

# **GTX 320/320A**

## **Transponder**

### **Installation Manual**



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### **GTX 320 HARDWARE MOD LEVEL HISTORY**

The following table identifies hardware modification (Mod) Levels for the GTX 320 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](http://www.garmin.com) using their Garmin-provided user name and password.

<b>MOD LEVEL</b>	<b>SERVICE BULLETIN NUMBER</b>	<b>SERVICE BULLETIN DATE</b>	<b>PURPOSE OF MODIFICATION</b>
<b>1</b>	<b>NA</b>	<b>NA</b>	<b>Initial Release</b>
<b>2</b>	<b>9805</b>	<b>10-30-1998</b>	<b>Incorporates new circuitry in power supply</b>

### **GTX 320A HARDWARE MOD LEVEL HISTORY**

The following table identifies hardware modification (Mod) Levels for the GTX 320A 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](http://www.garmin.com) using their Garmin-provided user name and password.

<b>MOD LEVEL</b>	<b>SERVICE BULLETIN NUMBER</b>	<b>SERVICE BULLETIN DATE</b>	<b>PURPOSE OF MODIFICATION</b>

# 1 GENERAL DESCRIPTION

## 1.1 Introduction

This manual provides the installation and operating instructions for the Garmin GTX 320 and the GTX 320A Transponders. Information pertaining to the maintenance, alignment, and procurement of replacement parts is found in the GTX 320 Maintenance Manual, P/N 190-00133-02 and the GTX 320A Maintenance Manual, P/N 190-00133-08. After installation of the GTX 320/ GTX 320A, 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 320/320A Transponder is a radio transmitter and receiver that operates on radar frequencies. Receiving ground radar interrogations at 1030 MHz, it transmits 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 320/320A replies with any one of 4,096 codes, which differ in the position and number of pulses transmitted. By “replying” to ground transmissions, your GTX 320/320A enables ATC computers to display aircraft identification, altitude and ground speed on ATC radar screens. The GTX 320/320A is equipped with IDENT capability that activates the Special Position Identification Pulse (SPI) for approximately 20 seconds (18 seconds for the GTX 320A) identifying your transponder return from other aircraft on the controller’s scope.

## 1.3 Technical Specifications

### 1.3.1 Transponder Specifications

Table 1-1 Transponder Specifications

Characteristic	Specification
TSO C74c Class 1A, JSTO C74C Class 1A	TSO, JTSO
(A1D1)-CA(BMN)XXXXXXZBABAUXXXXXXX	TSO ENV CAT
GTX 320: FAA TSO C74c; RTCA DO-160C, JTSO C74c GTX 320A: FAA TSO C74c; RTCA DO-160D, JTSO C74c	Applicable Documents
-20°C to +55°C (Continuous Operation)	Temperature Range
GTX 320: 14/28 VDC: 12 Watts Max. GTX 320A: 14/28 VDC: 20 Watts Max.	Power Requirements
95% @ +55°C for 16 Hours; 85% @ +38°C for 32 Hours	Humidity
50,000 Feet	Altitude
1090 MHz	Transmitter Frequency
125 Watts minimum, 150 Watts nominal at the antenna with 1.5 dB coaxial cable loss at 1090 MHz	Transmitter Power
1030 MHz	Receiver Frequency
GTX 320: -72 dBm Nominal for 90% replies GTX 320A: -74 dBm Nominal for 90% replies	Receiver Sensitivity
4096 Identification Codes	Mode A Capability
100 Foot Increments from -1000 to 63,000 Feet	Mode C Capability
Low ≤ 0.5 V; High ≥ 8 V	External Suppression Input

### 1.3.2 Physical Characteristics-GTX 320

**Table 1-2 GTX 320 Physical Characteristics**

<b>Characteristic</b>	<b>Specification</b>
Bezel Height	1.63 inches (41 mm)
Bezel Width	6.25 inches (159 mm)
Rack Height (Dimple to Dimple)	1.71 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)	8.78 inches (223 mm)
Weight (Unit Only)	1.7 lbs. (0.8 kg)
Weight (Installed with rack and connectors)	2.3 lbs. (1.1 kg)

### 1.3.3 Physical Characteristics-GTX 320A

**Table 1-3 GTX 320A Physical Characteristics**

<b>Characteristic</b>	<b>Specification</b>
Bezel Height	1.63 inches (41 mm)
Bezel Width	6.25 inches (159 mm)
Rack Height (Dimple to Dimple)	1.71 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)	8.78 inches (223 mm)
Weight (Unit Only)	2.3 lbs. (1.1 kg)
Weight (Installed with rack and connectors)	2.9 lbs. (1.3 kg)

## 1.4 Equipment Available

### 1.4.1 Available Configurations

**Table 1-4 Available Configurations**

<b>Item</b>	<b>Garmin P/N</b>
Garmin GTX 320 Transponder	010-00135-00
Garmin GTX 320A Transponder	010-00247-00
Garmin GTX 320 Transponder includes Garmin installation kit, P/N 010-10161-00	010-00135-03
Garmin GTX 320A Transponder includes Garmin installation kit, P/N 010-10161-01	010-00247-02



## 1.4.2 Installation Accessories

**Table 1-5 Available Installation Accessories**

Item	Garmin P/N
Mounting Rack	115-00285-00
Connector Kit	011-00651-01
Rear Backplate	011-00677-01
Mounting Rack, Rear Backplate and Connector Kit (Includes 115-00285-00, 011-00677-01 and 011-00651-01)	010-10161-01
Garmin GTX 320/320A Narco Adapter	010-10158-00
Garmin GTX 320/320A KT76A Adapter	010-10159-00
Garmin GTX 320/320A Antenna kit*	010-10160-00

\* 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 320/320A.

## 1.5 Additional Equipment Required

- Antenna Sealant - Use antenna manufacturer's instructions, install according to FAA AC 43.13-2A.
- Cables - The installer will supply all system cables. Cable requirements and fabrication is detailed in Section 2 of this manual.
- Hardware - #6 Flat Head Screw (6 ea.) and #6-32 Self Locking Nut (6 ea.). Hardware required to mount installation rack is not provided.

## 1.6 Installation Approval

The conditions and tests required for TSO approval of the GTX 320/320A Transponder and antenna are minimum performance standards. It is the responsibility of the installer to determine that the aircraft installation standards for a specific type or class of aircraft are in compliance with all applicable TSO requirements. The GTX 320/320A and antenna may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the administrator. For GTX 320/320A TSO compliance, see Appendix A. For antenna TSO compliance, refer to antenna manufacturer's literature.

## 1.7 ATC Transponder Tests and Inspections

The ATC transponder tests required by 14 CFR, Part 91.413 may be conducted using a bench check or portable test equipment and must meet the requirements prescribed in Part 43 Appendix F.

If portable test equipment with appropriate coupling to the aircraft antenna system is used, operate the test equipment for ATCRBS transponders at a nominal rate of 235 interrogations per second to avoid possible ATCRBS interference. An additional 3 dB loss is allowed to compensate for antenna coupling errors during receiver sensitivity measurements conducted in accordance with Part 43 Appendix F, Paragraph (c)(1) when using portable test equipment.

