S-TEC

SA|200

Pilot's Operating Handbook

List of Effective Pages	* Asterisk indicates pages changed, added, or deleted by revision.

Record of Revisions	Retain this record in front of handbook. Upon receipt of a revision, insert changes and complete table below.

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1st Edition	February 5, 2002	
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SECTION 1
INTRODUCTION

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1.0 Introduction

The primary purpose of this Altitude Selector / Alerter **(ASA) POH** is to provide information about system functions and controls, and Preflight / In-flight Operating Procedures.

The **SA-200 Altitude Selector / Alerter, PILOT'S OPERATING HANDBOOK**, part number 87118, dated 26 September 2003, or later, must be carried in the aircraft and be available to the pilot while in flight.

NOTE: This handbook must 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 aircraft specific information, aircraft emergency procedures, and return of aircraft to service.

The Altitude Selector / Alerter enables the pilot to pre-select altitude. In addition, the pilot will receive both aural (tone and voice) and visual **(LED)** alert indications relative to the selected altitude. This handbook provides information on the features and functions of the **ASA** and operating instructions for its proper use.

The Altitude Selector / Alerter is a single panel mounted unit that contains the display, the operating switches and the computer electronics. The system was designed to interface with encoding altimeters that provide a standard 100 ft. increment altitude output and baro correction output. The unit also works with encoding altimeters that output baro corrected altitude via an **RS-422** digital interface or **EFIS** system.

Operation of the Altitude Selector / Alerter with the **S-TEC** autopilot is easy and straight forward. The Selector / Alerter can also be used as a stand- alone system without the autopilot. However, in order to achieve maximum benefit, and to utilize all of the system's features, it is important to have a clear understanding of the system and its operating characteristics, features, and functions. Please read this manual carefully before using the **SA-200 Altitude Selector / Alerter**.

