

## GARMIN GTX SERIES TRANSPONDER SYSTEM - ADJUSTMENT/TEST

### 1. General

- A. This section gives the adjustment and test procedures for the GTX Series Transponder System. For a general overview refer to Garmin GTX Series Transponder System - Description and Operation.

### 2. Garmin GTX Series Transponder System Operational Check

**NOTE:** The operational check procedures are typical for Garmin GTX-33, GTX-33ES, GTX-335R and GTX-345R transponders unless otherwise noted.

#### A. Tools and Equipment

**NOTE:** For the supplier publication part number and manufacturer data, refer to the Introduction - Supplier Publication List.

##### (1) Tools and Equipment

- Metal Shrouds
- IFR 6000.

##### (2) Special Consumables

- None.

##### (3) Reference Material

- Chapter 34, Garmin GTX Series Transponder System - Description and Operation.
- Chapter 34, Garmin G1000 Integrated Avionics System - Adjustment/Test.

#### B. Prepare the Airplane

##### (1) Make sure that the switches that follow are in the OFF position:

- (a) BATTERY switch.
- (b) EXTERNAL POWER switch.
- (c) AVIONICS 1 and 2 switches.

##### (2) Connect external electrical power to the airplane.

##### (3) Make sure that all the circuit breakers on the Avionics circuit breaker panel are engaged.

##### (4) Put the switches that follow to the positions given:

- (a) External POWER switch to the BUS position.
- (b) BATTERY switch to the ON position.
- (c) Avionics 1 and 2 switches to the ON position.

##### (5) After the Garmin G1000 system is fully initiated refer to Garmin G1000 Integrated Avionics System - Adjustment/Test and do the steps that follow:

- (a) Do the Architecture Verification check and make sure all systems are serviceable.
- (b) Make sure that the correct software and configuration has been installed.

##### (6) Use the code Softkeys, tune the Transponder 1 to code 0600.

**WARNING:** When selecting a transponder code, be careful not to radiate any of the following codes: Code 0000 ✦ military intercept code code 7500 ✦ hijack code code 7600 ✦ VHF com receiver failure code code 7700 ✦ emergency code.

**NOTE:** The transponder functionality spans three levels of Softkeys on the PFD. These levels are entitled the top level, the mode selection level, and the code selection level. On PFD 1, push the XPDR Softkey to select the mode selection menu, and push the CODE Softkey to select the code selection.

##### (7) Connect the test set coax cable to the flat plane antenna BNC connector.

##### (8) Connect the other end of the coax to the antenna input of the IFR 6000

##### (9) Find a location around the aircraft with a clear view of the transponder antenna and set the flat plane antenna so it point directly at the transponder antenna.

- (a) Either attach the flat plane antenna to the IFR 6000, or set the antenna on the ground.

**NOTE:** Do not hold the antenna.

(10) Put the parameters that follow in the IFR 6000 test set. Refer to Table 501.

**Table 501. IFR 6000 Test Set Up**

Parameter	Value
ANTENNA	Bottom
RF PORT	Antenna or direct connect
CABLE LOSS	Normally set once; figure marked on supplied RF coax cable.
ANT RANGE	This is the range difference between the test antenna and transponder antenna.
ANT HEIGHT	This is the height difference between the test antenna and transponder antenna.
UUT ADDRESS	AUTO
DIVERSITY TEST	OFF

**CAUTION:** If the option described in the note below is used, reduce the power of the test set to the minimum.

**NOTE:** It is permissible to connect the IFR 6000 test set directly to any transponder coax connector in the event that any of the following automated tests fail while using the flat plane antenna. To use the IFR 6000 directly coupled to a transponder, connect appropriate coax cables/adapters between the affected antenna connection (either on the transponder rack or at the antenna) and the ant port on the IFR 6000. Press the setup key on the IFR 6000 and change the port to direct.

C. Transponder 1 Antenna Operational Check.

**NOTE:** This test can be performed by going into maintenance mode on the PFDs (IN AIR) mode or connecting the IFR 6000 to the pitot/static system to simulate flight.

(1) For G1000 NXi Software configuration, make sure air data test set is connected to the left pitot/static system and is configured to an airspeed greater than 100 knots.

**NOTE:** Above 100 knots the ALT indication will turn from WHITE to GREEN. If airspeed is not simulated over 100 knots, the air data test will fail.

(2) An alternative to the air data test box connection to the pitot/static ports for the G1000 NXi.

(a) Pull PFD1 circuit breaker for 10 seconds.

(b) Push PFD1 circuit breaker back in while holding the ENT button on the PFD.