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## 1.8 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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## 2 INSTALLATION OVERVIEW

### 2.1 Introduction

This section provides the necessary information for installing the GTX 320/320A Transponders, and where required, optional accessories. Installation of the GTX 320/320A Transponder should comply with the aircraft Type Certificate (TC) or Supplemental Type Certificate (STC). Cabling will be fabricated by the installing agency to fit each particular aircraft. The guidance of FAA advisory circulars AC 43.13-1B and AC 43.13-2A, where applicable, may be found useful for accomplishing retro-fit installations that comply with FAA regulations. This section contains interconnect diagrams, mounting dimensions, and information pertaining to installation.

### 2.2 Unpacking and Inspecting Equipment

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.

### 2.3 Antenna Installation

#### 2.3.1 Location Considerations

- A. The antenna (Garmin P/N 010-10160-00) should be well removed from any major protrusions, the engine(s), propeller(s), and antenna masts. It should also be as far removed as practical from landing gear doors, access doors, or other openings that could alter its radiation pattern.
- B. The antenna should be mounted on the underside of the aircraft and in a vertical position (relative to the position of the aircraft in level flight).
- 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 mounted a minimum distance of three feet from the GTX 320/320A.

<b>NOTE</b>
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If the antenna is being installed on a composite aircraft, ground planes may be required. 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.

#### 2.3.2 Antenna Installation

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

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### 2.3.3 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.

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

### 2.3.4 Antenna Cable Installation

When routing antenna cables, observe the following precautions:

- All cable routing should be kept as short as possible and as direct as possible.
- 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 cable near ADF antenna cable (allow at least a 12-inch separation).

The table below lists the recommended 50 ohm double shielded coax antenna cable vendor and the type to be used for specific lengths of cable. Adherence to this table will ensure that the coax installation will not exceed the maximum allowable 1.5 dB attenuation at the transmitter operating frequency of 1090 MHz.

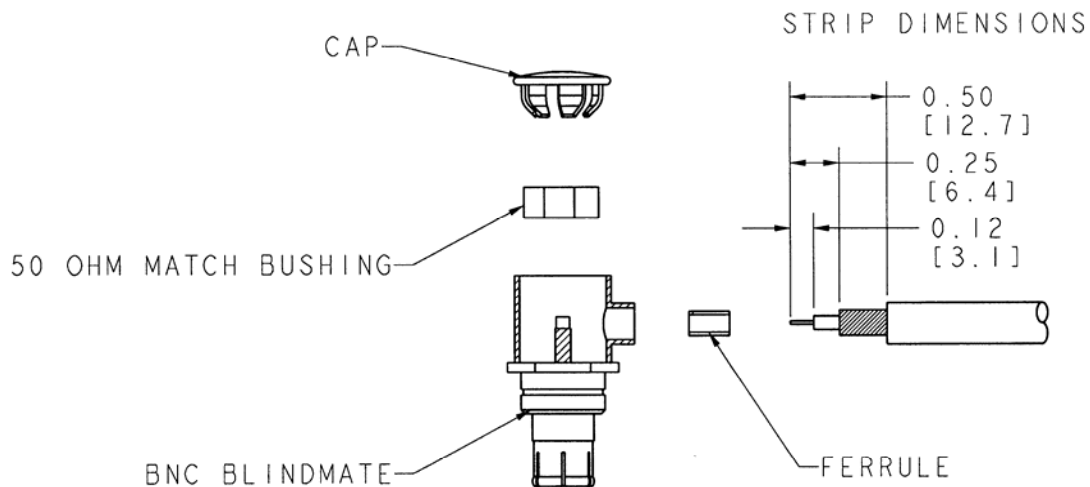
**Table 2-1 Antenna Coax Cable, Vendor & Type**

Max. Length (feet)	ECS Type	MIL-C-17 Type	RG Type
8.8		M17/128	RG400
10.0	3C142B		
12.5		M17/112	RG304
17.0	311601	M17/127	RG393
21.0	311501		
27.0	311201		
41.0	310801		
<b>Supplier Information</b>	Vendor: Electronic Cable Specialists 5300 W. Franklin Drive Franklin, WI 53132 Tel: 800-327-9473 414-421-5300 Fax: 414-421-5301	MIL-C-17 types: See current issue of Qualified Products List QPL-17.	RG types: See current issue of Qualified Products List QPL-17.

### 2.3.5 Antenna Cable Connectors

One of two rack connectors is provided (item 6 or 12 in the installation drawing, figure B2). RF Adapter item 12 (P/N 330-00326-00) requires the cable to be terminated to an appropriate type BNC plug (provided by installer), which is then attached to item 12. Any 50 ohm, double shielded cable may be used, provided it introduces less than 1.5 dB attenuation at 1 GHz including the connector.

Connector item 6 (P/N 330-00198-00) requires the cable to be terminated directly to it and can accommodate only M17/128 (RG-400) cable. The completed cable including connectors must introduce no more than 1.5 dB attenuation at 1 GHz. Instructions for installing the item 6 are shown in Figure 2-1 and detailed in the following steps A-G.



**Figure 2-1 BNC Connector Assembly Drawing**

- A. Trim coax outer insulation back 0.50"
- B. Trim braid (not center conductor or insulation) back 0.25".
- C. Strip Insulation back 0.120".

**NOTE**

Place the ferrule over the coax braid, flush against the coax outer insulation before performing the next step if the outside diameter of the coax braid is smaller than the inside diameter of the center connector sidewall opening.

- D. Insert cable (center conductor, dielectric and shield braid) through the sidewall of the connector and solder the center conductor to the center pin of the connector.

**NOTE**

When using low loss cable it may be necessary to flatten the solid wire center conductor slightly so it can fit the slot on the RF connector center pin. When soldering, avoid applying excess heat to the connector body, and center conductor insulator.

- E. Heat the outside of the connector sleeve and at the same time apply solder between the braid and the sleeve. Continue to apply heat until the solder flows evenly.
- F. Install 50  $\Omega$  Matching Bushing.
- G. Insert connector cap and tack solder in two places.

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## 2.4 GTX 320/320A Installation

<b>NOTES</b>
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Avoid installing the unit near heat sources. If this is not possible, ensure 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 43.13-2A.

***GTX 320 units that are at Mod Level 1 must use the Mod Level 1 Rack Assembly. After Mod Level 1, GTX 320 installations are 0.170" (4.31 mm) deeper in the panel.***

- A. Assemble the connector/rack kit according to figure B2. Install the rack assembly according to the dimensions given in figures B1. 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 ensure a sturdy mount, rear support for the unit should be provided.
- B. Do not insert screws through the rear plate of the mounting tray, into the transponder. These holes are only for use with the adapter described in paragraph 2.8.
- C. 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.
- D. Slide the unit into the rack until the front lobe of the unit touches the rack. Guide pins on the back plate will help in the proper alignment of the unit in the rack.
- E. Turn the Allen wrench clockwise until unit is secured in the rack. Continue turning until tight. Do not overtighten the screw.
- F. To remove the unit from the rack, turn the 3/32" Allen wrench counterclockwise until it disengages from the rack.

