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GTS 8XX

AML STC Installation Manual

Part 4

Configuration, Checkout and Maintenance

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RECORD OF REVISIONS

Revision	Revision Date	Description
1	11/5/09	Initial Release
2	11/30/09	Updated to clarify installation requirements and incorporate feedback from Garmin Engineering.

Revision	Page Number(s)	Section Number	Description of Change
2	2-6	2.2.2	Clarified ADS-B transmit equipage.
	2-10	2.5.3.2	Corrected statement to include any GAMA 429 output.
	2-12	2.5.4.1	Removed unnecessary instructions.
	2-16	2.5.6	Clarified "GNS 480 initialization".
	2-17	2.5.6.1	Removed unnecessary instructions.
	3-6	3.3	Added Audio system checkout procedure.
	3-9	3.4.2	Added system checkout procedures checklist items.
	4-1, 4-2	4.3	Revised instructions to include references to other sections of install manual.

DOCUMENT PAGINATION

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1 Introduction

This manual covers the instructions for checkout and maintenance of the GTS 8XX traffic device. It describes the system configuration required for each type of installation as well as the post installation ground checks and flight checks required prior to operating the GTS 8XX traffic device.

1.1 Installation Manual Format

This installation manual is only a part of the full documentation required for installation of the GTS 8XX. The installation is broken into four separate parts with a separate manual for each part of the installation. This manual provides instructions pertaining to the configuration and checkout of the GTS 8XX traffic device. For other aspects of the installation, see the pertinent installation manual. Be sure to read each of the separate manuals before beginning the installation. Installation Manual part numbers are contained in Figure 1-1.

```
                    ┌─────────────────────┐
                    │      Part 1:        │
                    │   Overview and      │
                    │    Limitations      │
                    │  (190-00993-00)     │
                    └─────────────────────┘
```
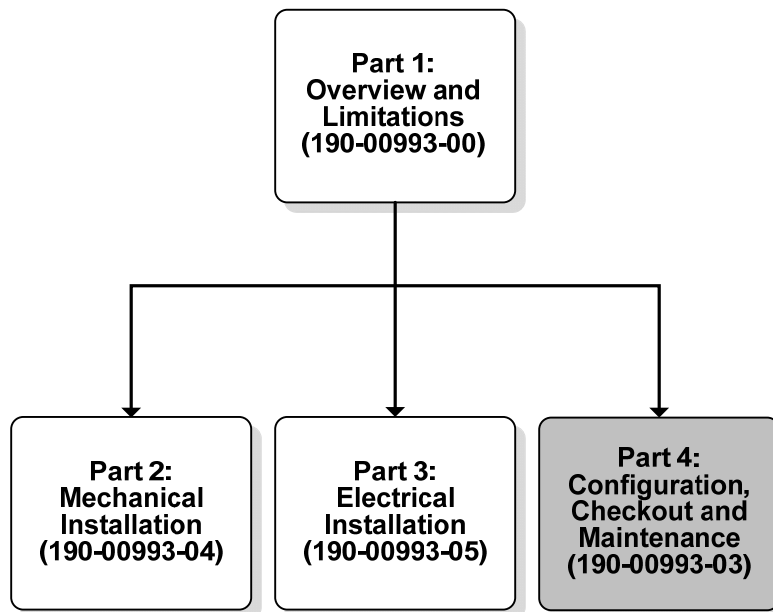
Figure 1-1. Installation Manual Documentation Format

Part 1: Overview and Limitations describes the pre-installation information necessary to plan for installing the GTS 8XX system into an aircraft. For brevity, will be referred to as GTS-IM1.

Part 2: Mechanical Installation describes location considerations and instructions pertaining to the mechanical installation of the GTS 8XX and related hardware. Referred to as GTS-IM2.

Part 3: Electrical Installation describes cabling and wiring requirements, electrical harness build-up and installation, as well as electrical interconnect information. Referred to as GTS-IM3.

Part 4: Configuration and Checkout describes software loading and configuration and system checks required prior to operation of the GTS 8XX. Referred to as GTS-IM4.

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2 System Configuration

2.1 System Configuration Overview

The GTS 8XX configuration and software loading is performed using a computer (installed with Microsoft Windows XP or later) and the GTS 8XX Install Tool, Garmin part number 006-A0242-00. The tool is available for download from the Dealers Only portion of the Garmin website (www.garmin.com). The GTS 8XX system is interfaced with the USB pigtail installed in the wiring harness.

NOTE

A USB-A plug to USB-B plug cable (not provided) is required to interface between a computer USB-A receptacle and the GTS 8XX USB-B receptacle installed in the wiring harness.

2.2 GTS 8XX Install Tool

The GTS 8XX Install Tool allows for configuration, diagnostics, and upload of GTS 8XX software.

The following GTS 8XX modes are accessible with the GTS 8XX Install Tool.
- Normal mode – Allows selection of Traffic Mode, to Standby, Operate or Test. Reports System Faults, Status Flags, and Operation Status. Allows Ground Test Mode to be Enabled or Disabled.
- Configuration Mode – Allows selection of installation options
- Upload Mode – Allows upload of software to the GTS 8XX unit

2.2.1 Normal System Mode Tab

The Normal tab displays various faults, flags and operational information. When the Normal tab is selected, the unit is commanded to Normal System Mode.
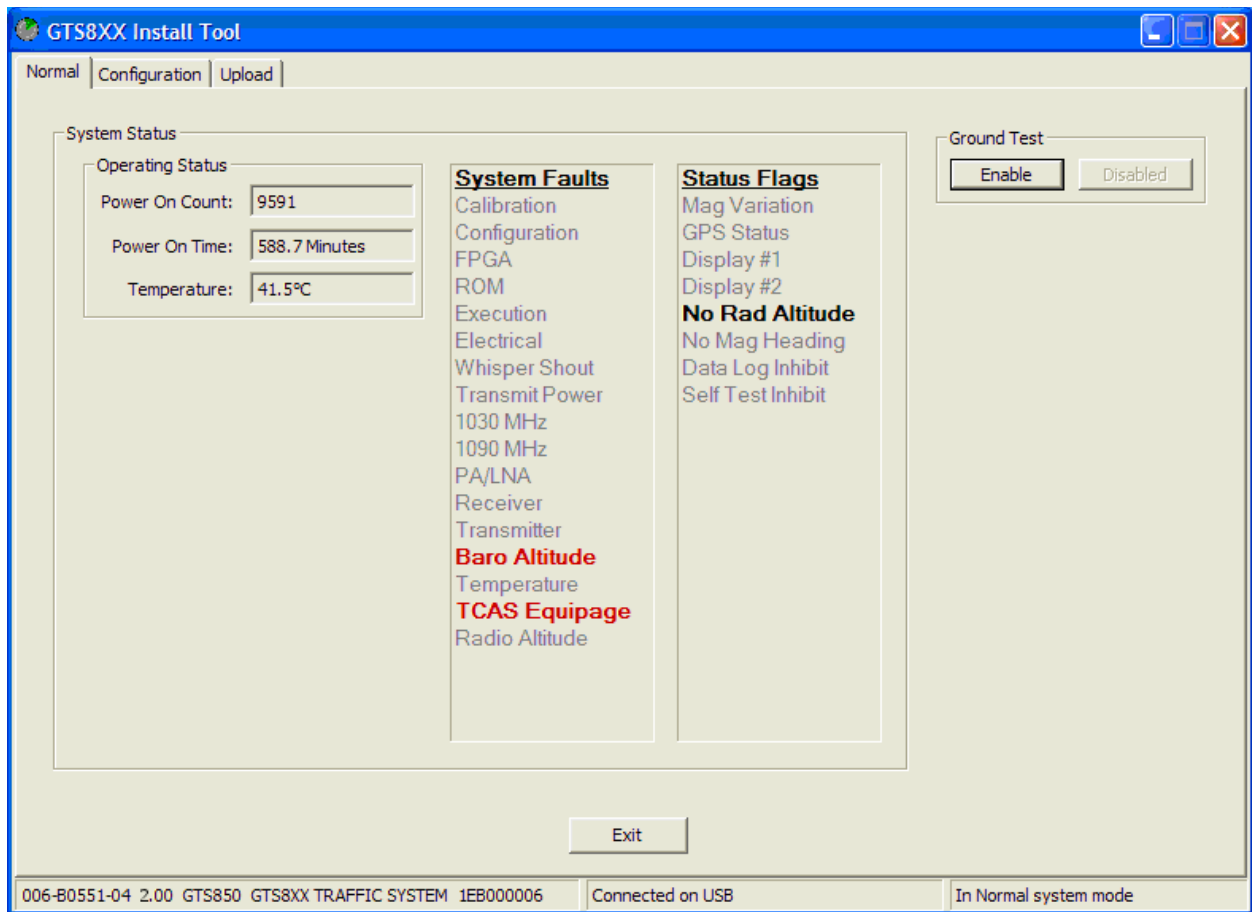
Figure 2-1. GTS 8XX Install Tool – Normal Tab

Normal Mode –

System Faults:

Red Bold text indicates that a fault is active.

