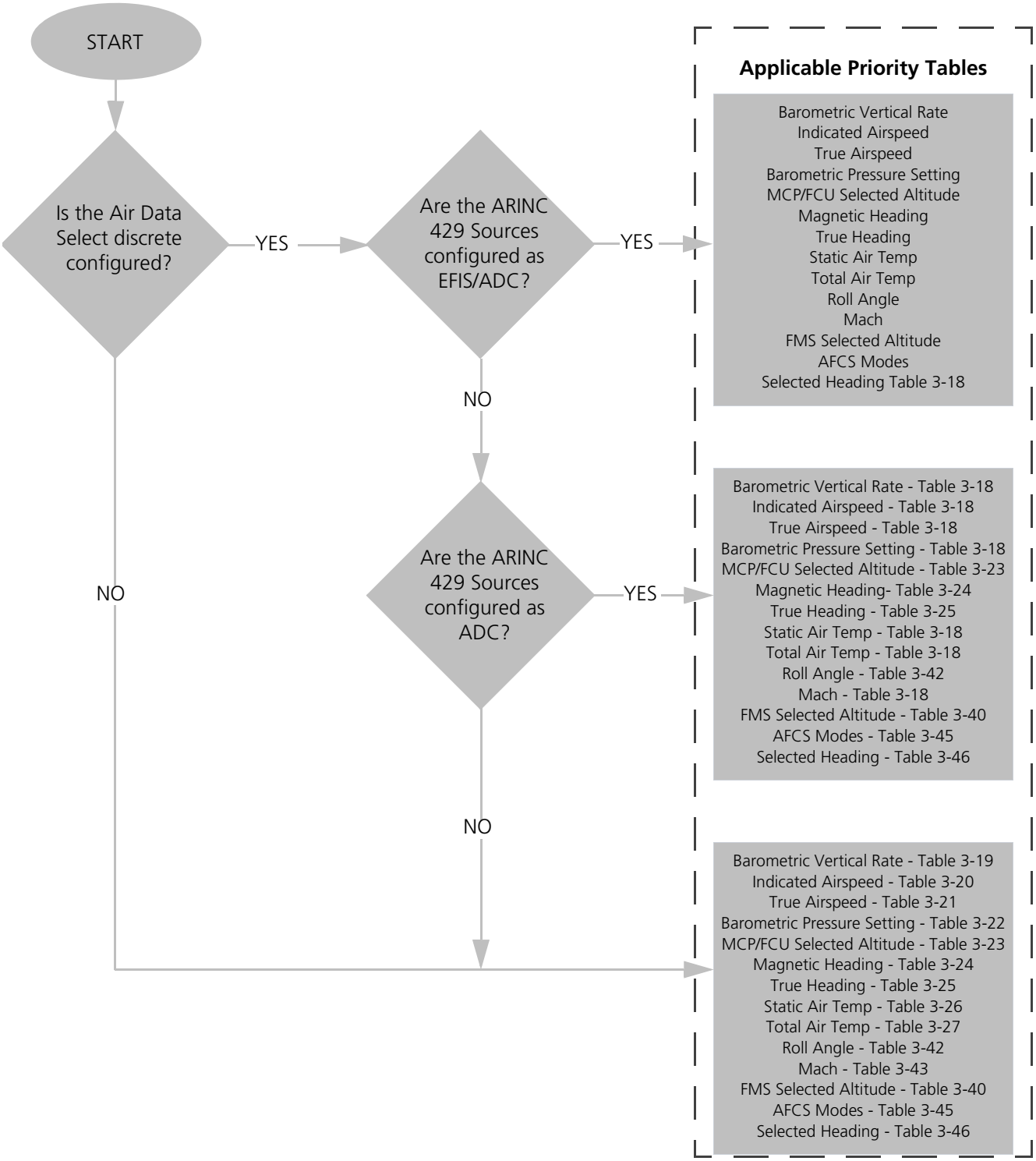



**Figure 3-1 Air Data Discrete Priority Order**

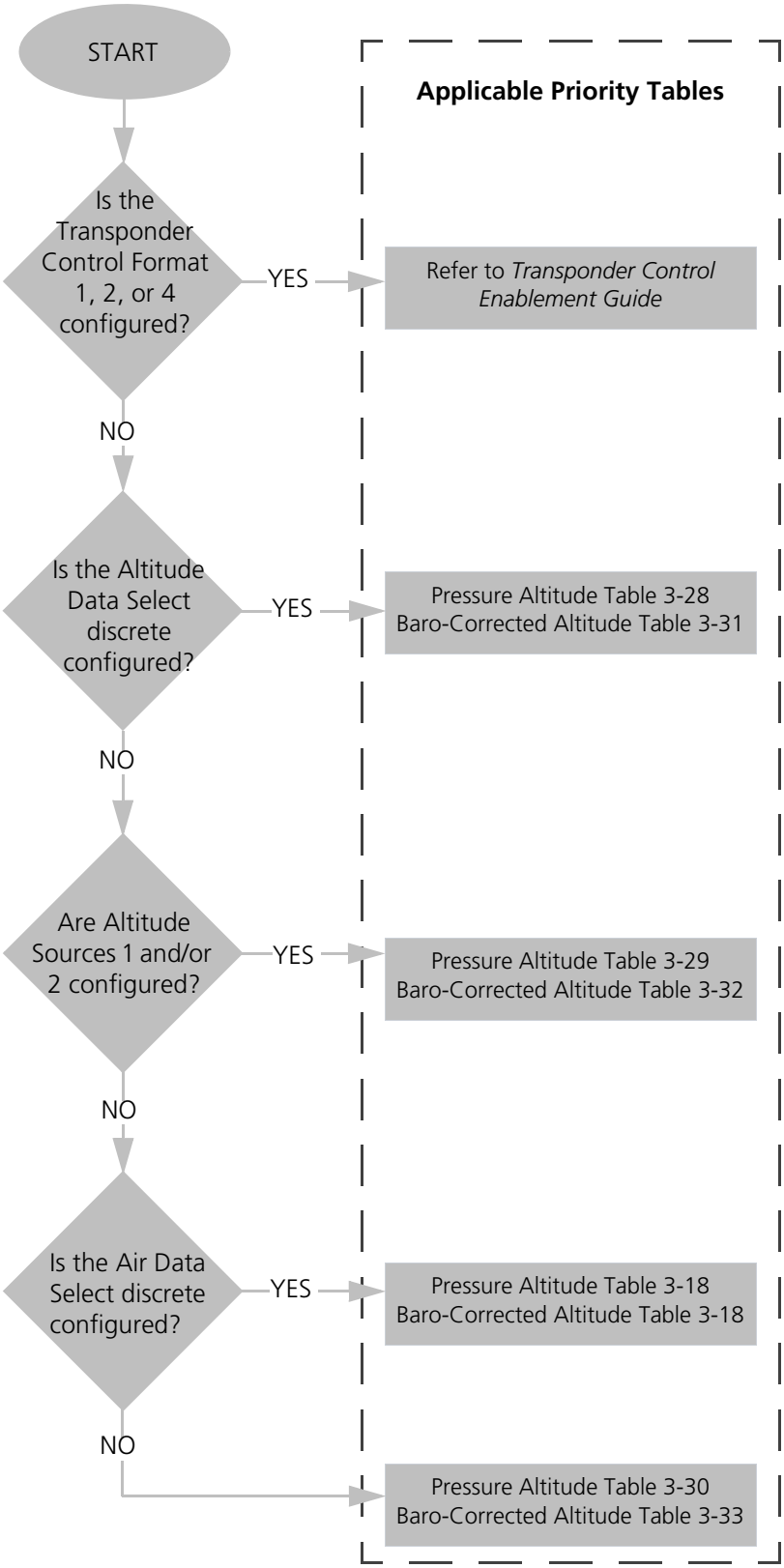



**Figure 3-2 Pressure Altitude Priority Order**

**Table 3-18 Air Data Select Source Priority**

| Air Data Select Discrete | Source |
|---|---|
| Open | Configured port 1 ARINC 429 EFIS ADC/ADC input |
| Ground | Configured port 2 ARINC 429 EFIS ADC/ADC input |

**Table 3-19 Barometric Vertical Rate Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 212 from an ADC |
| 2 | ARINC 429 label 212 from an EFIS/ADC |
| 3 | RS-232 from an ADC |
| 4 | RS-232 from a remote control panel |
| 5 | Refer to table 3-47. |

**Table 3-20 Indicated Airspeed Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 206 from an ADC |
| 2 | ARINC 429 label 206 from an EFIS/ADC |
| 3 | RS-232 from an ADC |
| 4 | RS-232 from a remote control panel |
| 5 | Refer to table 3-47. |

**Table 3-21 True Airspeed Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 210 from an ADC |
| 2 | ARINC 429 label 210 from an EFIS/ADC |
| 3 | RS-232 from an ADC |
| 4 | RS-232 from a remote control panel |
| 5 | Refer to table 3-47. |

**Table 3-22 Barometric Pressure Setting Source Priority**

**NOTE**

If the Air Data Select discrete input is configured and the source is Air Data or EFIS/Air Data, Label 235 will have priority over Label 234.

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 235 from an ADC |
| 2 | ARINC 429 label 234 from an ADC |
| 3 | ARINC 429 label 235 from an EFIS/ADC |
| 4 | ARINC 429 label 234 from an EFIS/ADC |
| 5 | ARINC 429 label 235 from an AFCS |
| 6 | ARINC 429 label 234 from an AFCS |
| 7 | RS-232 from an ADC |
| 8 | RS-232 from a remote control panel |
| 9 | Refer to table 3-47. |

**Table 3-23 MCP/FCU Selected Altitude Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 102 from an AFCS |
| 2 | ARINC 429 label 102 from an EFIS/ADC |
| 3 | RS-232 from a remote control panel |
| 4 | Refer to table 3-48. |

**Table 3-24 Magnetic Heading Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 320 from a heading source |
| 2 | ARINC 429 label 320 from an AHRS |
| 3 | ARINC 429 label 320 from an EFIS/ADC |
| 4 | RS-232 from an ADC |
| 5 | RS-232 from a remote control panel |
| 6 | Refer to table 3-47. |

**Table 3-25 True Heading Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 314 from a heading source |
| 2 | ARINC 429 label 314 from an AHRS |
| 3 | ARINC 429 label 314 from an EFIS/ADC |
| 4 | RS-232 from a remote control panel |
| 5 | Refer to table 3-47. |

**Table 3-26 Static Air Temperature Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 213 from an ADC |
| 2 | ARINC 429 label 213 from an EFIS/ADC |
| 3 | RS-232 from an ADC |
| 4 | RS-232 from a remote control panel |
| 5 | Refer to table 3-47. |

**Table 3-27 Total Air Temperature Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 211 from an ADC |
| 2 | ARINC 429 label 211 from an EFIS/ADC |
| 3 | RS-232 from an ADC |
| 4 | RS-232 from a remote control panel |
| 5 | Refer to table 3-47. |
| 6 | Outside air temperature sensor if OAT sensor installed and is active |

**Table 3-28 Pressure Altitude Source Selection #1**

| Altitude Data Select Discrete | Source |
|---|---|
| Open | Source specified in altitude source configuration 1 |
| Ground | Source specified in altitude source configuration 2 |

**Table 3-29 Pressure Altitude Source Priority Order #1**

| Priority | Source |
|---|---|
| 1 | Source specified in altitude source configuration 1 |
| 2 | Source specified in altitude source configuration 2 |

**Table 3-30 Pressure Altitude Source Priority Order #2**

| Priority | Source | Precision |
|---|---|---|
| 1 | ARINC 429 label 203 from an ADC | High |
| 2 | ARINC 429 label 203 from an EFIS/ADC | High |
| 3 | RS-232 from an ADC | High |
| 4 | RS-232 from a 25 ft resolution altitude source | High |
| 5 | RS-232 from a remote control panel | High |
| 6 | $I^2C$ from a GAE 12 | High |
| 7 | Refer to table 3-47. | High |
| 8 | Gray code altitude | Low |
| 9 | RS-232 from a 100 ft resolution altitude source | Low |

**Table 3-31 Baro-Corrected Altitude Source Selection #1**

| Altitude Data Select Discrete | Source |
|---|---|
| Open | Source specified in altitude source configuration 1 |
| Ground | Source specified in altitude source configuration 2 |

**Table 3-32 Baro-Corrected Altitude Source Priority Order #1**

| Priority | Source |
|---|---|
| 1 | Source specified in altitude source configuration 1 |
| 2 | Source specified in altitude source configuration 2 |

**Table 3-33 Baro-Corrected Altitude Source Priority Order #2**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 204 from an ADC |
| 2 | ARINC 429 label 204 from an EFIS/ADC |
| 3 | RS-232 from an ADC |
| 4 | RS-232 from a remote control panel |

**Table 3-34 AHRS Source Priority**

| Priority | Source |
|---|---|
| 1 | A429 labels 270, 324, 325, 332, 333, and 340 from an AHRS |
| 2 | RS-232 from a remote control panel |
| 3 | Refer to table 3-47. |
| 4 | AHRS data from the Internal AHRS |

**Table 3-35 Airport Reference Points Source Priority**

| Priority | Source |
|---|---|
| 1 | RS-232 from a remote control panel |
| 2 | HSDB runway information from GTN/GPS 175 #1 |
| 3 | HSDB runway information from GTN/GPS 175 #2 |
| 4 | HSDB runway information from a GX000 |
| 5 | HSDB runway information from G500/600 GDU #1 |
| 6 | HSDB runway information from G500/600 GDU #2 |
| 7 | HSDB runway information from GI 275 #1 |
| 8 | HSDB runway information from GI 275 #2 |

**Table 3-36 Density Altitude Source Priority**

**NOTE**

If density altitude could not be retrieved from an external source, density altitude is calculated based on current pressure altitude and static air temperature.

| Priority | Source |
|---|---|
| 1 | RS-232 from an ADC |
| 2 | RS-232 from a remote control panel |
| 3 | Refer to table 3-47. |
| 4 | Internally calculated from pressure altitude and static air temperature |

**Table 3-37 Height Above Terrain Source Priority**

| Priority | Source |
|---|---|
| 1 | RS-232 from a remote control panel |
| 2 | RS-232 from a GNS |
| 3 | HSDB height above terrain from GTN/GPS 175 #1 |
| 4 | HSDB height above terrain from GTN/GPS 175 #2 |
| 5 | HSDB height above terrain from a GX000 |
| 6 | HSDB height above terrain from G500/600 GDU #1 |
| 7 | HSDB height above terrain from G500/600 GDU #2 |
| 8 | HSDB height above terrain from GI 275 #1 |
| 9 | HSDB height above terrain from GI 275 #2 |

**Table 3-38 Radio Altitude Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 164 from a radar altimeter |
| 2 | ARINC 429 label 164 from an EFIS/ADC |
| 3 | RS-232 from a remote control panel |
| 4 | HSDB radio height from GTN/GPS 175 #1 |
| 5 | HSDB radio height from GTN/GPS 175 #2 |
| 6 | HSDB radio height from a GX000 |
| 7 | HSDB radio height from G500/600 GDU #1 |
| 8 | HSDB radio height from G500/600 GDU #2 |
| 9 | Radio height from GI 275 #1 |
| 10 | Radio height from GI 275 #2 |

**Table 3-39 Selected Course and Joystick Waypoint Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 labels 100, 306, and 307 from an EFIS/ADC |

**Table 3-40 FMS Selected Altitude Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 107 from a Garmin AFCS |
| 2 | ARINC 429 label 107 from a Garmin EFIS |
| 3 | RS-232 from a remote control panel |
| 4 | Refer to table 3-48. |
| 5 | HSDB FMS vertical navigation data from G500/600 GDU #1 |
| 6 | HSDB FMS vertical navigation data from G500/600 GDU #2 |
| 7 | Vertical navigation data from GI 275 #1 |
| 8 | Vertical navigation data from GI 275 #2 |
| 9 | HSDB FMS vertical navigation data from a GMC 605 |

**Table 3-41 Magnetic Variation Source Priority**

| Priority | Source |
|---|---|
| 1 | HSDB magnetic variation from a GX000 |
| 2 | HSDB magnetic variation from G500/600 GDU #1 |
| 3 | HSDB magnetic variation from GTN/GPS 175 #1 |
| 4 | HSDB magnetic variation from GTN/GPS 175 #2 |
| 5 | HSDB magnetic variation from G500/600 GDU #2 |
| 6 | HSDB magnetic variation from GI 275 #1 |
| 7 | HSDB magnetic variation from GI 275 #2 |
| 8 | RS-232 from a GNS |

**Table 3-42 EHS Roll Angle Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 325 from an AHRS |
| 2 | ARINC 429 label 325 from an EFIS/ADC |
| 3 | RS-232 from a remote control panel |
| 4 | Refer to table 3-47. |

**Table 3-43 Mach Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 205 from an ADC |
| 2 | ARINC 429 label 205 from an EFIS/ADC |
| 3 | RS-232 from an ADC |
| 4 | RS-232 from a remote control panel |
| 5 | Refer to table 3-47. |

**Table 3-44 Inertial Vertical Rate Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 365 from an AHRS |
| 2 | RS-232 from a remote control panel |
| 3 | Refer to table 3-47. |

**Table 3-45 AFCS Modes Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 labels 304 and 305 from a Garmin AFCS |
| 2 | ARINC 429 labels 271 and 276 from an AFCS |
| 3 | ARINC 429 labels 304 and 305 from a Garmin EFIS/ADC |
| 4 | ARINC 429 labels 271 and 276 from a Garmin EFIS/ADC |
| 5 | RS-232 AFCS modes from a remote control panel |
| 6 | HSDB AFCS modes from a GX000 |
| 7 | HSDB AFCS modes from G500/600 GDU #1 |
| 8 | HSDB AFCS modes from G500/600 GDU #2 |
| 9 | HSDB AFCS modes from GI 275 #1 |
| 10 | HSDB AFCS modes from GI 275 #2 |
| 11 | HSDB AFCS modes from a GMC 605 |
| 12 | RS-232 vertical modes from a remote control panel |

**Table 3-46 Selected Heading Source Priority**

| Priority | Source |
|---|---|
| 1 | ARINC 429 label 101 from an AFCS |
| 2 | ARINC 429 label 101 from an EFIS/ADC |
| 3 | RS-232 from a remote control panel |
| 4 | Refer to table 3-48. |

**Table 3-47 ADAHRS HSDB Source Priority**

| Priority | GTX #1 | GTX #2 |
|---|---|---|
| 1 | Selected flight director [1] | Selected flight director [1] |
| 2 | Pilot sensor selection | Copilot sensor selection |
| 3 | Copilot sensor selection | Pilot sensor selection |
| 4 | #1 sensors | #2 sensors |
| 5 | #2 sensors | #1 sensors |
| 6 | #3 sensors | #3 sensors |
| 7 | Standby sensors | Standby sensors |

[1] Considered in GX000 and TXi installations only.

**Table 3-48 Flight Control Source Priority**

| Priority | GTX #1 | GTX #2 |
|---|---|---|
| 1 | Selected flight director [1] | Selected flight director [1] |
| 2 | #1 sensors | #2 sensors |
| 3 | #2 sensors | #1 sensors |

[1] Considered in GX000 and TXi installations only.

# 3.11 ADS-B In Considerations

The GTX 345 ADS-B In and FIS-B functionality can be configured independently of the ADS-B Out and transponder functionality. GX000 systems with supporting loader card software/configuration combined with GTX 345 main software v2.60 and later and ADS-B software v3.20 and later support HSDB connection to more than one ADS-B In source and more than one FIS-B source. Older GX000 system releases and other HSDB display units cannot connect to more than one ADS-B In/FIS-B source. If a GTX 345 is in a system that contains a GDL 88, ADS-B In and FIS-B must be disabled in the GTX 345.

In dual transponder installations with one or more GTX 345 units, it is recommended that each transponder have a dedicated transponder antenna, to support ADS-B In and FIS-B functionality when the GTX 345 is in standby. If the transponders share a single antenna using an antenna switch, ADS-B In and FIS-B functionality will be available only when the ADS-B In/FIS-B source is connected to the antenna. GX000 systems with supporting loader card software/ configuration and GTX 345 main software v2.60 and later and ADS-B software v3.20 and later support dual GTX 345 units connected to a single antenna such that the active GTX will be the ADS-B In/FIS-B source. Installations that configure multiple ADS-B in sources with a TAS/TCAS are supported only if the TAS/TCAS interfaces to the GTX and displays via HSDB (i.e., GTS).

In ADS-B software v3.20 and later, when configured, the GTX 345 supports the output of ADS-B In traffic targets that do not meet performance requirements for display on certified traffic display systems. These targets are referred to as Non-Performing Emitters (NPEs). When using ADS-B software v3.30 and later, these traffic targets are always output on Connext Bluetooth (i.e. wireless). They can be output on wired Connext interfaces based on the NPE PROC configuration setting. In ADS-B software version v3.60 and later, they can also be output on HSDB based on the NPE PROC configuration setting. HSDB based NPEs output is supplemental to the traffic output that meets criteria for use on certified displays. NPE support is dependent on the capability of the interfaced display. HSDB based NPE transmission applies in a way that does not impact connected certified displays. Other wired interfaces do not support output of NPEs.

The GTX 345 NPE capability only supports installations on uncertified aircraft. Visual alerting and aural alerting for NPE traffic targets are optional based on the NPE configuration. GTX 345 NPE functionality is configured to disabled by default and must remain disabled for installations on certified aircraft.

GPS Time Mark input is required for UAT receive antenna selection on GTX 345D units. In G1000 installations and non-GIFD installations, time mark input should be provided to the GTX 345D from the GPS source configured as GPS source #1 on the GTX 345D. In G1000 NXi and G2/3/5000 installations, time mark input should be provided to the GTX 345D from the on-side GIA.

## 3.11.1 TAS/TCAS I Considerations

When a TAS/TCAS I is installed with a GTX 345, the GTX is responsible for providing combined traffic information to the display unit(s) and providing combined traffic aural alerting that includes muting of traffic aural alerts at low altitudes.

Traffic aural alert suppression in fixed-wing aircraft installations is configurable on units running main software v2.90 and ADS-B software v3.60, or later approved combination. It can be configured for no suppression, suppression below 400' AGL, or suppression below 500' AGL. It is based on height above ground and radio altitude. When using software earlier than main v2.90 and ADS-B v3.60, traffic aural alert suppression in fixed-wing aircraft installations is not configurable. It occurs below 500' AGL when height above ground or radio altitude data is available.

## 3.11.2 TCAS II Considerations

In GX000 installations with supporting loader card software/configuration, the GTX 345 can be installed to provide ADS-B In functionality in an aircraft with TCAS II. In such installations, the GTX 3000 provides the transponder and ADS-B out functions and these functions of the GTX 345 are disabled by configuration. The GTX 345 can be configured for ADS-B In traffic and FIS-B, ADS-B In traffic only, or FIS-B only.

When the GTX 345 is used as a source of traffic in TCAS II installations, the GTX is responsible for providing combined ADS-B and TCAS II traffic information to the display unit(s). The GTX traffic alerting is disabled when installed with TCAS II, but other ADS-B In applications, such as CAVS, are still available. The TCAS II is responsible for providing traffic visual and aural alerting and resolution advisories.

# 3.12 Bluetooth Considerations

## GTX 345R

For optimal connectivity with a GTX 345R, the Bluetooth antenna must point towards the passenger area of the aircraft. This is identifiable by the Garmin label. Due to aircraft obstructions, Bluetooth performance may be limited. To obtain ideal Bluetooth performance, use a Flight Stream 110/210.

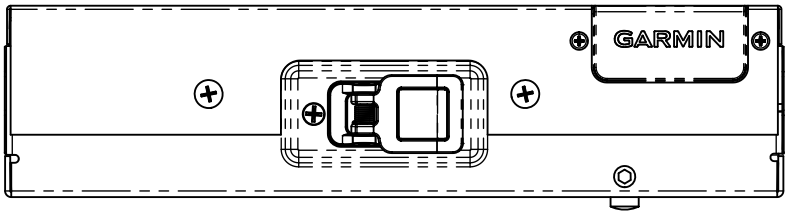



**Figure 3-3 Garmin Label on Remote Units**

## GTX 345DR

If the internal antenna does not give optimal performance, the GTX 345DR has a connector on the back to attach an external Bluetooth antenna. Refer to section 3.4.7 for more information.

If using the external Bluetooth antenna choose a location to mount the antenna that is within reach of the GTX 345DR rack using a maximum length of 12 feet of RG-316 coax. Ensure to mount the antenna in a location that is free from conducting obstructions between the antenna and desired Bluetooth access.

# 3.13 AHRS Considerations

The GTX 345 includes an internal AHRS and will output attitude data via Connext interfaces, when installed in fixed wing aircraft. AHRS is supported in rotorcraft running ADS-B software v3.51 and later. The following steps are needed to configure and adjust the internal AHRS for the installation.

1. Configure the AHRS orientation as described in section 6.8.18 or the GTX 3X5 Installation Tool Guide.
2. With the GTX installed in the aircraft and the aircraft level, perform the AHRS in-aircraft calibration procedure to set the level pitch and roll offsets. Refer to section 6.8.19 or the GTX 3X5 Installation Tool Guide.
3. Optionally, the pitch and roll offsets can be adjusted during level flight via Connext using a PED. This only adds an adjustment to the calibrated offsets; the offsets must first have been set using the on-ground calibration procedure described in step 2.

When using GTX 3X5 main software v2.70 and ADS-B software v3.40, or later approved combination, the GTX Install Tool provides an AHRS Diagnostics/Calibration page. This page is intended to be used rarely and only in the event of observed attitude failures or inaccuracies during flight. It is used to collect diagnostics while the unit is installed in the aircraft to determine if a bench calibration could improve performance. It also supports performing the bench calibration process if needed. Refer to the GTX 3X5 Installation Tool Guide for use of this page.

**NOTE**

Perform the in-aircraft calibration procedure (step 2 above) following any change to the orientation parameters (connectors, vent, or yaw), following the bench calibration procedure, or after reverting to factory calibration. Attitude data will not be output if the in-aircraft calibration procedure is not performed.

# 3.14 Field Enablements

Transponder Control and Mode A/C Lock field enablements are available with main software v2.05 and later. For more information refer to *GTX 3X5 Mode A/C Lock Enablement Guide* and *GTX 3X5 Transponder Control Enablement Guide.*

Extended Modes enablement is available on units running main software v2.60 or later and diversity CLD v2.50 (P/N 006-C0184-25) or later. Extended Modes is currently only supported on diversity units. For more information, refer to *GTX 3X5 Extended Modes Enablement Guide.*

# 3.15 GPS/SBAS Parameters

The GTX 3X5 receives the following information from internal and external GPS receivers.

- 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

# 3.16 Antenna Considerations

Mounting location considerations for the antenna(s) are provided in this section.

## 3.16.1 Transponder Antenna

Ground planes must be considered for installations on composite aircraft. Conductive wire mesh, radials, or thin aluminum sheets embedded in the composite material supply the ground plane to maximize the antenna pattern (gain). This can improve transponder performance.

The antenna mounting must use the aircraft manufacturer's type certificated antenna location and style. The antenna must be installed in accordance with manufacturer instructions and/or AC 43.12-2A Chapter 3.

Transponder antenna considerations help the installer to select the best location for the antenna. The antenna should:

1. Be attached away from major protrusions, such as engines, nacelles, propellers, and antenna masts.
2. Be as far as practical from landing gear doors, access doors, or other openings that could affect its radiation pattern.
3. Be vertically attached on the bottom of the aircraft. For diversity configurations, the second antenna must be attached vertically on the top of the aircraft.
4. Not be attached within three feet of the ADF sense antenna or any other communication antenna.
5. Not be attached within six feet of a DME antenna.
6. Be attached a minimum of three feet from the GTX 3X5 to prevent RF interference.
7. The antenna must be installed at least 20 inches from any transponder, TAS/TCAS, or other L-Band antenna.

### 3.16.2 GPS Antenna

**NOTE**

When attaching a combination antenna, the recommended distance of two feet or more is not applicable to the distance between the antenna elements of the combination antenna (ex. GPS and COM, GPS and XM) provided the combination antenna is TSO authorized and has been tested to meet Garmin's minimum performance standards. For approved antennas refer to table 1-12.

If twelve inch spacing is not practical, the maximum center-to-center spacing must be used, but never less than nine inches. Spacing less than nine inches results in unacceptable antenna pattern degradation.The installation guidelines meet the intent of AC 20-138A section 16. The greater the deviation from these guidelines, the greater the chance of decreased signal quality and availability. It is possible that all of the installation guidelines cannot be met. These guidelines are listed in order of importance to get the best performance. The installer should use best judgment to balance the installation guidelines.The GPS antenna should:

1. Be installed as near to level as possible with respect to the normal cruise flight attitude of the aircraft.
2. Be installed in a location to minimize the effects of airframe shadowing during typical maneuvers.
3. Be installed a minimum of two feet from any VHF COM antenna or any other antenna which may emit harmonic interference at the L1 frequency of 1575.42 MHz.
4. Be installed a minimum of two feet from any antennas emitting more than 25 watts.
5. Be installed a minimum of nine inches (center to center) from other antennas, including passive antennas such as another GPS or XM antenna.
6. Be installed a minimum of three inches from the windscreen.
7. Have a twelve inch center to center spacing between GPS antennas.

The recommended antenna locations are shown in figure 3-4.

An aircraft EMC check can find the source of GPS degradation in the presence of interference signals. If an EMC check shows unacceptable interference, either insert a GPS notch filter in line with the offending VHF COM or the (re-radiating) ELT transmitter, or select a different GPS antenna location.

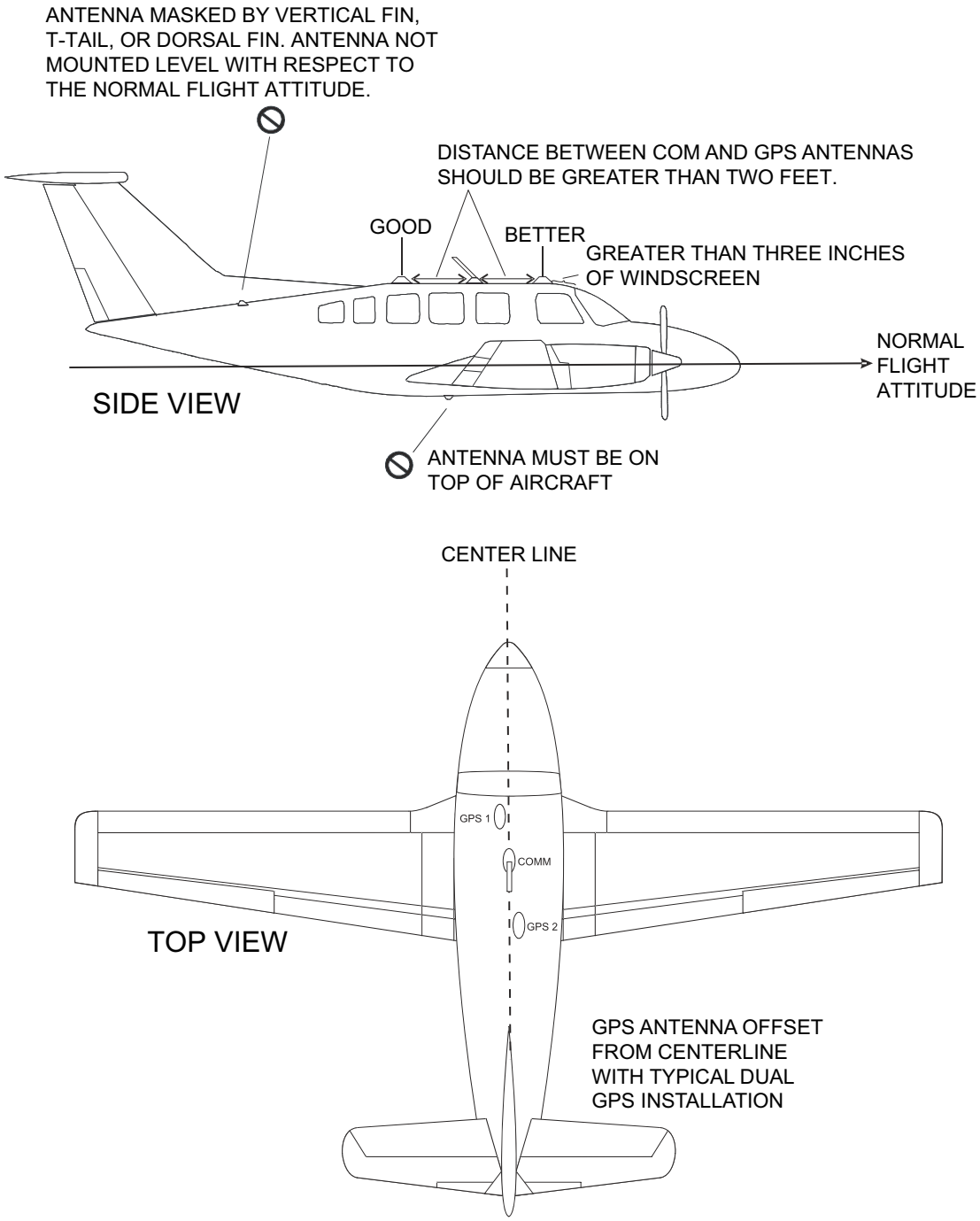



**Figure 3-4 GPS Locations of Antennas**

## 3.17 Electrical Bonding

Ensure the transponder and GPS antennas are electrically bonded to the aircraft.

## 3.18 Cabling and Wiring

Use AC 43.13-1B chapter 11, sections 8 through 13 to install wiring. The considerations are:

1. It should not be possible for the cable harness to be exposed to wire chafing.
2. The cable harness should not be located near flight control cables, high capacity electrical lines (e.g., DC electric motor cables), or fuel lines.
3. Do not put cables near high energy sources (e.g., DC motors, high heat sources).
4. Wiring that must be shielded must be done as shown in appendix D.
5. Shield pigtail lengths must be less than 3.0 inches.

## 3.19 Electrical Bonding Considerations

Bond electrical equipment, supporting brackets, and racks to the aircraft's main structure. When surface preparation is necessary to get an electrical bond refer to SAE ARP 1870 section 5. To measure the resistance of the bond between the equipment and the adjacent aircraft structure use a calibrated milliohm meter. The bond must have a DC resistance no more than 2.5 milliohms.

## 3.20 Cooling Requirements and Considerations

There are no cooling requirements or considerations for the GTX 3X5. The chassis has provisions for a fan, however, one is not necessary or provided.

## 3.21 Position Source (GPS Equipped Units Only)

GTX 3X5 units with internal GPS can output position data to other devices.

- GTX 330(D)/33(D) ES
- GDL 88(D)
- GTX 3X5(D)(R)
- GTX 3000
- GMC 605
- G5
- GTR 255
- GNC 255

In main software v2.60 and later, GTX 3X5 w/GPS units can be configured to disable the transponder and ADS-B functions. This allows a unit to be configured as a position source if needed.

# 4 Installation Procedure



## 4.1 Wire Harness Installation

All electrical connections, except for the antenna(s) and shield grounds, are made through the D-sub connectors on the rear of the unit. The shield grounds terminate to the connector backshells.

For additional information:

- For rear connector pinout and descriptions of interface connections refer to section 5
- For interconnect diagrams, refer to appendix D
- For special tools, refer to section 3.16

Give sufficient space for installation of cables and connectors. The installer supplies and assembles all cables. Cable lengths are dependent upon the installation.

To install pins into connectors and build a wire harness:

1. Remove 0.17 inches of insulation from wires going to the connectors.
2. Put the wire into the pin and crimp with one of the recommended (or equivalent) crimping tools.
3. Put the pin into the connector housing location as specified by the interconnect drawings in appendix D.
4. Gently pull on the wire to make sure the pin is properly engaged into the connector.
5. Route and attach the cable run from the GTX 3X5 to the other units. Refer to section 3.18.

## 4.2 Backshell Assembly Parts

The GTX 3X5 connector kits include backshell assemblies and ground adapter assemblies. Use the shield block ground kit to terminate shield grounds to the backshell housing. Garmin part numbers for the D-sub connectors and the backshell assemblies are in table 4-1.

**Table 4-1 Backshell Assembly**

| Figure 4-2 through Figure 4-4 | Description | Garmin P/N | Notes |
|---|---|---|---|
| 1 | Backshell (P3251)<br>Backshell (P3252) | 125-00084-00<br>125-00081-00 | [1] |
| 2 | Shield block (P3251)<br>Shield block (P3252) | 117-00147-01<br>117-00147-00 | [2] |
| 3 | Screw, 4-40 x.250, FLHP100°, SS/P, nylon | 211-63234-08 | [2] |
| 6 | Screw, 4-40x.375, PHP, SS/P, with nylon | 211-60234-10 | [1] |
| 7 | Strain relief (P3251)<br>Strain relief (P3252) | 115-00499-03<br>115-00499-00 | [1] |
| 8 | Cover (P3251)<br>Cover (P3252) | 115-00500-03<br>115-00500-00 | [1] |
| 9 | Screw, 4-40x.187, FLHP100, SS/P, with nylon | 211-63234-06 | [1] |
| 10 | Connector, D-sub, HD, 62-pin (P3251)<br>Connector, D-sub, HD, 15-pin (P3252) | 330-00185-62<br>330-00185-15 | [3] |
| 11 | Multiple conductor shielded cable | As necessary | [4] |
| 12 | Shield terminator | As necessary | [4] [5] |
| 13 | Wire, insulated, 20-22 AWG (3 inches maximum length) | As necessary | [4] [5] |
| 14 | Pin contacts, #22D | 336-00021-00 | [3] |
| 15 | Ring terminal, #8, insulated, 18-22 AWG, 14-16 AWG | MS25036-149,<br>MS25036-153,<br>MS25036-156 | [4] [6] |
| 16 | Screw, PHP, 8-32 x .312", stainless or cad plated steel | MS51957-42,<br>MS35206-242 | [4] [6] |
| 17 | Split washer, #8, (.045" compressed thickness) stainless or cad-plated steel | MS35338-137,<br>MS35338-42 | [4] [6] |
| 18 | Flat washer, #8, .032" thick, .174" ID, .375" OD, stainless or cad plated steel | NAS1149CN832R,<br>NAS1149FN832P | [4] [6] |
| 19 | Silicone fusion tape | 249-00114-00 | [4] |

[1] Supplied as part of backshell kits, P/N 011-00950-03 (P3251), and P/N 011-00950-00 (P3252). These are included in the connector kits, P/N 011-02977-( ).

[2] Supplied as part of ground adapter kits P/N 011-01169-01 (P3251) and P/N 011-01169-00 (P3252). These are included in the connector kits, P/N 011-02977-( ).

[3] Supplied as part of GTX connector kit P/N 011-02977-00 (GTX 325 and GTX 335), and P/N 011-02977-01 (GTX 345).

[4] Not supplied – must be purchased separately.

[5] Solder sleeve with pre-installed shield drain wire may be used instead of items 12 and 13.

[6] Not a Garmin part number.

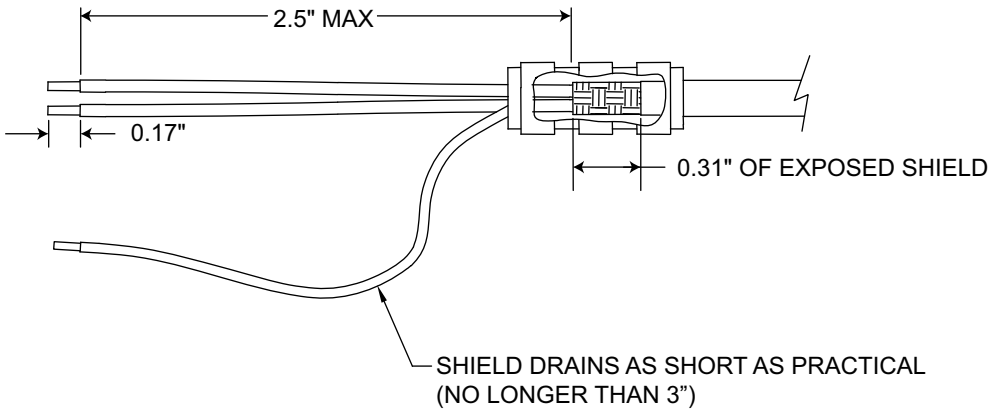
## 4.3 Shielded Cable Preparation

**NOTE**

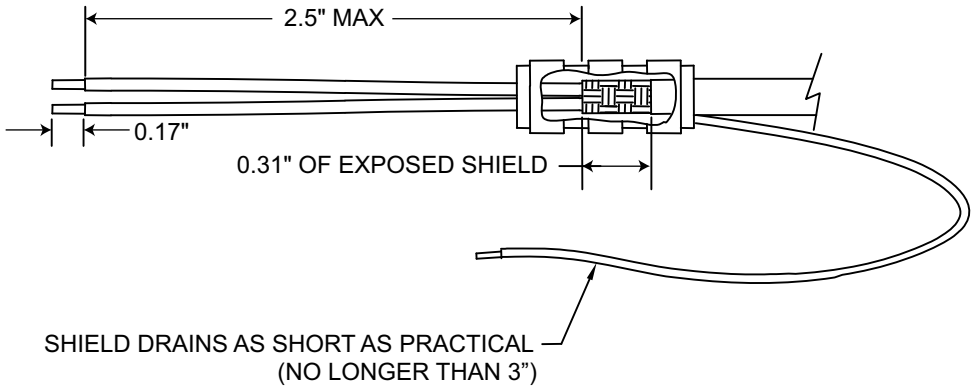
Solder sleeves with pre-installed shield drains can be used instead of separate shield terminators (12) and individual wires (13). A preferred solder sleeve is M83519/2-X series with a pre-installed shield drain.

Prepare all of the shielded cables using one of the methods shown in figure 4-1. For details of the shield termination to the connector backshell refer to figure 4-2.

1. At the end of the shielded cable (11), strip back a 2.5" maximum length of the jacket to expose the braid.
2. Remove the exposed braid.
3. Carefully score the jacket 1/4" to 5/16" from the end and remove the jacket to leave the braid exposed.
4. Connect a 20 or 22 AWG wire (13) to the exposed shield of the prepared cable assembly. Refer to figure 4-1. For termination techniques refer to AC 43.13-1B.
5. Slide a shield terminator (12) onto the prepared cable assembly (11).
6. Connect the shield wire (13) to the shield using a heat gun approved for use with solder sleeves.
7. Crimp contacts (14) onto the cable wires. Refer to section 4.1.
8. For the remaining shielded cables, repeat steps 1 through 7 as necessary.
9. Install a ring terminal (15) onto the cable shield termination wires (13).
10. Group wires as applicable for the connector. Refer to section 4.4.




## Preferred Method




## Alternate Method

**Figure 4-1 Shielded Cable Preparation**

# 4.4 Connector and Backshell Assembly

**CAUTION**

*DO NOT PLACE THE CONCAVE SIDE OF THE STRAIN RELIEF CLAMP (9) ACROSS THE CABLE BUNDLE. THE CABLE BUNDLE CAN BE DAMAGED.*

**NOTE**

The configuration module and GAE use the same connector pin locations and cannot be used at the same time.

**NOTE**

Each tapped hole on the backshell (1) will only take two ring terminals (15). It is recommended to terminate a maximum of two wires (13) per ring terminal. This necessitates the use of a ring terminal, #8, insulated, 14-16 AWG (MS25036-153). If only a single wire is left or if only a single wire is necessary for this connector, a ring terminal, #8, insulated, 18-22 AWG (MS25036-149) can be used. If more wires exist for the connector than two per ring terminal, it is permitted to terminate three wires per ring terminal.

For this procedure refer to figure 4-2 and figure 4-3.

1. Insert flathead screws (3) through holes on the shield block (2).
2. Attach to the backshell (1).
3. Insert the crimped wire harness contacts (14) in the D-sub connector (10). For the chosen contact location. refer to appendix D.
4. Install the configuration module or GAE wires into the connector if a configuration module or GAE is used. Refer to section 4.5.
5. Group wires as applicable for the connector.
6. Wrap the cable bundle with silicone fusion tape (19) so the backshell strain relief and cast housing touches the cable bundle.
7. Place the backshell around the connector and wire harness so it rests against the front of the backshell.
8. Place the smooth side of the backshell strain relief clamp (7) across the cable bundle.
9. Attach with three 4-40 x 0.375" pan head screws (6).
10. Attach configuration module. Refer to section 4.5 and figure 4-4.
11. Attach the cover (8) to the backshell using two screws (9).
12. On the pan head screw(16) place in order:
    a. Split washer (17)
    b. Flat washer (18)
    c. First ring terminal (15)
    d. If necessary, second ring terminal
13. Insert the assembled pan head screw (16) into the tapped holes on the shield block (2).

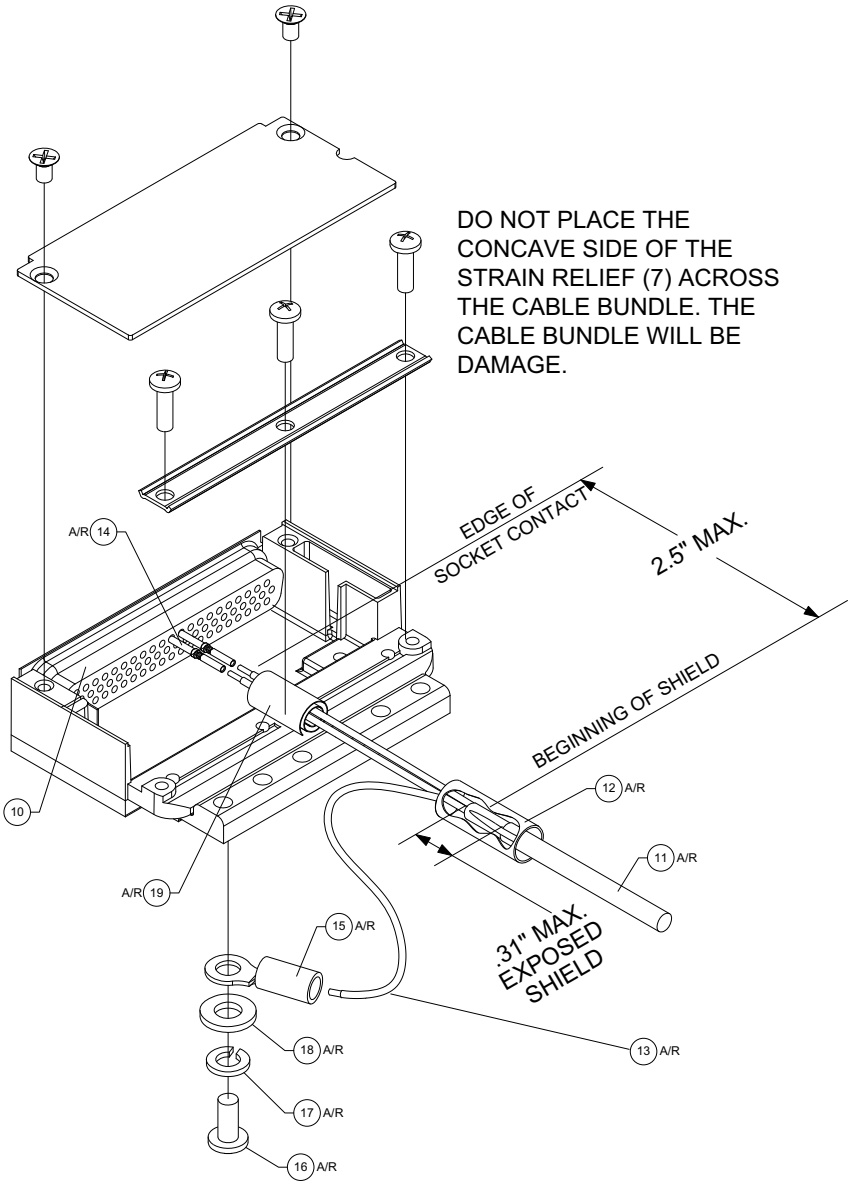



**Figure 4-2 Shield Termination on Backshell Assembly**

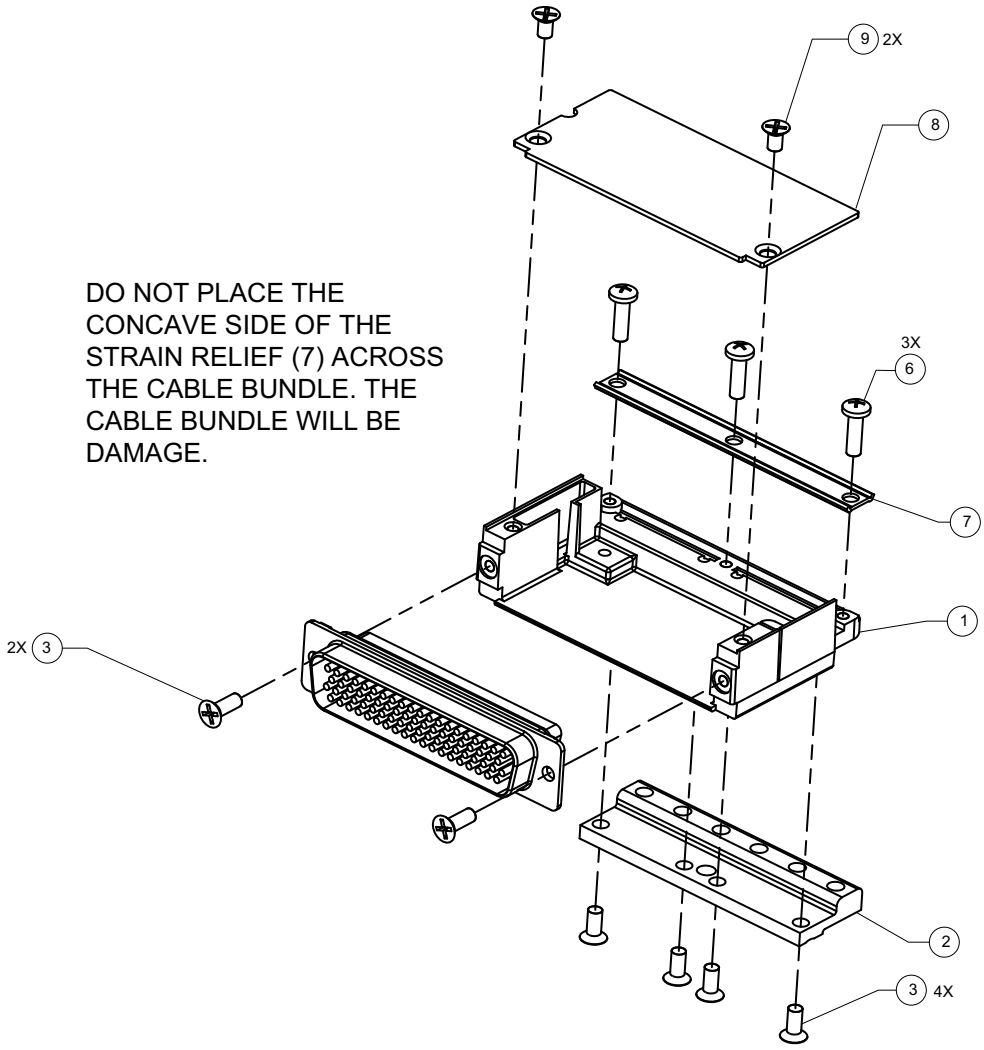



**Figure 4-3 Connector and Backshell Assembly**

# 4.5 Configuration Module Installation

**NOTE**

Installations with an optional GAE module do not require a configuration module.

**NOTE**

The configuration module stores unit configuration data. This lets the installer remove and replace the GTX without loss of configuration data. Installation of the module is part of the aircraft harness.

GTX 335 and GTX 345 standard kits include a configuration module, optional with the GTX 325. Garmin recommends to use the configuration module with these models, but it is not required.

Do not install the configuration module in the connector backshell when the GAE is installed on the connector backplate. The GAE module has a built-in configuration data storage device and interfaces to the GTX 3X5 through the same pins as the configuration module.

The GAE wire harness is routed out the back of the backshell and plugged into the GAE when the backplate is assembled. Refer to section 5.13 and figure B-11.

For this procedure refer to figure 4-4 and figure D-1.

1. Remove 0.17 inches of insulation from the end of each wire (2).
2. Crimp socket contacts (3) onto each wire of the four-conductor wire harness (2).
3. Insert crimped socket contacts (3) and wires (2) into the applicable connector housing location. Refer to figure D-1.
4. Plug the four-conductor wire harness (2) into the connector on the configuration module (1).
5. Insert configuration module (1) into the backshell recess.
6. Point the connector housing so the inserted four conductor wire harness (2) is on the same side of the backshell as the configuration module (1).

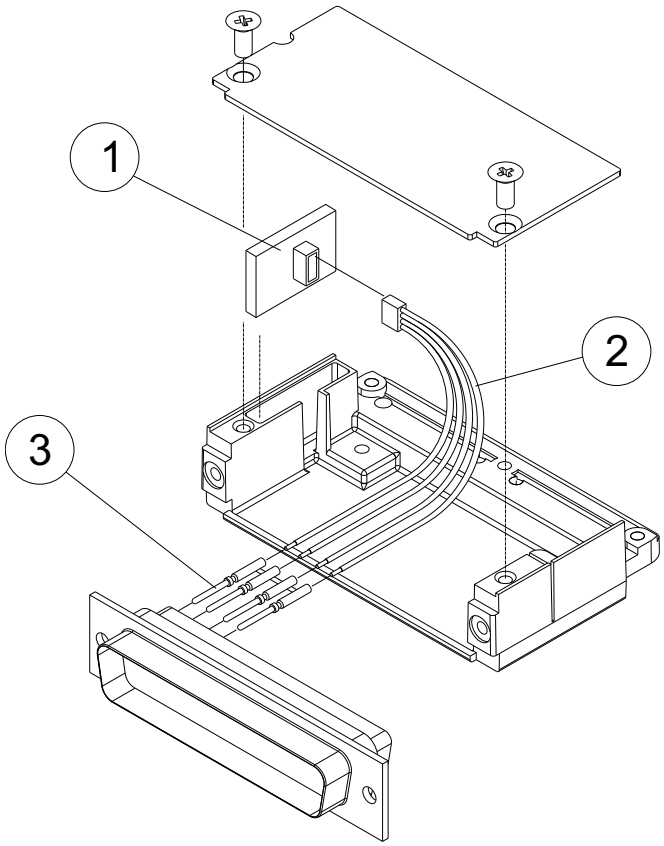



**Figure 4-4 Configuration Module Installation**

**Table 4-2 Configuration Module Kit, P/N 011-00979-03**

| Figure 4-4 | Description | Garmin P/N |
|---|---|---|
| 1 | Sub-assembly, potted configuration module, with EEPROM | 011-02178-00 |
| 2 | 4-conductor harness | 325-00122-00 |
| 3 | Socket contact, crimp #22D | 336-00021-01 |

# 4.6 Coax Cable Installation

**NOTE**
Make sure the length is set for the necessary cable loss. Some antennas have minimum cable loss specifications, that may need a cable longer than the physical run in the aircraft.

To install coaxial cables:

1. Route the cable to the radio rack location keeping in mind the recommendations of section 3.18.
2. Attach the cable in accordance with AC 43.13-1B chapter 11, section 11.
3. Trim the cable to the applicable length.
4. Install the connectors to the cable per the manufacturer's instructions.

# 4.7 Equipment Rack Installation

## 4.7.1 Panel Mount Units

**CAUTION**
*EXERCISE CAUTION WHEN INSTALLING THE RACK IN THE INSTRUMENT PANEL. DEFORMATION OF THE RACK WILL MAKE IT DIFFICULT TO INSTALL AND REMOVE THE GTX 3X5.*

**NOTE**
If the front lip of the mounting rack is behind the surface of the aircraft panel, the GTX 3X5 connectors may not fully engage. For more information refer to appendix B.

**NOTE**
Make sure no screw heads or other obstructions prevent the unit from fully engaging in the rack. For drawing dimensions necessary to prepare the cutouts for the GTX 3X5 unit, refer to figure B-9. For drilling the mounting holes, the GTX 3X5 mounting rack may be used as a template.

