

400/500 Series GTS 8XX Interface

Pilot's Guide Addendum

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This manual reflects the operation of Software version 5.03 or later for 4XX series products and 6.03 for 5XX series products. Some differences in operation may be observed when comparing the information in this manual to earlier or later software versions.

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WARNING: The altitude calculated by 4XX/5XX GPS receivers is geometric height above Mean Sea Level and could vary significantly from the altitude displayed by pressure altimeters in aircraft. GPS altitude should never be used for vertical navigation. Always use pressure altitude displayed by pressure altimeters in the aircraft.



WARNING: The Jeppesen database used in the 4XX/5XX system must be updated regularly in order to ensure that its information remains current. Updates are released every 28 days. A database information packet is included in the 4XX/5XX package. Pilots using an outdated database do so entirely at their own risk.



WARNING: The basemap (land and water data) must not be used for navigation, but rather only for non-navigational situational awareness. Any basemap indication should be compared with other navigation sources.



WARNING: For safety reasons, 4XX/5XX operational procedures must be learned on the ground.



WARNING: The United States government operates the Global Positioning System and is solely responsible for its accuracy and maintenance. The GPS system is subject to changes which could affect the accuracy and performance of all GPS equipment. Portions of the Garmin 4XX/5XX units utilize GPS as a precision electronic NAVigation AID (NAVAID). Therefore, as with all NAVAIDs, information presented by the 4XX/5XX units can be misused or misinterpreted and, therefore, become unsafe.



WARNING: The GTS 8XX interface is intended for advisory use only to aid the pilot in visually acquiring traffic. No avoidance maneuvers should be based solely upon TAS or TCAS traffic information. It is the responsibility of the pilot in command to see and maneuver to avoid traffic.



NOTE: Unless otherwise specified within this manual, the term '4XX/5XX' applies to all the following models: GPS 400, GNC 420(A), GNS 430(A), GPS 500, GNS 530(A).



NOTE: References to the GTS 8XX throughout this document refer equally to the GTS 800, GTS 820, and GTS 850 unless otherwise noted.



NOTE: All visual depictions contained within this document, including screen images of the 4XX/5XX panel and displays, are subject to change and may not reflect the most current 4XX/5XX system. Depictions of equipment may differ slightly from the actual equipment.



NOTE: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



NOTE: This product, its packaging, and its components contain chemicals known to the State of California to cause cancer, birth defects, or reproductive harm. This notice is being provided in accordance with California's Proposition 65. If you have any questions or would like additional information, please refer to our website at www.garmin.com/prop65.



NOTE: This section assumes the user has experience operating the 4XX/5XX units and the GTS 8XX.



NOTE: TIS is disabled when a GTS 8XX unit is installed.

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GTS 8XX INTERFACE OVERVIEW

All information in this addendum pertains to the display and control of the Garmin 4XX/5XX Series units using a GTS 8XX interface. This addendum does not replace or supersede the 4XX/5XX Pilot's Guides. Refer to the 400/500 Series Display Interfaces Pilot's Guide Addendum (190-00140-10) when interfacing with non-Garmin products

1.0 SYSTEM DESCRIPTION

The 4XX/5XX provides an optional display interface for the GTS 8XX Traffic Advisory (TAS) and Traffic Collision Avoidance (TCAS I) Systems. The GTS 800 and GTS 820 are TAS systems, the GTS 850 is a TSO-Certified TCAS I system. The GTS 8XX uses active interrogations of Mode A/C/S (GTS 820 and GTS 850 only) and Mode A/C transponders to provide Traffic Advisories to the 4XX/5XX.

The GTS 8XX is an active traffic advisory system that operates as an aircraft-to-aircraft interrogation device. The GTS 8XX monitors the airspace surrounding an aircraft, and advises the flight crew where to look for transponder-equipped aircraft that may pose a collision threat. When the GTS 8XX receives replies to its interrogations, it computes the responding aircraft's range, bearing, relative altitude, and closure rate. The GTS 8XX then determines the advisory status of the target and sends the location information and alert status to the 4XX/5XX for display.

The GTS 800 is capable of tracking up to 45 Mode A/C/S intruders. The GTS 820/850 is capable of tracking up to 45 Mode A/C plus 30 Mode S intruders. Up to 30 of the most threatening targets are displayed.