Gray text indicates that there is no active fault.

(System Faults are described in the Self-Test section.)

Status Flags:

Black Bold text indicates that a flag is set.

Gray text indicates that the flag is not set.

(Status Flags are described in the Self-Test section>)

Ground Test:

Enabled

Disabled

(Ground Test is described in the Ramp Test and Return to Service Tests section)

2.2.2 Configuration System Mode Tab

The Configuration tab displays configuration data and allows the installer to change the installation configuration. When the Configuration tab selected, the unit is commanded to Configuration System Mode.
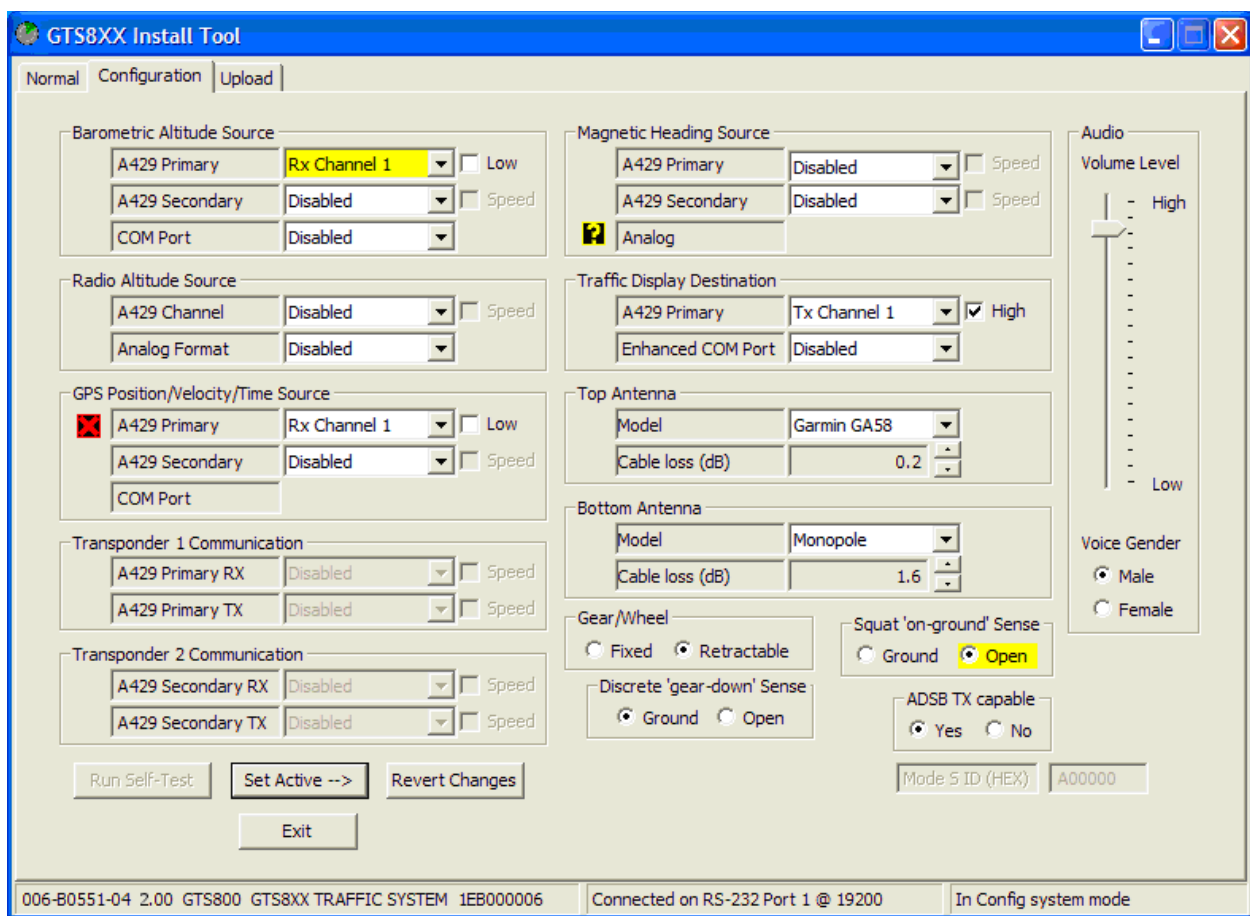
Figure 2-2. GTS 8XX Install Tool – Configuration Tab (GTS 800)
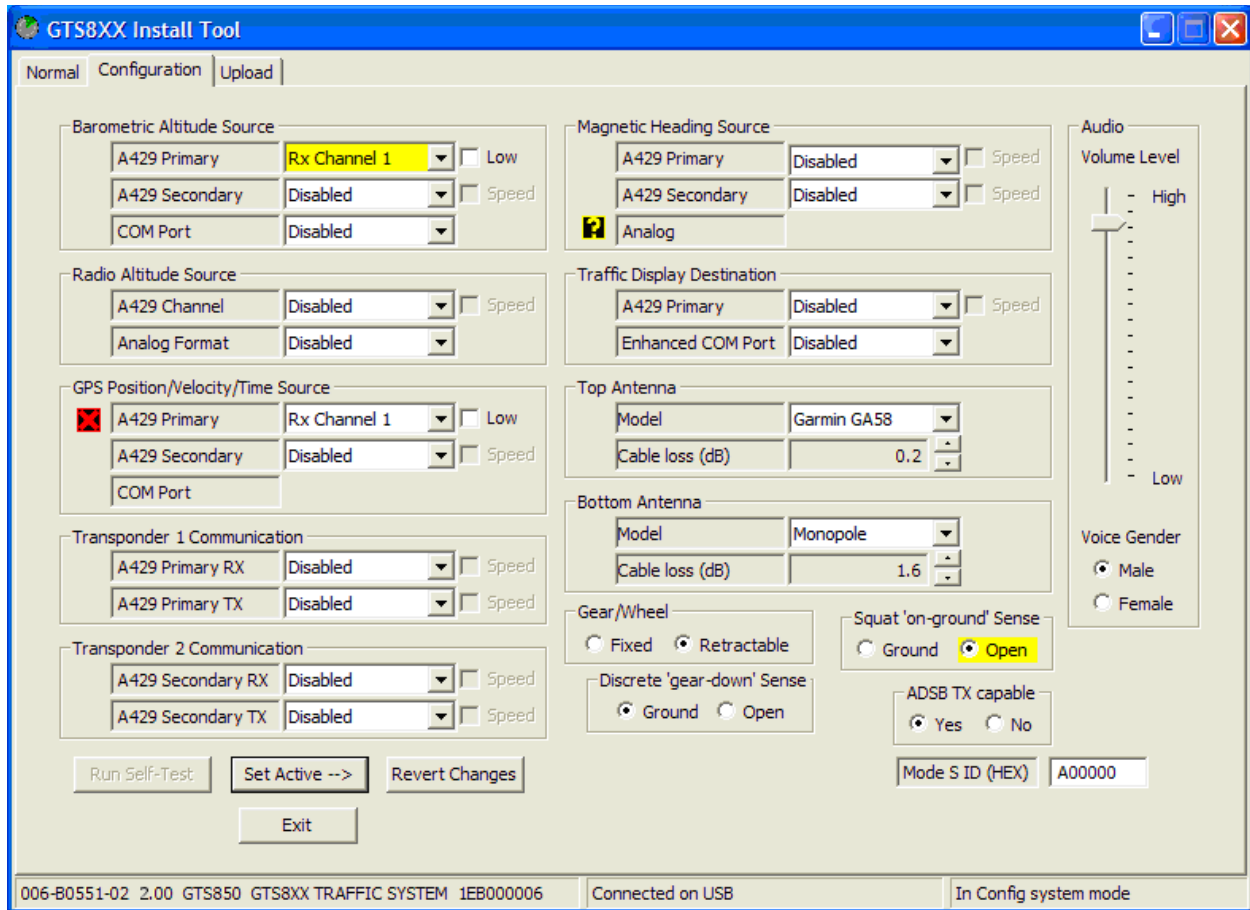
Figure 2-3. GTS 8XX Install Tool – Configuration Tab (GTS 820 and GTS 850)