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

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SECTION 2
BLOCK DIAGRAM

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2.0   Block Diagrams

SA-200 ALTITUDE SELECTOR/ALERTER

ENCODING ALTIMETER WITH BARO CORRECTION

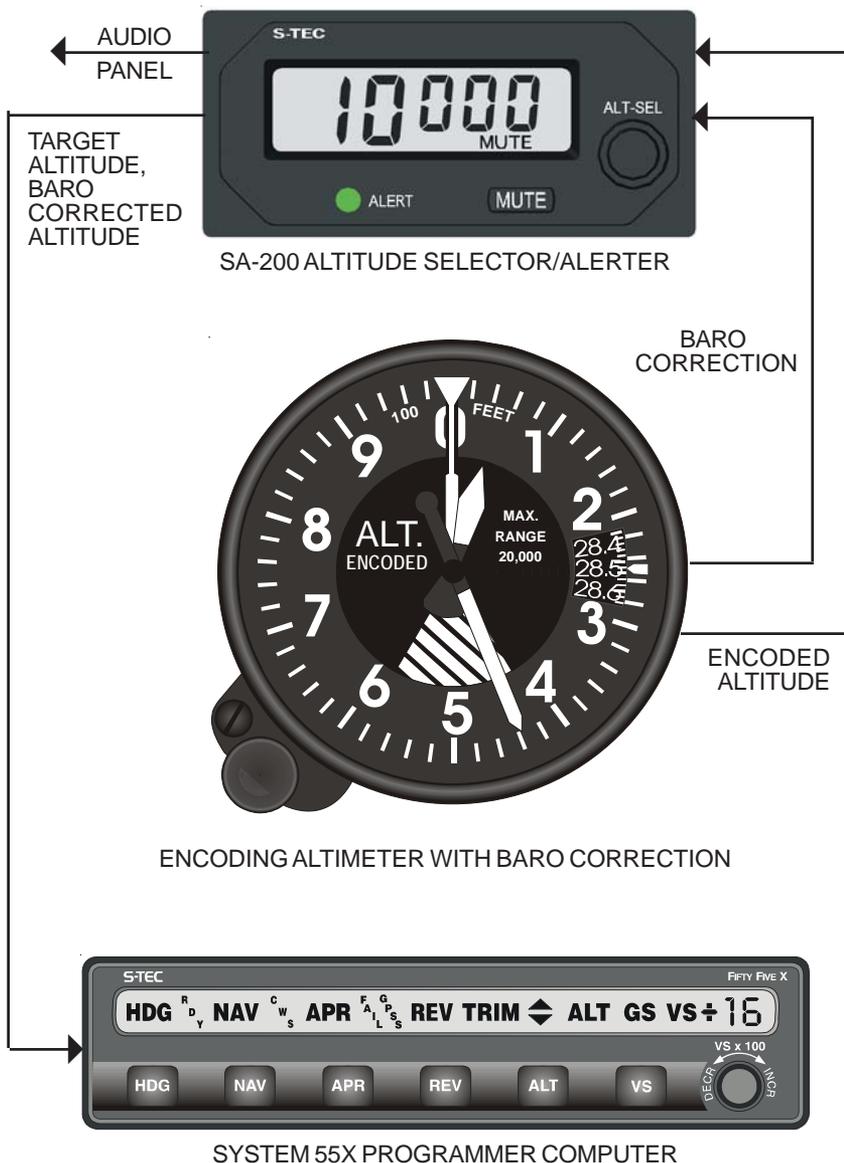SYSTEM 55X PROGRAMMER COMPUTER

Fig. 2-1. SA-200 Altitude Selector/Alerter Block Diagram
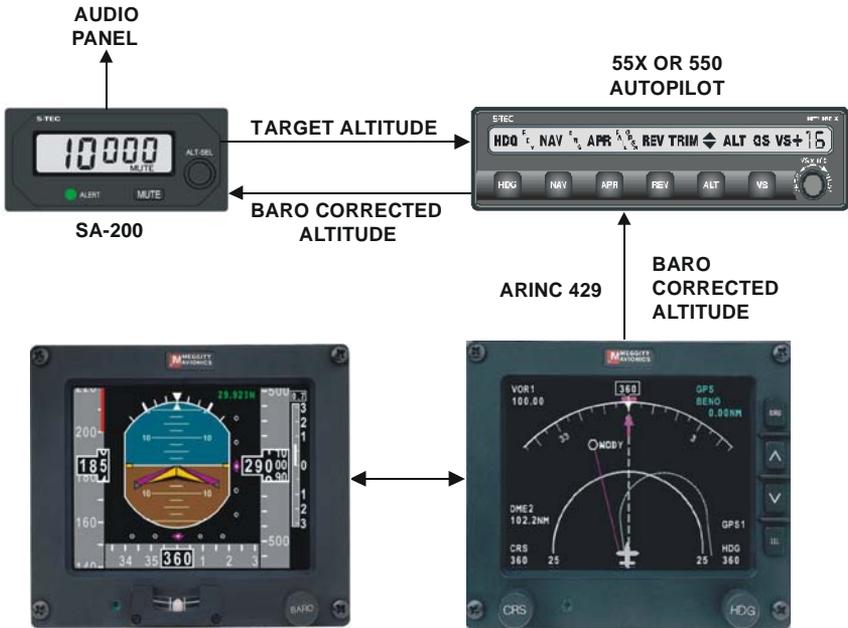
Fig. 2-2. SA-200 Altitude Selector/Alerter Block Diagram (With MAGIC EFIS)

SECTION 3
OVERVIEW

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3.0   Overview

3.1   Theory of Operation

The Altitude Selector/Alerter (ASA) reads the Altimeter's altitude information from the Altimeter's altitude encoder output and baro correction voltage output. The pilot entered target altitude and baro corrected altitude are then transmitted to the autopilot via a dedicated digital interface (RS-422). The interfacing autopilot performs all altitude functions such as altitude hold, vertical speed, and altitude capture.

As the aircraft altitude approaches the selected target altitude, the ASA emits a series of tones, voice annunciations, and visual cues to indicate approach to target altitude as well as subsequent capture, and departure from captured altitude.

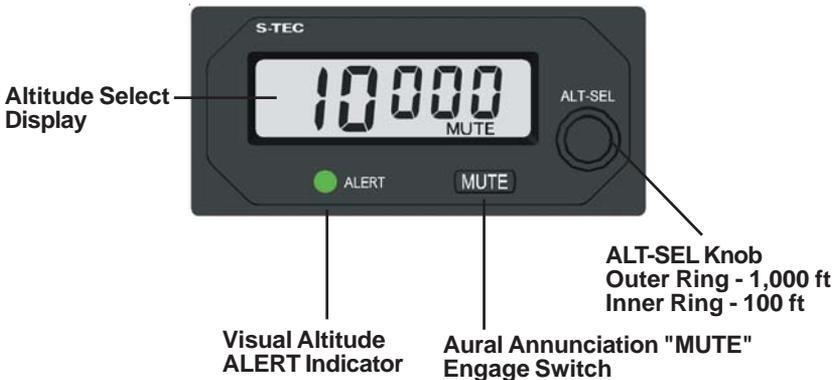**3.2   Quick Reference**

Fig. 3-1. Altitude Selector / Alerter Quick Reference

3.3   Important Points to Remember:

1. Rotate **ALT-SEL** knob to set target altitude following initial self-test.

2. Push **MUTE** to enable or disable the aural alert annunciations.

3. Push the **ALT-SEL** Knob to activate and deactivate the altitude target.

3.4 Features and Functions

3.4.1 Self Test (Power Up)

When power is applied to the Altitude Selector / Alerter, the system will conduct an internal self test of the computer electronic elements, the display, the alert indicator and the altitude alerter audio tone (a two tone "chime"). Subsequently, a dash will translate across the display until the barometric altitude has been acquired. Successful power up is indicated by the display of five constant dashes on the altitude selector readout after completion of the test cycle.