**NOTE**
Step 3 can be done before or after the wire harness is installed in the aircraft.

1. Install the rack in a rectangular hole (or gap between units) in the instrument panel, typically in the radio stack. The lower front lip of the rack should be flush with, or extend slightly beyond, the finished aircraft panel.
2. Use six #6-32 flat head screws and self-locking nuts to install the rack in the aircraft panel. The screws are inserted from the inside through holes in the sides of the rack.
3. Use provided screws to attach the connector(s) to the backplate.
4. Use two #4-40 flat head screws to attach the GAE to the backplate, if used. Refer to figure B-11.
5. Align the backplate so the backplate screw heads pass through the keyed holes in the back of the rack.
6. Connect the wire harness to the GAE, if used. Refer to figure B-9.
7. Slide the backplate to the left (viewing from the front of the unit) until an audible click is heard.
8. Attach the backplate by tightening the four #4-40 screws.

### 4.7.2 Standard Remote Mount Units

The GTX 3X5 standard remote mount racks can be mounted in any orientation as long as all six mounting screws are attached to a mounting bracket. Design the mounting bracket(s) for the GTX 3X5 unit with the dimension shown in figure B-4.

Attach the connectors and optional GAE, if used, to the connector backplate the same way as panel mount units. Refer to section 4.7.1.

### 4.7.3 Vertical Remote Mount Units

The GTX 3X5 vertical remote mount base is installed in the vertical orientation with six #10-32 100° flat-head screws and locking nuts. For mounting hole spacing dimensions refer to figure B-6. To mark or drill the mounting holes, the base may be used as a template.

To install the vertical mount shoe:

1. Point the wedge-shaped end of the vertical remote mount shoe to the back of the unit.
2. Attach the vertical remote mount shoe to the unit with the four screws provided.
3. Torque screws to 15-16 in-lbs.
4. Attach the connectors and optional GAE, if used, to the connector backplate the same way as panel mount units. Refer to section 4.7.1.

### 4.7.4 GX000 Integrated Flight Decks

The GTX 3X5 G1000 rack is mounted to the main system rack with the nutplate kit listed in section 3.4.2. At least eight screws are required to secure the rack as shown in figure B-7. Refer to *G1000 System Installation Manual*. Attach the connectors and optional GAE, if used, to the connector backplate the same way as panel mount units. Refer to section 4.7.1.

### 4.7.5 GAE Installation

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.
3. Mount the GAE to the backplate using two countersunk screws as shown in figure 4-5.
4. Torque screws to 8 in-lbs.
5. Plug the four-conductor wire harness into the connector on the GAE. Refer to figure D-1.

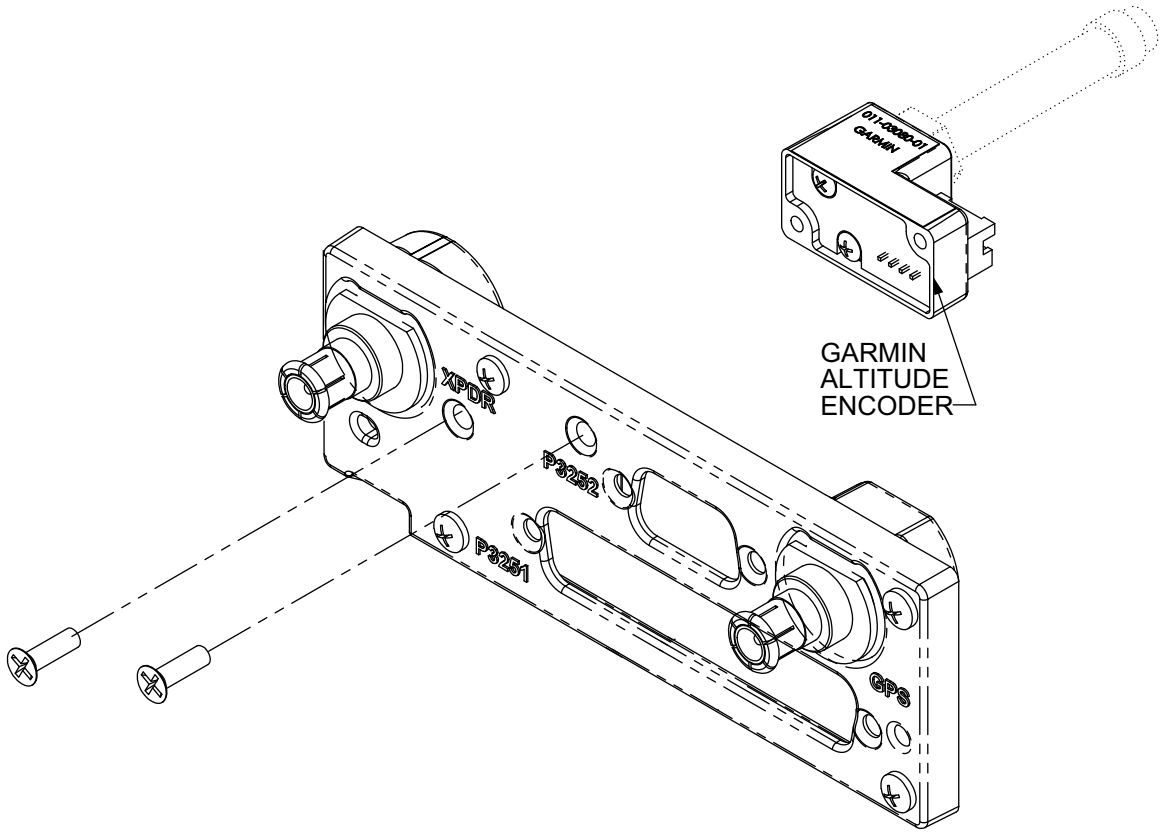



**Figure 4-5 GAE Assembly**

# 4.8 Panel and Standard Remote Mount Unit Installation and Removal

**CAUTION**

*THE APPLICATION OF HEX DRIVE TOOL TORQUE MORE THAN 8 IN-LBS CAN DAMAGE THE LOCKING MECHANISM.*

**NOTE**

When a unit is installed make sure it successfully powers up. For configuration procedures refer to section 6.

**NOTE**

Before placing the unit in the rack, in order to make sure the position of the retention mechanism is correct, it can be necessary to insert the hex drive tool into the access hole and turn the hex drive tool counterclockwise until it fully stops.

## Insertion

1. Slide unit in until it stops, approximately 3/8 inch short of the final position.
2. Insert a 3/32" hex drive tool into the access hole at the bottom of the unit face.
3. Push on the left side of the bezel and turn hex drive tool clockwise and apply 8 in-lbs of torque.

## Removal

1. Insert the hex drive tool into the access hole on the unit face.
2. Turn hex drive tool counterclockwise until the hex drive tool stops.
3. Pull the unit from the rack.

# 4.9 Vertical Remote Mount Unit Installation and Removal

**NOTE**

When a unit is installed make sure it successfully powers up. For configuration procedures refer to section 6.

**NOTE**

The connector backplate can be attached/detached before or after the installation/removal of the GTX 3X5 onto the base. Refer to figure B-5.

## Insertion

1. Insert the toe of the GTX 3X5 shoe into the base at an angle.
2. Make sure the unit is fully engaged and in line with the base.
3. Rotate the GTX 3X5 down flat onto the base.
4. Rotate the base locking mechanism up and place the cup over the shoe.
5. Rotate the knob clockwise until tight.
6. Directly attach the connector backplate to the GTX 3X5 with two screws using a 3/32" hex tool.

## Removal

1. On the base, pull the knob back.
2. Rotate knob counter-clockwise.
3. Remove the cup off of the shoe.
4. Lift the end of the GTX 3X5 from the base and remove the unit.
5. Detach the connector backplate from the GTX 3X5 with a 3/32" hex tool.

# 5 Connector Pinout Information



## 5.1 Connector Layouts

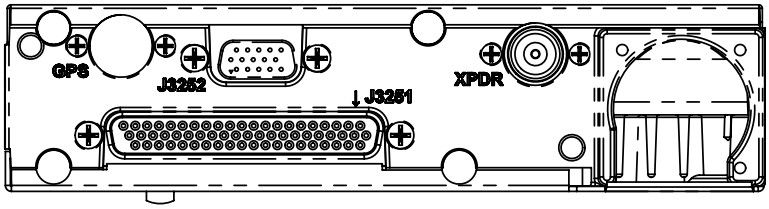



**Figure 5-1 Rear Connector Layout - Non-diversity**

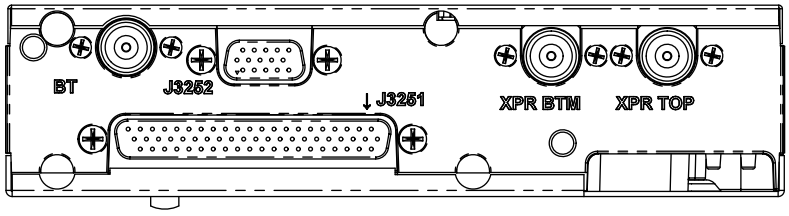



**Figure 5-2 Rear Connector Layout - Diversity**

# 5.2 Main Board Connector - J3251

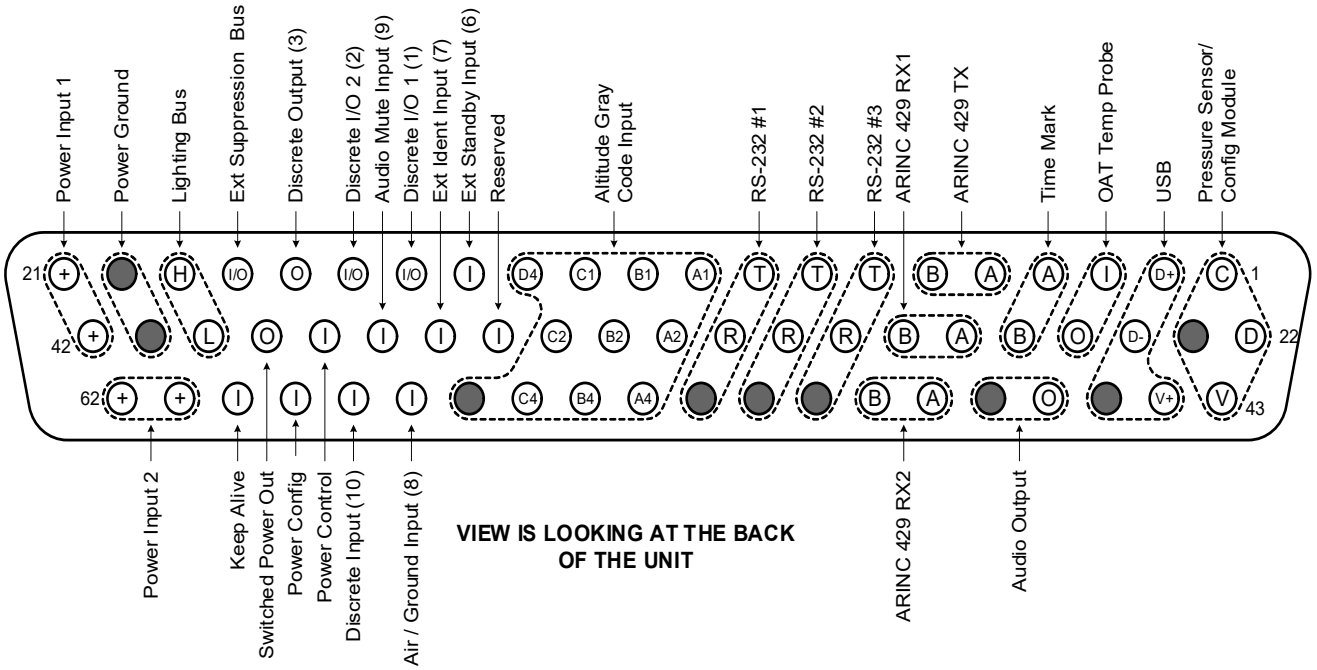



**Table 5-1 J3251 Connector**

| Pin | Pin Name | I/O |
|---|---|---|
| 1 | ALT ENCODER/CONFIG MODULE CLOCK | I/O |
| 2 | USB DATA HI | I/O |
| 3 | TEMP PROBE IN | I |
| 4 | TIME MARK A [2] | I/O |
| 5 | ARINC 429 OUT A | O |
| 6 | ARINC 429 OUT B | O |
| 7 | RS-232 OUT 3 | O |
| 8 | RS-232 OUT 2 | O |
| 9 | RS-232 OUT 1 | O |
| 10 | ALTITUDE A1* or CONFIGURABLE* | I |
| 11 | ALTITUDE B1* or CONFIGURABLE* | I |
| 12 | ALTITUDE C1* or CONFIGURABLE* | I |
| 13 | ALTITUDE D4* or CONFIGURABLE* | I |
| 14 | EXTERNAL STANDBY SELECT* or CONFIGURABLE* | I |
| 15 | CONFIGURABLE DISCRETE 1* | I/O |

| Pin | Pin Name | I/O |
|---|---|---|
| 16 | CONFIGURABLE DISCRETE 2* | I/O |
| 17 | XPDR FAIL 1* or CONFIGURABLE* | O |
| 18 | EXTERNAL SUPPRESSION | I/O |
| 19 | LIGHTING BUS HI | I |
| 20 | AIRCRAFT GROUND | I |
| 21 | AIRCRAFT POWER 1 | I |
| 22 | ALT ENCODER/CONFIG MODULE DATA | I/O |
| 23 | ALT ENCODER/CONFIG MODULE GND | O |
| 24 | USB DATA LO | I/O |
| 25 | TEMP PROBE OUT | O |
| 26 | TIME MARK B [2] | I/O |
| 27 | ARINC 429 IN 1A | I |
| 28 | ARINC 429 IN 1B | I |
| 29 | RS-232 IN 3 | I |
| 30 | RS-232 IN 2 | I |
| 31 | RS-232 IN 1 | I |
| 32 | ALTITUDE A2* or CONFIGURABLE* | I |
| 33 | ALTITUDE B2* or CONFIGURABLE* | I |
| 34 | ALTITUDE C2* or CONFIGURABLE* | I |
| 35 | RESERVED | I |
| 36 | EXTERNAL IDENT SELECT* or CONFIGURABLE* | I |
| 37 | AUDIO INHIBIT 2* or CONFIGURABLE* | I |
| 38 | POWER CONTROL | I |
| 39 | SWITCHED POWER OUT | O |
| 40 | LIGHTING BUS LO | I |
| 41 | AIRCRAFT GROUND | -- |
| 42 | AIRCRAFT POWER 1 | I |
| 43 | ALT ENCODER/CONFIG MODULE POWER | O |
| 44 | USB VBUS POWER | I |
| 45 | USB GND | -- |
| 46 | AUDIO OUT HI | O |
| 47 | AUDIO OUT LO | O |
| 48 | ARINC 429 IN 2A | I |

| Pin | Pin Name | I/O |
|---|---|---|
| 49 | ARINC 429 IN 2B | I |
| 50 | RS-232 GND 3 | -- |
| 51 | RS-232 GND 2 | -- |
| 52 | RS-232 GND 1 | -- |
| 53 | ALTITUDE A4* or CONFIGURABLE* | I |
| 54 | ALTITUDE B4* or CONFIGURABLE* | I |
| 55 | ALTITUDE C4* or CONFIGURABLE* | I |
| 56 | ALTITUDE GROUND | O |
| 57 | SQUAT SWITCH* or CONFIGURABLE* | I |
| 58 | AIR DATA SELECT* or CONFIGURABLE* | I |
| 59 | POWER CONFIG | I |
| 60 | GPS KEEP ALIVE [1] | I |
| 61 | AIRCRAFT POWER 2 | I |
| 62 | AIRCRAFT POWER 2 | I |

An asterisk (*) following a signal name denotes the signal is an Active-Low discretes.

[1] GTX 335/345 with internal GPS only.

[2] Output on GTX 335/345 units with internal GPS. Input on diversity units.

# 5.3 ADS-B Board Connector - J3252 (GTX 345 Only)

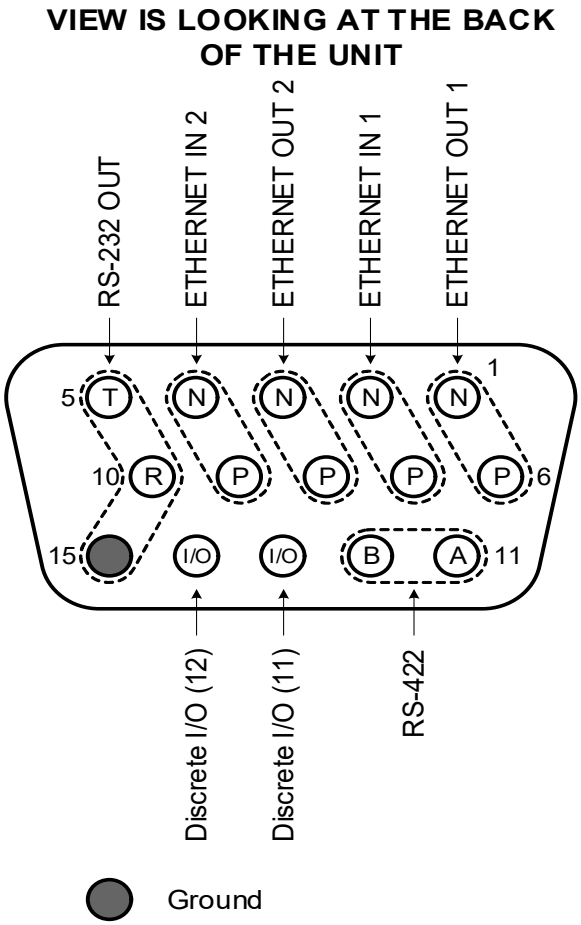



**Table 5-2 J3252 Connector**

| Pin | Pin Name | I/O |
|---|---|---|
| 1 | ETHERNET OUT 1B | O |
| 2 | ETHERNET IN 1B | I |
| 3 | ETHERNET OUT 2B | O |
| 4 | ETHERNET IN 2B | I |
| 5 | RS-232 OUT 4 | O |
| 6 | ETHERNET OUT 1A | O |
| 7 | ETHERNET IN 1A | I |
| 8 | ETHERNET OUT 2A | O |
| 9 | ETHERNET IN 2A | I |
| 10 | RS-232 IN 4 | I |
| 11 | RS-422 A | O |
| 12 | RS-422 B | O |

| Pin | Pin Name | I/O |
|---|---|---|
| 13 | CONFIGURABLE DISCRETE 11* | I/O |
| 14 | CONFIGURABLE DISCRETE 12* | I/O |
| 15 | RS-232 GND 4 | -- |

An asterisk (*) following a signal name denotes the signal is an Active-Low discretes.

# 5.4 Power

The GTX 3X5 is compatible with 14 VDC and 28 VDC aircraft electrical systems. The AIRCRAFT POWER 2 input is diode-isolated from AIRCRAFT POWER 1 and is used for connecting to an alternate power source, such as on an aircraft with two electrical buses.

**Table 5-3 Power Pins**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| AIRCRAFT POWER 1 | P3251 | 21 | I |
| AIRCRAFT POWER 1 | P3251 | 42 | I |
| AIRCRAFT POWER 2 | P3251 | 61 | I |
| AIRCRAFT POWER 2 | P3251 | 62 | I |
| AIRCRAFT GROUND | P3251 | 20 | -- |
| AIRCRAFT GROUND | P3251 | 41 | -- |
| SWITCHED POWER OUT | P3251 | 39 | O |
| GPS KEEP ALIVE [1] | P3251 | 60 | I |

[1] Applicable to the GTX 335 and GTX 345 with internal GPS only.

The SWITCHED POWER OUT pin is a switched power output source, typically used for powering devices such as a remote altitude encoder module. It is active when the GTX 3X5 power is on, and has a 1 ampere max rating.

On models with built-in GPS/SBAS, the GPS KEEP ALIVE input is optional. Continuous battery input power maintains the internal GPS clock and decreases initial GPS satellite acquisition time during system power-up.

## 5.4.1 Power Configuration and Control Inputs

The power control inputs are for remote power on/off and enabling the power auto on feature.

The POWER CONFIG input controls the remote on/off feature. The POWER CONFIG input connects to ground for remote unit installation. The input is left open for panel mount unit installation.

The POWER CONTROL connection controls the POWER CONTROL input. This is used as a remote power on/off control or to use the power auto on feature when the avionics master is turned on.

**Table 5-4 Power Configuration and Control Inputs**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| POWER CONFIG | P3251 | 59 | I |
| POWER CONTROL | P3251 | 38 | I |

**Table 5-5 Power Configuration and Power Control Functions**

| Power Config | Power Control | Unit Type | Description |
|---|---|---|---|
| Open | Open | Panel mount | Auto on disabled |
| Open | Ground | Panel mount | Auto on enabled |
| Ground | Open | Remote | Power off |
| Ground | Ground | Remote | Power on |

## 5.5 Lighting Bus

The lighting bus input controls the front panel display and keypad brightness of panel mount units using the aircraft panel lighting bus. The GTX 3X5 can also be configured to adjust the display and keypad brightness for ambient lighting conditions using an internal photo sensor.

The lighting bus input is configured for 5 VDC, 14 VDC, 28 VDC, or 5 VAC inputs.

Use both the LIGHTING BUS HI and LIGHTING BUS LO inputs to connect the lighting bus input to a 5 VAC bus.

Use the LIGHTING BUS HI input to connect the light bus input to a DC input. The return is the unit ground connection. LIGHTING BUS LO should be left open.

**Table 5-6 Lighting Bus Pins**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| LIGHTING BUS HI | P3251 | 19 | I |
| LIGHTING BUS LO | P3251 | 40 | I |

## 5.6 Altitude Inputs

The GTX 3X5 uses pressure altitude inputs from several different sources:

- Gray code inputs
- RS-232 serial inputs
- ARINC 429 inputs
- The optional GAE module (Garmin P/N 011-03080-00)
- HSDB (GTX 345 only)

For altitude source priorities refer to section 3.10. With the proper encoder, the Mode S transponder transmits altitude reporting in 25-foot resolution to ground stations and other aircraft. The unit must receive altitude from an applicable altitude reporting device or from the optional GAE module. A parallel Gray code encoder provides altitude in 100 foot resolution.

For altitude encoders that supply both a serial interface and the parallel Gray code input, such as the GAE 43 (P/N 013-00066-00), connect one or the other interfaces, but not both. The serial interface is preferred.

### 5.6.1 Pressure Sensor Module

The optional GAE module (Garmin P/N 011-03080-00) is used for the GTX 3X5 pressure altitude input. It uses the same interface as the configuration module and also includes the configuration module functionality.

### 5.6.2 Gray Code Altitude Input

The GTX 3X5 accepts ten Gray code altitude discrete inputs.

The Gray code inputs are pulled down for active, or open for inactive.

The GTX 3X5 includes internal isolation diodes on the Gray code inputs to prevent the unit from pulling the encoder lines to ground when the transponder is turned off.

**Table 5-7 Altitude Inputs**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| ALTITUDE A1* or CONFIGURABLE* | P3251 | 10 | I |
| ALTITUDE A2* or CONFIGURABLE* | P3251 | 32 | I |
| ALTITUDE A4* or CONFIGURABLE* | P3251 | 53 | I |
| ALTITUDE B1* or CONFIGURABLE* | P3251 | 11 | I |
| ALTITUDE B2* or CONFIGURABLE* | P3251 | 33 | I |
| ALTITUDE B4* or CONFIGURABLE* | P3251 | 54 | I |
| ALTITUDE C1* or CONFIGURABLE* | P3251 | 12 | I |
| ALTITUDE C2* or CONFIGURABLE* | P3251 | 34 | I |
| ALTITUDE C4* or CONFIGURABLE* | P3251 | 55 | I |
| ALTITUDE D4* or CONFIGURABLE* | P3251 | 13 | I |
| ALTITUDE GROUND | P3251 | 56 | O |

## 5.7 Discrete I/O

Active-Low discrete inputs are considered active if either the voltage to ground is <3.5 VDC or the resistance to ground is <375 ohms. These inputs are considered inactive if the voltage to ground is 6.5-33 VDC or the resistance to ground is >100 kilohm.

The GTX 3X5 has discrete outputs that are configurable. Each is an open drain output capable of sinking 250 milliamp when active. For discrete input and output configuration refer to table 6-7 and table 6-8.

**Table 5-8 Discrete Inputs and Outputs**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| EXTERNAL STANDBY SELECT* or CONFIGURABLE* | P3251 | 14 | I |
| XPDR FAIL 1* or CONFIGURABLE* | P3251 | 17 | O |
| EXTERNAL IDENT SELECT* or CONFIGURABLE* | P3251 | 36 | I |
| AUDIO INHIBIT 2* or CONFIGURABLE* | P3251 | 37 | I |
| SQUAT SWITCH* or CONFIGURABLE* | P3251 | 57 | I |
| AIR DATA SELECT* or CONFIGURABLE* | P3251 | 58 | I |
| CONFIGURABLE DISCRETE 1* | P3251 | 15 | I/O |
| CONFIGURABLE DISCRETE 2 * | P3251 | 16 | I/O |
| CONFIGURABLE DISCRETE 11* | P3252 | 13 | I/O |
| CONFIGURABLE DISCRETE 12* | P3252 | 14 | I/O |

# 5.8 Serial Data Interfaces

## 5.8.1 RS-232

The RS-232 outputs are compatible with EIA Standard RS-232C with an output voltage swing of at least ± 5 V when driving a standard RS-232 load. The RS-232 inputs and outputs can be configured for different functions depending on the installation. Refer to section 6.5. Pins P3252-5, -10, and -15 are on the GTX 345 only.

**Table 5-9 RS-232 Inputs and Outputs**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| RS-232 OUT 1 | P3251 | 9 | O |
| RS-232 IN 1 | P3251 | 31 | I |
| RS-232 GND 1 | P3251 | 52 | O |
| RS-232 OUT 2 | P3251 | 8 | O |
| RS-232 IN 2 | P3251 | 30 | I |
| RS-232 GND 2 | P3251 | 51 | -- |
| RS-232 OUT 3 | P3251 | 7 | O |
| RS-232 IN 3 | P3251 | 29 | I |
| RS-232 GND 3 | P3251 | 50 | -- |
| RS-232 OUT 4 | P3252 | 5 | O |
| RS-232 IN 4 | P3252 | 10 | I |
| RS-232 GND 4 | P3252 | 15 | O |

## 5.8.2 ARINC 429

The ARINC 429 output conforms to the ARINC 429 electrical specification when loaded with up to five standard ARINC 429 receivers. The ARINC 429 inputs and outputs can be configured for different functions depending on the installation. Refer to section 6.5.

**Table 5-10 ARINC 429 Inputs and Outputs**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| ARINC 429 OUT A | P3251 | 5 | O |
| ARINC 429 OUT B | P3251 | 6 | O |
| ARINC 429 IN 1A | P3251 | 27 | I |
| ARINC 429 IN 1B | P3251 | 28 | I |
| ARINC 429 IN 2A | P3251 | 48 | I |
| ARINC 429 IN 2B | P3251 | 49 | I |

### 5.8.3 HSDB (GTX 345 Only)

**Table 5-11 Ethernet Inputs and Outputs**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| ETHERNET OUT 1A | P3252 | 6 | O |
| ETHERNET OUT 1B | P3252 | 1 | O |
| ETHERNET IN 1A | P3252 | 7 | I |
| ETHERNET IN 1B | P3252 | 2 | I |
| ETHERNET OUT 2A | P3252 | 8 | O |
| ETHERNET OUT 2B | P3252 | 3 | O |
| ETHERNET IN 2A | P3252 | 9 | I |
| ETHERNET IN 2B | P3252 | 4 | I |

### 5.8.4 RS-422 (GTX 345 Only)

The RS-422 interface conforms to the electrical specifications of EIA standard RS-422.

**Table 5-12 RS-422 Outputs**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| RS-422 A | P3252 | 11 | O |
| RS-422 B | P3252 | 12 | O |

## 5.9 Suppression Bus

**NOTE**

The mutual Suppression I/O Bus is not compliant with the maximum applied DC steady state voltage of +70V from ARINC 735 Attachment 8. The maximum applied DC steady voltage for the suppression is +32 V. Under normal operation, the Mutual Suppression I/O signal is pulsed.

The GTX 3X5 Mutual Suppression I/O bus may not be compatible with all models of DME units that have output only suppression. Known incompatible units include the Bendix/King KN 62, KN 64, and KNS 80. Incompatible DME units can be damaged by the GTX mutual suppression output. For DME units that only have output suppression, an in-line diode must be installed between the GTX 3X5 Suppression I/O (cathode) and the output only suppression line.

The EXTERNAL SUPPRESSION is intended for connection to other L-band equipment, such as a DME or UAT. The output is active whenever the GTX 3X5 transmits. When driven by another source, the GTX 3X5 transponder receiver and transmitter functions will be suppressed.

The EXTERNAL SUPPRESSION output is driven to ≥ 18 VDC when the GTX 3X5 transmits. An input voltage of ≥ 10 VDC will suppress the GTX 3X5.

**Table 5-13 External Suppression Bus Pin**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| EXTERNAL SUPPRESSION | P3251 | 18 | I/O |

## 5.10 OAT Input

The GTX 3X5 includes an OAT input, used for OAT and density altitude displays.

TEMP PROBE IN uses a current sensor type probe, such as the EDMO P/N 655-PROBE or the Davtron P/N C307PS. The temperature input specification is 1 microamp per degree Kelvin (1uA/°K). Connect the probe positive wire to pin 25 and negative wire to pin 3. For wire designations refer to the manufacturer's specifications.

**Table 5-14 OAT Input and Output**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| TEMP PROBE OUT | P3251 | 25 | O |
| TEMP PROBE IN | P3251 | 3 | I |

## 5.11 Audio Output

The audio output is used to provide aural alerts. The output is capable of 100 mW into a 500 ohm load.

**Table 5-15 Audio Inputs and Outputs**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| AUDIO OUT HI | P3251 | 46 | O |
| AUDIO OUT LO | P3251 | 47 | O |

## 5.12 Time Mark

**Table 5-16 Time Mark Outputs**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| TIME MARK A | P3251 | 4 | O |
| TIME MARK B | P3251 | 26 | O |

With either a GTX 335 or GTX 345 with internal GPS, the TIME MARK can be used as an output to provide 1PPS to other equipment in the aircraft. GTX 345D units use TIME MARK as an input to support UAT receive antenna selection.

## 5.13 Configuration Module

The configuration module interface is used for connection to either a configuration module or an optional GAE module.

The configuration and GAE module kits include a wire harness for connection to the GTX 3X5 D-sub connector. Connect using The wire colors are shown in table 5-17.

The configuration module stores the specified aircraft installation configuration settings.

The optional GAE module is used to provide the pressure altitude for the transponder. The GAE module also includes configuration memory function to store the installation configuration. When used, A separate configuration module is not necessary.

**Table 5-17 Configuration Module Inputs and Outputs**

| Pin Name | Color | Connector | Pin | I/O |
|---|---|---|---|---|
| ALT ENCODER/CONFIG MODULE CLOCK | White | P3251 | 1 | O |
| ALT ENCODER/CONFIG MODULE DATA | Yellow | P3251 | 22 | I/O |
| ALT ENCODER/CONFIG MODULE POWER | Red | P3251 | 43 | O |
| ALT ENCODER/CONFIG MODULE GROUND | Black | P3251 | 23 | O |

## 5.14 USB Interface

**CAUTION**

*USE THE USB CABLE SHIPPED WITH THE UNIT. DO NOT LENGTHEN OR TIE UP IN BUNDLES WITH OTHER ELECTRICAL WIRES. POTENTIAL DAMAGE OR INTERFERENCE DUE TO COUPLING WITH OTHER CABLES WILL OCCUR.*

Only use the USB interface for unit configuration, software updates, and service while the aircraft is on the ground. Do not use during normal operation or when airborne.

**Table 5-18 USB Inputs and Outputs**

| Pin Name | Connector | Pin | I/O |
|---|---|---|---|
| USB DATA HI | P3251 | 2 | I/O |
| USB DATA LO | P3251 | 24 | I/O |
| USB VBUS POWER | P3251 | 44 | I |
| USB GND | P3251 | 45 | O |

# 6 Post Installation Configuration & Checkout

# 6.1 System Configuration Overview

The required GTX 3X5 configuration and checkout procedures are as follows:

1. Complete the installation checks.
2. Configure the GTX 3X5 for the specified installation.
3. Complete ground checks to make sure it interfaces to external equipment.

For additional checkout procedures, refer to *GTX 3X5 Mode A/C Lock Enablement Guide*.

For main software v2.50 and later, the GTX 3X5 has data logging capability. Data logging can be enabled or disabled by using GTX installation tool. Refer to *GTX 3X5 Installation Tool Guide*.

## 6.2 Mounting, Wiring, and Power Checks

**CAUTION**

*MAKE SURE ALL LIGHTING BUSES ARE TURNED TO THEIR LOWEST ADJUSTMENT BEFORE APPLYING POWER TO THE UNIT. THE LOWEST ADJUSTMENT PREVENTS DAMAGE TO THE UNIT IF THERE ARE ANY WIRING ERRORS.*

Examine the wire harness to make sure the connection to aircraft systems and avionics equipment is correct before the unit is energized. Point-to-point continuity must be examined to expose any faults such as shorting to ground or wiring discrepancies. All faults or discrepancies must be corrected before continuing.

Before and during the installation make sure:

1. All cables are properly attached.
2. Shields are connected to connector shield blocks.
3. Movement of the flight and engine controls through the full range of motion do not touch cabling and control systems.
4. Wire is installed as described in section 3.18.

Make sure these items are completed after the installation or a continuity check.

1. Power and ground checks.
2. Faults and discrepancies are corrected.
3. Installation rack is correctly attached.
4. Unit is correctly seated in the installation rack.

## 6.3 Configuration Mode and Settings

**NOTE**

Screen shots are for illustrative purposes only. They do not imply the shown setting(s) should be used in any installation.

System and interface settings are shown in configuration mode and are unique to the GTX 3X5 installation. The configuration settings are stored in internal memory. If connected, the configuration module stores configuration settings. The optional GAE module operates as a configuration module. In this section, configuration instructions are for panel mount units. To configure remote units refer to section 6.12.

To enter configuration mode on a panel mount unit, push and hold **ENT** and apply power.

- Push and hold **OFF** until the unit powers off to exit configuration mode.
- Push **FUNC** to cycle through the group pages.
- Push **8** or **9** to scroll up or down on the page without an active field selected.
- Push **CRSR** to access items on the page.
- Push **8** or **9** to cycle through the selections of an item on the page.
- Push **ENT** to move within the page with a field highlighted or to accept setting.
- Push **CLR** to move to previous selection on the page.
- Push **FUNC** to exit the page.

# 6.4 Audio Settings

Configures the audio output, volume, and alert types.

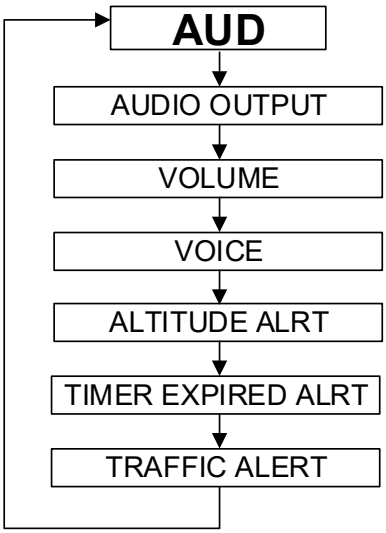



**Figure 6-1 Audio Group**

## 6.4.1 Audio Output

**NOTE**

The volume setting, voice setting, and test audio capabilities below only apply if audio output is configured to XPDR. These sections are not applicable if audio output is configured to HSDB.

To use the audio output of the transponder, select XPDR. If installing a GTX 345 in a G1000 NXi or G2/3/5000 system, select HSDB.

## 6.4.2 Volume

To raise the volume of the transponder audio, push **8**. To lower the volume, push **9**. The range is 0 to 100.

## 6.4.3 Voice

Set the voice type to MALE or FEMALE.

## 6.4.4 Test Audio

The test audio files are used to set the volume level of the transponder. MSG 3 is not applicable to the GTX 325. Selections are:

- NONE
- TONE
- MSG 1
- MSG 2
- MSG 3

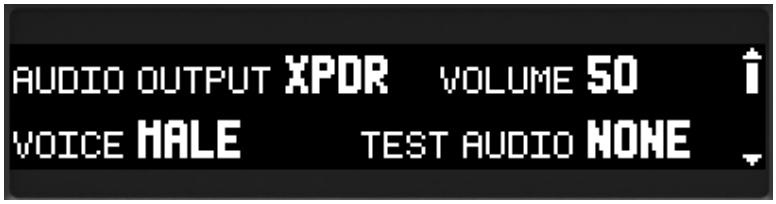



**Figure 6-2 Audio Page**

### 6.4.5 Altitude Alrt (Panel Mount Units Only)

Configures altitude alerting type. Selections are:

- OFF
- MESSAGE
- MSG W/CHIME

### 6.4.6 Timer Expired Alrt (Panel Mount Units Only)

Configures timer expired alert type. Selections are:

- OFF
- MESSAGE
- MSG W/CHIME


**Figure 6-3 Audio Page 2**

### 6.4.7 Traffic Alert (Not Applicable to GTX 325)

Configures the traffic alerting type. Selections are:

- OFF
- MESSAGE
- MSG W/CHIME (GTX 335 ONLY)


**Figure 6-4 Audio Page 3**

## 6.5 Interfaces

Configures inputs and outputs of RS-232, ARINC 429, discretes, and HSDB interfaces.

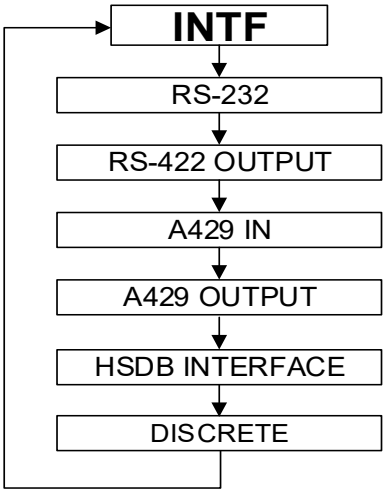



**Figure 6-5 Interface Group**

### 6.5.1 RS-232 - Channel 1 through Channel 3

Configures the input and output format for channel 1, channel 2, and channel 3 of RS-232 interfaces. For data format information refer to appendix A. References made to G1000 apply to G950/G1000 systems running software v15.xx and earlier.

**Table 6-1 RS-232 Channel 1 through Channel 3 Selections**

| Input/Output | Selection | Description | Unit Applicability | Notes |
|---|---|---|---|---|
| Input/Output | Off | No information is received or transmitted. | All | |
| Input/Output | XPDR FMT 1 | Supports transponder interface to GX000 and NXi. | All | |
| Input/Output | XPDR FMT 2 | Supports transponder interface and TIS-A traffic to GX000 and NXi. | GTX 335 only | |
| Input or Output | ADS-B+ FMT 1 | Receives or transmits necessary ADS-B GPS data at 9600 baud. | All | [1] |
| Input or Output | ADS-B+ FMT 2 | Receives or transmits necessary ADS-B GPS data at 38400 baud. | All | [1] |
| Input/Output | REMOTE FMT 1 | Supports transponder interface to GTN, GNS 480 (CNX80), and G1000. | All | |
| Input/Output | REMOTE FMT 2 | Supports transponder interface and TIS traffic to GTN, GNS 480 (CNX80), and G1000. | GTX 335 only | |
| Input/Output | GDL | Supports GDL 88 interface | All | [2] |
| Input/Output | GNS | Supports GNS 400W/500W Series FIS-B weather from the GTX 345. Supplies GPS and HAT data to the GTX. | All | [4] [6] |
| Input/Output | CONNEXT FMT 1 | Supports G3X for ADS-B In traffic and FIS-B. | GTX 345 only | |
| Input | CONNEXT FMT 3 | Supports input from a Flight Stream 110/210. | GTX 345 only | |
| Input/Output | CONNEXT FMT 4 | Supports G3X for ADS-B In traffic and FIS-B. | GTX 345 only | [10] |
| Input | ALT FMT 1 25ft | Supports Sandia/Icarus/ACK altitude format with 25 ft or lower encoding. | All | |
| Input | ALT FMT 1 100ft | Supports Sandia/Icarus/ACK altitude format with a parallel Gray source or 100 ft encoding. | All | |
| Input | ALT FMT 3 25ft | Supports Shadin altitude format with 25 ft or lower encoding. | All | |
| Input | ALT FMT 3 100ft | Supports Shadin altitude format with100 ft encoding. | All | |
| Input | ADC FMT 1 | Supports Shadin G/S/Z ADC formats. | All | |
| Input/Output | LGCY REMOTE 1 | Supports transponder interface to G1000. | All | |

| Input/Output | Selection | Description | Unit Applicability | Notes |
|---|---|---|---|---|
| Input | NMEA FMT | Supports NMEA 0183 GPS format from Aera 500/660/795/796 and GPSMAP 396/ 496/695/696. | All | [7] [8] [9] |
| Input | AVIATION FMT | Supports the Aviation GPS input from GNS 400/500 series. | GTX 325<br>GTX 335 | [7] [8] [9] |
| Input/Output | LGCY REMOTE 2 | Supports transponder interface and TIS-A traffic to G1000. | GTX 335 only | |
| Output | ALT FMT 1 | Transmits pressure altitude in 1 to 100 ft resolution depending on the source of the data. | All | |
| Output | MX FMT 1 | Supports GMX 200 with an RS-232 to RS-422 converter. | GTX 345 only | [7] [11] [13] |
| Output | MX FMT 3 | Supports FIS-B to G1000 (RS-232 to RS-422 converter needed if interfacing to a GIA RS-422/485 input). | GTX 345 only | [11] [12] |
| Output | TIS-A OUT FMT | Transmits TIS-A traffic for non-certified displays: GPSMAP 396/496/695/696, G3X, G300. | GTX 335 only | |
| Output | LGCY TRAFFIC | Supports GDL 90 traffic interface to G1000. | GTX 345 only | [11] |
| Output | MAPMX | Supports Garmin AHRS units. | All | [1] [3] |
| Output | AVIATION FMT 2 | Provides internal GPS data to the GTR or GNC. | All | [1] [5] |

[1] Output available only on GTX 335 with GPS and GTX 345 with GPS.

[2] Not supported by GDL 88 software v3.34 and earlier.

[3] Available in software v2.10 and later.

[4] Available in all software versions for GTX 345. Available in software v2.11 and later for GTX 325 and GTX 335.

[5] Available only in software v2.12 and later.

[6] This interface does not supply traffic data. Traffic data to the GNS is supported over ARINC 429.

[7] Available only in software v2.50 and later.

[8] This GPS data is not AC 20-165B compliant.

[9] GPS HAE is not available for ADS-B out on the GTX 335 when using this GPS source interface.

[10] Available only in software v2.60 and later.

[11] Configuration of this output on multiple serial output channels is not supported.

[12] Available in software v2.65 and later.

[13] When using software v2.65 or later, MX FMT 3 should be used instead of MX FMT 1 for providing FIS-B to G1000.

### 6.5.2 RS-232 - Channel 4 (GTX 345 Only)

Configures the input and output format for channel 4 of RS-232 interfaces. For data format information, refer to appendix A.

**Table 6-2 RS-232 Channel 4 Selections**

| Input/Output | Selection | Description | Notes |
|---|---|---|---|
| Input/Output | OFF | Information is not received or transmitted. | |
| Input/Output | GNS | Supports GNS 400W/500W Series FIS-B. Supplies GPS and HAT information to the GTX. | [1] |
| Input/Output | CONNEXT FMT 1 | Supports G3X for ADS-B In traffic and FIS-B. | |
| Input | CONNEXT FMT 3 | Supports input from Flight Stream 110/210. | |
| Input/Output | CONNEXT FMT 4 | Supports G3X for ADS-B In traffic and FIS-B. | [2] |
| Input/Output | TRAFFIC FMT 4 | Supports Ryan TCAD. | |
| Output | MX FMT 1 | Supports GMX 200 with an RS-232 to RS-422 converter. | [3] [5] |
| Output | MX FMT 3 | Supports FIS-B to G1000 (RS-232 to RS-422 converter needed if interfacing to a GIA RS-422/485 input). | [4] [5] |
| Output | LGCY TRAFFIC | Supports GDL 90 enhanced traffic interface to G1000. | [5] |

[1] This interface does not supply traffic data. Traffic data to the GNS is supported over ARINC 429.
[2] Available only in software v2.60 and later.
[3] Available only in software v2.50 and later.
[4] Available only in software v2.65 and later.
[5] Configuration of this output on multiple serial output channels is not supported.

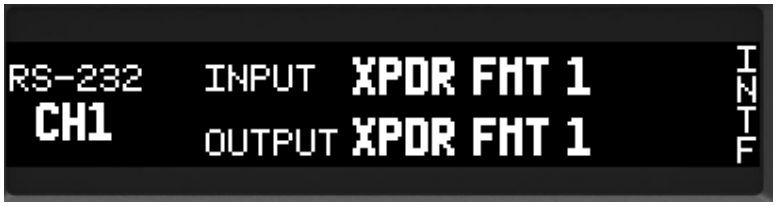



**Figure 6-6 RS-232 Interface Page**

### 6.5.3 RS-422 Output (GTX 345 Only)

Configures the output format for the RS-422 interface.

**Table 6-3 RS-422 Selections**

| Channel | Input/Output | Selection | Description | Notes |
|---|---|---|---|---|
| RS-422 | Output | OFF | Information is not transmitted. | |
| | | CONNEXT FMT 3 | Supports output to Flight Stream 210. | |
| | | MX FMT 1 | Supports GMX 200 and FIS-B to G1000. | [3] [4] |
| | | MX FMT 2 | Supports MX20. | |
| | | MX FMT 3 | Supports FIS-B to G1000. | [2] [3] |
| | | OPT LGCY ADSB | Supports third-party display of ADS-B In information. | [1] |

[1] Supported with software v2.05 and later.

[2] Supported with software v2.65 and later.

[3] Configuration of this output on multiple serial output channels is not supported.

[4] When using software v2.65 or later, MX FMT 3 should be used instead of MX FMT 1 for providing FIS-B to G1000.


**Figure 6-7 RS-422 Output Page**

### 6.5.4 A429 In

Reference appendix A for packet details.

**Table 6-4 ARINC 429 Inputs**

| Channel/Speed | Format | Description | Notes |
|---|---|---|---|
| CH1/CH2 High/Low | OFF | Information is not received. | |
| | AHRS | Receives heading, roll, pitch, and yaw information from systems with AHRS. | |
| | ADC | Receives altitude, airspeed, and altitude rate information from air data systems. | |
| | ARINC 743A | Receives GPS information from ARINC 743A. | |
| | EFIS AIR DATA | Receives altitude, airspeed, altitude rate, and heading information from EFIS and ADC systems. | |
| | FLIGHT CONTROL | Receives MCP/FCU selected altitude, selected heading, barometric setting, non-standard AFCS modes and FMS selected altitude, and non-standard pitch/roll discrete data for Bendix King KFC 225/275/325. | |
| | HEADING | Receives heading information. | |
| | FLIGHT ID | Allows the flight ID controller to change the flight ID. | |
| | RADIO ALTITUDE | Receives radar altitude information. | |
| | TRAFFIC 1 | Receives traffic information from Garmin GTS 800, GTS 820, and GTS 850 systems. | [1] |
| | TRAFFIC 2 | Receives traffic information from L-3 Comm SKY497 Skywatch and SKY899 Skywatch HP. | [1] |
| | TRAFFIC 5 | Receives traffic information from Honeywell KTA 870 (KTA 810), KTA 970 (KTA 910), KMH 880 (KMH 820), KMH 980 (KMH 920), and TPU-66A. | [1] |

[1] Applicable to GTX 345 only.

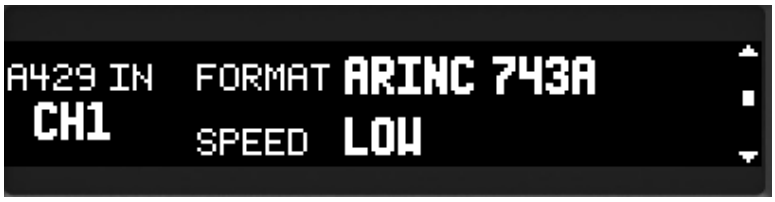



**Figure 6-8 A429 In Page**

### 6.5.5 A429 Output

Reference appendix A for packet details.

**Table 6-5 ARINC 429 Outputs**

| Format | Description | Notes |
|---|---|---|
| OFF | Information is not transmitted. | |
| FORMAT 2 | Garmin concentrator | |
| FORMAT 4 | Garmin TAS and GPS data | [1] |
| FORMAT 5 | Garmin concentrator, Garmin TAS, and GPS data | [1] |
| FORMAT 8 | Garmin TIS-A | [2] |
| FORMAT 9 | Garmin concentrator and Garmin TIS-A | [2] |
| TRAFFIC | ADS-B traffic output for GNS 400W/500W Series units | [3] |
| A735 | Combined TAS/TCAS/ADS-B Traffic output for ARINC 735A compatible displays. | [3] [4] [5] |
| BCAS | Combined TAS/TCAS/ADS-B Traffic output for BCAS compatible displays. | [3] [4] [5] |

[1] Supported by the GTX 335/345 only.
[2] Supported by the GTX 335 only.
[3] Supported by the GTX 345 only.
[4] A TAS/TCAS system is required for these outputs to function.
[5] Only available in software v2.50 and later.


**Figure 6-9 A429 Output Page**

### 6.5.6 HSDB Interface (GTX 345 Only)

Configures the presence of specified HSDB devices interfaced to the GTX 345. Selections are YES, NO.

**Table 6-6 HSDB Formats**

| Interface | Description |
|---|---|
| G500/G600 | Controls HSDB communication with:<br>• G500/600 GDU<br>• GTN 6XX/7XX<br>• GTS 8X5<br>• GX000<br>• GMC 605<br>• GPS 175<br>• GI 275<br>• GNC 355 |
| NAVIGATOR | |
| GTS | |
| GX000 | |
| GMC 605 [1] | |
| SFD [1] | |
| DISPLAY 1 (RESERVED) [2] | |

[1] Main software 2.50 and later.

[2] Main software 2.90 and later.


**Figure 6-10 HSDB Interface Page**

### 6.5.7 Discrete In

For pinout information, refer to section 5.

**NOTE**

The source priority is based upon the selections made during configuration. Refer to section 3.10.

**Table 6-7 Discrete Inputs**

| Function | Selection | Description |
|---|---|---|
| AUD MUTE | All discrete inputs | The audio output will be muted until the discrete is opened. This is connected to a higher priority audio such as TAWS. |
| AUD CNCL | Off<br>P3251-37 | When this discrete is grounded by a momentary switch, audio alerts are canceled. |
| IDENT | Off<br>P3251-36 | When this discrete is grounded by a momentary switch, the SPI activates. |
| STANDBY | Off<br>P3251-14 | When this discrete is grounded, the unit will go into standby mode. Ensure standby select is not configured if a transponder control format (remote or transponder formats) is used to control the transponder. |
| SQUAT | Off<br>P3251-57 | This input determines the on-ground status of the aircraft. It is active low, and a ground on this input can be configured to mean On Ground or In Air. |
| AIR DATA | Off<br>P3251-58 | Switches between two ARINC 429 ADC sources or two EFIS ADC sources. Source 1 and 2 are set during configuration. Source 1 is used when the discrete is open and Source 2 is used when the discrete is grounded. |
| ALT DATA | All discrete inputs | Selects between two pressure altitude sources. |
| ID SLCT | All discrete inputs on main board (P3251) | Selects the system ID and overrides configuration setting. GTX 1 system ID is selected when this discrete is open. GTX 2 system ID is selected when the discrete is grounded. |
| TRFC MUTE [1] | All discrete inputs | All Traffic Audio output will be muted until the discrete is opened. This is connected to a higher priority audio such as TAWS. Does not mute timers or altitude alert messages. |
| TRFC CNCL [1] | All discrete inputs | When this discrete is grounded by a momentary switch, traffic audio alerts are canceled. Does not cancel timers or altitude alert messages.<br><br>**GTX 345 ADS-B**<br>If the discrete is grounded while there is no traffic alert condition, the GTX will annunciate "Traffic Clear" when the discrete is opened. If the discrete is grounded while there are active traffic alert conditions but no active traffic audio alerts, an updated traffic audio alert will be annunciated for the highest priority alert when the discrete is opened. |
| DEMO MODE [1] | All discrete inputs | When this discrete is grounded the GTX simulates a functional transponder while not transmitting. |
| GILLHAM | On, Off | Activates all ten Gillham/Gray code inputs. If set to OFF, the input pins are available for configuration to other discrete input functions. |
| TIS-A<br>(GTX 335 Only) | All discrete inputs | When this discrete is momentarily grounded, TIS-A will toggle between operate/standby. |

| Function | Selection | Description |
|---|---|---|
| AP OFF 1 [2] | All discrete inputs | The GTX will aurally annunciate "Autopilot Off" when this discrete transitions to active. This input can be configured to provide an annunciation when either grounded or open. If the AP OFF 2 discrete is already active when this discrete transitions to active, a second alert will not annunciate. This aural alert will interrupt any currently playing messages (except test messages). |
| AP OFF 2 [2] | All discrete inputs | The GTX will aurally annunciate "Autopilot Off" when this discrete transitions to active. This input can be configured to provide an annunciation when either grounded or open. If the AP OFF 1 discrete is already active when this discrete transitions to active, a second alert will not annunciate. This aural alert will interrupt any currently playing messages (except test messages). |

[1] Only available in software v2.50 and later.

[2] Only available in software v2.65 and later.


**Figure 6-11 Discrete In Page**

### 6.5.8 Discrete Out

**Table 6-8 Discrete Outputs**

| Function | Pin Selection | Description | Notes |
|---|---|---|---|
| ALT ALERT | Off<br>All discrete outputs on P3251 or P3252 | When this discrete is grounded, it indicates a deviation from the preset altitude setting. | |
| FAIL 1 | Off<br>P3251-17 | Failure of transponder causes discrete to ground. | |
| FAIL 2 | Off<br>All discrete outputs on P3251 or P3252 | Failure of transponder causes discrete to open. | |
| RPLY ACTV | Off<br>All discrete outputs on P3251 or P3252 | Discrete alternates between open and ground when the transponder is replying to interrogations. | |

| Function | Pin Selection | Description | Notes |
|---|---|---|---|
| EQUIP STS | Off<br>All discrete outputs on P3251 or P3252 | **All Units**<br>If the unit needs service soon, this discrete will switch between open and ground for the first 30 seconds after power up.<br>**GTX 335/345**<br>If after 30 seconds, there is no detection of pressure altitude or ADS-B In/Out failures the discrete opens. The discrete will ground if any pressure altitude or ADS-B In/Out failures are detected after 30 seconds. Failures related to ADS-B output are instead reported by the ADS-B Out Function Fail discrete if configured. Pressure altitude failures are instead reported by the Altitude Valid discrete if configured.<br>**GTX 325**<br>If there is no detection of pressure altitude failures after 30 seconds, the discrete opens. The discrete will ground if any pressure altitude failures are detected after 30 seconds. Pressure altitude failures are instead reported by the Altitude Valid discrete if configured. If the Altitude Valid discrete is configured, the equipment status discrete will only provide the service soon indication (first 30 seconds after power up). | [2] |
| TRFC STBY | Off<br>All discrete outputs on P3251 or P3252 | Commands TAS/TCAS standby/operate. Discrete output operation automatically sets through TAS/TCAS input configuration.<br>GTX 345 only. | |
| TRFC TEST | Off<br>All discrete outputs on P3251 or P3252 | Commands TAS/TCAS into test mode.<br>GTX 345 only. | |
| TRFC ALRT | Off<br>All discrete outputs on P3251 or P3252 | When a traffic alert is active, this discrete will ground. GTX 345 only. The discrete will not ground when ADS-B In is configured for enabled with TCAS II. It should not be used in these installations. This discrete output is not activated by a CAVS Minimum Range alert. | |
| TCAD SL | Off<br>All discrete outputs on P3251 or P3252 | Supports automatic control and integration with Ryan TCAD and Avidyne TAS600 Series traffic systems. GTX 345 only. | |
| XPDR ACTV | Off<br>All discretes outputs on P3251 | Discrete grounds when transponder is not in standby. | [1] |
| ADS-B OUT | Off<br>All discrete outputs on P3251 or P3252 | Discrete activates when ADS-B Out is enabled, the transponder is not in SBY mode, and the unit does not have a valid GPS position (GTX 335 and GTX 345 only). The active state can be configured as either ground or open. | [1] [2] |
| SBY ALERT | Off<br>All discrete outputs on P3251 or P3252 | Discrete grounds when the transponder is the selected transponder and is in standby. | [3] |

| Function | Pin Selection | Description | Notes |
|---|---|---|---|
| ALT VLD | Off<br>All discrete outputs on P3251 or P3252 | Discrete activates when pressure altitude is valid, Standby Mode is inactive, and Altitude Mode is active. The active state can be configured as either ground or open. When configured, pressure altitude failures are reported by this discrete instead of the Equipment Status Alert discrete. | [4] |

[1] Available in system software v2.10 and later.