Pilots should be aware of TAS/TCAS system limitations. If an intruder transponder does not respond to interrogations due to antenna shading or marginal transponder performance, it will not be displayed, or display may be intermittent. Pilots should remain vigilant for traffic at all times when using TAS/TCAS systems for non-transponder equipped airplanes or unresponsive airplanes.

1.1 TCAS I SURVEILLANCE VOLUME

Top and bottom mounted antennas allow an active surveillance range of up to 12 nm (GTS 800) or 40 nm (GTS 820/850) in the forward direction, and somewhat reduced ranges to the sides and aft of own aircraft due to the directional interrogation patterns. Interference limiting in GTS 820/850 units may automatically reduce range in high density traffic areas.

1.2 TRAFFIC SYMBOLOGY

Traffic information from the GTS 8XX is displayed on the 4XX/5XX unit using TAS/TCAS symbology (Table 1) on a dedicated Traffic page, and on the moving Map Page. The displayed traffic information generally includes the relative range, bearing, and altitude of intruder aircraft. The GTS 8XX also generates aural announcements heard on the cockpit audio system. Proximity Advisories and Other Traffic symbols normally displayed in white may be displayed in cyan if configured for alternate traffic color (see the applicable 4XX/5XX installation manual).





Symbol	Traffic Type	Description
	Traffic Advisory (TA)	A TA (Traffic Advisory) is generated when the GTS 8XX predicts that an intruder aircraft may pose a collision threat. A solid yellow circle represents an intruder aircraft that meets the TA criteria as described in the TA Alerting Conditions section. A TA consists of the traffic symbol and an aural alert (e.g., "traffic, 12 o'clock, high, 3 miles").
	Out-of-Range Traffic Advisory	This solid yellow half circle appears (on the outer range ring) under the same conditions and has the same urgency as a TA. Its appearance differs from the TA only to signify that the intruder is outside of the current range of the Traffic Page.
	Proximity Advisory (PA)	Proximity Advisories (PA) are displayed as solid white (may be configured as cyan) diamonds. PAs are defined as traffic within the 6.0-nm range, within ± 1200 ft. of altitude separation, and are not a traffic advisory (TA).
	Other Traffic Symbol	The hollow white (may be configured as cyan) diamond represents traffic detected within the selected display range that does not meet the criteria for a TA or a PA and does not pose an immediate collision threat.

Table 1 TAS/TCAS Symbology

1.3 TA ALERTING CONDITIONS

The GTS 8XX automatically adjusts its TA sensitivity level (Table 2) to reduce the likelihood of nuisance TA alerting during flight phases likely to be near airports. Level A (less sensitivity) TA sensitivity is used when the aircraft's radar altimeter (if

equipped) indicates own altitude is less than 2000 feet AGL. If no radar altimeter is present, Sensitivity Level A is active when the landing gear is extended. Level A is also active when groundspeed is less than 120 knots with no radar altimeter present in a fixed gear aircraft. In all other conditions, Level B (greater sensitivity) TA sensitivity is used to assess TA threats.

Sensitivity Level	Intruder Altitude Available	TA Alerting Conditions
A	Yes	Intruder closing rate provides less than 20 seconds of vertical and horizontal separation. Or: Intruder range is within 0.2 nm and vertical separation is within 600 feet.
A	No	Intruder closing rate is less than 15 seconds.
B	Yes	Intruder closing rate provides less than 30 seconds of vertical and horizontal separation. Or: Intruder range is within 0.55 nm and vertical separation is within 800 feet.
B	No	Intruder closing rate is less than 20 seconds.

Table 2 TA Sensitivity Level and TA Alerting Criteria

Target altitude relative to own aircraft altitude (relative altitude) is displayed (in hundreds of feet) for each target symbol (Figure 1). If traffic is above own aircraft altitude the relative altitude is shown above the target next to a '+' symbol. If traffic is below own aircraft altitude the relative altitude is shown below the target next to a '-' symbol.

Altitude trend (Figure 1) is displayed as an up arrow ($\geq +500$ fpm), down arrow (≤ -500 fpm), or no symbol if less than 500 fpm rate in either direction.

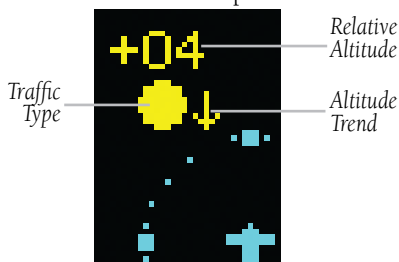


Figure 1 Traffic Symbol Components

1.4 AURAL ALERTS

A TA consists of a displayed traffic symbol (solid yellow circle) and an aural alert. The aural alert announces “traffic”, followed by the intruder aircraft’s position, altitude relative to own aircraft (“high”, “low”, or “same altitude”), and distance from own aircraft; e.g. “traffic, 12 o’clock, high, 3 miles”.