## 2.5 Electrical Connections

All electrical connections, except for the antenna, are made through a single, 25 pin, D subminiature connector. Figure 2-1 defines the electrical characteristics of all input and output signals and identifies the cable requirements for each signal. Required connector and associated hardware are supplied in the installation kit (P/N 010-10160-00). See figures B4 and B5 for interconnect wiring diagrams.

Larger pins are supplied for the connector to provide power and ground at pins 13, 14, 15, and 25 when required. Refer to Figure B4, Note 3.

**Table 2-2 Pin Contact Part Numbers**

Manufacturer	25 pin D-Subminiature connector (P102)	
	18 AWG (Power Only)	22-24 AWG
Garmin P/N	336-00023-00	336-00022-00
Military P/N	N/A	M39029/63-368
AMP	N/A	205090-1
Positronic	FC6018D	M39029/63-368
ITT Cannon	See Note 3	031-1007-42

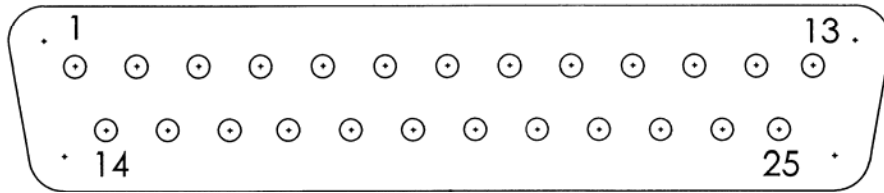
**Table 2-3 Recommended Crimp Tools**

Manufacturer	Hand Crimping Tool	18 AWG		22-24 AWG	
		Positioner	Insertion/ Extraction Tool	Positioner	Insertion/ Extraction Tool
Military P/N	M22520/2-01	N/A	M81969/1-02	M22520/2-08	M81969/1-02
Positronic	9507	9502-11	M81969/1-02	9502-5	M81969/1-02
ITT Cannon	995-0001-584	N/A	N/A	995-0001-604	980-2000-426
AMP	601966-1	N/A	N/A	601966-5	91067-2
Daniels	AFM8	K774	M24308/1-02	K13-1	M24308/1-02
Astro	615717	N/A	M81969/1-02	615724	M81969/1-02

### NOTES

1. Insertion/extraction tools from ITT Cannon are all plastic; others are plastic with metal tip.
2. Non-Garmin part numbers shown are not maintained by Garmin and consequently are subject to change without notice.
3. Alternate contacts for 18 AWG wire: As an alternative to the Positronic contacts listed (and provided in the installation kit), the installer may use contacts made by ITT Cannon under P/N 031-1007-001. These contacts require the use of a different crimp tool positioner than shown in the table, with the part numbers as follows: Daniels P/N K250, Astro P/N 616245, or ITT Cannon P/N 980-0005-722.
4. All wires must be passed through the backshell before being assembled to connector.
5. In aircraft equipped with a dropping resistor for +28 VDC buss voltage, make sure the dropping resistor is bypassed.





**Figure 2-2 25 Pin D-Sub Connector Drawing**

**Table 2-4 25 Pin D-Sub Pin-Out Definitions**

<b>Pin</b>	<b>Description</b>
1	Not Used
2	Do Not Connect
3	Altitude A1
4	Altitude C2
5	Altitude A2
6	Altitude A4
7	Altitude C4
8	External Ident
9	Altitude B1
10	Altitude C1
11	Altitude B2
12	Altitude B4
13	Ground
14	Switched Power Output
15	Aircraft Power (+11 to +33 VDC)
16	External Standby
17	External Suppression (Suppress I/O-GTX 320A)
18	Altitude D4
19	Not Used
20	Not Used
21	Not Used
22	Not Used
23	28 V Lighting
24	14 V Lighting
25	Ground

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## 2.6 Check Existing Coax and Antenna Before Using a GTX 320/320A Adapter in an Existing Installation

### CAUTION

Before using a Narco or Bendix/King Adapter to install a GTX 320/320A into an existing installation, the RF coaxial cable, its connectors, and the antenna must be checked to ensure the following:

- There must be no corrosion or damage on the coax or its RF connectors that would adversely affect operation.
- The RF attenuation of the coax from the installation rack to the antenna must not exceed 1.5 dB at 1090 MHz.
- The antenna must not have corrosion, damage, or loose connections.

## 2.7 Installation Using Existing Narco AT 150 Installation Rack

The GTX 320 and GTX 320A can be used with an existing NARCO AT 150 Installation Rack by using the NARCO AT 150 Installation Adapter (P/N 011-00292-00). See figure B6 for the NARCO AT 150 Adapter assembly drawing.

### NOTES

GTX 320 units that are at Mod Level 1 must use the Mod Level 1 NARCO Installation Adapter. After Mod Level 1, the GTX 320 sits 0.17" (4.3 mm) closer to the instrument panel. Also, when installing the GTX 320 in an existing NARCO AT 150 rack (using the AT 150 Adapter) and when the aircraft has a bus voltage of +28 VDC, make sure the +28 VDC dropping resistor is bypassed.

- A. Slide the adapter into the rack installation until the jackscrew mates with its nut.
- B. Turn the jack screw with a 3/32" Allen wrench until the adapter is secure.
- C. 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.
- D. Slide the unit into the rack until the front lobe of the unit touches the rack. Guide pins on the back plate will help properly align the unit in the rack.
- E. Turn the Allen wrench clockwise until unit is secured in the rack. Continue turning until tight. Do not overtighten the screw.
- F. To remove the unit from the rack turn the 3/32" Allen wrench counterclockwise until it disengages from the rack.

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## 2.8 Installation Using Existing Bendix/King KT 76A/78A Installation Rack

The GTX 320 and GTX 320A can be used with an existing Bendix/King KT 76A/78A installation rack by using the KT 76A/78A Installation Adapter (P/N 011-00289-00). See figure B7 for the Bendix/King KT 76A/78A Adapter assembly drawing.

<b>NOTES</b>
--------------

GTX 320 units that are at Mod Level 1 must use the Mod Level 1 Bendix/King KT 76A/78A Installation Adapter. After Mod Level 1, the GTX 320 sits 0.17" (4.3 mm) closer to the instrument panel. Also, when installing the GTX 320 in an existing Bendix/King KT 76A/78A rack (using the KT 76A/78A Adapter) and when the aircraft has a bus voltage of +28 VDC, make sure the +28 VDC dropping resistor is bypassed.

- A. Attach the KT 76A/78A installation adapter to the rear of the GTX 320 using the two captive screws on the adapter.
- B. 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.
- C. Slide the unit into the rack until the front lobe of the unit touches the rack. Guide pins on the back plate will help in the proper alignment of the unit in the rack.
- D. Turn the Allen wrench clockwise until unit is secured in the rack. Continue turning until tight. Do not overtighten the screw.
- E. To remove the unit from the rack, turn the 3/32" Allen wrench counterclockwise until it disengages from the rack.