The Configuration tab displays installation configuration options. Changes made in the Configuration tab are not immediately committed to the GTS. Changed options will be colored yellow until 'Set Active' is selected. Not all configuration items are applicable to the GTS 8XX. These items are disabled in the Install Tool.

Configuration Mode –

    Barometric Altitude Source:
        Note: At least one source must be selected (same altitude source used for the transponder).

Primary	A429 RX Channels 1 – 6 or Disabled
Secondary	A429 RX Channels 1 – 6 or Disabled
COM	RS-232 Ports 1 – 5 or Disabled

    Magnetic Heading Source (optional):

Primary	A429 RX Channels 1 – 6 or Disabled
Secondary	A429 RX Channels 1 – 6 or Disabled

    Radio Altitude Source (optional):

A429	A429 RX Channels 1 – 6 or Disabled
Analog	Disabled
	ARINC 552
	ARINC 552A
	Bonzer MK10X
	Collins ALT50

Collins ALT55
King KRA10
King KRA405
Sperry AA100
Terra TRA3000/3500

GPS Position/Velocity/Time Source:
Note: At least one source required for ADS-B IN functionality.
Primary   A429 RX Channels 1 – 6 or Disabled
Secondary   A429 RX Channels 1 – 6 or Disabled

Traffic Display Destination:
Note: At least one source is required.
Primary   A429 TX Channels 1 – 6 or Disabled
COM   RS-232 Ports 1 – 5 or Disabled

Transponder 1 & 2 Communication:
Note: At least Transponder 1 RX and TX required for GTS 820 and GTS 850.
Primary should be configured for channels wired to Transponder 1.
Secondary should be configured for channels wired to Transponder 2 in a dual
transponder installation.
Primary RX   A429 RX Channels 1 – 6 or Disabled
Primary TX   A429 TX Channels 1 – 6 or Disabled
Secondary RX   A429 RX Channels 1 – 6 or Disabled
Secondary TX   A429 TX Channels 1 – 6 or Disabled

Top Antenna:

Model   None
                                 Garmin GA 58
                                 Sensor Systems
Cable loss (dB)   0.2 – 4.0
                                 Note: For GTS 820 and GTS 850 Systems, the Top
                                 Antenna Cable loss is the sum of the GTS unit to the
                                 GPA 65 loss plus the GPA 65 to the TCAS Antenna loss.
                                 Cable loss information is described in GTS –IM3.

Bottom Antenna:
Model   None
                                 Monopole
                                 Garmin GA 58
                                 Sensor Systems
Cable loss (dB)   0.2 – 4.0
                                 Note: Cable loss information is described in GTS –IM3.
Note: All A429 options have the ability to select High and Low speed.

Note: If an input is inactive, a *will be displayed.*

If an input is active, a *will be displayed.*

If an input is in an unknown state, a *will be displayed.*

Volume Level:

Allows audio volume level selection from 0 to -63 dB in 0.5 dB increments.

Maximum audio output is at least 80 mW into a 600 Ohm load. (6.93Vrms)

Voice Gender:

Enter voice gender preference selection.

Gear/Wheel:

Enter type of aircraft gear design.

ADSB TX Capable:

Indicate whether the aircraft is equipped with an ADS-B transmitter, such as a GDL 90, GTX 330 ES, etc.

Squat 'on-ground' Sense;

Indicate type of sense switch.

Mode S ID (HEX):

Applicable to GTS 820 and GTS 850 Only. Enter the Mode S transponder ID (must match the Mode S ID used by the transponder).

Set Active:

Must select Set Active to enable the settings on the GTS 8XX.

Revert Changes:

Select to show current GTS 8XX settings.

An incorrect configuration will be reverted back to the previous settings.

Note: Default is "disabled" for all inputs and outputs.

NOTE

After the configuration changes are complete make sure the "Set Active" button is pressed and the Normal tab is press on the install tool. Failure to return the install tool to the Normal tab will prevent the GTS 8XX from going into Operate mode.

2.2.3 Upload System Mode Tab

The Upload tab displays version information for Boot Block, Region List, System, FPGA, Audio and Magnetic Variation. Boot Block updating is not allowed. For other files, select the appropriate image files and select Upload.
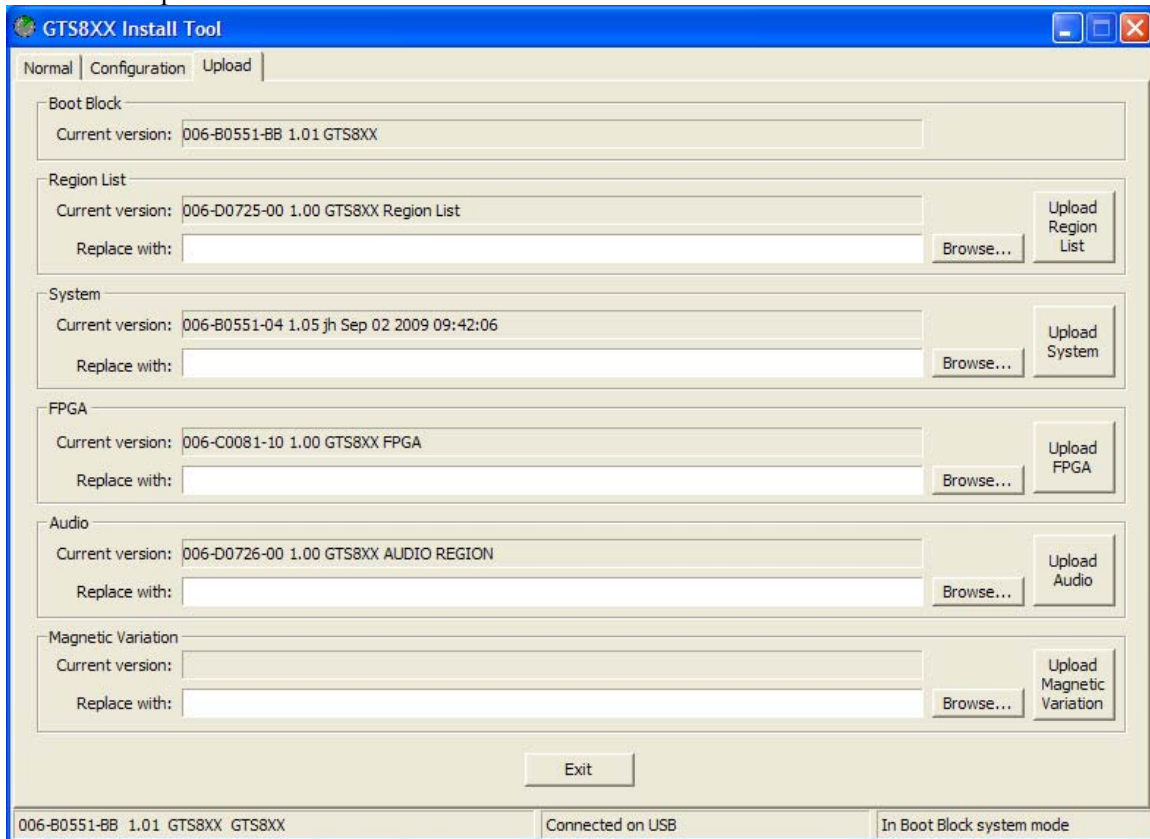
Figure 2-4. GTS 8XX Install Tool – Upload Tab

2.3 Mounting, Wiring and Power Checks

Before beginning the installation calibration, the installer must perform a visual inspection to verify the coaxial cables are installed correctly based upon the system and antenna configuration.