1.5 SELF-TEST

The GTS 8XX automatically performs a self-test upon power up. The self-test checks internal parameters and calibrates components of the GTS 8XX. The self-test can also be initiated by the user during normal operation.

Check for the following test criteria on the Traffic Page during power-up:

- If the GTS 8XX passes the power-up test; and the aircraft both has a squat switch and is on the ground, the Standby Screen is displayed (Figure 2).
- If the GTS 8XX passes the power-up test and the aircraft both has a squat switch and is airborne, the Traffic Page is displayed on the 6-nm display range and in the normal altitude display mode.
- If the GTS 8XX passes the power-up test and the aircraft does not have a squat switch, the Standby Screen is displayed (Figure 2).
- If the GTS 8XX fails the power-up test (as indicated by a FAILED screen), the GTS 8XX is inoperable, see the GTS 8XX Installation Manual for detailed information on Failure Response.



NOTE: *The FAILED message is displayed when the system detects an error that prohibits further traffic display operation.*



NOTE: *When the system is in standby, the GTS 8XX does not transmit, interrogate, or track intruder aircraft.*

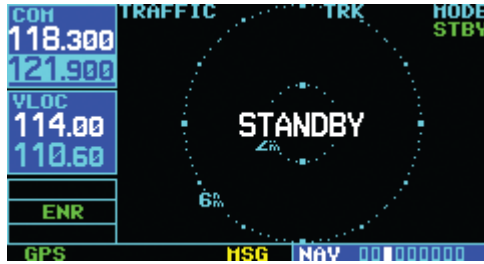


Figure 2 Standby Mode

1.6 USER-INITIATED TEST

In addition to the power-up test, the GTS 8XX performs self-tests during normal operation. A self-test is performed once per minute to verify that the antenna is connected. Also, a calibration is performed at varying intervals based on time and temperature. A user-initiated test of the GTS 8XX interface can also be performed. The test criteria are identical to the power up self-test, although the user-initiated test is concluded by an aural pass/fail message.



NOTE: A user-initiated test can only be performed when in standby or failed mode.

Performing a user-initiated test:

- 1) Turn the small right knob to select the Traffic Page.
- 2) From the Traffic Page, press the MENU Key to display the Page Menu.
- 3) Turn the small right knob to select 'Self Test?'.
- 4) Press the ENT Key, 'TEST' is displayed.

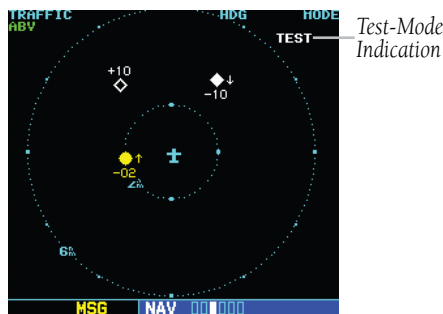


Figure 3 Self-Test Mode

1.7 SWITCHING BETWEEN STANDBY AND OPERATING MODES

The unit must be in operating mode for traffic to be displayed. The ability to switch out of standby into operating mode on the ground is especially useful for scanning the airspace around the airport before takeoff. Operating Mode is confirmed by the display of 'OPER' in the upper right-hand corner of the Traffic Page (Figure 4).

Switching to Operating Mode from Standby Mode:

- 1) Press the small **right** knob to activate the cursor and highlight 'STBY'.
- 2) Turn the small **right** knob to select 'OPER?'
- 3) Press the **ENT** Key to confirm and place the GTS 8XX in operating mode, the GTS 8XX switches out of standby into the 6-nm display range.



NOTE: The GTS 8XX will automatically switch out of standby 8 to 10 seconds after takeoff, which is determined by ground speed or by a transition of the aircraft squat switch (if connected).

Switching to Standby Mode from the Traffic Page:

- 1) Press the small right knob to activate the cursor and highlight 'OPER'.
- 2) Turn the small right knob to select 'STBY?'
- 3) Press the ENT Key to confirm and place the GTS 8XX in standby mode.