3.4.2 Altitude (ALT - SEL) Select Function

The **ALT-SEL** switch has two functions. The first function is to select the desired altitude by rotating the selector knob. The outer concentric knob increments/decrements the target altitude in thousands of feet, while the inner concentric knob increments/decrements the target altitude in hundreds of feet.

The second function is to push the **ALT-SEL** knob which cancels the selected target altitude, the voice annunciations, the aural tone, and the visual alert while displaying dashes on the display panel. A subsequent push of the **ALT-SEL** knob will reinstate the altitude target and both the visual alert and the aural alert capabilities (if previously selected).

3.4.3 Altitude Read Out

When the display shows dashes and either the inner or outer **ALT-SEL** knob is rotated one knob click, the alerter will display the current altitude. Subsequent rotation of the **ALT-SEL** knob will increment or decrement the target altitude depending on the direction of knob rotation.

3.4.4 Altitude Alert (MUTE) Button

The **MUTE** button enables or disables the voice and tone functions of the ASA. When the display shows dashes and a target altitude is entered, the aural alert will automatically be armed. A subsequent push of the **MUTE** button will disable / enable the aural tone output.

3.4.5 Altitude Alert

As the aircraft moves within 1000 ft +/-100 ft. (+/-10 ft. with **ADAHRS**) of the selected target altitude, the altitude **ALERT** indicator will be lit and **"1000 TO GO"** will be annunciated by voice. The **ALERT** indicator will remain active (lit) until the barometric altitude is within 200 ft. +/-100 ft. (+/-10 ft. with **ADAHRS**) of the selected altitude at which point the **ALERT** indicator will turn off and **"200 TO GO"** will be annunciated by voice.

At altitude capture, the **ALERT** indicator will flash for 2 seconds and **"ALTITUDE"** will be annunciated by voice.

3.4.5   Altitude Alert (Cont'd)

After altitude capture, if the barometric altitude deviates from the selected altitude by +/-200 ft., the **ALERT** indicator will be activated **(LIT)** and the audio alert ("ding dong") will chime followed by **"CHECK ALTITUDE."** The **ALERT** indicator will be active until a deviation of 1000 ft. is achieved or the barometric altitude returns to within the +/-200 ft. band.

3.4.6   Setup Mode

The Altitude Selector / Alerter includes a Setup Mode. This software driven mode enables the installer to make initial display and volume adjustments utilizing four distinct setup modes. These include alert volume, voice volume, **LCD** backlight brightness and panel light brightness. The remaining three modes are used for viewing the revision level, display type, and barometric correction.

With power off, the setup mode is entered by pushing in and holding the **ALT-SEL** knob. Apply power to the system and when the display indicates **"88 888"**, immediately release the knob. The unit will display **"ADJ"**, indicating the unit is entering the Adjust Mode. After the initial power up sequence (about 15 seconds), the Altitude Selector / Alerter will display **"1A"** indicating the first menu in the setup mode.

3.4.6.1   Revision Level

The revision level is the first setup mode entered after initial power up and will display the Altitude Selector / Alerter's current software revision level. After entering this mode, the **LCD** display indicates **"1AXX"**. **1A** indicates that this is the first adjust menu and **XX** highlights the current software revision level (01 to 99). During this mode, rotating the outer knob right or left will select the next or previous setup mode, while the inner knob rotation has no effect. Pressing the **ALT-SEL** knob takes the unit out of the setup mode and saves all the setup changes.

3.4.6.2   Alert Volume

The alert volume is the second menu in the setup mode and enables the user to adjust the volume of the two-tone alert. After entering this mode, the **LCD** display indicates **"2AXXX"**. **2A** indicates that this is the second adjust menu and **XXX** indicates the current volume level. The volume level is displayed from 0 - 100 in increments of 10 with 0 the lowest and 100 the highest. During this mode, rotating the outer knob right or left will select the next or previous setup mode, while rotation of the inner knob left or right will increase or decrease the volume. Pressing **ALT-SEL** takes the unit out of the setup mode and saves all the setup changes.