The following actions need to be performed after the equipment is installed:

1. GTS 8XX Configuration (refer to section 2.5.1)

2. CDTI (Cockpit Display of Traffic Information) Display setup and configuration

3. Calibration

4. Self test

5. Ramp test and return to service tests

6. Antenna verification

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2.4 Software Loading

Use the GTS 8XX Install Tool and refer to section 2.2.3 to load software to the GTS 8XX

2.5 System Setup

2.5.1 GTS 8XX System Setup

Use the GTS 8XX Install Tool and refer to section 2.2.2 to configure the GTS 8XX based on the installation.

NOTE

Always return the GTS 8XX Install tool to normal mode by pressing the Normal tab. Failure to return the install tool to normal mode will keep the GTS 8XX from going into Operate mode.

2.5.2 GTX 330 System Setup

NOTE

The configuration descriptions given in this section reflect software version 6.00 or higher. Refer to GTS-IM3 Appendix A for required transponder software version.

Holding down the FUNC key and pressing the ON key provides access to the configuration pages. The FUNC key sequences forward through the configuration pages. The START/STOP key reverses through the pages, stopping at the Menu page. The CRSR key highlights selectable fields on each page. When a field is highlighted, the 0 – 9 keys enter numeric data and the 8 or 9 keys move through list selections. Press the CRSR key to accept changes. When a field is highlighted, pressing the FUNC key moves to the next configuration page without saving the changes.

Changes made through the configuration pages 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.

The configuration page sequence is as follows (menu categories are listed in parentheses):

- 'Jump To' Menu
- Audio and Messages #1
- Audio and Messages #2
- Traffic Messages
- Display Mode
- Display Backlight
- Key Backlight
- Contrast
- VFR Key Configuration
- ARINC 429 Input #1 (First I/O Configuration page)
- ARINC 429 Input #2 (Second I/O Configuration page)
- ARINC 429 Output
- RS-232 Input Output
- Operation Configuration #1 (First Aircraft Configuration page)
- Operation Configuration #2 (Second Aircraft Configuration page)
- Temperature
- Aircraft Address
- Flight ID

- Aircraft Type

- Aircraft Size

- ADS-B Configuration (ES Enabled Units Only)

- EHS

- Gray Code Input

- External Switch State

- Analog Input

- RS-232 Input Display

- ARINC 429 Input Display #1

- ARINC 429 Input Display #2

2.5.2.1 Traffic Setup

CONFIGURATION MENU

CONFIGURATION MENU Page

The JUMP TO menu page provides the capability to select a Configuration mode starting page without having to step through all of the pages. Press the CRSR key and sequence through to the desired selection with the 8 and 9 keys. Jump to the selection by pressing the CRSR key again with the desired selection highlighted.

The FUNC key steps to the next configuration page, after which the START/STOP key reverses until stopping at the JUMP TO menu page.

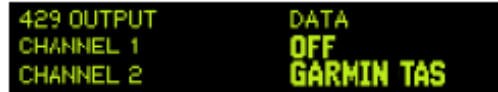| SELECTION	DESCRIPTION
DIAGNOSTICS	Jumps to Gray Code Input page.
DISPLAY/AUDIO	Jumps to Audio Volume page.
I/O CONFIG	Jumps to ARINC 429 INPUT #1 page.
ACFT CONFIG	Jumps to Operation Configuration #1 page.

ARINC 429 INPUT

ARINC 429 INPUT (First) Page

ARINC 429 INPUT (Second) Page

When a GTS 820 or GTS 850 is installed the GTX 330 should be configured to GARMIN TAS and HIGH.

ARINC 429 OUTPUT

ARINC 429 OUTPUT Page

The ARINC 429 OUTPUT should be configured for GARMIN TAS

2.5.2.2   ADS-B Page (Extended Squitter Enabled Units Only)

ADS-B

ADS-B Page

Set Automatic Dependant Surveillance-Broadcast (ADS-B) to ENABLE.

2.5.3 GNS 400/500 System Setup

With power applied to the aviation rack and the 400/500 Series unit turned off, press and hold the ENT key and turn the unit on. Release the ENT key when the display activates. After the Data Base and Instrument Panel Self-test pages, the first page displayed is the MAIN ARINC 429 CONFIG page. While in Configuration Mode, pages can be selected by ensuring the cursor is off and rotating the small right knob.

To change data on the displayed configuration pages, press the small right knob (CRSR) to turn on the cursor. Turn the large right knob to change between data fields. Turn the large or small right knob to change a field that the cursor is on. Once you have made the desired selection, press the ENT key to accept the entry.

2.5.3.1   Traffic Display Setup

Select the MAIN ARINC 429 CONFIG Page (see Figure 2-5). Select the input port that the GTS 8XX is wired to. Configure the port to "High" speed and "Traffic Advisory"

Figure 2-5 GNS 400/500 ARINC 429 Config

2.5.3.2   GPS Output Setup (Optional)

To provide the GTS 8XX with GPS information configure the ARINC 429 output to "High" speed and configure it for any GAMA output.

2.5.4 GMX 200 System Setup

NOTE

The GTS 8XX must be wired to A429 input 1 on P2002 when connecting to a GMX 200 I/O.

As part of the initial configuration, the GMX 200 functions must be enabled/disabled as desired, external data sources must be configured, and miscellaneous options must be set up.

1. Turn on power to the GMX 200.

2. Immediately after the self-test is complete, press line select keys 1, 4, and 6 in sequence before pressing any other keys (where 1 is the top line select key, 4 is the fourth key down, and 6 is the lower most line select key). If other keys are pressed before or during this sequence, the GMX 200 will be in the normal operational mode. To enter the install mode, turn off the GMX 200 and start again at step 1.

Figure 2-6 GMX 200 Keys

3. Press the FN key until the INSTL function is present. If the INSTL function is not found, restart the unit. Carefully press line select keys 1, 4, and 6 in sequence. Do not press any other buttons before pressing the 1, 4, 6 line select key sequence.

4. Select the INSTL function by pressing the smart key directly below the INSTL label. The Enable/Disable Functions will be the first screen to appear.

NOTE

GMX 200 power must be cycled before configuration changes will take affect. All changes made to configuration items are immediately stored in the configuration module so there is no need to wait to cycle power after making the final configuration change.

NOTE

The following sections describe all available configuration options. Depending upon the model of GMX 200 being installed, the described options may or may not be available for a particular unit.

