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# Pilot's Operating Handbook

for

429

## GPS STEERING (GPSS) CONVERTER



**S-TEC Corporation**

## REVISIONS

List of Effective Pages

\* The asterisk indicates the pages changed, added, or deleted by the current change

Record of Revisions

Retain this record in the front of this manual. On receipt of revisions, insert revised pages in the manual and enter date inserted and initials.

| REV NO | REVISION DATE | INSERTION DATE/BY | SB NUMBER | REV NO | REVISION DATE | INSERTION DATE/BY | SB NUMBER |
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**NOTES**

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## INTRODUCTION

The primary purpose of the GPS Steering (GPSS) Converter **Pilot Operating Handbook (POH)** is to provide pilots with step-by-step functional Preflight and In-Flight Operating Procedures for the installed system.

### Notice

This manual may be used in conjunction with FAA approved autopilot Airplane Flight Manual Supplement (AFMS), Pilots Operating Handbook Supplement (POHS), or Supplemental Flight Manual (SFM). Refer to the specific AFMS, POHS or SFM for your aircraft specific information and emergency operating procedures.

If the autopilot is to be used during Instrument Flight Rules (IFR) operations, we recommend that you develop a thorough understanding of the autopilot system, its functions and characteristics in Visual Meteorological Conditions (VMC). Accomplish this before undertaking a Visual Flight Rules (VFR) flight.

## THEORY OF OPERATION

### General

The 429 Global Positioning System Steering (GPSS) Converter is an autopilot accessory that enables a pilot to switch between heading and GPS navigational signals. The converter provides direct digital coupling between the GPS navigator and the autopilot using an accessory unit that is compatible with select S-TEC autopilots.

During normal flight operations, the GPSS Converter can be switched between the heading and GPSS modes of operation. In the heading mode, the converter receives a heading error signal from the heading bug on the Horizontal Situation Indicator (HSI) or Directional Gyro (DG). The converter processes this information and sends this heading error directly to the autopilot. In the GPSS mode, the converter receives ground speed and bank angle digital signals (429 Data) that are calculated and converted to a commanded turn rate. The turn rate is then scaled and converted to a DC heading error signal that is compatible with S-TEC autopilots. The end result is an autopilot that can be directly coupled to the roll steering commands produced by the GPS Navigator, eliminating the need for the pilot to make any further adjustments to the HSI course arrow or the DG's heading bug.

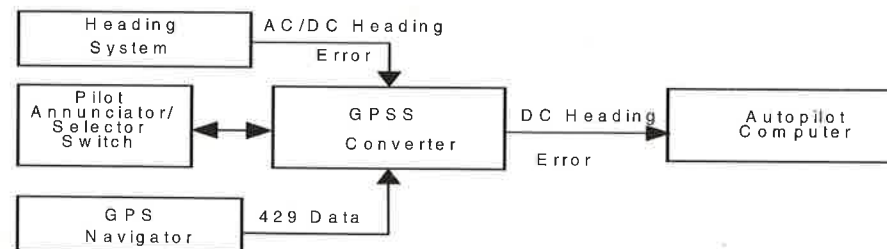


Fig. 1 GPSS Converter Operation

## GPSS Converter

The GPSS Converter accepts either 14 or 28 VDC power input that enables it to switch between the Heading (HDG) and GPSS modes of operation. The switch, a momentary push button, is equipped with both a HDG and a GPSS indicator. The unit illuminates the proper indicator according to the current mode of operation. The pilot can switch between modes by simply pushing the button. If the unit is in the HDG mode, autopilot HDG operation will be normal. During flight, if the pilot selects the GPSS mode and valid 429 data is present, the autopilot will begin to track to the GPS waypoint. If the unit is in the GPSS mode of operation and valid 429 data is lost, or if GPSS is selected and no valid GPSS signal is available, the GPSS indicator will flash to indicate a problem. The aircraft will immediately go wings level until the pilot can program a valid GPS flight plan or switch the unit to the HDG mode.

## Interfacing With Existing Autopilots

For S-TEC autopilots that do not have a dedicated 429 GPSS data input channel, the autopilots heading channel is used. The heading channel will limit the commanded turn to 90% of a standard rate turn. The 429 GPSS Converter is configured as necessary to accommodate variations in the aircraft's heading system and the autopilot is configured to accept the standard DC Heading Error Signal.



Fig. 2 GPSS 429 Data Input

## Configuration

The GPSS Converter comes in three different configurations; horizontal mount, vertical mount, and a panel switch with a remotely located converter unit. In the first configuration, the GPSS is horizontally positioned with the switch extending through the instrument panel. Configuration two is the same as configuration one, except the unit is mounted vertically. In the third configuration, the switch is mounted on the instrument panel with the converter unit remotely located. The system responds the same regardless of configuration.



