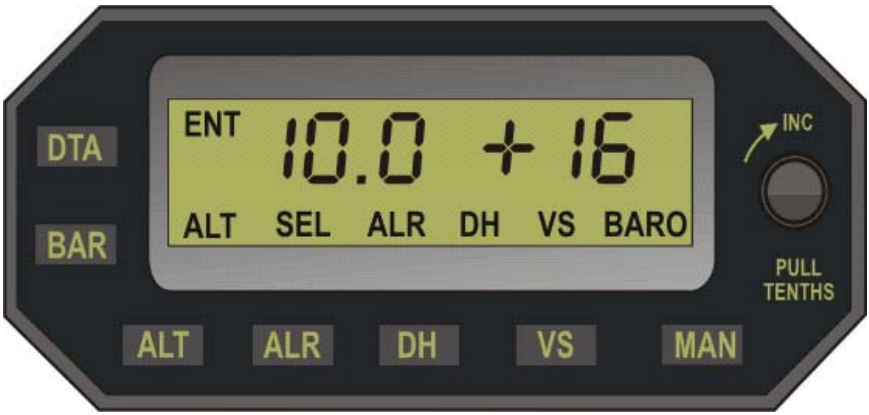
S-TEC

Pilot's Operating Handbook

ST|360



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1.1 Document Organization

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1.2 Purpose

This Pilot's Operating Handbook (POH) provides Pre-Flight and In-Flight operating procedures for the S-TEC ST-360 Altitude (ALT) / Vertical Speed (VS) Selector / Alerter.

Note:

This POH must be carried in the A/C and made available to the pilot at all times. It can only be used in conjunction with the Federal Aviation Administration (FAA) approved Aircraft Flight Manual (AFM) or Aircraft Flight Manual Supplement (AFMS). Refer to the applicable AFM or AFMS for A/C specific information, such as unique ground tests, limitations, and emergency procedures.

Note:

The Selector / Alerter is a tool provided to aircraft owners, that serves to assist them with cockpit workload management. The ability of the Selector / Alerter to provide optimum assistance and performance is directly proportional to the pilot's knowledge of its operating procedures. Therefore, it is highly recommended that the pilot develop a thorough understanding of the Selector / Alerter and its operating procedures in Visual Meteorological Conditions (VMC), prior to using it under Instrument Flight Rules (IFR).

1.3 General Control Theory

The Selector / Alerter can be used with the following S-TEC autopilots:

System Fifty Five X

System Sixty Two

System Sixty Five

Pitch Stabilization System (PSS)

The Encoding Altimeter / Blind Encoder sends the encoded altitude to the Selector / Alerter. The encoded altitude must be converted to the true altitude, through barometric calibration.

The selected altitude and selected vertical speed must be programmed into the Selector / Alerter. Thereafter, upon engaging the autopilot's vertical speed mode and arming its altitude hold mode, the aircraft will attain and hold the selected vertical speed. As the aircraft approaches the selected altitude, a scheduled reduction in the selected vertical speed will automatically occur. This enables the aircraft to transition from vertical flight to altitude capture, without adverse acceleration. Once the selected altitude has been captured, the autopilot's vertical speed mode will disengage and its altitude hold mode will engage. The aircraft will then hold the selected altitude.

1.4 Block Diagram

The Selector / Alerter Block Diagram is shown in Fig. 1-1.