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2.5.4.1 Enable/Disable Functions

This menu allows the activation or deactivation of GMX 200 functions. Ensure the Enable/Disable Functions page of the GMX 200 has the desired configuration. Modifications can be made using the select key beside the appropriate function to toggle between Enabled and Disabled. Record all of the settings in the checkout log sheet provided in section 3.4.2.
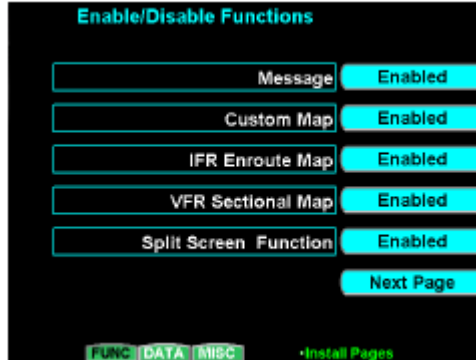

Figure 2-7 GMX 200 Function Screen

1. If not already on the Function menu, press the FUNC smart key to bring up the Enable/Disable Functions menu.
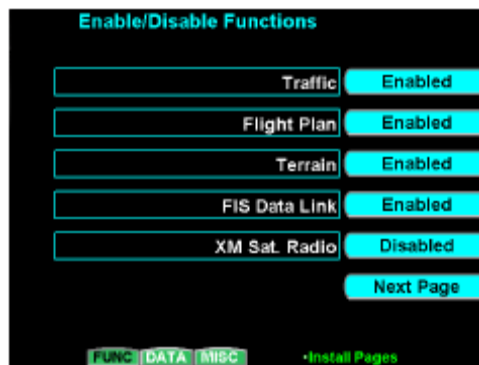
Figure 2-8 GMX 200 Function Screen 2

2. Press the Next Page line select key to view additional functions.
   a. Traffic: verify that Traffic is "Enabled".

NOTE

The Flight Plan function must be enabled to conduct the system operational checkout.

   b. Terrain: Enable only if an altitude source is supplied to the GMX 200 (GPS or pressure), or if a suitable TAWS sensor is installed.
   c. FIS Data Link: Enable only if a GDL 90 UAT, GDL 69/69A or WSI AV-300/350 system is installed.
   d. XM Sat. Radio: Enable only if a GDL 69A (i.e. with weather and audio) is installed. This should be disabled if a GDL 69 (i.e. weather-only) or WSI AV-300/350 is installed.

2.5.4.2 External Data Sources

This menu allows the installer to configure the GMX 200 for external equipment connected to it. Ensure that all of the external data sources for the GMX 200 are set to the desired configuration. Modifications can be made using the line select key beside the appropriate function to cycle through available selections. Record all of the settings in the checkout log sheet provided in section 3.4.2.

1. If not already on the Data Source menu, press the DATA smart key to bring up the External Data Sources menu. Configure the external data sources to match the installation.
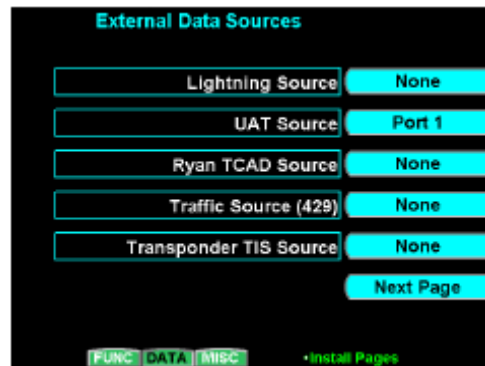
Figure 2-9 GMX 200 External Data Sources

2. Press the Next Page line select key to view additional data source selections.

   a. Traffic Source (429):
      Selections: None, TAS, TAS+Disp
      Select the port to which an ARINC 429 traffic source is connected. If the GMX 200 is wired to drive the traffic system discrete inputs and control the traffic system, select the TAS option. If the GMX 200 is not wired to drive the discrete inputs, select the TAS+DISP option. Using the TAS+DISP option indicates that an external display is responsible for driving the discrete inputs and the corresponding GMX 200 controls will be disabled on the GMX 200 Traffic page.

NOTE

Only one traffic source may be present (i.e. For UAT Source, Ryan TCAD Source Traffic Source (429) and Transponder TIS Source, only one may be configured for an external data source – the others must be set to None.)

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2.5.5 GDU 620 System Setup

2.5.5.1 System Page Group

Navigation of the different pages in the System Page Group is done by rotating the small MFD knob located on the bottom right hand corner of the unit.

2.5.5.2 System Configuration Page

This page allows the installers to select what LRUs are present and not present in a given installation.

Figure 2-10 GDU 620 System Configuration

Activate the cursor, select the system using the large MFD knob, and then press the ENT button. This will activate or deactivate the highlighted system. For activated systems, use the small knob to select the appropriate LRU from the dropdown TYPE menu, and then press enter to select the LRU.

Continue to activate or deactivate each LRU, as required.

A green light means that the LRU is configured as 'present'. No light (black) means that the LRU is configured as 'not present' (the TYPE field will be blank in this case).

INTERFACING SYSTEMS Window:

Traffic Type, Selections: Set the INPUT to SkyWatch.

+External Control, verify that the external control is not enabled. The GDU 620 will not be able to control the traffic system if this item is selected.

Deactivate the cursor.

2.5.5.3   ARINC PORT CONFIG

This page is for displaying port setting information only. No configuration is required. Port configuration is automatically set based upon which LRUs are configured as present (refer to section 2.5.5.2).

Figure 2-11 GDU 620 ARINC Port Config

ARINC 429 INPUT Window:

Green Light: The device is configured as 'Present' and data is being received on this input.

No Light (Black): The device is configured as 'Not Present' (OFF is set for INPUT), or the device is configured as 'Present' and no data is being received on this input.

ARINC 429 OUTPUT Window:

No settings can be changed. These ports are automatically configured based upon the system configuration.

2.5.6 GNS 480 System Setup

Prior to system operation, the GNS 480 must be configured for the particular installation using the setup functions provided.

The system setup and checkout functions are reached in the Ground Maintenance mode of the GNS 480. This mode should not be accessed during flight. The Ground Maintenance mode is reached by pressing the line select keys 1, 4, and MENU/ENTER in sequence immediately after the GNS 480 initialization is complete (after the cloud scene and "GNS 480" disappear) and before any other bezel keys on the GNS 480 are pressed. Line select key 1 is the top line select key, line select key 4 is the fourth key down, and MENU/ENTER is the lower most key below the line select keys. After pressing the keys, wait for the GNS 480 to restart into Ground Maintenance mode. The Ground Maintenance mode default menu display (SETUP) is shown in Figure 3-1. Pressing the SETUP, TEST or INPUT smart keys along the bottom allows selection of that function. Pressing the EXIT smart key will return the GNS 480 to the Airborne mode.
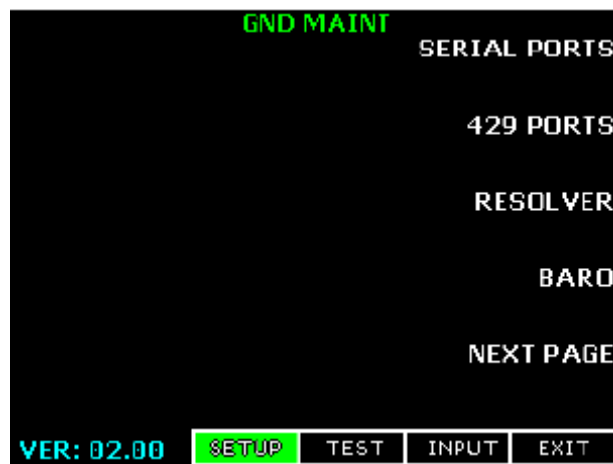
Figure 2-12 GNS 480 Maintenance Page

2.5.6.1 Setup Function

The SETUP function allows the custom configuration of the GNS 480 for each individual installation. The SETUP function allows the installer to configure the serial and ARINC 429 ports, calibrate the resolver head (if installed), calibrate the baro potentiometer (if installed), and set COM parameters.

While on the Ground Maintenance SETUP menu page, press the 429 PORTS line select key to configure the ARINC 429 ports. The ARINC 429 ports setup page is shown in Figure 3-3.

Figure 2-13 GNS 480 ARINC 429 Setup

Push in the Cursor knob to allow editing of the settings. Turn the large, outer knob to select the next or previous item and the Cursor knob to change currently selected setting. Set each ARINC 429 port according to the installation, and leave unused ports set to NONE. Either press the Cursor knob in again or press the MENU/ENTER key to save the settings. Press the SETUP or BACK smart key to return to the Ground Maintenance SETUP menu.

Configure the GNS 480 ARINC 429 port for "SKYWATCH"

2.5.7 Other System Setup

Refer to the 3rd party system installation manual for instructions on configuring the unit to work with the GTS 8XX unit.

Configure displays to look for a TAS or SkyWatch system.

