GTX™ 327 TRANSPONDER INSTALLATION MANUAL

GARMIN™

Garmin International, Inc.

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RECORD OF REVISIONS

Revision	Revision Date	Description	ECO #
A	01/19/00	Initial Release	12550
B	02/28/00	Update Configuration Procedure	12785
C	06/01/00	Update Configuration Procedure. Add JTSO references and STC form.	13450
D	07/18/00	Correct Interconnect Diagram, New RF Connector Spacer P/N, Plus Misc Changes	13763
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This manual is written for software version 2.08, and is not suitable for earlier software versions. The software version and information in this document is subject to change without notice.

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GTX 327 HARDWARE MOD LEVEL HISTORY

The following table identifies hardware modification (Mod) Levels for the GTX 327 Transponder. Mod Levels are listed with the associated service bulletin number, service bulletin date, and the purpose of the modification. The table is current at the time of publication of this manual (see date on front cover) and is subject to change without notice. Authorized Garmin Sales and Service Centers are encouraged to access the most up-to-date bulletin and advisory information on the Garmin Dealer Resource web site at www.garmin.com using their Garmin -provided user name and password.

MOD LEVEL	SERVICE BULLETIN NUMBER	SERVICE BULLETIN DATE	PURPOSE OF MODIFICATION

1 GENERAL DESCRIPTION

1.1 Introduction

This manual presents the mechanical, and electrical installation requirements for the GTX 327 Digital Display Mode A/C Transponder. After installation of the GTX 327, FAA Form 337 must be completed by an appropriately certificated agency and ATC transponder tests required by 14 CFR, Part 91.413 must be completed to return the aircraft to service.

1.2 Equipment Description

The Garmin GTX 327 is a panel-mounted transponder with the addition of altitude reporting and timing functions. The transponder is a radio transmitter and receiver that operates on radar frequencies, receiving ground radar or TCAS interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz.

As with other Mode A/Mode C transponders, the GTX 327 replies with any one of 4,096 codes, which differ in the position and number of pulses transmitted. By replying to ground transmissions or TCAS interrogations, the GTX 327 enables ATC to display aircraft identification, altitude and groundspeed on ATC radar screens or TCAS traffic indicators. The GTX 327 is equipped with IDENT capability that activates the Special Position Identification (SPI) pulse for 18 seconds.

The GTX 327 is configured with all key controls. The layout of the front panel keys and displays segregates the transponder's primary functions from the secondary timing functions. The unit can be configured so the aircraft avionics master bus can turn the unit on.

The GTX 327 can also be incorporated in installations with other compatible control/display units such as the Garmin GNS 480 (CNX80).

Provision is made for unit software upgrade by means of RS-232 data transfer through rear connector pins. The installation of an optional connector is highly recommended. If the optional connector is placed in the aircraft, transponder removal and reinstallation for software upgrade is not required. The software can be changed while the unit is still mounted inside the aircraft.

CAUTION

The GTX 327 lens is coated with a special anti-reflective coating, which is very sensitive to skin oils, waxes and abrasive cleaners. CLEANERS CONTAINING AMMONIA WILL HARM THE ANTI-REFLECTIVE COATING. It is very important to clean the lens using a clean, lint free cloth and an eyeglass lens cleaner that is specified as safe for anti-reflective coatings.

1.3 Mutual Suppression Pulses

Other equipment on board the aircraft may transmit in the same frequency band as the transponder, such as DME or another transponder. Mutual suppression is a synchronous pulse that is sent to the other equipment to suppress transmission of a competing transmitter for the duration of the pulse train transmission. The transponder transmission may be suppressed by an external source and other equipment on board may be suppressed by the transponder. This feature is designed to limit mutual interference.

1.4 Interface Summary

The GTX 327 provides the following interface connections via the rear connector:

- Ten (10) encoding altimeter inputs.
- External IDENT input.
- External STBY input (useful for dual transponder installations).
- External suppression pulse input.
- Switched power output of up to 1.5 amps (for digital altitude encoder power).
- Aircraft power input (11 to 33 Volts).
- Aircraft dimming bus input voltage.
- Aircraft master switch turn-on option.
- Serial airdata or GPS groundspeed input.
- Serial altitude input. (Reduces wire count vs. parallel wire gray code altimeter interface.)
- Software update input.

1.5 Technical Specifications

The following table presents general environmental specifications. For detailed specifications, see the Environmental Qualification form in Appendix A.

1.5.1 Electrical Specifications

Characteristic	Specification
TSO, JTSO	TSO C74c Class 1A, JTSO-C74c Class 1A
TSO ENV CAT	Refer to Appendix A
FCC Authorization	Emission Designator 11M0M1D
Applicable Documents	FAA TSO C74c, JTSO-C74c, RTCA DO-160D
Unit Software	RTCA DO-178B Level D
Temperature Range	-20°C to +55°C (Continuous Operation)
Power Requirements	11.0 to 33.0 Vdc; Power Input: 15 Watts typical, 22 Watts Maximum
Humidity	95% @ +55°C for 16 hours; 85% @ +38°C for 32 Hours
Altitude	50,000 Feet
Transmitter Frequency	1090 MHz
Transmitter Power	125 Watts minimum, 150 Watts nominal at the antenna through 1.5 dB coax.
Receiver Frequency	1030 MHz
Receiver Sensitivity	74 dBm nominal for 90% replies
Mode A Capability	4096 Identification Codes
Mode C Altitude Capability	100 Foot Increments from -1000 to 62,700 feet.
External Suppression Input	Low ≤ 0.5 V; High ≥ 8 V

1.5.2 Physical Characteristics

Characteristic	Specification
Bezel Height	1.65 inches (42 mm)
Bezel Width	6.25 inches (159 mm)
Rack Height (Dimple to Dimple)	1.68 inches (43 mm)
Rack Width	6.30 inches (160 mm)
Depth Behind Panel with Connectors (measured from face of aircraft panel to rear of connector backshells)	8.77 inches (223 mm)
GTX 327 Unit Weight	2.4 lbs. (1.1 kg)
GTX 327 Weight (Installed with rack and connectors)	3.0 lbs. (1.4 kg)

1.5.3 Power Requirements

Characteristic	Specification
Input Voltage Range	11.0 to 33.0 Vdc
Power Input	22 Watts Typical, 45 Watts Maximum
Maximum Full TSO Reply Rate; 1200 PRF, Code 7777	0.95 A @ 27.5 Vdc, 1.85 A @ 13.75 Vdc
Maximum Quiescent	0.50 A @ 27.5 Vdc, 0.90 A @ 13.75 Vdc

1.6 Installation Approval

The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only in compliance with 14 CFR Part 43 or the applicable airworthiness requirements. For GTX 327 TSO compliance and STC, see Appendix A. For antenna TSO compliance, refer to antenna manufacturer's literature.

1.7 Aircraft Station License 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 327 installation must comply with current transmitter licensing requirements. To find out the specific details on whether a particular installation is exempt from licensing, please visit the FCC web site http://wireless.fcc.gov/aviation.

If an aircraft license is required, make application for a license on FCC form 404, Application for Aircraft Radio Station License. The FCC also has a fax-on-demand service to provide forms by fax. The GTX 327 owner accepts all responsibility for obtaining the proper licensing before using the transponder.

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.

1.8 Reference Documents

If the GTX 327 is installed with a GNS 480 (CNX80) unit, the following publication is a source of additional information. Before installing the unit, the technician should read all referenced materials along with this manual.

Part Number	Document
560-0982-01	GNS 480 (CNX80) Installation Manual

1.9 Limited Warranty

This Garmin product is warranted to be free from defects in materials or workmanship for two years from the date of purchase. Within this period, Garmin will at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor, provided that the customer shall be responsible for any transportation cost. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alteration or repairs.

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Garmin retains the exclusive right to repair or replace the unit or software or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

To obtain warranty service, contact your local Garmin Authorized Service Center. For assistance in locating a Service Center near you, call Garmin Customer Service at one of the numbers shown below.

Products sold through online auctions are not eligible for rebates or other special offers from Garmin. Online auction confirmations are not accepted for warranty verification. To obtain warranty service, an original or copy of the sales receipt from the original retailer is required. Garmin will not replace missing components from any package purchased through an online auction.

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2 INSTALLATION OVERVIEW

2.1 Introduction

This section provides hardware equipment information for installing the GTX 327 Transponder, related hardware and optional accessories. Installation of the GTX 327 should follow the data detailed in this manual. Cabling is fabricated by the installing agency to fit each particular aircraft. The installation should follow the guidance of FAA AC 43.13-1B and AC 43.13-2A where applicable.

2.2 Installation Materials

The GTX 327 is available under the following part numbers:

2.2.1 GTX 327 Configurations Available

Catalog Part Number	Unit Part Number	Front Panel Color	With Install Kit/Docs*
010-00188-00	011-00490-00	Black	No
010-00188-03	011-00490-00	Black	Yes
010-00188-10	011-00490-10	Gray	No
010-00188-12	011-00490-10	Gray	Yes

* **Note**: Documentation includes pilot's guide and warranty registration card.

2.2.2 Equipment Available

Item	Garmin P/N
Mounting Rack, GTX 327	115-00431-00*
Sub Assy, Connector Kit, GTX 327	011-00651-01
Sub Assy, Rear Backplate, GTX 327	011-00677-01
Mounting Rack, Backplate and Connector Kit (Includes 115-00431-00, 011-00677-01 and 011-00651-01)	010-10161-01
Garmin GTX 327 Antenna kit*	010-10160-00

* **Notes**: Mounting Rack P/N 115-00431-00 replaces P/N115-00285-00.

A transponder antenna approved to TSO C66( ) or C74( ) that has been installed to meet the requirements of this manual may be approved for use with the GTX 327.

2.2.3 Additional Equipment Required

- Cables - The installer will supply all system cables including circuit breakers. Cable requirements and fabrication are detailed in Section 3 of this manual.
- Hardware - #6-32 x 100° Flat Head SS Screw [(MS24693, AN507R or other approved fastener) (6 ea.)] and #6-32 Self-Locking Nut [MS21042 or other approved fastener (6 ea.)]. Hardware required to mount the installation rack is not provided.
- Encoding Altitude Digitizer - Use encoding altimeter manufacturer's instructions, install according to FAA AC 43.13-1B and AC 43.13-2A. The Garmin GAE 43 (Garmin P/N 013-00066-00) can provide altitude data in either serial or parallel gray code format.

2.3 Installation Considerations

The GTX 327 can interface with equipment including altimeters and Air Data Computer (ADC). RS-232 and ARINC 429 provide a serial communication path between interfacing equipment. Fabrication of a wiring harness is required.

Optional available discrete line interfaces are described in Section 4.3, Discrete Inputs, and shown in installation diagrams provided in Appendix C.

2.4 Antenna Installation

2.4.1 Antenna Location Considerations

Antenna mounting should utilize the aircraft manufactures Type Certificated antenna location and style of antenna. The antenna installation should be installed in accordance with AC 43.12-2A Chapter 3. Note that penetration of the pressure vessel on the pressurized aircraft requires additional data not contained in this manual. (See Section 2.6)

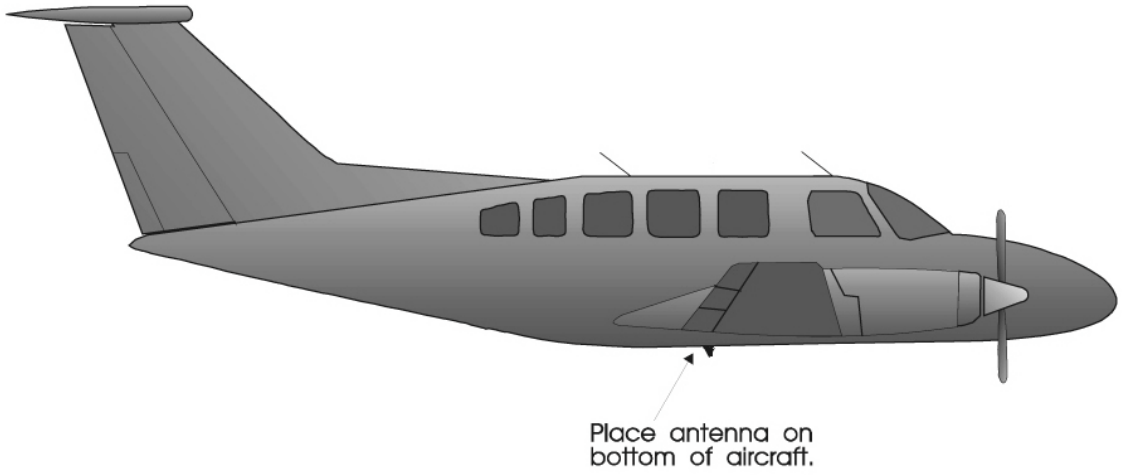

Figure 2-1. Antenna Installation Considerations

A. The antenna (Garmin P/N 010-10160-00) should be mounted away from major protrusions, such as engine(s), propeller(s), and antenna masts. It should also be as far as practical from landing gear doors, access doors, or other openings that could effect its radiation pattern.