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### 3 POST INSTALLATION CONFIGURATION & CHECKOUT PROCEDURE

#### 3.1 Aircraft Station Licensing Requirements

The Telecommunications Act of 1996, effective February 8, 1996, provides the FCC discretion to eliminate radio station license requirements for aircraft and ships. At the present time, you do not need an individual license to operate the GTX 320/320A aboard your private aircraft in many circumstances. To find out the specific details on whether you are exempt from licensing, please see FCC Fact Sheet PR 5000 or contact the FCC at (800)-322-1117.

If an aircraft license is required or desired, contact the FCC at (800)-322-1117 to request form 404, Application for Aircraft Radio Station License. The FCC also has a fax-on-demand service to provide forms by fax at (202)-418-0177.

The GTX 320/320A owner accepts all responsibility for obtaining the proper licensing before using the transponder.

#### 3.2 Operation

##### NOTE

The coverage you can expect from the GTX 320/320A 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.

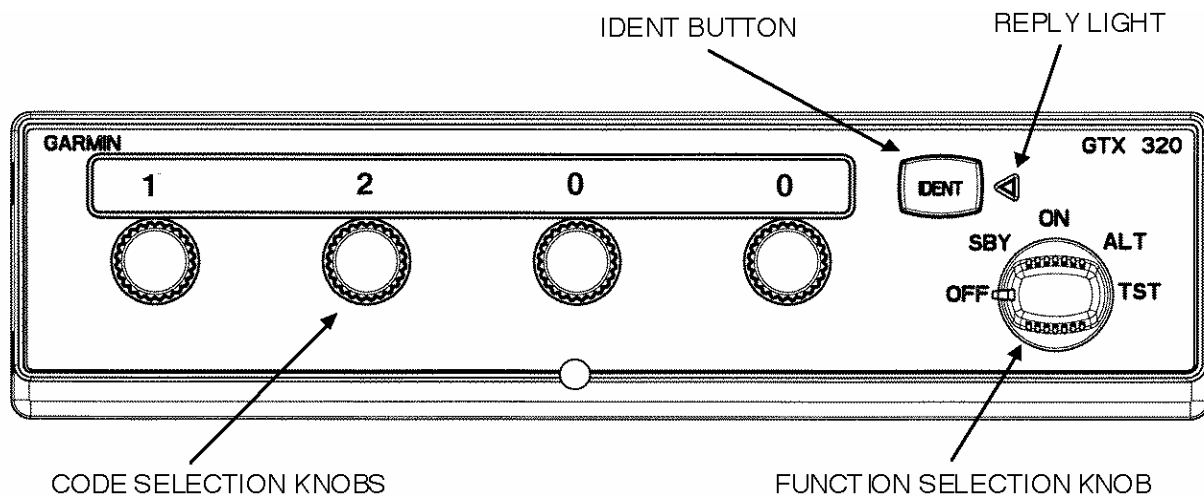


Figure 3-1. Transponder Front Panel (GTX 320 Shown)

##### NOTE

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

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### 3.2.1 Function Selection Switches

The function selector switch is a five position rotary switch. The five positions are:

- OFF — Turns off all power to the GTX 320/320A.
- SBY — Turns the transponder on, but when in SBY the transponder will not reply to any interrogations from the ground radar system.
- ON — Places the transponder in Mode A, the identification mode. In addition to the aircraft's identification code, the transponder will also reply to altitude interrogations (mode C) with signals that do not contain altitude information.
- ALT — Places the transponder in Mode A and Mode C, the identification and altitude reporting modes to respond to ATC aircraft identification interrogations and altitude interrogations with standard pressure altitude (29.92 inches Hg.) received from an external altitude digital encoder. The ALT position may be used in aircraft that are not equipped with the optional altitude encoder, however, the only response will be discreet signals that do not contain altitude information.

<b>NOTE</b>
-------------

Any time the function switch is in the ON or ALT position the transponder becomes an active part of the beacon system. Select ON or ALT as late as practical prior to takeoff and to OFF or SBY as soon as practical after completing landing roll unless the change to SBY has been accomplished previously at the request of ATC.

- TST — Turning the switch to the TST position tests the reply indicator. The TST position is spring loaded and must be held momentarily. When released, it will automatically return to the ALT position.

### 3.2.2 Code Selection

The code selector consists of four, eight position switches that provide 4,096 active identification codes.

<b>NOTE</b>
-------------

When making routine code changes, you should avoid inadvertent selection of codes 7500, 7600, or 7700 thereby causing momentary false alarms at automated ground facilities. For example when switching from code 2700 to code 7200, switch first to 2200 then 7200, NOT to 7700 and then 7200.

This procedure applies to nondiscrete code 7500 and all discrete codes in the 7600 and 7700 series (i.e., 7600-7677, 7700-7777) which trigger special indicators in automated facilities. Only nondiscrete code 7500 will be decoded as the hijack code. An aircraft's transponder code (when available) is utilized to enhance the tracking capabilities of the ATC facility, therefore you should not turn the transponder to SBY when making routine code changes.

See the Aeronautical Information Manual (AIM) for a detailed explanation of the identification codes.

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### **3.2.3 IDENT Button**

On occasion, the controller will request “SQUAWK IDENT”. Respond by momentarily pressing and releasing the IDENT button. Pressing the IDENT button activates the Special Position Identification Pulse (SPI) for approximately 20 seconds identifying your transponder return from other aircraft on the controller’s scope.

### **3.2.4 Reply Light**

The reply light will blink each time the transponder replies to ground interrogation. The reply light also remains lit during the IDENT time interval.

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# APPENDIX A

## CERTIFICATION DOCUMENTS

### A.1 Continued Airworthiness

Other than for regulatory periodic functional checks, maintenance of the GTX 320/320A is “on condition” only. Refer to the GTX 320 and GTX 320A Maintenance Manuals. Periodic maintenance of the GTX 320/320A 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 320/320A 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 320/320A

##### 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 320/320A.

Applicability: Applies to aircraft altered by installation of the Garmin GTX 320/320A.

Definitions/Abbreviations: None, N/A.

Precautions: None, N/A.

Units of Measurement: None, N/A.

Referenced Publications: Garmin GTX 320/320A Installation Manual, P/N 190-00133-01  
Garmin GTX 320 Maintenance Manual, P/N 190-00133-02  
Garmin GTX 320A Maintenance Manual, P/N 190-00133-08  
Garmin STC # [applicable STC number for the specific model installed, refer to Appendix B of this manual].  
Garmin GTX 320/320A Pilot’s Guide, P/N 190-00133-09.

Distribution: This document should be a permanent aircraft record.

##### 2. Description of the Alteration

Installation of the Garmin GTX 320/320A, with interface to Encoding Altimeter or Blind Encoder. Refer to section 2.4 and Appendix B of this manual for interconnect information. Antenna installation, removal and replacement should be in accordance with applicable provisions of AC43.13-1B and 43.13-2A.