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3 System Checkout

3.1 Ground Checks

3.1.1 Ramp Test and Return To Service Test

Using a ramp tester, such as a TIC TR220 or equivalent, make the following setup and measurements to verify GTS 8XX operation and surveillance functionality. Refer to section 3.2 if a ramp tester is unavailable.

To select a scenario that will properly converge and intercept the GTS 8XX, the GTS 8XX must be in Ground Test mode. To enable Ground Test mode, the aircraft must be on the ground and the GTS 8XX must be in Normal System mode and in Standby.

Activate ground test mode by clicking 'Enable' in the Ground Test field on the Normal tab of the GTS 8XX Install Tool.

This simulates the GTS 8XX to be airborne at 50,000 ft with magnetic heading of 0°.

NOTE

The GTS 8XX will not accept the Ground Test command unless the unit is in Standby and the squat switch indicates the aircraft is on the ground.

NOTE

Configure Squat 'on-ground' sense as Open if no sense switch is installed. Leave Air/Ground* discrete Open. Configuration of Gear/Wheel as 'Fixed' will cause system to ignore the Gear Down and Locked* discrete input.

Position the test set directional antenna with a clear line of sight to the GTS 8XX antenna at 90 degrees.

With the GTS 8XX powered up and in Standby mode indicated on the CDTI, cycle the GTS 8XX to "Operate".

Select the following scenario:

Set the intruder type as ATCRBS.

Intruder Start Distance	Intruder Start Altitude	Vertical Speed	Velocity
10 NM	50,000 ft	0 fpm	360 Kts

Initiate the intruder scenario and observe the following:

- Traffic should be acquired at approximately 10 NM at 90 degree bearing and co-altitude. Observe intruder closes on own aircraft at a rate of .1 NM/sec.

- The intruder should transition from Other Traffic (displayed as an open diamond with 00 displayed above), to proximate traffic (displayed as a filled white diamond with 00 displayed above), to a Traffic Advisory (TA) alarm.

- The appropriate TA symbology (yellow filled circle with 00 displayed above, and an audio annunciation of "Traffic! 3 O'clock! At Altitude! 3 Miles!"), displayed when the intruder approaches within 3 NM.

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3.1.2 Antenna Verification

The first step in antenna verification is to verify auto-calibration operates without indicating a fault.

1. With the GTS 8XX powered up and "Standby" indicated on the CDTI cycle the GTS 8XX to "Operate". Each time the GTS 8XX transitions between these modes a self test of the antenna circuit is initialized. If the antenna connection is not correct the CDTI will display "Failure" indicating it will be necessary to recheck the antenna coaxial connections. If the CDTI displays "Operate" without indicating a fault, proceed to the next step of antenna verification.

Using a ramp tester, such as a TIC TR220 or equivalent, make the following set up and measurements to assure the antenna is properly connected and the GTS 8XX is operational.

2. Position the test set directional antenna with a clear line of sight to the GTS 8XX antenna.

3. Ensure that the transmitter or receiver (RX/TX) that you are testing is significantly closer to the ramp tester than another operating RX/TX, or erroneous and inaccurate results may occur. All four quadrants (forward, starboard, aft, and port) will be similarly tested to verify bearing of simulated intruder supplied via the ramp tester are correctly displayed on the CDTI.

4. Using the ramp tester, select the proper antenna gain and distance to aircraft.

5. Position ramp test set at 0 degrees.

6. Turn the test set on.

7. Connect the directional antenna to the ramp test set.

8. Set the multifunction test set to perform "TCAS" testing. Configure the GTS 8XX to the normal operating mode.

9. Program a static intruder per the following scenario:

NOTE

See ramp test set operators manual to set the following parameters

Intruder Start Distance	Intruder Start Altitude	Vertical Speed	Velocity
2 NM	50,000 ft	0 fpm	0 Kts

10. Set the intruder type as ATCRBS.

11. Verify a target is annunciated on the GTS 8XX TAS/TCAS display at the correct bearing of approximately 0 degree azimuth at 2 NM and co-altitude (read as 00 above a filled diamond indicating proximate traffic).

12. Toggle intruder traffic to standby or off.

13. Reposition ramp test set and directional antenna to a starboard position of 90 degrees.

14. Reengage the same intruder scenario as above.

15. Verify a target is annunciated on the GTS 8XX TAS/TCAS display at the correct bearing of approximately 90 degree azimuth at 2 NM and co-altitude.

16. Toggle intruder traffic to standby or off.

17. Reposition ramp test set and directional antenna to an aft position of 180 degrees.

18. Reengage the same intruder scenario as above.

19. Verify a target is annunciated on the GTS 8XX TAS/TCAS display at the correct bearing of approximately 180 degree azimuth at 2 NM and co-altitude.

20. Toggle intruder traffic to standby or off.

21. Reposition ramp test set and directional antenna to a port position of 270 degrees.

22. Reengage the same intruder scenario as above.

23. Verify a target is annunciated on the GTS 8XX TAS/TCAS display at the correct bearing of approximately 270 degree azimuth at 2 NM and co-altitude.

24. Toggle intruder traffic to standby or off.

25. If the bearing is not as anticipated, recheck the antenna coaxial connections by verifying the following:

    a. QMA connectors are 'snapped' firmly in place

    b. Connections are made to the proper channels and color-coded heat shrink is the same color on both ends of cable

    c. QMA connectors are correctly installed on cables

    d. Correct antenna type is selected in the configuration

NOTE

If multiple targets are displayed during the antenna tests, recheck the antenna coaxial connections.

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3.2 Alternate Installation Verification Check

A flight check of the GTS 8XX may be performed in the event that a TIC TR220 or equivalent ramp tester is unavailable. The purpose of the flight check is to evaluate the GTS 8XX installation and confirm that traffic is displayed at the correct relative bearing and altitude and targets are portrayed correctly. It is performed as an **alternative** to the ramp test and return to service test.

CAUTION

The flight check must be performed in Visual Meteorological Conditions (VMC) to allow visual acquisition of the target aircraft. Maintain constant radio contact with the target aircraft throughout the flight check to ensure safe separation minimums.

CAUTION

Do not perform head to head maneuvers with the target aircraft. For safety, all maneuvers should be performed in the same direction with GPS using offsets from known navaids so that both pilots know the test aircraft to target aircraft separation at all times.

Flight crew briefing by all participating crewmembers must be conducted prior to initiating the flight to ensure safety.

The operational check is performed with the GTS 8XX test aircraft in addition to a target aircraft with an operating transponder installed. After takeoff, observe traffic on the display and verify visually that the display is accurate regarding intruder bearing, relative altitude, and range.

3.2.1 Antenna Verification Flight Check

The first step is to verify that the auto-calibration operates without indicating a fault.

With the GTS 8XX powered up and "Standby" indicated on the CDTI, cycle the GTS 8XX to "Operate". Each time the GTS 8XX transitions between these modes a self test of the antenna circuit is initialized. If the antenna connection is not correct the CDTI will display "Failure" indicating it will be necessary to recheck the antenna coaxial connections. If the CDTI displays "Operate" without indicating a fault, proceed to the antenna verification flight test.

Set up the target aircraft to observe the target on all 4 quadrants. See figure 1-1 for additional information. Ensure that the test article aircraft and the target aircraft maintain the same relative altitude. Verify that the visual location of the target aircraft matches the location of the target on the display. For each of the target aircraft scenarios below, the target should appear on the traffic display as a filled diamond with a 00 above which indicates Proximate Traffic.

- To verify the 12 o'clock position, maneuver the target aircraft approximately within 4 NM directly ahead of the test article aircraft with both aircraft at the same relative altitude. Obtain a visual of the target aircraft and verify that the target aircraft is depicted at the 12 o'clock position on the traffic display.

- To verify the 3 o'clock position, maneuver the target aircraft approximately within 4 NM directly to the right of the test article aircraft with both aircraft at the same relative altitude. Obtain a visual of the target aircraft and verify that the target aircraft is depicted at the 3 o'clock position on the traffic display.

- To verify the 6 o'clock position, maneuver the target aircraft approximately within 4 NM directly behind the test article aircraft with both aircraft at the same relative altitude. Obtain a visual of the target aircraft and verify that the target aircraft is depicted at the 6 o'clock position on the traffic display.