[2] Some failure/warning indications that affect this discrete output state are suppressed for a duration after power up. For example, the position input warning is suppressed for 3 minutes and the pressure altitude warning is suppressed for 5 minutes. These suppressions do not occur if the unit is in configuration mode.

[3] Available in system software v2.50 and later.

[4] Available in system software v2.65 and later.


**Figure 6-12 Discrete Out Page**

# 6.6 Unit Settings

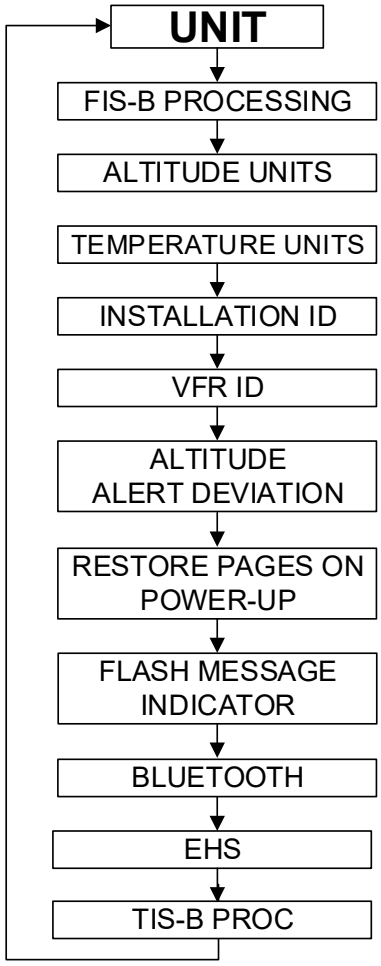



**Figure 6-13 Unit Group**

## 6.6.1 FIS-B Processing (GTX 345 Only)

To receive FIS-B data, select ENABLED.

**NOTE**

When enabling FIS-B Processing, ADS-B In Processing must not be disabled. The FIS-B Processing setting has no affect if ADS-B In Processing is disabled.


**Figure 6-14 FIS-B Processing Page**

## 6.6.2 Altitude Units (Panel Mount Units Only)

Configures pressure and density altitude units. Selections are:

- FLIGHT LVL
- FEET
- METERS

### 6.6.3 Temperature Units (Panel Mount Units Only)

Configures temperature display units. Selections are:

- CELSIUS
- FAHRENHEIT


**Figure 6-15 Altitude and Temperature Units Page**

### 6.6.4 Installation ID

**NOTE**
The Installation ID Select discrete overwrites the configuration setting.

Selects the ID number for the transponder. Set the Installation ID to 1 in single installations. Set the primary transponder Installation ID to 1, and the secondary transponder to 2 in dual installations.

### 6.6.5 VFR ID

Configures the VFR squawk code for your country. Range in octal is 0000-7777.


**Figure 6-16 Installation and VFR ID Page**

### 6.6.6 Altitude Alert Deviation (Panel Mount Units Only)

This field determines the amount of altitude difference from selected altitude to generate an altitude alert. Range is 150 ft to 999 ft.

### 6.6.7 Restore Pages On Power-up (Panel Mount Units Only)

To save the selected pages set in normal operating mode as the new default page settings next time the unit is power up, select YES.


**Figure 6-17 Altitude Alert Deviation and Restore Page**

### 6.6.8 Flash Message Indicator (Panel Mount Units Only - Software v2.05 and Later)

To have "MSG" flash when a new alert occurs, select YES. If No is selected, the MSG indicator is visible when an alert is active but does not flash.


**Figure 6-18 Flash Message Indicator Page**

### 6.6.9 Bluetooth (GTX 345 Only)

To transmit information to a PED using Bluetooth, select ENABLED.


**Figure 6-19 Bluetooth Page**

### 6.6.10 Enhanced Surveillance (GTX 335 and GTX 345 Only)

Enhanced surveillance provides additional data available for interrogation by ground stations. To enable replies with additional data, select ENABLED.


**Figure 6-20 EHS Page**

### 6.6.11 TIS-B Processing (GTX 345 Only)

Select ENABLED to enable processing of airborne TIS-B targets. To disable processing airborne TIS-B targets on aircraft equipped with TAS/TCAS, select GND TRFC ONLY. Ground TIS-B targets will be processed regardless of this configuration setting. Select ENABLED if no TAS/TCAS is configured.


**Figure 6-21 TIS-B PROC Page**

# 6.7 Display Pages

**NOTE**

Make sure the brightness levels match the lighting levels of other equipment in the panel under night conditions.

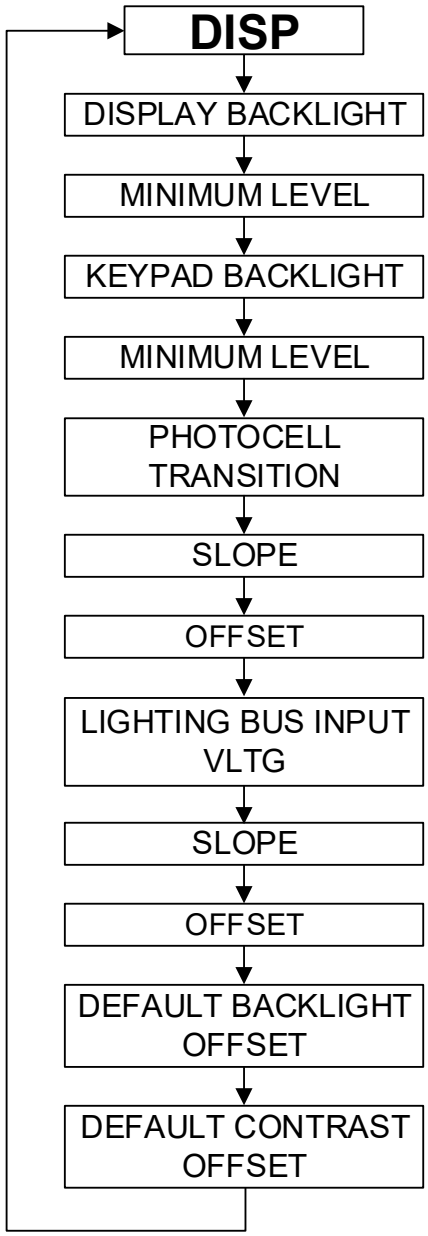



**Figure 6-22 Display Group**

## 6.7.1 Display Backlight

Configures the source for the display backlight control and adjustment. Select PHOTOCELL if the lighting level uses ambient lighting. Select LIGHTING BUS if an input from the lighting bus is used to dim the display.

### 6.7.2 Minimum Level

Configures the minimum brightness of the display. The range is 0 to 100. The higher the number, the brighter the minimum brightness.


**Figure 6-23 Display Backlight and Minimum Level Page**

### 6.7.3 Keypad Backlight

Configures the source for the keypad backlight control and adjustment. Select PHOTOCELL if the lighting level uses ambient lighting. Select LIGHTING BUS if an input from the lighting bus is used to dim the keypad.

### 6.7.4 Minimum Level

Configures the minimum brightness of the keypad. The range is 0 to 100. The higher the number, the brighter the minimum brightness.

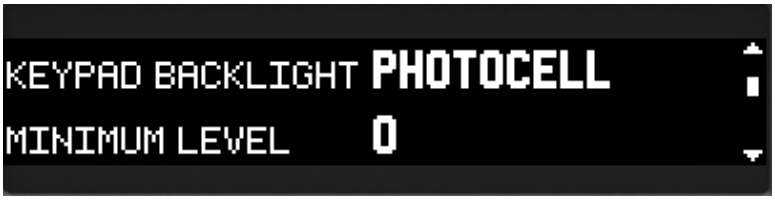



**Figure 6-24 Keypad Backlight and Minimum Level Page**

### 6.7.5 Photocell Transition

Configures a point on the lighting bus. When the lighting bus is below this point, the GTX 3X5 uses the photocell to adjust the display brightness. The range is 5 to 50.

### 6.7.6 Photocell Slope

Configures the sensitivity of the photocell input level. Adjusting the slope higher results in a greater display brightness change for a given increase in the photocell input level. The range is 0 to 100.

### 6.7.7 Offset

Adjusts the lighting level up or down for any given photocell input level. This field has a range of 0 to 100. Use the offset setting to match lighting curves with other equipment in the panel.


**Figure 6-25 Photocell Transition, Slope, and Offset Page**

### 6.7.8 Lighting Bus Input Vltg

Configures the voltage of the lighting bus source. Selections are:

- 14 VDC
- 28 VDC
- 5 VDC
- 5 VAC


**Figure 6-26 Lighting Bus Input Voltage Page**

### 6.7.9 Display and Bezel Key Lighting Slope

Configures the sensitivity of the display or bezel keys for any given lighting bus input level. Set the slope higher for a brighter display for a given increase in the lighting bus input level. This field has a range of 0 to 100.

### 6.7.10 Display and Bezel Key Offset

Configures the lighting level up or down for any given lighting bus input level. This field has a range of 0 to 100. Use the offset setting to match lighting curves with other equipment in the panel.

### 6.7.11 Default Backlight Offset

Manually configures the default backlight offset value from -10 to 99.

### 6.7.12 Default Contrast Offset

Manually configures the default contrast offset value from -50 to 50.


**Figure 6-27 Default Backlight and Contrast Offset Page**

## 6.8 Sensors

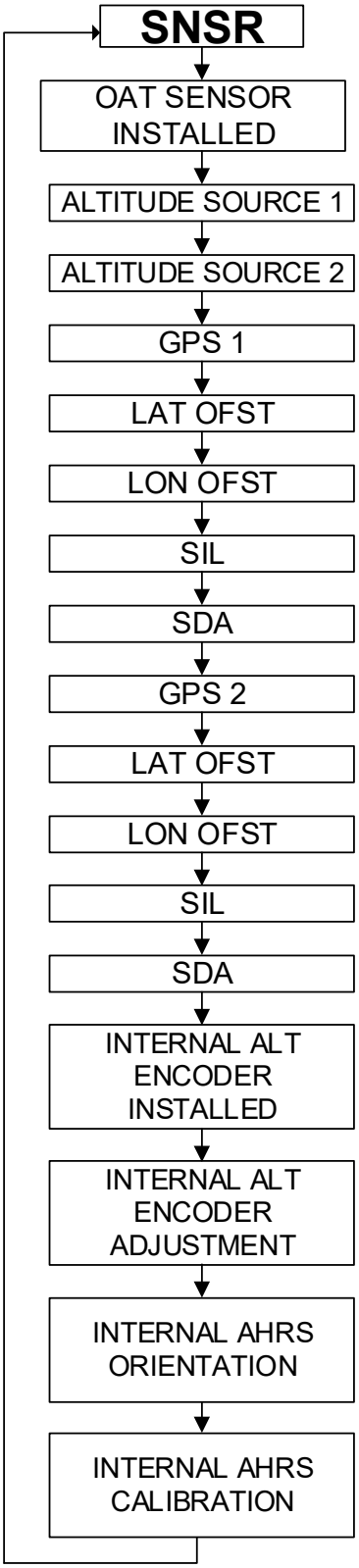



**Figure 6-28 Sensor Group**

### 6.8.1 OAT Sensor Installed

Select YES if an OAT sensor is installed.

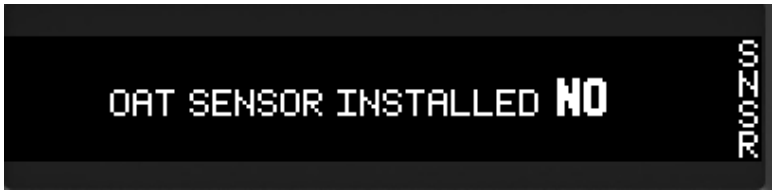



**Figure 6-29 Sensor Page**

### 6.8.2 Altitude Source 1

**NOTE**

Altitude sources do not need to be set. The GTX 3X5 uses both altitude sources if set. The GTX uses any altitude source in priority order if no altitude sources are selected. Refer to section 3.10.

Configures the primary altitude source. Selections are:

- NONE
- RS232 1
- RS232 2
- RS232 3
- A429 1
- A429 2
- HSDB (GTX 345 only)
- GILLHAM
- ALT ENC

### 6.8.3 Altitude Source 2

Configures the secondary altitude source. Selections are:

- NONE
- RS232 1
- RS232 2
- RS232 3
- A429 1
- A429 2
- HSDB (GTX 345 only)
- GILLHAM
- ALT ENC


**Figure 6-30 Altitude Source Page**

### 6.8.4 GPS 1 SRC

**NOTE**

RS-232 4, NAV 1, NAV 2, GIA/GPS 1, and GIA/GPS 2 are applicable to GTX 345 only.

**NOTE**

Lateral offset settings are determined from the perspective of the pilot. Right is positive and left is negative.

**NOTE**

When configuring the GPS source from a panel mount display, the following statements apply.

- When the GPS source is configured to an AC 20-165B compliant interface, the source design assurance level is set to level B.
- When the GPS source is configured to the NMEA FMT or AVIATION FMT interface, the source design assurance level is configurable.

**NOTE**

The GTX ADS-B out function transmits an SDA that is the lesser of the unit design assurance level (Level C) and the selected GPS source design assurance level.

Configures the primary GPS source. Selections are:

- NONE
- INTRNL
- RS232 1
- RS232 2
- RS232 3
- RS232 4
- A429 1
- A429 2
- NAV 1
- NAV 2
- GIA/GPS 1
- GIA/GPS 2

### 6.8.5 SIL (GTX 335 and GTX 345 Only)

Configures the integrity for the primary GPS. Choose the setting for the GPS. All certified Garmin GPS sources are 1E-7. Selections are:

- UNK
- IE-3
- IE-5
- IE-7
- AUTO (Garmin GPS only)

### 6.8.6 Lat Ofst (GTX 335 and GTX 345 Only)

Configures the distance from the antenna and the centerline of the aircraft in meters. Selections are:

- UNK
- -6 mt
- -4 mt
- -2 mt
- 0 mt
- 2 mt
- 4 mt
- 6 mt

### 6.8.7 Lon Ofst (GTX 335 and GTX 345 Only)

Configures the distance of the GPS antenna from the nose of the aircraft in meters. Selections are:

- UNK
- 2 mt to 60 mt in 2 mt increments

### 6.8.8 SDA (GTX 335 and GTX 345 Only)

Configures the design assurance for GPS 1 Src. Selections are:

- UNK
- D
- C
- B

### 6.8.9 GPS 2 SRC

**NOTE**

RS-232 4, NAV 1, NAV 2, GIA/GPS 1, and GIA/GPS 2 are applicable to GTX 345 only.

Configures the secondary GPS source. Selections are:

- NONE
- INTRNL
- RS232 1
- RS232 2
- RS232 3
- RS232 4
- A429 1
- A429 2
- NAV 1
- NAV 2
- GIA/GPS 1
- GIA/GPS 2

### 6.8.10 SIL (GTX 335 and GTX 345 Only)

Configures the integrity for the secondary GPS. Selections are:

- UNK
- IE-3
- IE-5
- IE-7
- AUTO (Garmin GPS Only)

### 6.8.11 SDA (GTX 335 and GTX 345 Only)

Configures the design assurance for GPS 2 Src. Selections are:

- UNK
- D
- C
- B

### 6.8.12 Lat Ofst (GTX 335 and GTX 345 Only)

Configures the secondary GPS lateral offset in meters. Selections are:

- UNK
- -6 mt
- -4 mt
- -2 mt
- 0 mt
- 2 mt
- 4 mt
- 6 mt

### 6.8.13 Lon Ofst (GTX 335 and GTX 345 Only)

Configures the secondary GPS longitudinal offset. Selections are:

- UNK
- 2 mt to 60 mt in 2 mt increments


**Figure 6-31 Source, Integrity, and Offset Page**

### 6.8.14 Internal Alt Encoder Installed

Select YES if a GAE module is connected to the backplate.

### 6.8.15 Ceiling

Configures aircraft maximum altitude between 8,000 feet and 30,000 feet.

### 6.8.16 Test Points

Configures the number of test points used to calibrate the GAE module. The range is 3 to 20. The maximum number of test points are limited by the aircraft ceiling setting.


**Figure 6-32 Internal Alt Encoder Page**

### 6.8.17 Internal Alt Encoder Adjustment

Configures the GAE module altitude to match the primary altitude display.


**Figure 6-33 Internal Alt Encoder Adjustment Page**

## 6.8.18 Internal AHRS Orientation (GTX 345 Only)

Configures connectors and vent to the orientation of the unit. Refer to figure B-10. Set the yaw angle of the unit relative to the centerline of aircraft. When setting the yaw angle, a positive angle indicates the GTX 345 is rotated clockwise from the longitudinal axis of the airplane (line from nose to tail). A negative angle indicates the GTX 345 is rotated counterclockwise. Refer to figure 6-34.

If the vent is to the left and the connectors are forward/down, the pitch offset is limited to +/- 50°. For all other orientations, the pitch offset is limited to +/- 30°.

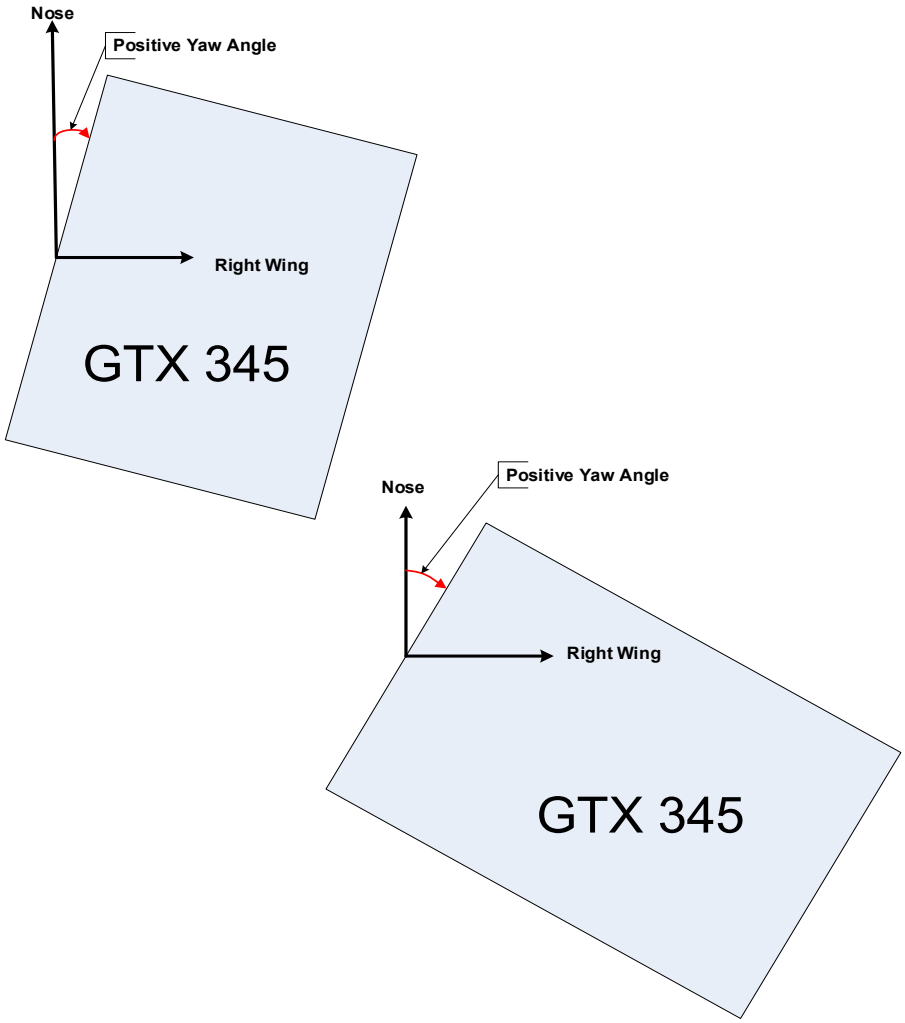



**Figure 6-34 Setting the Yaw Angle**


**Figure 6-35 Internal AHRS Orientation Page**

## 6.8.19 Internal AHRS Calibration (GTX 345 Only)

Calibrate the internal AHRS to level (0° pitch and 0° roll). The Internal AHRS Orientation must be set and the aircraft must be level before beginning this procedure.


**Figure 6-36 Internal AHRS Calibration Page**

# 6.9 ADSB

**NOTE**

Both 1090ES and UAT In settings can be set to YES when a portable ADS-B In receiver system, such as a GDL 39, is installed. It is not necessary to install a certified ADS-B In system.

**NOTE**

GTX 325: The following items are available if the RS-232 GDL format is configured.

- Aircraft Tail Number
- Allow Pilot to Edit
- Flt ID
- Default Flt ID
- Flt ID Prefix

**NOTE**

The RS-232 GDL format must be configured to modify UAT OUT RMT CONTROL.

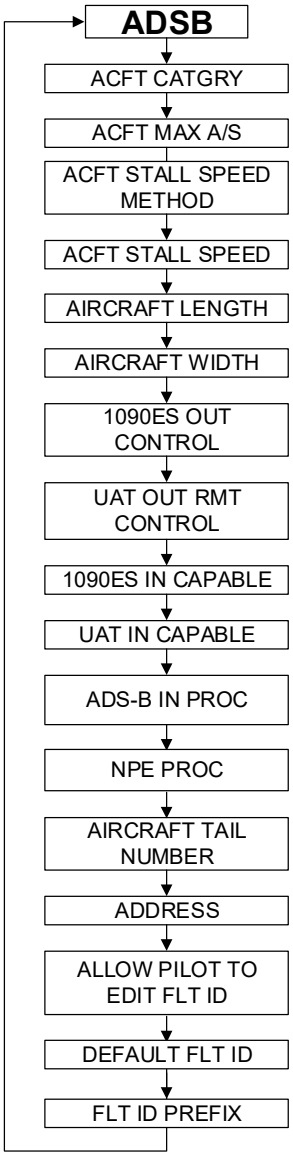



**Figure 6-37 ADS-B Group**

### 6.9.1 Acft Catgry

Configures the aircraft type. Select:

- LIGHT for aircraft with a maximum gross weight less than 15,500 lbs.
- LARGE for aircraft with a maximum gross weight between 75,000 and 300,000 lbs that does not qualify for the high vortex category.
- HIGH-VORTEX for aircraft with a maximum takeoff weight greater than or equal to 75,000 lbs but less than 300,000 lbs that generates a high wake vortex.
- HEAVY for aircraft with a maximum gross weight of 300,000 lbs or more.

The LARGE, HIGH-VORTEX, AND HEAVY settings are supported in main software version 2.53 and later. These settings display as "UNSUPPORTED" on panel mount displays. Confirmation of these settings must be done through the GTX Install Tool.

Selections are:

- UNKNOWN
- LIGHT
- SMALL
- LARGE
- HIGH-VORTEX
- HEAVY
- HIGH PERFORMANCE
- ROTORCRAFT
- GLIDER
- LIGHTER-THAN-AIR
- ULTRALIGHT
- UAV

### 6.9.2 Acft Max A/S (GTX 335 and GTX 345 Only)

Configures the maximum airspeed of the aircraft. Selections are:

- UNKNOWN
- <=75 kt
- <=150 kt
- <=300 kt
- <=600 kt
- <=1200 kt
- >1200 kt


**Figure 6-38 Aircraft Category and Max Airspeed Page**

### 6.9.3 Acft Stall Method

Configures which type of action is taken in the event of a stall. Selections are:

- DEFAULT
- MANUAL

### 6.9.4 Acft Stall Speed

If the aircraft category is set to Light, Small, or High Performance, stall speed selections are 30 kts to 200 kts, in 1 kt increments.


**Figure 6-39 Aircraft Stall Method and Stall Speed Page**

### 6.9.5 Aircraft Length (GTX 335 and GTX 345 Only)

Configures aircraft length in meters.

- UNKNOWN
- <=15 mt
- <=25 mt
- <=35 mt
- <=45 mt
- <=55 mt
- <=65 mt
- <=75 mt
- <=85 mt
- >85 mt

### 6.9.6 Aircraft Width (GTX 335 and GTX 345 Only)

Configures aircraft width in meters.

- Unknown
- <=23.0 mt
- <=28.5 mt
- <=33.0 mt
- <=34.0 mt
- <=38.0 mt
- <=39.5 mt
- <=45.0 mt
- <= 52.0 mt
- <=59.5 mt
- <=67.0 mt
- <=72.5 mt
- <=80.0 mt
- >80 mt


**Figure 6-40 Aircraft Length and Width Page**

### 6.9.7 1090ES Out Control (GTX 335 and GTX 345 Only)

**NOTE**

Pilot control of ADS-B out is not typically required. "Enabled" is the recommended setting for most installations. Placing the transponder in standby is an acceptable method of disabling ADS-B out if directed to do so by ATC. Refer to 14 CFR 91.225 item f, FR Doc. 2019-15248 section IV B, paragraph 4, and AC 20-165B section 3.7.2.2 for more information.

Configures 1090ES ADS-B transmission function. Selections are:

- Enabled
- Pilot Set
- Disabled

### 6.9.8 UAT Out Rmt Control

Not available with GDL 88 software v3.41 or earlier.


**Figure 6-41 1090ES Out Control and UAT Out Remote Control Page**

### 6.9.9 1090ES In Capable (GTX 335 and GTX 345 Only)

Select YES if the aircraft can receive 1090ES ADS-B messages.

## 6.9.10 UAT In Capable (GTX 335 and GTX 345 Only)

Select YES if the aircraft can receive UAT ADS-B messages.


**Figure 6-42 1090ES In Capable and UAT In Capable Page**

## 6.9.11 ADS-B In Proc (GTX 345 Only)

Configures the ADS-B In processing. Select Enabled to allow ADS-B In traffic processing, with FIS-B based on the FIS-B Processing setting. Select Disabled to disable all ADS-B In traffic and FIS-B processing.

For remote mount installations with TCAS II, select Enabled/TCAS II.

FIS-B Only is intended for use with ADS-B In displays that support independent sources of traffic and FIS-B. For more information, refer to section 3.11.

For TCAS II installations where the TCAS is responsible for alerting, select ENABLED with TCAS II. To disable traffic processing select FIS-B Only.

Selections are:

- Disabled
- Enabled
- Enabled/TCAS II
- FIS-B Only

## 6.9.12 NPE PROC

**NOTE**

NPE PROC must be configured to Disabled (default) for certified aircraft installations.

Selections are:

- Disabled
- Output Only
- OUT/VIS
- OUT/VIS/AUD


**Figure 6-43 ADS-B In Processing Page**

## 6.9.13 Aircraft Tail Number

Set this to the registered aircraft tail number.

## 6.9.14 Address (GTX 335 and GTX 345 Only)

Set the ICAO address to either octal or hex format. If the tail number is recognized as a US registered tail number, the ICAO address will be pre-filled by the GTX. It only needs to be compared to the aircraft registration records. Selections are:

- Octal
- Hex


**Figure 6-44 Aircraft Tail Number and Address Page**

## 6.9.15 Allow Pilot To Edit Flt ID

**NOTE**

To avoid a call sign mismatch (CSMM), the Flight ID must always match the Aircraft Identification (call sign) included in the flight plan for any given flight. Consult with the aircraft operator to determine if variable flight ID is required for the aircraft. If the operator intends to file a flight plan using an Aircraft Identification other than the aircraft registration (i.e. "DCM0000" from FltPlan.com), variable flight ID is required.

Select YES to let the pilot change the flight ID. YES must be selected if variable flight ID is required for the aircraft.


**Figure 6-45 Allow Pilot to Edit Flight ID Page**

## 6.9.16 Default Flt ID

Configures the default flight ID used in normal mode. This is typically desired to be the aircraft tail number. Needs specific to the aircraft and aircraft operators should be considered prior to configuration.

## 6.9.17 Flight ID Prefix

Configures the flight ID prefix with the carrier abbreviation. For example, Garmin AT is GAT.


**Figure 6-46 Default Flight ID and Flight ID Prefix Page**

# 6.10 Antenna (Diversity Units Only)

Configures cable delays and losses for the top and bottom antennas, as well as enables or disables non-diversity mode.

**NOTE**

Optimum performance is achieved when the top and bottom antenna coax cables match for both cable delay and loss. This ensures the unit meets the DO-181E antenna selection criteria.

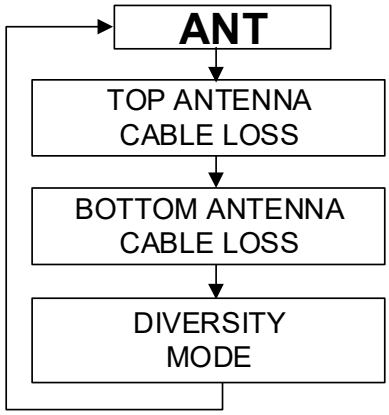



**Figure 6-47 Antenna Group - Diversity Units Only**

## 6.10.1 Top Antenna Cable Loss

Configures top antenna cable loss in decibels.

- 0dB
- .25dB
- .50dB
- .75dB
- 1.00dB
- 1.25db
- 1.50dB
- 1.75dB
- 2.00dB

### 6.10.2 Bottom Antenna Cable Loss

Configures bottom antenna cable loss in decibels.

- 0dB
- .25dB
- .50dB
- .75dB
- 1.00dB
- 1.25db
- 1.50dB
- 1.75dB
- 2.00dB

If the difference between the top and bottom cable loss is 0.5 dB or greater, the unit must be configured to compensate for the difference in order to best ensure the unit meets the DO-181E specification for antenna selection criteria. To configure the cable loss, round each calculated cable loss value to the nearest 0.25 dB and enter the values in the corresponding antennas slot.

Table 6-9 lists the typical difference in cable delay and loss for several cables.

**Table 6-9 Cable Loss and Delay**

| Cable Delay (ns/ft) | Cable Loss (dB/ft) | Carlisle IT Type | MIL-C-17 Type | RG Type |
|---|---|---|---|---|
| 1.46 | .180 | | M17/128-RG400 | RG-400 |
| 1.46 | .1445 | 3C142B | | |
| 1.46 | .155 | | M17/60-RG142 | RG-142 |
| 1.46 | .120 | | M17/112-RG304 | RG-304 |
| 1.25 | .088 | 311601 | M17/127-RG393 | RG-393 |
| 1.25 | .0712 | 311501 | | |
| 1.25 | .0556 | 311201 | | |
| 1.25 | .0363 | 310801 | | |


**Figure 6-48 Top and Bottom Antenna Cable Loss Page**

### 6.10.3 Diversity Mode

Configures diversity mode. Select DISABLED to stop the top antenna from transmitting or receiving. Selections are:

- Allowed
- Inhibited


**Figure 6-49 Diversity Mode Page**

## 6.11 Diagnostics

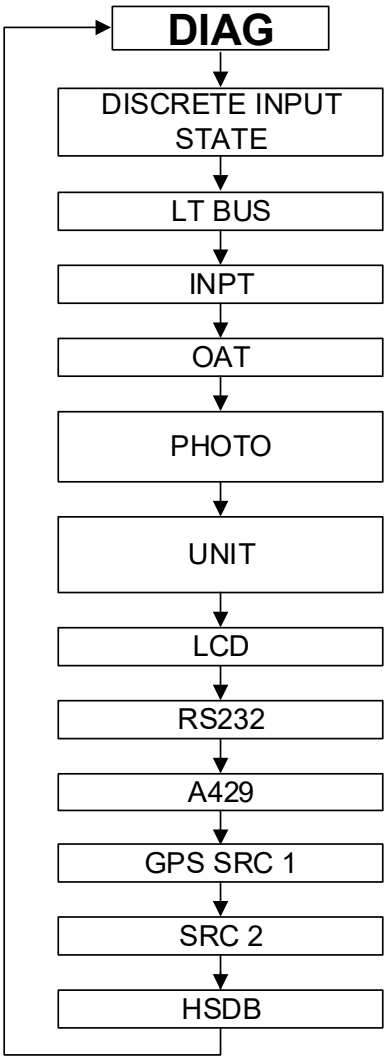



**Figure 6-50 Diagnostics Group**

The Diagnostics group shows information for troubleshooting purposes. Information includes:

- Discrete input state
- Lighting bus voltages
- Photocell voltages
- Outside air temperature
- Display temperature
- RS-232 channels
- ARINC 429 channels
- GPS Source 1 and GPS Source 2 status
- HSDB status (GTX 345)
- Gillham input state


**Figure 6-51 Diagnostics Page**

## 6.11.1 Message Details

In normal mode, the GTX 3X5 displays system messages to alert the pilot of unit failures or service needs. See the following for an example page of messages displayed in normal mode.


**Figure 6-52 Message Details**

To support troubleshooting during installation/maintenance activities, additional details pertaining to these messages are available on the Status page of the GTX Install Tool (refer to the GTX 3X5 Installation Tool Guide for more information). On panel mount GTX units, these additional details can also be displayed on the front panel. While on the messages page shown above, enter the code 5676 using the keypad to enable display of message details. Once message details have been enabled, they remain enabled for the remainder of the GTX power/reset cycle. When message details are enabled, the user may scroll through the messages and press "ENT" to see detailed information about the alert. The figures below show the message details for a Service Soon alert, which is due to an altitude encoder calibration fault in this example.


**Figure 6-53 Message Details - Service Soon**


**Figure 6-54 Message Details - Altitude Encoder**

## 6.12 Remote Unit Configuration

For remote unit configuration refer to *GTX 3X5 Installation Tool Guide*.

## 6.13 Ground Check - GPS Reception Check

**NOTE**

If an external GPS is in use, GPS reception checks are not necessary.

The GPS check in this section is applicable to GTX 335 and GTX 345 units with an optional internal GPS receiver.

1. Make sure the LAT/LON on the ADS-B Out page matches with a known reference.
2. Select 121.150 MHz on the COM transceiver to be tested.
3. Transmit for a period of 35 seconds.
4. Make sure the LAT/LON continues to match the known reference.
5. Repeat steps 3 and 4 for the following frequencies.

- 121.15 MHz
- 121.17 MHz
- 121.20 MHz
- 121.22 MHz
- 121.25 MHz
- 131.20 MHz
- 131.22 MHz
- 131.25 MHz
- 131.27 MHz
- 131.30 MHz
- 131.32 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.

## 6.14 Ground Check - Transponder

FAR 91.413 transponder checks require the GTX to reply to different types of interrogations. The GTX 335 and GTX 345 only reply to Mode S/A/C All Calls when airborne. FAR 91.413 provides guidance for the transponder check.

To simulate a temporary airborne state, place the GTX 3X5 in Ground Test mode. Ground Test mode overrides the air/ground logic to transmit as if the GTX is airborne. This mode has a duration of one power cycle.

To enable Ground Test mode on a GTX 3X5 panel mount unit, press and hold **CRSR** while applying power to the unit. For panel and remote mount units, Ground Test mode can be enabled via the State page of the GTX Install Tool.

Other methods to force a temporary airborne state for transponder testing exist for specific installations. Installations that use a GTN to control the GTX 3X5 include a "Force Airborne Test" function on the transponder page on the GTN in configuration mode. Refer to the GTN installation manual for details. In GX000 installations, transponder ground test may be enabled via a GX000 display depending on the airframe loader card configuration. Refer to the GX000 airframe documentation for details.

## 6.15 Ground Check - Traffic

In main software v2.60 and later and ADS-B software v3.20 and later, the GTX 345 also provides a Traffic Ground Test mode to support ground checkout of the traffic function. While in traffic ground test mode, the internal pressure altitude, height above terrain, and radio altitude values used by the traffic function are overridden to avoid suppression of traffic alerts while on-ground and for consistency with Garmin's GTS ground check procedures.

Traffic ground test mode is enabled via the **CRSR** key method or the GTX Install Tool method. In a GX000 installation, traffic ground test may be enabled via a GX000 display depending on the airframe loader card configuration. Refer to the GX000 airframe documentation for details.

**NOTE**

If the GTX 345 is configured to interface with a GTS, traffic processing will use 50,000' for ownship pressure altitude while in traffic ground test mode. This pressure altitude override does not apply if the GTX 345 is not configured to interface with a GTS. The override value is not used by the transponder and ADS-B Out functions (i.e. the override pressure altitude value is not transmitted).

When the GTX 345 is integrated with a GTS, traffic ground test mode must be used when performing GTS ground test procedures. Refer to *GTS 8X0/GPA 65 Installation Manual* or *GTS Processor GTS 825/855/8000 Installation Manual.* The GTX 345 automatically enters traffic ground test mode if an integrated GTS reports ground test mode is active via HSDB.

## 6.16 Software Installation Procedure

For software installation procedures refer to *GTX 3X5 Installation Tool Guide*.

# 7 Continued Airworthiness

Test the transponder according to Title 14 CFR 91.411 and 91.413 as well as Part 43 Appendix F. Test for ADS-B Out compliance according to Title 14 CFR 91.227. Other than for regulatory periodic functional checks, maintenance of the GTX 3X5 is “on condition” only. Periodic maintenance of the GTX 3X5 is not required.

# Appendix A Data Formats

# A.1 RS-232 Air Data Input Format

## A.1.1 Electrical Interface

The input signals are compatible with RS-232C. Data input at 9600 baud with a word length of 8 bits, one stop bit, and no parity. One message is received per second.

## A.1.2 Altitude Format 1 Sentence

The GTX 3X5 is capable of receiving the following 10-byte message from the altitude serializer.

ALT <sp>12345<CR>

Where:

| | |
|---|---|
| ALT | ASCII characters |
| <sp> | space (0x20) |
| 12345 | altitude in feet |
| <CR> | carriage return (0x0D) |

## A.1.3 Altitude Format 3 Sentence

The GTX 3X5 is capable of receiving the following 17-byte message from GAE modules, altitude serializers, and altitude converters.

RMS<sp><+/->12345T<+/->12ul<CR>

Where:

| | |
|---|---|
| RMS | ASCII characters |
| <sp> | space (0x20) |
| <+/-> | sign indicator (0x2B[+] or 0x2D[-]) |
| 12345 | altitude in feet |
| T | ASCII character |
| <+/-> | sign indicator |
| 12 | sensor temperature |
| ul | checksum of bytes 1 through 14 in hex ASCII (i.e., FA) |
| <CR> | carriage return (0x0D) |

**NOTE**

Checksum is calculated by adding each byte in the message (1 through 14).

## A.1.4 Airdata Format 1 Sentence

The GTX 3X5 is capable of receiving the following message strings from the air data computer.

**SHADIN Z FORMAT**

<STX>

| | |
|---|---|
| ZA012<CR><LF> | ZA (ASCII characters); 012 represents indicated air speed (knots) |
| ZB345<CR><LF> | ZB (ASCII characters); 345 represents true air speed (knots) |
| ZC678<CR><LF> | ZC (ASCII characters); 678 represents mach speed (thousandths) |
| ZD<+/->9012<CR><LF> | ZD (ASCII characters); sign; 9012 represents pressure altitude (tens of feet) |
| ZE<+/->3456<CR><LF> | ZE (ASCII characters); sign; 3456 represents density altitude (tens of feet) |
| ZF<+/->78<CR><LF> | ZF (ASCII characters); sign; 78 represents outside air temperature (Celsius) |
| ZG<+/->90<CR><LF> | ZG (ASCII characters); sign; 90 represents true air temperature (Celsius) |
| ZL234<CR><LF> | ZL (ASCII characters); 234 represents heading (degrees from north) |
| ZQ345<CR><LF> | ZQ (ASCII characters); 345 represents error log/reason indicator |
| ZR678<CR><LF> | ZR (ASCII characters); 678 represents checksum |

<ETX>

Where:

| | |
|---|---|
| <STX> | start-transmit character (0x02) |
| <CR> | carriage-return character (0x0D) |
| <LF> | line-feed character (0x0A) |
| <+/-> | sign indicator (0x2B[+] or 0x2D[-]) |
| <ETX> | end-transmit character (0x03) |

**NOTE**

Checksum is calculated by adding each byte in the message (including all characters from <STX> up to and including the error log/reason indicator), such that carries are discarded to give a one byte result. The ASCII-coded decimal representation of that byte is given, ranging from 0 (0x30, 0x30, 0x30) to 255 (0x32, 0x35, 0x35).

**SHADIN G FORMAT**

| | |
|---|---|
| <STX> | |
| GA012<CR><LF> | GA (ASCII characters); 012 represents indicated air speed (knots) |
| GB345<CR><LF> | GB (ASCII characters); 345 represents true air speed (knots) |
| GC678<CR><LF> | GC (ASCII characters); 678 represents Mach speed (thousandths) |
| GD<+/->9012<CR><LF> | GD (ASCII characters); sign; 9012 represents pressure altitude (tens of feet) |
| GE<+/->3456<CR><LF> | GE (ASCII characters); sign; 3456 represents density altitude (tens of feet) |
| GF<+/->78<CR><LF> | GF (ASCII characters); sign; 78 represents outside air temperature (Celsius) |
| GG<+/->90<CR><LF> | GG (ASCII characters); sign; 90 represents true air temperature (Celsius) |
| GK<+/->901<CR><LF> | GK (ASCII characters); sign; 901 represents vertical speed (tens of ft/minute) |
| GL234<CR><LF> | GL (ASCII characters); 234 represents heading (degrees from north) |
| GP89012<CR><LF> | GP (ASCII characters); 89012 represents fuel used, left (or Single) (tenths gallons) |
| GR6789.0<CR><LF> | GR (ASCII characters); 6789.0 represents fuel remaining (gallons) [1] |
| Ga<+/->1234<CR><LF> | Ga (ASCII characters); sign; 12.34 represents barometric corrected altitude (tens of feet) |
| Gb56.78<CR><LF> | Gb (ASCII characters); 56.78 represents current barometric pressure setting (inches Hg) |
| G*901<CR><LF> | G* (ASCII characters); 901 represents checksum |
| <ETX> | |

Where:

| | |
|---|---|
| <STX> | start-transmit character (0x02) |
| <CR> | carriage-return character (0x0D) |
| <LF> | line-feed character (0x0A) |
| <+/-> | sign indicator (0x2B[+] or 0x2D[-]) |
| <ETX> | end-transmit character (0x03) |

[1] Not available from Airdata Computer

**NOTE**

Checksum is calculated by adding each byte in the message (including all characters from <STX> up to and including the error log/reason indicator), such that carries are discarded to give a one byte result. The ASCII-coded decimal representation of that byte is given, ranging from 0 (0x30, 0x30, 0x30) to 255 (0x32, 0x35, 0x35).

**SHADIN S FORMAT**

<STX>

| | |
|---|---|
| SA012<CR><LF> | SA (ASCII characters); 012 represents indicated air speed (knots) |
| SB345<CR><LF> | SB (ASCII characters); 345 represents true air speed (knots) |
| SC678<CR><LF> | SC (ASCII characters); 678 represents Mach speed (thousandths) |
| SD<+/->9012<CR><LF> | SD (ASCII characters); sign; 9012 represents pressure altitude (tens of feet) |
| SE<+/->3456<CR><LF> | SE (ASCII characters); sign; 3456 represents density altitude (tens of feet) |
| SF<+/->78<CR><LF> | SF (ASCII characters); sign; 78 represents outside air temperature (Celsius) |
| SG<+/->90<CR><LF> | SG (ASCII characters); sign; 90 represents true air temperature (Celsius) |
| SK<+/->901<CR><LF> | SK (ASCII characters); sign; 901 represents vertical speed (tens of ft/minute) |
| SL234<CR><LF> | SL (ASCII characters); 234 represents heading (degrees from north) |
| Sa<+/->1234<CR><LF> | Sa (ASCII character); sign; 1234 represents barometric corrected altitude (tens of feet) |
| Sb56.78<CR><LF> | Sb (ASCII character); 56.78 represents current barometric pressure setting (inches Hg) |
| S*901<CR><LF> | S* (ASCII character); 901 represents checksum |

<ETX>

Where:

| | |
|---|---|
| <STX> | start-transmit character (0x02) |
| <CR> | carriage-return character (0x0D) |
| <LF> | line-feed character (0x0A) |
| <+/-> | sign indicator (0x2B[+] or 0x2D[-]) |
| <ETX> | end-transmit character (0x03) |

**NOTE**

Checksum is calculated by adding each byte in the message (including all characters from <STX> up to and including the error log/reason indicator), such that carries are discarded to give a one byte result. The ASCII-coded decimal representation of that byte is given, ranging from 0 (0x30, 0x30, 0x30) to 255 (0x32, 0x35, 0x35).

# A.2 ARINC 429 Input Formats

## AHRS

**Table A-1 AHRS Inputs**

| Label | Data | Transmission Rate | Periodic Timeout |
|---|---|---|---|
| 270 | AHRS Discrete Word | 500 ms | 2000 ms |
| 314 | True Heading | 50 ms | 200 ms |
| 320 | Magnetic Heading | 50 ms | 200 ms |
| 324 | Pitch Angle | 50 ms | 200 ms |
| 325 | Roll Angle | 50 ms | 200 ms |
| 332 | Body Lateral Acceleration | 60 ms | 240 ms |
| 333 | Body Normal Acceleration | 60 ms | 240 ms |
| 340 | Inertial Yaw Rate | 20 ms | 80 ms |
| 365 | Inertial Vertical Velocity | 40 ms | 160 ms |

## ADC

**Table A-2 ADC Inputs**

| Label | Data | Transmission Rate | Periodic Timeout |
|---|---|---|---|
| 203 | Altitude | 62.5 ms | 250 ms |
| 204 | Baro-Corrected Altitude #1 | 62.5 ms | 250 ms |
| 205 | Mach | 125 ms | 500 ms |
| 206 | Indicated Airspeed | 125 ms | 500 ms |
| 210 | True Airspeed | 125 ms | 500 ms |
| 211 | Total Air Temperature | 500 ms | 2000 ms |
| 212 | Altitude Rate | 62.5 ms | 250 ms |
| 213 | Static Air Temperature | 500 ms | 2000 ms |
| 234 | Baro Setting (hPa) | 125 ms | 500 ms |
| 235 | Baro Setting (in Hg) | 125 ms | 500 ms |

## ARINC 743A

**Table A-3 ARINC 743A Inputs**

| Label | Data | Transmission Rate | Periodic Timeouts |
|---|---|---|---|
| 76 | GNSS Altitude | 200 ms | 2000 ms |
| 101 | HDOP | 200 ms | 2000 ms |
| 102 | VDOP | 200 ms | 2000 ms |
| 103 | GNSS Track Angle | 200 ms | 2000 ms |
| 110 | GNSS Latitude | 200 ms | 2000 ms |
| 111 | GNSS Longitude | 200 ms | 2000 ms |
| 112 | GNSS Ground Speed | 200 ms | 2000 ms |
| 120 | GNSS Latitude Fine | 200 ms | 2000 ms |
| 121 | GNSS Longitude Fine | 200 ms | 2000 ms |
| 130 | Horizontal Protection Limit [1] | 200 ms | 2000 ms |
| 133 | Vertical Protection Limit | 200 ms | 2000 ms |
| 136 | Vertical Figure of Merit | 200 ms | 2000 ms |
| 140 | UTC Fine | 200 ms | 2000 ms |
| 141 | UTC Fine Fractions | 200 ms | 2000 ms |
| 142 | Vertical Figure of Merit Velocity [2] | 200 ms | 2000 ms |
| 145 | Horizontal Figure of Merit Velocity [3] | 200 ms | 2000 ms |
| 150 | UTC | 200 ms | 2000 ms |
| 165 | Vertical Velocity | 200 ms | 2000 ms |
| 166 | North/South Velocity | 200 ms | 2000 ms |
| 174 | East/West Velocity | 200 ms | 2000 ms |
| 247 | Horizontal Figure of Merit | 200 ms | 2000 ms |
| 260 | Date | 200 ms | 2000 ms |
| 273 | GNSS Sensor Status | 200 ms | 2000 ms |
| 370 | GNSS Height | 200 ms | 2000 ms |

[1] When using GTX 3X5 main software v2.85 or later, the unit will inflate the HPL value received on the ARINC 743A interface by 3% while SBAS Navigation GBAS/GRAS Navigation or Approach mode are active per the GNSS Sensor Status (Label 273).

[2] When using GTX 3X5 main software v2.85 or later, VFOMV is defaulted to 9.0 m/s if VFOMV is not received via label 142. Once VFOMV is received, the default value is no longer used and only received values are used for the remainder of the unit's power cycle.

[3] When using GTX 3X5 main software v2.85 or later, HFOMV is defaulted to 9.0 m/s for a NACv of 1 if HFOMV is not received via Label 145. Once HFOMV is received, the default value is no longer used and only received values are used for the remainder of the unit's power cycle. When using an ARINC 743A GPS source that does not provide HFOMV, via label 145, the GPS source must be certified to a NACv of 1 or greater.

## EFIS Air Data

**Table A-4 EFIS Air Data**

| Label | Data | Transmission Rate | Periodic Timeout |
|---|---|---|---|
| 100 | Selected Course #1 | 250 ms | 250 ms |
| 101 | Selected Heading | 500 ms | 2000 ms |
| 102 | Selected Altitude | 800 ms | 800 ms |
| 107 [1] | FMS Selected Altitude | 200 ms | 800 ms |
| 164 | Radio Height | 250 ms | 250 ms |
| 203 | Altitude | 250 ms | 250 ms |
| 204 | Baro-Corrected Altitude #1 | 250 ms | 250 ms |
| 205 | Mach | 500 ms | 500 ms |
| 206 | Indicated Airspeed | 500 ms | 500 ms |
| 210 | True Airspeed | 50 ms | 500 ms |
| 211 | Total Air Temperature | 2000 ms | 2000 ms |
| 212 | Altitude Rate | 250 ms | 250 ms |
| 213 | Static Air Temperature | 2000 ms | 2000 ms |
| 234 | Baro Setting (hPa) | 500 ms | 500 ms |
| 235 | Baro Setting (in Hg) | 500 ms | 500 ms |
| 271 [1] | Pitch Discrete Data, Bendix/ King KFC 225/275/325 | 125 ms | 500 ms |
| 276 [1] | Roll Discrete Data, Bendix/King KFC 225/275/325 | 125 ms | 500 ms |
| 304 [1] | AFCS Modes | 500 ms | 2000 ms |
| 305 [1] | Target Altitude Source | 500 ms | 2000 ms |
| 306 | Joystick Waypoint Latitude | 500 ms | 500 ms |
| 307 | Joystick Waypoint Longitude | 500 ms | 500 ms |
| 314 | True Heading | 200 ms | 200 ms |
| 320 | Magnetic Heading | 200 ms | 200 ms |
| 325 | Roll Angle | 200 ms | 200 ms |
| 371 | General Aviation Equipment Identifier | 500 ms | 2000 ms |

[1] Used only if label 371 is received with the Garmin company identifier.

## Flight Control

**Table A-5 Flight Control**

| Label | Data | Transmission Rate | Periodic Timeout |
|---|---|---|---|
| 101 | Selected Heading | 500 ms | 2000 ms |
| 102 | Selected Altitude | 200 ms | 800 ms |
| 107 [1] | FMS Selected Altitude | 200 ms | 800 ms |
| 234 | Baro Setting (hPa) | 125 ms | 500 ms |
| 235 | Baro Setting (in Hg) | 125 ms | 500 ms |
| 271 | Pitch Discrete Data, Bendix/ King KFC 225/275/325 | 125 ms | 500 ms |
| 276 | Roll Discrete Data, Bendix/King KFC 225/275/325 | 125 ms | 500 ms |
| 304 [1] | AFCS Modes | 500 ms | 2000 ms |
| 305 [1] | Target Altitude Source | 500 ms | 2000 ms |
| 371 | General Aviation Equipment Identifier | 500 ms | 2000 ms |

[1] Used only if label 371 is received with the Garmin company identifier.

## Heading

**Table A-6 Heading**

| Label | Data | Transmission Rate | Periodic Timeout |
|---|---|---|---|
| 314 | True Heading | 50 ms | 200 ms |
| 320 | Magnetic Heading | 50 ms | 200 ms |

## Flight ID

**Table A-7 Flight ID**

| Label | Data | Transmission Rate | Periodic Timeout |
|---|---|---|---|
| 233 | Flight ID Data Word 1 | 5000 ms | 20000 ms |
| 234 | Flight ID Data Word 2 | 5000 ms | 20000 ms |
| 235 | Flight ID Data Word 3 | 5000 ms | 20000 ms |
| 236 | Flight ID Data Word 4 | 5000 ms | 20000 ms |

## Radar Altimeter

**Table A-8 Radio Altitude**

| Label | Data | Transmission Rate | Periodic Timeout |
|---|---|---|---|
| 164 | Radio Height | 62.5 ms | 250 ms |

## Traffic Input

The traffic input formats are only available on the GTX 345.

**Table A-9 Traffic Inputs**

| Label | Data | Transmission Rate | Periodic Timeout |
|---|---|---|---|
| 013 | Control Panel Set | 500 ms | 2000 ms |
| 015 | Altitude Select Limits | 500 ms | 2000 ms |
| 016 | TCAS Mode/ Sense | 500 ms | 2000 ms |
| 130 | Intruder Range | 500 ms | N/A |
| 131 | Intruder Altitude | 500 ms | N/A |
| 132 | Intruder Bearing | 500 ms | N/A |
| 270 | Vertical RA | 500 ms | 2000 ms |
| 274 | TCAS Output | 500 ms | 2000 ms |
| 320 | Magnetic Heading | 500 ms | 2000 ms |
| 350 | TCAS Fault Summary | 500 ms | 2000 ms |
| 357 | Request to Send/End of Transmission | 500 ms | N/A |

# A.3 ARINC 429 Output Formats

## GPS Data

The GPS data format is used to forward GPS data received from the selected GPS source as defined in ARINC 743. The GPS Data format can only be used when combined with other ARINC output formats from table A-10. GPS labels transmit in the order specified.

**Table A-10 GPS Data Formats**

| Label | Data | Transmission Rate | Priority Order |
|---|---|---|---|
| 273 | GNSS Sensor Status | 200 ms | 1 |
| 130 | Horizontal Protection Limit | 200 ms | 2 |
| 76 | GNSS Altitude (MSL) | 200 ms | 3 |
| 101 [1] | Horizontal Dilution of Precision | 200 ms | 4 |
| 103 [1] | GNSS Track Angle | 200 ms | 5 |
| 112 | GNSS Ground Speed | 200 ms | 6 |
| 136 | Vertical Figure of Merit | 200 ms | 7 |
| 145 [1] | Horizontal Velocity Figure of Merit | 200 ms | 8 |
| 165 [1] | Vertical Velocity | 200 ms | 9 |
| 166 [1] | North/South Velocity | 200 ms | 10 |
| 174 [1] | East/West Velocity | 200 ms | 11 |
| 247 [1] | Horizontal Figure of Merit | 200 ms | 12 |
| 260 | Date | 200 ms | 13 |
| 370 [1] | GNSS Height | 200 ms | 14 |
| 110 | GNSS Latitude | 200 ms | 15 |
| 111 | GNSS Longitude | 200 ms | 16 |
| 120 | GNSS Latitude Fine | 200 ms | 17 |
| 121 | GNSS Longitude Fine | 200 ms | 18 |
| 150 | UTC | 200 ms | 19 |

[1] Only transmitted on ARINC 429 channels configured for high speed.

## Garmin Concentrator

**Table A-11 Garmin Concentrator Labels**

| Label | Data | Transmission Rate |
|---|---|---|
| 100 | Selected Course #1 | 200 ms |
| 203 | Altitude | 100 ms |
| 204 | Baro-Corrected Altitude #1 | 100 ms |
| 206 | Indicated Airspeed | 100 ms |
| 210 | True Airspeed | 100 ms |
| 211 | Total Air Temperature | 100 ms |
| 213 | Static Air Temperature | 100 ms |
| 306 | Joystick Waypoint Latitude | 500 ms |
| 307 | Joystick Waypoint Longitude | 500 ms |
| 314 | Own Aircraft True Heading | 100 ms |
| 320 | Own Aircraft Magnetic Heading | 100 ms |

## TAS Output

The Garmin TAS format is only available on the GTX 335 and the GTX 345. This format is used to perform TCAS coordination with a Garmin TCAS 1 system. GPS data is also provided to the Garmin TCAS 1 system with this format. The Garmin TAS format is a simplified version of the transponder-to-TCAS interface specified in ARINC 735, also known as the XT bus.