B. The main antenna should be mounted vertically on the bottom of the aircraft.

C. Avoid mounting the antenna within three feet of the ADF sense antenna or any other communication antenna and six feet from the DME antenna.

D. To prevent RF interference, the antenna must be physically mounted a minimum distance of three feet from the GTX 327.

NOTE

If the antenna is being installed on a composite aircraft, sufficient ground plane material must be added. Conductive wire mesh, radials, or thin aluminum sheets embedded in the composite material provide the proper ground plane allowing the antenna pattern (gain) to be maximized for optimum transponder performance.

2.4.2 Antenna Installation

Install the antenna according to the antenna manufacturer's instructions and FAA AC 43.13-1B and AC 43.13-2A.

2.5 Cabling and Wiring

Use MIL-W-22759/16 or other approved wire, AWG #24 or larger wire for all interface connections. The standard pin contacts supplied in the connector kit are compatible with up to AWG #22 wire. In cases where some installations have more than one unit sharing a common circuit breaker, sizing and wire gauge is based on aircraft circuit breaker layout, length of wiring, current draw of units, and internal unit protection characteristics. Do not attempt to combine more than one unit on the same circuit breaker unless it is specified on aircraft manufacturer approved drawings.

In some cases, a larger gauge wire such as AWG #18 or #16 may be needed for power connections. If using #16 or #18 barrel contacts, ensure that no two contacts are mounted directly adjacent to each other. This minimizes the risk of contacts touching and shorting to adjacent pins or to ground.

Ensure that routing of the wiring does not come in contact with sources of heat, RF or EMI interference. Check that there is ample space for the cabling and mating connectors. Avoid sharp bends in cabling and routing near aircraft control cables.

The following table lists examples of the recommended antenna cable vendors and the type of cable to be used for specific lengths of cable. Any cable meeting specifications is acceptable for the installation.

The maximum coaxial cable attenuation at 1090 MHz must not exceed 1.5 dB, including connectors.

The following table is for reference only, and lists some suitable cable types, along with the maximum length based on an assumed loss figure of 0.2 dB per connector. Any 50 Ω, double shielded coaxial cable assembly that meets airworthiness requirements and the 1.5 dB maximum loss figure (including connectors) may be used.

Max. Length (feet – [m])	Insertion loss (dB/100ft)	ECS Type	MIL-C-17 Type	RG Type
6' 1.3" [1.86m]	18.0		M17/128-RG400	RG-400
7' 7.3" [2.32m]	14.45	3C142B		
9' 2.0" [2.79m]	12.00		M17/112-RG304	RG-304
12' 6.0" [3.81m]	8.80	311601	M17/127-RG393	RG-393
15' 5.4" [4.71m]	7.12	311501		
19' 9.4" [6.03m]	5.56	311201		
30' 3.6" [9.24m]	3.63	310801		
Supplier Information		Vendor: Electronic Cable Specialists 5300 W. Franklin Drive Franklin, WI 53132 Tel: 800-327-9473 414-421-5300 Fax: 414-421-5301 www.ecsdirect.com	See current issue of Qualified Products List QPL-17.	RG types are obsolete and are shown for reference only; replaced by M17 type numbers.

2.5.1 Cable Routing Considerations

When routing cables, observe the following precautions:

- All cable routing should be kept as short and as direct as practical.
- Avoid sharp bends.
- Avoid routing cables near power sources (e.g., 400 Hz generators, trim motors, etc.) or near power for fluorescent lighting.
- Avoid routing antenna cables near ADF antenna cable (allow at least a 12-inch separation).

2.6 Installation Approval Considerations for Pressurized Aircraft

Antenna and cable installations on pressurized cabin aircraft require FAA approved installation design and engineering substantiation data whenever such installations incorporate alteration (penetration) of the cabin pressure vessel by connector holes and/or mounting arrangements. Use of existing bulkhead connectors previously approved by other means is permissible without additional approval.

For needed engineering support pertaining to the design and approval of such pressurized aircraft antenna installations, it is recommended that the installer proceed according to any of the following listed alternatives:

1. Obtain approved antenna installation design data from the aircraft manufacturer.

2. Obtain an FAA approved Supplemental Type Certificate (STC) pertaining to and valid for the subject antenna installation.

3. Contact the FAA Aircraft Certification Office in the appropriate Region and request identification of FAA Designated Engineering Representatives (DERs) who are authorized to prepare and approve the required antenna installation engineering data.

4. Obtain FAA Advisory Circular AC-183C and select (and contact) a DER from the roster of individuals identified thereunder.

5. Contact an aviation industry organization such as the Aircraft Electronics Association and request their assistance.

Antenna installation in the pressure vessel of pressurized aircraft is beyond the scope of the GTX 327 STC. Additional manufacturer's data may be necessary and FAA approval may be required to cover the installation of the antenna.

2.7 Cooling Air

The GTX 327 meets all applicable TSO requirements without forced air cooling. The application of forced air cooling to the rear air nozzle of the GTX 327 is highly recommended to provide beneficial cooling to the unit.

The GTX 327 was designed to handle a constant 450 PRF, with short periods of 1200 PRF. Rate limit is set at 1200 PRF. A typical radar site would interrogate the transponder once every 5 to 10 seconds for approximately 100 msec at a 400 PRF rate. In very high traffic areas with multiple ground stations and TCAS traffic it is possible to have long term PRF rates above 450 PRF. The GTX 327 measures the unit temperature and without forced-air cooling the reply rate will be reduced to protect the transmitter from overheating.

2.8 GTX 327 Installation

2.8.1 Viewing Angle

Ensure that any mounting location will offer sufficient viewing angle. The display has been proven to meet specifications when seen within the following envelope of viewing positions:

Direction	Pilot's Viewing Angle
Left and Right	±45°
From Top	30°
From Bottom	10°

2.8.2 Mechanical Installation

NOTE

Avoid installing the unit near heat sources. If this is not possible, insure that additional cooling is provided. Allow adequate space for installation of cables and connectors. The installer will supply and fabricate all of the cables. All wiring must be in accordance with FAA AC 43.13-1B and AC 43.13-2A.

1. Assemble the connector/rack kit according to Figure B-2. Install the rack assembly according to the dimensions given in Figure B-1 and paragraph 1.5.2, Physical Characteristics. Mounting brackets are not supplied due to the wide range of mounting configurations available. Suitable mounting brackets may be fabricated from sheet metal or angle stock. To insure a sturdy mount, rear support for the unit must be provided.

2. Looking at the bottom of the transponder, make sure the front lobe of the locking mechanism is in a vertical position. This can be accomplished by using a 3/32" Allen wrench through the face plate.

3. Slide the unit into the rack until the front lobe of the unit touches the rack.

4. Turn the Allen wrench clockwise until unit is secured in the rack. Continue turning until tight. Do not overtighten the screw.

5. To remove the unit from the rack, turn the 3/32" Allen wrench counterclockwise until it disengages from the rack.

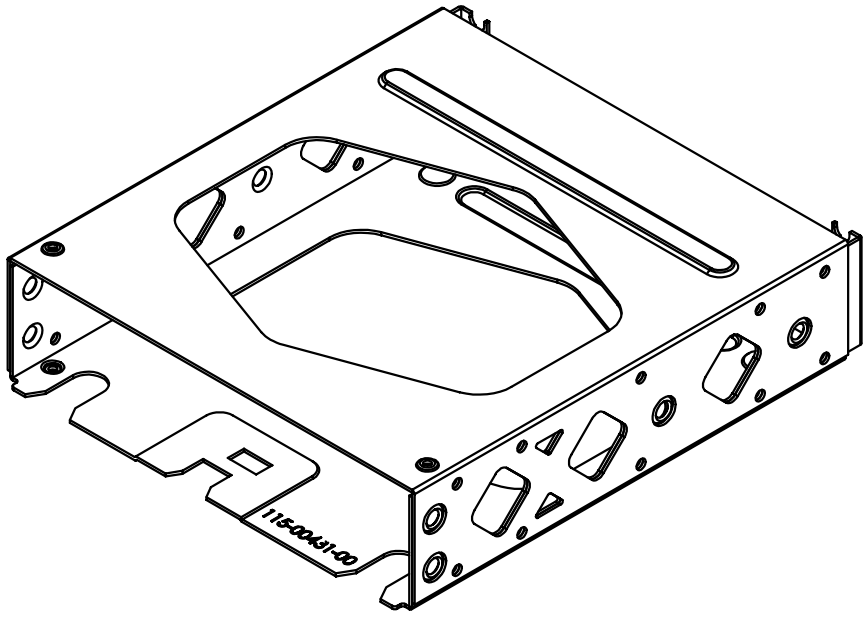

Figure 2-2. GTX 327 Unit Rack (115-00431-00)

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3 INSTALLATION PROCEDURE

3.1 Unpacking Unit

Carefully unpack the equipment and make a visual inspection of the unit for evidence of damage incurred during shipment. If the unit is damaged, notify the carrier and file a claim. To justify a claim, save the original shipping container and all packing materials. Do not return the unit to Garmin until the carrier has authorized the claim.

Retain the original shipping containers for storage. If the original containers are not available, a separate cardboard container should be prepared that is large enough to accommodate sufficient packing material to prevent movement.

3.2 Electrical Connections

All electrical connections, except for the antenna and shield ground, are made through a single, 25 pin D-subminiature connector (see Figure 4-1). The card-edge connector may be used to terminate shield grounds to the GTX 327 back plate. Table 4-1 lists the electrical connections of all input and output signals. See Appendix C for interconnect wiring diagrams and cable requirements for each signal. Required connector and associated hardware are supplied in the connector kit (P/N 011-00651-01).

CAUTION

Check wiring connections for errors before inserting the GTX 327 into the rack. Incorrect wiring could cause internal component damage.

Table 3-1. Pin Contact Part Numbers

Manufacturer	25 pin D-Subminiature connector (P3271)			
	16 AWG (Power Only)	18 AWG (Power Only)	20 AWG	22-28 AWG
Garmin P/N	336-00044-01	336-00044-00	336-00044-02	336-00021-00
Military P/N	N/A	N/A	N/A	M39029/58-360
AMP	N/A	N/A	N/A	204370-2
Positronic	N/A	N/A	N/A	MC8522D
ITT Cannon	N/A	N/A	N/A	030-2042-000

Table 3-2. Recommended Crimp Tools

Manufacturer	Hand Crimping Tool	16, 18 & 20 AWG		22-28 AWG	
		Positioner	Insertion/ Extraction Tool (note 2)	Positioner	Insertion/ Extraction Tool
Military P/N	M22520/2-01	N/A	M81969/1-04	M22520/2-09	M81969/1-04
Positronic	9507	9502-11	M81969/1-04	9502-3	M81969/1-04
ITT Cannon	995-0001-584	N/A	N/A	995-0001-739	N/A
AMP	601966-1	N/A	91067-1	601966-6	91067-1
Daniels	AFM8	K774	M81969/1-04	K42	M81969/1-04
Astro	615717	N/A	M81969/1-04	615725	M81969/1-04

NOTES

1. Non-Garmin part numbers shown are not maintained by Garmin and consequently are subject to change without notice.
2. Extracting the #16, #18 and #20 contact requires that the expanded wire barrel be cut off from the contact. It may also be necessary to push the pin out from the face of the connector when using an extractor due to the absence of the wire. A new contact must be used when reassembling the connector.

3.3 Circuit Breaker Placard

Install a Circuit Breaker Placard labeled Transponder or Transponder 1, Transponder 2 as appropriate as indicated in AC 43.13–2A, paragraph 27c(4).

3.4 Post Installation Configuration and Checkout

After the installation is complete, refer to Section 5 for system configuration.

Verify proper operation of the transponder by testing in accordance with Appendix F to 14 CFR Part 43 – ATC Transponder Tests and Inspections.

