



# **GTX 3X5 Series Transponder**

## G1000 Pilot's Guide

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This manual reflects the operation of GTX 3X5 Series Transponders.

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**WARNING**

*Do not use data link weather information for maneuvering in, near, or around areas of hazardous weather. Information contained within data link weather products may not accurately depict current weather conditions.*



**WARNING**

*Do not use the indicated data link weather product age to determine the age of the weather information shown by the data link weather product. Due to time delays inherent in gathering and processing weather data for data link transmission, the weather information shown by the data link weather product may be significantly older than the indicated weather product age.*



**WARNING**

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**WARNING**

*To reduce the risk of unsafe operation, carefully review and understand all aspects of the GTX 3X5 Pilot’s Guide. Thoroughly practice basic operation prior to actual use.*



**WARNING**

*Traffic information shown is provided as an aid in visually acquiring traffic. Pilots must maneuver the aircraft based only upon ATC guidance or positive visual acquisition of conflicting traffic.*

**CAUTION**

*Unauthorized repairs or modifications could result in permanent damage to the equipment, and void your warranty and your authority to operate this device under FCC and FAA regulations.*

**NOTE**

*The coverage expected for all operations (transponder replies to ATC, ADS-B and FIS-B reception) from the Garmin GTX 3X5 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.*

**NOTE**

*This product does not contain any user-serviceable parts. Repairs should only be made by an authorized Garmin service center.*

**NOTE**

*It is the responsibility of the GTX 3X5 owner, residing outside of the U.S., to obtain proper licensing before using the transponder.*

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<b>Record of Revisions</b>			
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## Abbreviations and Acronyms

ADS-B	Automatic Dependant Surveillance - Broadcast
AHRS	Attitude and Heading Reference System
ATC	Air Traffic Control
FIS-B	Flight Information Service-Broadcast
TAS	Traffic Advisory System
TCAS	Traffic Collision Avoidance System
TIS-B	Traffic Information Service-Broadcast

## Sources and References

Automatic Dependent Surveillance – Broadcast (ADS-B) is an important part of the FAA's NextGEN effort. ADS-B is a precise GPS-based surveillance system that provides ATC access to traffic data well beyond the capabilities of RADAR alone. It enables the display of precise traffic data in cockpits equipped to receive ADS-B.

For more information about ADS-B, visit Garmin's ADS-B Academy website.  
[www.garmin.com/us/intheair/ads-b/](http://www.garmin.com/us/intheair/ads-b/)

For more information about ADS-B and other NextGEN programs, visit the FAA NextGEN website.  
[www.faa.gov/nextgen/](http://www.faa.gov/nextgen/)

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## 1 GTX 3X5/G1000 TRANSPONDER INTEGRATION

Integration of the GTX 3X5 into the G1000 brings minimal, but important changes to pilot interaction with the transponder, as well to certain traffic aspects of the system. Functional changes occurred with the integration of the GTX 3X5 interface, in addition to typical transponder operation.

The GTX 3X5 remote transponder is a TSO-C112e (Level 2els, Class 1) compliant mode S transponder. It features TSO-C166b compliant ADS-B Out Extended Squitter functionality, with optional internal GPS. The GTX 345 includes ADS-B In functionality, when connected to a suitable display.

GTX 345 Features:

- Dual-band ADS-B In traffic display output with aural alerting
- Integration with TCAD/TAS/TCAS I traffic systems
- FIS-B weather and flight information display output
- Connect PED interface to traffic, weather, and AHRS, via Bluetooth

## 1.1 G1000 Mode Selection Key Modifications



### NOTE

*GND mode is no longer supported by the transponder system. Always operate the transponder in ALT mode while in controlled airspace, in accordance with 14 CFR 91.215(d). For guidance on transponder operation, refer to the FAA Aeronautical Information Manual (AIM), 4-1-20(a)(3).*



### NOTE

*Do not disable ADS-B transmission unless requested by ATC. Select **STBY** mode to disable the transponder replies and ADS-B Out. Select **ADS-B TX** soft key to maintain basic transponder functionality.*

When on the ground or in the air, always operate the transponder in ALT mode, unless otherwise requested by ATC. The transponder automatically determines whether the aircraft is in the air or on the ground and sends that information to other aircraft and ATC.

Refer to table 1-1 for mode selection key modifications.