**Table A-12 TAS Output Labels**

| Label | Data | Transmission Rate |
|---|---|---|
| 272 | TCAS COORDINATION DATA (MID PART 1) | 100 ms |
| 274 | TCAS COORDINATION DATA (MID PART 2) | 100 ms |

## TIS-A Output

The Garmin TIS-A format is only available on the GTX 335. The Garmin TIS-A format is used to send TIS-A traffic data to traffic displays using a variant of the TCAS-to-Display interface specified in ARINC 735. Because the format is unidirectional, TIS-A control must be performed by another means, such as the TIS-A toggle discrete.

**Table A-13 TIS-A Output Labels**

| Label | Data | Transmission Rate |
|---|---|---|
| 130 | Intruder Range | 500 ms |
| 131 | Intruder Altitude | 500 ms |
| 132 | Intruder Bearing | 500 ms |
| 274 | TCAS Output | 500 ms |
| 313 | Own Aircraft Track Angle | 500 ms |
| 350 | TCAS Fault Summary | 500 ms |
| 357 | End of Transmission | 500 ms |
| 371 | GA Equipment Identifier | 500 ms |

## Traffic

The Traffic Output is only available on the GTX 345. The traffic output format is used to send consolidated ADS-B and TCAS traffic data to a traffic display using a variant of the TCAS-to-display interface specified in ARINC 735.

**Table A-14 Traffic Labels**

| Label | Data | Transmission Rate |
|---|---|---|
| 130 | Intruder Range | 500 ms |
| 131 | Intruder Altitude | 500 ms |
| 132 | Intruder Bearing | 500 ms |
| 203 | Own Aircraft Pressure Altitude | 100 ms |
| 313 | Own Aircraft True Track | 100 ms |
| 314 | Own Aircraft True Heading | 100 ms |
| 353 | ADS-B Alerts and Status | 500 ms |
| 354 | TAS/TCAS/TCAD Status | 500 ms |
| 357 | Request to Send/End of Transmission | 500 ms |

## ARINC 735 Traffic (GTX 345 Only)

**NOTE**

The GTX forwards any label received on A429 Traffic Input (except intruder file labels). The labels listed only include labels the GTX either generates itself or modifies before forwarding.

**Table A-15 ARINC 735 Traffic Labels**

| Label | Data | Transmission Rate |
|---|---|---|
| 013 | Control Panel Set | [1] |
| 015 | Altitude Select Limits | [1] |
| 016 | TCAS Mode/Sense | [1] |
| 130 | Intruder Range | 500 ms |
| 131 | Intruder Altitude | 500 ms |
| 132 | Intruder Bearing | 500 ms |
| 357 | Request to Send/End of Transmission | 500 ms |

[1] These labels are forwarded when received from a connected TAS/TCAS via the A429 Traffic Input formats. The GTX 345 modifies these labels with data received via HSDB before forwarding.

## BCAS Traffic (GTX 345 Only)

**NOTE**

The GTX forwards any label received on A429 Traffic Input (except intruder file labels). The labels listed above only include labels the GTX either generates itself or modifies before forwarding.

**Table A-16 BCAS Traffic Labels**

| Label | Data | Transmission Rate |
|---|---|---|
| 001 | Request to Send | 500 ms |
| 013 | Control Panel Set | [1] |
| 015 | Altitude Select Limits | [1] |
| 016 | TCAS Mode/Sense | [1] |
| 100 | Intruder Range | 500 ms |
| 101 | Intruder Altitude | 500 ms |
| 102 | Intruder Bearing | 500 ms |
| 103 | Intruder Range | 500 ms |
| 104 | Intruder Altitude | 500 ms |
| 105 | Intruder Bearing | 500 ms |
| 106 | Intruder Range | 500 ms |
| 107 | Intruder Altitude | 500 ms |

| Label | Data | Transmission Rate |
|---|---|---|
| 110 | Intruder Bearing | 500 ms |
| ... | ... | ... |
| 221 | Intruder Range | 500 ms |
| 222 | Intruder Altitude | 500 ms |
| 223 | Intruder Bearing | 500 ms |
| 224 | Intruder Range | 500 ms |
| 225 | Intruder Altitude | 500 ms |
| 226 | Intruder Bearing | 500 ms |
| 227 | Intruder Range | 500 ms |
| 230 | Intruder Altitude | 500 ms |
| 231 | Intruder Bearing | 500 ms |
| 274 [2] | TCAS Output | 500 ms |
| 277 | End of Transmission | 500 ms |
| 313 [3] | Altitude | 500 ms |
| 351 | Transponder Diagnostics | 500 ms |

[1] These labels are forwarded when received from a connected TAS/TCAS via the A429 Traffic Input formats. The GTX 345 modifies these labels with data received in the HSDB packet before forwarding.

[2] If the SSM of the received label 274 (TCAS Output) on Traffic Input is not normal operation, the GTX sets the RI field to "TA only" and the SL field to 0 before forwarding. Otherwise, the GTX will forward this label unaltered.

[3] When pressure altitude is received on traffic input, the GTX forwards the data on the BCAS format in label 313.

# A.4 RS-232 National Marine Electronics Association (NMEA) 0183 Input Format

## A.4.1 Electrical Interface

The input signals are compatible with RS-232C. Data input at 4800 baud with a word length of 8 bits, one stop bit, and no parity.

## A.4.2 General Format

The NMEA 0183 format is used to send GPS data to the GTX 3X5. GPS data received on this interface is not AC 20-165B compliant. Data should be provided a rate of at least 1 Hz. The format consists of three sentences as described in the following sections. The first sentence in a group must be the GPRMC sentence and the last must be the PGRMH sentence. All data fields are ASCII decimal or alphanumeric formats. Data contained within null fields is invalidated. The general format of a sentence is as follows:

<start> <identifier> <sentence data> <checksum> <end>

Where:

| | |
|---|---|
| <start> | $ (Single ASCII character - 0x24) |
| <identifier> | Five ASCII characters (e.g. "GPRMC") followed by a comma |
| <sentence data> | n comma delimited data fields of ASCII decimal or alphanumeric format |

**NOTE**

The last field of sentence data does not have a trailing comma.

<checksum> *xx where xx is the hexadecimal XOR checksum

**NOTE**

The checksum is calculated as the XOR of all bytes between the start of sentence and the checksum as two ASCII characters.

<end><CR><LF> (carriage-return - 0x0D, line-feed - 0x0A)

## A.4.3 Recommended Minimum Data (GPRMC) Sentence Data Format

**Table A-17 GPRMC Sentence Data Format**

| Field Number | Field Data | Format | Description |
|---|---|---|---|
| 1 | UTC Time | hhmmss.ss | hh = Hours from (0, 23)<br>mm = Minutes from 0 to 59)<br>ss = Seconds are from 0 to 60)<br>This field is variable length [1] |
| 2 | Status | a | A = Active<br>V = Void |
| 3 | Latitude | ddmm.mmm | dd = Degrees of latitude<br>mm.mmm = Decimal minutes<br>Latitude is in the range of -90.0 to 90 where positive latitudes are north. Leading zeros are required. The decimal portion of the minutes is variable length but must provide at least two decimal places [1]. |
| 4 | Latitude Hemisphere | a | N = North<br>S = South |
| 5 | Longitude | dddmm.mmm | ddd = Degrees of longitude<br>mm.mmm = Decimal minutes<br>Longitude is in the range of -180.0 to 179.9999 where positive longitudes are east. Leading zeros are required. The decimal portion of the minutes is variable length but must provide at least two decimal places [1]. |
| 6 | Longitude Hemisphere | a | Longitude hemisphere<br>E = East<br>W = West |
| 7 | Ground Speed | dddd.dd | Ground speed in knots from 0 to 999 knots. This field has a variable length [1] |
| 8 | Ground Track | dddd.dd | Ground track in degrees from 0 to 360 degrees. This field has a variable length [1]. |
| 9 | Date | ddmmyy | dd = Day of the current month from 1 to 31<br>mm = Month of the year from 1 to 12<br>yy = Years after the year 2000 from 0 to 99 |
| 10 | Magnetic Variation | [2] | |
| 11 | Magnetic Variation Direction | [2] | |
| 12 | Fix Type | a | N = Acquisition<br>A = Unaugmented 3D position<br>D = Differential 3D position |

[1] Variable length fields are allowed to have leading zeros and trailing zeros. The decimal is optional and may be placed at any location as long as it is not the first or last. The overall length of the field is limited to 14 characters.

[2] This data field is not processed.

### A.4.4 Altitude (PGRMZ) Sentence Data Format

**Table A-18 PGRMZ Sentence Data Format**

| Field Number | Field Data | Format | Description |
|---|---|---|---|
| 1 | Geoid altitude | dddd.dd | Geoid altitude in feet from -99,999.99 meters, 99999.99 meters. A sign character is only allowed for negative altitudes. This field is variable length [1]. |
| 2 | Geoid altitude units | [2] | N/A |
| 3 | Fix type | d | 1 = Invalid<br>2-3 = Valid<br>All other values are considered valid. |

[1] Variable length fields are allowed to have leading zeros and trailing zeros. The decimal is optional and may be placed at any location as long as it is not the first or last. The overall length of the field is limited to 14 characters.

[2] This data field is not processed.

### A.4.5 Aviation Height and VNAV Data (PGRMH) Sentence Data Format

**Table A-19 PGRMH Sentence Data Format**

| Field Number | Field Data | Format | Description |
|---|---|---|---|
| 1 | Status | a | A = Active<br>V = Void |
| 2 | Vertical Speed | dddd.dd | Vertical speed in fpm from -99999.99 fpm to 99999.99 fpm. A sign character is only allowed for negative altitudes. This field is variable length [1]. |
| 3 | VNAV Profile Error | [2] | N/A |
| 4 | Vertical Speed to VNAV Target | [2] | N/A |
| 5 | Vertical Speed to Next Target | [2] | N/A |
| 6 | Approximate Height Above Terrain | [2] | N/A |
| 7 | Desired Track | [2] | N/A |
| 8 | Course of Next Route Leg | [2] | N/A |

[1] Variable length fields are allowed to have leading zeros and trailing zeros. The decimal is optional and may be placed at any location as long as it is not the first or last. The overall length of the field is limited to 14 characters.

[2] This data field is not processed.

# A.5 RS-232 Aviation Input Format

## A.5.1 Electrical Interface

The input signals are compatible with RS-232C. Data input at 9600 baud with a word length of 8 bits, one stop bit, and no parity.

## A.5.2 General Format

The Aviation input format is used to send GPS data to the GTX 3X5. GPS data received on this interface is not AC 20-165B compliant. Data should be provided a rate of at least 1 Hz. The format consists of a single sentence containing multiple messages as described in the following sections. The "z" message is optional but, if provided, it must be the first message in the sentence. The order of messages in a sentence must be "z" (optional), "A," "B,", "C," "D." The general format of a sentence is as follows:

<start><id><msg><it><id><msg><it>…<id><msg><it><end>

Where:

<start> STX (start-transmit - 0x02)

<id> The message designator character (e.g. z)

<msg> The message data (refer to the following sections for format)

<it> Message terminator

**NOTE**

If the "z" message is provided, the message terminator is <CR><LF> (carriage-return - 0x0D, line-feed - 0x0A) for all messages. If the "z" message is not provided, the message terminator is <CR> (carriage-return - 0x0D) for all messages.

<end> ETX (end-transmit - 0x03)

## A.5.3 Geoid Altitude Data (z) Message Data Format

**Table A-20 Geoid Altitude Data Message Format**

| Byte | Size in Bytes | Format | Description |
|---|---|---|---|
| 0:4 | 5 | ASCII | Geoid altitude in feet. Only positive Geoid altitudes are supported. |

## A.5.4 Latitude Data (A) Message Data Format

**Table A-21 Latitude Data Message Data Format**

| Byte | Size in Bytes | Format | Description |
|---|---|---|---|
| 0:8 | 9 | ASCII | Latitude, s dd mmmm format<br>s = N/S, for northern or southern latitudes<br>dd = degrees of latitude<br>mmmm = hundredths minutes of latitude |

### A.5.5 Longitude Data (B) Message Data Format

**Table A-22 Longitude Data Message Data Format**

| Byte | Size in Bytes | Format | Description |
|---|---|---|---|
| 0:9 | 10 | ASCII | Longitude, s ddd mmmm format<br>s = E/W, for eastern or western longitudes<br>ddd = degrees of longitude<br>mmmm = hundredths minutes of longitude |

### A.5.6 Ground Track Data (C) Message Data Format

**Table A-23 Ground Track Data Message Data Format**

| Byte | Size in Bytes | Format | Description |
|---|---|---|---|
| 0:3 | 3 | ASCII | Ground track in degrees from 0 through 359 |

### A.5.7 Ground Speed Data (D) Message Data Format

**Table A-24 Ground Speed Data Message Data Format**

| Byte | Size in Bytes | Format | Description |
|---|---|---|---|
| 0:3 | 3 | ASCII | Ground speed in knots |

# Appendix B GTX 3X5 Mechanical Drawings

## NON-DIVERSITY UNITS



## DIVERSITY UNITS

## NON-DIVERSITY UNITS

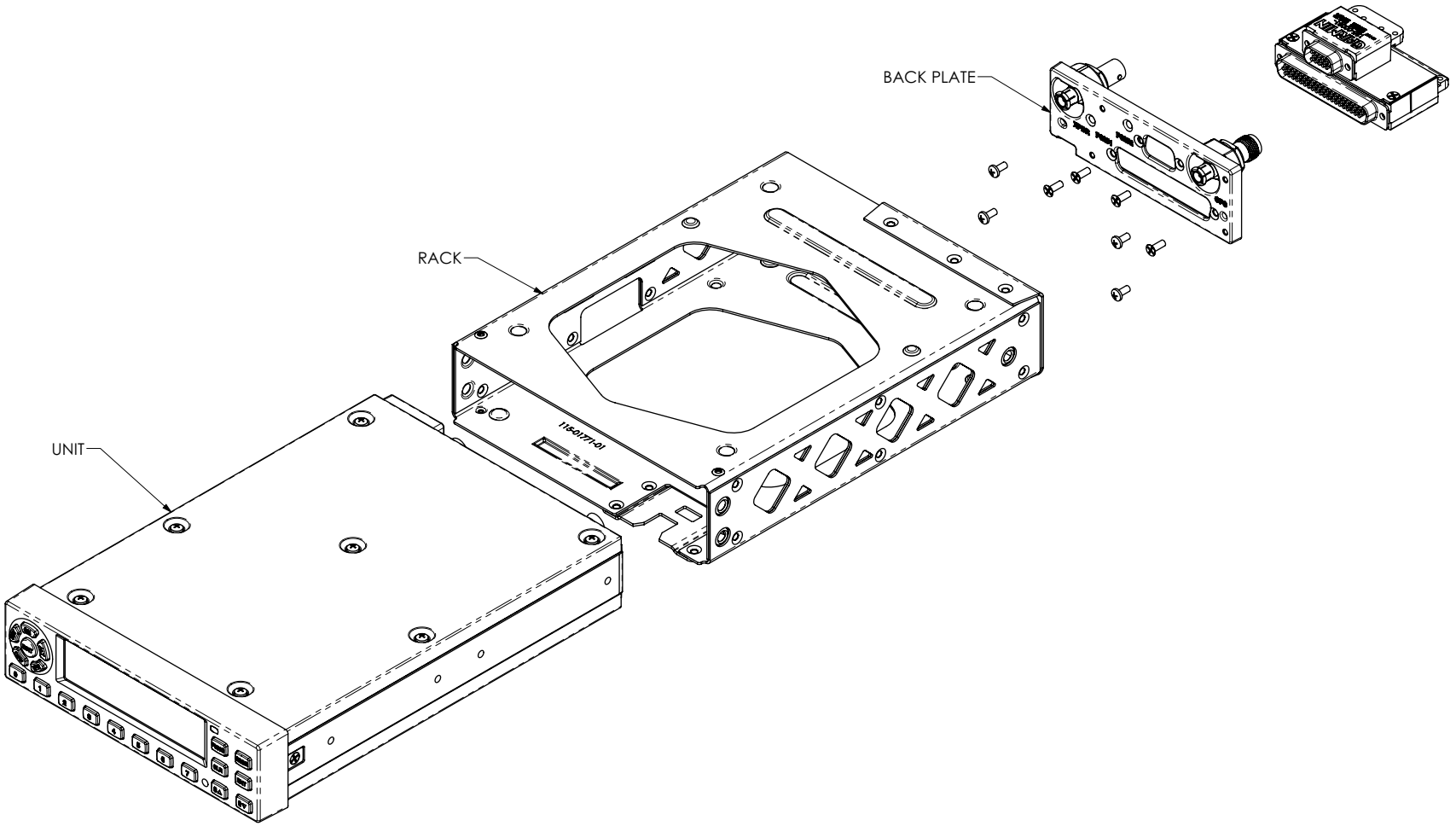



**Figure B-1 GTX 3X5 GPS Panel Mount Assembly**

For unit part numbers and kit contents refer to table 3-1. For part numbers of supplied accessories refer to table 3-2.

| UNIT DESCRIPTION | Dim A - inch (mm) | Dim B - inch (mm) | Dim C - inch (mm) |
|---|---|---|---|
| GTX 325 | 4.5 (114) | 3.2 (81) | 0.8 (20) |
| GTX 335 | 4.5 (114) | 3.2 (81) | 0.8 (20) |
| GTX 335 NV | 4.5 (114) | 3.2 (81) | 0.8 (20) |
| GTX 335, GPS | 4.5 (114) | 3.2 (81) | 0.8 (20) |
| GTX 345 | 4.7 (119) | 3.0 (76) | 0.8 (20) |
| GTX 345 NV | 4.7 (119) | 3.0 (76) | 0.8 (20) |
| GTX 345, GPS | 4.6 (117) | 3.0 (76) | 0.8 (20) |
| GTX 345 NV, GPS | 4.6 (117) | 3.0 (76) | 0.8 (20) |

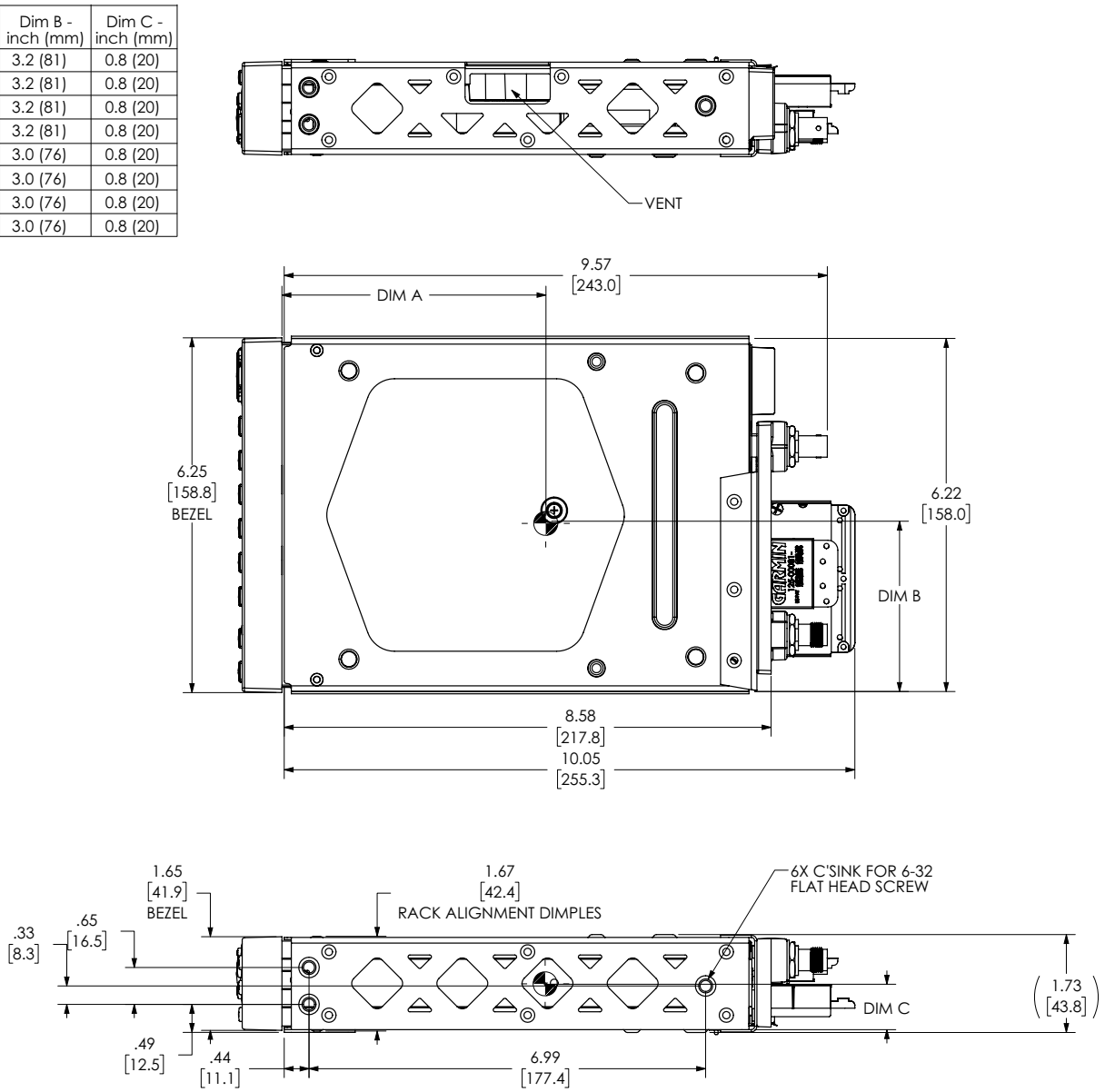



**Figure B-2 GTX 3X5 GPS Panel Mount Dimensions and Center of Gravity**

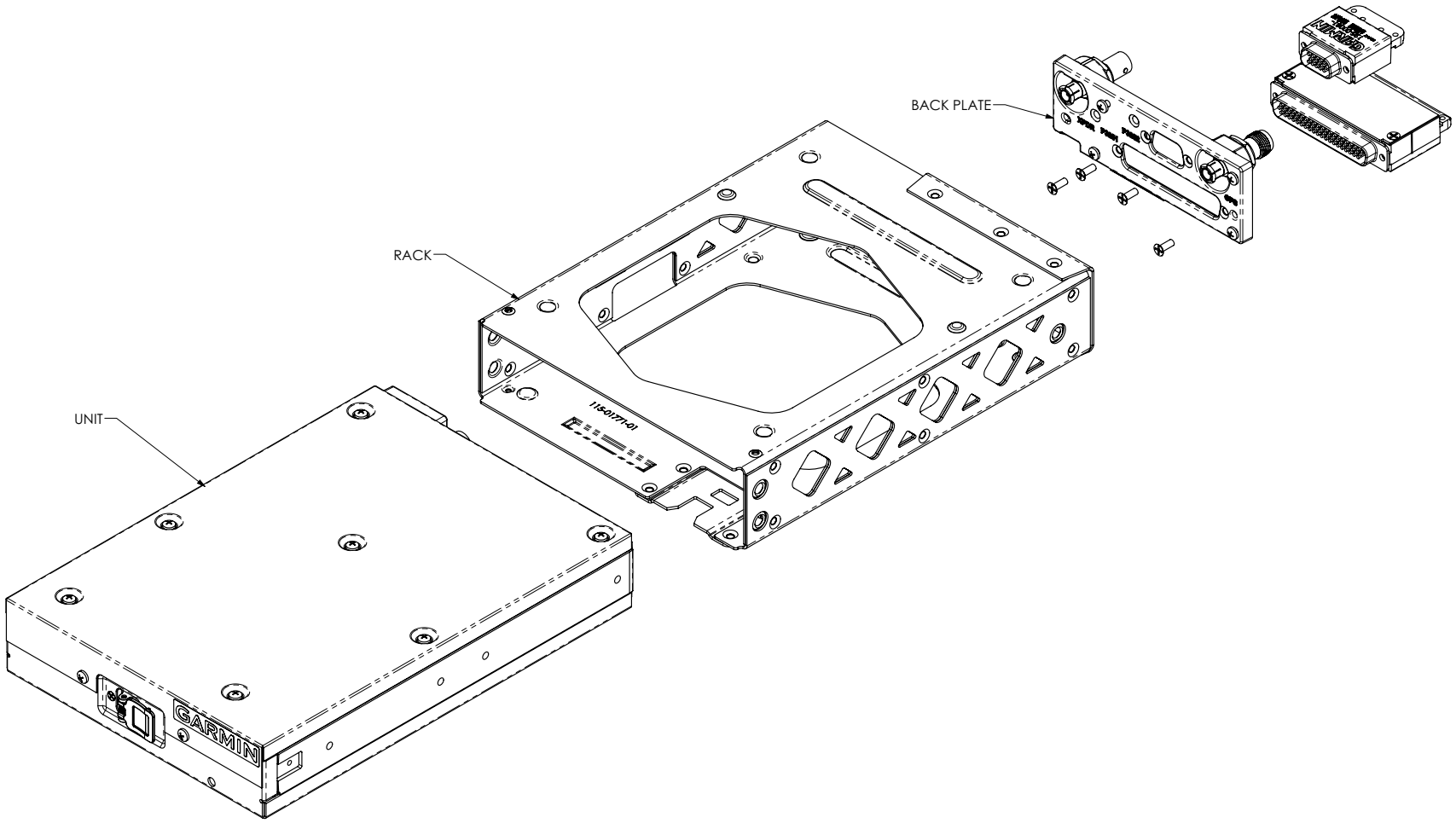



**Figure B-3 GTX 3X5R GPS Standard Remote Mount Assembly**

For unit part numbers and kit contents refer to table 3-1. For part numbers of supplied accessories refer to table 3-2.

| UNIT DESCRIPTION | Dim A - inch (mm) | Dim B - inch (mm) | Dim C - inch (mm) |
|---|---|---|---|
| GTX 335R | 4.8 (120) | 3.3 (84) | 0.8 (20) |
| GTX 335R, GPS | 4.9 (124) | 3.2 (81) | 0.8 (20) |
| GTX 345R | 5.0 (127) | 3.0 (76) | 0.8 (20) |
| GTX 345R, GPS | 5.0 (127) | 3.1 (79) | 0.8 (20) |

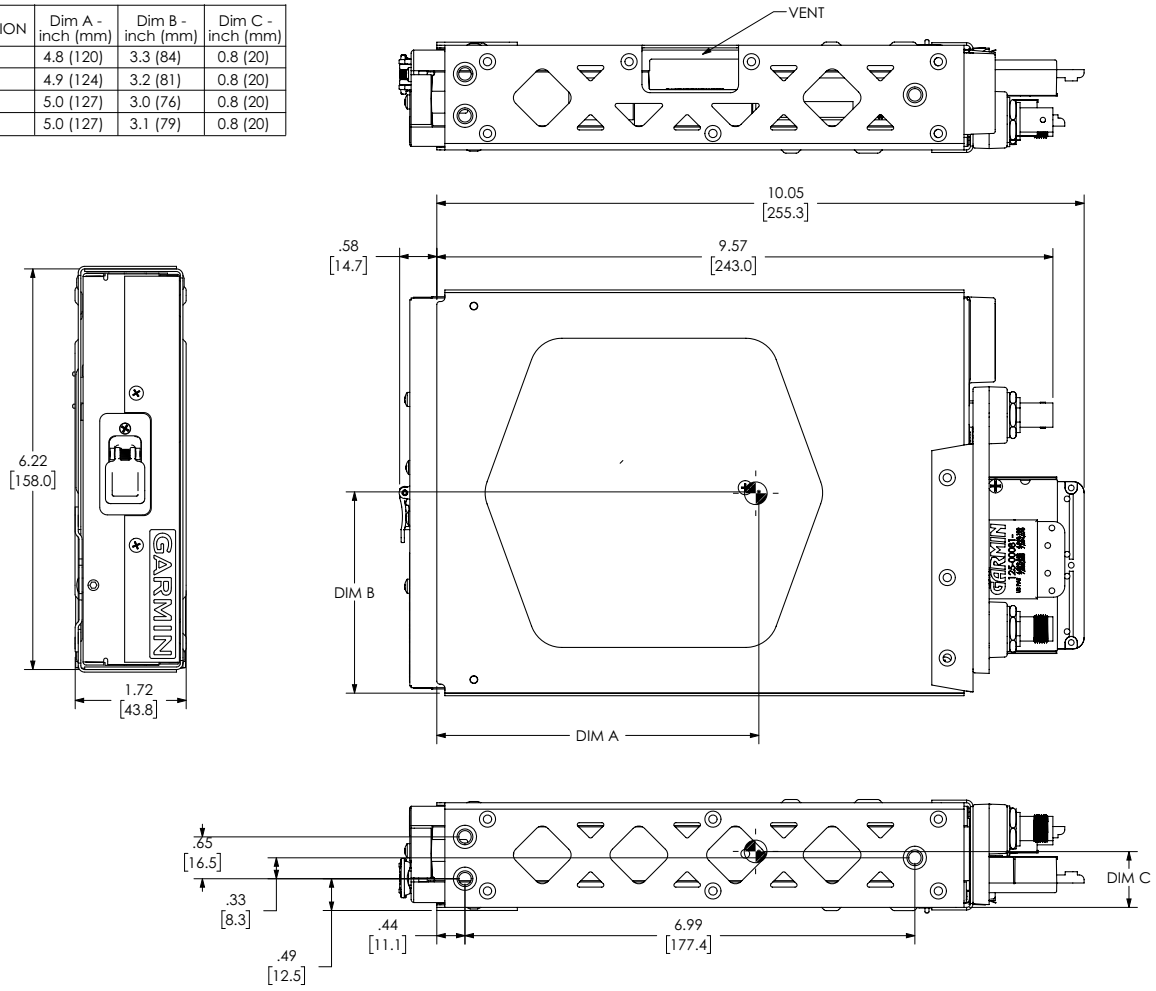



**Figure B-4 GTX 3X5R GPS Standard Remote Mount Dimensions and Center of Gravity**

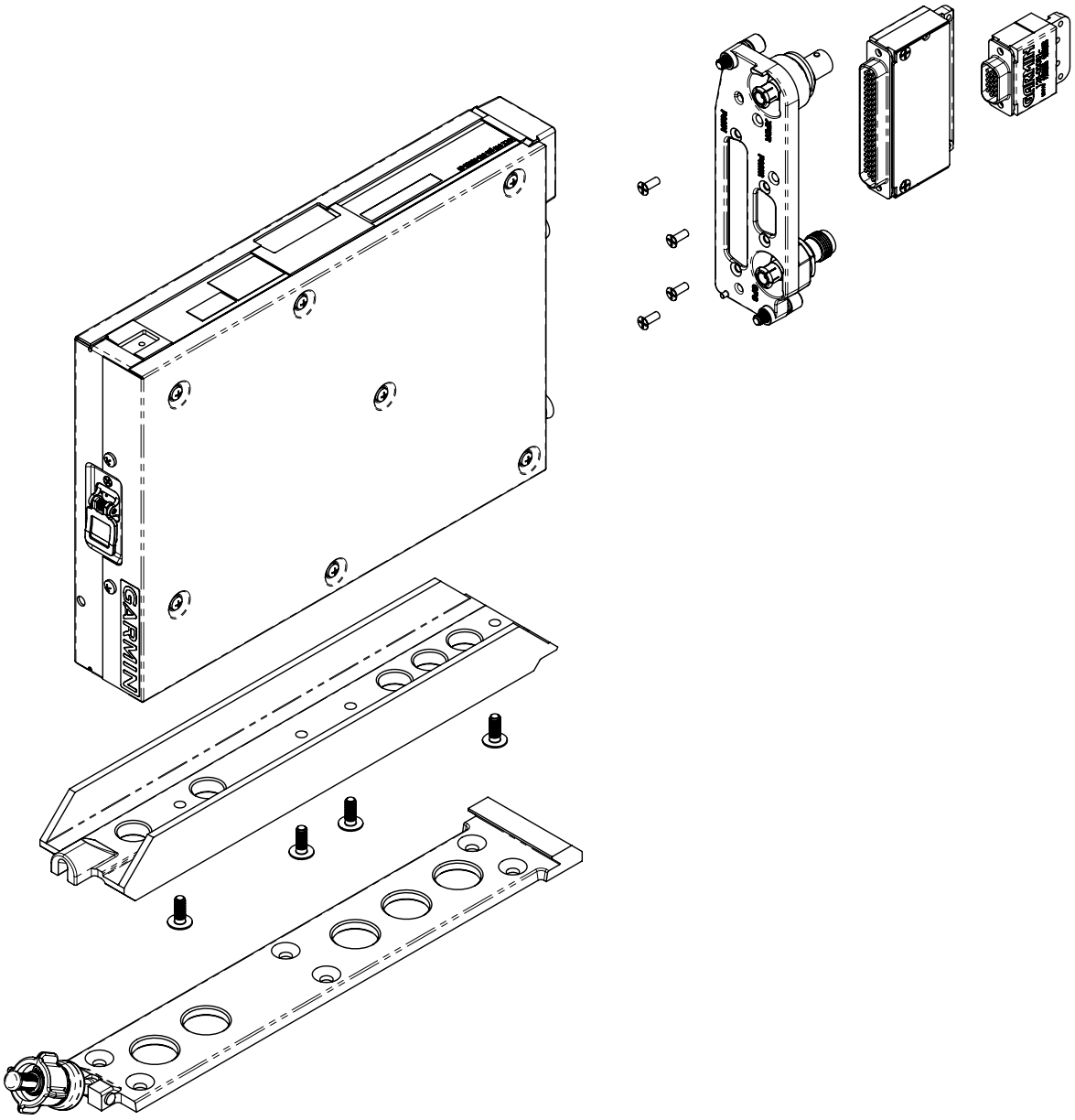



**Figure B-5 GTX 3X5 Vertical Remote Mount Assembly**

For unit part numbers and kit contents refer to table 3-1. For part numbers of supplied accessories refer to table 3-2.

| UNIT DESCRIPTION | Dim A - inch (mm) | Dim B - inch (mm) | Dim C - inch (mm) |
|---|---|---|---|
| GTX 335R | 5.5 (140) | 2.7 (69) | 1.0 (25) |
| GTX 335R, GPS | 5.5 (140) | 2.8 (71) | 0.9 (23) |
| GTX 345R | 5.6 (142) | 2.7 (69) | 0.9 (23) |
| GTX 345R, GPS | 5.6 (142) | 2.7 (69) | 0.9 (23) |

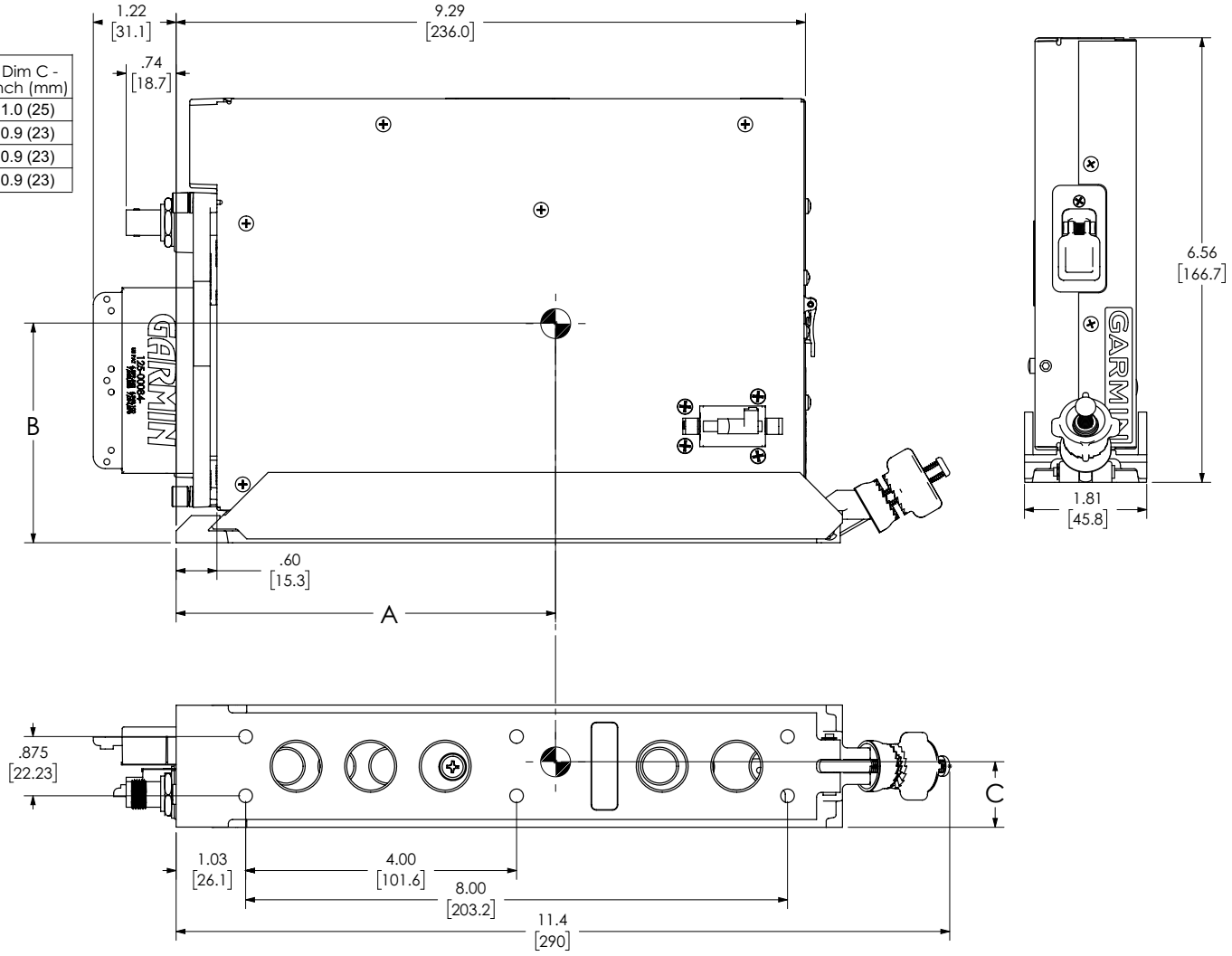



**Figure B-6 GTX 3X5 Vertical Remote Mount Dimensions and Center of Gravity**

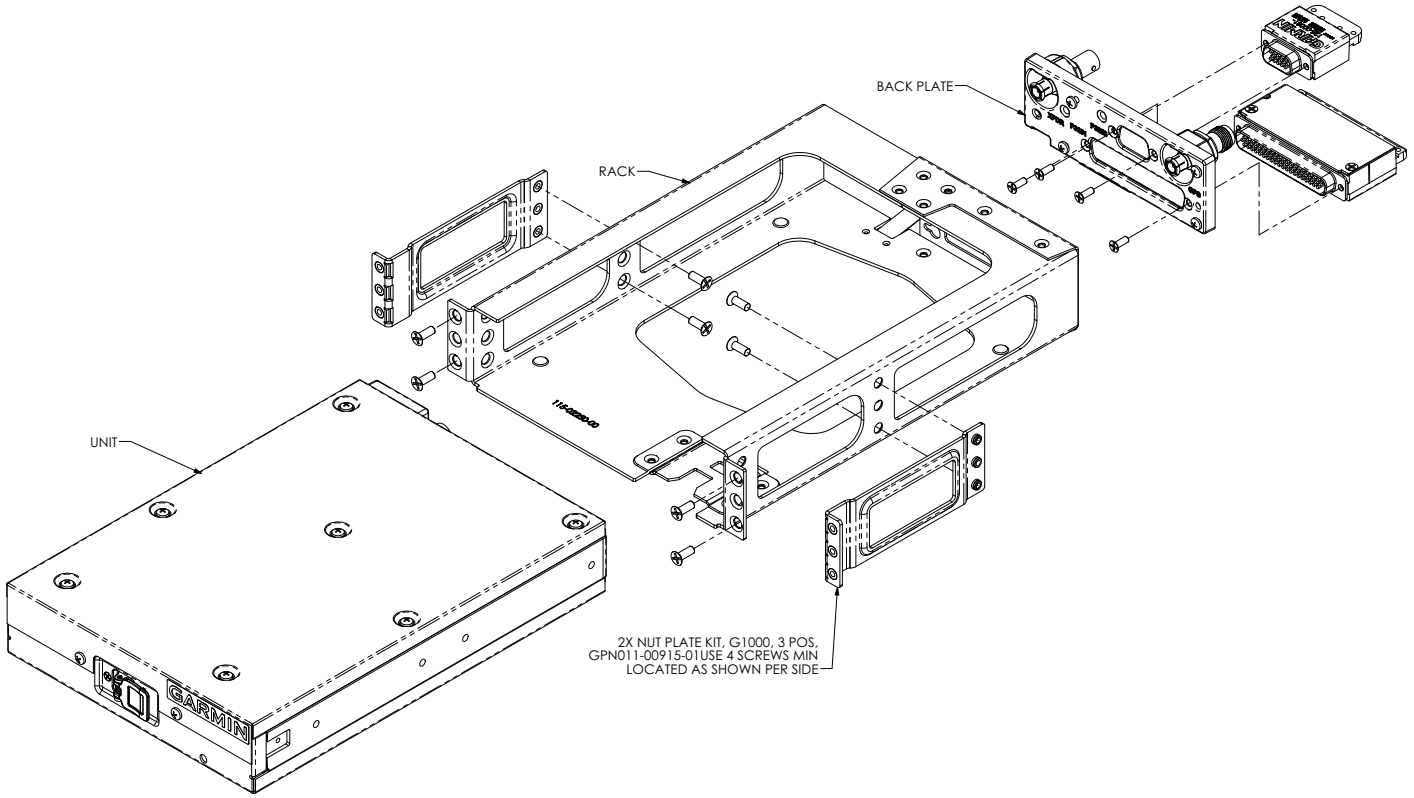



**Figure B-7 GTX 3X5R GPS G1000 Mount Rack Assembly**

For unit part numbers and kit contents refer to table 3-1. For part numbers of supplied accessories refer to table 3-2.

| UNIT DESCRIPTION | Dim A - inch (mm) | Dim B - inch (mm) | Dim C - inch (mm) |
|---|---|---|---|
| GTX 335R | 5.3 (135) | 3.2 (81) | 0.7 (18) |
| GTX 335R, GPS | 5.3 (135) | 3.2 (81) | 0.8 (20) |
| GTX 345R | 5.4 (137) | 3.0 (76) | 0.8 (20) |
| GTX 345R, GPS | 5.4 (137) | 3.1 (79) | 0.8 (20) |

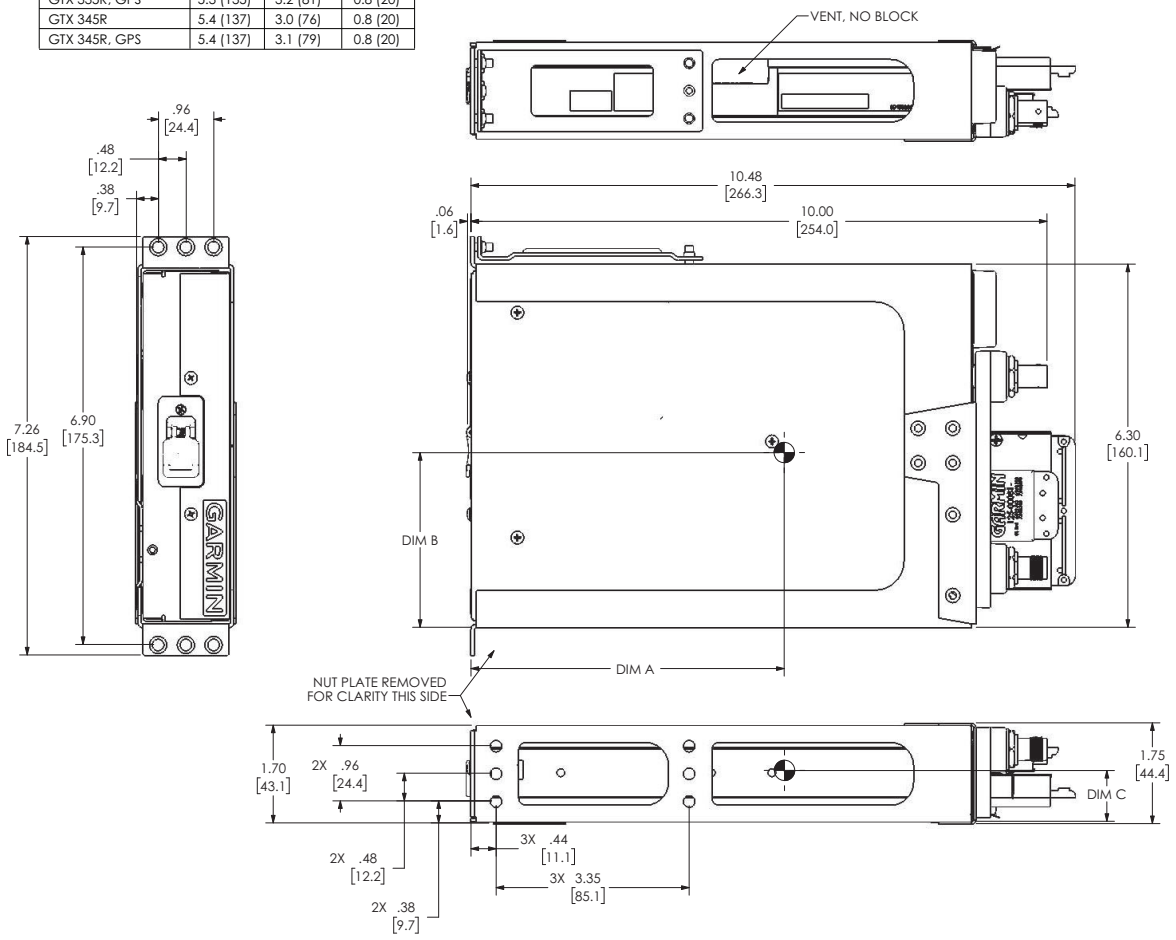
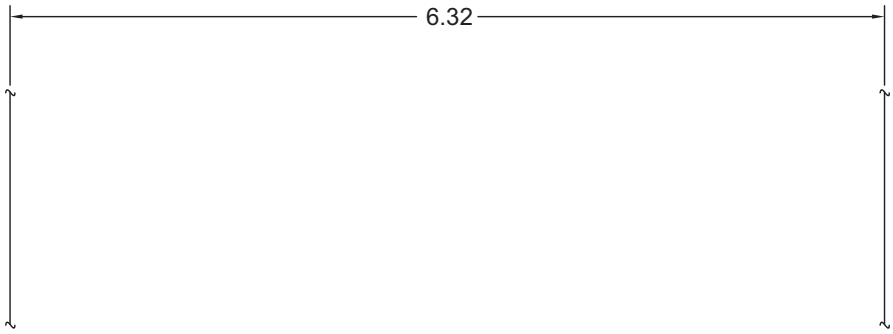
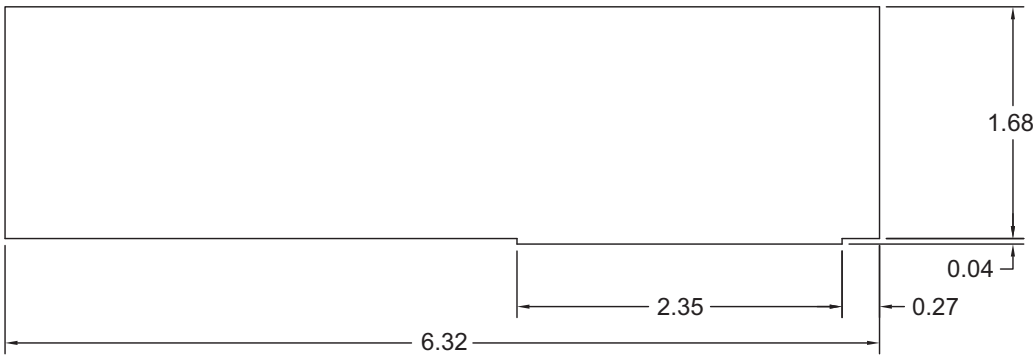



**Figure B-8 GTX 3X5R GPS G1000 Mounting Rack Dimensions and Center of Gravity**




SUGGESTED STACK DIMENSION OPTION #1




SUGGESTED PANEL CUTOUT OPTION #2

NOTES - BOTH OPTIONS
1. DIMENSIONS ARE IN INCHES
2. IF THE FRONT LIP OF THE MOUNTING RACK IS BEHIND THE SURFACE OF THE AIRCRAFT INSTRUMENT PANEL, THE UNIT CONNECTORS MAY NOT FULLY ENGAGE.