4 SYSTEM INTERCONNECTS

Figure 4-1. Rear Connector, J3271

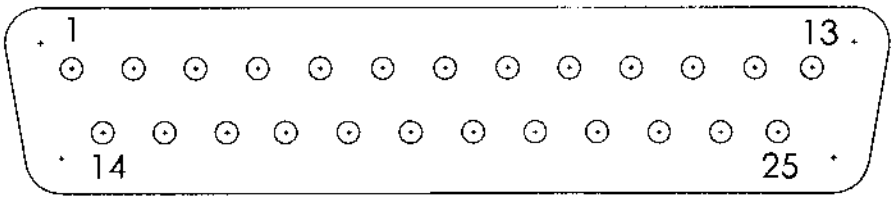


Table 4-1. P3271 Pin Assignments

Pin	Pin Name	I/O
1	AVIONICS MASTER ON	In
2	RS-232 IN 2	In
3	ALTITUDE A1	In
4	ALTITUDE C2	In
5	ALTITUDE A2	In
6	ALTITUDE A4	In
7	ALTITUDE C4	In
8	EXTERNAL IDENT INPUT*	In
9	ALTITUDE B1	In
10	ALTITUDE C1	In
11	ALTITUDE B2	In
12	ALTITUDE B4	In
13	POWER GROUND	--
14	SWITCHED POWER OUTPUT	Out
15	POWER INPUT (+11 TO +33 VDC)	In
16	EXTERNAL STANDBY*	In
17	EXTERNAL SUPPRESSION I/O	I/O
18	ALTITUDE D4	In
19	RS-232 IN 1	In
20	RS-232 OUT 1	Out
21	(RESERVED FOR SOFTWARE UPLOAD)	--
22	AIRBORNE SENSE (SQUAT SWITCH)	In
23	28 VDC PANEL LIGHTING INPUT	In
24	14 VDC/5 VDC PANEL LIGHTING INPUT	Out
25	POWER GROUND	--

* Denotes Active Low (Ground to activate).

4.1 Power and Lighting Function

Power Input requirements and Lighting Bus input are listed in the following tables. The power-input pins accept 11-33 Vdc. Switched Power Out is a power source available for devices such as a remote digital altitude encoder. Refer to Figures C-1 and C-2 for power interconnections.

4.1.1 Aircraft Power

Table 4-2. Aircraft Power Pin Assignments

Pin Name	Pin Number	I/O
AIRCRAFT POWER 1	15	In
SWITCHED POWER OUT	14	Out
POWER GROUND	13	--
SIGNAL GROUND	25	--

4.1.2 Lighting Bus

The GTX 327 unit can be configured to track a 28 Vdc, 14 Vdc, 5 Vdc or 5 Vac lighting bus using these inputs. The GTX 327 can also automatically adjust for ambient lighting conditions based on the photocell. Refer to sections 5.2.2 and 5.2.3 for lighting configuration.

Table 4-3. Aircraft Lighting Pin Assignments

Pin Name	Pin Number	I/O
14 V/5 V LIGHTING BUS HI	24	In
28 V LIGHTING BUS HI	23	In

4.2 Altitude Functions

Parallel gray code altitude inputs are considered active if either the voltage to ground is < 1.9 V or the resistance to ground is < 375 Ω. These inputs are considered inactive if the voltage to ground is 11-33 Vdc. Refer to Figure C-3 for parallel gray code and serial data altitude interconnection. Carefully check encoder input lines for correct connection after wiring is complete.

NOTES

The GTX 327 contains internal altitude code line isolation diodes to prevent the unit from pulling the encoder lines to ground when the transponder is turned off.

If two separate altimeters are connected to the GTX 327, one providing parallel gray code and the other, serial data, the unit selects only one for use at a time, with serial data input receiving the highest priority.

For altimeters that can be connected in both serial data and parallel gray code format, such as the Garmin GAE 43 (Garmin P/N 013-00066-00), select one or the other but not both wiring connections.

When connecting two GTX 327 transponders to a GPS, the unit can only receive RS-232 serial data from one unit at a time. Use a DPDT switch for connecting both serial data and External Standby Select. Refer to Figure C-3.

4.2.1 Altimeter Inputs

Table 4-4. Encoded Altitude Pin Assignments

Pin Name	Pin Number	I/O
ALTITUDE D4	18	In
ALTITUDE A1	3	In
ALTITUDE A2	5	In
ALTITUDE A4	6	In
ALTITUDE B1	9	In
ALTITUDE B2	11	In
ALTITUDE B4	12	In
ALTITUDE C1	10	In
ALTITUDE C2	4	In
ALTITUDE C4	7	In
ALTITUDE COMMON SIGNAL GROUND	13 or 25*	--
RS-232 IN 2	19	In

* Altitude Common may be connected to pin 13 or 25. See Note 10 on Figure C-1, and Note 7 on Figure C-2.

4.2.2 Altimeter Interconnect, Dual GTX 327 Installation

Refer to Figure 4-2 and Figure C-3, sheets 1 and 2 for Dual GTX 327 altimeter interconnections. A dual GTX 327 installation can accept either parallel wire gray code altimeter input or RS-232 serial data input as shown.

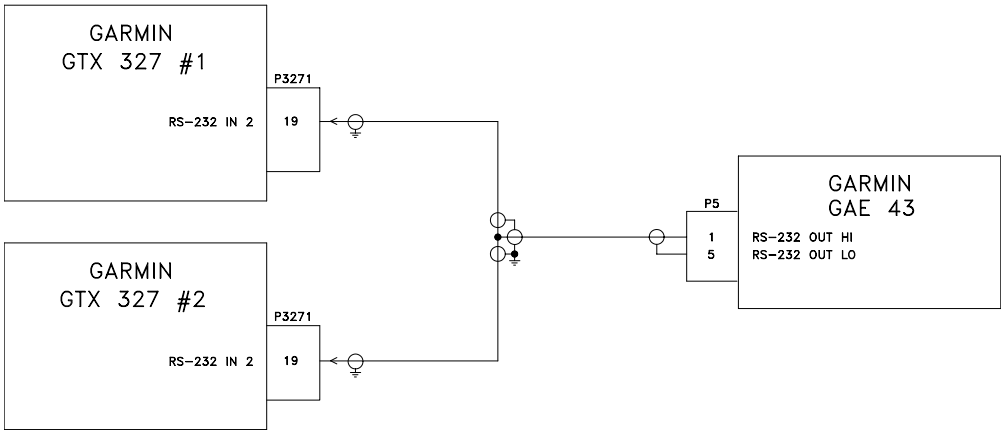


Figure 4-2. Dual GTX 327, Single Encoder, Serial Input Connections

For a complete dual installation containing two encoders, it is best to connect one encoder to each transponder.

4.2.3 Altimeter Selection Priority

The installer must be aware of the GTX 327 priority for selecting encoded altimeter interconnections. The GTX 327 searches in this sequence for altitude, and stops when it finds a valid pressure altitude input.

Altitude reporting equipment order of precedence:

1) **RS-232 data from GNS 480 (CNX80)**
2) **RS-232 Fuel/Air Data Computer (if configured W/ALT.)**
3) **Parallel wire Gray Code input**
4) **Shadin Altitude Serializer/Encoder**
5) **Icarus Altitude Serializer/Encoder**

Only approved devices may provide altitude to the GTX 327 in accordance with 14 CFR Part 91.217. In addition, all altitude reporting devices installed in the aircraft must meet certification requirements of 14 CFR Part 91.413. The installer must select an altitude reporting device that is a certified altitude source for the particular aircraft.

For additional information, refer to GNS 480 (CNX80) Installation Manual 560-0982-01 for the altitude data reporting configuration when connecting a GTX 327 to a GNS 480 (CNX80).

4.3 Discrete Inputs

Table 4-5. Discrete Inputs Pin Assignments

Pin Name	Pin Number	I/O
EXTERNAL IDENT SELECT*	8	In
XPDR SYSTEM ID PROGRAM*	16	In
AIRBORNE SENSE (SQUAT SWITCH)	22	In
EXTERNAL SUPPRESSION (TXP/DME)	17	In/Out

* These inputs are considered active if either the voltage to ground is < 1.9 V or the resistance to ground is < 375 Ω. These inputs are considered inactive if the voltage to ground is 11-33 Vdc.

EXTERNAL IDENT SELECT (remote IDENT) is a momentary input. Refer to Figures C-1 and C-2 for the remote IDENT switch interconnect and to Sections 5.2.6.2 and 5.2.10 for the configuration.

AIRBORNE SENSE (SQUAT SWITCH) IN is an ON or OFF input. The squat switch is one of the Airborne Determination methods available for sensing airborne status. Input for Airborne Determination allows automatic start and stop of the flight timer and enables automatic STBY mode selection. Refer to Figure C-2 for the squat switch interconnect and Sections 5.2.6.2 and 5.2.10 for squat switch configuration.

EXTERNAL STANDBY SELECT* (remote STBY) is an ON or OFF input used typically for dual transponder installations. When grounded, the GTX 327 is placed in standby. Refer to the figures in Appendix C and Section 5.2.10 for the EXTERNAL STANDBY SELECT interconnect.

EXTERNAL SUPPRESSION should be connected if a DME is installed in the aircraft avionics system. The GTX 327 suppression I/O pulses may not be compatible with all models of DME. Known incompatible units include the Bendix/King KN 62, KN 64 and KNS 80. These models have an output-only suppression port and can be damaged by the GTX 327 mutual suppression output. In this case, leave the suppression pin open. Refer to Figure C-2 for the external suppression interconnect.

4.3.1 RS-232 Serial Data Electrical Characteristics

The GTX 327 can be configured to include GPS, Altitude and Airdata data inputs on two RS-232 input lines. Altitude data supplied to the GTX 327 can be output to the GPS on an RS-232 output line.

Table 4-6. RS-232 Input/Output Pin Assignments

Pin Name	Pin Number	I/O
RS-232 OUT 1	20	Out
RS-232 IN 1	19	In
RS-232 IN 2	2	In

The RS-232 outputs conform to EIA Standard RS-232C with an output voltage swing of at least ±5 V when driving a standard RS-232 load. Refer to Figures C-1 through C-3 for the RS-232 serial data interconnect and to section 5.2.5 for RS-232 serial data configuration.

4.4 RS-232 Input/Output, Software Update Connections

NOTE

The installation of an optional software upgrade connector is highly recommended. If the connector is wired in the aircraft, transponder removal and reinstallation for software upgrade is not required.

When the GTX 327 is installed in an aircraft an optional RS-232 serial data connector should be installed for future software upgrades, negating the need to remove the transponder from the aircraft. The connector can be mounted anywhere convenient for access, such as under the instrument panel, on a remote avionics shelf or in the instrument panel itself. Be sure to label the connector for Software Update. Do not include the Test Mode Select switch in the aircraft. See Figure 4-3 for software update connections.

If the GTX 327 installation interfaces with a GNS 480 (CNX80) in the aircraft, the GNS 480 (CNX80) must be turned off during GTX 327 software upload, due to loading of RS-232 port 1.

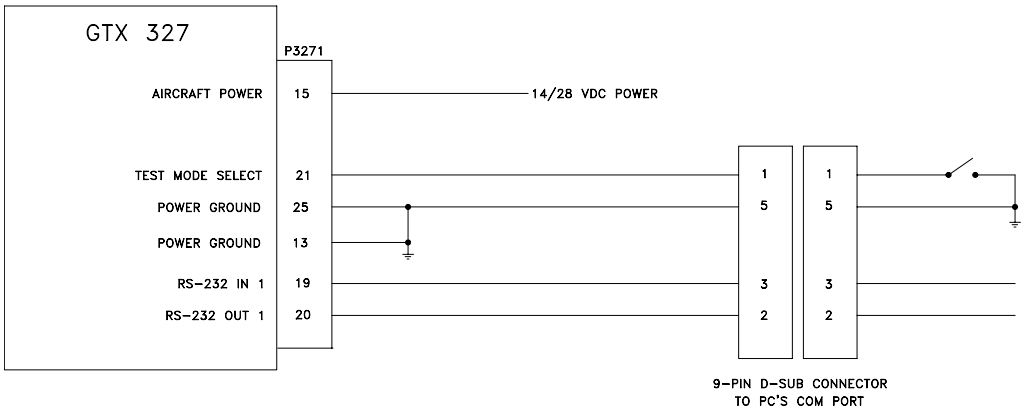


Figure 4-3. GTX 327 Software Update Connections

5 POST INSTALLATION CONFIGURATION & CHECKOUT PROCEDURE

5.1 Operation

NOTE

The coverage you can expect from the GTX 327 is limited to line of sight. Low altitude or aircraft antenna shielding by the aircraft itself may result in reduced range. Range can be improved by climbing to a higher altitude. It may be possible to minimize antenna shielding by locating the antenna where dead spots are only noticed during abnormal flight attitudes.

