GRT Autopilot

Autopilot Modes
All GRT EFIS Models

April 2011
Rev. C
Initial Release

Grand Rapids Technologies, Inc.
3133 Madison Avenue SE
Wyoming MI 49548
616-245-7700
www.grtavionics.com

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FORWARD

Welcome to Grand Rapids Technologies' GRT Autopilot! We are pleased that you have chosen our product to meet your flying needs.

Visit the Grand Rapids Technologies (GRT) website (**www.grtavionics.com**) for the latest updates and supplemental information concerning the operation of this and other GRT products.

This manual describes the operation and modes of a **GRT Autopilot/EFIS** using the software version shown in the Record of Revisions. Some differences may be observed when comparing the information in this manual to other software versions. Every effort has been made to ensure that the information in this manual is accurate and complete. GRT is not responsible for unintentional errors or omissions in the manual or their consequences.

Information in the document is subject to change without notice. Grand Rapids Technologies reserves the right to change or improve their products and to make changes in the content of this material without obligation to notify any person or organization of such changes or improvements.

CAUTIONS

WARNING: Improper installation of GRT autopilot servos and improper use of the GRT Autopilot/EFIS may cause flight control system lock and/or loose of aircraft control resulting in injury or death. An understanding of the flight control system, servo installation and operation of the autopilot/EFIS is crucial to minimize this risk.

WARRANTY

"Satisfaction" Guarantee

If for any reason you are unhappy with your GRT product, you may return it for a full refund anytime during the first 60 days you own it.

Limited Warranty

All GRT products include a 2-year warranty starting on the day the instrument is put into service (or 3 years after purchase, whichever comes first) against manufacturer defect.
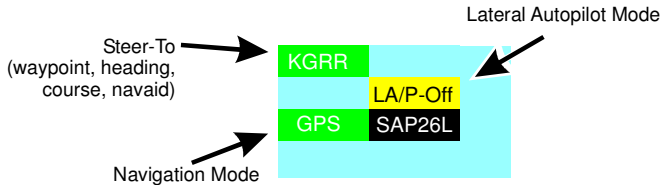
RECORD OF REVISIONS

Rev	Date	AP SW Rev	Change(s)
C	April 2011	16	Initial Release

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Lateral Nav and Autopilot Status Indicators

This example shows a steer-to of KGRR, lateral autopilot off (no power to servo), nav mode of GPS, and synthetic approach is armed to runway 26L.
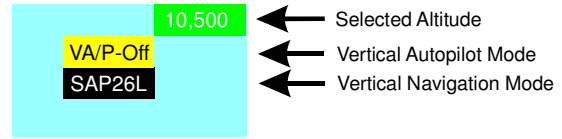
Steer-To (waypoint, heading, course, navaid) → **KGRR**

Lateral Autopilot Mode → **LA/P-Off**

GPS **SAP26L**

Navigation Mode →

This column indicates the active status.

This column indicates pending or inactive status.

Vertical Nav and Autopilot Status Indicators

This example shows a selected altitude of 10,500 feet, vertical autopilot is off, and the synthetic approach is armed to 26L.
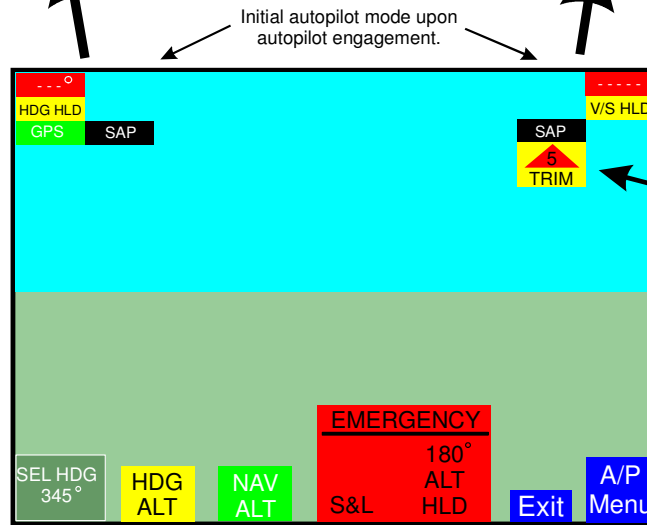
10,500 ← Selected Altitude

VA/P-Off ← Vertical Autopilot Mode

SAP26L ← Vertical Navigation Mode

This column indicates pending or inactive status.

This column indicates the active status.

Initial autopilot mode upon autopilot engagement.
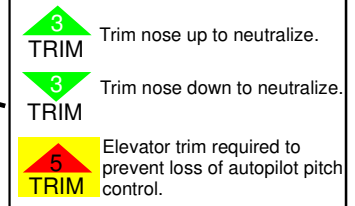
A/P Softkey menu will appear on all display units that not on a "Set Menu" page when the autopilot is engaged. The A/P can not be engaged if only set menu pages are selected on all display unit(s).

Softkeys do not function for one second after this menu appears to safeguard against inadvertent mode selection.

Elevator Trim Indicator

3 TRIM (green, up) — Trim nose up to neutralize.

3 TRIM (green, down) — Trim nose down to neutralize.

5 TRIM (red/yellow) — Elevator trim required to prevent loss of autopilot pitch control.

Display:
- - - °
HDG HLD
GPS **SAP**

- - - - -
V/S HLD
SAP
5 TRIM

SEL HDG 345° | **HDG ALT** | **NAV ALT** | **EMERGENCY** | **Exit** | **A/P Menu**

EMERGENCY
180° ALT HLD
S&L

Turn to set heading. (Press to set to current heading.)

Push or turn to select A/P softkeys or set altitude

HDG/ALT - Shortcut to set LA/P mode to HDG and VA/P mode to AUTO and will use current selected heading and altitude with climb/descent selections.

