400/500 SERIES
PILOT'S GUIDE ADDENDUM
Fault Detection and Exclusion (FDE) Interface

NOTE: This addendum assumes the user has experience operating the applicable 400/500 Series Unit and is familiar with the operation of RAIM. The figures in this Addendum apply to the GNS 430. The same information applies to the other 400/500 units unless otherwise stated.

FAULT DETECTION AND EXCLUSION (FDE)

The GARMIN 400/500 Series Main and GPS Software version 3.00 and higher (Figure 1) incorporate Fault Detection and Exclusion (FDE) display interface and control, satisfying the requirements for "GPS as a Primary Means of Navigation for Oceanic/Remote Operations" per FAA Notice N8110.60.

FDE consists of two distinct parts, fault detection and fault exclusion. The fault detection part detects the presence of an unacceptably large pseudorange error (and presumably, position error) for a given mode of flight. Upon the detection, fault exclusion follows and excludes the source of the unacceptably large pseudorange error, thereby allowing navigation to return to normal performance without an interruption in service. To enhance safety, FDE functionality is provided for other phases of flight (non-precision approach, terminal, en route). The FDE functionality for non-oceanic flight phases adheres to the same missed alert probability, false alert probability, and failed exclusion probability specified by N8110.60.

The following 400/500 Series Units are affected:

- GPS 400
- GNC 420/420A
- GNS 430/430A
- GPS 500
- GNS 530/530A

Figure 1.

PRE-DEPARTURE VERIFICATION OF FDE

An FDE prediction must be performed prior to departure for a flight plan involving Oceanic/Remote operation where GPS is to be the sole source of navigation. Prior to departure, the operator must use the FDE Prediction Program supplied with the 400/500 Trainer Software to demonstrate that there are no outages in the capability to navigate on the specified route of flight (the FDE Prediction Program determines whether the GPS constellation is robust enough to provide a navigation solution for the specified route of flight). Refer to the instructions that came with your 400/500 Trainer Software for complete details on using the FDE Prediction Program.

FDE INTERFACE AND CONTROL

• **RAIM Prediction—**The RAIM prediction user-interface remains the same for all units in the 400/500 Series. RAIM is an acronym for Receiver Autonomous Integrity Monitoring, a GPS receiver function that performs a consistency check on all tracked satellites. RAIM ensures that the available satellite geometry will allow the receiver to calculate a position within a specified protection limit (2 nautical miles for oceanic and en route, 1 nm for terminal, and 0.3 nm for non-precision approaches).

During oceanic, en route and terminal phases of flight will be available nearly 100% of the time. Because of the tighter protection limits on approaches, there may be times when RAIM is not available. The 400/500 Series Unit automatically monitors RAIM and will warn you with an alert message (see the applicable Pilot's Guide) when it is not available, and the INTEG annunciator will appear at the bottom left corner of the screen. If RAIM is not available when crossing the FAF, the pilot must fly the missed approach procedure. The unit's RAIM prediction function will also allow you to see whether RAIM will be available for a specified date and time. ***NOTE: If RAIM is not predicted to be available for the final approach course, the approach will not become active-as indicated by an "Approach is not active" message, a "RAIM not available from FAF to MAP" message and the INTEG annunciator.***

• **CDI/Alarms—**allows you to define the scale for the GNS 430's on-screen course deviation indicator. The scale values represent full scale deflection for the CDI to either side. The default setting is "Auto". At this setting, the CDI scale is set to 5 nm during the en route and oceanic/remote phases of flight. Within 30 nm of your destination airport the CDI scale gradually ramps down to 1.0 nm (terminal area). Likewise when leaving your departure airport the CDI scale is set to 1.0 nm and gradually ramps up to 5 nm beyond 30 nm (from the departure airport). Oceanic flight phase (OCN) begins when the aircraft is more than 200 nm from the nearest airport.

During approach operations the CDI scale gradually ramps down even further, to 0.3 nm. This transition normally occurs within 2.0 nm of the final approach fix (FAF). If a lower CDI scale setting is selected (i.e., 1.0 nm or 0.3 nm) the higher scale settings will not be selected during ANY phase of flight. For example, if 1.0 nm is selected, the GNS 430 will use this for the en route and terminal phase and ramp down to 0.3 nm during an approach. Note that the Receiver Autonomous Integrity Monitoring (RAIM) protection limits listed below follow the selected CDI scale and corresponding modes:

CDI Scale	**RAIM Protection** (no display)
Auto (oceanic)	4.0 nm
±5.0 nm or Auto (en route)	2.0 nm
±1.0 nm or Auto (terminal)	1.0 nm
±0.3 nm or Auto (approach)	0.3 nm

An "Auto" ILS CDI selection allows the GNS 430 to automatically switch the external CDI from the GPS receiver to the VLOC receiver, when established on the final approach course. Or, select "manual" to manually switch the external CDI connection, as needed. An arrival alarm, provided on the CDI / alarms page, may be set to notify you with a message when you have reached a user-defined distance to the final destination (the direct-to waypoint or the last waypoint in a flight plan). Once you have reached the set distance (up to 99.9 units), an "Arrival at [waypoint]" message will be displayed.