Figure 5-1. GTX 327 Front Panel

NOTES

The GTX 327 should be turned off before starting aircraft engine(s).

If the GTX 327 is configured with Automated Airborne Determination, flight operation is automatic and not dependent on user mode selection. Whether STBY, ON or ALT is selected on the ground, the transponder annunciation continues to indicate STBY and does not respond to radar or TCAS interrogations. When liftoff is sensed, the unit automatically selects the ALT mode.

5.1.1 Function Selection Switches

The function selection switches are:

- OFF — Powers off the GTX 327. Pressing the STBY, ON or ALT key powers on the transponder displaying the last active identification code.
- STBY — Selects the standby mode. When in standby mode the transponder will not reply to any interrogations.
- ON — Selects Mode A. In this mode, the transponder replies to Mode A and Mode C interrogations, as indicated by the Reply Symbol ("®"), but the replies do not include altitude information.
- ALT — Selects Mode A and Mode C. In ALT mode, the transponder replies to identification and altitude as indicated by the Reply Symbol ("®"). Replies to altitude interrogations include the standard pressure altitude (29.92 inches Hg.) received from an external altitude source, which is not adjusted for barometric pressure. The ALT mode may be selected in aircraft not equipped with an optional altitude encoder; however, the reply signal will not include altitude information.

NOTE

Any time the function switch is in the ON or ALT position the transponder becomes an active part of the Air Traffic Control Radar Beacon System (ATCRBS). The transponder also responds to interrogations from TCAS equipped aircraft.

- IDENT — Pressing the IDENT key activates the Special Position Identification (SPI) Pulse for 18 seconds, identifying the transponder return from others on an air traffic controller's screen. During the IDENT period, the word 'IDENT' appears in the upper left corner of the display.

- VFR — Sets the transponder code to the pre-programmed VFR code selected in Configuration mode (set to 1200 at the factory). Pressing the VFR key again will restore the previous identification code.

- FUNC — Changes the page shown on the right side of the display. Display data includes Pressure Altitude, Flight Time, Count Up and Count Down timers. In the Configuration mode, steps through the function pages.

Pressure Alt:	Displays the altitude data supplied to the GTX 327 in feet, flight level format or meters, depending on configuration setup.
Flight Time:	Displays the Flight Time which is controlled as configured on Configuration #1 page.
Count Up Timer:	Controlled by START/STOP and CLR buttons.
Count Down Timer:	Controlled by START/STOP, CLR, and CRSR buttons. Count down time entered with 0 – 9 buttons.
Contrast:	Controlled by 8 and 9 buttons.
Display Brightness:	Controlled by 8 and 9 buttons

- START/ STOP — Starts and stops the Count Up, Count Down and Flight Time. In the Configuration mode, reverses through the function pages.

- CRSR — Activates the change fields for the Count Down timer.

- CLR — Resets the Count Up, Count Down and Flight timers. Returns cursor to fourth code digit up to five seconds after code entry is complete.

- 8 — Reduces screen Contrast and Display Brightness. Enters the number eight into the Count Down timer.

- 9 — Increases screen Contrast and Display Brightness. Enters the number nine into the Count Down timer.

5.1.2 Function Display

PRESSURE ALT	Displays the altitude data supplied to the GTX 327 in feet, hundreds of feet (i.e., flight level), or meters, depending on configuration.
FLIGHT TIME	Displays the Flight Time, controlled by the START/STOP key or by one of four airborne sources (squat switch, GPS ground speed recognition, airdata airspeed recognition or altitude increase) as configured during installation. The timer begins when the GTX 327 determines that the aircraft is airborne.
COUNT UP TIMER	Controlled by START/STOP and CLR keys.
COUNT DOWN TIMER	Controlled by START/STOP, CLR, and CRSR keys. The initial Count Down Time is entered with the 0 – 9 keys.
CONTRAST	This page is only displayed if manual contrast mode is selected in Configuration mode. Contrast is controlled by the 8 and 9 keys .
DISPLAY	This page is only displayed if manual backlighting mode is selected in Configuration mode. Backlighting is controlled by the 8 and 9 keys.

5.1.3 Code Selection

Code selection is done with eight keys (0 - 7) that provide 4,096 active identification codes. Pushing one of these keys begins the code selection sequence. The new code is not activated until the fourth digit is entered. Pressing the CLR key moves the cursor back to the previous digit. Pressing the CLR key when the cursor is on the first digit of the code, or pressing the CRSR key during code entry, removes the cursor and cancels data entry, restoring the previous code. You may press the CLR key up to five seconds after code entry is complete to return the cursor to the fourth digit. The numbers 8 and 9 are not used for code entry, only for entering a Count Down time, contrast and display brightness, and data selection in the Configuration mode.

NOTE

The selected identification code should be entered carefully, either one assigned by air traffic control for IFR flight or an applicable VFR transponder code.

- Important Codes:

1200 — VFR code for any altitude in the US (Refer to ICAO standards elsewhere)

2000 — VFR code commonly used in Europe (Refer to ICAO standards)

7000 — VFR code commonly used in Europe (Refer to ICAO standards)

7500 — Hijack code (Aircraft is subject to unlawful interference)

7600 — Loss of communications

7700 — Emergency

Avoid selecting code 7500 and all codes in the 7600-7777 range. These codes trigger special indicators in automated facilities. An aircraft's transponder code is used for ATC tracking purposes, therefore exercise care when making routine code changes.

5.2 Configuration Pages

With the unit turned off, holding down the FUNC key and pressing one of the power on keys provides access to the configuration pages. The FUNC key sequences through the configuration pages. The START/STOP key reverses through the pages, stopping at the first configuration page. The CRSR key highlights selectable fields on each page. When a field is highlighted, numeric data entry is performed with the 0 – 9 keys and list selections are performed with the 8 or 9 keys. Press the CRSR key to accept changes. Pressing the FUNC key displays the next configuration page without saving the changes.

Configuration page changes are stored in EEPROM memory. To exit the configuration pages, turn the power off. Then turn on again (without holding the FUNC key) for normal operation.

5.2.1 DISPLAY MODE Page

DISPLAY MODE Page

DISPLAY MODE

Selection	Description
AUTO (Automatic)	DEFAULT. The display will automatically change between Positive mode (during the day) and Negative mode (at night), depending on the ambient light level received by the photocell.
NGTV (Negative)	The display will always be light characters on a black background, regardless of ambient lighting.
PSTV (Positive)	The display will always be black characters on a light background, regardless of ambient lighting.

LEVEL

Sets the ambient light level required for AUTO mode to change between negative and positive display. The higher the number, the brighter the ambient light level required for the change-over. This field has a range of 0 (zero) to 99, and is set to 75 at the factory.

5.2.2 DISPLAY BACKLIGHT Page

DISPLAY BACKLIGHT Page

BKLT (Backlight)

Selection	Description
MAN (Manual)	Display backlighting is controlled manually by the pilot on the GTX 327 DISPLAY page. No backlight parameters can be entered when the manual mode is selected.
AUTO (Automatic)	DEFAULT. Display backlighting is automatically controlled, based on the parameters entered on this configuration page. When AUTO is selected, the DISPLAY page does not appear to the pilot when the GTX 327 is operated in normal mode.

LVL (Level)

Shows the current level of display backlighting, based on the lighting input source (lighting bus voltage, or the ambient light if the source is PHOTO) and the settings on this configuration page. This field has a range of 0 (zero) to 999. The level is set by pressing the 8 and 9 keys when MAN mode is selected. When in AUTO mode, the field is for display only.

RSP TIME (Response Time)

Sets the speed with which the brightness responds to ambient light changes (only for AUTO backlight mode). The higher the number, the slower the display responds. This field has a range of 3 to 7, and is set to 4 at the factory.

MIN (Minimum) (Auto Only)

Sets the minimum brightness of the display. The higher the number, the brighter the minimum brightness. Display minimum brightness has a range of 0 (zero) to 99, and is set to 8 at the factory. It is prudent to verify that display lighting characteristics match those of other equipment in the panel under night lighting conditions.

BKLT SRCE (Backlight Source) (Auto Only)

Selection	Description
PHOTO (Photocell)	DEFAULT. Backlight level is determined by the ambient light level as measured by the photocell on the GTX 327.
14V	Backlight level tracks a 14 Volt DC aircraft lighting bus.
28V	Backlight level tracks a 28 Volt DC aircraft lighting bus.
5V	Backlight level tracks a 5 Volt DC aircraft lighting bus.

NOTE

If a lighting bus (any selection other than PHOTO) is selected, and the lighting bus control is turned to its minimum (daytime) setting, the display brightness will track the GTX 327 photocell.

SLOPE (Auto Only)

Sets the sensitivity of the display brightness to changes in the input level. The higher the number, the brighter the display will be for a given increase in the input level. This field has a range of 0 (zero) to 99, and is set to 50 at the factory.

OFFSET (Auto Only)

Adjusts the lighting level up or down for any given input level. This field has a range of 0 (zero) to 99, and is set to 50 at the factory. This may also be used to match lighting curves with other equipment in the panel.

5.2.3 KEY LIGHTING Page

KEY LIGHTING Page

The key lighting mode is always the same as the display backlight mode, so the mode must be changed on the Display Backlight configuration page. If the lighting mode is AUTO, then the key lighting parameters can be edited on this page.

KEY (Key Lighting)

Selection	Description
MAN (Manual)	Key lighting is controlled manually by the pilot on the GTX 327 DISPLAY page.
AUTO (Automatic)	Key lighting is automatically controlled based on the parameters entered on this configuration page.

LVL (Level)

Shows the current level of key lighting, based on the lighting input source (lighting bus voltage, or the ambient light if the source is PHOTO) and the settings on this configuration page. This field has a range of 0 (zero) to 999. The level is set by pressing the 8 and 9 keys when MAN mode is selected. When in AUTO mode, the field is for display only.

RSP TIME (Response Time)

Sets the speed with which the brightness responds to ambient light changes (only for AUTO key lighting mode). The higher the number, the slower the key lighting responds. This field has a range of 3 to 7, and is set to 4 at the factory.

MIN (Minimum) (Auto Only)

Sets the minimum brightness of the key lighting. The higher the number, the brighter the minimum brightness. Key lighting minimum brightness has a range of 0 (zero) to 99, and is set to 8 at the factory. It is prudent to verify that key lighting characteristics match those of other equipment in the panel under night lighting conditions.

KEY SRCE (Key Lighting Source) (Auto Only)

Selection	Description
PHOTO (Photocell)	DEFAULT. Key lighting level is determined by the ambient light level as measured by the photocell on the GTX 327.
14V	Backlight level tracks a 14 Volt DC aircraft lighting bus.
28V	Backlight level tracks a 28 Volt DC aircraft lighting bus.
5V	Backlight level tracks a 5 Volt DC aircraft lighting bus.

SLOPE (Auto Only)

Sets the sensitivity of the key lighting brightness to changes in the input level. The higher the number, the brighter the key lighting will be for a given increase in the input level. This field has a range of 0 (zero) to 99, and is set to 50 at the factory.

OFFSET (Auto Only)

Adjusts the key lighting level up or down for any given input level. This field has a range of 0 (zero) to 99, and is set to 50 at the factory. This may also be used to match lighting curves with other equipment in the panel.

5.2.4 CONTRAST CONFIGURATION Page

CONTRAST CONFIGURATION Page

CONTRAST MODE

Selection	Description
MAN (Manual)	The display contrast is manually adjusted either here or by the pilot using the GTX 327 CONTRAST page.
AUTO (Automatic)	DEFAULT. The display contrast is automatically compensated for temperature and other factors. An offset can be entered in the contrast level adjustment described below.

CONTRAST LEVEL ADJUSTMENT

This is a "slider" bar graph control. Use the 8 key to move it further to the left, decreasing the contrast level. Use the 9 key to move it to the right, increasing the contrast level. It is set to 50% at the factory. In manual contrast mode, this is a direct adjustment of the display contrast level. In automatic contrast mode, this adjusts the offset to the automatically compensated contrast. Numeric ranges are: contrast level (1-63) and contrast offset (0-99; default 50).

5.2.5 RS-232 INPUT/OUTPUT Page

RS-232 INPUT/OUTPUT Page

This is the electrical source for the GTX 327 altitude and GPS data input. Refer to paragraph 4.2.3 for altimeter data selection priority.