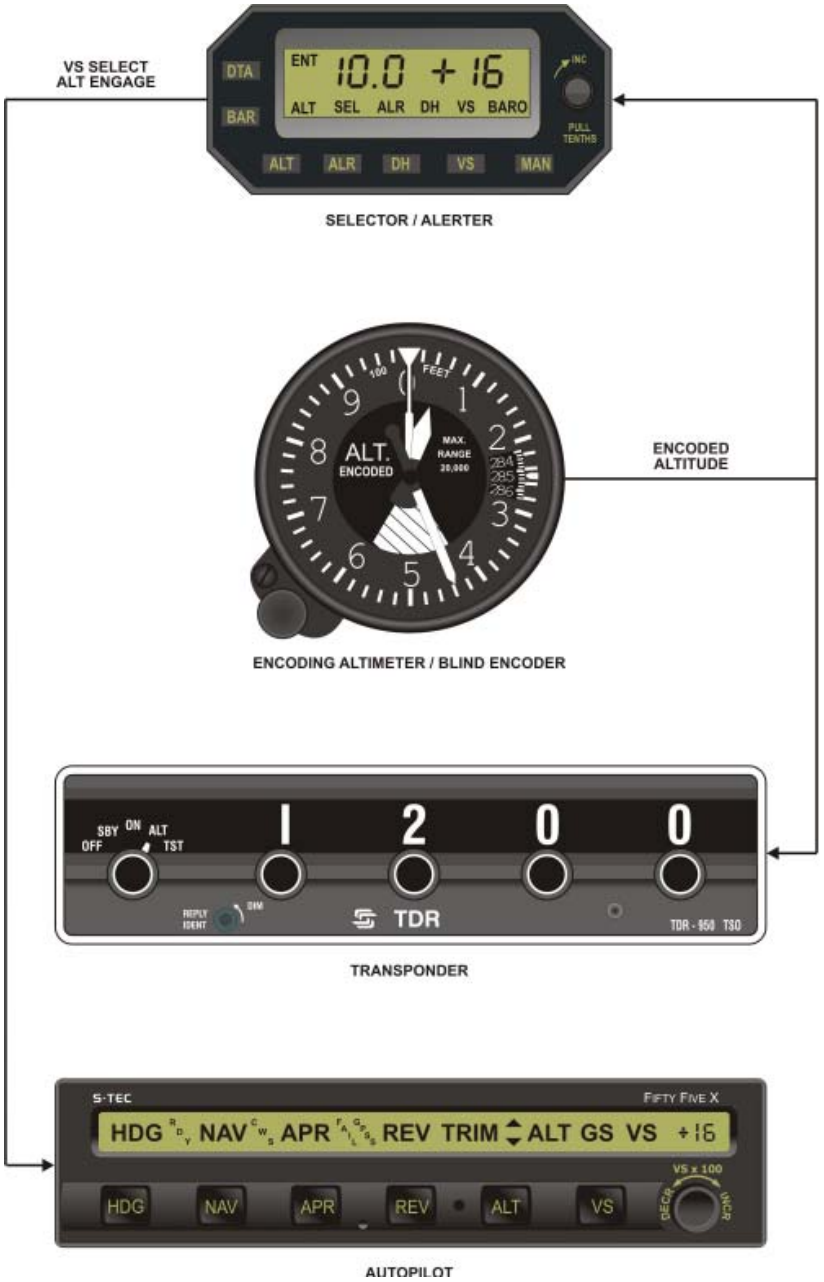

Fig. 1-1. ST-360 ALT / VS Selector / Alerter Block Diagram

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SECTION 2
PRE-FLIGHT PROCEDURES

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2.1 Pre-Flight Test

Prior to takeoff and with engine running, perform the actions shown in Table 2-1. For each action, verify the corresponding response where applicable.

Table 2-1. Pre-Flight Test (continued on page 2-4)

ACTION	RESPONSE
1. Set Battery Master Switch to ON position.	------
2. Set Avionics Master Switch to ON position.	------
3. Set Transponder Master Switch to ON position.	------
4. Set Encoding Altimeter / Blind Encoder Master Switch to ON position.	------
5. Set Autopilot Master Switch to ON position.	------
6. Complete Autopilot Pre-Flight Procedures contained in respective POH.	------
7. Set ALT Alerter Master Switch to ON position.	A two-tone audible alert sounds once. All left numeric segments, all right polarity / numeric segments, and all annunciations (ENT, ALT, SEL, ALR, DH, VS, BARO) appear on Selector / Alerter display for 5 seconds, as shown in Fig. 2-1. Thereafter, only ENT annunciation and left numeral 29.9 (barometric pressure in inches mercury) appear, along with a flashing BARO annunciation, as shown in Fig. 2-2.

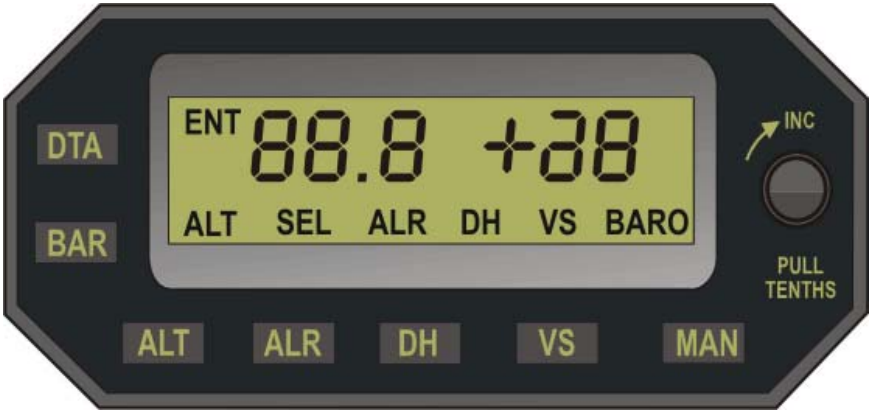

Fig. 2-1. Selector / Alerter Display, All Segments and Annunciations Appear

Fig. 2-2. Selector / Alerter Display, Enter Barometric Correction

Table 2-1. Pre-Flight Test (continued from page 2-3)