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### 3. Control, Operation Information

Refer to the GTX 320/320A Pilot's Guide.

### 4. Servicing Information

N/A

### 5. Maintenance Instructions

Maintenance of the GTX 320/320A is 'on condition' only. Periodic maintenance is not required. Refer to the GTX 320 and the 320A Series Maintenance Manuals.

### 6. Troubleshooting Information

Refer to the GTX 320 and the GTX 320A Maintenance Manuals.

### 7. Removal and Replacement Information

Refer to section 2.4 of this manual. If the unit is removed and reinstalled, a functional check of the equipment should be conducted in accordance with section 3.2 of this manual.

### 8. Diagrams

Refer to Appendix B 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 AC43.13-1A and 43.13-2A. Also, refer to section 2.3 of this manual.

### 12. Special Tools

N/A

### 13. This Section is for Commuter Category Aircraft Only

A. Electrical loads: Refer to section 1.3 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 AC43.13-1B and 43.13-2A.

### 14. Overhaul Period

No additional overhaul time limitations.

### 15. Airworthiness Limitation Section

N/A.

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## 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.

### 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.2 Environmental Qualification Form (GTX 320)

NOMENCLATURE: GTX 320 Airborne ATC Transponder Equipment

TYPE/MODEL/PART NO.: 010-00135-00/10 TSO - C74c Class 1A

MANUFACTURER'S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION: 004-00042-00

MANUFACTURER: Garmin International

ADDRESS: 1200 E 151st St, Olathe, Kansas 66062

**Table A-1 GTX 320 EQF Table**

Conditions	RTCA DO-160C Section	Description of Conducted Tests
Temperature and Altitude	4.0	Equipment tested to Categories A1 & D1 except as noted
Low Temperature	4.5.1	Cooling air not required
High Temperature	4.5.2. & 4.5.3	
In-Flight Loss of Cooling	4.5.4	
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 according to DO-160C, Par. 7.2.1
Operational	7.2	
Crash Safety	7.3	
Vibration	8.0	Equipment tested without shock mounts to Categories B, M and N (Table 8-1)
Explosion	9.0	Equipment identified as Category X, no test required
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 B
Voltage Spike	17.0	Equipment tested to Category A

**Table A-1 GTX 320 EQF Table (continued)**

<b>Conditions</b>	<b>RTCA DO-160C Section</b>	<b>Description of Conducted Tests</b>
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 to Category U
Radio Frequency Emission	21.0	Equipment tested to Category Z
Lightning Induce 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
Other Tests		
Remarks- None		

### A.3 Environmental Qualification Form (GTX 320A)

Nomenclature: GTX320A Airborne ATC Transponder Equipment

Type/Model/Part No.: 010-00247-( ) TSO - C74c Class 1A  
(Includes 011-00728-( ))

Manufacturer's Specification And/Or Other Applicable Specification: 004-00111-00

Manufacturer: Garmin Corporation

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

**Table A-2 GTX 320A EQF Table**

Conditions	RTCA DO-160D Section	Description of Conducted Tests
Temperature and Altitude	4.0	Equipment tested to Categories A1 & D1  Cooling Air Not Required
Low Temperature	4.5.1	
High Temperature	4.5.2. & 4.5.3	
In-Flight Loss of Cooling	4.5.4	
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 5 Hz to 17 Hz, 1.5 g-Pk from 17 Hz to 500 Hz.
Explosion	9.0	Equipment identified as Category X, no test required
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

**Table A-2 GTX 320A EQF Table (continued)**

<b>Conditions</b>	<b>RTCA DO-160D Section</b>	<b>Description of Conducted Tests</b>
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- None		

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## **APPENDIX B**

### **STC PERMISSION**

Consistent with N8110.69 or Order 8110.4, Aviation Authority approved installations are hereby granted permission to use STC # SA00642WI data to modify aircraft.

United States of America  
Department of Transportation -- Federal Aviation Administration  
**Supplemental Type Certificate**

*Number* SA00642WI

*This certificate issued to-*

GARMIN International  
1200 East 151st Street  
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 :* 2A3

*Make :* Mooney

*Model :* M20J

*Description of Type Design Change:*

Installation of GARMIN Transponder, GTX 320, in accordance with GARMIN Master Document List (MDL) Number 005-00060-00, Revision G, Dated April 2, 1998, 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 :* November 20, 1995

*Date reissued :*

*Date of issuance :* April 02, 1998

*Date amended :*



*By direction of the Administrator*

*J. R. Flores*  
(Signature)

Jose R. Flores  
Senior Electrical/Avionics Engineer  
Wichita Aircraft Certification Office

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

FAA FORM 8110-2(10-68)

PAGE 1 of 2 PAGES

This certificate may be transferred in accordance with FAR 21.47.

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## APPENDIX C

### ASSEMBLY AND INSTALLATION DRAWINGS

#### C.1 GENERAL

This section contains the following installation drawings:

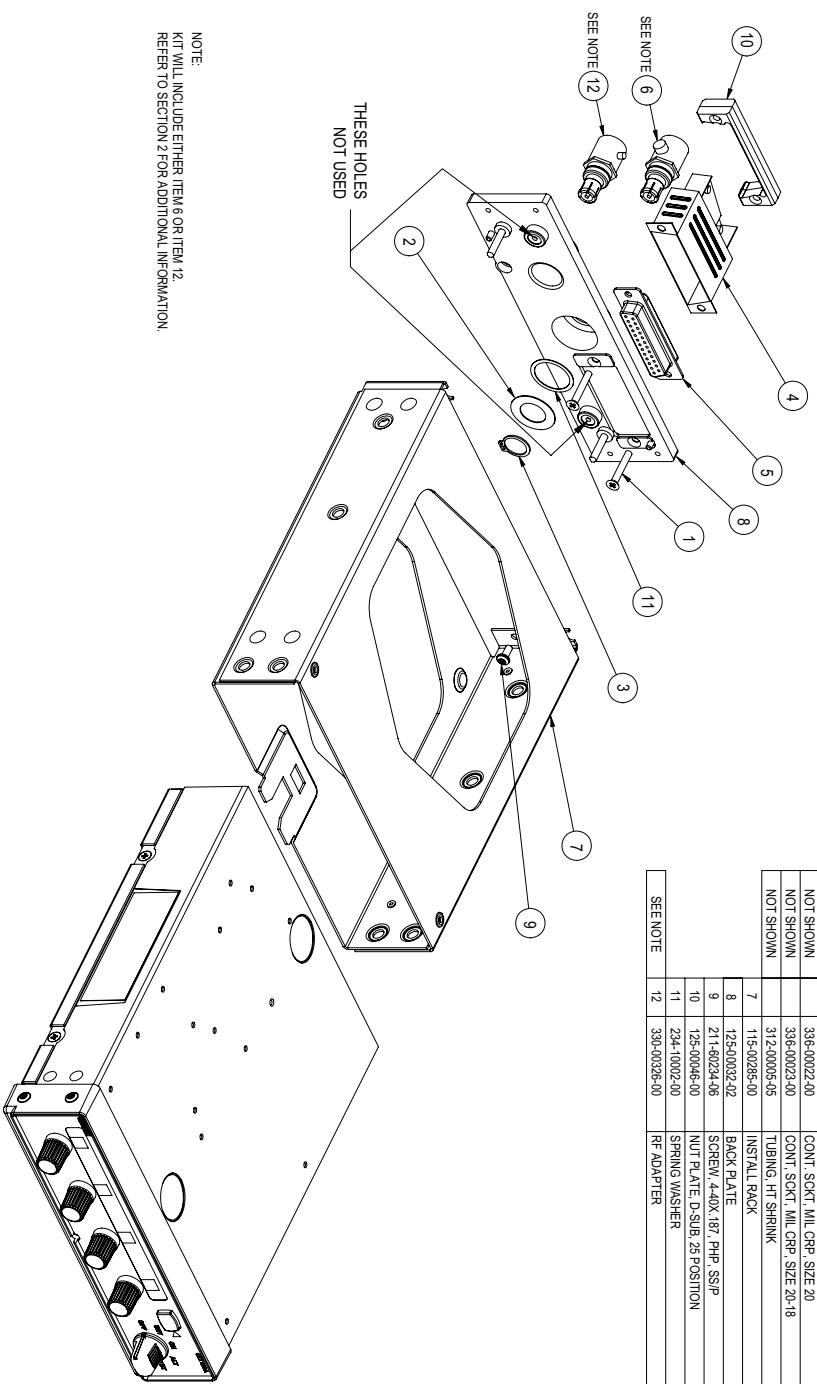
- C-1, GTX 320/320A Outline Drawing
- C-2, GTX 320/320A Connector/Rack Kit Assembly Drawing
- C-3, GTX 320/320A Recommended Panel Cutout Dimensions
- C-4, GTX 320/320A Interconnect Wiring Diagram
- C-5, Dual Transponder Interconnect Wiring Diagram
- C-6, Narco AT 150 Installation Adapter Assembly Drawing
- C-7, King KT 76A/78A Adapter Assembly Drawing

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011-00339-00 CONNECTOR/RACK KIT			
ITEM	PART NUMBER	DESCRIPTION	QTY
1	211-63234-12	SCREW, 4.40X.75, FLHP, SSP	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 POS.	1
5	330-00194-25	CONN., D-SUB, MIL, CRP, SCKT, 25	1
6	330-00198-00	CONN. BNC, MALE, BLINDMATE	1
NOT SHOWN	336-00022-00	CONT. SCKT, MIL, CRP, SIZE 20	25
NOT SHOWN	312-00005-05	TUBING, HT SHRNK	5
NOT SHOWN	115-00265-00	INSTALL RACK	1
7	125-00324-02	BACK PLATE	1
8	211-60024-06	SCREW, 4.40X.187, PHF, SSP	4
9	125-00046-00	NUT PLATE, D-SUB, 25 POSITION	1
10	234-10002-00	SPRING WASHER	1
11	330-00326-00	RF ADAPTER	1
12	SEE NOTE		1



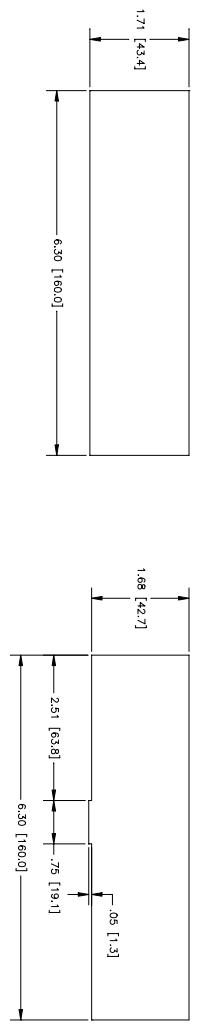
NOTE:  
KIT WILL INCLUDE EITHER ITEM 6 OR ITEM 12.  
REFER TO SECTION 2 FOR ADDITIONAL INFORMATION.

Figure C-2 GTX 320/320A CONNECTOR/RACK KIT ASSEMBLY DRAWING

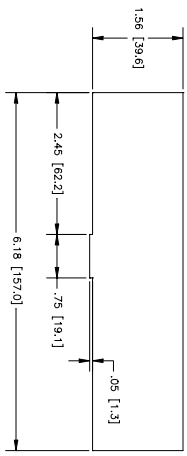
OPTION 1:  
 STACK CUTOUT (RACK INSTALLED  
 FROM FRONT OF AIRCRAFT PANEL)



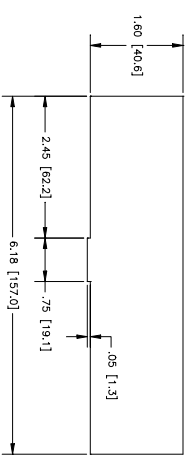
OPTION 2:  
 RADIO CUTOUT (RACK INSTALLED  
 FROM FRONT OF AIRCRAFT PANEL)



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



GTX 320/320A OLD RACK (115-00285-00)



GTX 320/320A 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 C-3 GTX 320/320A RECOMMENDED PANEL CUTOUT DIMENSIONS**