RS-232 INPUT (Altitude Source, GPS Data)

SELECTION	DESCRIPTION
OFF	DEFAULT. The altitude code input is not from an RS-232 source.
GPS	RS-232 ground speed from a GPS device.
ICARUS ALT	RS-232 serial altitude from an Icarus Instruments 3000.
ADC NO ALT	RS-232 serial air data information from Shadin ADC 200, 200+, 2000.
ADC W/ALT	RS-232 serial air data information from Shadin ADC 200, 200+, 2000 plus altitude data.
SHADIN ALT	RS-232 serial altitude from Shadin 8800T, 9000T, 9200T.
FADC NO ALT	RS-232 serial air data from Shadin 9628XX-X family of Air Data Computers and Fuel/Air Data Computers.
FADC W/ALT	RS-232 serial air data from Shadin 9628XX-X family of Air Data Computers and Fuel/Air Data Computers plus altitude data.
REMOTE	RS-232 serial input remote data. Reserved for future use.

RS-232 OUTPUT (Altitude Out)

SELECTION	DESCRIPTION
OFF	No RS-232 output from this channel.
ICARUS ALT	DEFAULT. RS-232 serial altitude from an Icarus Instruments 3000.
REMOTE	RS-232 serial output remote data. Reserved for future use.

5.2.6 OPERATION CONFIGURATION Pages

5.2.6.1 First Configuration Page

First Configuration Page

VS RATE (Vertical Speed Rate)

This field is the typical vertical speed for climb/descent of the aircraft. This number determines when a climb or descent arrow is displayed on the PRESSURE ALT page of the GTX 327. The range is 0 (zero) feet per minute to 9999 feet per minute. It is set to 500 fpm at the factory.

FLT TMR (Flight Timer)

Available choices are MANUAL, CLEAR and ACCUMULATE. Selecting CLEAR resets Flight Time to zero and starts the flight timer when lift off is sensed.

Selection	Description
MANUAL	Flight timer START/STOP is controlled manually by the pilot.
CLEAR	DEFAULT. Automated flight timer START/STOP resets to zero at every lift off.
ACCUMULATE	Automated flight timer START/STOP continues counting up at lift off.

VFR ID (VFR Transponder Code)

This field is the four-digit code that will be selected when the user presses the GTX 327 VFR key. In the United States, 1200 is the VFR code for any altitude. Many European countries use 7000 as the VFR code. It is set to 1200 at the factory.

FORMAT (Altitude Format)

This field determines how the pressure altitude will be shown on the GTX 327 display.

Selection	Description
FLIGHT LVL (Flight Level)	DEFAULT. The pressure altitude is displayed in hundreds of feet. For example, a pressure altitude of 12,300 feet is displayed as “FL 123”.
FEET	Pressure altitude is displayed in feet.
METERS	Pressure altitude is displayed in meters.

5.2.6.2 Second Configuration Page

Second Configuration Page

SQUAT SWITCH

The GTX 327 Flight Time may be based on the squat switch state. The squat switch field may be set to either YES or NO. (Default NO). If YES, sense may be set to HIGH or LOW. If set to NO, airborne status for auto standby and flight timer features will be determined by input data. The highest priority is GPS groundspeed. The next is serial port ADC input followed by pressure altitude change, if no other RS-232 source is available.

SENSE (Squat Switch Sense)

This field can only be entered if the AIRBORNE SOURCE selection is YES.

Selection	Description
LOW	DEFAULT. The installed squat switch or airspeed switch is low (grounded) when the aircraft is on the ground, and open when airborne.
HIGH	The installed squat switch or airspeed switch is open when the aircraft is on the ground, and low (grounded) when airborne.

AUTO STANDBY?

Selection	Description
OFF	Selection of STBY (standby) and ALT (altitude-reporting) modes is initiated manually by the pilot.
ON	DEFAULT. The GTX 327 will automatically transition from STBY to ALT when the unit determines the aircraft has become airborne. When the unit determines the aircraft has been on the ground ("ground-borne") for the configured delay time (see "Delay Time", below), the unit will automatically transition from ALT (or ON) to STBY.

Delay Time

This is the number of seconds the aircraft must be on the ground before the AUTO STBY feature automatically switches the unit to STBY mode. Delay Time has a range of 0 (zero) to 99 seconds, and is set to 24 seconds at the factory. When the unit is configured with a SQUAT SWITCH, an additional air-state delay time (4.5 seconds for fixed-wing; 1 second for rotorcraft) is added to this user-configured delay time for ground-borne determination.

5.2.7 AIRCRAFT TYPE Page

AIRCRAFT TYPE Page

SELECTION	DESCRIPTION
AC TYPE	UNKNOWN, <15.5K, >=15.5K, or ROTOR.

AIRCRAFT TYPE

Used for Automated Airborne Determination (time to STBY, required airspeed, ground speed). Sets the AIRCRAFT TYPE to ROTOR, to a weight of less than 15,500 pounds, more than or equal to 15,500 pounds, or unknown weight. Defaults to less than or equal to 15,500 pounds.

5.2.8 RS-232 INPUT VIEW Page

RS-232 INPUT VIEW Page

Depending on the selected inputs on Channel 1 and Channel 2, this page displays the information received on the channel. If GPS is selected as an input, ground speed (GSPD), latitude (LAT), longitude (LON) and track (TRK) can be viewed.

If ICARUS or SHADIN-ALT is selected as an input, pressure altitude (PALT) can be viewed.

If SHADIN-FADC or SHADIN-ADC is selected as an input, true or static air temperature (SAT), outside or total air temperature (TAT), indicated air speed (IAS), true air speed (TAS), density altitude (DALT), pressure altitude (PALT), current barometric pressure (BARO) and vertical speed (VSPD) can be viewed.

5.2.9 GRAY CODE INPUT Page

GRAY CODE INPUT Page

Information on this page may aid in installation troubleshooting. There are no user inputs or operations on this page.

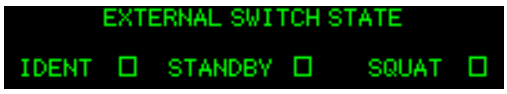
GRAY CODE

This field shows the status (1 = ground, 0 = open) of each of the ten gray code altitude inputs. This information may aid in installation troubleshooting. This page is not used in systems that contain serial altitude input.

DECODED ALTITUDE

This field displays the gray code altitude input in feet. Verify that it is the correct altitude.

5.2.10 EXTERNAL SWITCH Page



EXTERNAL SWITCH Page

Displays the state of the external switch discrete inputs.

IDENT

Displays the state of the EXTERNAL IDENT discrete input. The box is filled when EXTERNAL IDENT is grounded.

STANDBY

Displays the state of the EXTERNAL STANDBY discrete input. The box is filled when EXTERNAL STANDBY is grounded.

SQUAT

Displays the state of the SQUAT SWITCH input. The box is filled when the SQUAT SWITCH input is active (the aircraft is on the ground as configured on the Second Configuration page).

5.2.11 ANALOG INPUT Page

ANALOG INPUT Page

The Analog to Digital Converter (ADC) counts are shown on the display, providing troubleshooting data. There are no user inputs or operations on this page.

14/5V LTG

Displays the current 14 Volt lighting bus ADC level.

PHOTO

Displays the current photocell ADC level.

LCD TEMP

Displays the current LCD temperature ADC level.

28V LTG

Displays the current 28 Volt lighting bus ADC level.

REPLY

Displays the current reply active ADC level.

UNIT TEMP

Displays the current unit temperature ADC level.

APPENDIX A CERTIFICATION DOCUMENTS

A.1 STC

Consistent with N8110.69 or Order 8110.4, Aviation Authority approved installers are hereby granted permission to use STC #SA00870WI data to modify aircraft.

United States of America

Department of Transportation -- Federal Aviation Administration

Supplemental Type Certificate

Number SA00870WI

This certificate issued to GARMIN International
1200 E 51st St.
Olathe, KS 66062

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part 3 *of the* Civil Air *Regulations.*

Original Product - Type Certificate Number : A3S0

Make : Piper

Model : PA-32

Description of Type Design Change:
Installation of GTX 327, transponder, IAW GARMIN MDL, GTX 327 in a Piper PA-32, Dwg. No. 005-00089-01, Revision E, dated 3/13/00, or later FAA Approved revision.

Limitations and Conditions :
Compatibility of this design change with previously approved modifications must be determined by the installer. If the holder agrees to permit another person to use this certificate to alter the product, the holder shall give the other person written evidence of that permission.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application : September 22, 1999

Date of issuance : April 03, 2000

Date reissued :

Date amended :

By direction of the Administrator

Carlos B Carbord
(*Signature*)

For Tina L. Miller
Program Manager
Wichita Aircraft Certification Office

(*Title*)

A.2 Continued Airworthiness

Other than for regulatory periodic functional checks, maintenance of the GTX 327 is "on condition" only. Refer to the GTX 327 Maintenance Manual (Garmin P/N 190-00207-05). Periodic maintenance of the GTX 327 is not required.

This section provides assistance to the installing agency in preparing Instructions for Continued Airworthiness (ICA) in response to Bulletin Number HBAW 98-18, "Checklist for Instructions for Continued Airworthiness for Major Alterations Approved Under the Field Approval Process", effective 10/7/98.

Aviation Authority approved installers are hereby granted permission to reference appropriate service instructions and excerpts from this Installation Manual to accomplish the Instructions for Continued Airworthiness. This permission does not construe suitability of the documents. It is the applicant's responsibility to determine the suitability of the documents for the ICA.

Following is a suggested ICA for a Garmin GTX 327 unit installation. Some of the checklist items do not apply, in which case they should be marked "N/A" (Not Applicable).

INSTRUCTIONS FOR CONTINUED AIRWORTHINESS, GARMIN GTX 327

1. Introduction

[Aircraft that has been altered: Registration (N-) number, Make, Model and Serial Number]

Content, Scope, Purpose and Arrangement:	This document identifies the Instructions for Continued Airworthiness for the modification of the above aircraft by installation of a Garmin GTX 327.
Applicability:	Applies to aircraft altered by installation of the Garmin GTX 327.
Definitions/Abbreviations:	None, N/A.
Precautions:	None, N/A.
Units of Measurement:	None, N/A.
Referenced Publications:	Garmin GTX 327 Installation Manual, P/N 190-00187-02 Garmin GTX 327 Maintenance Manual, P/N 190-00187-05 Garmin STC # SA00870WI. Garmin GTX 327 Pilot's Guide, P/N 190-00187-00.
Distribution:	This document should be a permanent aircraft record.

2. Description of the Alteration

Installation of the Garmin GTX 327, with interface to Encoding Altimeter or Blind Encoder. Refer to Section 4 and figures in Appendix C of this manual for interconnect information. Antenna installation, removal and replacement should be in accordance with applicable provisions of AC 43.13-1B and AC 43.13-2A.

3. Control, Operation Information

Refer to the GTX 327 Pilot's Guide.

4. Servicing Information

N/A

5. Maintenance Instructions

Maintenance of the GTX 327 is 'on condition' only. Periodic maintenance is not required. Refer to the GTX 327 Maintenance Manual.

6. Troubleshooting Information

Refer to the GTX 327 Maintenance Manual.

7. Removal and Replacement Information

Refer to Section 2 of this manual. If the unit is removed and reinstalled, a functional check of the equipment should be conducted in accordance with Section 5 of this manual.

8. Diagrams

Refer to Sections 2, 4 and Appendices B and C of this manual.

9. Special Inspection Requirements

N/A

10. Application of Protective Treatments

N/A

11. Data: Relative to Structural Fasteners

Antenna installation, removal and replacement should be in accordance with applicable provisions of AC 43.13-1B and AC 43.13-2A. Also, refer to Section 2 of this manual.

12. Special Tools

N/A

13. This Section is for Commuter Category Aircraft Only

A. Electrical loads: Refer to Section 1.5 of this manual.
B. Methods of balancing flight controls: N/A.
C. Identification of primary and secondary structures: N/A.
D. Special repair methods applicable to the airplane: Antenna installation, removal, and replacement should be in accordance with applicable provisions of AC 43.13-1B and AC 43.13-2A.

14. Overhaul Period

No additional overhaul time limitations.

15. Airworthiness Limitation Section

N/A.

16. Revision

To revise this ICA, a letter must be submitted to the local FSDO with a copy of the revised FAA Form 337, and revised ICA. The FAA inspector accepts the change by signing Block 3 and including the following statement:

"The attached revised/new Instructions for Continued Airworthiness (date _____) for the above aircraft or component major alteration have been accepted by the FAA, superseding the Instructions for Continued Airworthiness (date _____)."

17. Assistance

Flight Standards Inspectors have the resources to respond to questions regarding the ICA.