ACTION	RESPONSE
8. Set Altimeter to posted airport elevation.	------
9. Rotate Selector / Alerter Modifier Knob as required, until barometric pressure (inches of mercury) on display matches that shown on Kollsman scale of Altimeter. *Note:* *To convert barometric pressure to millibars, press Selector / Alerter BAR switch once.*	------
10. Press Selector / Alerter ALT switch.	------
11. Rotate Selector / Alerter Modifier Knob as required, until altitude on left numeric field of display is 400 feet above airport elevation.	------
12. Press Selector / Alerter VS switch.	------
13. Rotate Selector / Alerter Modifier Knob as required, until vertical speed polarity on right numeric field of display is positive (+).	------
14. Press Selector / Alerter ALT switch.	------
15. Set Heading Bug on DG or HSI under Lubber Line. *Note:* *This may not apply to the System Sixty PSS.*	------

Table 2-1. Pre-Flight Test (continued from page 2-5)

ACTION	RESPONSE
16. Press Autopilot HDG mode selector switch to engage heading mode. *Note:* *This may not apply to the System Sixty PSS.*	HDG annunciation appears on Autopilot display.
17. Press/Hold Autopilot VS mode selector switch, and then press ALT mode selector switch to engage vertical speed mode and arm altitude hold mode.	ALT and VS annunciations appear on Autopilot display.
18. Rotate Selector / Alerter Modifier Knob counter-clockwise (CCW) until Autopilot VS annunciation is extinguished.	Selector / Alerter altitude on left numeric field of display is at airport elevation ± 100 feet.
19. Disconnect Autopilot.	------
20. Set Selector / Alerter for desired vertical speed and altitude hold following takeoff (reference section 3.0).	------

SECTION 3
IN-FLIGHT PROCEDURES

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3.1 Selector / Alerter Operation

3.1.1 Data Entry

Press the DTA switch, such that ENT is annunciated. Any of the following quantities can now be entered into the Selector / Alerter:

Barometric Calibration (reference section 3.1.2)

Selected Altitude (reference section 3.1.3)

Selected Vertical Speed (reference section 3.1.4)

Selected Decision Height (reference section 3.1.5)

Whenever ENT is annunciated, the Selector / Alerter is decoupled from the autopilot. In that case, if the Selector / Alerter happens to have vertical speed command authority as indicated on its display, then the autopilot will hold the aircraft at the last selected vertical speed.

Once the particular quantity has been entered, press the DTA switch again to make it operational. The ENT annunciation will extinguish as a result.

Note:

It is not necessary for ENT to be annunciated, in order to enter vertical speed selection changes.

3.1.2 Barometric (BARO) Calibration

The true altitude is the altitude above Mean Sea Level (MSL). The output of an Encoding Altimeter / Blind Encoder is the altitude expressed as a digital Gray Code, relative to the standard barometric pressure of 29.9 inches of mercury (inHg) or 1013 millibars (mb). This output is known as the encoded altitude.

When the Altimeter is set to the true altitude, the barometric pressure at MSL will be shown on its Kollsman scale. The Selector / Alerter must then be calibrated to the Altimeter. This is accomplished by changing the barometric pressure setting on the Selector / Alerter to match the Kollsman scale. As a result, the encoded altitude at the input of the Selector / Alerter is internally converted to the true altitude, for use in making computations.

Following the power-up self test (reference section 2.0), the barometric pressure setting is 29.9 inHg, and ready to be changed to match the Kollsman scale. Rotate the Modifier Knob clockwise (CW) to increase the barometric pressure setting, or counter-clockwise (CCW) to decrease the setting. Each detent changes the setting by 0.1 inHg, regardless of whether the Modifier Knob is pushed-in or pulled-out.