Refer to figure 1-1 for 3X5/G1000 transponder soft key sections.

**Table 1-1 Mode Selection Key Modifications**

<b>GND</b>	The <b>GND</b> soft key function is not available with the GTX 3X5 transponder. “XPDR GND UNAVL” will annunciate when the <b>GND</b> soft key is pressed. The unit will revert to the mode it was in before the <b>GND</b> soft key being pressed.
<b>ADS-B TX</b>	Press the <b>ADS-B TX</b> soft key to enable/disable ADS-B transmission. ADS-B defaults to the enabled state at system power-up. In systems where the <b>ADS-B TX</b> soft key is not available, ADS-B Out is always enabled.

**Figure 1-1 3X5/G1000 Transponder Soft Key Selections**



## 1.2 System Modified Annunciations

G1000 system dependent messages will display in the annunciation window and/or in the “ALERTS” window as descriptive text. Refer to figure 1-2.

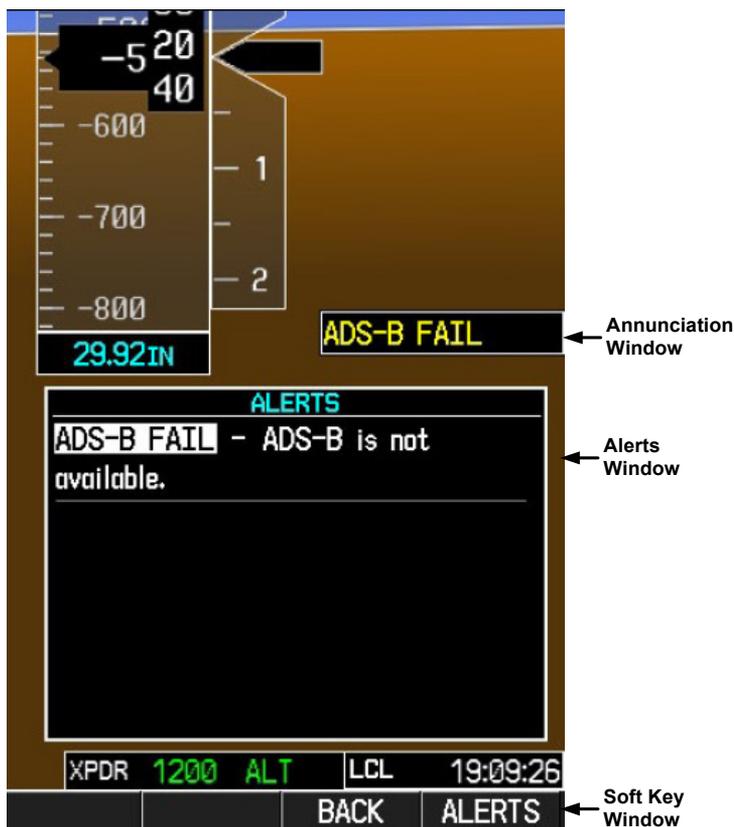


Figure 1-2 Annunciation Display

### 1.2.1 XPDR GND UNAVL Annunciation

When the **GND** soft key is pressed the advisory message will annunciate, indicating that the ground mode is no longer available. This is normal operation with a GTX 3X5 in a G1000 system. Refer to figure 1-3.