18. Implementation and Record Keeping

For major alterations performed in accordance with FAA field approval policy, the owner/operator operating under Part 91 is responsible for ensuring that the ICA is made part of the applicable Section 91.409 inspection program for their aircraft. This is accomplished when a maintenance entry is made in the aircraft's maintenance record in accordance with Section 43.9. This entry records the major alteration and identifies the original ICA location (e.g., Block 8 of FAA Form 337, dated _____) along with a statement that the ICA is now part of the aircraft's inspection/maintenance requirements.

A.3 Environmental Qualification Forms, GTX 327 Mode A/C Transponder

The following pages are copies of the Environmental Qualification Forms for the Garmin GTX 327 Transponder (005-00089-51) provided for reference only.

ENVIRONMENTAL QUALIFICATION FORM

Nomenclature: GTX327 Airborne ATC Transponder Equipment

Type/Model/Part No.: 010-00188-( ) TSO - C74c Class 1A
(Includes 011-00490-( ))

Manufacturer's Specification And/Or Other Applicable Specification:
004-00070-00

Manufacturer: GARMIN Corporation

Address: 1200 E 151st St., Olathe, Kansas 66062

Conditions	RTCA DO-160D Section	Description of Conducted Tests
Temperature and Altitude	4.0	Equipment tested to Categories A1 & D1
Low Temperature	4.5.1	
High Temperature	4.5.2. & 4.5.3	
In-Flight Loss of Cooling	4.5.4	Cooling Air Not Required
Altitude	4.6.1	
Decompression	4.6.2	
Overpressure	4.6.3	
Temperature Variation	5.0	Equipment tested to Category C
Humidity	6.0	Equipment tested to Category A
Shock	7.0	Equipment tested to Category B
Vibration	8.0	Equipment tested in each aircraft type to aircraft zone 2. Aircraft Type 2 and 6 were tested to Category S2 , Vibration level B2. Aircraft Type 3, 4, and 5 were tested to Category S, Vibration level M. **Note:** Vibration level M modified to increase level to RTCA DO-160C Curve N for Helicopters as follows-0.1 inches peak-to-peak double amplitude from 5Hz to 17Hz, 1.5g-Pk from 17Hz to 500Hz.
Explosion	9.0	Equipment identified as Category X, no test required

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Figure A-1. GTX 327 Environmental Qualification Form (Sheet 1 of 2)

Waterproofness	10.0	Equipment identified as Category X, no test required
Fluids Susceptibility	11.0	Equipment identified as Category X, no test required
Sand and Dust	12.0	Equipment identified as Category X, no test required
Fungus	13.0	Equipment identified as Category X, no test required
Salt Spray	14.0	Equipment identified as Category X, no test required
Magnetic Effect	15.0	Equipment tested to Class Z
Power Input	16.0	Equipment tested to Category A
Voltage Spike	17.0	Equipment tested to Category A
Audio Frequency Susceptibility	18.0	Equipment tested to Category B
Induced Signal Susceptibility	19.0	Equipment tested to Category A
Radio Frequency Susceptibility	20.0	Equipment tested for conducted susceptibility to Category T, radiated susceptibility to Category T, and pulse test to Category T.
Radio Frequency Emission	21.0	Equipment tested to Category B, Equipment tested to Category M up to 2 GHz.
Lightning Induced Transient Susceptibility	22.0	Equipment identified as Category XXXX, no test required
Lightning Direct Effects	23.0	Equipment identified as Category X, no test required
Icing	24.0	Equipment identified as Category X, no test required
Electrostatic Discharge	25.0	Equipment identified as Category X, no test required
Remarks- In the Y-Axis vibration sweep, there were two critical frequencies identified very close together at 160Hz and 181Hz. At the end of the vibration test cycle the two frequencies had combined into one frequency at 179Hz. There was no change in unit performance.		

005-00089-51 Rev. E

Page 2 of 2

Figure A-1. GTX 327 Environmental Qualification Form (Sheet 2 of 2)

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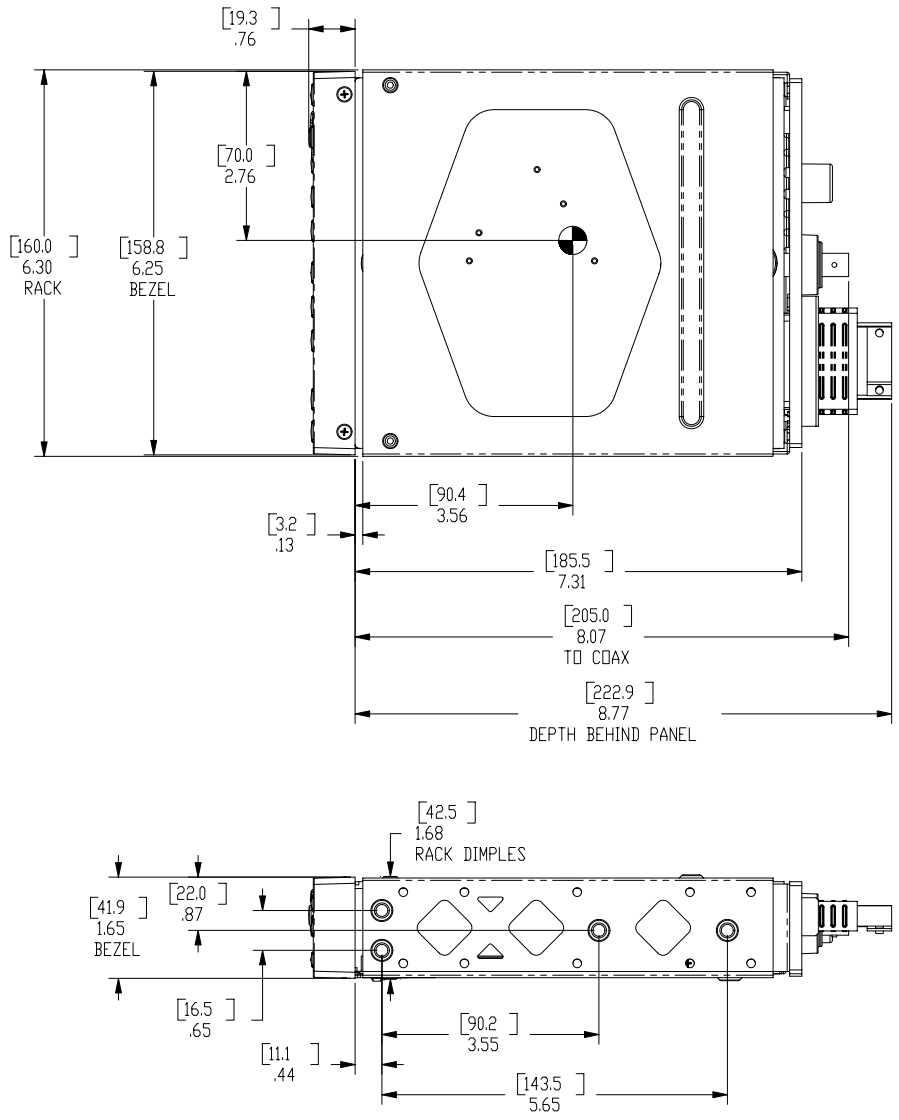
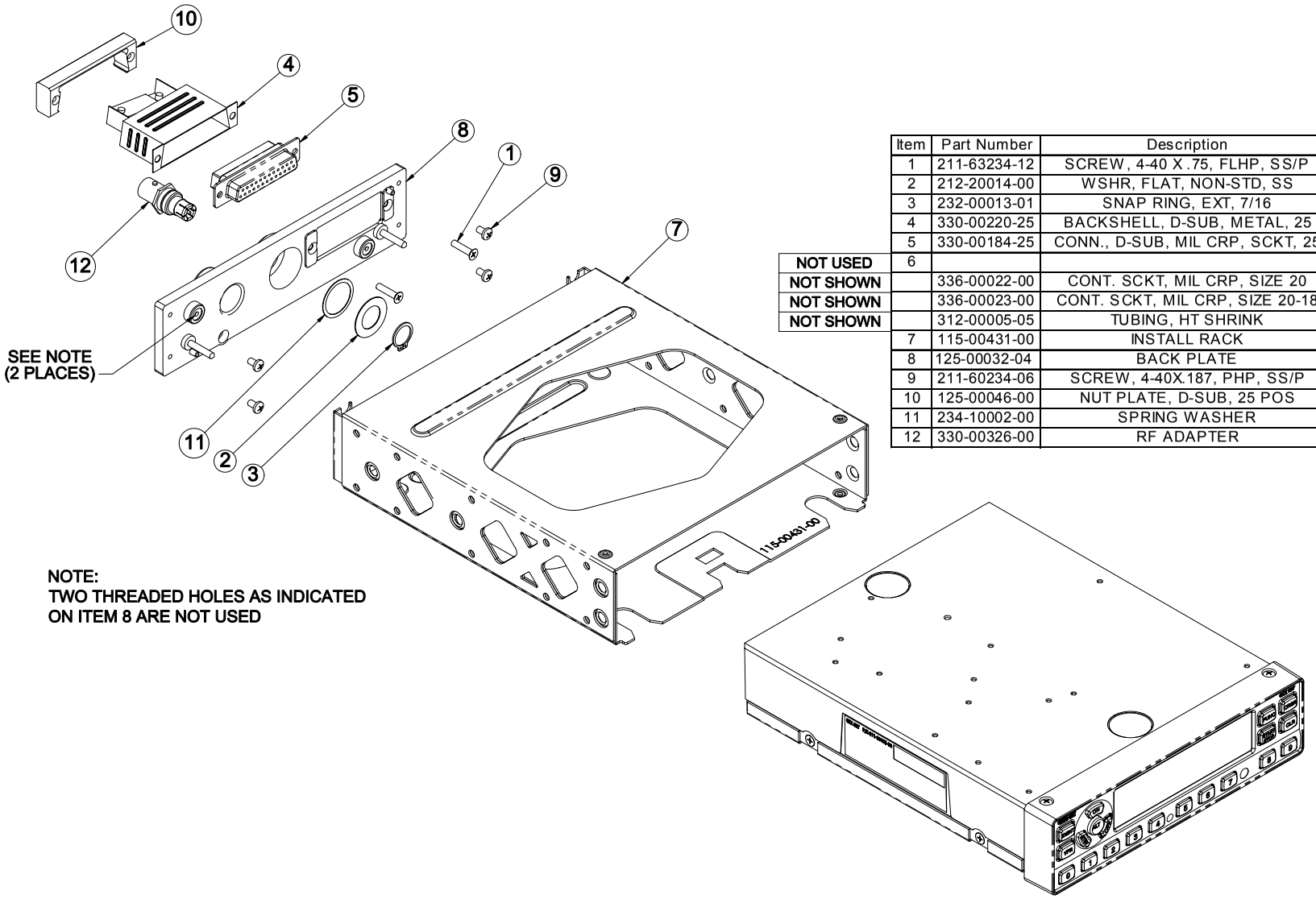


DIMENSIONS: INCHES [mm]

Figure B-1. GTX 327 Outline Drawing



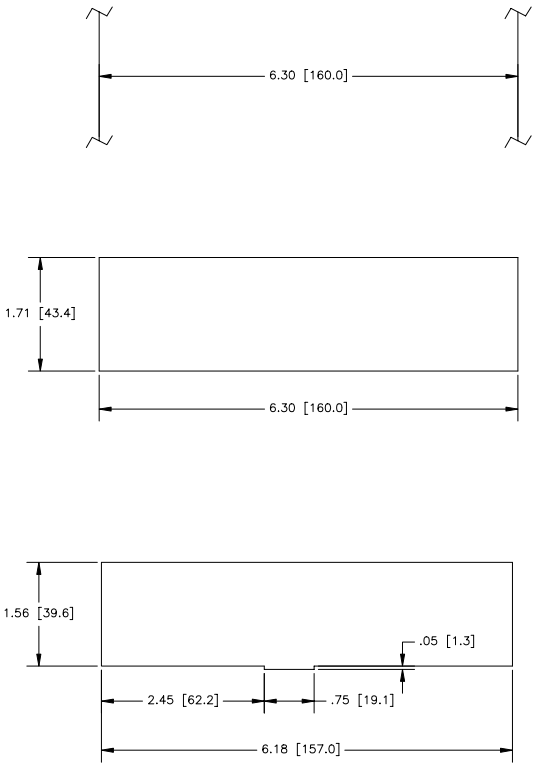
Item	Part Number	Description	Qty
1	211-63234-12	SCREW, 4-40 X .75, FLHP, SS/P	2
2	212-20014-00	WSHR, FLAT, NON-STD, SS	1
3	232-00013-01	SNAP RING, EXT, 7/16	1
4	330-00220-25	BACKSHELL, D-SUB, METAL, 25	1
5	330-00184-25	CONN., D-SUB, MIL CRP, SCKT, 25	1
NOT USED 6			
NOT SHOWN	336-00022-00	CONT. SCKT, MIL CRP, SIZE 20	25
NOT SHOWN	336-00023-00	CONT. SCKT, MIL CRP, SIZE 20-18	5
NOT SHOWN	312-00005-05	TUBING, HT SHRINK	2.3IN
7	115-00431-00	INSTALL RACK	1
8	125-00032-04	BACK PLATE	1
9	211-60234-06	SCREW, 4-40X.187, PHP, SS/P	4
10	125-00046-00	NUT PLATE, D-SUB, 25 POS	2
11	234-10002-00	SPRING WASHER	1
12	330-00326-00	RF ADAPTER	1