NOTE: The GTS 8XX goes into standby mode 24 seconds after landing, which is determined by ground speed or by a transition of the aircraft squat switch (if connected). This delay allows the GTS 8XX to remain out of standby during a touch-and-go maneuver.

1.8 TRAFFIC PAGE

Traffic can be displayed both on the Map Page (only if heading is available) and on the Traffic Page (Figure 4). The orientation source shown at the top of the display first uses heading ('HDG'), then GPS Track ('TRK') if no heading is available, to orient the display.

If the GTS 8XX does not have bearing information for an active TA, 'TA' followed by range, relative altitude, and altitude trend is displayed in the lower right corner. The Traffic Banner is displayed if more than one TA with no bearing info is active, while the TA of most immediate threat is displayed in text below the banner.

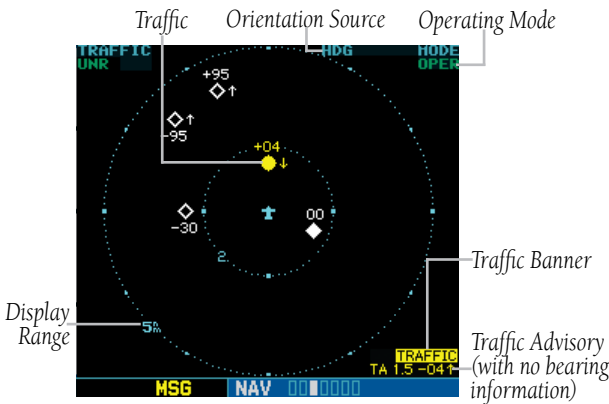


Figure 4 Traffic Page

1.9 TRAFFIC PAGE DISPLAY RANGE

The display range on the Traffic Page can be changed at any time.

Changing the display range on the Traffic Page:

Press the RNG Key to step through the following range options:

- 2 nm
- 2 and 6 nm
- 6 and 12 nm
- 12 and 24 nm (GTS 820/850 only)
- 24 and 40 nm (GTS 820/850 only)

1.10 ALTITUDE DISPLAY MODE

The GTS 8XX has four altitude display modes (Figure 5).

- Normal ($\pm 2,700$ ft)
- Above ($-2,700$ ft to $+9,000$ ft)
- Below ($-9,000$ ft to $+2,700$ ft)
- Unrestricted ($\pm 9,900$ ft)

The GTS 8XX continues to display up to 30 intruder aircraft within its maximum surveillance range, regardless of the altitude display mode selected.

The selected altitude display mode (Figure 6) is displayed in the upper left-hand corner of the Traffic Page.

Changing the Altitude Display Mode:

- 1) From the Traffic Page, press the small right knob to activate the cursor and highlight the current mode (Figure 6).
- 2) Turn the small right knob to cycle through the options. The screen changes to display the traffic detected within the selected altitude display range. Refer to Figure 5 for information regarding altitude display ranges.

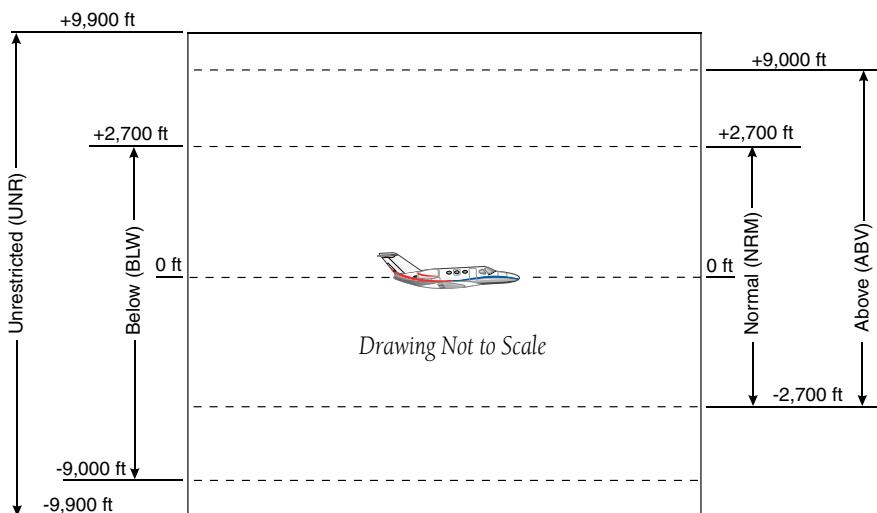


Figure 5 Altitude Display Modes



NOTE: Confirmation is not required, the mode is changed immediately when using the small right knob.