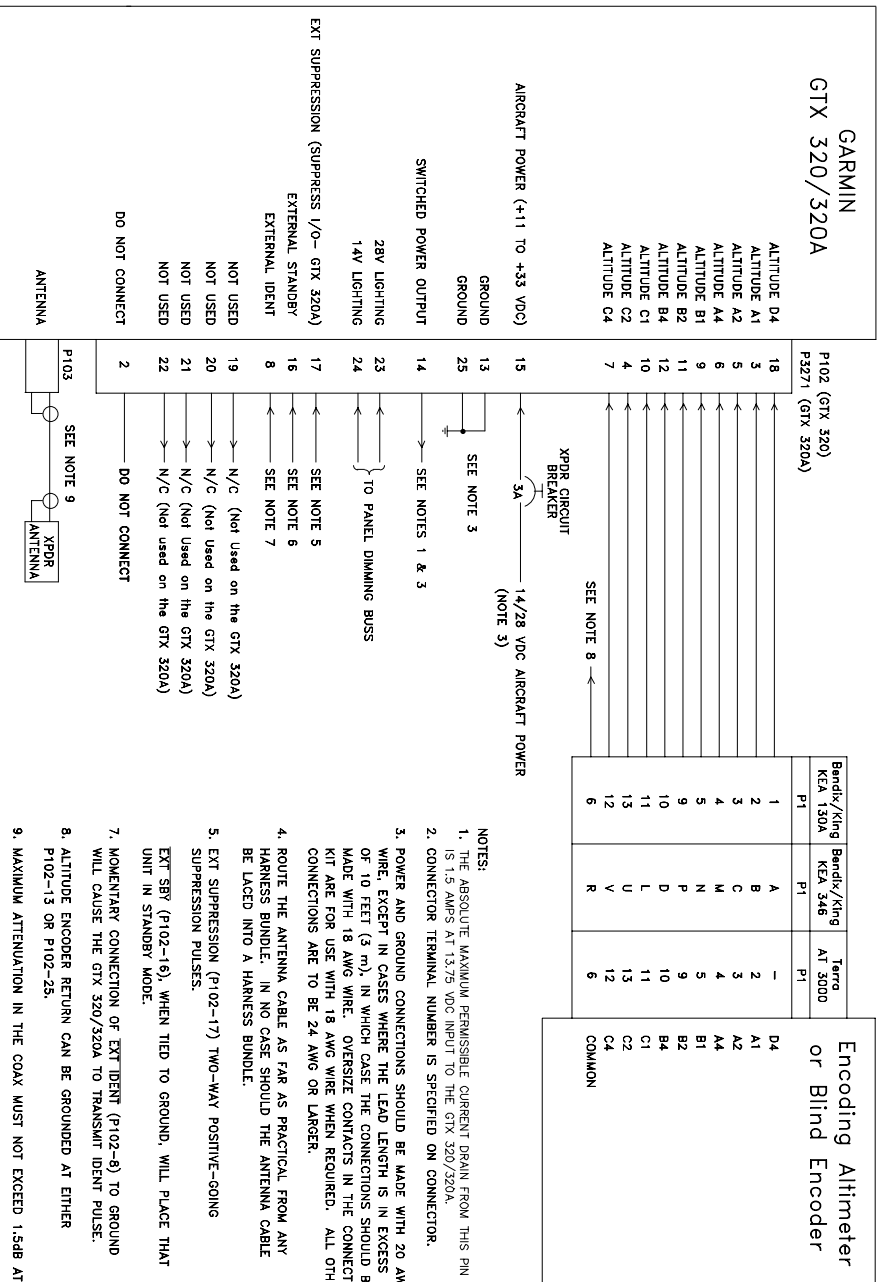
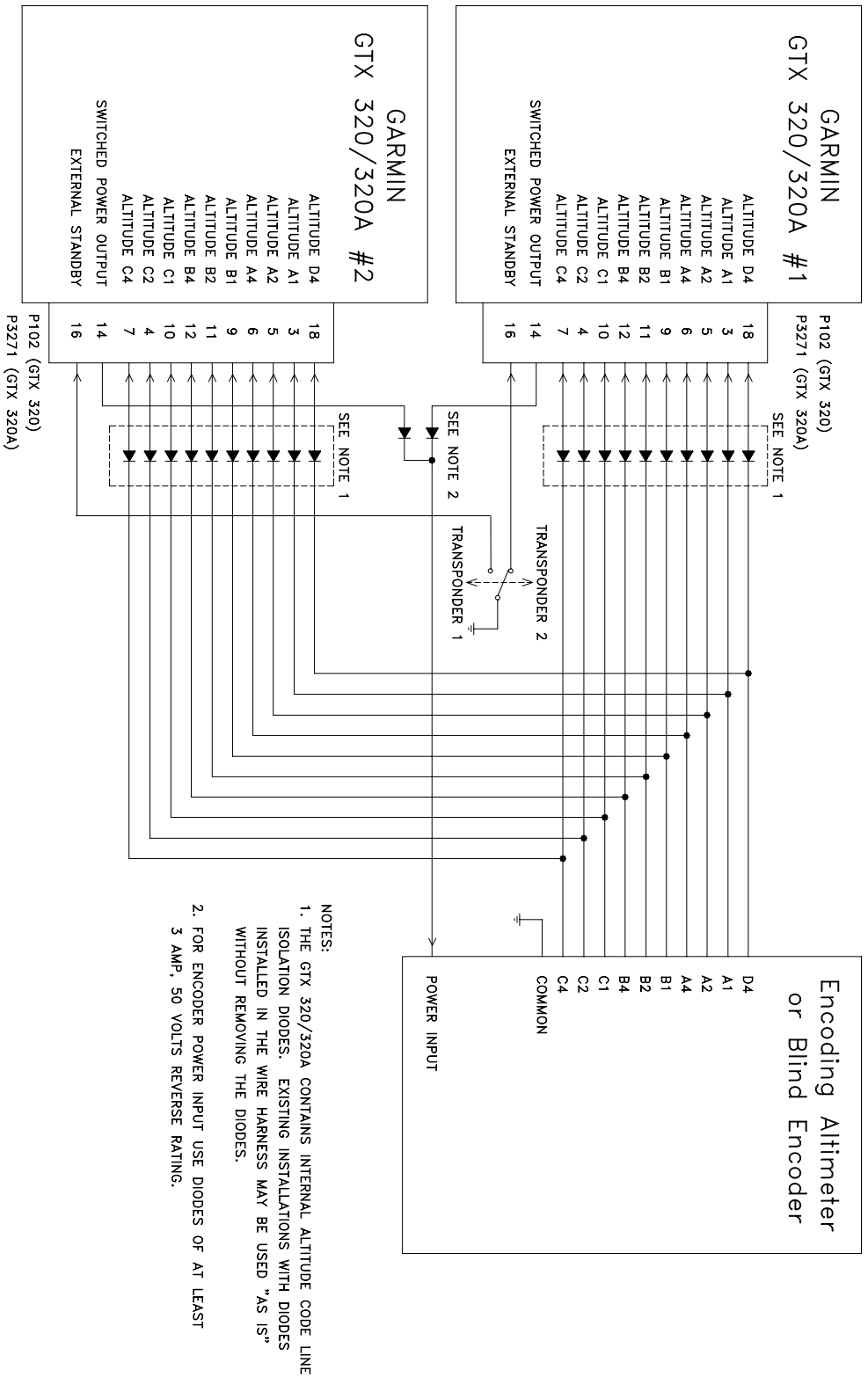