- To verify the 9 o'clock position, maneuver the target aircraft approximately within 4 NM directly to the left of the test article aircraft with both aircraft at the same relative altitude. Obtain a visual

of the target aircraft and verify that the target aircraft is depicted at the 9 o'clock position on the traffic display.

NOTE

If multiple targets are displayed during the antenna flight tests, recheck the antenna coaxial connections. If the target appears 45˚ off on the traffic display, check the configured antenna setting, described in section 2.2.2.

NOTE

Ensure that the target aircraft only appears in the anticipated location on the traffic display. It is possible that the target will appear in dual locations, 180˚ opposite from each other if the antenna cable connections are swapped or incorrectly connected in a dual directional antenna installation.
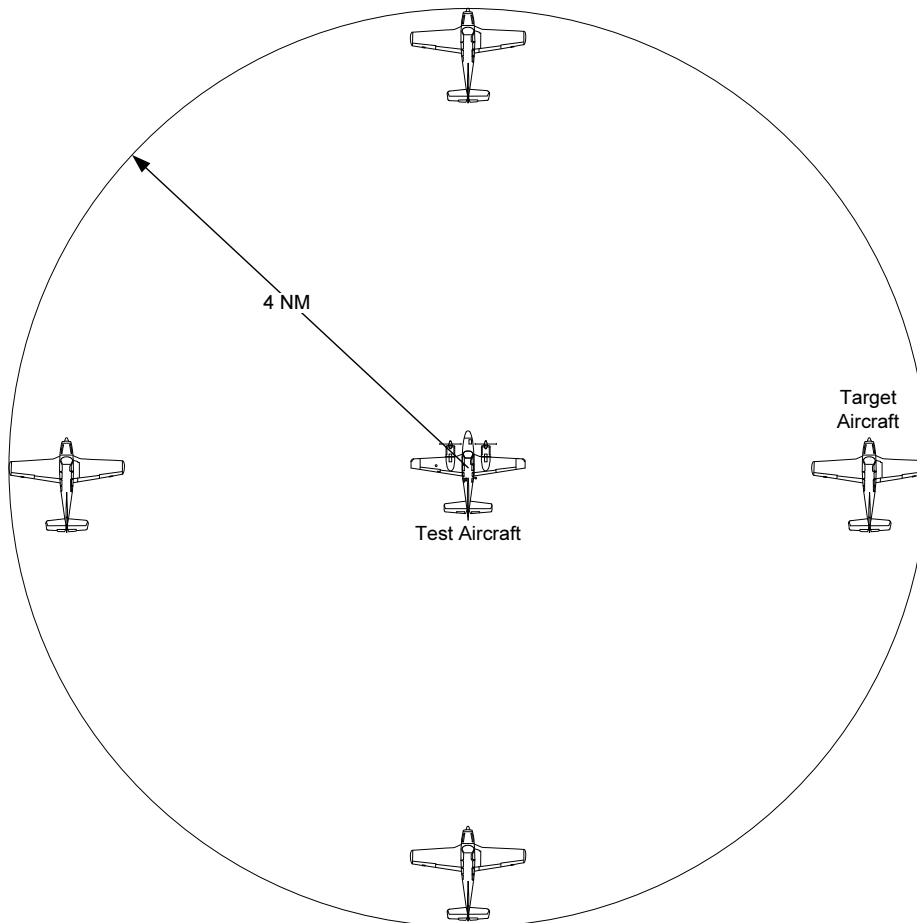
4 NM

Target
Aircraft

Test Aircraft

Figure 3-1. Target Aircraft Position for Traffic Display Flight Check

If the bearing is not as anticipated, recheck the antenna coaxial connections by verifying the following:

 a. QMA connectors are 'snapped' firmly in place

 b. Connections are made to the proper channels and color-coded heat shrink is the same color on both ends of cable

 c. QMA connectors are correctly installed on cables

 d. Correct antenna type is selected in the Configuration System Mode

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3.3 System Test and Audio Check

Verify that the GTS 8XX produces aural alerts.

- While on the ground, turn on the GTS 8XX and audio panel following normal power-up procedures.
- Connect a headset to the audio panel in accordance with audio panel operating instructions. Set the volume to a typical in-flight volume level.
- On the installed COM receiver in the aircraft, tune to the appropriate Automatic Terminal Information Service (ATIS) frequency.
- Command the GTS 8XX into self-test mode as described in the chosen display product operating instructions. (If switches are used to control the mode of the GTS 8XX, flip the "traffic test" switch.)
- When the self-test is completed, the aural announcement "TAS SYSTEM TEST PASSED" should be heard. Evaluate the audio for acceptable volume and intelligibility during anticipated cockpit noise conditions. Ensure that the traffic audio is not muted during transmission of the ATIS broadcast.
- Adjust the volume as needed in the Configuration System Mode tab described in section 2.2.2.
- After making adjustments, command the GTS 8XX into self-test mode again and re-verify the audio.

3.4 Documentation Checks

3.4.1 Instructions for Continued Airworthiness (ICAW)

Ensure that the appropriate aircraft information is filled in on the Instructions for Continued Airworthiness (ICAW) is completed and inserted in the aircraft permanent records.

1. Fill in the Aircraft Make, Model, Reg. No. and S/N information on the cover of the ICAW (Garmin document 190-00993-01).
2. In the ICAW Appendix A, fill in the locations of all LRUs that were installed as part of the GTS 8XX installation. Also sketch the location of the wire runs for the GTS 8XX system.
3. Insert the completed ICAW in the aircraft permanent records.

3.4.2 Configuration and Checkout Log

The completed checkout log sheet should be maintained with the aircraft permanent records.

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# GTS 8XX Configuration and Checkout Log	Date: ____ / ____ / ____ By: _____

INSTALLATION INFORMATION:

AIRCRAFT MODEL _____ AIRCRAFT SERIAL # _____

❑ GTS 800
❑ GTS 820
❑ GTS 850
❑ GPA 65

GTS 8XX   P/N   011-0_____-_____   Mod Level _____
Serial # _____

GPA 65   P/N   011-01347-_____   Mod Level _____
Serial # _____

GA 58 (Top) P/N   011-01346-_____   Mod Level _____
Serial # _____

GA 58 (Bot.) P/N   011-01346-_____   Mod Level _____
Serial # _____

Mono Ant   P/N   010-10160-_____   Mod Level _____
Serial # _____

Low Prof   P/N   013-00276-_____   Mod Level _____

Serial # _____

Other Ant   P/N   _____   Mod Level _____

Serial # _____

EQUIPMENT LOCATION:

For each unit listed below, record the fuselage station and provide a brief description of the location.

Unit	*Station (CG)*	*Description of Location*
GTS 8XX	_____ (in)	_____
GPA 65	_____ (in)	_____
Top Antenna	_____ (in)	_____
Bottom Antenna	_____ (in)	_____

CONFIGURATION ITEMS:

System Configuration

Barometric Altitude Source: ❑ Present ❑ Not Present

      A429 Primary RX Channel: _____ ❑ Low ❑ High

      A429 Secondary RX Channel: _____ ❑ Low ❑ High

      COM Port: _____

Radio Altitude Source: ❑ Present ❑ Not Present

      A429 Primary RX Channel: _____ ❑ Low ❑ High

      Analog Format: _____

GPS Position/ Velocity/ Time Source: ❑ Present ❑ Not Present

      A429 Primary RX Channel: _____ ❑ Low ❑ High

      A429 Secondary RX Channel: _____ ❑ Low ❑ High

      COM Port: _____

Transponder 1 Communication: ❑ Present ❑ Not Present

      A429 Primary RX Channel: _____ ❑ Low ❑ High

      A429 Primary TX Channel: _____ ❑ Low ❑ High

Transponder 2 Communication: ❑ Present ❑ Not Present

      A429 Secondary RX Channel: _____ ❑ Low ❑ High

      A429 Secondary TX Channel: _____ ❑ Low ❑ High

Magnetic Heading Source: ❑ Present ❑ Not Present

      A429 Primary RX Channel: _____ ❑ Low ❑ High

      A429 Secondary RX Channel: _____ ❑ Low ❑ High

      Analog: _____

Traffic Display Destination: ❑ Present ❑ Not Present

      A429 Primary TX Channel: _____ ❑ Low ❑ High

      Enhanced COM Port: _____

Top Antenna: ❑ Present ❑ Not Present

      Model: _____

    Total Cable loss (dB): _____   Total Cable Length (in):_____

Antenna to GPA Cable loss (dB): _____   GPA to GTS 8XX Cable loss (dB):_____

Bottom Antenna: ❑ Present ❑ Not Present

      Model: _____

      Cable loss (dB):_____   Cable Length (in): _____

ADSB TX capable: ❑ Yes ❑ No

Gear/Wheel: ❑ Fixed ❑ Retractable

Squat 'on-ground' Sense: ❑ Ground ❑ Open

Discrete Gear Down Sense: ❑ Ground ❑ Open

Mode S ID (HEX): _____

SYSTEM CHECKOUT
System Operation

❑ Ramp Test Complete **OR** ❑ Flight Check Complete (choose one)

❑ System Self-Test Complete

❑ Audio Check Complete

DOCUMENTATION CHECKS
Aircraft Documentation

❑ Weight and Balance complete

❑ Included this statement in the Aircraft logbook:

"This installation is TSO-C166a Class A0/Type 1 Receiving Only"

❑ FAA Form 337 Complete

❑ Electrical Load Analysis complete

NOTES:

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4 Unit Replacement Removal & Installation

Whenever removing or replacing installed units, remove power from the LRU by removing aircraft power or opening the LRU circuit breaker.

4.1 GTS 8XX Unit

4.1.1 Removal

1. Verify that the power is off to the GTS 8XX unit
2. Disconnect the connectors on the GTS 8XX unit.
3. Disconnect the QMA connectors on the GTS 8XX unit.
4. Loosen the mounting screw on the front of the GTS 8XX LRU mounting tray.
5. Remove the GTS 8XX from the tray

4.1.2 Installation

1. Place the GTS 8XX unit in the mounting tray.
2. Tighten the mounting screw on the front of the GTS 8XX LRU mounting tray.
3. Connect the rear connectors, ensuring that each jackscrew is secured on both sides and the QMA connectors are secured.

NOTE

The installation configuration settings are stored in the configuration module and will be retained when the GTS 8XX is replaced with a new unit.

4.2 GPA 65 Unit

4.2.1 Removal

1. Verify that the power is off to the GTS 8XX unit.
2. Disconnect the QMA connectors on the GPA 65 unit.
3. Disconnect pigtail connector.
4. Remove the four (4) mounting screws on the GPA 65.
5. Retain the screws for reinstallation
6. Remove the GPA 65

4.2.2 Installation

1. Install the GPA 65.
2. Attach the GPA 65 with the four (4) mounting screws.
3. Connect the pigtail connector
4. Connect the antenna connectors on the GPA 65 ensuring each QMA connecter is secured.

4.3 Antenna

4.3.1 Removal

1. Verify that the power to the GTS 8XX unit is off.
2. Disconnect the coaxial antenna connector(s) on the antenna. (GA-58 antenna, connectors P1-P4)

3. Remove the sealant from the antenna and fuselage.

4. Remove the mounting screws on the antenna.

5. Retain the screws for reinstallation.

6. Remove the antenna.

4.3.2 Installation

1. Clean the area of debris or excess sealant.

2. Install the antenna.

3. Attach the antenna with the mounting screws. Refer to GTS-IM2 section 2.3 for sealant/bonding requirements.

4. Connect the antenna connectors (GA-58 antenna, connectors P1-P4) on the antenna ensuring each connecter is secured.

5. Verify the electrical bond of the antenna in accordance with the requirements in GTS-IM3 section 2.

6. Fillet seal the antenna and gasket to the fuselage in accordance with GTS-IM2 section 2.3.

5 Troubleshooting

This section provides information to assist troubleshooting if problems occur with a GTS 8XX installation.

5.1 GTS 8XX Troubleshooting

Problem	Cause	Solution
Unit does not power up – Data failed message	Improper wiring; circuit breaker open	Ensure power is properly wired to the GTS 8XX and the circuit breaker is closed
	Improper configuration	Verify using the USB install tool that the GTS 8XX is configured correctly for the desired display
GTS 8XX Install Tool won't display any pages	Improper wiring; circuit breaker open	Ensure USB is properly wired to the GTS 8XX and the circuit breaker is closed
No Audio alerts	Improper wiring; Volume not set correctly	Ensure the audio is properly wired from the GTS 8XX and volume is not set too low
Calibration Fault	Factory calibration invalid	If the unit fails to go into operate mode then return to Garmin for service
Configuration Fault	Both internal and external configuration checks failed	Verify the configuration via the GTS 8XX Install Tool.
		Verify wiring to the configuration module and replace if necessary.
FPGA Fault	Internal Fault	Return to Garmin for service
ROM Fault	Internal Fault	Return to Garmin for service
Execution Fault	Internal Fault	Return to Garmin for service
Electrical Fault	Internal Fault	Return to Garmin for service
Whisper Shout Fault	Internal Fault	Return to Garmin for service
Transmit Power Fault	Internal voltages are out of tolerance	Verify input voltage and if it continues return to Garmin for service.
1030 MHz Fault	Internal Fault	Return to Garmin for service
1090 MHz Fault	Internal Fault	Return to Garmin for service
PA/LNA Fault	Antenna connections or internal fault	Ensure all antenna connections are correct otherwise return to Garmin for Service
Receiver Fault	Antenna connections or internal fault	Ensure all antenna connections are correct otherwise return to Garmin for Service
Transmitter Fault	Antenna connections or internal fault	Ensure all antenna connections are correct otherwise return to Garmin for Service
Baro Altitude Fault	Baro Altimeter is not powered on or improper wiring.	Verify that the baro altimeter has power and is properly wired.
	Improper configuration settings	Verify the configuration is set correctly using the GTS 8XX Install Tool.

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Problem	Cause	Solution
Temperature Fault	Fan is not operating, Poor ventilation at the mounting location	Verify the fan is running and the unit is getting adequate ventilation.
TCAS Equipage Fault	Broken wire, improper configuration	Verify configuration settings on the transponder and the GTS. Ensure proper wiring between the transponder and the GTS
Radio Altitude Fault	Radio Altimeter is not powered on or improper wiring.	Verify that the radio altimeter has power and is properly wired.
	Improper configuration settings	Verify the configuration is set correctly using the GTS 8XX Install Tool.
Red 'X' on a data port on the configuration page	Improper wiring; wrong port or speed selected	Ensure the port is properly wired to the GTS 8XX and the correct settings are selected on the configuration page.

6 PERIODIC MAINTENANCE

The GTS 8XX does not require regular maintenance. Maintenance of all GTS 8XX LRUs are "on condition" only.

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Appendix A   STC Data

A.1 STC/PMA Information

The STC with Approved Model List (AML), Master Drawing List (Garmin P/N 005-C0524-00) and other information are available for download from the Dealers Only portion of the Garmin website at www.garmin.com.

A.2 Permission to use STC

Consistent with Order 8110.4B and AC 21-40, a permission letter to use this STC data is available for download from the Dealers Only portion of the Garmin website at www.garmin.com.

A.3 Continued Airworthiness Instructions

The GTS 8XX Instructions for Continued Airworthiness (Garmin P/N 190-00993-01) is available for download from the Dealers Only portion of the Garmin website at www.garmin.com..

A.4 STC Approved Model List

The GTS 8XX STC includes an Approved Model List (AML) attached to the STC. The GTS 8XX system is approved for installation on all aircraft listed on the AML following installation instructions and limitations described in this GTS 8XX System Installation Manual. The AML is attached to the STC and is available for download from the Dealers Only portion of the Garmin website at www.garmin.com.

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