The units of barometric pressure can be changed from inHg to mb, by pressing the BAR switch. Each CW or CCW detent of the Modifier Knob changes the barometric pressure setting by 1 mb, regardless of whether the Modifier Knob is pushed-in or pulled-out. When the setting is greater than 999 mb, the one-thousand digit is not shown. For example, a setting of 1013 mb would appear only as 013. The units of barometric pressure can be changed back to inHg, by pressing the BAR switch again.

Once the barometric pressure setting has been entered, press the DTA switch to make it operational, such that the ENT annunciation is extinguished and the BARO annunciation stops flashing.

To change the barometric setting at times other than immediately following power-up, press the DTA switch such that ENT is annunciated. Then press the BAR switch, such that the BARO annunciation appears flashing. The setting can then be changed using the Modifier Knob as described above. Once the barometric pressure setting has been entered, press the DTA switch again to make it operational, such that the ENT annunciation is extinguished and the BARO annunciation stops flashing.

The Selector / Alerter barometric pressure setting will automatically change to 29.9 inHg or 1013 mb, above an altitude of 18,000 feet (FL 180). Even so, the last setting will continue to appear unchanged. Prior to descending below FL 180, change the barometric pressure setting as required for the new area. Once subsequently at or below FL 180, the Selector / Alerter will automatically reference this setting.

3.1.3 Altitude (ALT) Select

Press the DTA switch (more than once if necessary, depending on the current configuration of the Selector / Alerter), such that ENT and ALT are both annunciated, and the SEL annunciation is flashing. The selected altitude is now ready to be entered. Rotate the Modifier Knob clockwise (CW) to increase the altitude selection, or counter-clockwise (CCW) to decrease the selection. When the Modifier Knob is pushed-in, each detent changes the selection by 1000 FT. When the Modifier Knob is pulled-out, each detent changes the selection by 100 FT.

Once the selected altitude has been entered, press the DTA switch to make it operational, such that the ENT annunciation is extinguished and the SEL annunciation stops flashing.

To display the true altitude, press the ALT switch. The SEL annunciation will extinguish as a result. To go back and display the selected altitude, press the ALT switch again. The SEL annunciation will re-appear as a result.

If the newly selected vertical speed is not compatible with the selected altitude, then the latter will flash for 5 seconds to alert the pilot accordingly. ***There will be no automatic change to the selected altitude.***

Suppose that the aircraft is at an initial altitude of 5,000 FT, with a selected vertical speed of 100 FPM climbing and a selected altitude of 6,000 FT. If the selected vertical speed is subsequently changed to 100 FPM descending, then the selected altitude (6.0 on display) will flash for 5 seconds.

Suppose that the aircraft is at an initial altitude of 6,000 FT, with a selected vertical speed of 100 FPM descending and a selected altitude of 5,000 FT. If the selected vertical speed is subsequently changed to 100 FPM climbing, then the selected altitude (5.0 on display) will flash for 5 seconds.

3.1.4 Vertical Speed (VS) Select

Press the VS switch. The VS annunciation will appear, along with the selected vertical speed. The latter appears as a number in units of FPM x 100, prefixed by either a "+" to indicate a climb, or a "-" to indicate a descent (i.e., for example, +5 indicates 500 FPM climbing). For a climb, rotate the Modifier Knob clockwise (CW) to increase the vertical speed selection, or counter-clockwise (CCW) to decrease the selection. For a descent, rotate the Modifier Knob CCW to increase the vertical speed selection, or CW to decrease the selection.

It is not necessary for ENT to be annunciated, in order to enter the selected vertical speed and for it to be operational. If ENT does happen to be annunciated, then the VS annunciation will flash when the VS switch is pressed. In that case, pressing the DTA switch will cause the ENT annunciation to extinguish, the VS annunciation to stop flashing, and the selected vertical speed to become operational.

The Selector / Alerter now has vertical speed command authority. The ability to command vertical speed from the autopilot controls is disabled. These controls for each respective autopilot are as follows:

System Fifty Five X - Modifier Knob

System Sixty Two - UP Switch and DN Switch

System Sixty Five - UP Switch and DN Switch

Pitch Stabilization System (PSS) - UP Switch and DN Switch

The acknowledgment that its commanded vertical speed is coming from the Selector / Alerter is as follows, for each respective autopilot:

System Fifty Five X - SEL annunciation appears on optional Remote Annunciator

- Current Vertical Speed extinguished (polarity and number)

System Sixty Two - SEL annunciation appears on Programmer/Annunciator

System Sixty Five - SEL annunciation appears on Annunciator

Pitch Stabilization System (PSS) - No Acknowledgment

To revert vertical speed command authority back to the autopilot controls, press the MAN switch. This will be acknowledged by the Selector / Alerter, through the extinguishment of its VS annunciation and selected vertical speed.