Figure B-2. GTX 327 Connector/Rack Assembly Drawing

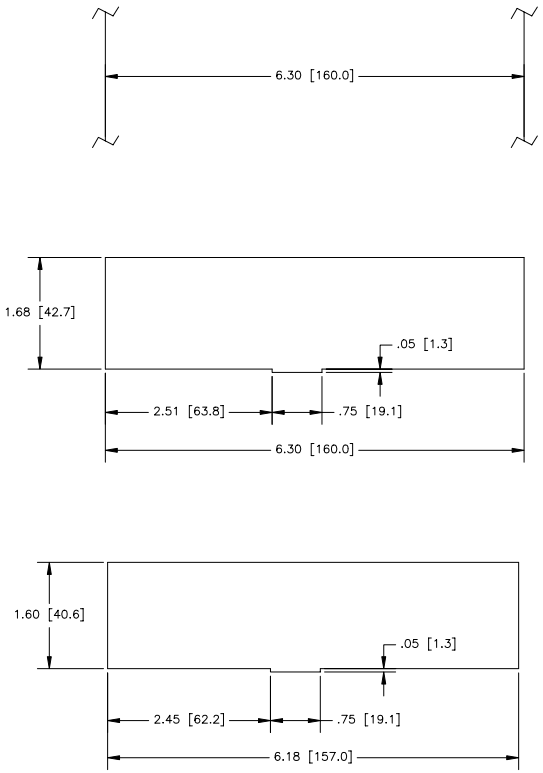
OPTION 1:
STACK CUTOUT (RACK INSTALLED FROM FRONT OF AIRCRAFT PANEL)

OPTION 2:
RADIO CUTOUT (RACK INSTALLED FROM FRONT OF AIRCRAFT PANEL)

OPTION 3:
RADIO CUTOUT (RACK INSTALLED FROM BACK OF AIRCRAFT PANEL ONLY) MAXIMUM AIRCRAFT PANEL THICKNESS IS .125 INCH [3.2 mm]



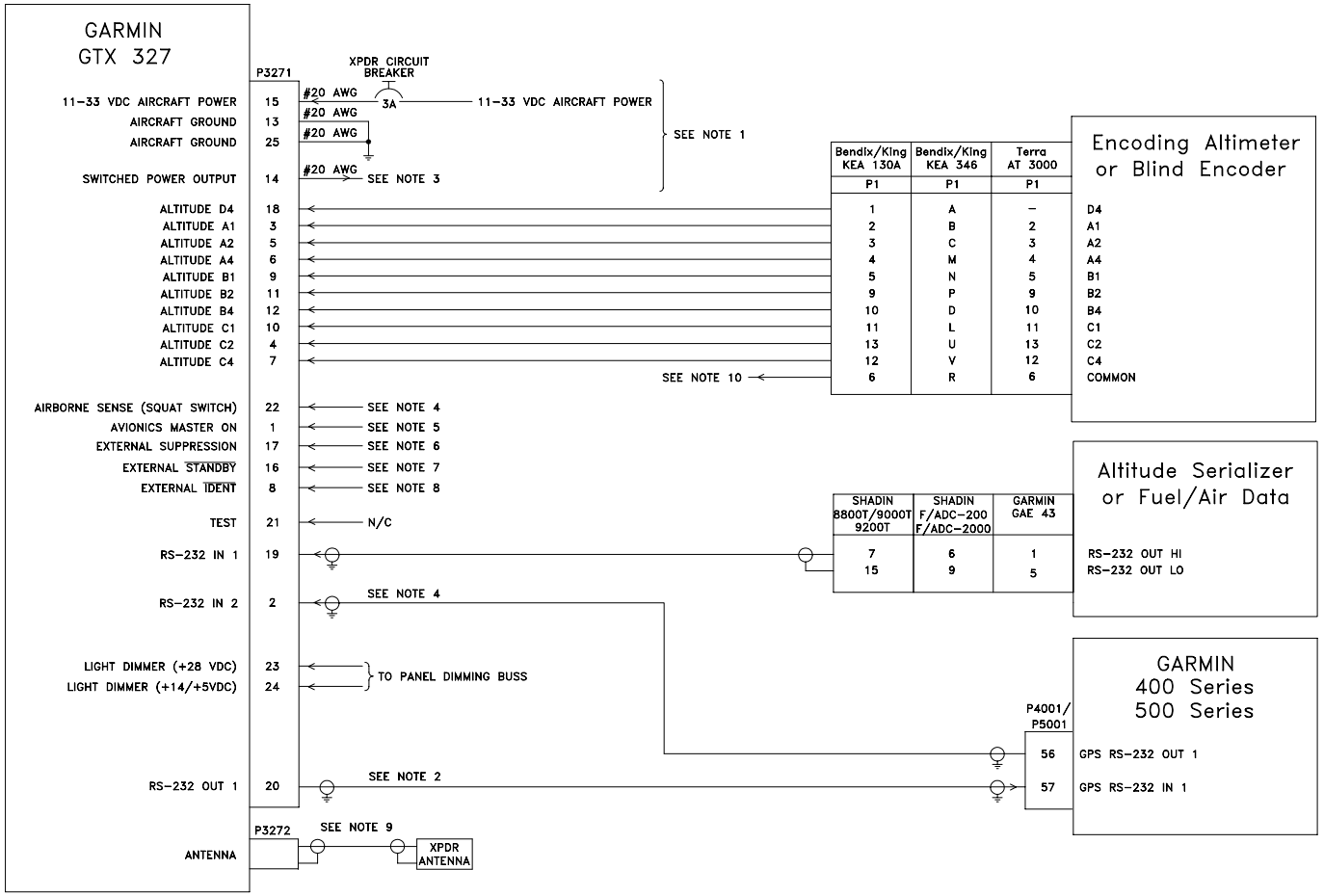
GTX 327 OLD RACK (115-00285-00)



GTX 327 NEW RACK (115-00431-00)

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

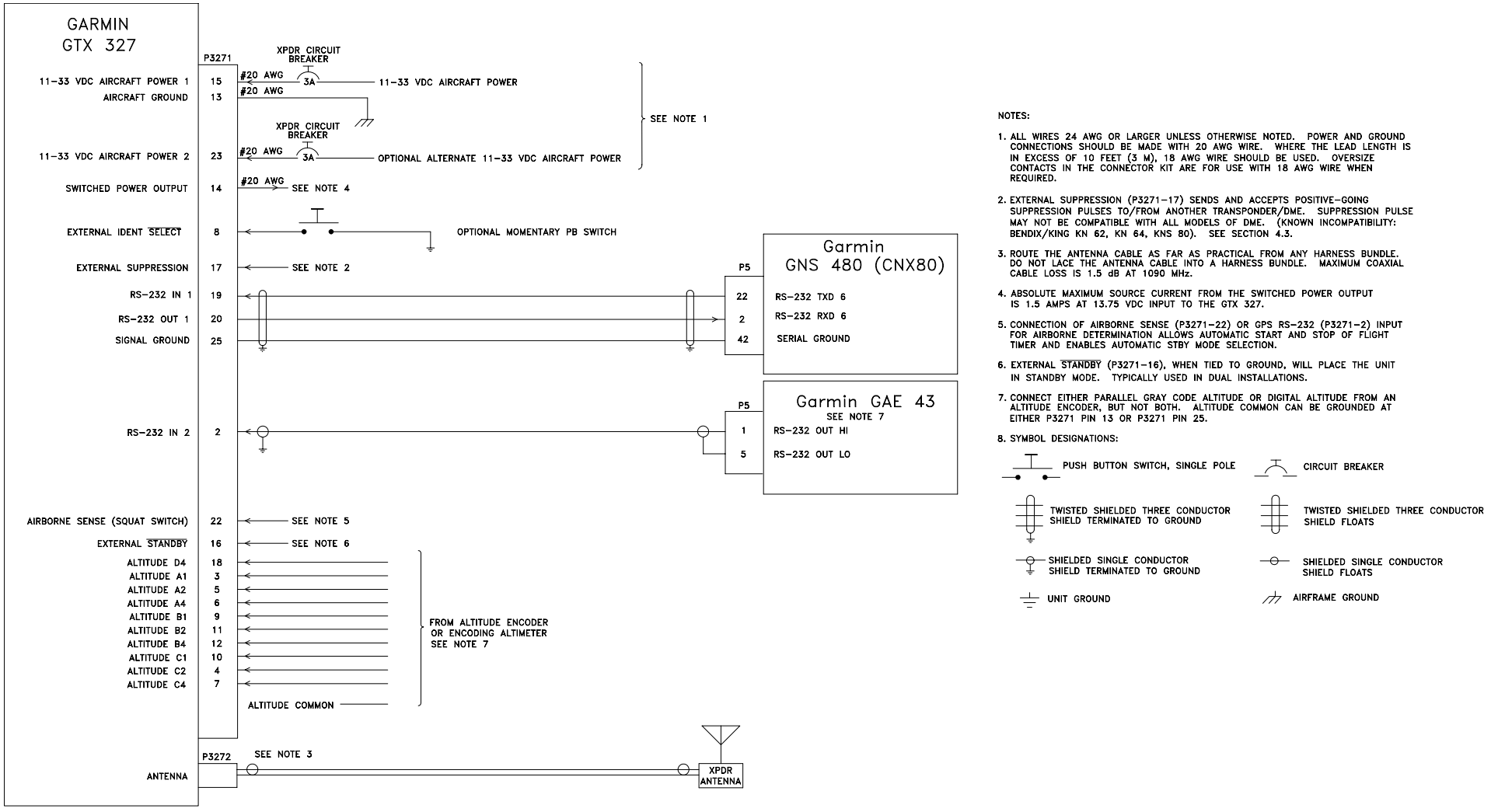
Figure B-3. GTX 327 Recommended Panel Cutout Dimensions



NOTES:

1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED. POWER AND GROUND CONNECTIONS SHOULD BE MADE WITH 20 AWG WIRE. WHERE THE LEAD LENGTH IS IN EXCESS OF 10 FEET (3 M), 18 AWG WIRE SHOULD BE USED. OVERSIZE CONTACTS IN THE CONNECTOR KIT ARE FOR USE WITH 18 AWG WIRE WHEN REQUIRED.
2. ALTITUDE DATA MAY BE SUPPLIED BY PARALLEL OR SERIAL SOURCE. SOURCE USED IS SELECTED VIA A CONFIGURATION PAGE. ALTITUDE DATA SUPPLIED TO THE GTX 327 CAN ALSO BE OUTPUT TO ANOTHER UNIT VIA RS–232.
3. ABSOLUTE MAXIMUM SOURCE CURRENT FROM THE SWITCHED POWER OUTPUT IS 1.5 AMPS AT 13.75 VDC INPUT TO THE GTX 327.
4. CONNECTION OF AIRBORNE SENSE (P3271–22) OR GPS RS–232 (P3271–2) INPUT FOR AIRBORNE DETERMINATION ALLOWS AUTOMATIC START AND STOP OF FLIGHT TIMER AND ENABLES AUTOMATIC STBY MODE SELECTION. REFER TO SECTIONS 4 AND 5.
5. AVIONICS MASTER ON (P3271–1), WHEN TIED TO 11–33 VDC INPUT (P3271–15) PROVIDES AUTOMATIC UNIT POWER UP. WHEN POWER IS APPLIED THE UNIT WILL POWER UP IN THE LAST MODE SELECTED.
6. EXTERNAL SUPPRESSION (P3271–17) SENDS AND ACCEPTS POSITIVE–GOING SUPPRESSION PULSES TO/FROM ANOTHER TRANSPONDER/DME. SUPPRESSION PULSE MAY NOT BE COMPATIBLE WITH ALL MODELS OF DME. (KNOWN INCOMPATIBILITY: BENDIX/KING KN 62, KN 64, KNS 80). SEE SECTION 4.3.
7. EXTERNAL STANDBY (P3271–16), WHEN TIED TO GROUND, WILL PLACE THE UNIT IN STANDBY MODE. TYPICALLY USED IN DUAL INSTALLATIONS.
8. MOMENTARY CONNECTION OF EXTERNAL IDENT (P3271–8) TO GROUND CAUSES THE GTX 327 TO TRANSMIT IDENT PULSES.
9. ROUTE THE ANTENNA CABLE AS FAR AS PRACTICAL FROM ANY HARNESS BUNDLE. DO NOT LACE THE ANTENNA CABLE INTO A HARNESS BUNDLE. MAXIMUM COAXIAL CABLE LOSS IS 1.5 dB AT 1090 MHz.
10. ALTITUDE ENCODER RETURN CAN BE GROUNDED AT EITHER P3271 PIN 13 OR P3271 PIN 25.
11. REFER TO MANUFACTURERS' DOCUMENTATION FOR COMPLETE PINOUT AND INTERCONNECT INFORMATION. PINOUTS OF OTHER UNITS SHOWN FOR REFERENCE ONLY.