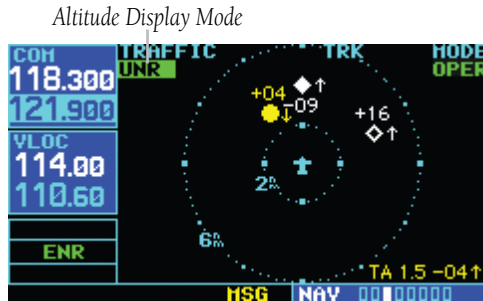


Figure 6 Unrestricted (UNR) Mode Selected

- 3) Press the small **right** knob to turn the cursor off after the selection is made.

1.11 TRAFFIC WARNING WINDOW

When the unit is not on the traffic page and the GTS issues a Traffic Advisory, the Traffic Warning Window (Figure 7) is displayed, which shows a small thumbnail map. When the Traffic Warning Window is displayed, press the ENT Key to display the Traffic Page, or press the CLR Key to return to the previous page.



NOTE: The Traffic Warning Window is disabled when the aircraft ground speed is less than 30 knots or when an approach is active.



Figure 7 Traffic Warning Window

1.12 MAP PAGE TRAFFIC BANNER

A ‘Traffic’ banner will be displayed in the lower right corner of the Map Page (Figure 8) if the Display Range setting is beyond the Traffic Symbol setting (Figure 9), and a Traffic Advisory is active.



Display Range

Traffic Banner

Figure 8 Traffic Banner

1.13 CONFIGURING TRAFFIC DATA ON THE MAP PAGE

Traffic is only displayed on the Map Page if aircraft heading data is available. The Traffic Mode setting allows the operator to choose which traffic type is displayed (all traffic, traffic and proximity advisories, or traffic advisories only). The Traffic Symbol and Traffic Label settings determine the maximum ranges at which these items are displayed.

Configuring traffic on the Map Page:

- 1) Turn the small right knob to select the Map Page.
- 2) Press the MENU Key to display the Page Menu.
- 3) Turn the small right knob to select 'Setup Map?'
- 4) Press the ENT Key. The flashing cursor highlights the GROUP field.
- 5) Turn the small right knob to select 'Traffic'.
- 6) Press the ENT Key (Figure 9).



Figure 9 Traffic Setup Menu

- 7) Turn the large right knob to select the desired Traffic Mode option.
- 8) Turn the small right knob to select the desired option.
- 9) Press the ENT Key. Repeat steps 7-9 for Traffic Symbol and Traffic Label.
- 10) Return to the Map Page by pressing the CLR Key.

1.14 THUMBNAIL TRAFFIC ON MAP PAGE

Traffic in a thumbnail format can be displayed in any of the three data fields on the right side of the Map Page (Figure 10).

Displaying Thumbnail Traffic on the Map Page

- 1) Turn the small right knob to select the Map Page.
- 2) Press the MENU Key to display the Page Menu.
- 3) Turn the small right knob to select 'Change Fields?'.
4) Press the ENT Key.
- 5) Turn the large right knob to select one of the three fields.
- 6) Turn the small right knob to select 'TRFC' from the Select Field Type List.
- 7) Press the ENT Key. (Figure 10)



Figure 10 Thumbnail Traffic on Map Page



NOTE: The thumbnail range defaults to 6 nm and cannot be changed.

1.15 HIGHLIGHTING TRAFFIC DATA USING MAP PANNING

Another map page function is panning, which allows changing the map beyond its current limits without adjusting the map scale. Select the panning function by pressing the small right knob, a target pointer flashes on the map display (Figure 11). Also a window appears at the top of the map display showing the latitude/longitude position of the pointer, and the bearing and distance to the pointer from the present position.

Selecting the panning function and panning the map display:

- 1) Press the small right knob to activate the panning target pointer (Figure 11).



Figure 11 Panning the Map Display

- 2) Turn the small right knob clockwise to move up, or counterclockwise to move down.
- 3) Turn the large right knob clockwise to move right, or counterclockwise to move left.
- 4) To cancel the panning function and return to the present position, press the small right knob.

When the target pointer is placed on traffic, the traffic range and relative altitude are displayed (Figure 11). The traffic is identified as:

- TA: Traffic Advisory
- PA: Proximity Advisory
- TRFC: Other Traffic



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