During a climb or descent, a scheduled reduction in the selected vertical speed will automatically occur as the aircraft approaches the selected altitude. This enables the aircraft to transition from vertical flight to altitude capture, without adverse acceleration.

The selected vertical speed will decrease in increments, as the aircraft arrives at fixed displacement points from the selected altitude. The result is that the vertical speed will be 300 FPM at altitude capture, which occurs 100 FT from the selected altitude.

Suppose that the aircraft is at an initial altitude of 10,000 FT, with a selected vertical speed of 1600 FPM climbing and a selected altitude of 11,100 FT. The scheduled reduction in vertical speed will be as follows:

Altitude (FT)	Vertical Speed (FPM)
10,000	1600
10,100	1400
10,200	1100
10,300	1000
10,400	900
10,500	800
10,600	700
10,700	600
10,800	500
10,900	400
11,000	300

Suppose that the aircraft is at an initial altitude of 11,100 FT, with a selected vertical speed of 1600 FPM descending and a selected altitude of 10,000 FT. The scheduled reduction in vertical speed will be as follows:

Altitude (FT)	Vertical Speed (FPM)
11,100	1600
11,000	1400
10,900	1100
10,800	1000
10,700	900
10,600	800
10,500	700
10,400	600
10,300	500
10,200	400
10,100	300

However, there will be no scheduled reduction if the selected vertical speed is 300 FPM or less.

If the newly selected altitude requires a vertical speed polarity opposite to that previously selected, then the vertical speed selection will automatically change polarity and magnitude, the latter always being 500 FPM.

Suppose that the aircraft is at an altitude of 5,000 FT, with a selected vertical speed of 1000 FPM climbing and a selected altitude of 10,000 FT. If the selected altitude is subsequently changed to 4,900 FT, then the vertical speed selection will automatically change to 500 FPM descending (-5 on display).

Suppose that the aircraft is at an altitude of 10,000 FT, with a selected vertical speed of 1000 FPM descending and a selected altitude of 5,000 FT. If the selected altitude is subsequently changed to 10,100 FT, then the vertical speed selection will automatically change to 500 FPM climbing (+5 on display).

3.1.5 Decision Height (DH) Select

This selection activates both an audible alert and a visual alert, first when entering and then when departing a 100 FT window about the actual decision height. The actual decision height does not have to be at the center of this window.

Press the DTA switch, such that ENT is annunciated. Then press the DH switch. The DH annunciation will appear flashing. The selected decision height is now ready to be entered. Rotate the Modifier Knob clockwise (CW) to increase the decision height selection, or counter-clockwise (CCW) to decrease the selection. When the Modifier Knob is pushed-in, each detent changes the selection by 1000 FT. When the Modifier Knob is pulled-out, each detent changes the selection by 100 FT.

Once the selected decision height has been entered, press the DTA switch to make it operational, such that the ENT annunciation is extinguished and the DH annunciation stops flashing. The selected decision height will extinguish after 5 seconds, and be replaced by the true altitude (reference section 3.1.2). The selected decision height is now armed.

Suppose that the aircraft is descending, and an alert about the actual decision height of 1160 FT is desired. Enter a selected decision height of 1200 FT (1.2 on display), which is the nearest 100 FT setting above the actual decision height, and make it operational. Once the aircraft arrives at 1250 FT, a two-tone audible alert will sound and the DH annunciation will flash for 3 seconds. This will occur again once the aircraft arrives at 1150 FT.

Suppose that the aircraft is climbing, and an alert about the actual decision height of 1160 FT is desired. Enter a selected decision height of 1200 FT (1.2 on display), which is the nearest 100 FT setting above the actual decision height, and make it operational. Once the aircraft reaches 1150 FT, a two-tone audible alert will sound and the DH annunciation will flash for 3 seconds. This will occur again once the aircraft arrives at 1250 FT.

To disarm the selected decision height, press the DH switch. The DH annunciation will extinguish as a result.

3.1.6 Altitude Alerter (ALR) Function

This function activates both an audible alert and a visual alert, at fixed displacement points from the selected altitude.

Enter the selected altitude, and make it operational (reference section 3.1.3). Press the ALR switch to arm the altitude alerter function. The ALR annunciation will appear as a result. Thereafter, once the aircraft arrives at 1000 FT from the selected altitude, a two-tone audible alert will sound and the ALR annunciation will flash for 3 seconds. This will occur again, once the aircraft arrives at 300 FT from the selected altitude.