Figure C-4 GTX 320/320A INTERCONNECT WIRING DIAGRAM





**Figure C-5 GTX 320/320A DUAL TRANSPONDER INTERCONNECT WIRING DIAGRAM**

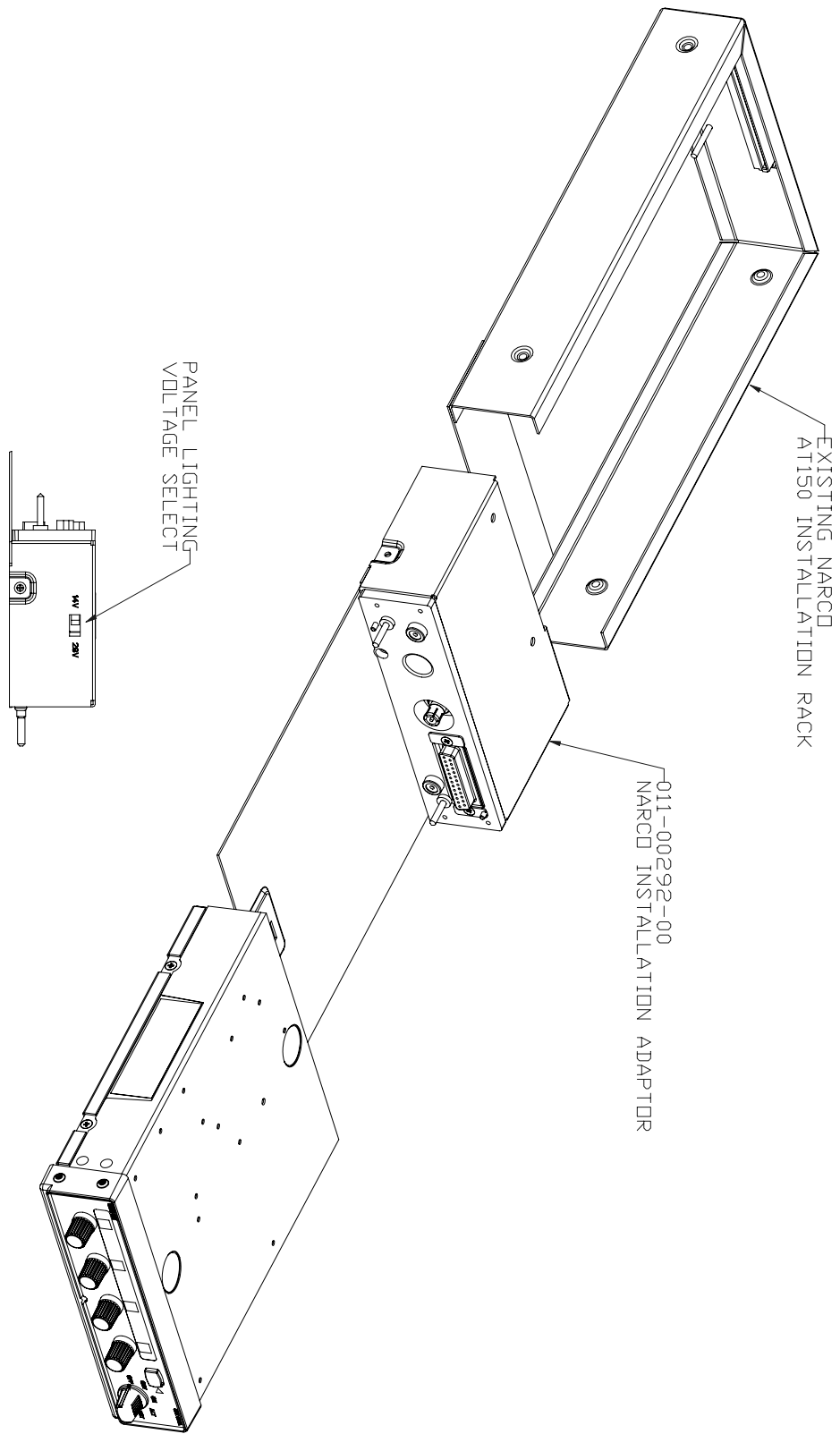


Figure C-6 NARCO AT 150 INSTALLATION ADAPTER ASSEMBLY DRAWING

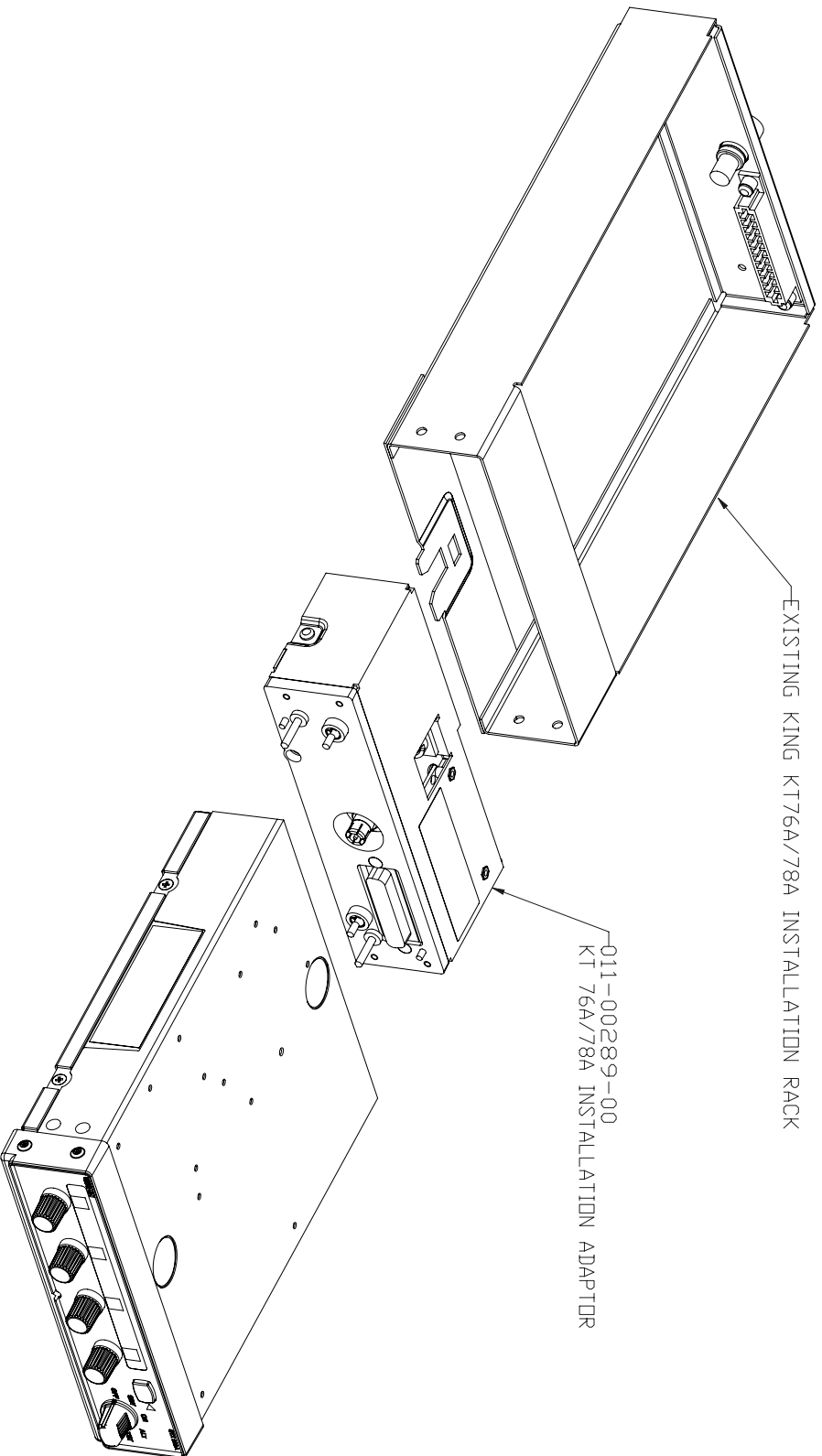


Figure C-7 KING KT 76A/78A ADAPTER ASSEMBLY DRAWING