**Figure B-9 GTX 3X5 Panel Cutout Detail**

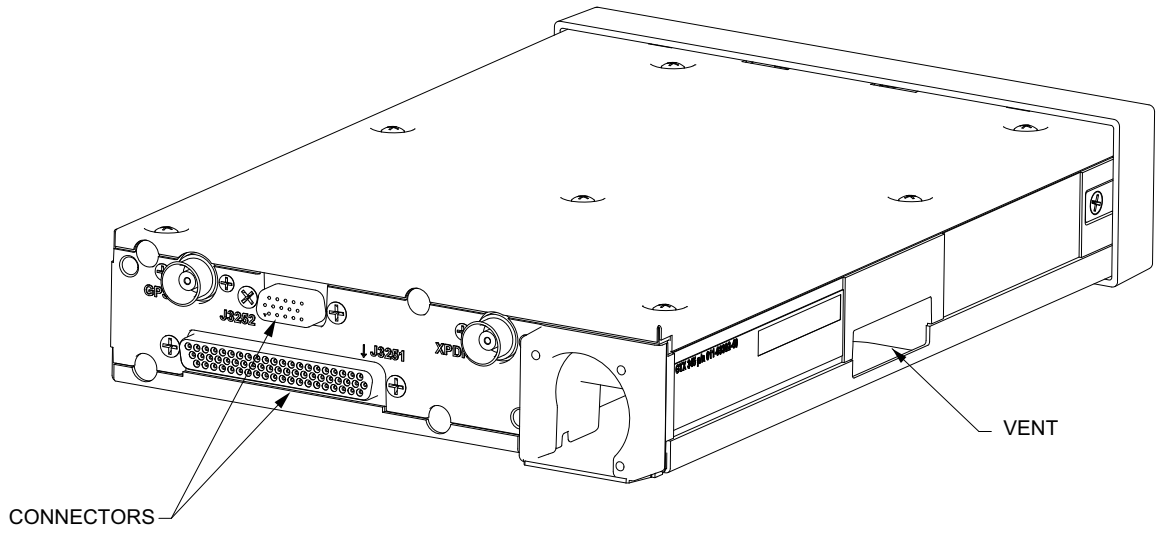



**Figure B-10 GTX 3X5 Connectors and Vent Locations**

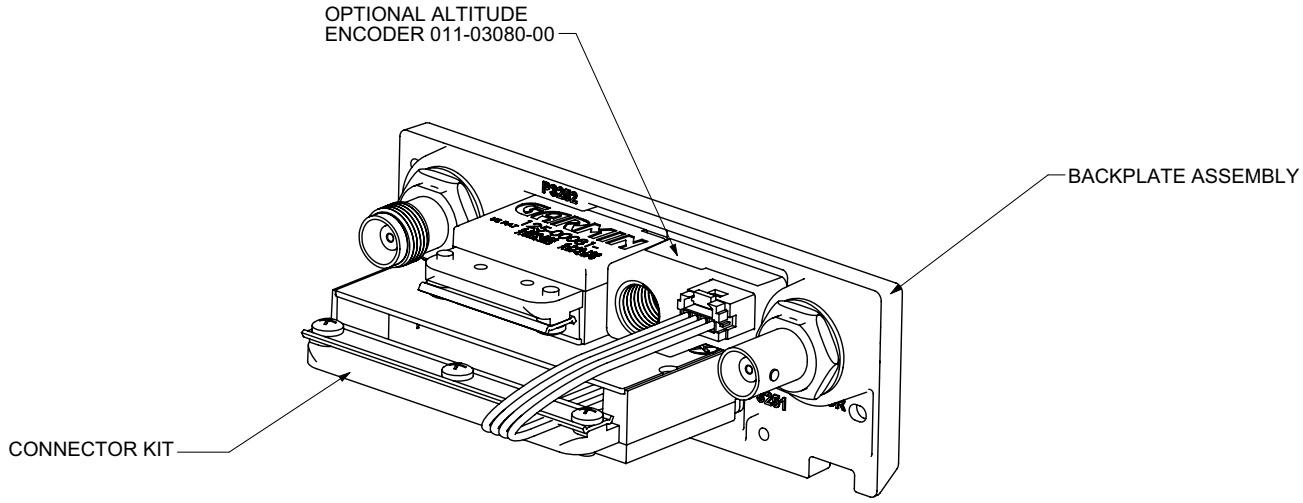



**Figure B-11 Backplate, Connector Kit, and Optional Altitude Encoder**

## DIVERSITY UNITS

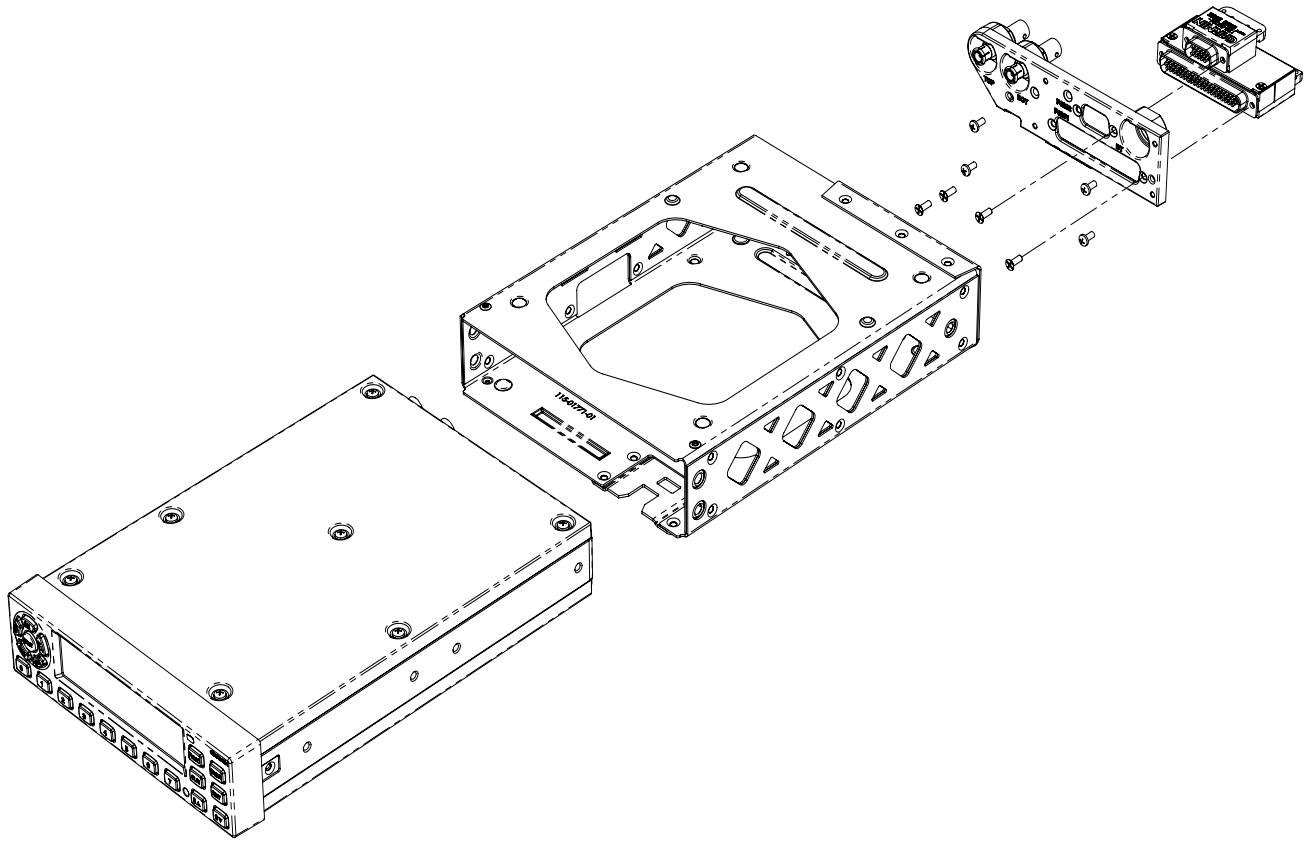


**Figure B-12 GTX 335D/345D Panel Mount Assembly**

For unit part numbers and kit contents refer to table 3-1. For part numbers of supplied accessories refer to table 3-2.

| UNIT DESCRIPTION | Dim A - inch (mm) | Dim B - inch (mm) | Dim C - inch (mm) |
|---|---|---|---|
| GTX 335D | 4.6 (118) | 3.2 (81) | 0.8 (21) |
| GTX 345D | 4.6 (118) | 3.2 (81) | 0.8 (19) |

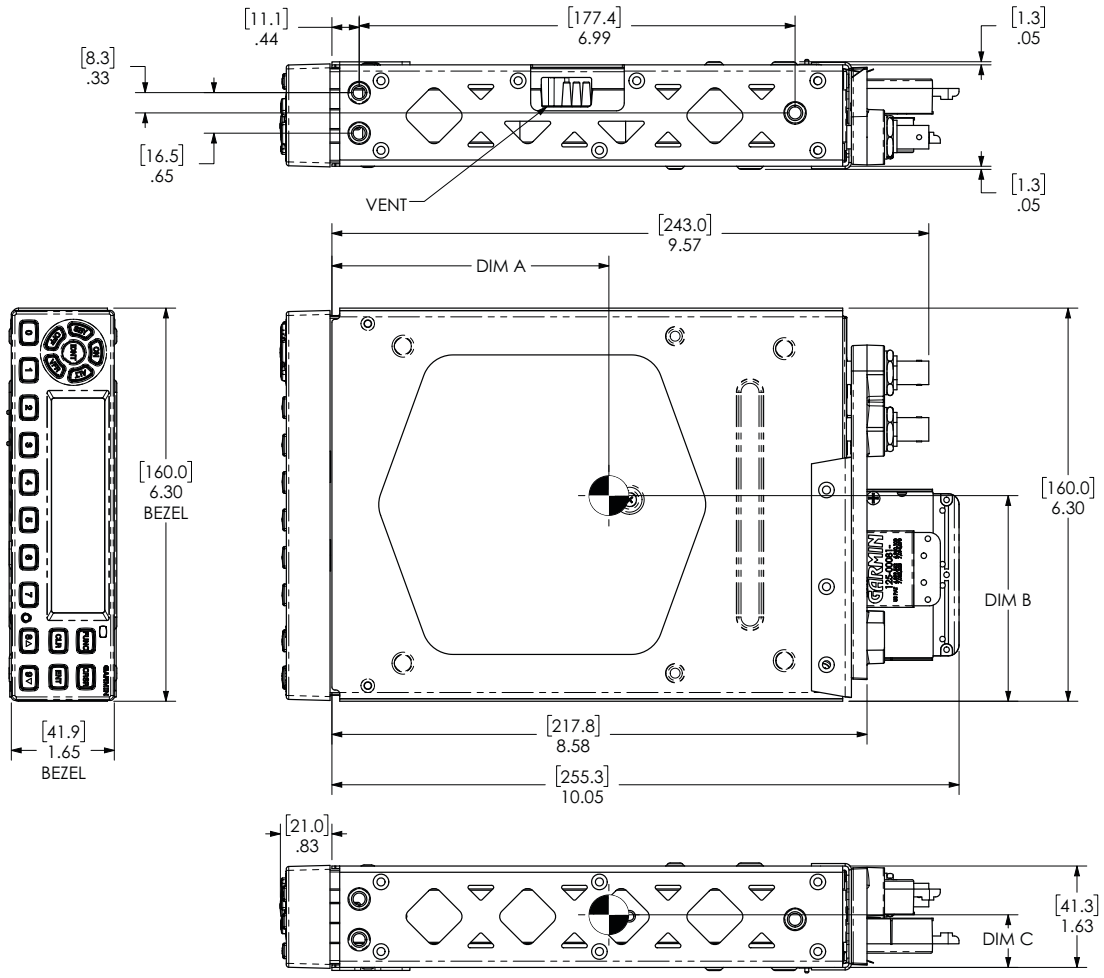



**Figure B-13 GTX 335D/345D Panel Mount Dimensions and Center of Gravity**

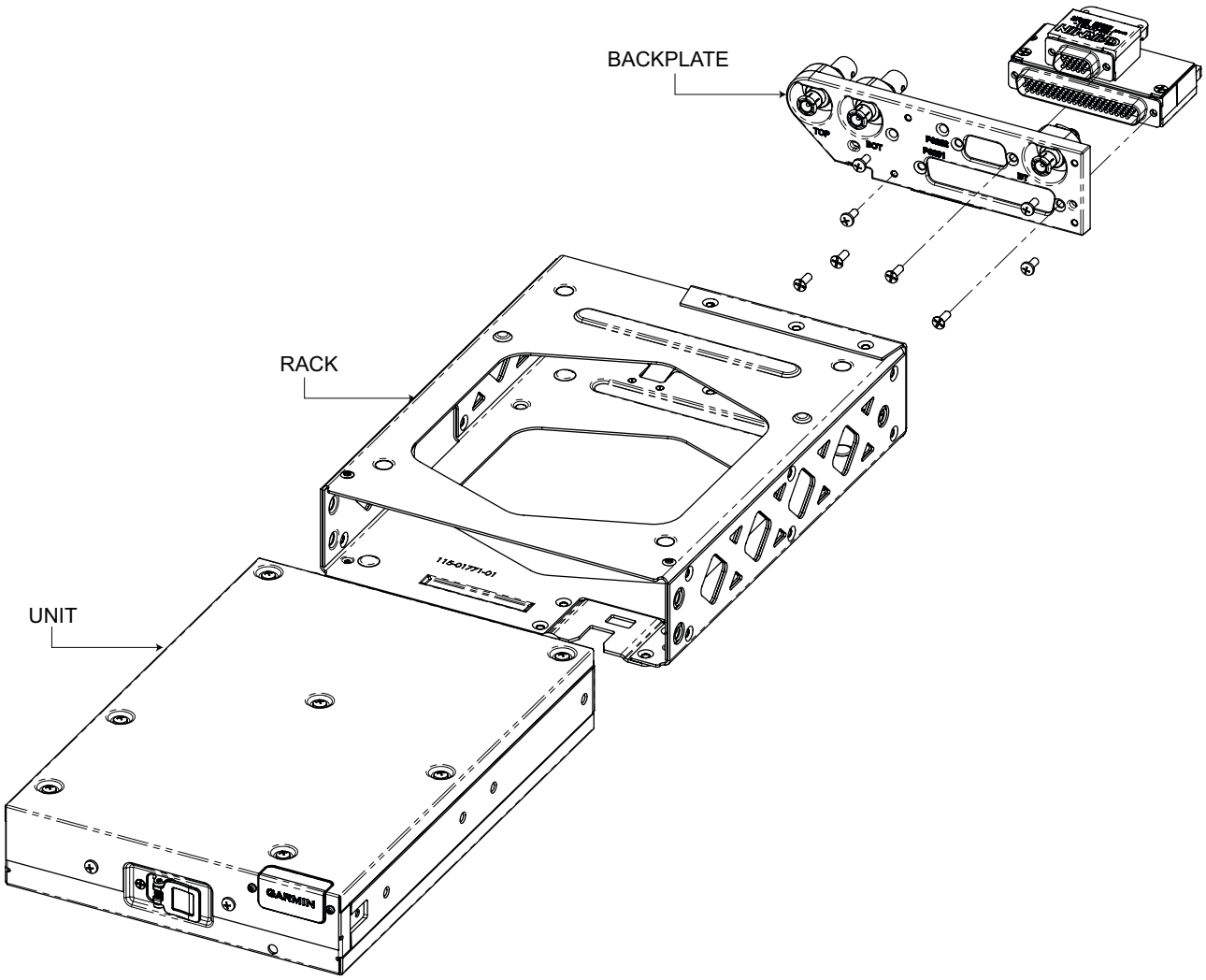



**Figure B-14 GTX 335DR/345DR Standard Remote Mount Assembly**

For unit part numbers and kit contents refer to table 3-1. For part numbers of supplied accessories refer to table 3-2.

| UNIT DESCRIPTION | Dim A - inch (mm) | Dim B - inch (mm) | Dim C - inch (mm) |
|---|---|---|---|
| GTX 335DR | 4.9 (125) | 3.3 (84) | 0.8 (20) |
| GTX 345DR | 4.9 (125) | 3.2 (81) | 0.8 (21) |

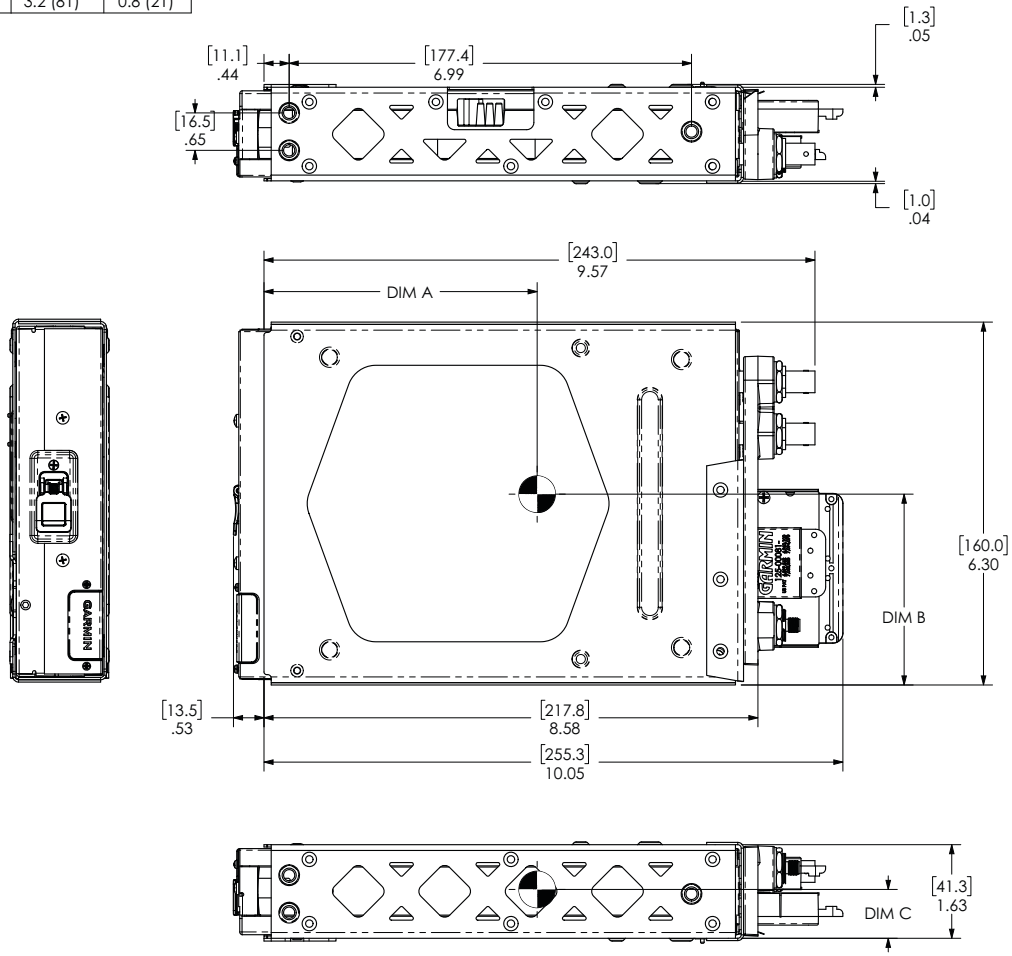



**Figure B-15 GTX 335DR/345DR Standard Remote Mount Dimensions and Center of Gravity**

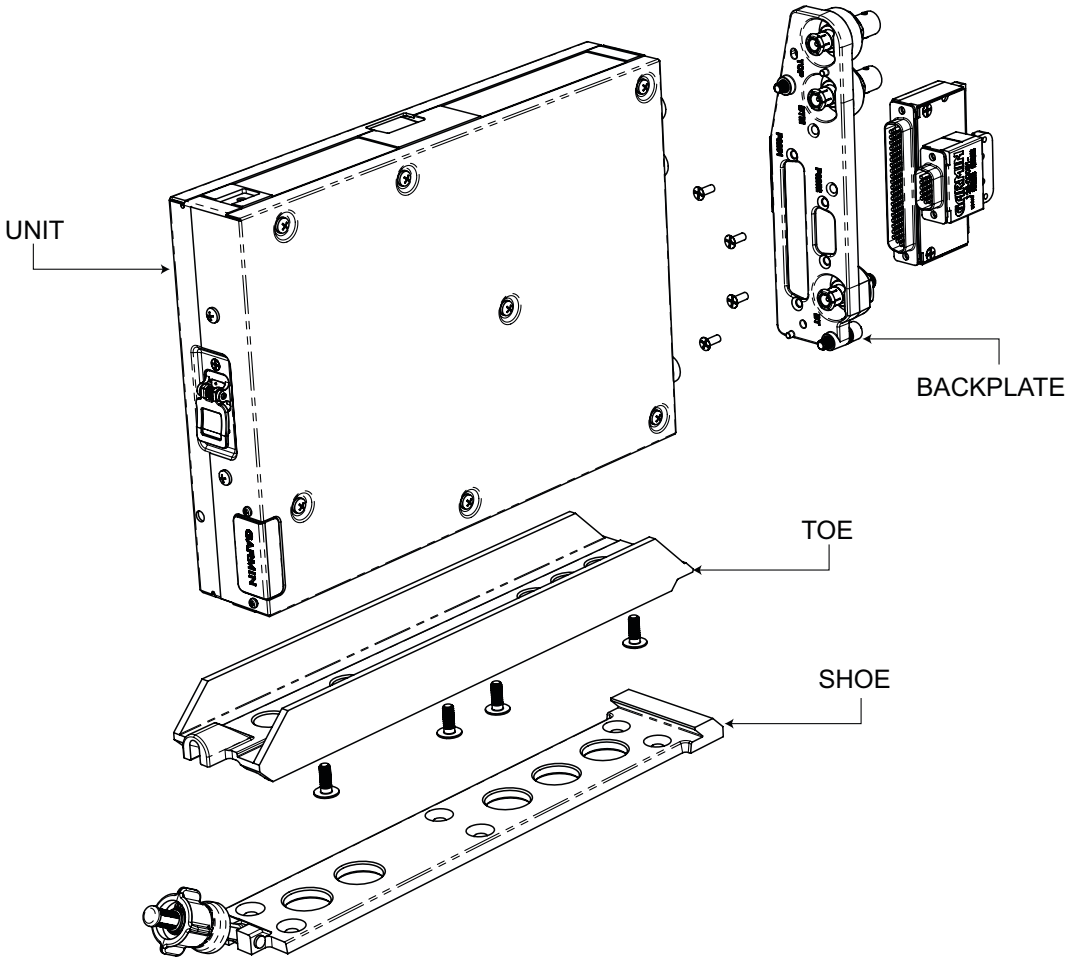



**Figure B-16 GTX 335DR/345DR Vertical Remote Mount Assembly**

For unit part numbers and kit contents refer to table 3-1. For part numbers of supplied accessories refer to table 3-2.

| UNIT DESCRIPTION | Dim A - inch (mm) | Dim B - inch (mm) | Dim C - inch (mm) |
|---|---|---|---|
| GTX 335DR | 4.4 (113) | 2.9 (74) | 0.8 (21) |
| GTX 345DR | 4.3 (108) | 2.9 (73) | 0.9 (22) |

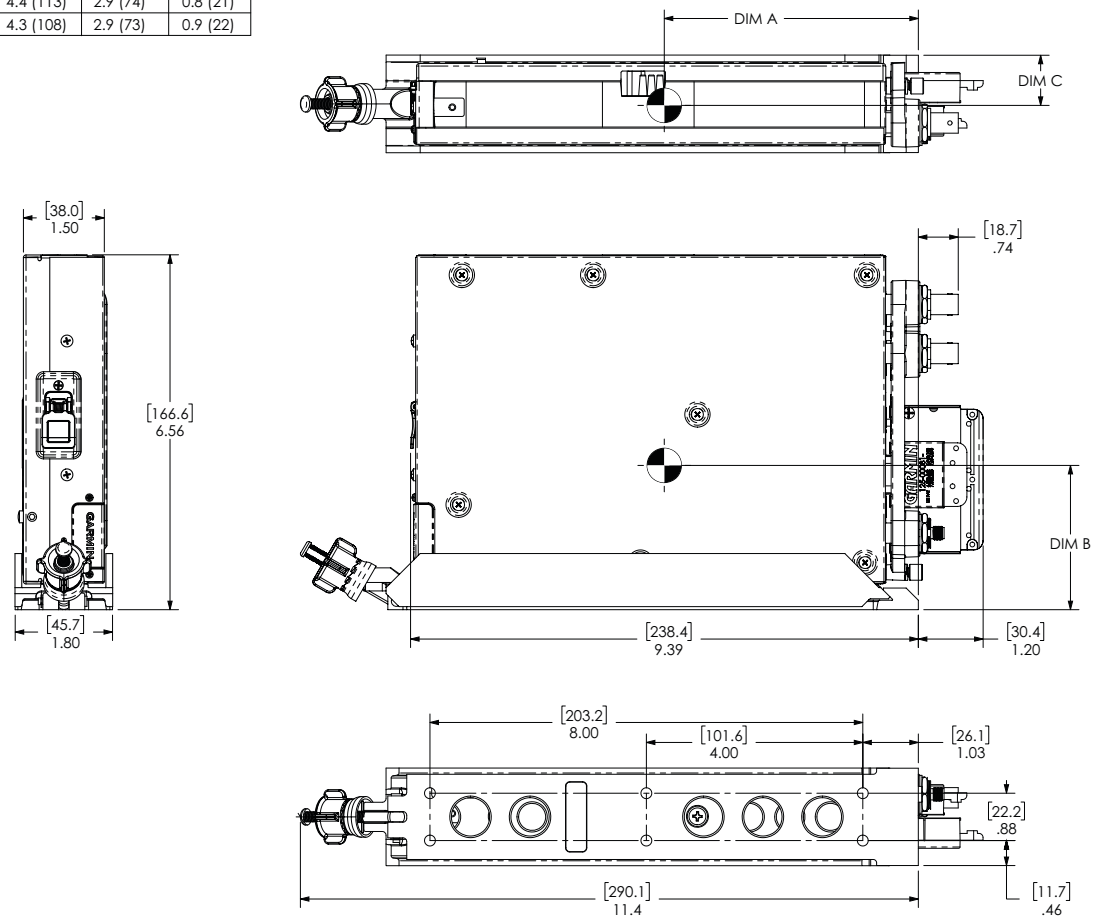



**Figure B-17 GTX 335DR/345DR Vertical Mount Dimensions and Center of Gravity**

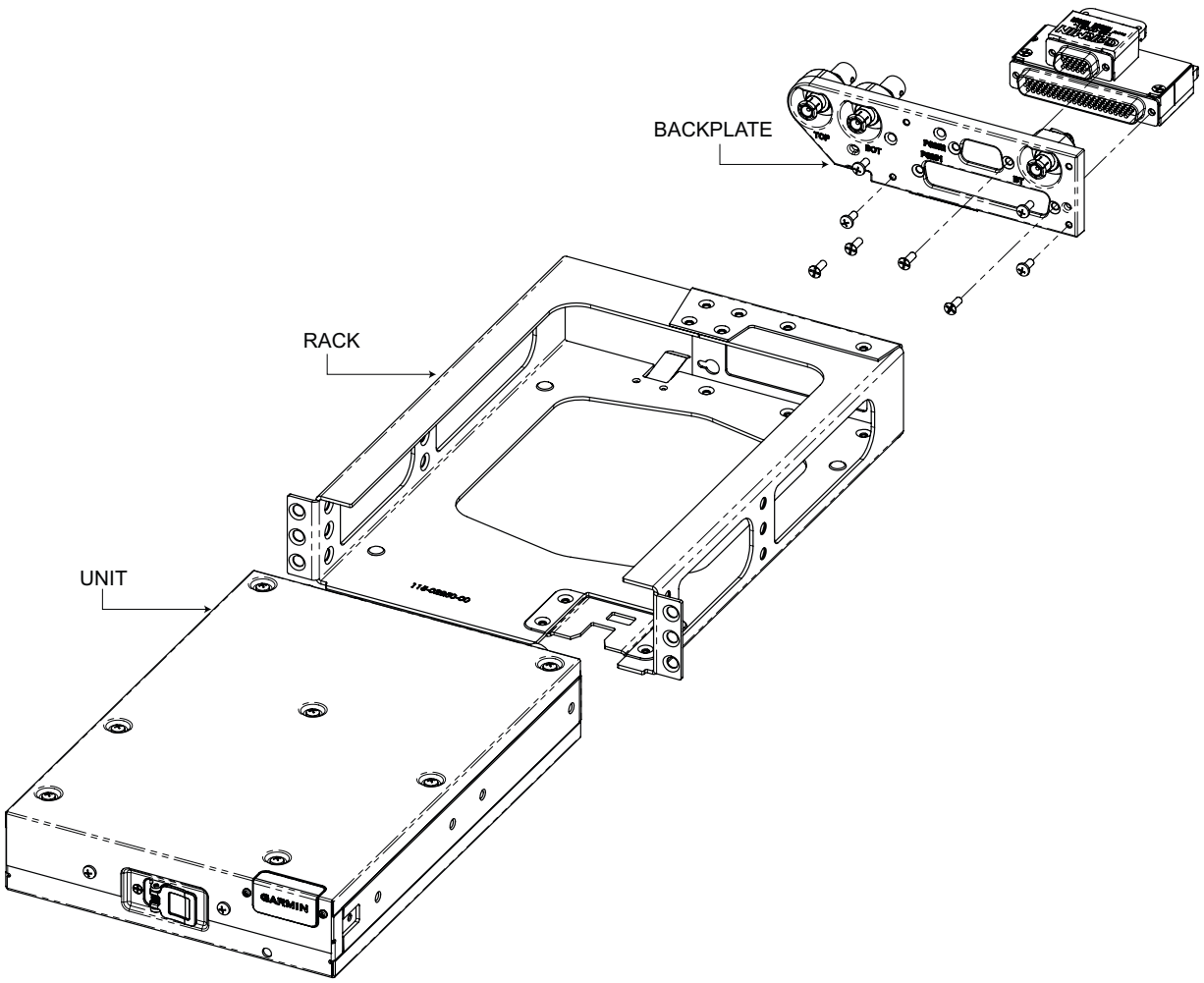



**Figure B-18 GTX 335DR/345DR G1000 Mount Rack Assembly**

For unit part numbers and kit contents refer to table 3-1. For part numbers of supplied accessories refer to table 3-2.

| UNIT DESCRIPTION | Dim A - inch (mm) | Dim B - inch (mm) | Dim C - inch (mm) |
|---|---|---|---|
| GTX 335DR | 5.0 (127) | 3.3 (84) | 0.8 (20) |
| GTX 345DR | 5.2 (133) | 3.1 (80) | 0.8 (21) |

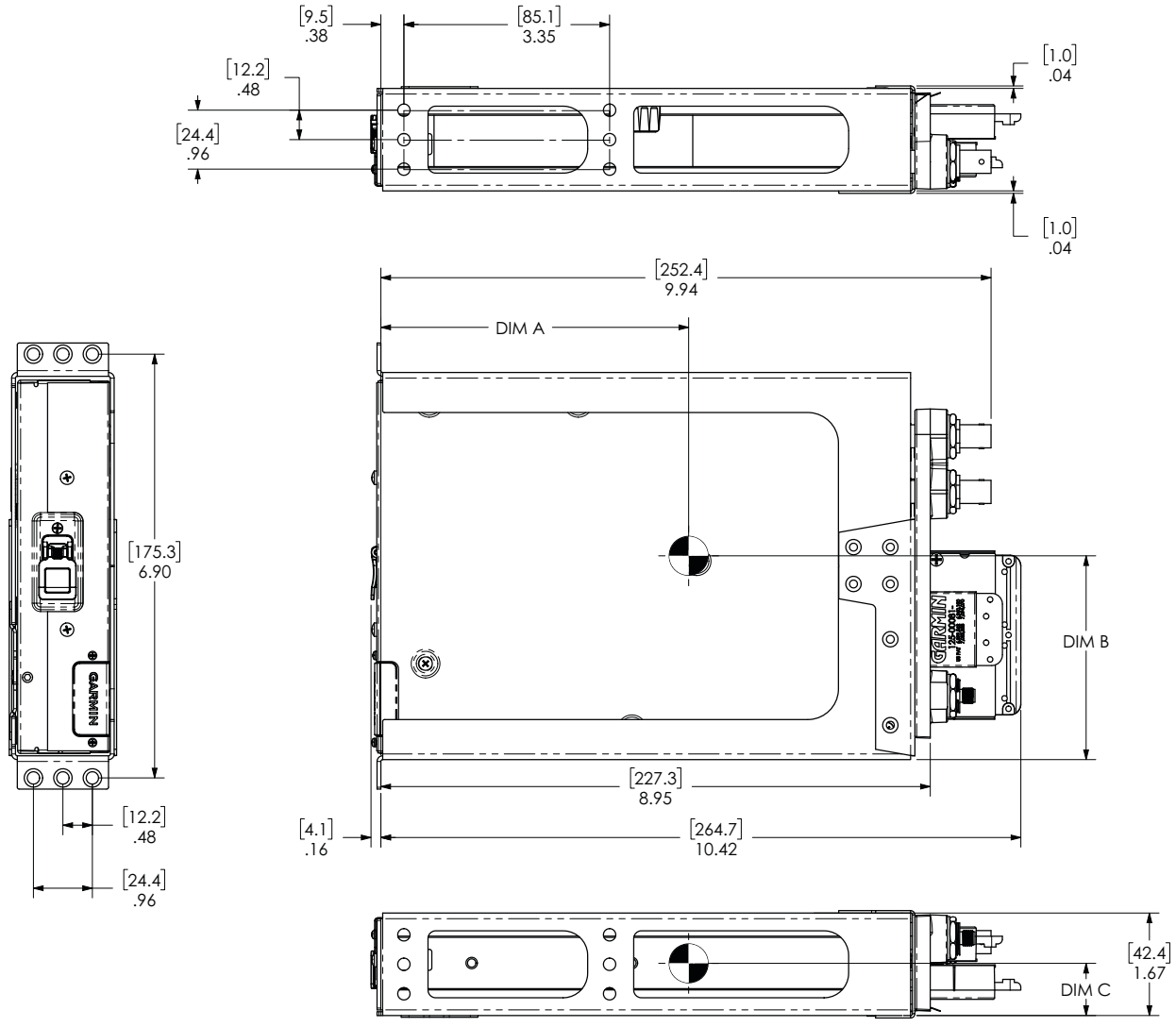



**Figure B-19 GTX 335DR/345DR G1000 Mounting Rack Dimensions and Center of Gravity**

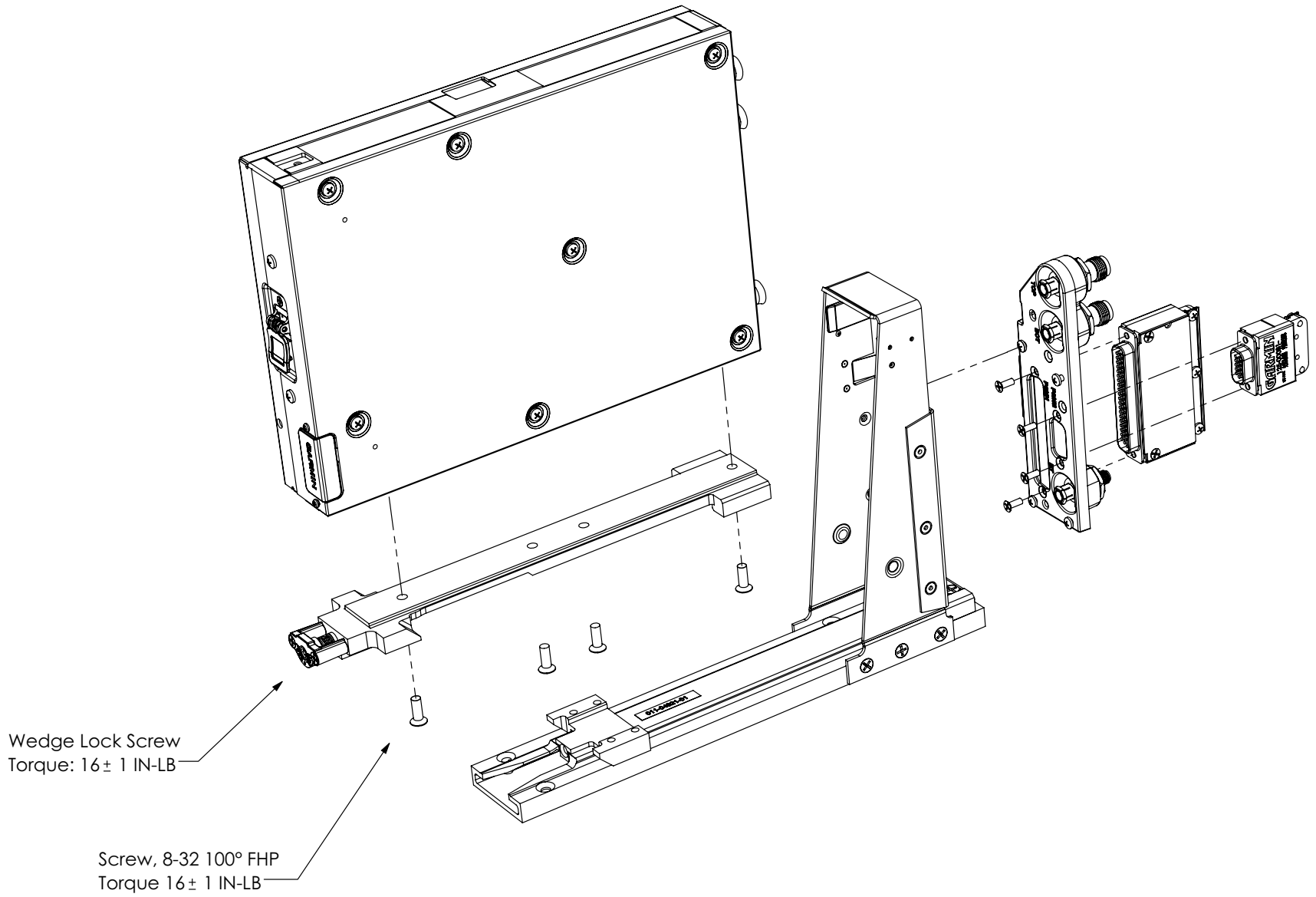



**Figure B-20 GTX 335DR/345DR Hi-Vib Vertical Remote Mount Assembly**

For unit part numbers and kit contents refer to table 3-1. For part numbers of supplied accessories refer to table 3-2.

| UNIT DESCRIPTION | Dim A - inch (mm) | Dim B - inch (mm) | Dim C - inch (mm) |
|---|---|---|---|
| GTX 335DR | 5.5 (140) | 3.2 (81) | 0.7 (18) |
| GTX 345DR | 6.0 (152) | 3.4 (86) | 0.9 (23) |

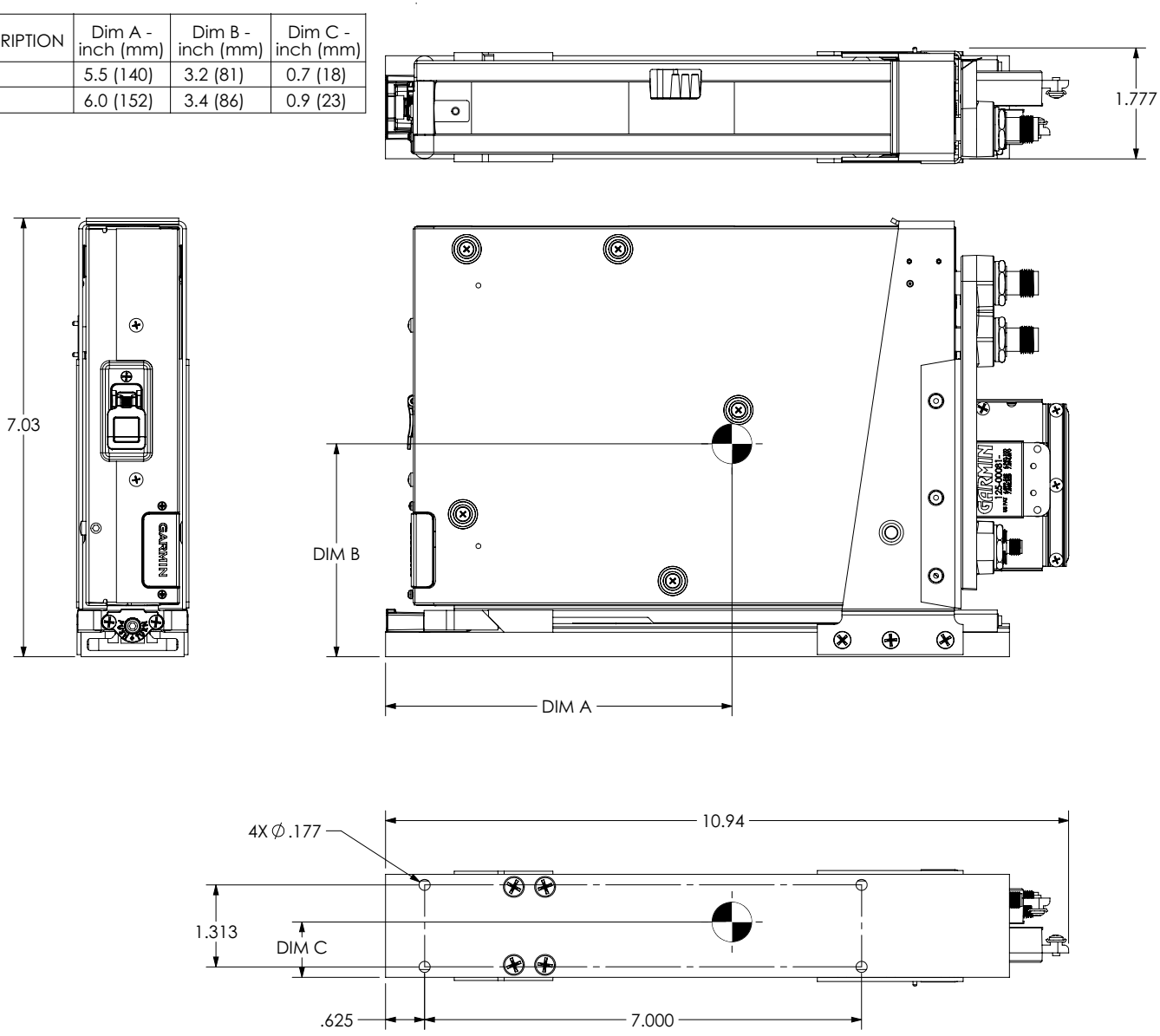



**Figure B-21 GTX 335DR/345DR Hi-Vib Vertical Mount Dimensions and Center of Gravity**

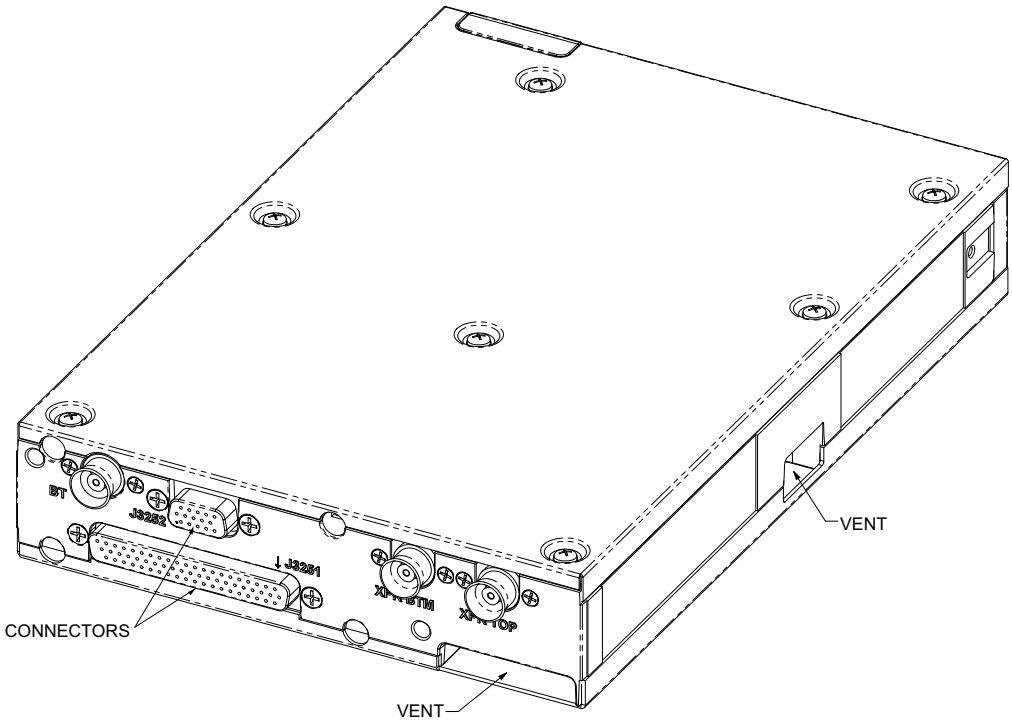



**Figure B-22 GTX 335DR/345DR Connectors and Vent Locations**

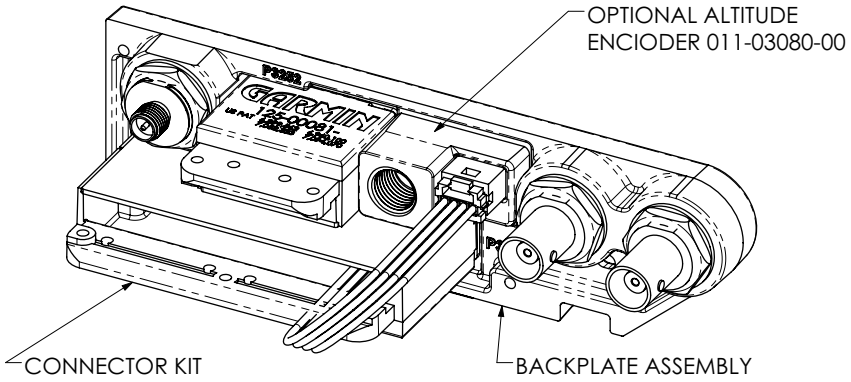



**Figure B-23 Backplate, Connector Kit, and Optional Altitude Encoder**

# Appendix C Equipment Compatibility and Configuration

# C.1 ADS-B In Displays

**Table C-1 ADS-B In Displays**

| Manufacturer | Model | Data Format | Interface Configuration | GTX 345 Configuration Setting | Notes |
|---|---|---|---|---|---|
| Garmin | GTN 6XX/7XX | HSDB | ADS-B In Source: GTX | Navigator - Present | |
| | GNS 400W/500W Series [2] | RS-232 | ADSB TFC | GNS | Supports control of ADS-B Traffic only (also includes GPS data from the GNS 400W/500W). |
| | | | ADSB TFC WX | GNS | Supports FIS-B and control of ADS-B traffic (also includes GPS data from the GNS 400W/500W). |
| | | ARINC 429 | ADSB TFC | TRAFFIC | Supports ADS-B traffic without TAS/TCAS. |
| | | | ADSB TFC w/TCAS | TRAFFIC | Supports ADS-B traffic w/ TAS/TCAS correlation. |
| | G950/G1000 [3] | RS-232 | GDL 90 | LGCY TRAFFIC | Supports GTX 345R installations only (ADS-B traffic). |
| | | RS-422 | GDL 90 ADS-B | Garmin MX Series 1 [1]<br>OR<br>Garmin MX Series 3 [1] [4]<br>OR<br>Off [1] | Supports GTX 345R installations only (FIS-B). |
| | G1000 NXi/G2000/G3000/ G5000 | HSDB | N/A | GX000 - Present | Configuration per loader card. |
| | GMX 200 | RS-422 | FIS Data Link: Enabled<br>GDL 90 UAT Radio: Disp Only<br>GDL 90 Code Edit: Disabled<br>UAT Source: Port 4 | MX Format 1 | The GMX 200 does not display correlated traffic. If a combined ADS-B In and TAS/TCAS system is installed in the aircraft, an additional approved display must provide the correlated picture. Refer to AC 20-172B, appendix C. |
| | GDU 620 | HSDB | ADS-B TX: Installed | G500/G600 Present | |
| | GDU 700( )/1060 | HSDB | ADS-B Selections: GTX 345 | G500/G600 Present | |

| Manufacturer | Model | Data Format | Interface Configuration | GTX 345 Configuration Setting | Notes |
|---|---|---|---|---|---|
| Garmin | GI 275 | HSDB | Traffic Source: GTX 345<br>Interface: GTX 345<br>Ports/Config:<br>Active Traffic, TAS/TCAS | SFD - Present | |
| | GPS 175 | HSDB | ADS-B SRC - GTX | Navigator - Present | |
| | GNC 355 | HSDB | ADS-B SRC - GTX | Navigator - Present | |
| UPSAT | MX20 | RS-422 | FIS Data Link: Enabled<br>GDL 90 UAT Radio: Disp Only<br>GDL 90 Code Edit: Disabled<br>UAT Source: Port 4 | MX Format 2 | The MX 20 does not display correlated traffic. If a combined ADS-B In and TAS/TCAS system is installed in the aircraft, an additional approved display must provide the correlated picture. Refer to AC 20-172B appendix C. |
| Honeywell | Various | ARINC 429 | BCAS | BCAS | |
| Various | Various | ARINC 429 | ARINC 735 | A735 | |

[1] If GDU software v12.00 and later and GIA software prior to v6.20 is used.

[2] The GNS 400W/500W interface requires the combination of one RS-232 and one ARINC 429 interface.

[3] Audio Cancel or Traffic Audio Cancel must be configured if an active traffic system is interfaced. Traffic Audio Cancel is recommended for the GTX 345, to cancel/acknowledge traffic audio alerts.

[4] When using software v2.65 or later, Garmin MX Series 3 format should be used to provide FIS-B to G1000.

# C.2 GPS Sources

**Table C-2 GPS Sources**

| Manufacturer | Model | Data Format | Interface Configuration | GTX 3X5 Configuration | Notes |
|---|---|---|---|---|---|
| Garmin | G950/G1000 | RS-232 | GTX 33ES #1 [1]<br>OR<br>GTX 33ES #1 w/ TIS [2] | REMOTE FMT 1 [1,3]<br>OR<br>REMOTE FMT 2 [2,3] | The primary purpose of this interface is transponder control, however this format also includes GPS data. Refer to table C-9. Not applicable to the GTX 325. |
| | | | | LGCY REMOTE 1 [1,4]<br>OR<br>LGCY REMOTE 2 [2,4] | |
| | G1000 NXi/ G2000/G3000/ G5000 | RS-232 | GTX 3X5 | XPDR FMT 1 [1]<br>OR<br>XPDR FMT 2 [2] | Configuration per loader card. Not applicable to the GTX 325. |
| | | HSDB | N/A | GX000 - Present | GTX 345 only, configuration per loader card. |
| | Internal | N/A | N/A | Refer to section 6.8. | |
| | GTN 6XX/7XX | RS-232 | ADS-B OUT+ Format 1 | ADS-B + FMT 1 | In GTN software v6.20 and later, ADS-B+ Format 2 is available and recommended, with GTX 3X5 ADS-B+ FMT 2. |
| | | RS-232 | GTX Mode S+ [1]<br>OR<br>GTX w/TIS+ [2] | REMOTE FMT 1 [1]<br>OR<br>REMOTE FMT 2 [2] | The primary purpose of this interface is transponder control, however, this format also includes GPS data. Refer to table C-9. |
| | | HSDB | ADS-B In Source: GTX | Navigator - Present | Applicable to GTX 345 installations only. |
| | GNS 400W/ 500W | RS-232 | ADSB TFC | GNS | Applicable to GTX 345 only (software version 2.10 and earlier), or GTX 325/335/345 (software version 2.11 and later). Note that the primary purpose of this interface is for ADS-B In Data, however this format also includes GPS data. Refer to table C-1.<br>When interfacing with a GNS, the GNS format is preferred over the ADS-B+ FMT 1 format. |
| | | | ADSB TFC WX | | |
| | | | ADS-B OUT + | ADS-B+ FMT 1 | Supports GPS data only. |

| Manufacturer | Model | Data Format | Interface Configuration | GTX 3X5 Configuration | Notes |
|---|---|---|---|---|---|
| Garmin cont'd | GNS 480 (CNX80) | RS-232 | GTX + [1] [5] | REMOTE FMT 1 [1] | Note that the primary purpose of this interface is transponder control, however this format also includes GPS data. Refer to table C-9. |
| | | | GTX w/TIS+ [2] | REMOTE FMT 2 [2] | |
| | | | ADS-B OUT + | ADS-B+ FMT 2 | Set the GNS 480 serial port baud rate to 38400. |
| | GTX 3X5 | RS-232 | ADS-B + FMT 1 | ADS-B+ FMT 1 | |
| | | | ADS-B + FMT 2 | ADS-B+ FMT 2 | |
| | GDL 88 with GPS/SBAS | ARINC 429 | ARINC 743A | ARINC 743A | |
| | | RS-232 | ADS-B+ Format 2 | ADS-B+ FMT 2 | Available in GDL 88 software v3.20 and later. |
| | GPS 175 | RS-232 | ADS-B+ Format 2 | ADS-B+ FMT 2 | |
| | | HSDB | ADS-B SRC - GTX | Navigator - Present | |
| | GNC 355 | RS-232 | ADS-B+ Format 2 | ADS-B+ FMT 2 | |
| | | HSDB | ADS-B SRC - GTX | Navigator - Present | |

| Manufacturer | Model | Data Format | Interface Configuration | GTX 3X5 Configuration | Notes |
|---|---|---|---|---|---|
| Various | Various | ARINC 429 | ARINC 743A | ARINC 743A | When using GTX 3X5 main software v2.85 or later, the unit inflates the HPL value received on the ARINC 743A interface by 3% while SBAS Navigation, GBAS/GRAS Navigation, or Approach mode are active per the GNSS Sensor Status (Label 273). VFOMV is defaulted to 9.0 m/s if VFOMV is not received vial Label 142. Once VFOMV is received, the default value is no longer used and only received values are used for the remainder of the unit's power cycle. HFOMV is defaulted to 9.0 m/s for a NACv of 1 if HFOMV is not received via Label 145. Once HFOMV is received, the default value is no longer used and only received values are used for the remainder of the unit's power cycle. When using an ARINC 743A GPS source that does not provide HFOMV, via Label 145, the GPS source must be certified to a NACv of 1 or greater.<br><br>GTX 3X5 main v2.85 or later is recommended when using an ARINC 743A position source. GTX 3X5 main v2.85 or later is required if the ARINC 743A source doesn't provide HFOMV via Label 145 or VFOMV via Label 142. VFOMV is only need for GTX 345(D)(R). |

[1] Installations with no TIS.
[2] Installations with TIS (GTX 335 only).
[3] Installations with GDU software v15.xx.
[4] Installations with GDU software prior to v15.00.
[5] Format is for GTX 335/GTX 345. Not for use with the GTX 325.

# C.3 Altitude Sources

**Table C-3 Altitude Sources**

| Manufacturer | Model | Data Format | Interfacing Equipment Configuration | GTX 3X5 Configuration Setting | Notes |
|---|---|---|---|---|---|
| ACT Tech | A-30 | RS-232 | N/A | ALT FMT 1 25 ft | |
| B&D | 90004-003 | ARINC 429 | N/A | ADC | |
| Garmin | G950/G1000 | ARINC 429 | GEN PURPOSE (Speed: HIGH) | EFIS AIR DATA (Speed: HIGH) | Interface is primarily for providing true heading to the GTX, however this format also provides altitude. Refer to table C-6. Required if external traffic system is installed. |
| | G1000 NXi/ G2000/ G3000/G5000 | RS-232 | GTX 3X5 | XPDR FMT [1] OR XPDR FMT2 [2] | Configuration per loader card. Not applicable to GTX 325. |
| | G1000 NXi/ G2000/ G3000/G5000 | HSDB | N/A | GX000 - Present | GTX 345 only. Configuration per loader card. |
| | GDC 72 | ARINC 429 | N/A | ADC | |
| | GDC 74( ) | ARINC 429 | N/A | ADC | |
| | GRS 79 | ARINC 429 | N/A | ADC | |
| | GSU 75 | ARINC 429 | N/A | ADC (Speed: HIGH) | |
| | GDU 620 | ARINC 429 | GENERAL (Speed: HIGH) | EFIS AIR DATA [3] (Speed: HIGH) | |

| Manufacturer | Model | Data Format | Interfacing Equipment Configuration | GTX 3X5 Configuration Setting | Notes |
|---|---|---|---|---|---|
| Garmin cont'd | | HSDB | Traffic/ADS-B:<br>GTX ADS-B #( )<br>+TAS/TCAS/TCAD:<br>Enabled [4] | G500/G600 - Present | GTX 345 only. |
| | GDU 700( )/ 1060 | ARINC 429 | General Purpose 2:<br>Present<br>(Speed: High) | ERIS AIR DATA [3]<br>(Speed: High) | |
| | | HSDB | ADS-B: GTX 345 | G500/G600 - Present | GTX 345 only. |
| | GTN 6XX/7XX | RS-232 | GTX Mode S+ [1]<br>OR<br>GTX w/TIS+ [2] | REMOTE FMT 1 [1]<br>OR<br>REMOTE FMT 2 [2] | This configuration is primarily for purposes of transponder remote control, however this configuration also provides altitude data. Refer to table C-9. |
| | GAE 12 | N/A | N/A | Garmin Altitude Encoder: Present | |
| | GI 275 | HSDB | | SFD - Present | |
| Honeywell (Bendix/King) | KDC 281 | ARINC 429 | N/A | ADC | |
| | KDC 481 | ARINC 429 | N/A | ADC | |
| Icarus Instruments | 3000 | RS-232 | N/A | ALT FMT 1 100 ft | |
| Sandia | SAE 5-35 | RS-232 | N/A | ALT FMT 1 25 ft | Either RS-232 or Gillham Gray code format can be used to provide altitude data from the Sandia SAE 5-35 to the GTX 3X5. |
| | | Discrete | N/A | Gillham Discretes ON | |

| Manufacturer | Model | Data Format | Interfacing Equipment Configuration | GTX 3X5 Configuration Setting | Notes |
|---|---|---|---|---|---|
| Shadin | 8800T | RS-232 | 25 ft or lower encoding | ALT FMT 3 25 ft | Applicable to installations with the 8800T unit configured for 25ft or lower encoding. |
| | | RS-232 | 100 ft encoding | ALT FMT 3 100 ft | 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 | |
| | F/ADC-2000 | RS-232 | N/A | ADC FMT 1 | 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) | |
| Trans-Cal Industries | IA-RS232-X | RS-232 | N/A | ALT FMT 1 100 ft | |
| | SSD120 | RS-232 | 25 ft or lower encoding | ALT FMT 1 25 ft | Applicable to installations with the SSD120 unit configured for 25ft or lower encoding. |
| | | RS-232 | 100 ft encoding | ALT FMT 1 100 ft | Applicable to installations with the SSD120 unit configured for parallel Gray source or 100ft encoding. |

[1] Installation with no TIS traffic.

[2] Installation with TIS traffic (GTX 335 only).

[3] Altitude, airspeed, altitude rate, attitude, and heading information.

[4] Only if GTX 345 is correlating external traffic.

## C.4 Audio Panels

**Table C-4 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.5 Radio Altimeters

**Table C-5 Radio Altimeters**

| Manufacturer | Model | Data Format | Interface Configuration | GTX 3X5 Configuration |
|---|---|---|---|---|
| Free Flight | RA-4500 | ARINC 429 | N/A | RADIO ALTITUDE |
| Garmin | GRA 55/5500 | | | |
| Honeywell (Bendix King) | KRA 405B | | | |

# C.6 Heading Reference Sources

**Table C-6 Heading Reference Sources**

| Manufacturer | Model | Configuration Parameter | Interfacing Equipment Configuration | GTX 3X5 Configuration Setting | Notes |
|---|---|---|---|---|---|
| Aspen | EFD1000 | ARINC 429 | N/A | HEADING [1]<br>(Speed: LOW) | |
| Avidyne | EXP5000<br>700-00006-() | ARINC 429 | | HEADING [1]<br>(Speed: LOW) | |
| Collins | AHC-85E | ARINC 429 | | AHRS [2]<br>(Speed: HIGH) | |
| Garmin | G950/G1000 | ARINC 429 | GEN PURPOSE | EFIS AIR DATA [3]<br>(Speed: HIGH) | |
| | G1000 NXi/<br>G2000/G3000/<br>G5000 | RS-232 | GTX 3X5 | XPDR FMT 1 [4]<br>OR<br>XPDR FMT 2 [5] | Configuration per loader card. |
| | G1000 NXi/<br>G2000/G3000/<br>G5000 | HSDB | N/A | GX000 - Present | GTX 345 only: Configuration per loader card. |
| | GRS 77 | ARINC 429 | N/A | AHRS [2]<br>(Speed: HIGH) | |
| | GRS 79 | ARINC 429 | N/A | AHRS [2] | |
| | GSU 75 | ARINC 429 | N/A | AHRS [2]<br>(Speed: HIGH) | |
| | GAD 42 | ARINC 429 | N/A | HEADING [1]<br>(Speed: LOW) | |
| | GDU 620 | ARINC 429 | GENERAL | EFIS AIR DATA [3]<br>(Speed: HIGH) | Note that this interface also provides altitude data. Refer to table C-3. |
| | | HSDB | Traffic/ADS-B: GTX ADS-B #( )<br>+TAS/TCAS/TCAD: Enabled [6] | G500/G600 - Present | GTX 345 only. |

| Manufacturer | Model | Configuration Parameter | Interfacing Equipment Configuration | GTX 3X5 Configuration Setting | Notes |
|---|---|---|---|---|---|
| Garmin | GDU 700( )/1060 | ARINC 429 | General Purpose 2: Present<br>(Speed: High) | ERIS AIR DATA [3]<br>(Speed: High) | |
| | | HSDB | ADS-B: GTX 345 | G500/G600 - Present | GTX 345 only. |
| | GTN 6XX/7XX | RS-232 | GTX Mode S+ [4]<br>OR<br>GTX w/TIS+ [5] | REMOTE FMT 1 [4]<br>OR<br>REMOTE FMT 2 [5] | This configuration is primarily for purposes of transponder remote control, however this configuration also provides magnetic heading. Refer to table C-9. |
| | GNS 400W/500W | ARINC 429 | ARINC 429 | HEADING [1]<br>(Speed: HIGH) | |
| | GI 275 | HSDB | | SFD - Present | |
| Honeywell (Bendix/King) | EFIS 40/50<br>(SG 465) | ARINC 429 | N/A | HEADING [1]<br>(Speed: LOW) | |
| Sandel | SN3500 | ARINC 429 | | AHRS [2]<br>(Speed: LOW) | |
| | SN3308 | | | AHRS [2]<br>(Speed: LOW) | |

[1] Heading information only.
[2] Attitude and heading information.
[3] Altitude, airspeed, altitude rate, attitude, and heading information.
[4] Installation with no TIS traffic.
[5] Installation with TIS traffic (GTX 335 only).
[6] Only if GTX 345 is correlating external traffic.