(c) Use the Inner and outer FMS knob to navigate the Aircraft Configurations page and select GND Test softkey on PFD1.

(d) Pull the PFD1 circuit breaker again and wait 10 seconds before you push it back in.

(e) The PFD will turn on in normal mode with a status message saying MAINTENANCE MODE. The transponder is now IN AIR condition.

(3) Use the mode Softkeys to select XPDR 1 and then select ALT.

(4) From the air data test set transponder menu, select AUTO TEST.

**NOTE:** The tests are tailored automatically according to reported transponder level, to avoid erroneous failures.

(5) After completion of auto test, verify that PASS is shown on the air data test set XPDR screen.

(a) Make sure that ALT is annunciated in the transponder status bar.

(b) Make sure that:

1 The Effective Radiated Power (ERP) is between 48.5 dbm and 57 dbm.

2 The acceptable level for MTL is -74.0, +3dbm or - 3dbm.

**NOTE:** The power/freq sub-test can fail if the unit is not configured correctly. Make sure the distance and height of antenna, and signal loss of the cable used are correct. If the power/freq sub-test

is the only sub-test failed and the values for ERP and MTL are within the tolerances listed above, then it is acceptable to continue the check.

**NOTE:** The UF20 and UF21 sub-tests will show as no reply and the UF24 sub-test can show as not capable. This is normal and should not be construed as a transponder failure.

**NOTE:** Remove power from all three displays and then power on after 10 seconds to take transponders out of IN AIR mode.

D. Transponder 2 Antenna Operational Check.

- (1) Do the steps above for the Transponder 2 antenna.
- (2) You must recalculate the distance and height values listed in Table 501 for the transponder 2 antenna.

E. Transponder 1 and transponder 2 Test False Failure Causes

- (1) There are problems that can cause a false failure condition when you do the transponder check. Refer to Table 502.

**Table 502. Transponder Check False Failures**

Indicated Transponder Check Failure	Possible Failure Corrections
A-mode or C-mode Side Lobe Suppression (SLS) failures. These failures occur when the transponder replies when the IFR 6000 expects the transponder to remain quiet.	1. Operation of other transponder test sets nearby, or interrogations from ATC radar facilities can cause SLS failures.
Minimum Trigger Level (MTL) too low (too sensitive) in conjunction with TX	1. This is usually caused by incorrect entry of distance between antenna and test set or incorrect entry of antenna or connecting cable losses, which results in incorrect coupling calculation by the test set.
PWR too high.	2. This usually occurs when the test set is too close to the antenna.
MTL too high (not sensitive enough) in conjunction with TX PWR too low.	1. This is usually caused by incorrect entry of distance between antenna and test set or incorrect entry of antenna or connecting cable losses, which results in incorrect coupling calculation by the test set.
	2. This usually occurs when the test set is too far from the antenna.
	3. This set of problems can also be caused by an unserviceable antenna and/or coaxial cables.

F. Ident Switch Operational Test

**CAUTION:** Make sure to use a transponder hood over transponder antennas to do this test.

- (1) Push the ALT softkey while transponder is active.
  - (a) Transponder will be in altitude mode.
- (2) Push the Pilot's control wheel Ident switch for a few seconds.
  - (a) IDNT is displayed in the Transponder Status Bar on both PFDs for approximately 20 seconds.
- (3) Push the Copilot's control wheel Ident switch for a few seconds.
  - (a) IDNT is displayed in the Transponder Status Bar on both PFDs for approximately 20 seconds.

G. GTX 33ES, GTX-335R, and GTX-345R ADS-B Out Operational Check

- (1) Use the FMS knobs to navigate to the AUX-STATUS page on the MFD.
- (2) Place the two formed metal shrouds or ecosorb over the base of both COM/GPS combo antennas and make sure that GPS reception is reduced.
  - (a) Push the GPS1 and GPS2 softkeys to show the GPS SOLUTION for each of the two GPS systems as ACQUIRING.

**CAUTION:** G1000 system power must be removed before you disconnect and/or connect the antennas or damage to the antenna can occur.