Figure 2. CDI Enroute/Oceanic (OCN) Scale

CDI SCALE CHANGE

The GNS 430 will begin a smooth CDI scale transition from the 5.0 nm (enroute/oceanic mode) to the 1.0 nm (terminal mode) scale 30 nm from the destination airport (see Figure 2). The CDI scale will further transition to 0.3 nm (approach mode) at 2 nm prior to the FAF during an active approach. If you are in a missed approach situation, and would like to return the CDI to the 1 nm scale, activate the missed approach sequence by pressing the OBS key. The CDI scale will also be 1.0 nm (terminal mode) within 30 nm of the departure airport.

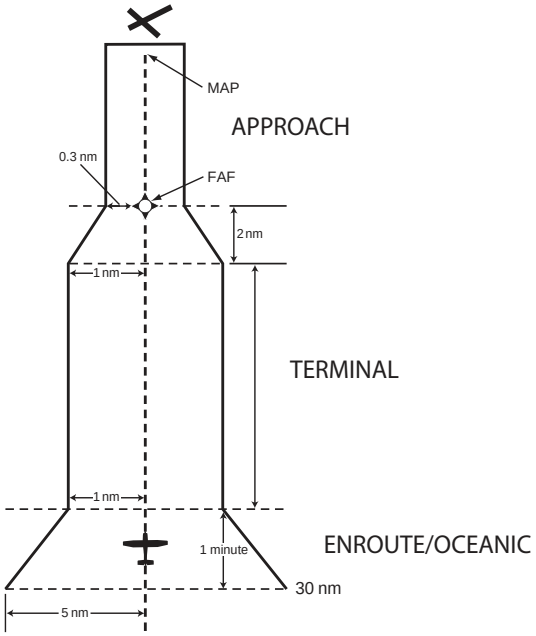

Figure 2. CDI Scale Transition

SATELLITE STATUS PAGE

The Satellite Status Page in Figure 3 shows satellite number 9 exclusion during oceanic phase of flight. No message notifying the user of exclusion appears. In addition to the EPE and DOP fields, there is the Horizontal Uncertainty Level (HUL) field which displays a 99% confidence level that the aircraft position is within a circle with radius of the value displayed in the HUL field.

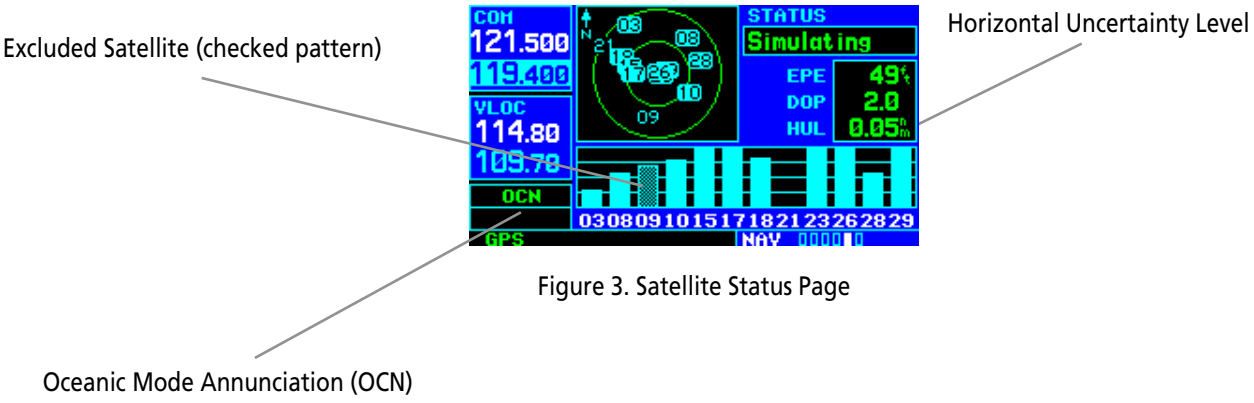

Figure 3. Satellite Status Page

NAV Terms

The following acronyms have been added to each of the 400/500 Pilot's Guides: FDE-Fault Detection and Exclusion; and OCN-oceanic.

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