# C.7 Traffic Sensors (GTX 345 Only)

**Table C-7 Traffic Sensors**

| Manufacturer | Model | Configuration Parameter | I/O (To/From GTX) | Interfacing Equipment Configuration | GTX 345 Configuration Setting | Notes |
|---|---|---|---|---|---|---|
| Avidyne | RYAN TAS 600 (9900BX) | RS-232 | Input/Output | N/A | TRAFFIC FMT 4 | Configuration setting available on RS-232 Channel 4 only. |
| Garmin | GTS 8XX | ARINC 429 [3] | Input | Traffic Display Destination (Primary TX) [1] | TRAFFIC (Speed - HIGH) | |
| | | | Output [2] | Transponder 1 Communication (Primary RX) [1] | FORMAT 4 (Speed - HIGH) | Data format includes Garmin TAS. |
| | | | | Pressure Altitude Source (Primary RX); Magnetic Heading Source (Primary RX); GPS Position/ Velocity/Time Source (Primary RX); Transponder 1 Communication (Primary RX) [1] | FORMAT 5 (Speed - HIGH) | Data format includes Garmin TAS as well as Garmin concentrator; required for G1000. |
| | | | N/A | Transponder 1 Communication (Primary TX) [1] (Speed - LOW) | N/A | This interface is required for GTS 8xx installations, even though it does not correspond to physical interface/wiring (configure for an unused ARINC 429 output port on the GTS 8XX). |
| | | HSDB | Input/Output | N/A | GTS-Enabled | Configuration per loader card. |

| Manufacturer | Model | Configuration Parameter | I/O (To/From GTX) | Interfacing Equipment Configuration | GTX 345 Configuration Setting | Notes |
|---|---|---|---|---|---|---|
| Honeywell (Bendix/King) | KTA 870/810<br>KMH 880/820<br>KTA 970/910<br>KMH 980/920<br>TPU-66A | ARINC 429 | Input | Controller - Discrete<br>Intruder File Protocol - ARINC 735 | TRAFFIC 5 (Speed - HIGH) | Installations with a GTX 345D(R) and KTA 870 TAS are susceptible to a latching KTA 870 failure that requires a power cycle of the KTA 870 to clear. The failure may occur if the GTX 345D(R) is powered up after the KTA 870.<br><br>The failure may result in a "MODEC_SUPPRESSION_EXCEPTION - suppression not set during interrogation" fault in the KTA 870. To avoid the issue power on the GTX 345D(R) before the KTA 870. If the issue occurs, cycle power on the KTA 870. |
| L3 Comm | SKY 497<br>SKY 899 | ARINC 429 | Input | N/A | TRAFFIC 2 (Speed - HIGH) | |

[1] Configure the listed function(s) with the appropriate ARINC 429 channel based on the specific installation.

[2] ARINC 429 output from GTX 345 to GTS 800 is not required, but is required for all other GTS 8XX units.

[3] Not required for G1000 NXi/G2000/G3000/G5000.

## C.8 Bluetooth

**Table C-8 Bluetooth**

| Manufacturer | Model | Data Format | Input/Output | GTX 345 Configuration Setting | Notes |
|---|---|---|---|---|---|
| Garmin | Internal | Bluetooth | N/A | Bluetooth: Enabled | |
| | Flight Stream 110/210 | RS-232 | Input | CONNEXT FMT 3 | Both the RS-232 input and RS-422 output are required; internal Bluetooth must be disabled on the GTX with a FS 110/210 installation. |
| | | RS-422 | Output | CONNEXT FMT 3 | |

# C.9 Remote Control

**Table C-9 Remote Control**

| Manufacturer | Model | Data Format | Interface Configuration | GTX 325 Configuration Setting | GTX 335 Configuration Setting | GTX 345 Configuration Setting | Notes |
|---|---|---|---|---|---|---|---|
| Garmin | GTN 6XX/7XX | RS-232 | GTX Mode S+ | REMOTE FMT 1 | REMOTE FMT 1 | REMOTE FMT 1 | Installations with no TIS. |
| | | | GTX w/TIS+ | N/A | REMOTE FMT 2 | N/A | Installations with TIS. |
| | GNS 480 | RS-232 | GTX+ | N/A | REMOTE FMT 1 | REMOTE FMT 1 | Installations with no TIS. |
| | | | GTX w/TIS+ | N/A | REMOTE FMT 2 | N/A | Installation with TIS. |
| | G950/G1000 | RS-232 | GTX 33 [1]<br>OR<br>GTX 33ES [2] | N/A | REMOTE FMT 1 [3]<br>OR<br>LGCY REMOTE 1 [4] | REMOTE FMT 1 [3]<br>OR<br>LGCY REMOTE 1 [4] | Installations with no TIS. |
| | | | GTX 33 w/TIS [1]<br>OR<br>GTX 33ES w/TIS [2] | N/A | REMOTE FMT 2 [3]<br>OR<br>LGCY REMOTE 2 [4] | N/A | Installations with TIS. |
| | G1000 NXi/ G2000/G3000/ G5000 | RS-232 | GTX 3X5 | N/A | XPDR FMT 1 | XPDR FMT 1 | Installation with no TIS. Configuration per loaded card. |
| | | RS-232 | GTX 3X5 | N/A | XPDR FMT 2 | N/A | Installation with TIS. Configuration per loaded card. |
| | | HSDB | N/A | N/A | N/A | GX000 - Enabled | Configuration per loader card. |
| | GI 275 [5] | HSDB | Transponder 1/2 - GTX 345 | N/A | N/A | SFD - Present | GTX 345 only |

[1] GDU software prior to v9.10.
[2] GDU software v9.10 and later.
[3] GDU software v15.xx.
[4] GDU software prior to v15.00.
[5] GI 275 software 2.30 and later.

# C.10 TIS-A Displays

**Table C-10 TIS-A Displays**

| Manufacturer | Model | Data Format | Interface Configuration | GTX 335 Configuration Setting | Notes |
|---|---|---|---|---|---|
| Garmin | GTN 6XX/7XX | RS-232 | GTX w/TIS+ | REMOTE FMT 2 | Note that the primary purpose of this interface is for remote control, however this format also includes TIS-A data. Refer to table C-9. |
| | GDU 620 | ARINC 429 | GTX 330 | FORMAT 8 | |
| | GNS 400W/500W Series | ARINC 429 | GARMIN GTX 330 | FORMAT 8 | |
| | GNS 480 | RS-232 | GTX w/TIS+ | REMOTE FMT 2 | Note that the primary purpose of this interface is for remote control, however this format also includes TIS-A data. Refer to table C-9. |
| | G950/G1000 | RS-232 | GTX 33 w/TIS [1]<br>OR<br>GTX 33ES w/TIS [2] | REMOTE FMT 2 [3]<br>OR<br>LGCY REMOTE 2 [4] | Note that the primary purpose of this interface is for remote control, however this format also includes TIS-A data. Refer to table C-9. |
| | G1000 NXi/G2000/ G3000/G5000 | RS-232 | GTX 3X5 | XPDR FMT 2 | Configuration per loader card. |
| | GDU 700( )/1060 | ARINC 429 | GTX 33/330/335 | Format 8 | |
| | GI 275 | ARINC 429 | Type: TIS-A<br>Interface GTX 33X | Format 8 | |

[1] GDU software prior to v9.10.

[2] GDU software v9.10 and later.

[3] GDU software v15.xx.

[4] GDU software prior to v15.00.

# Appendix D Interconnect Drawings

This section contains wiring interconnect details and examples for the connections necessary for the installation of the GTX 33X and GTX 3X5 Series transponders.

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

- Unless specified differently, all wires are 24 AWG or larger.
- Power and ground connections are 22 AWG wire for run lengths less than 10 feet, if not, use 18 AWG.
- Use oversize contacts in the connector kit for wire sizes greater than 22 AWG.
- In 14 VDC installations, use two power pins and two ground pins for power and ground connections.
- In 28 VDC installations, use only one wire for power and ground connections.
- Antennas and associated cables are shown for reference only.
- In dual GTX transponder installations, each transponder must be grounded through separate ground terminal/ stud locations on the aircraft.
- If practical, power and ground wires 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:

   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. For information refer to the manufacturer's installation manual.
- HDSB Ethernet wiring must use 24 AWG aircraft grade category 5 Ethernet cable:

| MANUFACTURER | P/N |
|---|---|
| PIC Wire and Cable | 10424 |
| Carlisle IT | 39204 |

- RS-232 and ARINC 429 ports shown are suggested port configurations.
- Installations can require alternate port configurations and are acceptable provided the equipment interfaces and data formats are available on alternate ports.
- G1000 units are identified as units running software v15.xx and earlier.

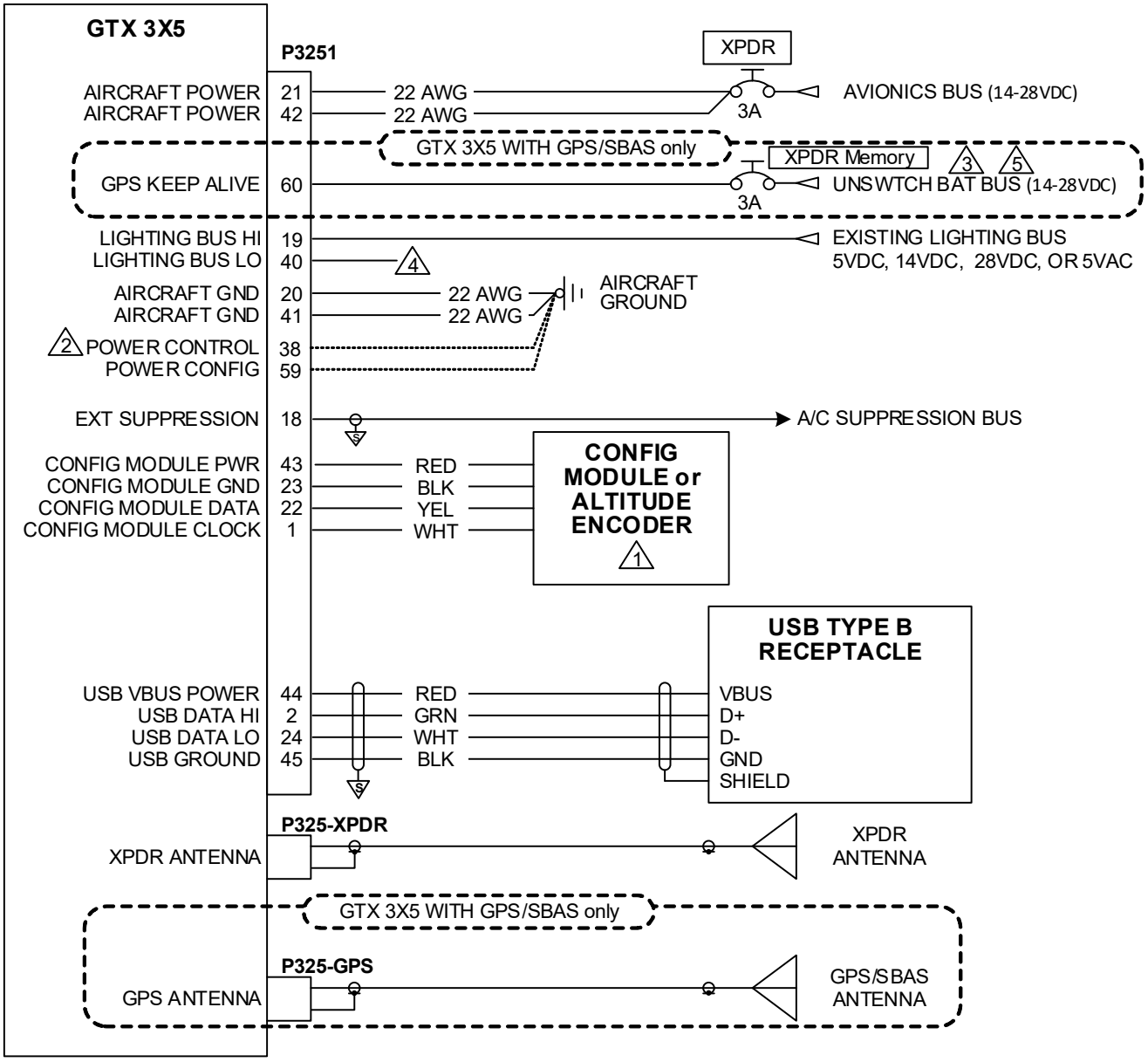



**Figure D-1 GTX 3X5 Power Configuration Typical Interconnect**
**Sheet 1 of 2**

**NOTES**

1. CONFIG MODULE REQUIRES WIRE HARNESS P/N: 325-00122-00. PRESSURE SENSOR/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. FOR DETAILS REFER TO SECTION 5.4.1.
3. GPS KEEP ALIVE IS RECOMMENDED FOR GPS INSTALLS. IF NOT CONNECTED GPS MAY TAKE UP TO 5 MINUTES TO OBTAIN A GPS FIX.
4. FOR LIGHTING BUS CONNECTIONS REFER TO SECTION 5.5.
5. GPS KEEP ALIVE MUST BE CONNECTED TO THE UNSWITCHABLE BATTERY BUS (BUS DIRECTLY CONNECTED TO THE BATTERY).

**Figure D-1 GTX 3X5 Power Configuration Typical Interconnect**
**Sheet 2 of 2**

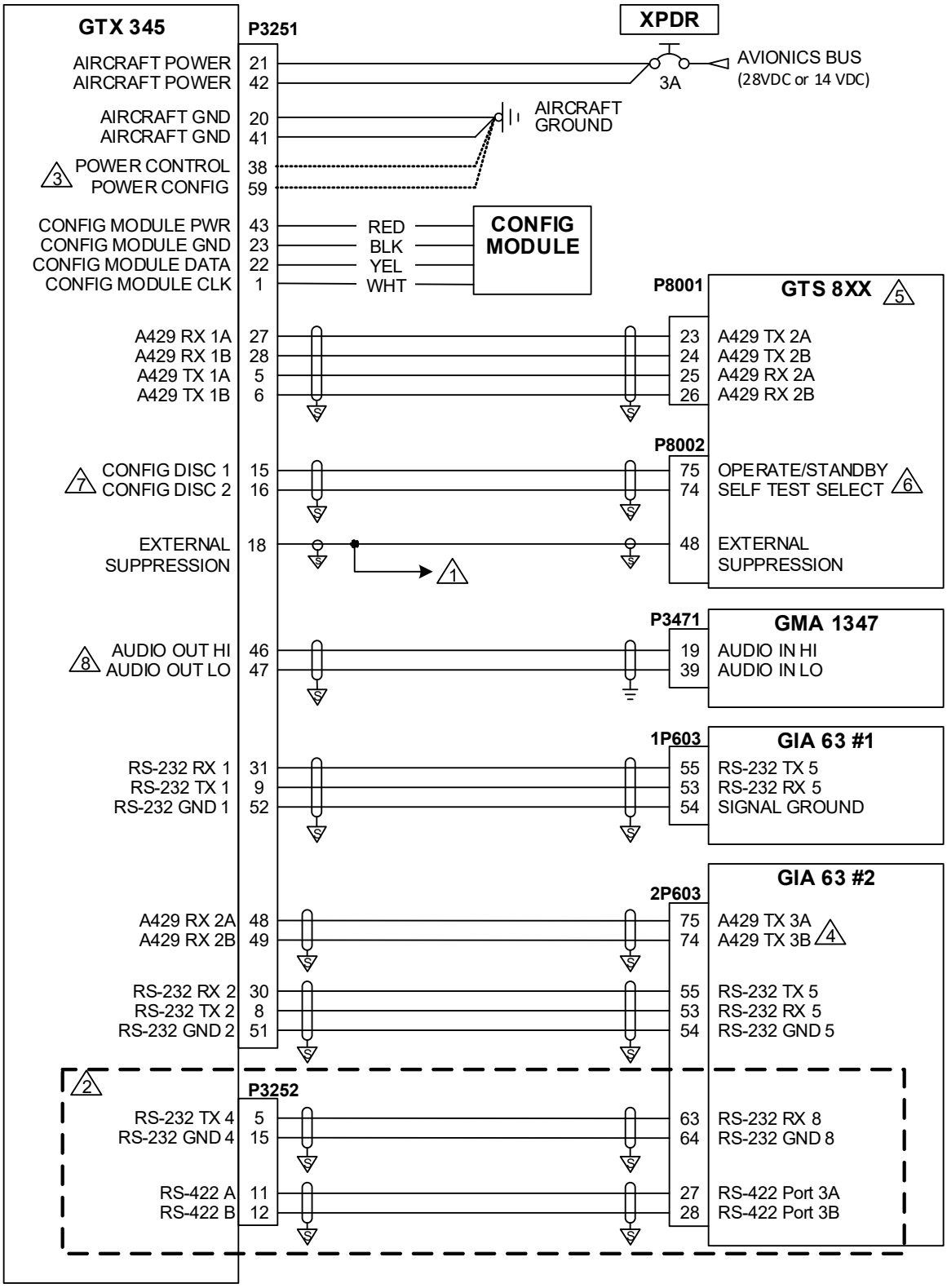
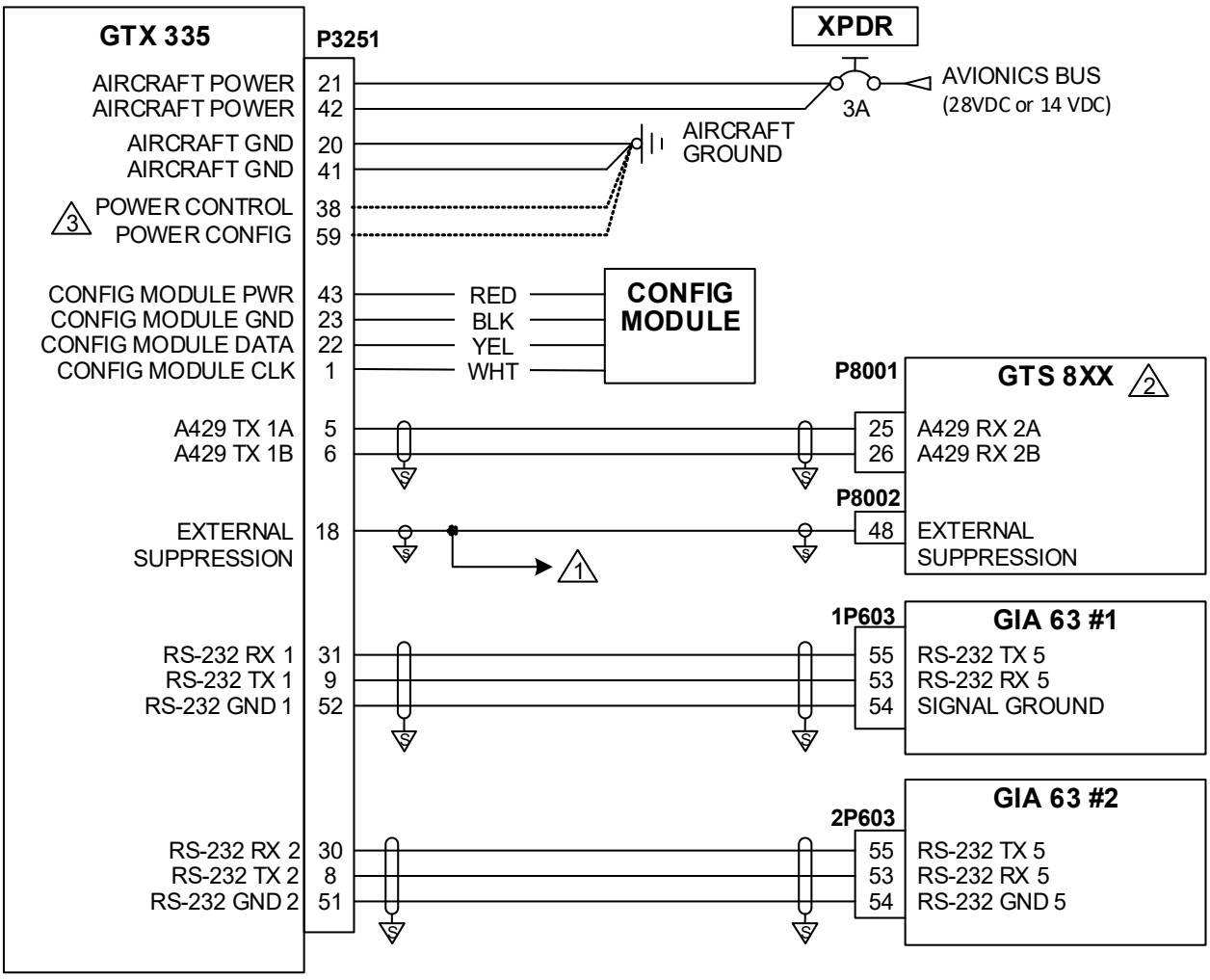



**Figure D-2 GTX 345 - G1000 Interconnect**
**Sheet 1 of 2**

**NOTES**

1. CONNECTION TO AIRCRAFT SUPPRESSION BUS.
2. GDL 90 EMULATION - RS-422 FIS-B CONNECTION AND RS-232 ADS-B IN TRAFFIC.
3. REFER TO SECTION 5.4.1.
4. PROVIDES TRUE HEADING TO UNIT. USE ANY AVAILABLE ARINC 429 PORT. THIS MUST BE CONFIGURED BY THE INSTALLER.
5. GTS 8XX SHOWN AS AN EXAMPLE, FOR ALTERNATE EXTERNAL TRAFFIC SYSTEM OPTIONS, REFER TO EXTERNAL TRAFFIC SENSORS.
6. GTX 345 PROVIDES AUTOMATIC CONTROL OF OPERATE/STANDBY BASED ON AIRBORNE STATUS.
   GTX 3X5 INSTALL TOOL PROVIDES TRAFFIC SELF TEST DISCRETE FOR EXTERNAL TRAFFIC VALIDATION.
7. THIS DIAGRAM PROVIDES AN OVERVIEW OF A TYPICAL INSTALLATION. FOR SPECIFIC EQUIPMENT, REFER TO APPLICABLE INTERCONNECT DIAGRAMS.
8. THIS AUDIO INTERFACE IS NOT NEEDED FOR G1000 NXi AND G2/3/5000 INSTALLATIONS.
9. THIS INTERCONNECT IS NOT NEEDED FOR G1000 NXi AND G2/3/5000 INSTALLATIONS. REFER TO FIGURE D-24 THROUGH FIGURE D-27 FOR INFORMATION ON G1000 NXi AND G2/3/5000 SYSTEM.

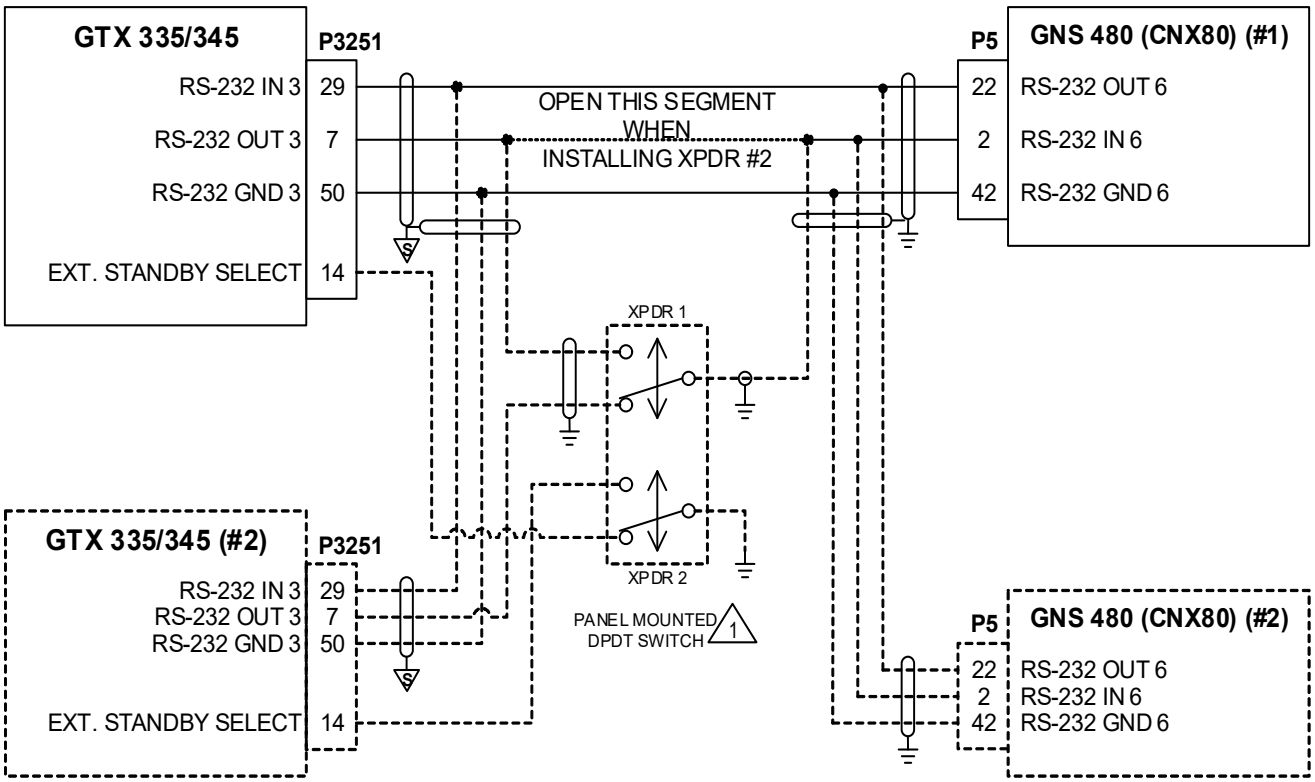
**Figure D-2 GTX 345 - G1000 Interconnect**
**Sheet 2 of 2**




**NOTES**

1. CONNECTION TO AIRCRAFT SUPPRESSION BUS.
2. GTS 8XX IS THE ONLY SUPPORTED TRAFFIC SYSTEM THAT INTERFACES WITH THE GTX 335.
3. FOR DETAILS REFER TO SECTION 5.4.1.
4. THIS INTERCONNECT IS NOT NEEDED FOR G1000 NXi AND G2/3/5000 INSTALLATIONS. REFER TO FIGURE D-24 THROUGH FIGURE D-27 FOR INFORMATION ON G1000 NXi AND G2/3/5000 SYSTEM.

**Figure D-3 GTX 335 - G1000 Interconnect**




**NOTES**

1. WHEN INSTALLING A SECOND TRANSPONDER, A SWITCH MUST BE INSTALLED TO LET ONLY ONE TRANSPONDER TO BE ACTIVE AT A TIME. SUITABLE DPDT SWITCHES: C&K 7000 SERIES P/N 7201SYZQE, OR EQUIVALENT.
2. DASHED LINES AND AREAS REPRESENT TRANSPONDER #2 AND GNS 480 (CNX80) #2 INSTALLATION DETAILS.

**Figure D-4 GTX 335/GTX 345 - GNS 480 (CNX80) Interconnect**

## GNS 480 PROVIDING GPS POSITION TO GTX 3X5

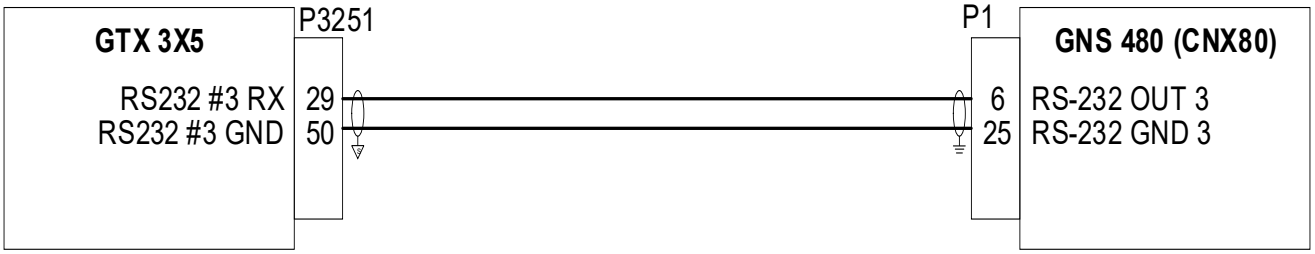
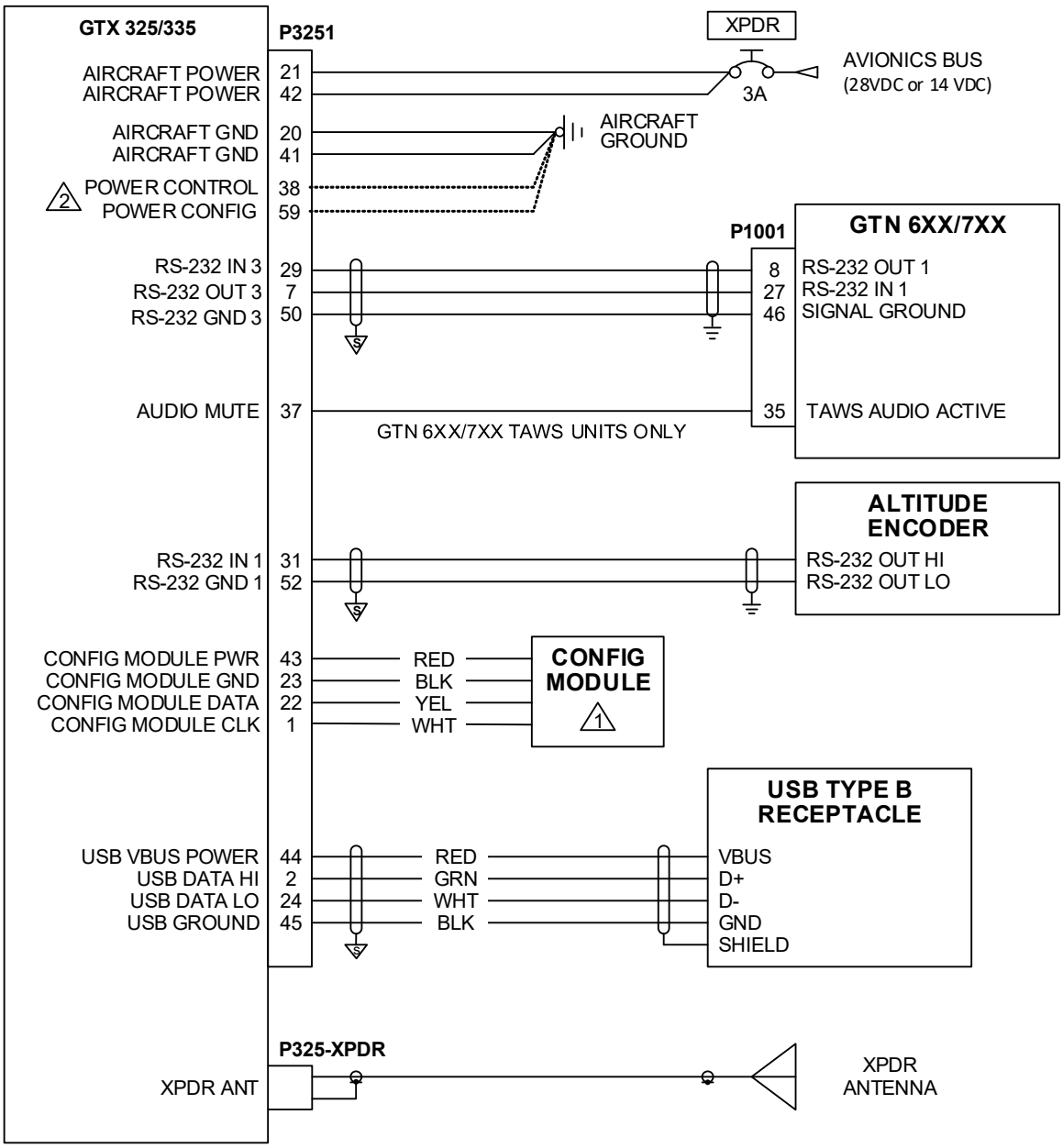



**Figure D-5 GTX 3X5 - GNS 480 (CNX80) Interconnect**

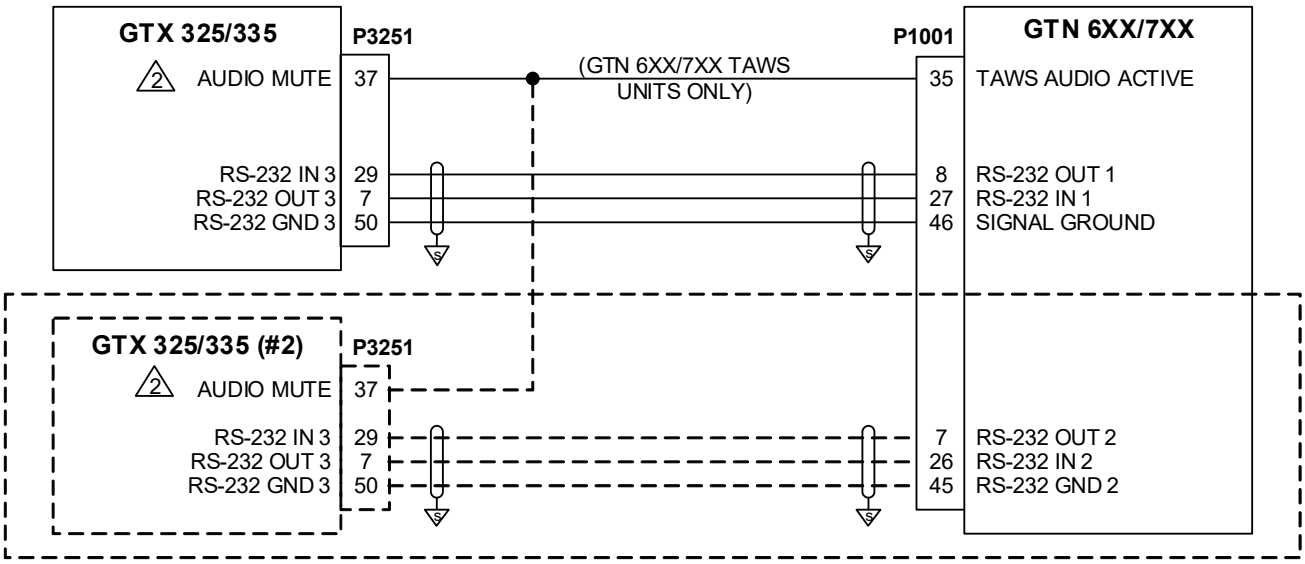



## NOTES

1. CONFIG MODULE REQUIRES WIRE HARNESS P/N: 325-00122-00. PRESSURE SENSOR/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. FOR DETAILS REFER TO SECTION 5.4.1.

**Figure D-6 GTX 325/335 - GTN 6XX/7XX Typical Interconnect**




## NOTES

1 DASHED AREAS INDICATE ADDITIONAL INTERCONNECTS FOR DUAL INSTALLATION AND ARE NOT REQUIRED FOR SINGLE INSTALLATION.

2 AUDIO INHIBIT I/O PIN IS CONFIGURABLE. FOR DETAILS, REFER TO SECTION 5.7.

**Figure D-7 Single/Dual GTX 325/335 - Single GTN 6XX/7XX Interconnect**

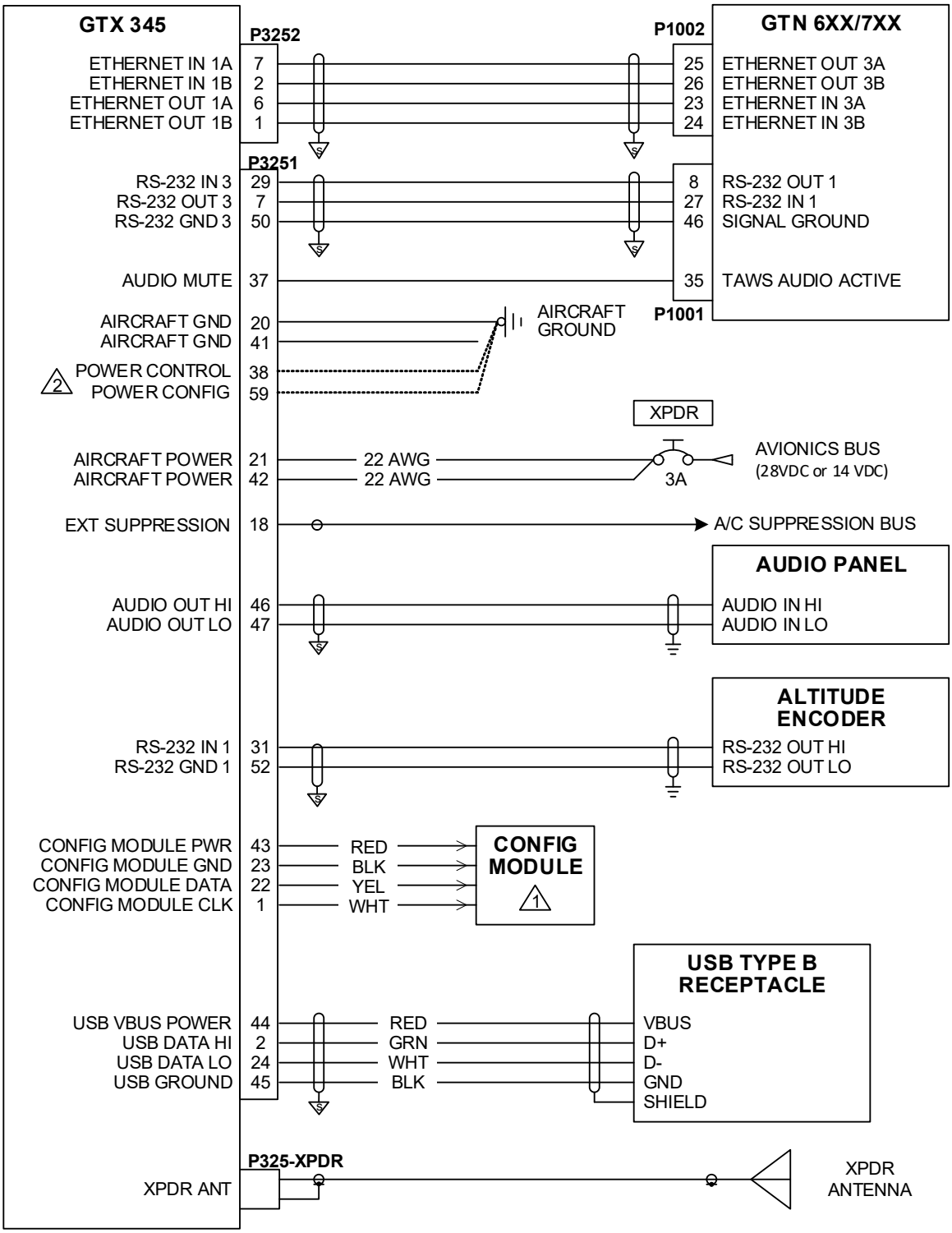



**Figure D-8 GTX 345 - GTN 6XX/7XX Typical Interconnect**
**Sheet 1 of 2**

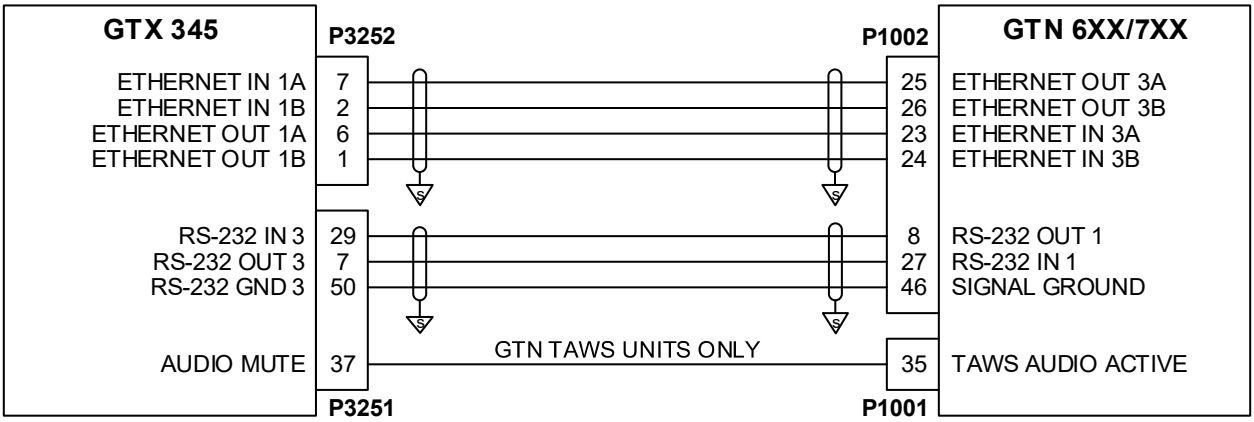
**NOTES**

1. CONFIG MODULE REQUIRES WIRE HARNESS P/N: 325-00122-00. PRESSURE SENSOR/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.

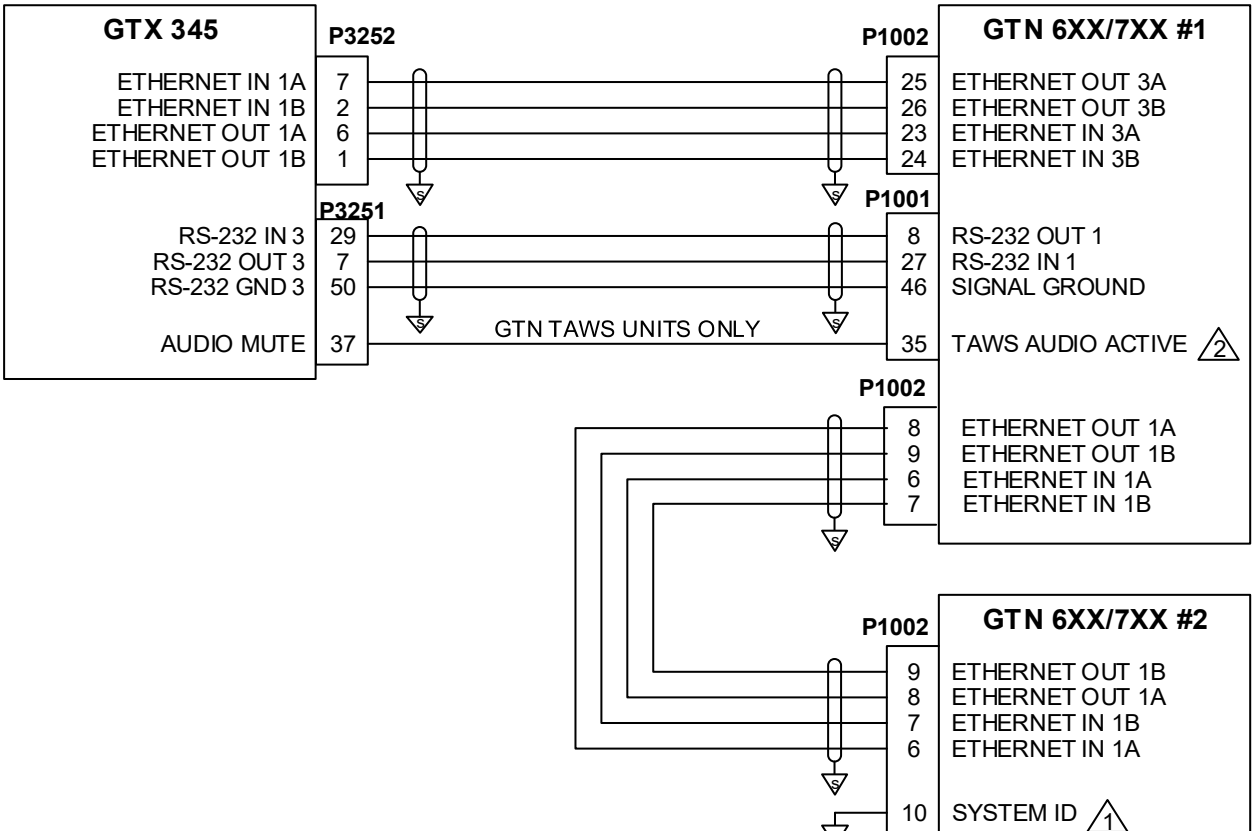
2. FOR DETAILS REFER TO SECTION 5.4.1.

**Figure D-8 GTX 345 - GTN 6XX/7XX Typical Interconnect**
**Sheet 2 of 2**

**SINGLE GTX 345 or GTX 345R with SINGLE GTN 6XX/7XX**




**SINGLE GTX 345 or GTX 345R with DUAL GTN 6XX/7XXs**



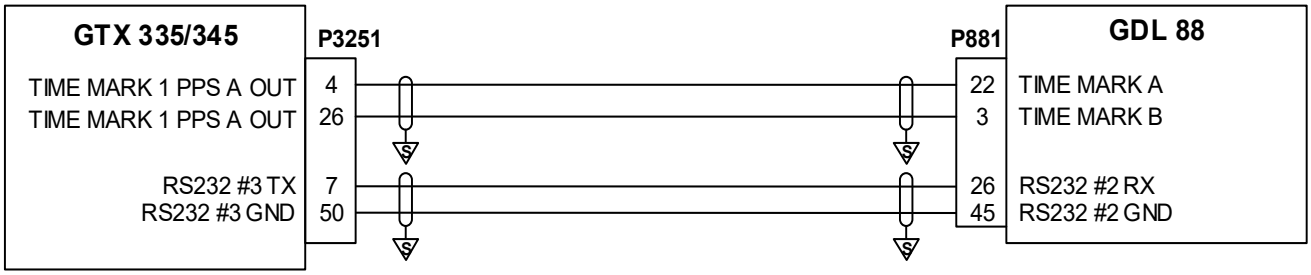

**NOTES**

1. WHEN GTN 6XX/7XX IS THE ONLY INSTALLED GPS NAVIGATOR, OR GPS NAVIGATOR #1 IN A DUAL GPS NAVIGATOR INSTALLATION, CONFIGURE GTN 6XX/7XX AS GTN #1 BY LEAVING SYSTEM ID (P1002-10) NOT CONNECTED. WHEN THE GTN 6XX/7XX IS GPS NAVIGATOR #2 IN A DUAL GPS INSTALLATION, CONFIGURE GTN #2 BY GROUNDING SYSTEM ID (P1002-10) TO THE SHIELD BLOCK.

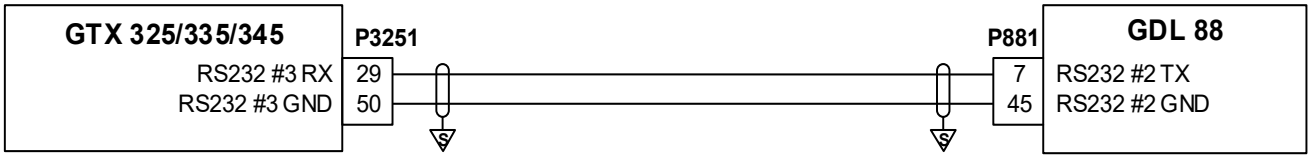
2. TAWS AUDIO INHIBIT FOR GTN 6XX/7XX TAWS UNITS ONLY.

**Figure D-9 GTX 345 - Single/Dual GTN 6XX/7XX Interconnect**

## GTX 335/345 PROVIDING GPS POSITION TO GDL 88



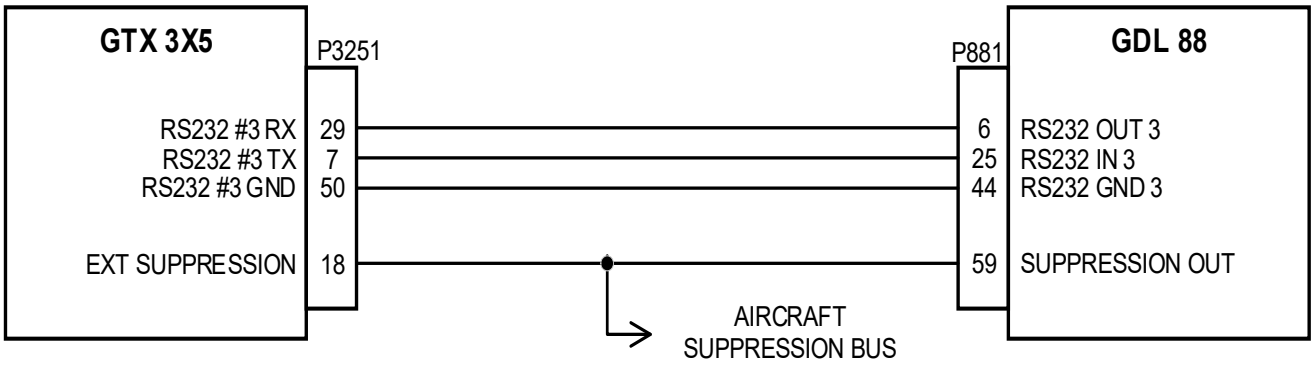

## GDL 88 with GPS/SBAS PROVIDING GPS POSITION TO GTX 325/335/345




**NOTES**

1 ADS-B + FORMAT 2 SHOULD BE USED FOR BOTH INTERFACES.

**Figure D-10 GTX 325/335/345 - GDL 88 Interconnect**




**NOTES**

1. CONFIGURE THE GTX 3X5 RS-232 PORT FOR REMOTE FORMAT 1
2. CONFIGURE THE GDL 88 RS-232 PORT FOR GTX MODE C #1/#2 WHEN CONNECTING TO A GTX 325, GTX MODE S #1/#2 WHEN CONNECTING TO A GTX 335/345
3. GPS DATA IS NOT INCLUDED ON THIS INTERFACE

**Figure D-11 GTX 3X5 - GDL 88 Interconnect**

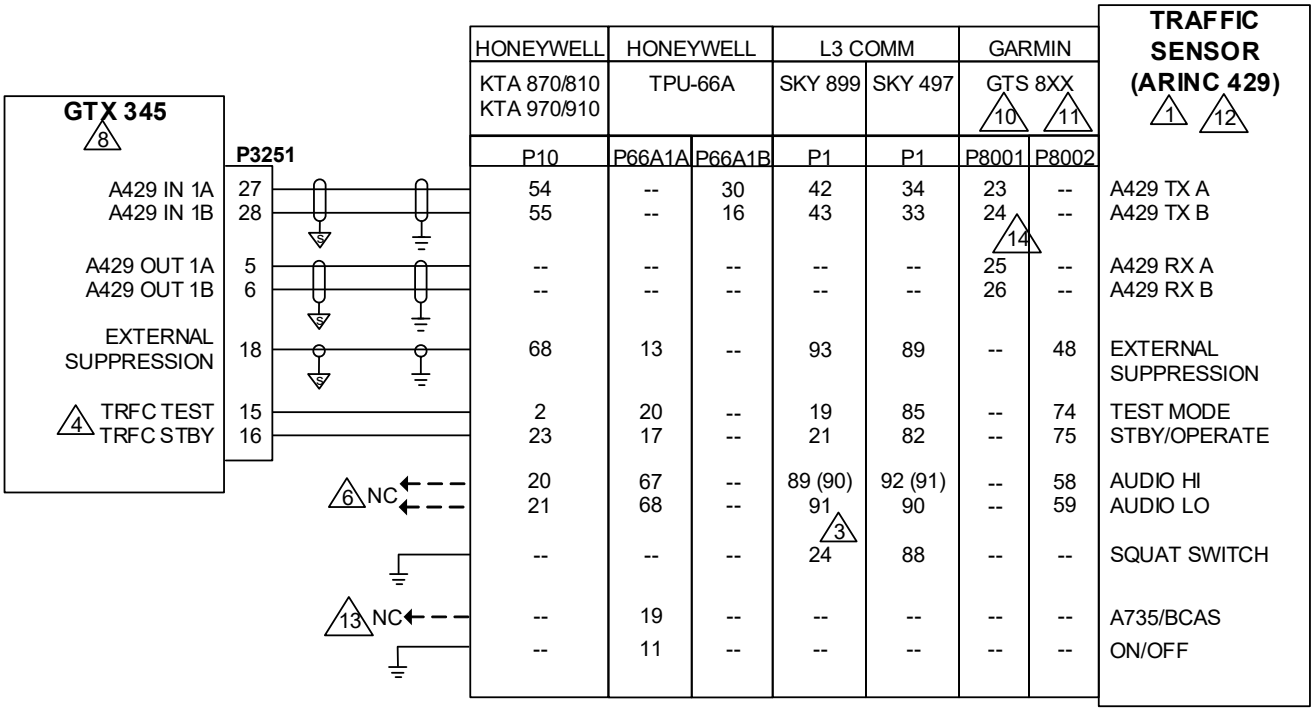



**Figure D-12 GTX 345 - Traffic Sensor Interconnect**
**Sheet 1 of 4**

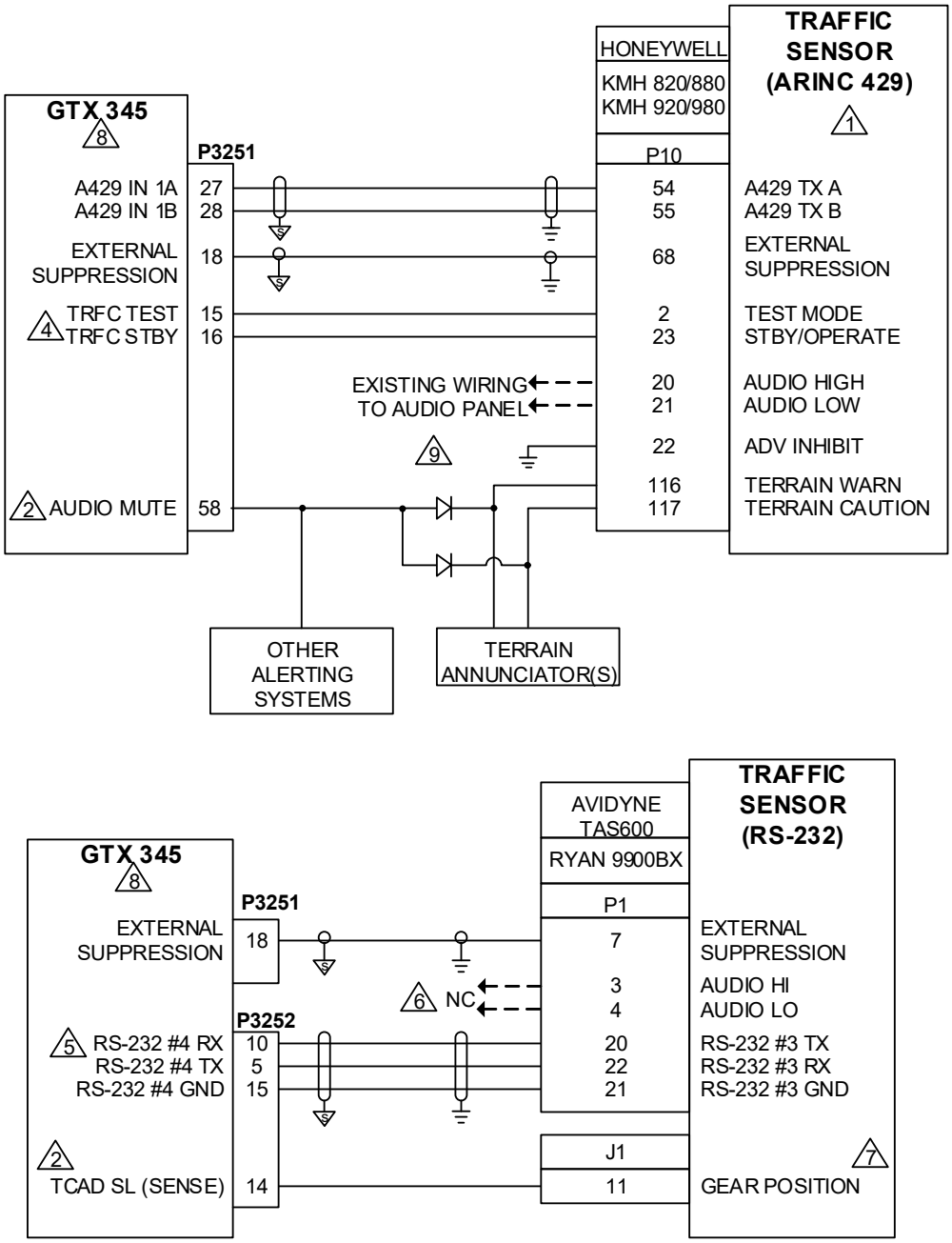
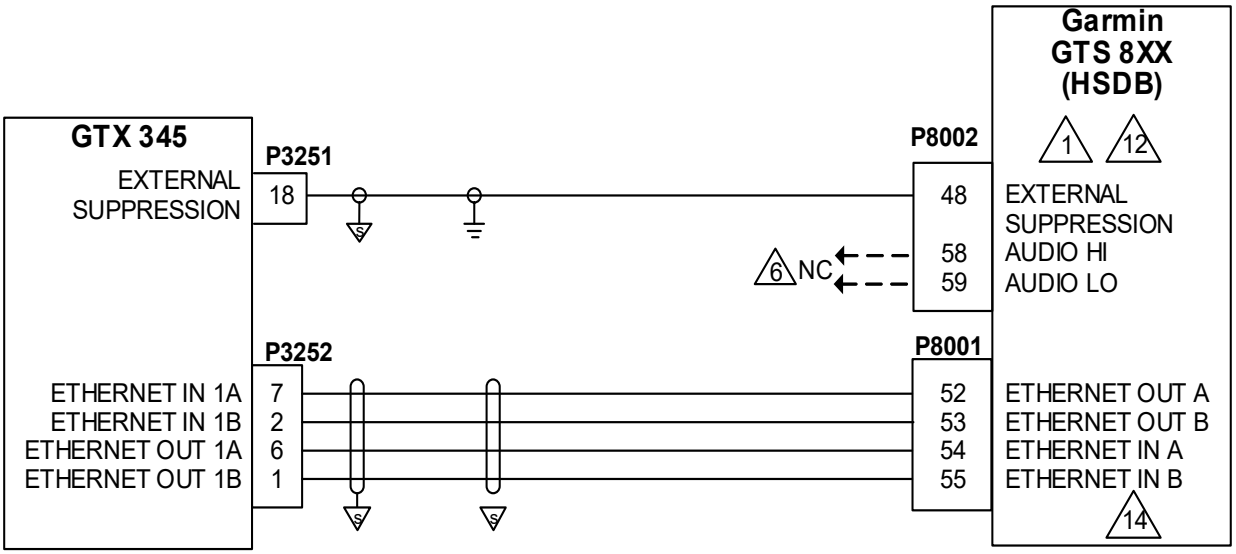



**Figure D-12 GTX 345 - Traffic Sensor Interconnect**
**Sheet 2 of 4**




## NOTES

1. FOR ADDITIONAL REQUIRED CONFIGURATIONS FOR THE GTX 345R AND AN EXTERNAL TRAFFIC SENSOR IN G950/1000 EQUIPPED AIRCRAFT, REFER TO THE STC INSTALLATION MANUAL.
2. ANY CONFIGURABLE OUTPUT DISCRETE CAN BE USED IF THIS DISCRETE IS ALREADY IN USE.
3. CONFIGURE THE TRC 899 “WEIGHT ON WHEELS” SWITCH AS “ACTIVE LOW.” FOR COMPLETE CONFIGURATION INFORMATION REFER TO MANUFACTURER’S DOCUMENTATION.
4. CONFIGURABLE FOR P3251 ONLY.
5. NON-CONFIGURABLE PORT. ONLY RS-232 PORT 4 CAN BE USED FOR THIS CONNECTION.
6. IF THE EXTERNAL TRAFFIC SENSOR WAS INTERFACED TO THE AUDIO PANEL, THESE WIRES SHOULD BE CAPPED AND STOWED.
7. THIS DISCRETE IS TO DRIVE THE SENSITIVITY LEVEL FOR THE TRAFFIC SYSTEM. FOR SPECIFIC G950/G1000 INSTALLATIONS, THIS DISCRETE IS NOT NECESSARY TO CONNECT TO THE GTX 345 UNLESS THE GTX 345 HAS A RADAR ALTIMETER INPUT OR HAT IS AVAILABLE.
8. FOR DETAILS REFER TO THE AUDIO PANEL INTERFACE.
9. IF THE KMH HAS THE COMBINED TAS/EGPWS, THE AUDIO WIRING REMAINS CONNECTED. THE TERRAIN ANNUNCIATOR SIGNALS DRIVE THE AUDIO MUTE INPUT TO THE GTX WITH THE APPLICATION OF TWO ADDITIONAL DIODES, P/N: 1N4007. IF OTHER SYSTEMS INTERFACE TO THE ADV INHIBIT (P10-22), THEY SHOULD BE REMOVED FROM P100-22 AND INTERFACED TO THE GTX AS SHOWN. IF THE EGPWS IS NOT ENABLED, THE AUDIO WIRING CAN BE CAPPED AND STOWED AND THE TERRAIN ANNUNCIATOR SIGNALS WITH THE DIODES DO NOT NEED TO BE CONNECTED TO THE GTX AUDIO MUTE.
10. GTS A429, TRFC TEST, AND TRFC STBY INTERFACES ARE NOT REQUIRED FOR G1000 NXi/GX000 INSTALLATIONS.