- (3) As an alternative to the metal shrouds, it is permitted to do the steps that follow:
  - (a) Disconnect G1000 system power.
  - (b) Disconnect the coaxial cables from either the GPS antennas or the GIAs.
  - (c) Push the GPS1 and GPS2 softkeys to show the GPS SOLUTION for each of the two GPS systems as ACQUIRING.
- (4) Push the XPDR softkey on the PFD1 and select XPDR1.
  - (a) Make sure the transponder is operating in ground (GND), or in altitude (ALT) mode.
  - (b) Make sure that a XPDR1 ADS-B FAIL amber CAS annunciation is shown on the PFD's.
- (5) If a second transponder has been installed, press the XPDR softkey on the PFD1 and select XPDR2 .
  - (a) Make sure that a XPDR2 ADS-B FAIL amber CAS annunciation is shown on the PFD's.
- (6) Do the steps that follow as applicable.
  - (a) Remove the metal shrouds from the antennas.
  - (b) Connect the antenna coaxial cables to the GPS antennas or the Garmin GIA 63W/64W Integrated Avionics Units.
- (7) When there is a GPS solution make sure that the CAS message is removed from the PFD's.
- (8) Push the right most softkey on the PFD to show the system messages and make sure that:
  - (a) A TRAFFIC FAIL system message is not shown on the PFD's.
  - (b) Air data information (such as airspeed, altitude, etc) is not red flagged as invalid (red X).
  - (c) AHRS1 GPS and AHRS2 GPS system messages are not displayed.
  - (d) Air data information (such as airspeed, altitude, etc) is not red flagged as invalid (red X).

H. GTX 345R (Optional Equipment Installation) ADS-B In Operational Check

- (1) Press the XPDR button on the IFR 6000 until the ADS-B/GICB/UAT MAIN menu appears.
  - (a) Press the ADSB GEN Softkey.
  - (b) Use the BDS ON Softkey to enable/disable the following BDS registers in the table below. Refer to Table 503, BDS Register Setup.

**Table 503. BDS Register Setup**

Parameter	Input
1 0, 5 AIRBORNE POS	ENABLE
2 0, 6 SURFACE POS	DISABLED
3 0, 8 IDENT & CAT	ENABLE
4 0, 9 AIRBORNE VEL	ENABLE
5 6, 1 A/C STATUS ST1	ENABLE
6 6, 1 A/C STATUS ST2	DISABLED
7 6, 2 TSS SUBTYPE 0	DISABLED
8 6, 2 TSS SUBTYPE 1	DISABLED
9 6, 5 A/C OP STATUS AIR	ENABLED
10 6, 5 A/C IP STATUS SUR	DISABLED
11 0, A TEST MSG	DISABLED

- (c) Highlight 0,5 AIRBORNE POS and press the BDS DATA Softkey.
- (d) Using the NEXT/PREV PARAM Softkeys and the Directional Data Keys to input the following data, refer to Table 504, AIRBORNE POS Setup.

**Table 504. AIRBORNE POS Setup**

Parameter	Input

TYPE:	9
LAT:	Pick a latitude near the aircraft
LONG:	Pick a longitude near the aircraft
BARO PRES ALT	Same as on PFD

- (e) Press the RETURN Softkey and scroll down to the 0,8 IDENT & CAT then press the BDS DATA Softkey.
- (f) Using the NEXT/PREV PARAM Softkeys and the Directional Data Keys to input the following data, refer to Table 505, IDENT & CAT Setup.

**Table 505. IDENT & CAT Setup**

Parameter	Input
FLIGHT ID:	TEST1
EMIT CAT SET=	A
EMIT CAT=	SMALL

- (g) Press the RETURN Softkey and scroll down to the 0,9 AIRBORN VEL and press the BDS DATA Softkey.
- (h) Using the NEXT/PREV PARAM Softkeys and the Directional Data Keys to input the following data, refer to Table 506, AIRBORNE VEL Setup.

**Table 506. AIRBORNE VEL Setup**

Parameter	Input
E-W VEL	70 E
N-S VEL	90 S
SUPTYPE	1-VEL OVR GRND NORM

- (i) Press the RETURN Softkey on the IFR 6000 then select MAPS, then select TRAFFIC MAP.
  - 1 Make sure the ADS-B Softkey is ON.
  - 2 Press the RUN TEST Softkey on the IFR 6000.
- (j) Press the MFD FMS knob, scroll through the Traffic Targets available and find the simulated Traffic Target. Refer to Figure 501.
  - 1 Highlight the Simulated Traffic Target.
  - 2 Make sure that FLIGHT ID, EMIT CAT, CR, TRK and GS information is displayed on the lower left side of the MFD.

- I. Put the Airplane Back to its Initial Condition.
  - (1) Put the switches that follow to the OFF position:
    - (a) BATTERY switch.
    - (b) EXTERNAL POWER switch.
    - (c) AVIONICS 1 and 2 switches.
  - (2) Disconnect external electrical power from the airplane.

Figure 501 : Sheet 1 : ADS-B In Simulated Aircraft Display