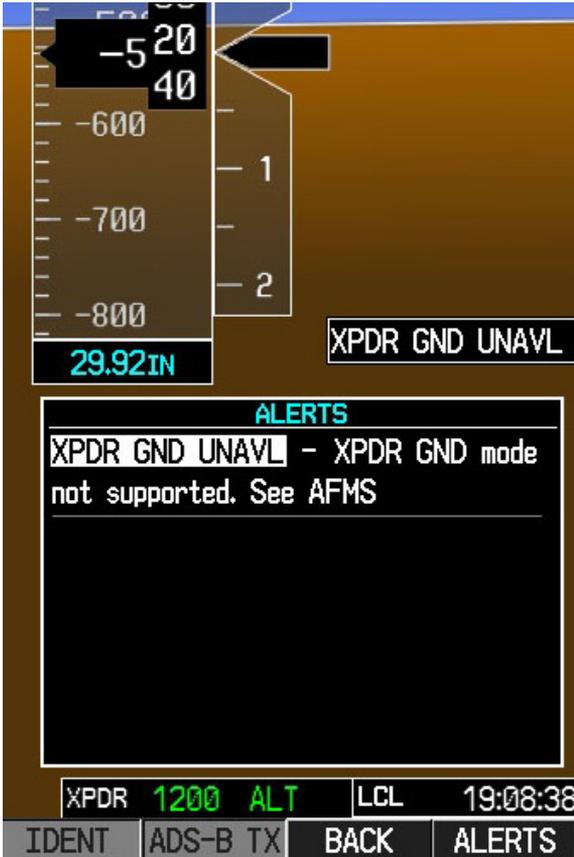


Figure 1-3 XPDR GND UNAVL Annunciation Display

## 1.2.2 ADS-B FAIL Annunciation



### NOTE

*When ADS-B is not transmitting, the aircraft may not be compliant with 14 CFR 91.225; however, the transponder is still working.*

When the GTX 3X5 is installed, transponder ground mode is not pilot selectable. When the **GND** soft key is pressed, “XPDR GND UNAVL” will display as white text in the CAS Window or Aircraft Alerts Window. Refer to figure 1-4.

**XPDR GND UNAVL**

**Figure 1-4 GND Mode Unavailable: CAS or Aircraft Alerts Window**

In the event of degraded GPS or failure of the ADS-B Out, an ADS-B failure is annunciated in one of two ways, depending on aircraft configuration. “ADS-B FAIL” may display as amber text in the CAS Window or Aircraft Alerts Window. Refer to figure 1-5. Or, it may display as a System Message in the Alerts Window or Message Window. Refer to figure 1-6.

**ADS-B FAIL**

**Figure 1-5 ADS-B Failure: CAS or Aircraft Alerts Window**

**XPDR2 ADS-B FAIL – XPDR2 unable  
to transmit ADS-B messages.**

**XPDR1 ADS-B FAIL – XPDR1 unable  
to transmit ADS-B messages.**

*Dual Transponder Installations Only*

**Figure 1-6 ADS-B Failure Alerts or Messages Window**

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## 2 ADS-B IN TRAFFIC (345 ONLY)



### NOTE

*Inherent inaccuracies exist in TIS-B and TAS/TCAS traffic position data. Because of this the GTX 345 may at times be unable to correlate targets from multiple sources for the same aircraft. When this occurs, a single aircraft is tracked and displayed as two co-located targets.*

ADS-B	Data transmitted directly from other aircraft.
ADS-R	Ground station rebroadcast of ADS-B data after data link translation (UAT to 1090 MHz or 1090 MHz to UAT). This function aids aircrafts only operating one frequency.
TIS-B	Ground station broadcast of secondary surveillance radar (SSR) derived traffic.

The GTX 345 receives ADS-B traffic data (ADS-B, ADS-R, TIS-B) through the UAT (978 MHz) and the 1090 MHz receivers. The GTX 345 may also receive traffic data from configured TAS/TCAS/TCAD. Traffic data is received, processed, and outputted to a connected display without pilot interaction. Traffic data may also be displayed on a PED (e.g., tablet) via the built-in Bluetooth interface. Bluetooth is always in pairing mode.

### 2.1 Traffic Integration and Operation

To optimize situational awareness, the GTX 345 correlates TCAD/TAS/TCAS with ADS-B In traffic, combining data from all sources to create the most accurate and comprehensive traffic picture. When a correlation is made, the most relevant target is displayed. There are no duplicates. Any active traffic system, or ADS-B traffic that is not correlated, is also displayed.

When a TAS/TCAS system is installed and interfaced to the GTX 345, the “STANDBY,” “NORMAL,” and “TEST” soft keys are no longer displayed, as pilot control is not required. Refer to figure 2-1 for the ADS-B and TAS/TCAS display.

The active traffic system is automatically placed in standby mode when on the ground, and the display of traffic is through the ADS-B system. When in the air, the active traffic system is automatically placed in operate mode and the display of traffic is through the ADS-B system and (if installed) the aircraft’s active traffic system.