**Figure D-12 GTX 345 - Traffic Sensor Interconnect**
**Sheet 3 of 4**

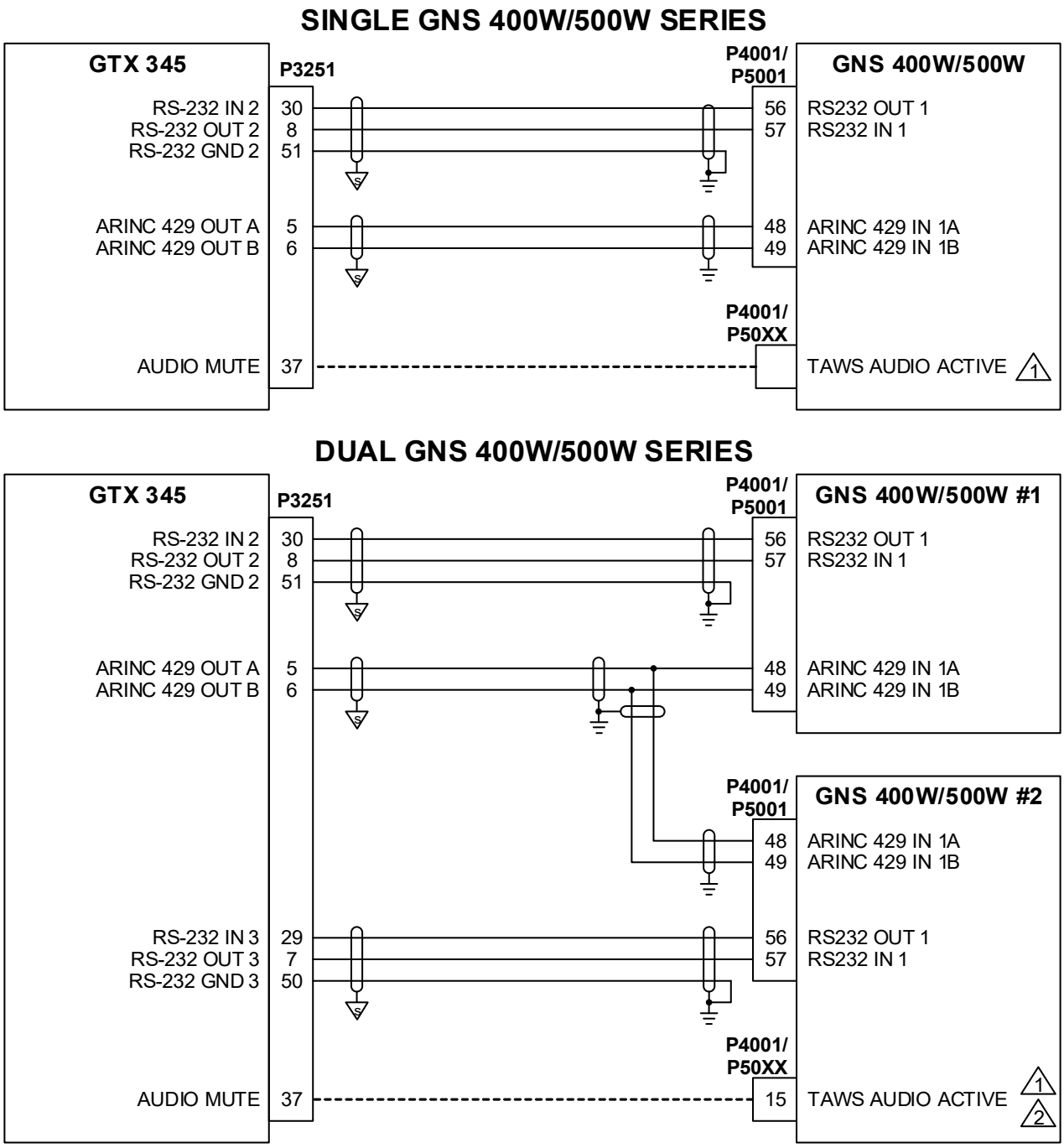
11 IF THE TRAFFIC SYSTEM IS A GTS 820, GTS 850, OR GTS 8X5, THE GTS TRAFFIC DISPLAY DESTINATION PORT MUST BE CONFIGURED TO A DIFFERENT PORT THAN THE TRANSPONDER COMMUNICATION PORTS.

12 ADDITIONAL INTERFACES TO THE EXTERNAL TRAFFIC SYSTEM NOT IDENTIFIED IN THE INTERCONNECT, SUCH AS ALTITUDE/ HEADING DATA, TA DISPLAY VALID DISCRETES, AND CONFIGURATION STRAPS, SHOULD REMAIN CONNECTED FOR PROPER TAS/TCAS OPERATION.

13 THE TA/RA BLOCK TRANSFER PROGRAM PIN MUST BE OPEN TO CONFIGURE THE TPU-66A DISPLAY BUS OUTPUT FOR ARINC 735 PROTOCOL.

14 GTS 8XX CAN BE CONNECTED VIA HSDB OR ARINC 429. ALL REQUIRED WIRING FOR THOSE INSTALLS IN THEIR RESPECTIVE DRAWINGS.

**Figure D-12 GTX 345 - Traffic Sensor Interconnect**
**Sheet 4 of 4**

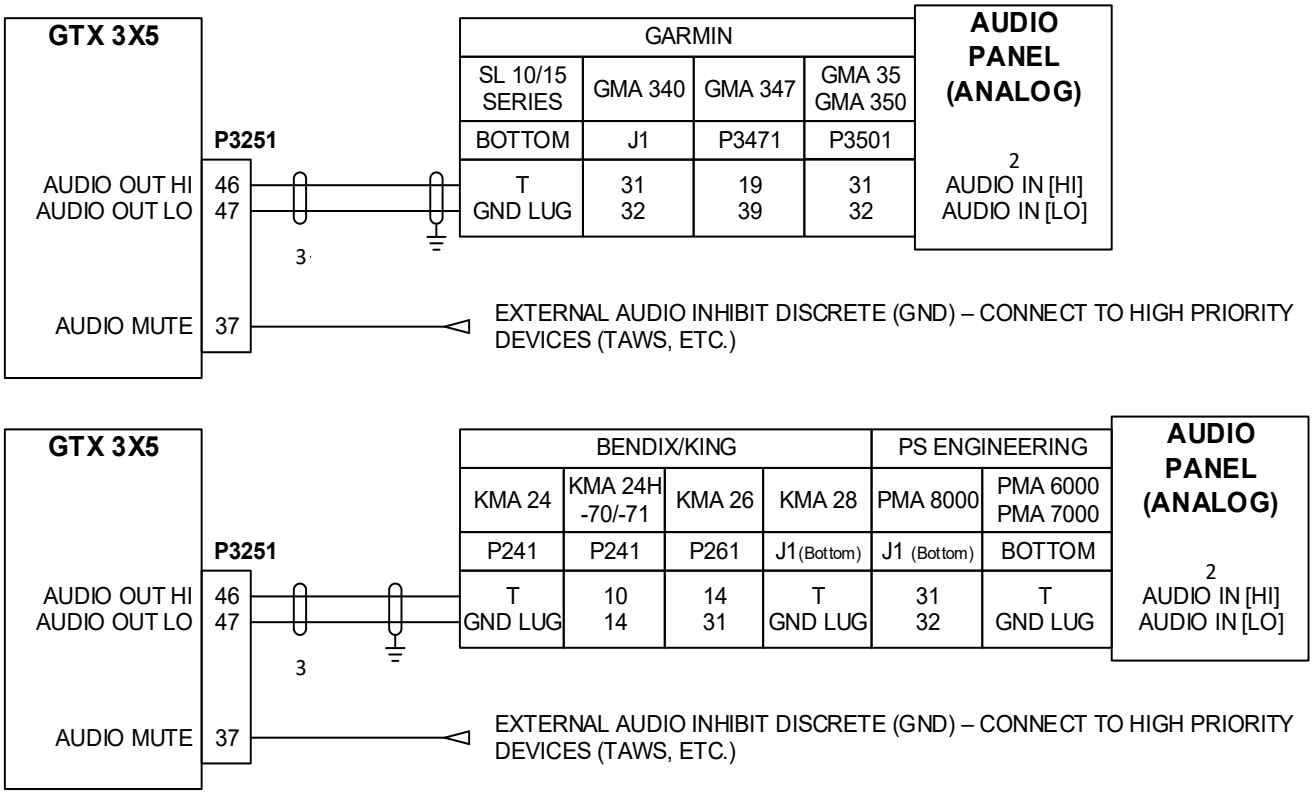



**NOTES**

1. TAWS AUDIO INHIBIT USED WITH 400S/500W SERIES UNITS ONLY.

2. CONNECTION CAN BE MADE TO NAVIGATOR #1 IN LIEU OF NAVIGATOR #2.

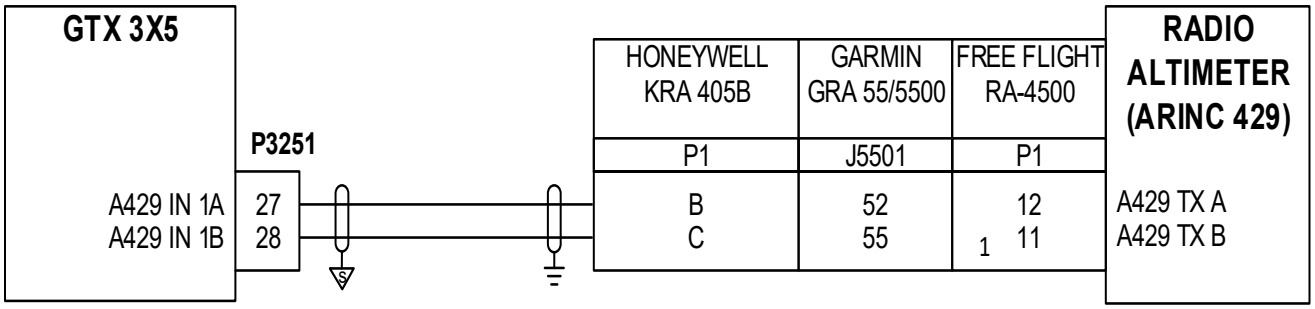
**Figure D-13 GTX 345 - Single and Dual 400W/500W Series Interconnect**




## NOTES

1. SEE THE GENERAL NOTES IDENTIFIED AT THE BEGINNING OF THIS APPENDIX FOR ADDITIONAL DETAILS AND REQUIREMENTS.
2. IT IS ACCEPTABLE TO USE OTHER AVAILABLE UNSWITCHED, UNMUTED INPUTS. IF 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 DEVICE. A TYPICAL VALUE FOR MIXING RESISTORS IS 390Ω ¼ W.
3. THE AUDIO LEVELS OF EXISTING AUDIO SOURCES WILL HAVE TO BE RE-EVALUATED AFTER MIXING RESISTORS ARE INSTALLED. SHIELDS FOR AUDIO CABLES SHOULD BE GROUNDED AT ONE END (WITH LEADS LESS THAN 3.0 INCHES) AND LEFT FLOATING AT THE OTHER END.

**Figure D-14 GTX 3X5 - Audio Interconnect**




**NOTES**

1. ONLY APPLICABLE TO FREE FLIGHT RA-4500 P/N 84560-X2-XXXX.

**Figure D-15 GTX 3X5 - Radio Altimeter Interconnect**

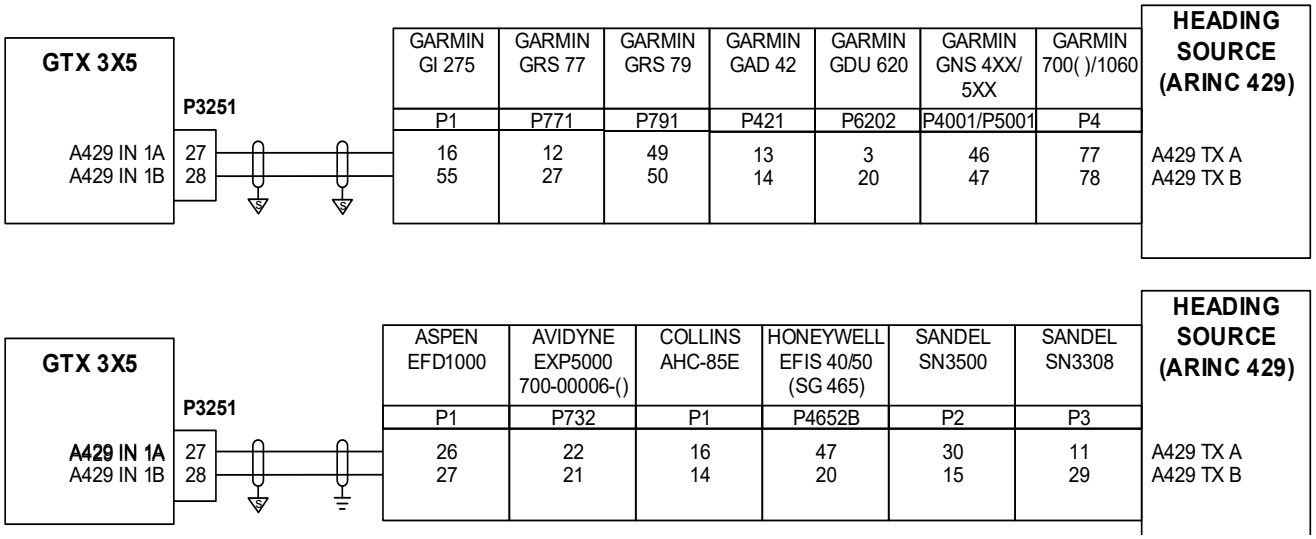
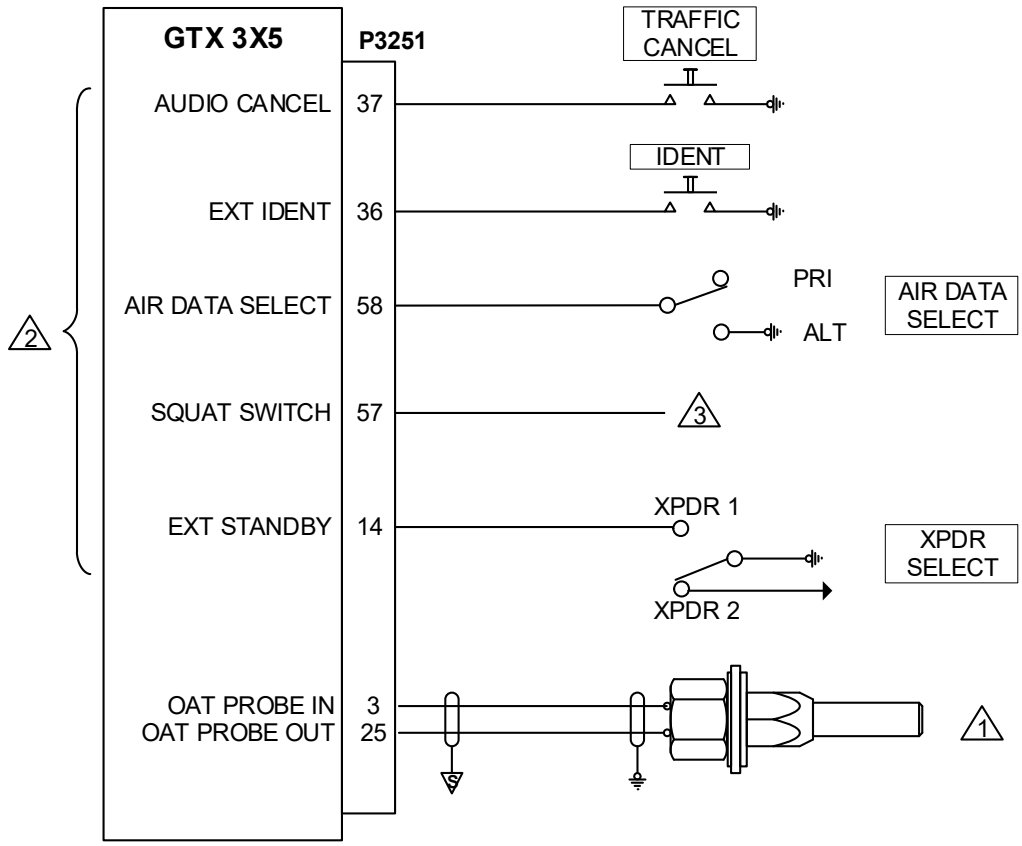



**Figure D-16 GTX 3X5 - AHRS/Heading Source Interconnect**




**NOTES**

1. OUTSIDE AIR TEMPERATURE PROBE STANDARD 2-WIRE THERMOCOUPLE WITH 1 MICRO-AMP PER DEGREE KELVIN RESPONSE. SUITABLE MODELS ARE: EDMO 655 AND DAVTRON C307PS.

2. DISCRETE I/O PINS ARE CONFIGURABLE. REFER TO SECTION 6.5.

3. THE SQUAT SWITCH INPUT CAN BE USED TO CONTROL AIR/GROUND STATUS. THE INPUT SENSE CONFIGURATION IS DESCRIBED IN TABLE 6-8.

4. AUDIO CANCEL AND TRAFFIC AUDIO CANCEL ARE SUPPORTED. TRAFFIC AUDIO CANCEL IS RECOMMENDED FOR ALERT CANCEL/ACKNOWLEDGE WHEN USING THE GTX 345.

**Figure D-17 GTX 3X5 - Switches and OAT Probe Interconnect**

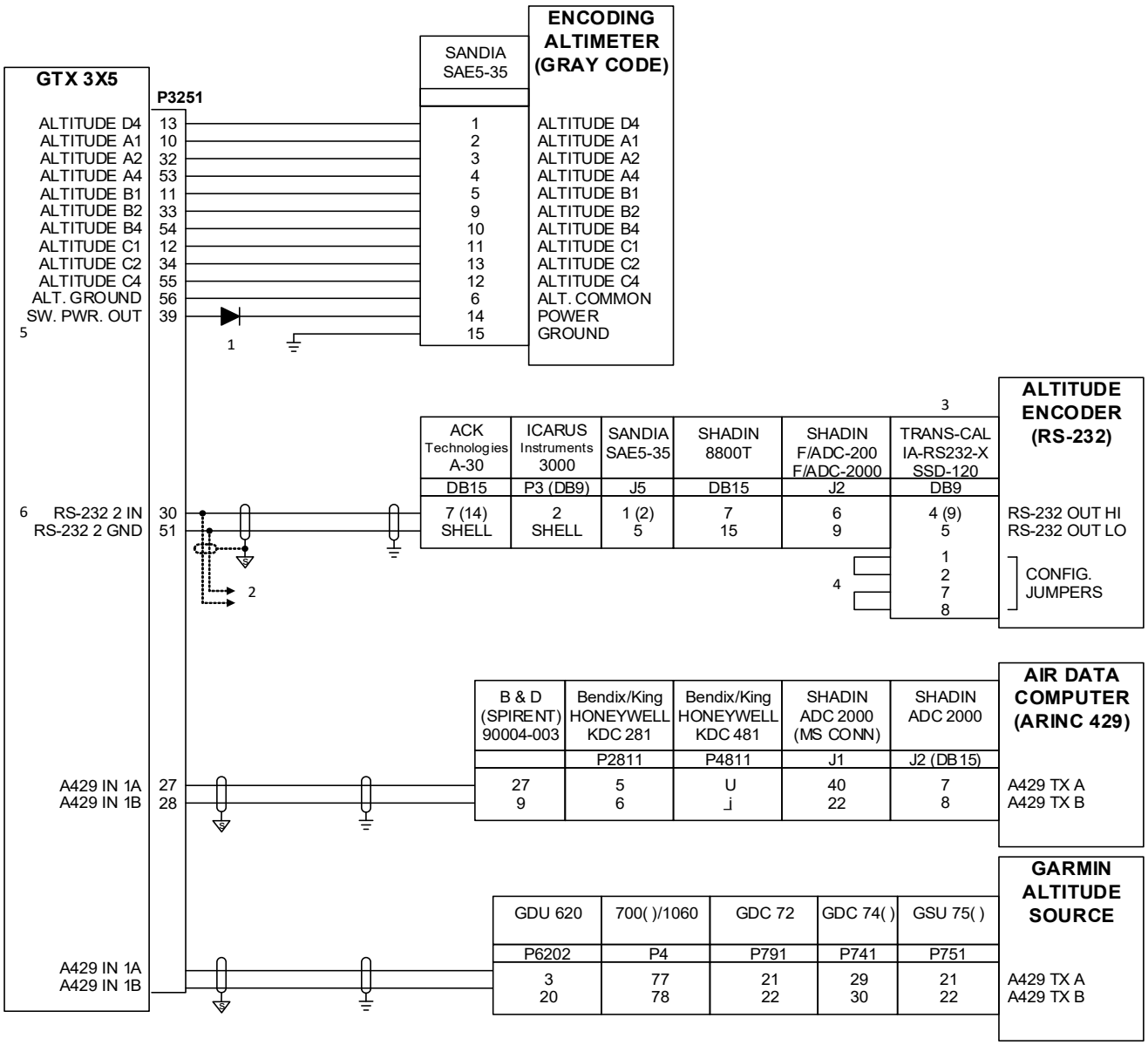



**Figure D-18 GTX 3X5 - Altitude Source Interconnect**
**Sheet 1 of 2**

**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. LIMIT STRAP LENGTH TO SPECIFIED LENGTH IN THE MANUFACTURER’S INSTALLATION MANUAL.
5. POWERING SAE 5-35 THROUGH THE SWITCHED OUTPUT IS OPTIONAL.
6. ALTITUDE MAY BE INPUT ON RS-232 IN 1, RS-232 IN 2, OR RS-232 IN 3.

**Figure D-18 GTX 3X5 - Altitude Source Interconnect**
**Sheet 2 of 2**

**GNS 400W/500W PROVIDING GPS AND HAT DATA TO GTX 325**

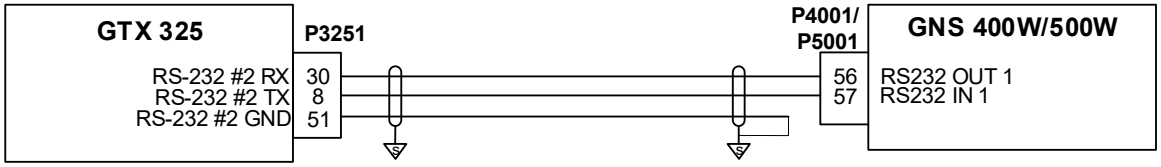
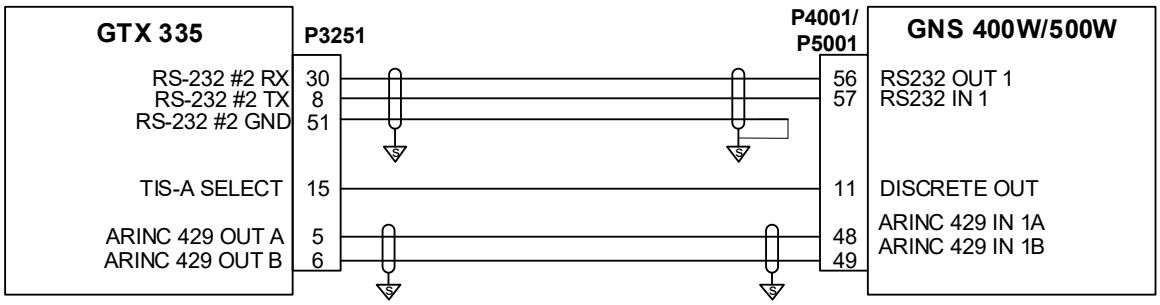
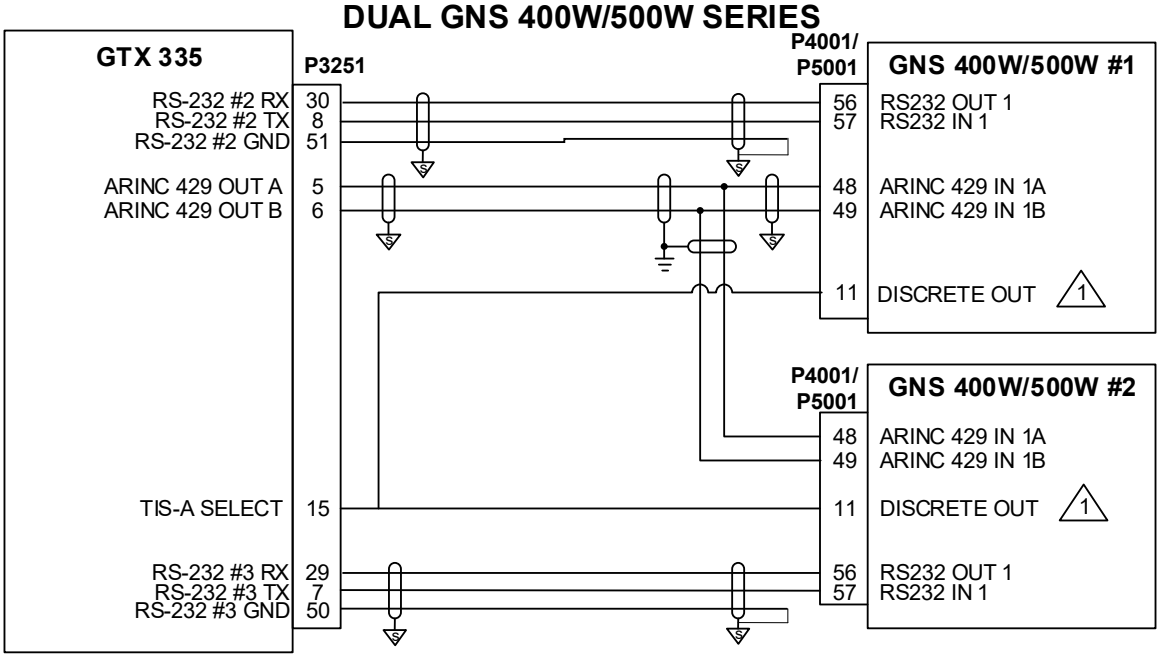



**Figure D-19 GTX 325 - GNS 400W/500W Series Interconnect**

## SINGLE GNS 400W/500W SERIES



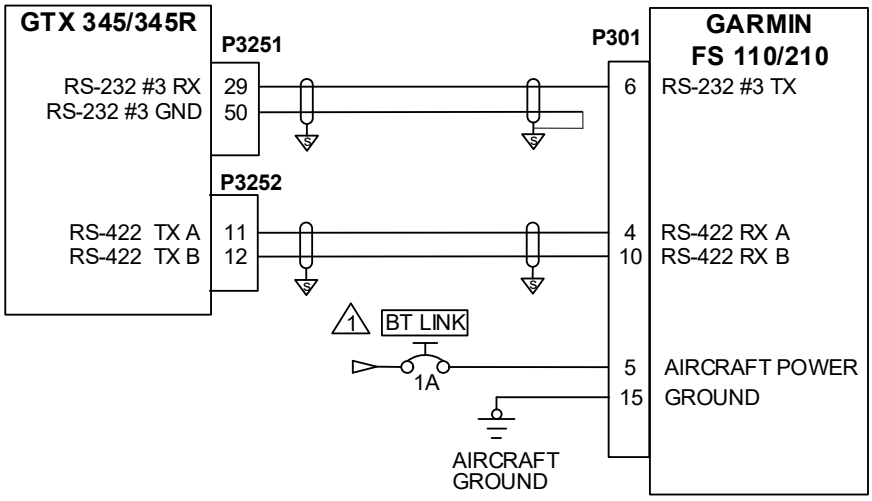

## DUAL GNS 400W/500W SERIES




**NOTES**

1. CONNECTION CAN BE MADE TO NAVIGATOR #1 IN LIEU OF NAVIGATOR #2.

**Figure D-20 GTX 335 - GNS 400W/500W Series Interconnect**




**NOTES**

1. CIRCUIT BREAKER SHOULD BE LABELED AS SHOWN.

**Figure D-21 GTX 345/345R - Flight Stream Interconnect**


**NOTES**

1. GMX 200 ONLY: JUMPER MUST BE INSTALLED AS SHOWN TO CONFIGURE PORT 4 FOR RS-422 OPERATION. IF PORT 4 IS USED AS AN RS-422 PORT, RS-232 PORT 4 CANNOT BE USED.

**Figure D-22 GTX 345 - MX20/GMX 200 Interconnect**

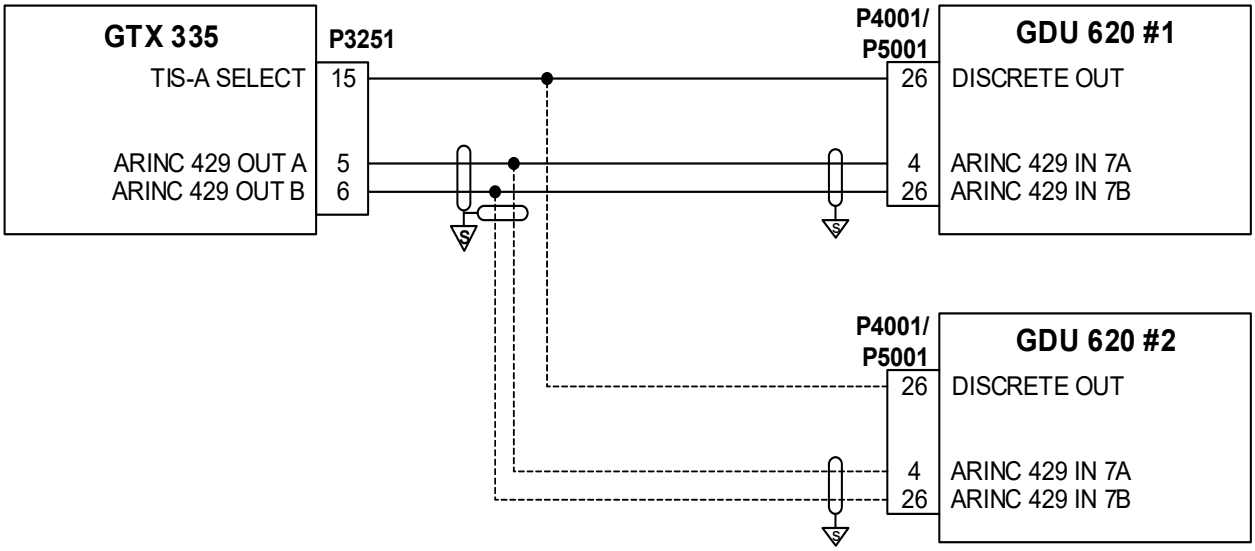
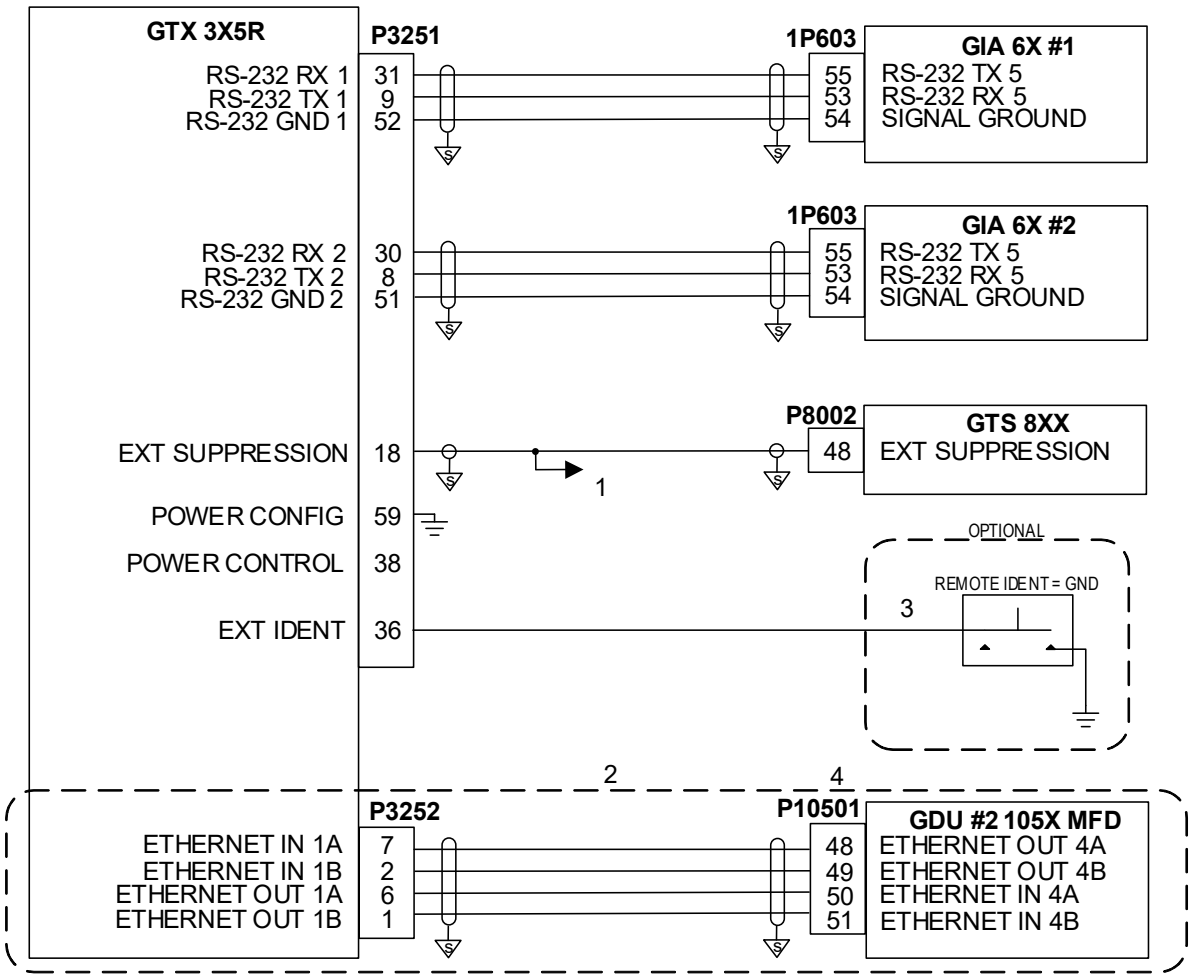



**Figure D-23 GTX 335 - GDU 620 Interconnect**




**NOTES**

1. CONNECTION TO AIRCRAFT SUPPRESSION BUS.
2. GTX 345R ONLY
3. OPTIONAL IDENT SWITCH
4. GDU SHOWN AS AN EXAMPLE ONLY. GTX 345R ETHERNET MUST BE CONNECTED SUCH THAT ALL DEVICES BETWEEN THE GTX 345R AND A GDU ARE HSDB 2 COMPATIBLE. CONTACT GARMIN PRODUCT FOR DEVICES THAT ARE HSDB 2 COMPATIBLE.
5. REFER TO FIGURE D-12 FOR INTERFACING THE GTX 345R DIRECT WITH A TAS/TCAS TRAFFIC UNIT USING ARINC 429 AND DISCRETE TRAFFIC TEST AND STANDBY CONNECTIONS. WHEN BOTH A GTX 345R AND GTS TRAFFIC SYSTEM ARE CONNECTED VIA ETHERNET TO THE NXi OR GX000 SYSTEM, THE GTX 345R TRAFFIC ARINC 429 AND DISCRETE CONNECTIONS, EXCLUDING EXTERNAL SUPPRESSION, ARE NOT USED.

**Figure D-24 Single GTX 3X5R - G1000 NXi and GX000 Interconnect**

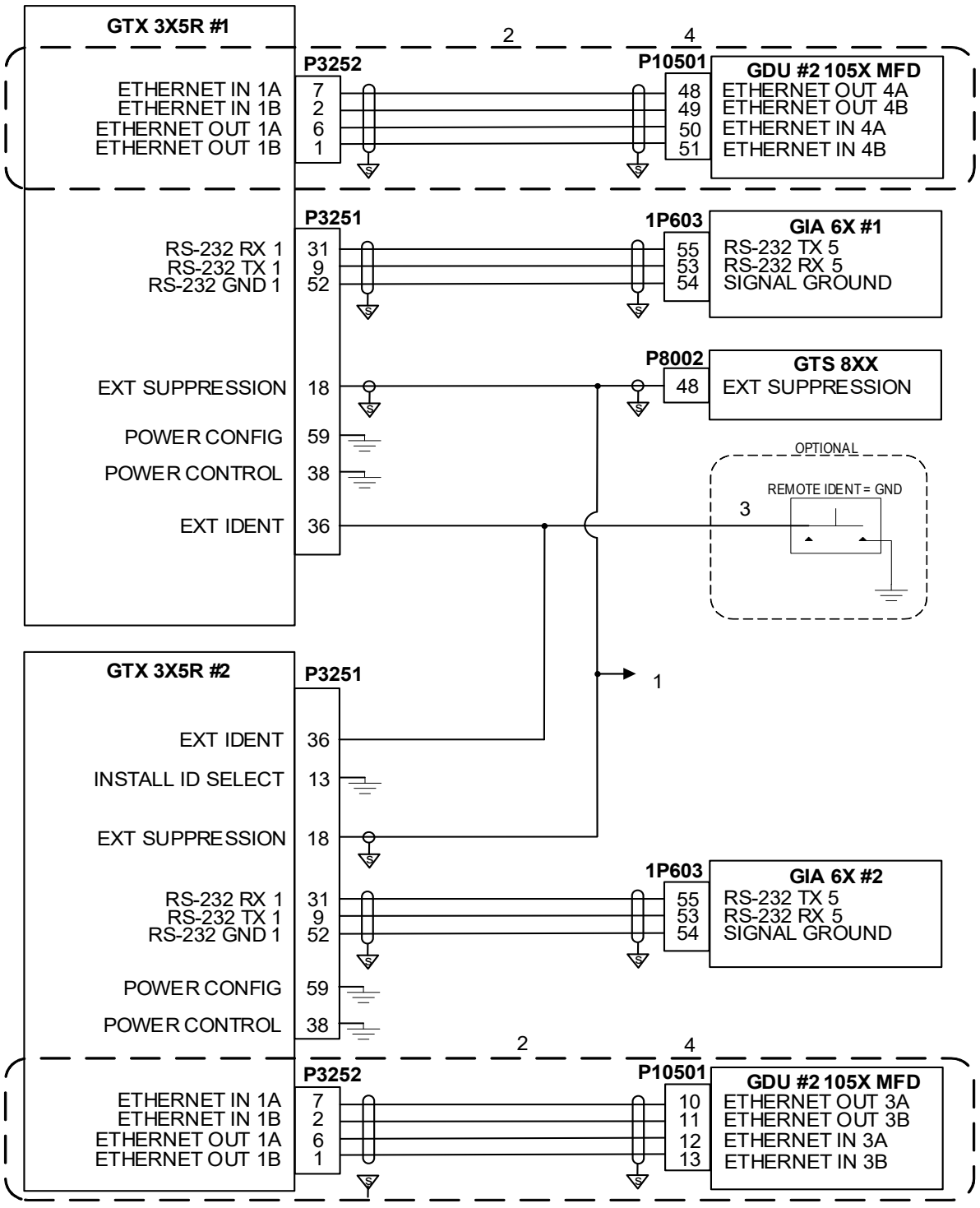



**Figure D-25 Dual GTX 3X5R - G1000 NXi and GX000 Interconnect**
**Sheet 1 of 2**

**NOTES**

1. CONNECTION TO AIRCRAFT SUPPRESSION BUS.

2. GTX 345R ONLY

3. OPTIONAL IDENT SWITCH

4. GDU SHOWN AS AN EXAMPLE ONLY. GTX 345R ETHERNET MUST BE CONNECTED SUCH THAT ALL DEVICES BETWEEN THE GTX 345R AND A GDU ARE HSDB 2 COMPATIBLE. CONTACT GARMIN PRODUCT FOR DEVICES THAT ARE HSDB 2 COMPATIBLE.

5. REFER TO FIGURE D-12 FOR INTERFACING THE GTX 345R DIRECT WITH A TAS/TCAS TRAFFIC UNIT USING ARINC 429 AND DISCRETE TRAFFIC TEST AND STANDBY CONNECTIONS. WHEN BOTH A GTX 345R AND GTS TRAFFIC SYSTEM ARE CONNECTED VIA ETHERNET TO THE NXi OR GX000 SYSTEM, THE GTX 345R TRAFFIC ARINC 429 AND DISCRETE CONNECTIONS, EXCLUDING EXTERNAL SUPPRESSION, ARE NOT USED.

6. WHEN TWO GTX 345R UNITS ARE INSTALLED, ONLY ONE GTX CAN BE THE ADS-B IN SOURCE. ADS-B IN FUNCTIONALITY MUST BE DISABLED BY CONFIGURATION IN ONE OF THE GTX UNITS.

**Figure D-25 Dual GTX 3X5R - G1000 NXi and GX000 Interconnect**
**Sheet 2 of 2**

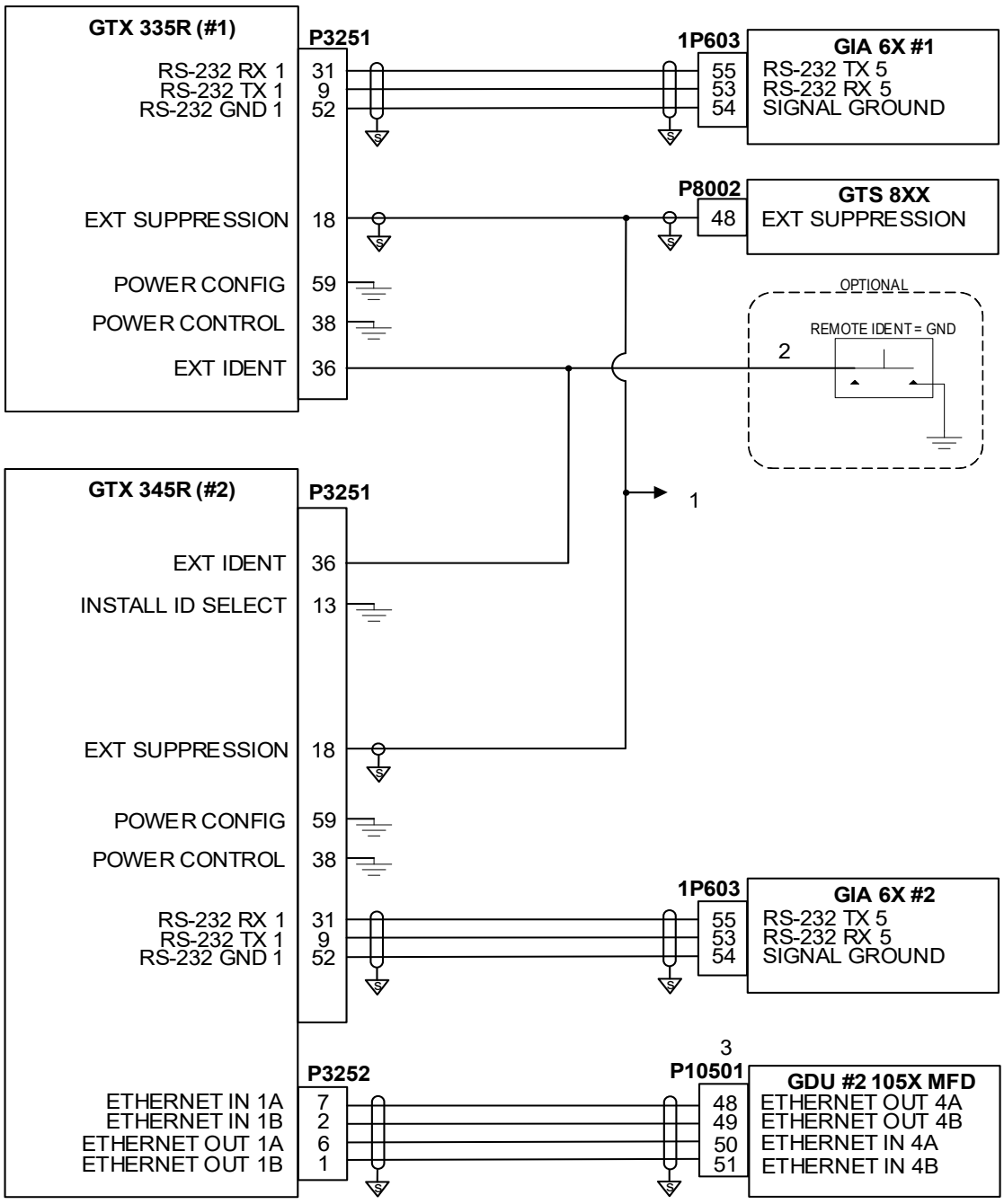



**Figure D-26 GTX 335R/GTX 345R - G1000 NXi and GX000 Interconnect**
**Sheet 1 of 2**

## NOTES

1. CONNECTION TO AIRCRAFT SUPPRESSION BUS.

2. OPTIONAL IDENT SWITCH.

3. GDU SHOWN AS AN EXAMPLE ONLY. GTX 345R ETHERNET MUST BE CONNECTED SUCH THAT ALL DEVICES BETWEEN THE GTX 345R AND A GDU ARE HSDB 2 COMPATIBLE. CONTACT GARMIN PRODUCT SUPPORT FOR DEVICES THAT ARE HSDB 2 COMPATIBLE.

| | |
|---|---|
| 4 | REFER TO FIGURE D-12 FOR INTERFACING THE GTX 345R DIRECT WITH A TAS/TCAS TRAFFIC UNIT USING ARINC 429 AND DISCRETE TRAFFIC TEST AND STANDBY CONNECTIONS. WHEN BOTH A GTX 345R AND GTS TRAFFIC SYSTEM ARE CONNECTED VIA ETHERNET TO THE NXi OR GX000 SYSTEM, THE GTX 345R TRAFFIC ARINC 429 AND DISCRETE CONNECTIONS, EXCLUDING EXTERNAL SUPPRESSION, ARE NOT USED. |

**Figure D-26 GTX 335R/GTX 345R - G1000 NXi and GX000 Interconnect**
**Sheet 2 of 2**

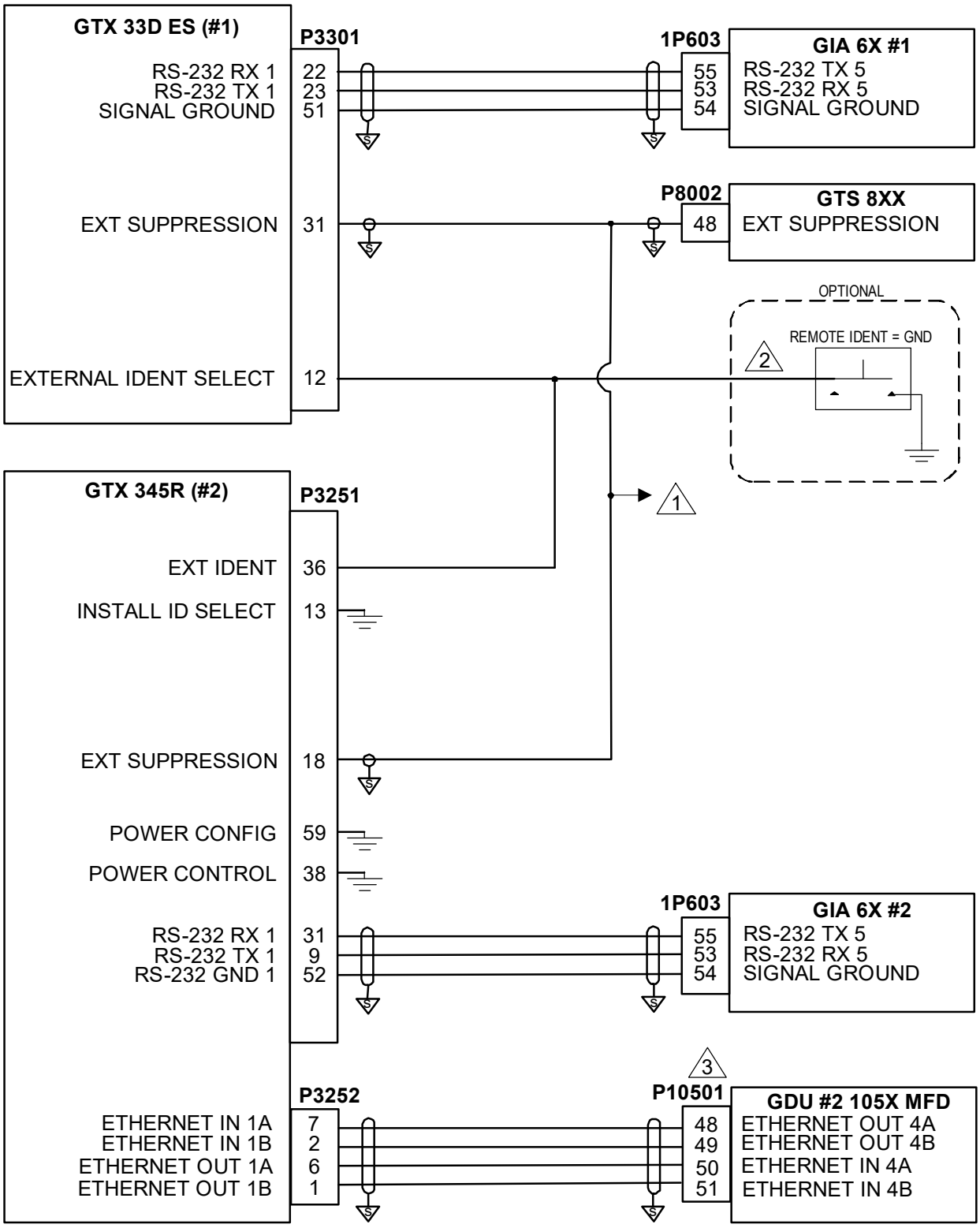



**Figure D-27 GTX 33D ES and GTX 345 - G1000 NXi and GX000 Interconnect**
**Sheet 1 of 2**

**NOTES**

1. CONNECTION TO AIRCRAFT SUPPRESSION BUS. REFER TO THE GTX 33 INSTALLATION MANUAL FOR KNOWN DME MODELS THAT ARE INCOMPATIBLE.

2. OPTIONAL IDENT SWITCH.

3. GDU SHOWN AS AN EXAMPLE ONLY. GTX 345R ETHERNET MUST BE CONNECTED SUCH THAT ALL DEVICES BETWEEN THE GTX 345R AND A GDU ARE HSDB 2 COMPATIBLE. CONTACT GARMIN PRODUCT SUPPORT FOR DEVICES THAT ARE HSDB 2 COMPATIBLE.

4. REFER TO FIGURE D-12 FOR INTERFACING THE GTX 345R DIRECT WITH A TAS/TCAS TRAFFIC UNIT USING ARINC 429 AND DISCRETE TRAFFIC TEST AND STANDBY CONNECTIONS. WHEN BOTH A GTX 345R AND GTS TRAFFIC SYSTEM ARE CONNECTED VIA ETHERNET TO THE NXi OR GX000 SYSTEM, THE GTX 345R TRAFFIC ARINC 429 AND DISCRETE CONNECTIONS, EXCLUDING EXTERNAL SUPPRESSION, ARE NOT USED.