The three configurations of the GPSS Converter



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## PRE-FLIGHT PROCEDURES

**NOTE:** The GPSS Converter requires either 14 or 28 VDC as input power.

1. Place aircraft master and avionics switches to on.

**NOTE:** When aircraft power is applied, the HDG lamp on the GPSS panel switch will illuminate. This indicates that the autopilot, when turned on, will operate normally in heading mode, when selected.

2. Place the autopilot master switch to on.
3. Select the HDG mode on the autopilot after the ready (RDY) annunciator appears.
4. Move the DG or HSI heading bug left and right. The control wheel should smoothly follow the HDG bug movement.
5. Activate a valid GPS waypoint or flight plan on the GPS Navigator.
6. Press and release the GPSS switch, the HDG lamp goes out and the GPSS lamp flashes. The HDG bug will no longer move the control wheel.

**NOTE:** The GPSS steering function cannot be ground tested even though a valid GPS Steering Signal is present on the GPS Navigator due to the missing ground speed component.

7. Disconnect the autopilot.

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## IN-FLIGHT PROCEDURES

1. Select the heading mode on the GPSS Converter.
2. Select the autopilot lateral modes as desired; autopilot operation is normal with the GPSS Converter in the HDG mode.
3. Tune the GPS Navigator to a valid waypoint or select a published approach on the navigator.
4. Select the HDG mode on the autopilot. (The autopilot must be in the HDG mode for the GPSS to function).
5. Select the GPSS mode on the panel-mounted switch. The autopilot should immediately turn the aircraft toward the desired course to the waypoint.

**NOTE:** If the GPSS lamp flashes when engaged, it indicates either:

1. The GPS Navigator is not on or does not have an active waypoint or flight plan.
2. The bank angle and ground speed signals are not being received or may not be valid.

**NOTE:** No further inputs from the HDG bug or course pointer are required when operating in the GPSS mode.

6. Monitor GPSS tracking quality during GPSS operations.

**NOTE:** If the GPSS lamp begins to flash, the aircraft will go wings level within .5 to 2 seconds. At this time the pilot can either enter a valid GPS waypoint or press and release the GPSS switch to return the autopilot to the HDG mode.

## EMERGENCY OPERATING PROCEDURES

In the event of a malfunction of the GPSS Converter or any time it is not performing as expected, do not attempt to identify the system problem. Immediately regain control of the aircraft by disabling and disconnecting the autopilot as necessary. Do not attempt to use the GPSS function until the problem has been identified and corrected.

**NOTE:** A GPSS malfunction will most likely affect the autopilots heading mode rendering it unusable. However, it may be possible to use the other autopilot lateral modes such as navigation (NAV) or approach and the pitch modes, if so equipped. Exercise caution when examining the use of these functions after a GPSS malfunction.

## GPSS CONVERTER SYSTEM REQUIREMENTS

|                                      | Horizontal/Vertical                                                                                    | Remote                                                                                   |
|--------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| <b>Power Required</b>                | 14/28 VDC                                                                                              | 14/28 VDC                                                                                |
| <b>Weight</b>                        | <b>Horizontal/Vertical</b><br>.25 lbs.                                                                 | <b>Remote Switch</b><br>.05 lbs.<br><b>Remote Unit</b><br>.25 lbs.                       |
| <b>Current Requirements</b>          | 200 mA                                                                                                 | 200 mA                                                                                   |
| <b>Dimensions</b>                    | <b>Horizontal Converter</b><br>3.6D X 2.28W X 1H<br><br><b>Vertical Converter</b><br>3.6D X 1W X 2.28H | <b>Remote Switch</b><br>1D X .8W X 1.3H<br><br><b>Remote Converter</b><br>4D X 3.4W X 1H |
| <b>Technical Specification Order</b> | C9c                                                                                                    | C9c                                                                                      |

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## LIST OF ACRONYMS

|             |                                    |
|-------------|------------------------------------|
| <b>D</b>    | Depth                              |
| <b>DC</b>   | Direct Current                     |
| <b>DG</b>   | Directional Gyro                   |
| <b>GPS</b>  | Global Positioning System          |
| <b>GPSS</b> | Global Positioning System Steering |
| <b>H</b>    | Height                             |
| <b>HDG</b>  | Heading                            |
| <b>HSI</b>  | Horizontal Situation Indicator     |
| <b>lbs.</b> | pounds                             |
| <b>mA</b>   | milli amps                         |
| <b>NAV</b>  | Navigation                         |
| <b>POH</b>  | Pilot's Operating Handbook         |
| <b>P/N</b>  | Part Number                        |
| <b>RDY</b>  | Ready                              |
| <b>VDC</b>  | Volts Direct Current               |
| <b>W</b>    | Width                              |