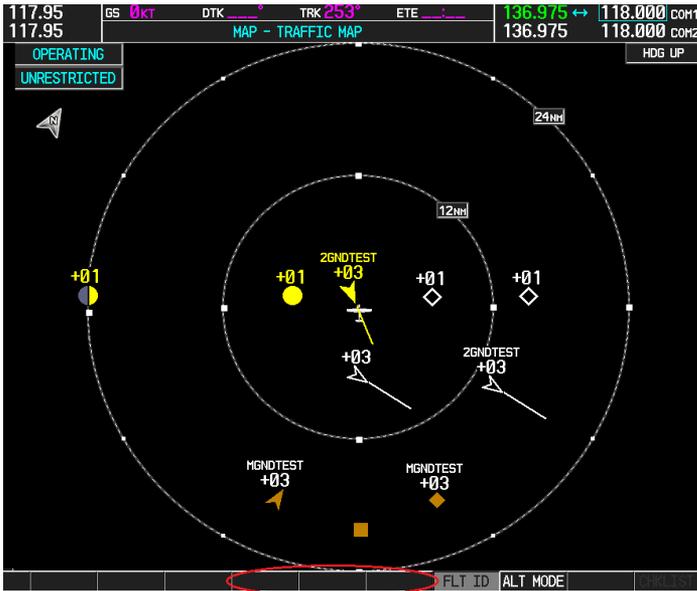


Figure 2-1 Display with ADS-B and TAS/TCAS

### 2.1.1 Traffic Alerting

To enhance situational awareness, the GTX 345 is equipped with traffic alerting on ADS-B, ADS-R, and TIS-B targets. An aural message is issued when an alert becomes active.

For example, “Traffic! Two O’clock, Low, Two Miles.”

To minimize nuisance alerts, the traffic alerting sensitivity adapts, based on altitude above ground level. No aural alerts are given below 500 feet.

### 2.1.2 No Bearing Traffic Alerting (Aural Only)

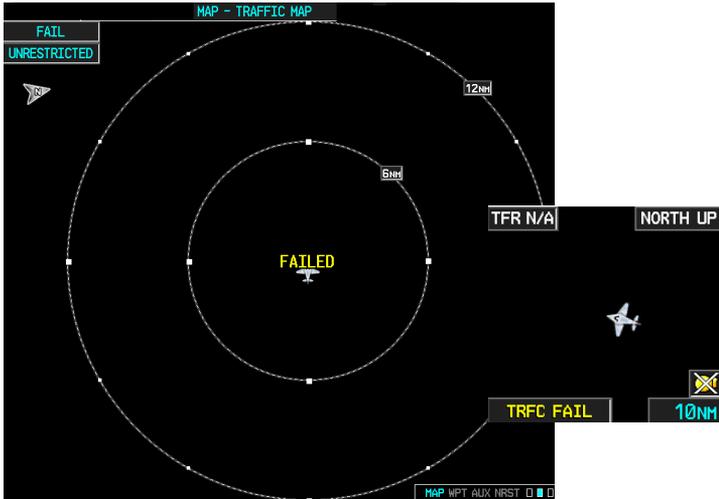
For G1000 installations with a TAS system, alerting for no bearing traffic will only be via aural alert (no visual alert on display).

For example, the aural alert, “Traffic, No Bearing, High, Less than one mile” indicates that there is traffic with no valid bearing, above own altitude and within one mile. Once all traffic is cleared, the system will provide an aural alert, “No bearing traffic clear.”

In some scenarios, such as a landing situation, a no bearing traffic aural alert could play above 500 feet, but if the traffic did not clear until below 500 feet, then no traffic clear aural alert would play.

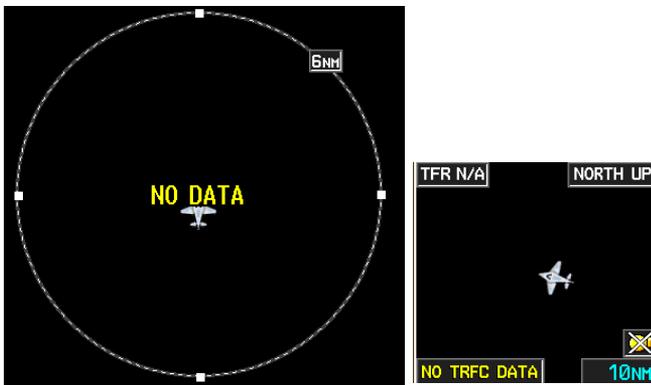
## 2.1.3 Traffic Annunciation

The GTX 345 automatically controls the entire traffic picture. If either the TIS-B or TAS/TCAS system fails, a “FAILED” annunciation will display on the MFD traffic page and PFD inset map. Refer to figure 2-2.