NAV/ALT - Shortcut to set LA/P mode to NAV and VA/P mode to AUTO and will use current altitude and climb/descent selections. Box color will correspond to current nav mode.

S&L - Sets LA/P mode to heading select, heading bug to current heading, selected altitude to current altitude. Useful also as a shortcut for heading select/altitude hold mode.

180/ALT HLD - Sets LA/P mode to heading select, heading bug to 180 degrees from current heading. Set VA/P mode to AUTO and altitude selection to current altitude. Allows for emergency 180 degree left turn.

Menu does not time out. Exit allows remaining in HDG/VS Hold mode.

Upon autopilot engagement, the autopilot mode set to vertical speed hold and heading hold. Selected heading and altitude will not apply. In this mode, the autopilot will simply attempt to hold the current vertical speed and heading indefinitely. Full autopilot mode selections are available on the "A/P Menu" selected with the right knob, but shortcuts to commonly used autopilot modes are also provided here.

Autopilot Shortcut Menu

Active Status Indicators   Pending or Inactive Status Indicators

Steer-To : This field indicates where the airplane is being steered using PFD navigation symbology, the flight director (if on), and the autopilot. Possible indications are:

`KGRR`

`345`

`119.1`

`GRR`

`230`

`- - -°`

Waypoint ID - GPS Navigation Mode
Selected Heading - When lateral autopilot mode is heading, or when the lateral autopilot mode is "NAV", but no valid navigation data is available.
Navaid Frequency - When the navigation mode is nav radio and the approach has not been armed.
Navaid Identifier - When the nav mode is nav radio and the approach has been armed.
GPS Course (typically after passing the last waypoint in a gps flight plan)
"___" - When the navigation mode is GPS, but no flight plan is active.
Dashes - Displayed when no steer-to is defined, such as HDG HLD mode.

Lateral Autopilot Mode : This field indicates the status of the lateral autopilot. Possible indications are:

`LA/P-Off`

`LA/P-Rdy`

`HDG HLD`

`NAV`

`HDG`

`CRS`

`GPSS`

`NAV` `GPSS`

LA/P-Off - Indicates power to the GRT servo is off or no serial communication has been detected. Envelope protection assist modes will be unavailable.
LA/P-Rdy - Indicates the GRT servo is ready and will function when engaged. Envelope protection assist modes may also be active.
HDG HLD - The autopilot has been engaged, but no mode has been selected.
NAV - The lateral autopilot is coupled to the current EFIS navigation mode. Color coding of this indicator will match the EFIS navigation mode.
HDG - The lateral autopilot mode is coupled to the heading bug. This mode is annunciated in yellow to clearly distinguish that steering is not to the navigation source.
***CRS** - The lateral autopilot mode is coupled to the course selection.
GPSS - Same as GPS mode except that the roll steering commands from the GPS are being sent to the autopilot allowing the EFIS to following GPS derived procedure turns and holds as well as the flight plan.

Note that when using the GRT Autopilot Servos, the EFIS is aware of the autopilot being engaged or disengaged, and the indication will move left or right appropriately. For non-GRT autopilot equipped airplanes, the EFIS do not know if the autopilot is engaged, and thus the indicator will always be show in the right column, and the "Off" and "Rdy" indication will not exist.

EFIS Navigation Modes : This field indicates the navigation data source used to drive the PFD steering symbology and which is provided to the autopilot when it is in NAV mode. Possible indications are:

`GPS` `GPS Lost`

`LOC` `LOC`

`VOR` `VOR`

`SAP10L` `SAP10L`

`LPV` `LPV`

`LOC2` `LOC2`
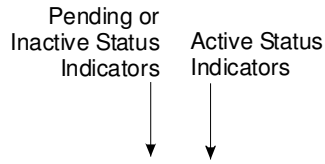
`VOR2` `VOR2`

GPS
LOC
VOR
SAPxxx - Synthetic Approach mode to runway xxx.
LPV - GPS LPV (Localizer Performance with Vertical guidance) lateral guidance.

Note: When two navigation radios are installed, nav radio 2 will be identified with cyan.

Lateral Navigation and Autopilot Modes

Pending or
Inactive Status
Indicators

Active Status
Indicators

`11,500`
`-----`
`1,450`

Selected Altitude : This field displays the altitude target for the vertical autopilot functions. If a condition exists where no selected altitude applies, the field will contain dashes. In VNAV mode, this field indicates the decision altitude if one has been specified (dashes otherwise). It color will correspond to the navigation source. Note that the autopilot will not level off at the decision altitude.

Vertical Autopilot Mode (VA/P) : This field indicates if the autopilot is enganged or not, and if so, how it is controlling the airplane. Possible indications are:

`VA/P-Off`
`VA/P-Rdy`
`VS+1200`
`VS HLD`
`IAS 125`
`ALT HLD`
`VNAV`
`SUSP`

VA/P Off
VA/P Rdy
VS xxxx
VS Hold
IAS xxx
Alt Hold
VNAV (color corresponds to vertical guidance source)
SUSP - The pitch control is suspended (pitch servo disengaged) because the roll angle is excessive.

Vertical Navigation Mode : This field is only present when the pilot has armed or activated a vertical navigation source for coupling to the vertical autopilot. Possible indications are:

`G/S  G/S`
`LPV  LPV`
`SAP  SAP`
`G/S  G/S2`

G/S   - Glideslope
LPV - GPS LPV (Localizer Performance with Vertical guidance) glideslope
SAP - EFIS Derived synthetic approach glideslope

Note that glideslope from nav radio 2 is indicated with a cyan background.

Vertical Navigation and Autopilot Modes