**Figure D-27 GTX 33D ES and GTX 345 - G1000 NXi and GX000 Interconnect**
**Sheet 2 of 2**

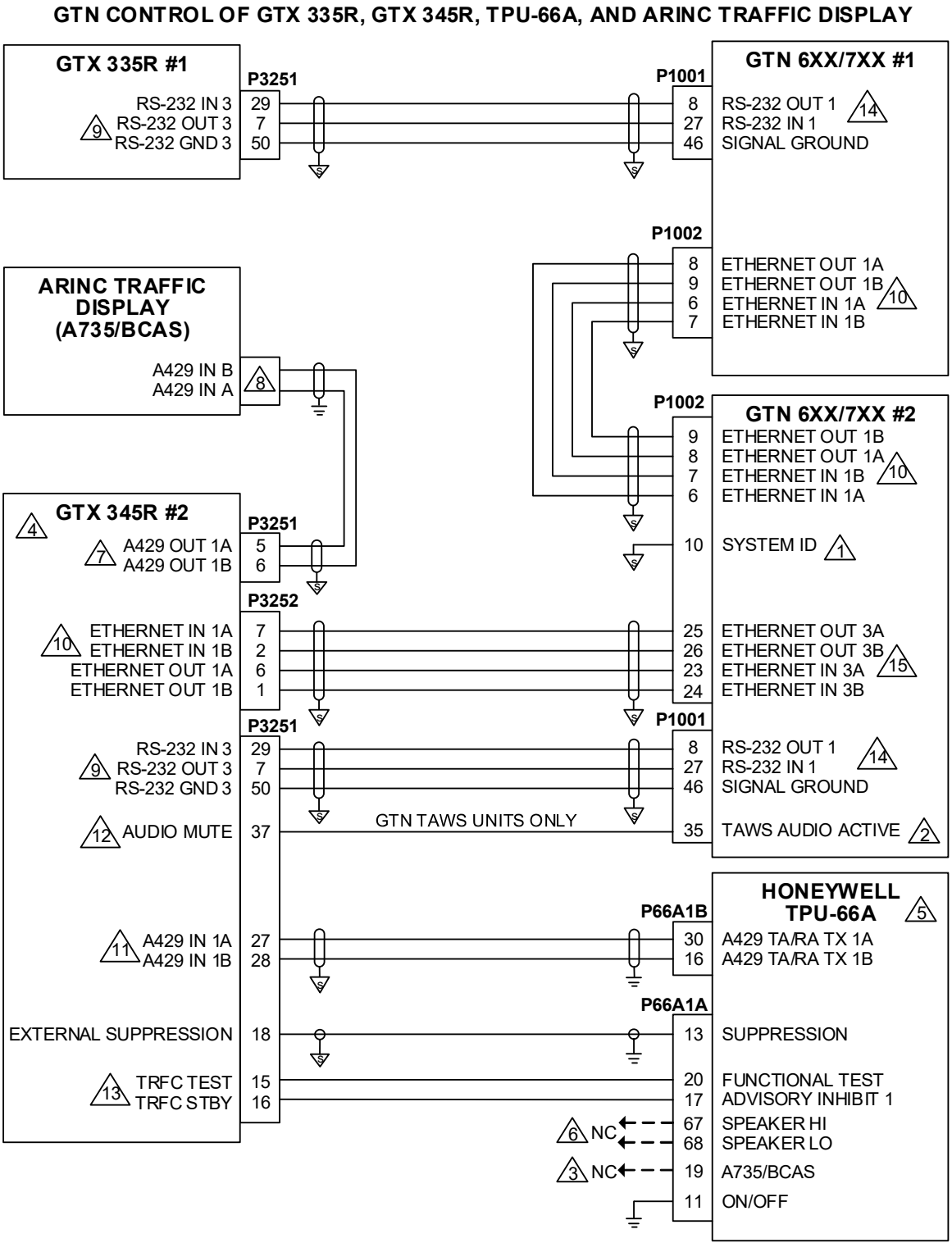
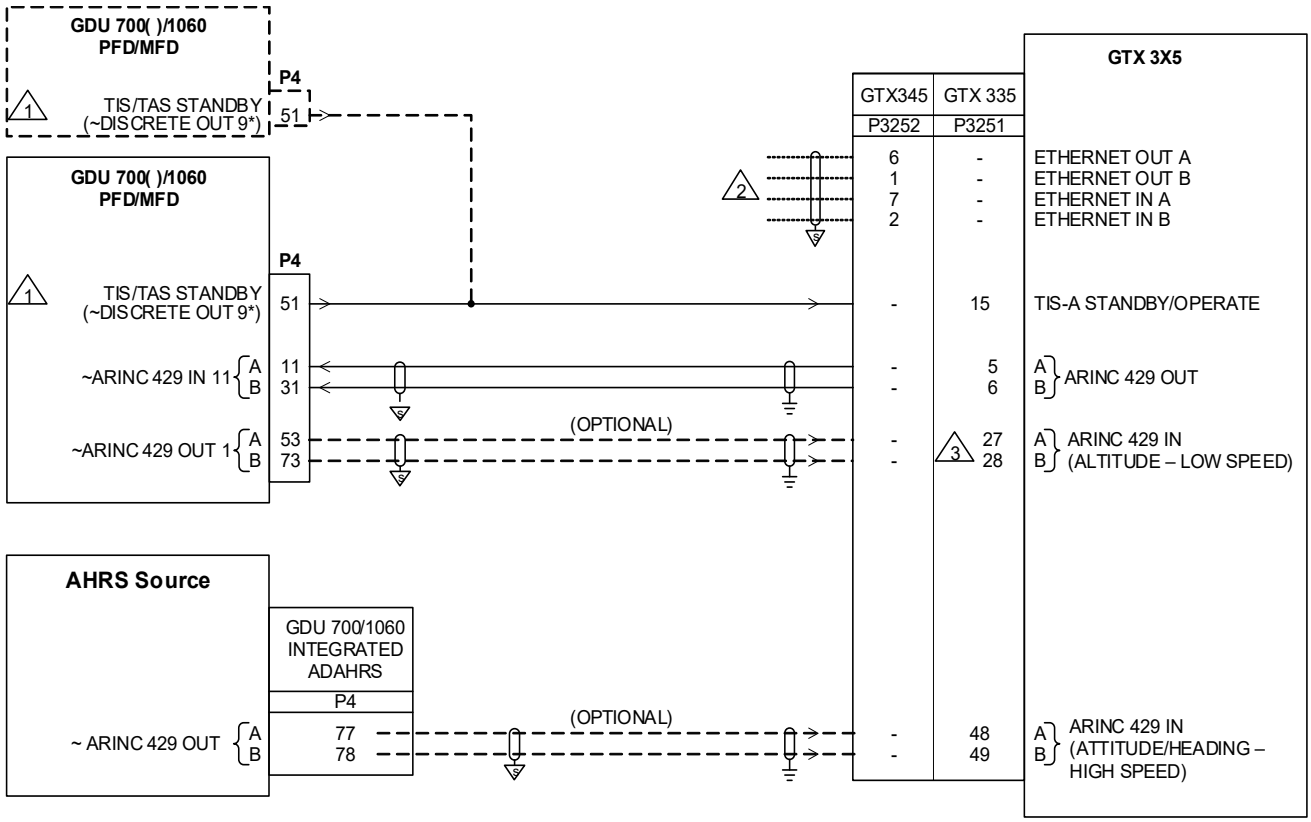



**Figure D-28 GTX 335R/GTX 345R - TPU-66A Traffic Display Interconnect**
**Sheet 1 of 2**

**NOTES**

1. WHEN THE GTN 6XX/7XX IS THE ONLY INSTALLED GPS NAVIGATOR, OR GPS NAVIGATOR #1 IN A DUAL GPS NAVIGATOR INSTALLATION, CONFIGURE GTN 6XX/7XX AS GTN #1 BY LEAVING SYSTEM ID (P1002-10) NOT CONNECTED. WHEN THE GTN 6XX/7XX IS GPS NAVIGATOR #2 IN A DUAL GPS INSTALLATION, CONFIGURE GTN #2 BY GROUNDING SYSTEM ID (P1002-10) TO THE SHIELD BLOCK.
2. TAWS AUDIO INHIBIT FOR GTN 6XX/7XX TAWS UNITS ONLY.
3. THE TA/RA BLOCK TRANSFER PROGRAM PIN (A735/BCAS) MUST BE OPEN TO CONFIGURE THE TPU-66A DISPLAY BUS OUTPUT FOR ARINC 735 PROTOCOL.
4. THE GTX 345 SHOULD BE INTERFACED TO THE AUDIO PANEL FOR TRAFFIC AUDIO ALERTS. REFER TO FIGURE D-14 .
5. ADDITIONAL INTERFACES TO THE TPU-66A NOT IDENTIFIED IN THIS INTERCONNECT, SUCH AS ALTITUDE/ HEADING DATA, TA DISPLAY VALID DISCRETES, AND CONFIGURATION STRAPS, SHOULD REMAIN CONNECTED FOR PROPER TCAS OPERATION.
6. IF THE TPU-66A WAS INTERFACED TO THE AUDIO PANEL, THESE WIRES SHOULD BE CAPPED AND STOWED. THE GTX 345R SHOULD BE THE ONLY SOURCE OF TRAFFIC AUDIO ALERTS.
7. CONFIGURE THE GTX 345R ARINC OUTPUT TO THE A429 BCAS FORMAT WHEN INTERFACING WITH A HONEYWELL BCAS DISPLAY. CONFIGURE THIS OUTPUT TO THE A735 FORMAT WHEN INTERFACING TO AN ARINC 735 TRAFFIC DISPLAY.
8. REFER TO THE TRAFFIC DISPLAY MANUFACTURER DOCUMENTATION FOR PIN NUMBERS.
9. GTX 3X5 RS-232 PORT 1, 2, OR 3 MAY BE USED.
10. ANY AVAILABLE ETHERNET PORT MAY BE USED.
11. ANY AVAILABLE GTX 3X5 A429 INPUT MAY BE USED.
12. ANY CONFIGURABLE GTX 3X5 DISCRETE INPUT PIN MAY BE USED. REFER TO SECTION 5.7 FOR CONFIGURABLE INPUT PINS.
13. CONFIGURABLE GTX 3X5 P3251 DISCRETE OUTPUT PINS ONLY.
14. ANY AVAILABLE GTN RS-232 PORT MAY BE USED.
15. ANY AVAILABLE GTN 1 OR GTN 2 ETHERNET PORT MAY BE USED.
16. THE GTN PROVIDES GTX 335R AND 345R TRANSPONDER CONTROL, GTX 345R ADS-B IN CONTROL, TPU-66A OPERATE/STANDBY/TEST CONTROL AND ARINC TRAFFIC DISPLAY CONTROL. GTN SOFTWARE VERSION 6.50 AND LATER REQUIRED. GTX 3X5 MAIN SOFTWARE VERSION 2.50 AND LATER AND GTX 3X5 ADS-B SOFTWARE VERSION 3.00 AND LATER REQUIRED.

**Figure D-28 GTX 335R/GTX 345R - TPU-66A Traffic Display Interconnect**
**Sheet 2 of 2**




## NOTES

1. TIS/TAS STANDBY DISCRETE CONNECTION IS ONLY REQUIRED IF THE GDU IS CONFIGURED FOR "CONTROL TRAFFIC."

2. ANY AVAILABLE GDU ETHERNET PORT MAY BE USED.

3. ALTITUDE, TEMPERATURE, HEADING, SPEED, AND SELECTED COURSE INFORMATION MAY BE PROVIDED BY THE GDU TO THE TRANSPONDER.

**Figure D-29 GTX 335/345 - GDU 700( )/1060 Interconnect**

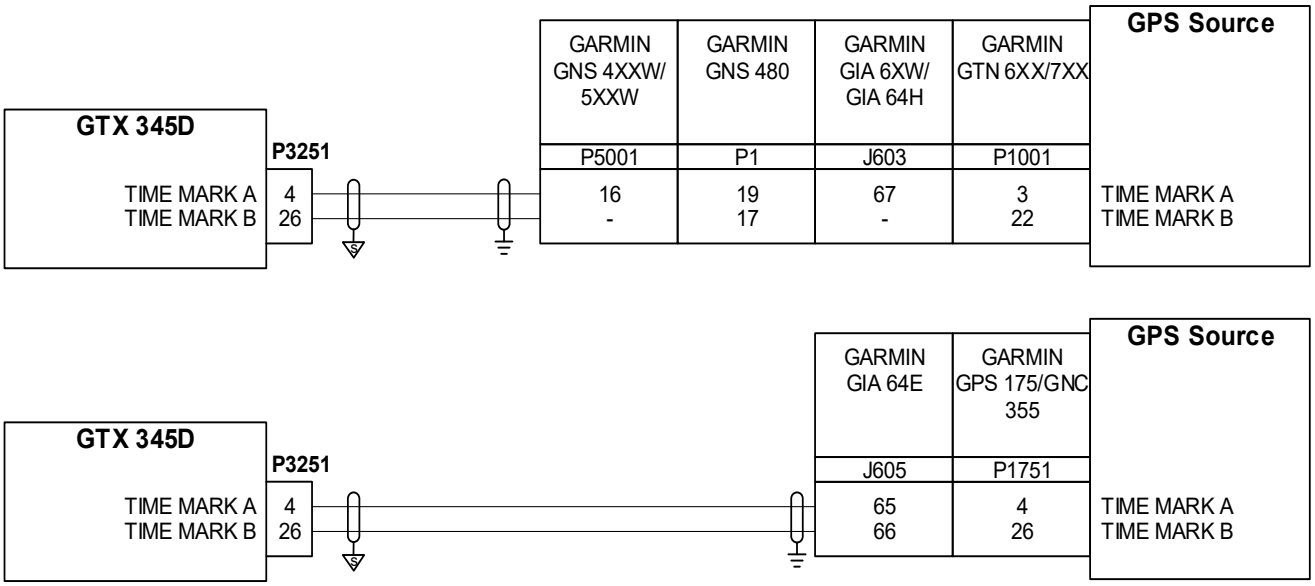



**Figure D-30 GTX 345D GPS Time Mark Input Interconnect**

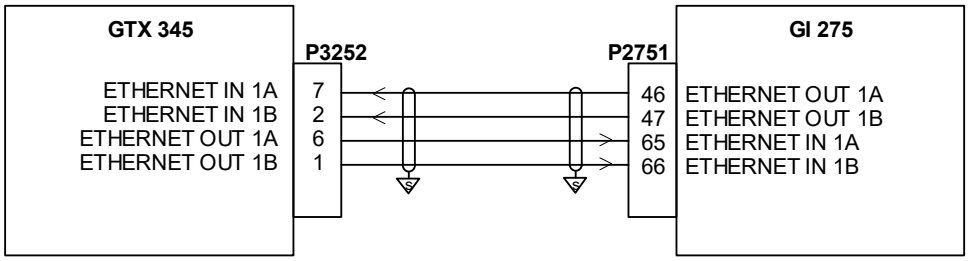



**Figure D-31 GTX 345 - GI 275 Interconnect**

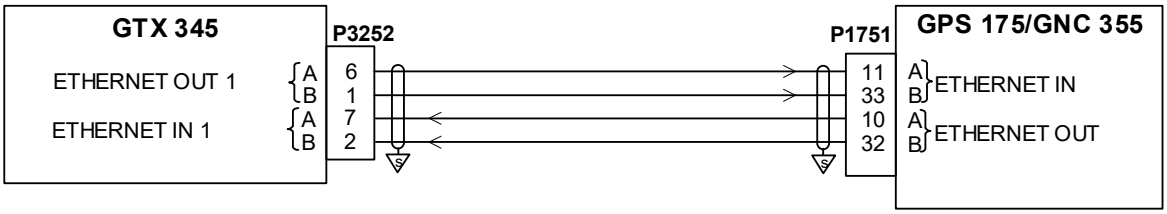
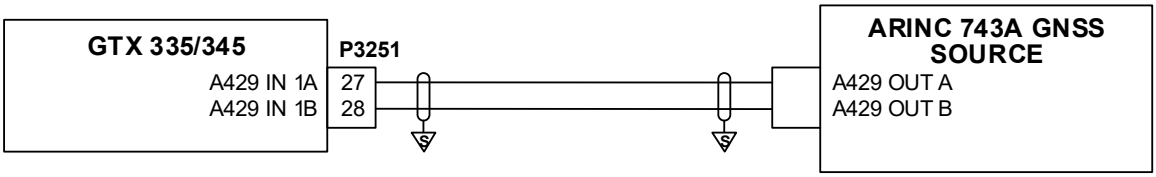



**Figure D-32 GTX 345 - GPS 175/GNC 355 Interconnect**


**Figure D-33 GTX 335 - GPS 175/GNC 355 Interconnect**




## NOTES

1 GTX 3X5 SOFTWARE P/N 006-B1607-0P (MAIN v2.85) OR LATER IS RECOMMENDED. REFER TO TABLE C-2 FOR ADDITIONAL DETAILS.

2 ANY AVAILABLE GTX 3X5 ARINC 429 INPUT PORT CAN BE USED.

**Figure D-34 GTX 335/345 - GNSS Source Interconnect**

# Appendix E CS-ACNS Compliance Matrix



## E.1 Elementary Surveillance (ELS)

The information in this section is applicable to GTX 335/335R/335D/335DR/345/345R/345D/345DR units.

**Table E-1 ELS**

| CS-ACNS SECTION | CS-ACNS ITEM DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ELS.001 Applicability | Provided that the differences listed in Appendix D have also been addressed, then previous compliance declarations with JAA TGL 13 Revision1 (Certification of Mode S Transponder Systems for Elementary Surveillance) supplemented with the additional assessments is another Acceptable Means of Compliance. | Not applicable for the new GTX 335/335R/345/345R units. |
| CS ACNS.D.ELS.010 Transponder Characteristics | a) The transponder(s) is (are) an approved level 2 or greater Mode S transponder(s) with Elementary Surveillance and Surveillance Identifier (SI) capability. | The GTX 335/335R/345/345R units are TSO Class 1 Level 2 transponder with Level C (Major) Failure classification with SI mode capability. |
| | b) The transponder(s) of aircraft that have ACAS II installed is (are) ACAS compatible. | The GTX 335/335R/345/345R units do not support an interface with an ACAS II system therefore the Resolution Advisory (BDS 3,0) is transmitted as all zeros. |
| | c) The peak pulse power available at the antenna end of the transmission line of the transponder is more than 125 W (21 dBW) and not more than 500 W (27 dBW) for aircraft that operate at altitudes exceeding 4,570 m (15 000 ft) or with a maximum cruising speed exceeding 90 m/s (175 knots). | The GTX 335/335R/345/345R units meets the minimum and maximum transmit power level, 125 W (21 dBW) and 500 W (27 dBW), respectively, when installed according to the installation manual. |

| CS-ACNS SECTION | CS-ACNS ITEM DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ELS.010 Transponder Characteristics (continued) | d) The peak pulse power available at the antenna end of the transmission line of the transponder is more than 70 W (18.5 dBW) and not more than 500 W (27 dBW) for aircraft operating at or below 4,570 m (15000 ft) with a maximum cruising airspeed of 90 m/s (175 knots) or less. | The GTX 335/335R/345/345R units are a Class 1 transponder meeting the higher requirements identified in ACNS.D.ELS.010.c, when installed according to the installation manual. |
| CS ACNS.D.ELS.015 Data Transmission | a) The surveillance system provides the following data in the Mode S replies: | The GTX 335/335R/345/345R units provide the following: |
| | 1. The Mode A Code in the range 0000 to 7777 (Octal) | 1. Mode A code provided in DF=5 and 21 replies. Mode A Code in the range 0000 to 7777 using either the panel mount push-buttons or a compatible control device e.g., GTN 6XX/7XX, GX000, GNS 480. |
| | 2. The pressure altitude corresponding to within plus or minus 38 m (125 ft), on a 95 percent probability basis, with the pressure-altitude information (referenced to the standard pressure setting of 1013.25 hectopascals), used on board the aircraft to adhere to the assigned flight profile. The pressure altitude ranges from minus 300 m (1,000 ft) to the maximum certificated altitude of aircraft plus 1,500 m (5,000 ft). | 2. Altitude is reported in DF=4 and 20 replies. The transponder transmits altitude in 100 ft increments from -1,000 to 62,700ft or 25ft increments from -1,000 to 50,175ft depending on the source data. |
| | 3. On-the-ground status information. | 3. CA field in DF=11 or FS field in DF = 4, 5, 20, and 21 replies includes airborne state. The GTX units automatically transition the aircraft state from airborne to ground-borne and report surface mode broadcasting ground-only information such as aircraft length and width. If the aircraft airborne state is unknown, it will report AIRBORNE with additional details in DF 11 with CA code of 6 or 7. |

| CS-ACNS SECTION | CS-ACNS ITEM DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ELS.015 Data Transmission (continued) | 4. The Aircraft Identification as specified in Item 7 of the ICAO flight plan or the aircraft registration. | 4. The GTX units provide BDS register 20 (Aircraft Identification) as configured by the installer, or changed by the flight crew via panel mount push-buttons or a compatible control device. BDS register 21 (Aircraft Registration) is provided as a constant message. |
| | 5. Special Position Indication (SPI). | 5. FS (Flight Status) field in DF=4, 5, 20, and 21 replies includes SPI/IDENT indication. SPI/IDENT is commanded by flight crew via discrete input, panel mount push button, or a compatible control device. |
| | 6. Emergency status (Emergency, Radio communication failure, Unlawful interference). | 6. Emergency status is reported in DF=5 and 21 replies. |
| | 7. The data link capability report. | 7. BDS register 10 (Data Link Capability Report) is provided. |
| | 8. The common usage GICB capability report. | 8. BDS register 17 (Common Usage Ground Initiated Comm-B Capability Report) is provided |
| | 9. The ICAO 24-bit aircraft address. | 9. ICAO 24-bit aircraft address is provided in DF=11 squitters. |
| | 10. Aircraft that have ACAS II installed provide the ACAS active resolution advisory report. | 10. Resolution Advisory (BDS 3,0) is transmitted as all zeros, as the GTX units do not support an interface with ACAS II. |
| | b) All other data transmitted is verified. | The installation data requires a transponder / ADS-B test to be run IAW Part 43 applicable regulatory tests. |
| | 1. If the system transmits one or more additional downlink airborne parameters in addition to those listed in paragraph (a), then the relevant sub specifications of CS ACNS.D.EHS.015 are also complied with. | |

| CS-ACNS SECTION | CS-ACNS ITEM DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ELS.015 Data Transmission (continued) | 2. If the system transmits additional parameters on the extended squitter and if their full compliance with CS ACNS.D.ADSB has not been verified, as a minimum the aircraft identification, pressure altitude, ICAO 24-bit aircraft address is identical to those transmitted in the Mode S replies. Additionally the position and velocity quality indicators reports the lowest quality. | The installation data requires a transponder / ADS-B test to be run IAW Part 43 applicable regulatory tests. |
| CS ACNS.D.ELS.020 On-the-Ground Status Determination | a) The on-the-ground status is not set by a manual action. | The GTX 335/335R/345/345R software's air/ground state will be automatically determined based on emitter category, remote air/ground state, ground speed, GPS track, airspeed, squat switch, height above terrain, and radio altitude when possible. The on-the-ground status cannot be set my manual action. |
| | b) If automatic determination of the on-the-ground status is not available, the on-the ground status is set to airborne. | The GTX 335/335R/345/345R units will report the airborne state in FS fields 4, 5, 20, 21 and the CA field of DF 11. Furthermore, DF 11 provides the additional capability of identifying if the aircraft didn't know the air/ground state by transmitting a CA code of 6 or 7 which still translates to an AIRBORNE state. |
| CS ACNS.D.ELS.025 Altitude Source | a) The reported pressure altitude is obtained from an approved source. | The installation manual provides approved altitude interfaces. |
| | b) The altitude resolution is equal to or less than 30.48 m (100 ft). | When the unit retrieves valid pressure altitude data, the unit sets the altitude precision of the system based on the data source and the precision field, with a worst-case resolution of 100ft. |
| | c) The altitude source connected to the active transponder is the source being used to fly the aircraft. | The GTX 335/335R/345/345R provides the option to utilize the Garmin Altitude Encoder which interfaces to the existing aircraft static system and provides the altitude data via I2C to the GTX. It is required to conduct a transponder test upon completion of the installation, which also requires an altitude inspection to compare the input altitude to the aircraft altitude and broadcasted altitude. |

| CS-ACNS SECTION | CS-ACNS ITEM DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ELS.030 Flight Deck Interface | a) A means is provided: | The GTX 335/335R/345/345R units provide the following: |
| | 1. To select Mode A Code, including emergency indicators. | 1. Mode A code entry either on the panel or from a compatible control device, e.g., GTN 6XX/7XX, GNS 480, or GX000. |
| | 2. To initiate the IDENT (SPI) feature. | 2. Ident can be activated via front panel button, discrete input, or compatible control device. |
| | 3. For an aircraft identification to be inserted by the flight crew if the aircraft uses variable aircraft identification. | 3. Flight ID is entered from the transponder main page on panel mounted units. For remote units, Flight ID is entered remotely from a compatible control device. |
| | 4. To notify the flight crew when the transmission of pressure altitude information has been inhibited, if a means to inhibit the transmission of pressure altitude is provided. | 4. The GTX 3X5 provides a means to inhibit the transmission of pressure altitude. The means is through selection of ON mode or Standby mode. The flight crew is notified when transmission of pressure altitude is inhibited, via the annunciation of ON or Standby mode on the front panel or remotely on a compatible control device. |
| | 5. To select the transponder to the 'standby' or "OFF" condition. | 5. The GTX 335/335R/345/345R units are equipped with an OFF and STBY key. Remotely installed units are controlled serially and provide a means to place the unit in OFF or STBY. |
| | 6. To indicate the non-operational status or failure of the transponder system without undue delay and without the need for flight crew action. | 6. Failure messages are provided to the display of panel mounted units. Failure messages are provided to the control source of remotely installed units. Failure messages are documented in the maintenance manual. |
| | 7. To display the selected Mode A code to the flight crew. | 7. Mode A codes are displayed and entered from the transponder main page on Panel mounted units. For remote units, Mode A codes are displayed and entered remotely from a compatible control device. |
| | 8. To display the aircraft identification to the flight crew | 8. Flight ID is displayed on the transponder main page on Panel mounted units. For remote units, Flight ID is displayed remotely on a compatible control device. |

| CS-ACNS SECTION | CS-ACNS ITEM DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ELS.030 Flight Deck Interface (continued) | b) Input which is not intended to be operated in flight, is not readily accessible to the flight crew. | The Transponders have a Ground Test mode, which requires a unit power cycle while depressing a soft key. |
| CS ACNS.D.ELS.040 Integrity | The Mode S ELS airborne surveillance system integrity is designed commensurate with a "minor" failure condition. | Mode S operations are classified as a Minor failure classification for the GTX 335/335R/345/345R units. The transponder is designed to meet design assurance level C which exceeds the "minor" failure classification for Mode S ELS. |
| CS ACNS.D.ELS.045 Continuity | The Mode S ELS airborne surveillance system continuity is designed to an allowable qualitative probability of "remote." | The GTX 335/335R/345/345R units have a design assurance level of C "remote" for listed functions. The GTX 335/335R/345/345R units also have a maximum ELS system failure rate of no less than 5000 hours using the MTBF rates, or 2.0E-04 failure rate. |
| CS ACNS.D.ELS.050 Dual/multiple Transponder Installation | If more than one transponder is installed, simultaneous operation of transponders is prevented. | Dual transponder installations are configured by the installer. A compatible control device (e.g., GTN 6XX/7XX) or a compatible external standby input discrete ensures that only one transponder can be in a state other than standby. |
| CS ACNS.D.ELS.055 ICAO 24-bit Aircraft Address | The ICAO 24-bit aircraft address assigned by the competent authority is correctly implemented on each transponder. | The ICAO address is programmed as part of the transponder configuration by the installer and verified as part of the transponder configuration and return to service procedures. |
| CS ACNS.D.ELS.060 Antenna Installation | a) The installed antenna(s) has (have) a resulting radiation pattern which is (are) vertically polarized, omni-directional in the horizontal plane, and has (have) sufficient vertical beam width to ensure proper system operation during normal aircraft maneuvers. | Transponder antenna must be compliant to TSO 112( ), TSO C66( ) or C74( ).The installation manual provides a list of compatible antennas. |
| | b) Antenna(s) is/are located such that the effect on the far field radiation pattern(s) by the aircraft structure are minimized. | The installation of the antennas is not covered by this installation manual, however, guidance for the antenna locations is provided in the installation manual. |

| CS-ACNS SECTION | CS-ACNS ITEM DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ELS.065 Antenna Diversity | Aircraft with a maximum certified take-off mass in excess of 5700 kg or a maximum cruising true airspeed capability, under International Standard Atmosphere (ISA) conditions, in excess of 130 m/s (250 knots) operates with an antenna diversity installation. | GTX 3X5D units support diversity operation. |

# E.2 Enhanced Surveillance (EHS)

The information in table E-2 is applicable to GTX 335/335R/345/345R units running software v2.10 and later and GTX 335D/335DR/345D/345DR units running software v2.50 and later.

**Table E-2 EHS**

| CS-ACNS SECTION | CS-ACNS DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.EHS.001 Applicability | a) This section provides standards for airborne Mode S EHS installations which provide on request (through Mode S replies elicited by Mode S interrogations) airborne parameters in addition to parameters provided by ELS installations compliant with Section 2 | See CS ACNS.D.EHS.015 (c)<br>See CS ACNS.D.EHS.015 (a) (8) (c) |
| | b) This certification specification is applied together with Mode S Elementary Surveillance certification specification defined in Section 2. | The GTX 3X5 was shown in the GTX 335/335R/ 345/345R ELS CS-ACNS compliance matrix to be compliant to CS.ACNS.D.ELS. |
| CS ACNS.D.EHS.010 Transponder Characteristics | a) The transponder is an approved Mode S transponder with EHS capability. | The GTX 3X5 complies with TSO-C112e requirements for enhanced surveillance. See table 1-13 and table 1-14 of the installation manual for applicable system TSO approvals and software part numbers. |

| CS-ACNS SECTION | CS-ACNS DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.EHS.015 Data Transmission | a) The surveillance system provides in the Mode S reply the following downlink aircraft parameters in addition to those specified in CS ACNS.D.ELS: | The GTX 3X5 was shown in the GTX 335/335R/ 345/345R ELS CS-ACNS compliance matrix to be compliant to CS.ACNS.D.ELS.<br>In addition, the GTX provides the following downlink aircraft parameters when available from input interfaces: |
| | 1. MCP/FCU Selected Altitude | 1. MCP/FCU Selected Altitude: is transmitted in BDS 4,0 by the GTX. |
| | 2. Roll Angle | 2. Roll Angle: is transmitted in BDS 5,0 by the GTX. |
| | 3. True Track Angle | 3. True Track Angle: is transmitted in BDS 5,0 by the GTX. |
| | 4. Ground Speed | 4. Ground Speed: is transmitted in BDS 5,0 by the GTX. |
| | 5. Magnetic Heading | 5. Magnetic Heading: is transmitted in BDS 6,0 by the GTX. |
| | 6. Indicated Airspeed or Mach No. | 6. Indicated Airspeed and Mach No: are transmitted in BDS 6,0 by the GTX. |
| | 7. Vertical rate: Barometric Altitude rate or Inertial vertical velocity. When barometric altitude rate field is provided, it is derived solely from barometric measurement. | 7. Vertical Rate: Barometric altitude rate and Inertial Vertical Velocity are transmitted in BDS 6,0 by the GTX. |
| | 8. Barometric Pressure Setting in use minus 80 000 Pascal. | 8. Barometric Pressure Setting: is transmitted in BDS 4,0. |
| | 9. Track Angle Rate or True Airspeed. | 9. True Airspeed is transmitted in BDS 5,0 by the GTX. Track Angle Rate is not transmitted. |
| | b) The sensor sources connected to the active transponder are the sensors relevant to the aircraft flight profile. | Input interfaces are configured during installation. Data source selection guidance is provided in the installation manual. |
| | c) All transmitted parameters are correct and are correctly indicated as available. | Check-out procedures are provided in the installation manual. Periodic inspections are also required. |

| CS-ACNS SECTION | CS-ACNS DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.EHS.020 Integrity | The Mode S EHS airborne surveillance system integrity is designed commensurate with a 'minor' failure condition for the downlink aircraft parameters listed in CS ACNS.D.EHS.015. | The GTX 3X5 is designed to meet design assurance level C which exceeds the “minor” failure classification for Mode S EHS. |
| CS ACNS.D.EHS.025 Continuity | The Mode S EHS airborne surveillance system continuity is designed to an allowable qualitative probability of “probable” for the downlink aircraft parameters listed in CS ACNS.D.EHS.015. | The GTX 3X5 units have a design assurance level of C 'remote' for listed functions which exceeds the allowable qualitative probability of “probable.” The GTX units have a maximum EHS system failure rate of no less than 5000 hrs using the MTBF rates, or 2.0E-04 failure rate. |

# E.3 ADS-B

**NOTE**

For Garmin GPS source documentation and to confirm assumptions, refer to *14 CFR 91.227 ADS-B Out Compatible Equipment*.

The information in table E-3 is applicable to GTX 335/335R/335D/335DR/345/345R/345D/345DR units.

**Table E-3 ADS-B**

| CS-ACNS SECTION | CS-ACNS DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ADSB.001 Applicability | This section provides standards for 1090 MHz Extended Squitter (ES) ADS-B Out installations. | Information only, no compliance statement necessary. |
| CS ACNS.D.ADSB.010 ADS-B Out System Approval | The equipment contributing to the ADS-B Out function is approved. | The GTX units are TSO Class 1 Level 2 transponder with Level C (Major) Failure classification with SI mode capability. They are 1090ES capable transponders that require a valid pressure altitude source, a valid GPS source, and meet ELS requirements. |
| CS ACNS.D.ADSB.020 ADS-B Out Data Parameters | a) The ADS-B Out system provides the following minimum set of data parameters: | |
| | 1. Aircraft Identification | 1. Supported in BDS (0,8) Aircraft Identification and Category, and sourced from the operator via the GTX panel, a compatible control device, or transponder configuration settings. Priority: (1) Flight ID, (2) Aircraft Registration |

| CS-ACNS SECTION | CS-ACNS DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ADSB.020 ADS-B Out Data Parameters (continued) | 2. Mode A Code | 2. Mode A code is supported in BDS (6,1) and entered from the transponder main page on Panel mounted units. For remote units, Mode A codes are provided / entered remotely via a compatible control device. |
| | 3. ICAO 24-bit aircraft address | 3. All DF=17 squitter transmissions provide the ICAO address. Aircraft address data is sourced from transponder internal configuration settings. |
| | 4. | 4. |
| | a. Airborne Horizontal Position - Latitude and Longitude | a. Supported in BDS (0,5) Airborne Position |
| | b. Airborne Navigation Integrity Category: NIC | b. Supported in BDS (0,5) Airborne Position |
| | c. Airborne/Surface Navigation Accuracy Category for Position: NACp | c. Supported in BDS (6,2) Target State and Status and (6,5) Aircraft Operational Status |
| | d. Airborne/Surface Source Integrity Level: SIL | d. Supported in BDS (6,2) Target State and Status and (6,5) Aircraft Operational Status |
| | e. Airborne/Surface System Design Assurance: SDA | e. Supported in BDS (6,5) Aircraft Operational Status |

| CS-ACNS SECTION | CS-ACNS DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ADSB.020 ADS-B Out Data Parameters (continued) | 5. Pressure Altitude (incl. NICbaro) | 5. Supported in BDS (0,5) Airborne Position. An encoding altimeter or other altitude source provides this data to the transponder. NICbaro is provided in BDS register (6,2) and (6,5). |
| | 6. Special Position Identification (SPI) | 6. Supported in BDS (6,5) Aircraft Operational Status. SPI data is sourced from transponder internal IDENT status. The IDENT function is controlled via GTX or via remote located button, which can also be activated via approved control source. |
| | 7. | 7. |
| | a. Emergency Status | a. Supported in BDS (6,1) Emergency/ Priority Status. |
| | b. Emergency Indication | b. Data is sourced from current Mode A code status. The Mode A code is entered and displayed via the GTX panel or a compatible control device. |
| | 8. 1090 ES Version Number | 8. Supported in BDS (6,5) Aircraft Operational Status, Bits 41-43 are populated with '2'. |
| | 9. | 9. |
| | a. Airborne velocity over Ground - (East/ West and North/South | a. Supported in BDS (0,9) Airborne Velocity Subtype 1&2. |
| | b. Airborne/Surface Navigation Accuracy Category for Velocity: NACv | b. Supported in BDS (0,9) Airborne Velocity Subtype 1&2. |
| | 10. Emitter Category | 10. Supported in BDS (0,8) Extended Squitter Identification and data source from transponder configuration. |
| | 11. Vertical Rate | 11. Supported in BDS (0,9) Airborne Velocity |
| | 12. | 12. |

| CS-ACNS SECTION | CS-ACNS DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ADSB.020 ADS-B Out Data Parameters (continued) | a. Surface Horizontal Position - Latitude and Longitude | a. Supported in BDS (0,6) Surface Position |
| | b. Surface Navigation Integrity Category: NIC | b. Supported in BDS (0,6) Surface Position and (6,5) Aircraft Operational Status. When the GPS mode is SBAS Nav, the GTX 3X5 limits the radius of containment to greater than or equal to 25 meters, otherwise it limits this value to greater than or equal to 75 meters |
| | 13. Surface Ground Track | 13. Supported in BDS (0,6) Surface Position |
| | 14. Movement (surface ground speed) | 14. Supported in BDS (0,6) Surface |
| | 15. Length/width of Aircraft | 15. Supported in BDS (6,5) Aircraft Operational Status Subtype 1. Data sourced from transponder configuration. |
| | 16. GPS Antenna Longitudinal Offset | 16. Supported in BDS (6,5) Aircraft Operational Status Subtype 1. Data sourced from transponder configuration. |
| | 17. | 17. |
| | a. Geometric Altitude | a. Supported in BDS (0,9) Airborne Velocity. |
| | b. Geometric Altitude Quality: GVA | b. Supported in BDS (6,5) Aircraft Operational Status Subtype 0. |
| | Where available in a suitable format, the ADS-B Out system provides the following data parameters: | |
| | 1. Selected Altitude | 1. Supported in BDS (6,2) Target State and Status Information. |
| | 2. Barometric Pressure Setting | 2. Supported in BDS (6,2) Target State and Status Information. |
| | 3. ACAS Resolution Advisory | 3. The GTX units do not interface with ACCAS II units and thus do not support ACAS II resolution advisory data. |

| CS-ACNS SECTION | CS-ACNS DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ADSB.025 Provision of Data | a) All data provided by the ADS-B Out system comes from approved sources. | Approved GPS sources consist of Garmin GPS sources (see Note 1) and compatible ARINC 743A sources that are approved for the installation. |
| | b) The data transmitted by the ADS-B Out system originates from the same data source as used in the transponder replies to Mode S interrogations. | The ADS-B Out system is integrated in the GTX transponder units. ADS-B related BDS registers are populated with the same DAP parameters used to populate transponder registers. |
| | c) When a data quality indication is required, it is provided to the ADS-B transmit unit together with the associated data parameter and it expresses the actual quality of the respective data as valid at the time of applicability of the measurement. | Data quality parameters are only used for data parameters from the same source interface (e.g., the same A429 channel). An ADS-B Fail indication is provided when the quality of the GPS position source is below the allowable tolerance. In addition, other data parameters will only be processed when their associated validity flags (if applicable) indicate the parameter is valid. |
| CS ACNS.D.ADSB.030 ADS-B Transmit Unit Approval | The ADS-B transmit unit is approved and it is integrated in the Mode S transponder. | The GTX 3X5 units have TSOA and meet TSO-C112d and TSO-C166b with granted deviations. |
| CS ACNS.D.ADSB.035 ICAO 24-bit Aircraft address | The ICAO 24 bit aircraft address is implemented as specified in CS ACNS.D.ELS.055. | The ICAO address is programmed as part of the transponder configuration by the installer and verified as part of the transponder configuration and return to service procedures. |
| CS ACNS.D.ADSB.040 Antenna Diversity | The ADS-B transmit unit employs antenna diversity under the same conditions as specified in CS ACNS.D.ELS.065. | GTX 3X5D units support diversity operation. |
| CS ACNS.D.ADSB.045 Antenna Installation | The antenna is installed as specified in CS ACNS.D.ELS.060. | Transponder antenna must be compliant to TSO-C66( ), TSO-C74( ), or TSO-C112( ). Antenna installations are not covered in the design/installation data however, minimum installation requirements are provided under the antenna installation guidance in sections 3.7 and 3.15 of the installation manual. |
| CS ACNS.D.ADSB.050 Transmit power | The ADS-B transmit unit has a peak transmit power as specified in CS ACNS.D.ELS.010(c);(d). | The GTX 3X5 units meets the minimum and maximum transmit power level, 125 W (21 dBW) and 500 W (27 dBW), respectively, when installed according to the installation manual. |

| CS-ACNS SECTION | CS-ACNS DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ADSB.055 Simultaneous Operation of ADS-B Transmit Units | If more than one ADS-B transmit unit is installed, simultaneous operation of the transmit systems is prevented. | Dual transponder installations are configured by the installer.<br>A compatible control device (e.g., GTN 6XX/7XX) or a compatible external standby input discrete ensures that only one transponder can be in a state other than standby. |
| CS ACNS.D.ADSB.060 On-the-ground status determination | a) The on-the-ground status is determined and validated by the ADS-B Out system. | The GTX 3X5 units automatically transitions the aircraft mode from airborne to ground-borne and report surface mode, broadcasting ground-only information such as aircraft length and width based on an algorithm within the GTX ADS-B system. |
| | b) The on-the-ground status is not set by a manual action. | The GTX 3X5 software's air/ground state will be automatically determined based on emitter category, remote air/ground state, ground speed, GPS track, airspeed, squat switch, height above terrain, and radio altitude when possible. The on-the-ground status cannot be set my manual action. |
| CS ACNS.D.ADSB.070 Horizontal Position and Velocity Data Sources | a) The horizontal position is derived from GNSS data. | Horizontal position data will be derived from approved GPS sources. |
| | b) The GNSS receiver based horizontal position and velocity data source is approved and performs, as a minimum, horizontal position receiver autonomous integrity monitoring (RAIM) and fault detection and exclusion (FDE). | Refer to Garmin GPS source documentation (see Note 1).<br>Refer to the position source documentation for non-Garmin GPS sources. |
| | c) Horizontal velocity data stems from the same source as horizontal position data. | Horizontal velocity data is ground speed and N/S E/W velocity provided in BDS register (0,6) when on ground and BDS register (0,9) when airborne. Both position and velocity are used from the same selected position source. |
| CS ACNS.D.ADSB.080 Data Sources as defined by Mode S Elementary and Enhanced Surveillance | a) The data source requirements as defined for in section 2 and 3 of this subpart, are applicable. | Refer to table E-1 and table E-2 of the installation manual for the GTX 3X5 ELS and EHS CS-ACNS compliance matrices for Mode S, ELS and EHS data.<br>GTX 335/335R/345/345R units with software version 2.05 and earlier are not EHS capable units. |

| CS-ACNS SECTION | CS-ACNS DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ADSB.085 Geometric Altitude | a) Geometric Altitude is provided by the horizontal position and velocity source (see CS ACNS.D.ADSB.070). | The GTX 3X5 sources Geometric Altitude from the selected GPS source, which is also the horizontal position and velocity source. |
| | b) Geometric Altitude is transmitted as height above WGS-84 ellipsoid. | The geometric altitude from the approved position sources is provided as the height above the WGS-84 ellipsoid in the APM (BDS register 0,5) when type codes 20-22 are transmitted, and in AVM (BDS register 0,9) as a difference between GPS and BARO altitude. |
| CS ACNS.D.ADSB.090 Flight deck interface | 1. The control and display of surveillance data items is as per CS ACNS.D.ELS.030. | Refer to the GTX 335/335R/345/345R ELS CS-ACNS compliance matrix. |
| | 2. A means is provided to indicate the non-operational status or failure of the ADS-B Out system without undue delay. | ADS-B Out failure indications are provided on the GTX front panel, panel annunciators, or to a compatible control device any time the ADS-B Out system constitutes a failure. |
| CS ACNS.D.ADSB.100 Integrity | a) The ADS-B Out system integrity is designed commensurate with a 'major' failure condition for the transmission of the following parameters: | The GTX 3X5 is designed to meet design assurance level C which meets the 'major' failure classification for ADS-B Out. All approved position sources are designed to meet at least a 'major' failure classification. |
| | 1. ICAO 24-bit aircraft address | |
| | 2. Airborne Horizontal Position - Latitude and Longitude | |
| | 3. Airborne Navigation Integrity Category: NIC | |
| | 4. Airborne/Surface Navigation Accuracy Category for Position: NACp | |
| | 5. 5.Airborne/Surface Source Integrity Level: SIL; | |
| | 6. 6.Airborne/Surface System Design Assurance: SDA | |
| | 7. 1090 ES Version Number; | |
| | 8. Airborne velocity over Ground - East/West and North/South; | |

| CS-ACNS SECTION | CS-ACNS DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ADSB.100 Integrity (continued) | 9. Airborne/Surface Navigation Accuracy Category for Velocity: NACv | The GTX 3X5 is designed to meet design assurance level C which meets the 'major' failure classification for ADS-B Out. All approved position sources are designed to meet at least a 'major' failure classification. |
| | 10. Emitter Category | |
| | 11. Surface Horizontal Position - Latitude and Longitude | |
| | 12. Surface Navigation Integrity Category: NIC | |
| | 13. Surface Ground Track | |
| | 14. Movement (surface ground speed) | |
| | 15. Length/width of Aircraft | |
| | 16. GPS Antenna Offset | |
| | 17. Geometric Altitude | |
| | 18. Geometric Altitude Quality: GVA | |
| | b) The ADS-B Out system integrity is designed commensurate with a 'minor' failure condition for the transmission of other data parameters. | GTX 3X5 is designed to meet design assurance level C which exceeds the 'minor' failure classification for TSO-C166b 3.b loss of ADS-B Out transmission as a 'minor' failure condition. |
| CS ACNS.D.ADSB.105 Continuity | The ADS-B Out system continuity is designed to an allowable qualitative probability of 'remote'. | The GTX 3X5 units have a design assurance level of C 'remote' for listed functions.<br>The GTX units have a maximum ADS-B system failure rate of no less than 5000 hrs using the MTBF rates, or 2.0E-04 failure rate. |
| CS ACNS.D.ADSB.110 Horizontal Position and Velocity Data Refresh Rate | A horizontal position and velocity source calculates position and velocity data with a rate of at least 1 Hertz. | For Garmin GPS sources an update rate of 5 Hz is assumed (see Note 1).<br>For non-Garmin GPS sources, the worst case update rate (1 Hz) is assumed. |

| CS-ACNS SECTION | CS-ACNS DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| CS ACNS.D.ADSB.115 Horizontal Position and Velocity Total Latency | Measured from the time of applicability within the source, the total latency of the horizontal position and horizontal velocity data introduced by the ADS-B Out system does not exceed 1.5 second. | For a GPS source with a 5 Hz update rate:<br>Position solution update delay until the next solution overwrite is relayed to the transponder <= 200 ms (5 Hz update rate).<br>The GTX 3X5 introduces an additional total latency of <= 400 ms to the ADS-B Out system. Therefore, the worst case total latency of the ADS-B Out system with a 5 Hz rate source and the listed assumptions is <= 850 ms.<br>For a GPS source with a 1 Hz update rate (ARINC 743) and total latency contribution <= 200 ms:<br>Position solution update delay until the next solution overwrite is relayed to the transponder <= 1000 ms (1 Hz update rate).<br>The GTX 3X5 introduces an additional total latency of <= 250 ms to the ADS-B Out system. Therefore, the total latency of the ADS-B Out system with a 1 Hz rate GPS source and the listed assumptions is <= 1450 ms. |
| CS ACNS.D.ADSB.120 Horizontal Position Uncompensated Latency | The uncompensated latency of the horizontal position data introduced by the ADS-B Out System does not exceed 0.6 second. | Uncompensated latency introduced by an approved GPS source is assumed to be <= 250 ms. See Note 1 for GPS source documentation.<br>Refer to the position source documentation for non-Garmin GPS sources.<br>The GTX 3X5 introduces an additional uncompensated latency of <= 150 ms to the ADS-B Out system when interfacing the GTX 3X5 to the position source via the RS-232 GNS format, otherwise the GTX 3X5 introduces <= 100 ms of uncompensated latency.<br>Therefore, the worst case uncompensated latency of the ADS-B Out system with an approved GPS source and given the listed assumptions is <= 400 ms. |

[1] Refer to *14 CFR 91.227 ADS-B Out Compatible Equipment*, P/N 190-01533-00, for Garmin GPS source documentation.

# Appendix F AC 20-165B Compliance Matrix

Table F-1 provides supplemental guidance for the AC 20-165B compliance matrix for the GTX 3X5 when using non-Garmin position sources.

**Table F-1 GTX 3X5 ADS-B Position Sources**

| AC 20-165B SECTION | AC 20-165B ITEM DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| B.3.5.2 Validity Limit. | If the integrity value of the output cannot be trusted beyond a certain limit, indicate this limitation in the design documentation. | The GTX 3X5 limits the NIC value to 8 or less when the GPS data is sourced from an ARINC 743 format source. |
| B.3.6 Position Integrity (Probability). | The position source manufacturer must provide information describing the basis for the probability of exceeding the horizontal integrity containment radius. This basis must indicate<br>the probability of exceeding the integrity containment radius as well as the sampling duration (per-hour or per-sample). | Some position sources report the HPL on a per approach basis (Kh = 6.18) during an approach instead of a per hour basis (Kh = 6.0). Thus, the position source reported HPL is 3% lower during approach than in other modes.<br><br>The GTX 3X5 inflates the HPL received from an ARINC 743A position source by 3% when label 273, the GNSS sensor status, indicates SBAS NAV, GBAS/ GRAS NAV, or Approach mode. |
| B.3.8 Velocity Accuracy. | The position source should have a velocity accuracy output that was qualified in conjunction with the system's TSOA or design approval. Instead of a dynamic output, the position source manufacturer may demonstrate a worst case velocity accuracy that can be assumed based on testing. A test for GNSS position sources is contained in the latest revision of AC 20-138, appendix 4. The position source manufacturer may propose a test method for non-GNSS sources or an alternate test for GNSS sources during the TSOA or design approval. | The GTX 3X5 will use a default HFOMv of 9 meters/second for a 743A format source that has not provided HFOMv data. This converts to a NACV = 1.<br><br>The GTX 3X5 will use dynamically received HFOMv from label 145 if it has been received. When using the GTX 3X5 with an ARINC 743 position source that does not provide HFOMv via Label 145, the installer must verify that the position source is certified for a fixed NACv of 1 or better. |
| B.3.5.3 Integrity Fault. | The position source must be able to identify, and output, an indication of an integrity fault. This indication should occur within 8 seconds of output of an erroneous position. The position source manufacturer must provide information on how this integrity fault is output. | The GTX 3X5 will invalidate the HPL, HFOM, HFOMv, VPL, VFOM, and VFOMv when label 130 is received with the RAIM alarm bit set. |

| AC 20-165B SECTION | AC 20-165B ITEM DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| B.3.12 Position Source Latency. | The position source manufacturer must provide position source latency information. Specifically, the manufacturer must provide the amount of position source total latency and uncompensated latency. Because the latency requirements are based on the entire ADS-B OUT system, and not just the position source, the following position source latency targets are only guidelines. Position source uncompensated latency should be less than 200 ms, compensated latency should be less than 500 ms, and total latency should be less than 700 ms.<br>Note 1: System latency requirements are described in section 3.1.3 and Appendix C of this AC.<br>Note 2: This section addresses position latency only. | Refer to appendix E for latency of the ADS-B out system. |
| B.4.1 Position. | GNSS position sources must provide a latitude and longitude output. Requirements and test procedures in TSO-C129/145/146/196 are sufficient and GNSS equipment with TSOA for the aforementioned TSOs require no additional qualification for the position output. Some GNSS position outputs are referenced to the center of navigation of the aircraft. Manufacturers should document under what conditions the position is output in this manner. Installers must configure the ADS-B installation to account for any position offset from the surveillance reference point or GNSS antenna position as applicable. Note: The intent is to output position, velocity, and HFOM in a consistent manner for time<br>of applicability (refer to RTCA/DO-229D, Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne Equipment,<br>sections 2.1.2.6 and 2.1.2.6.2). | The lateral and longitudinal offset configuration items of the GTX 3X5 are used.<br><br>The GNSS sensor should be configured to not apply a position offset to the position output. |
| B.3.14 Time Mark. | Position sources should output a time mark identifying the Coordinated Universal Time (UTC) time of applicability of the position. The time mark can be used by the ADS-B equipment to reduce uncompensated latency. | The GTX 3X5 does not utilize the time mark pulse to reduce uncompensated latency. The GTX 3X5 does not use time mark for ADS-B out. Refer to section 3.11 for details of time mark use for ADS-B In. |

| AC 20-165B SECTION | AC 20-165B ITEM DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| B.4.7.2 | Whether a TSO-C145 or TSO-C146 position source limits the HPL in non-SBAS augmented modes to greater than 75 meters. If the position source does not limit the HPL output in non-augmented modes, the position source manufacturer should provide guidance to the ADS-B system installer to ensure the ADS-B equipment limits the NIC to .8 in non-augmented modes. The position source manufacturer should also provide instructions on how to determine the position source mode if appropriate. | The GTX 3X5 limits the NIC to 8 or less when GPS data is sourced from an ARINC 743A format source. |
| B.4.7.2.2 TSO-C145/146 Rev a Class 2/3. | Means of compliance for this TSO require GNSS manufacturers to present substantiation data whether HPL is limited or not, and provide proper installation instructions for the<br>ADS-B integration. Installations intending to support NIC .9 must use LNAV/VNAV or LPV/LP approach requirements (RTCA/DO-229C, section 2.1) at the time of HPL output, in accordance with TSO-C145/C146 Rev a, but the en route through LNAV K-Factor (6.18 vs. 6) must be applied (refer to RTCA/DO-229C, appendix J, section 2.1 and appendix U, section 4). Either the GNSS source equipment sets the K-Factor for HPL, or the ADS-B equipment applies proper scaling. The GNSS manufacturer must present substantiation data on which K-Factor is used and provide proper installation instructions for the ADS-B integration. | See the comment for B.3.6 Position Integrity (Probability) for more information. |
| B.4.14.1 $NAC_V$ = 1. | For installations intending to support NACV = 1, the GNSS manufacturer must perform the velocity tests in AC 20-138D, appendix 4, section A4-1 through A4-8 associated with<br>NACV = 1. The GNSS manufacturer must indicate that the equipment satisfies the requirements for NACV =1 in the installation instructions for the ADS-B integration. | See the comment for B.3.8 Velocity Accuracy for more information. |

| AC 20-165B SECTION | AC 20-165B ITEM DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| B.4.14.2 $NAC_V$ = 2. | For installations intending to support NACV = 2, the GNSS manufacturer must perform the velocity tests in AC 20-138D, appendix 4, sections A4-1 through A4-9 associated with NACV = 1 and NACV = 2. The GNSS manufacturer must present substantiation data that the equipment dynamically outputs HFOMv and VFOMv (refer to AC 20-138(), appendix 4, sections A4-5 and A4-8) and that the equipment velocity and accuracy outputs have passed the velocity tests associated with NACV = 1 and NACV = 2. The GNSS manufacturer must indicate that the equipment satisfies the requirements for NACV = 2 in the installation instructions for the ADS-B integration. | See the comment for B.3.8 Velocity Accuracy for more information. |
| B.4.14.3 $NAC_V$ = 3 or 4. | No standard for performance has been developed to support NACv = 3 or NACV = 4. A NACV = 3 or NACV = 4 should not be set based on GNSS velocity accuracy unless it can be demonstrated to the FAA that the error contributions have been adequately modeled to meet those levels of performance. | The GTX 3X5 limits the NACV to a maximum value of 2. |
| B.4.16 Mode Output. | If interpretation of the integrity output of the position source can change due to a change in the position source mode, the position source must have a way of communicating that change of mode to the ADS-B equipment. Additionally, the position source manufacturer should provide a description of the modes and a description of how the position source outputs the mode indication. | See the comment for B.3.6 Position Integrity (Probability) for more information. |

| AC 20-165B SECTION | AC 20-165B ITEM DESCRIPTION | COMPLIANCE SUMMARY |
|---|---|---|
| B.4.17 Approach Mode Integrity. | SBAS equipment certified under any revision of TSO-C145 or TSO-C146 is required to have several modes of operation depending on the availability of augmentation. For example, when operating in an augmented mode intended for LPV approach guidance, the position source may determine HPL based on a lateral error versus a horizontal error and an exposure time based on the duration of the approach versus flight hour (refer to RTCA/DO-229D, appendix J). If the position source outputs the HPL on lateral error and approach exposure time, it is possible that the ADS-B transmitter would need to inflate the HPL by 3 percent in approach modes to ensure the integrity is appropriately bounded. GBAS equipment is required to comply with the GNSS or SBAS requirements for the output of position data. This is an integration issue between the GPS and ADSB transmitter. The position source manufacturer must provide information to the system integrator to determine if the integrity output needs to be scaled (that is, by applying an inflation factor). Although we do not address the interface of a GBAS differentially-corrected position source in this AC, it will have similar considerations in approach modes as SBAS. | See the comment for B.3.6 Position Integrity (Probability) for more information. |
| B.4.18 Track Angle Validity. | GNSS position sources can provide a track angle; however, the GNSS track angle may become invalid below a certain velocity. Optimally, the position source should either invalidate or remove the track angle when it is no longer valid. If the position source does not invalidate the track angle or remove the track angle when it is potentially invalid, the position source manufacturer must provide information on velocity limitations for GNSS track angle. | The GTX 3X5 will not use GPS ground track for ADS-B out if the ground speed is less than 7 knots. |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