**Figure 2-2 Failed Annunciation on MFD Traffic Page and PFD Inset Map**

If both TIS-B and TAS/TCAS systems are operating normally, but data is not available due to the interface being corrupt or are not properly connected, then “NO DATA” will display on the MFD traffic page and PFD inset map. Refer to figure 2-3.



**Figure 2-3 No Data Annunciation on MFD Traffic Page and PFD Inset Map**

## 2.2 Traffic Picture

The G1000 communicates with the GTX 345 using the GDL 90 protocol. Table 2-1 depicts the possible targets that are generated using this protocol. These include targets from the TAS/TCAS system.

**Table 2-1 GTX 345/GDL 90 Protocol Targets**

	<ul style="list-style-type: none"> <li>• Traffic advisory is without directional information.</li> <li>• Will depict aircraft relative altitude and Flight ID, if available.</li> </ul>
	<ul style="list-style-type: none"> <li>• Traffic Advisory is out of the selected display range.</li> <li>• Displayed at outer range ring at proper bearing.</li> <li>• Will depict aircraft relative altitude and Flight ID, if available.</li> </ul>
	<ul style="list-style-type: none"> <li>• Non-threat, non-directional aircraft.</li> <li>• Will depict aircraft relative altitude and Flight ID, if available.</li> </ul>
	<ul style="list-style-type: none"> <li>• Non-threat traffic with directional information.</li> <li>• Points in the direction of the aircraft track.</li> <li>• Will depict aircraft relative altitude and Flight ID, if available.</li> </ul>
	<ul style="list-style-type: none"> <li>• Traffic advisory with directional information.</li> <li>• Points in the direction of the intruder aircraft track.</li> <li>• Will depict intruder aircraft relative altitude and Flight ID, if available.</li> </ul>
	<ul style="list-style-type: none"> <li>• Traffic located on the ground with directional information.</li> <li>• Ground traffic is only displayed when your aircraft is below 1,000 feet AGL or on the ground.</li> <li>• Will depict aircraft relative altitude and Flight ID, if available.</li> </ul>
	<ul style="list-style-type: none"> <li>• Traffic located on the ground without directional information.</li> <li>• Will depict aircraft relative altitude and Flight ID, if available.</li> </ul>
	<ul style="list-style-type: none"> <li>• Non-aircraft traffic, i.e. equipped ground vehicles.</li> <li>• Ground traffic is only displayed when your the aircraft is below 1,000 feet AGL or on the ground.</li> </ul>

### 3 FIS-B WEATHER AND FLIGHT INFORMATION (345 ONLY)



#### NOTE

*FIS-B weather is only supported if GDU software v12.00 or later, and GIA software v6.20 or later, is in use.*

The GTX 345 Flight Information Services–Broadcast (FIS-B) function is capable of receiving weather and flight information. FIS-B is a subscription-free service that is broadcast over the UAT (978 MHz) data link. Reception of FIS-B data requires the aircraft to be within range and line-of-sight of a ground station. Because terrain may obstruct the signal, it may be necessary to gain altitude in order to receive the broadcast. For information regarding the display of weather data and the associated symbology, refer to the display operator's guide. Table 3-1 lists FIS-B weather products and the timing associated with each.

Transmission interval is how often the weather product is broadcast by the ground stations. Update interval is how often the weather product is refreshed with new data from on-ground sensors.

**Table 3-1 G1000 Supported FIS-B Weather Products**

Weather Product	Expiration Time (Minutes)	Transmission Interval (Minutes)	Update Interval (Minutes)
CONUS NEXRAD	60	15	1
Regional NEXRAD	30	2.5	5
METARS	90	5	As available, 1 minute typically $\leq$ 20 minutes
TAFs	60	10	8

### 3.1 Weather Source Selecting

The system uses the selected data link weather source for all maps the data link is displayed.

#### To View a Weather Data Link Page:

1. Turn the large **FMS** Knob to select the Map Page Group.
2. Turn the small **FMS** Knob to select the Weather Data Link (XM or FIS-B) Page.

To change the weather data link source:

3. Press the **Menu Key**.
4. Turn the small **FMS** Knob to select either "Display XM Weather" or "FIS-B Weather," then press the **ENT** key.



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