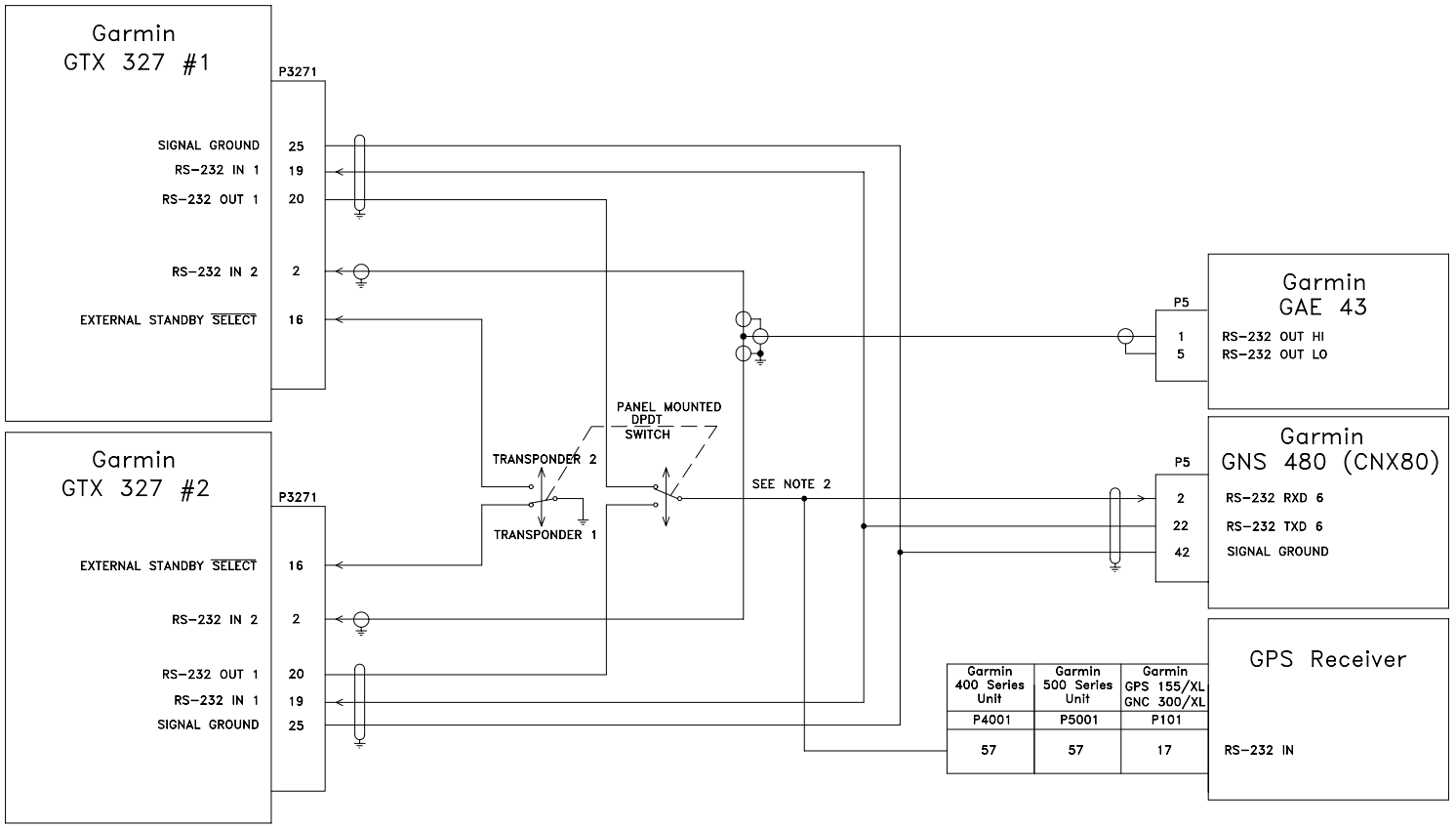
Figure C-1. GTX 327 to 400/500 Series Units, Typical Interconnect Wiring Diagram



NOTES:

1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED. POWER AND GROUND CONNECTIONS SHOULD BE MADE WITH 20 AWG WIRE. WHERE THE LEAD LENGTH IS IN EXCESS OF 10 FEET (3 M), 18 AWG WIRE SHOULD BE USED. OVERSIZE CONTACTS IN THE CONNECTOR KIT ARE FOR USE WITH 18 AWG WIRE WHEN REQUIRED.
2. EXTERNAL SUPPRESSION (P3271–17) SENDS AND ACCEPTS POSITIVE–GOING SUPPRESSION PULSES TO/FROM ANOTHER TRANSPONDER/DME. SUPPRESSION PULSE MAY NOT BE COMPATIBLE WITH ALL MODELS OF DME. (KNOWN INCOMPATIBILITY: BENDIX/KING KN 62, KN 64, KNS 80). SEE SECTION 4.3.
3. ROUTE THE ANTENNA CABLE AS FAR AS PRACTICAL FROM ANY HARNESS BUNDLE. DO NOT LACE THE ANTENNA CABLE INTO A HARNESS BUNDLE. MAXIMUM COAXIAL CABLE LOSS IS 1.5 dB AT 1090 MHz.
4. ABSOLUTE MAXIMUM SOURCE CURRENT FROM THE SWITCHED POWER OUTPUT IS 1.5 AMPS AT 13.75 VDC INPUT TO THE GTX 327.
5. CONNECTION OF AIRBORNE SENSE (P3271–22) OR GPS RS–232 (P3271–2) INPUT FOR AIRBORNE DETERMINATION ALLOWS AUTOMATIC START AND STOP OF FLIGHT TIMER AND ENABLES AUTOMATIC STBY MODE SELECTION.
6. EXTERNAL STANDBY (P3271–16), WHEN TIED TO GROUND, WILL PLACE THE UNIT IN STANDBY MODE. TYPICALLY USED IN DUAL INSTALLATIONS.
7. CONNECT EITHER PARALLEL GRAY CODE ALTITUDE OR DIGITAL ALTITUDE FROM AN ALTITUDE ENCODER, BUT NOT BOTH. ALTITUDE COMMON CAN BE GROUNDED AT EITHER P3271 PIN 13 OR P3271 PIN 25.
8. SYMBOL DESIGNATIONS:

Figure C-2. GTX 327 to GNS 480 (CNX80), Typical Interconnect Wiring Diagram



NOTES:

1. ALL WIRES 24 AWG OR LARGER UNLESS OTHERWISE NOTED.
2. THE GPS CAN ONLY RECEIVE RS-232 SERIAL DATA FROM ONE GTX 327 UNIT AT A TIME. ALSO, DUE TO SYSTEM CONFIGURATION, DUAL TRANSPONDERS MUST BE IDENTICAL (I.E. DUAL GTX 327's) IN A SYSTEM WITH ONE GNS 480 (CNX80).

3. SYMBOL DESIGNATIONS

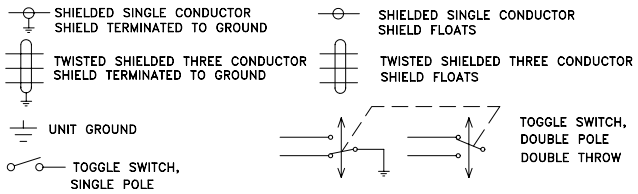


Figure C-3. Dual TXP Interconnect Wiring Diagram, Encoding Altitude Connections (Sheet 1 of 2)

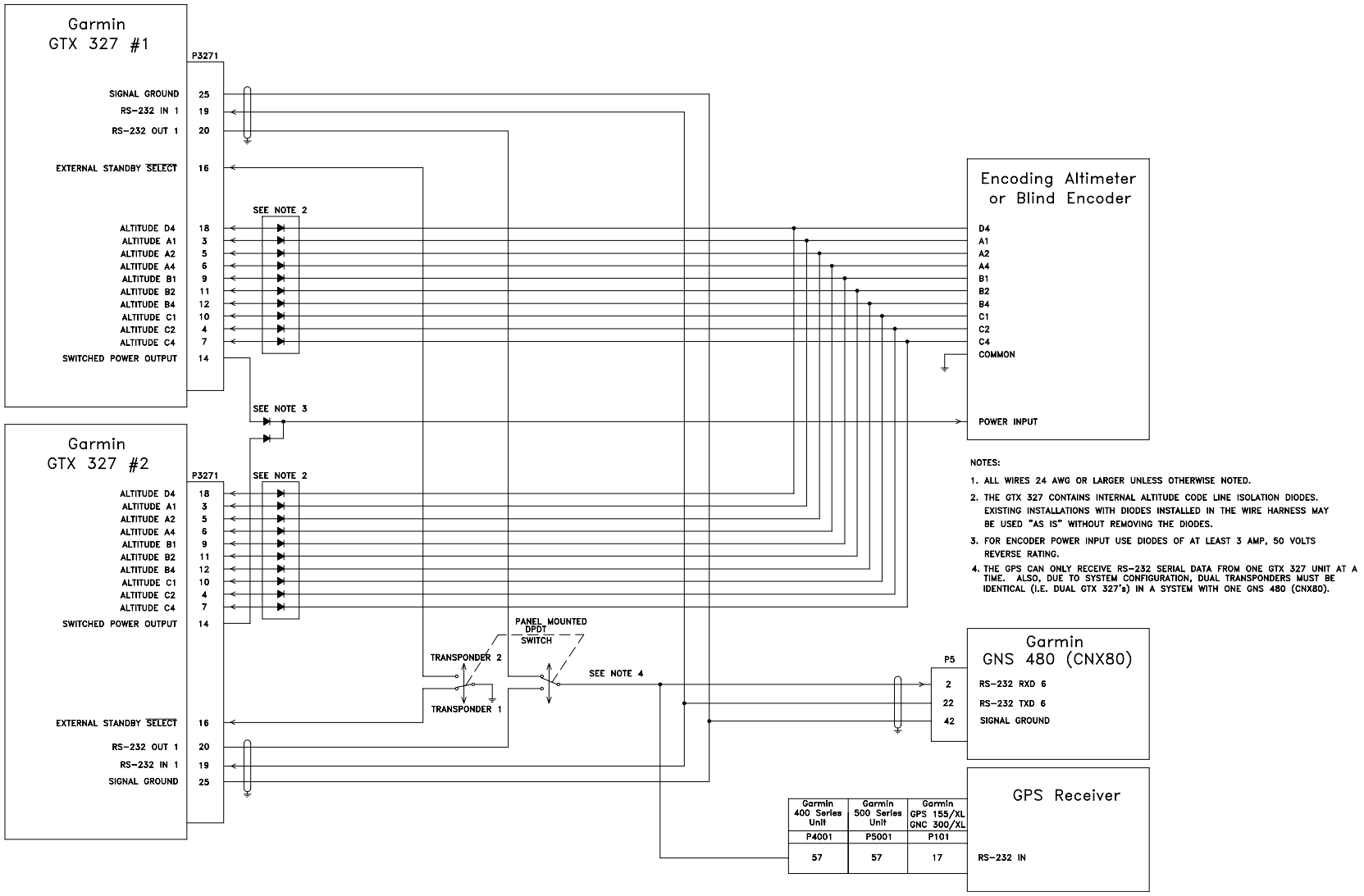


Figure C-3. Dual TXP Interconnect Wiring Diagram, Encoding Altitude Connections (Sheet 2)