Following capture of the selected altitude, should the aircraft ever happen to deviate from it by 300 FT, there will again occur the two-tone audible alert and flashing ALR annunciation.

To disarm the altitude alerter function, press the ALR switch. The ALR annunciation will extinguish as a result.

3.1.7 Loss of Encoded Altitude

Should the encoded altitude at the input of the Selector / Alerter ever be lost (i.e., interrupted), then a two-tone audible alert will sound 3 times, while the displayed altitude is replaced by flashing dashes as shown in Fig. 3-1. Thereafter, these dashes stop flashing but remain.

In that event, the selected altitude is no longer attainable using the Selector / Alerter. In addition, if the Selector / Alerter happens to have vertical speed command authority as indicated on its display, then immediately press the MAN switch to revert such authority back to the autopilot.

Should the encoded altitude be subsequently restored, then the dashes will be replaced by the displayed altitude. The Selector / Alerter can then be re-programmed for use.

Fig. 3-1. Selector / Alerter Display, Loss of Encoded Altitude

3.1.8 Selector / Alerter Disconnect

If a Selector / Alerter malfunction is suspected, then set the ALT Alerter Master Switch to the OFF position. Do not attempt further use of the Selector / Alerter, until it has been inspected by authorized service personnel. A Selector / Alerter malfunction will not likely cause an autopilot failure.

3.2 Autopilot Operation

Program the Selector / Alerter for the selected vertical speed and selected altitude. On the autopilot, press/hold the VS mode selector switch and then press the ALT mode selector switch, to engage the vertical speed mode and arm the altitude hold mode. The VS and ALT annunciations will appear on the autopilot display. The aircraft will attain and hold the selected vertical speed.

As the aircraft approaches the selected altitude, a scheduled reduction in the selected vertical speed will automatically occur. This enables the aircraft to capture the selected altitude, without adverse acceleration. Once the selected altitude has been captured, the VS annunciation on the autopilot display will extinguish, to indicate engagement of the altitude hold mode. The aircraft will hold the selected altitude.

Note:

With the vertical speed mode engaged and the altitude hold mode armed:

1. Pressing the ALT mode selector switch on the autopilot will engage the altitude hold mode, and disengage the vertical speed mode. Consequently, the VS annunciation will extinguish on the autopilot display. This may cause some adverse acceleration, as the autopilot works to hold the aircraft at the captured altitude.

2. Pressing the VS mode selector switch on the autopilot will disarm the altitude hold mode, but leave the vertical speed mode engaged. Consequently, the ALT annunciation will extinguish on the autopilot.

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SECTION 4
OPERATING PARAMETERS

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4.1 Ranges

Altitude (ALT) Select Range

0.0 to 35.9 Thousand FT

Altitude Alerter (ALR) Function Range

0.0 to 35.9 Thousand FT

Barometric (BARO) Calibration Range

27.9 to 32.0 inHg

945 to 1083 mb

Decision Height (DH) Select Range

0.0 to 35.9 Thousand FT

Vertical Speed (VS) Select Range

Selector / Alerter PN 01279-PX: 1600 FPM Climbing or Descending

Selector / Alerter PN 01279-PM: 3000 FPM Climbing or Descending

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SECTION 5
GLOSSARY

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Term	Meaning
A/C	Aircraft
AFM	Aircraft Flight Manual
AFMS	Aircraft Flight Manual Supplement
ALR	Alerter
ALT	Altitude
BAR	Barometric
BARO	Barometric
CCW	Counter-Clockwise
CW	Clockwise
DG	Directional Gyro
DH	Decision Height
DN	Down
DTA	Data
ENT	Enter
FAA	Federal Aviation Administration
FL	Flight Level
FPM	Feet–per–Minute
FT	Feet
HDG	Heading
HSI	Horizontal Situation Indicator
IFR	Instrument Flight Rules
INC	Increment
inHg	Inches of Mercury
MAN	Manual
mb	Millibars
MSL	Mean Sea Level
PN	Part Number
POH	Pilot's Operating Handbook
PSS	Pitch Stabilization System
SEL	Select
VMC	Visual Meteorological Conditions
VS	Vertical Speed

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Notice:

Contact S-TEC Customer Support at 800-872-7832 for a Return Material Authorization (RMA) number prior to the return of any component for any reason.

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