3.4.6.3 Voice Volume

Voice volume is the third menu in the setup mode and enables the user to adjust the volume of the voice annunciations. After entering this mode, the **LCD** display indicates **"3AXXX"**. **The 3A** indicates that this is the third adjust menu and **XXX** indicates the current volume level. The volume level is displayed from 0 - 100 in increments of 10 with 0 the lowest and 100 the highest. During this mode, rotating the outer knob right or left will select the next or previous setup mode, while rotation of the inner knob left or right will increase or decrease the volume. Pressing the **ALT-SEL** knob takes the unit out of the setup mode and saves all the setup changes.

3.4.6.4 LCD Backlight Brightness

LCD Backlight Brightness is the fourth menu in the setup mode and enables the user to adjust the brightness of the **LCD** backlight. After entering this mode, the **LCD** display indicates **"4AXXX"**. **4A** indicates that this is the fourth adjust menu and **XXX** indicates the current brightness level. The brightness level is displayed from 0 - 100 in increments of 10 with 0 the lowest and 100 the highest. During this mode, rotating the outer knob right or left will select the next or previous setup mode, while rotation of the inner knob left or right will increase or decrease the brightness. Pressing the **ALT-SEL** knob takes the unit out of the setup mode and saves all the setup changes.

3.4.6.5 Panel Light Brightness

Panel Light Brightness is the fifth menu in the setup mode and enables the user to adjust the brightness of the Panel Lights. After entering this mode, the **LCD** display indicates **"5AXXX"**. **5A** indicates that this is the fifth adjust menu and **XXX** indicates the current brightness level. The brightness level is displayed from 0 - 100 in increments of 10 with 0 the lowest and 100 the highest. During this mode, rotating the outer knob right or left will select the next or previous setup mode, while rotation of the inner knob left or right will increase or decrease the brightness. Pressing the **ALT-SEL** knob takes the unit out of the setup mode and saves all the setup changes .

3.4.6.6 Display Type

Display Type is the sixth menu in the setup mode. After entering this mode, the **LCD** display indicates **"6A X"**. **6A** indicates that this is the sixth adjust menu and **X** indicates either a **0** or **1**. The **0** is for normal display (5 V drive) and **1** is for alternate display (17 V drive). However, there are no user adjustments as these settings are made at the factory. During this mode, rotating the outer knob right or left will select the next or previous setup mode, while rotation of the inner knob has no effect. Pressing the **ALT-SEL** knob takes the unit out of the setup mode and saves all the setup changes.

3.4.6.7 Barometric Correction

Barometric Correction is the seventh menu in the set-up mode.

Barometric Correction, derived from the analog Baro Correction input, is calibrated by the pilot. After entering this mode, the LCD display indicates **"XXYY"**. **XX** indicates inches of Mercury (28" - 30") and **YY** indicates tenths of inches of Mercury (.00" - .99"). To calibrate the correction input, set the baro on the Interfacing Altimeter to 29.92. Rotate the inner knob on the ASA until the display shows 29.92. If RS-422 data is being used, the display will show "RS-422" and no calibration is necessary. Rotating the outer knob right or left will select the next or previous setup mode. Pressing the **ALT-SEL** knob takes the unit out of the setup mode and saves all the setup changes.

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SECTION 4
OPERATING PROCEDURES

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4.0   Operating Procedures

4.1   Operation With Autopilot (S-TEC 55X / 550)

The Altitude Selector / Alerter System is coupled to the autopilot by use of the **VS** and **ALT** switches on the autopilot programmer.

For Altitude Preselect, set the desired altitude on the Altitude Selector/ Alerter then simultaneously depress both the **VS** and **ALT** switch buttons on the autopilot programmer. The autopilot mode annunciator will display **VS**, **ALT**, and a **VS** value (example **500 FPM**), indicating that the autopilot is operating in **VS** mode with altitude armed for the altitude intercept. The aircraft will then intercept the target altitude and the autopilot **VS** annunciator will extinguish leaving the autopilot in altitude hold mode (**ALT**).

If no target altitude is set, the autopilot will not accept pilot activation of the "dual mode" **VS** and **ALT**. Only the **VS** mode will be engaged if a dual mode operation is attempted with no target altitude set.

4.2   Lost Altitude Data

Anytime the Altitude Selector / Alerter is in use and Altitude data or the RS-422 link is lost, the target altitude will be replaced by a **FAIL** indication followed by a tone and lockout of the **ALT-SEL** knob**.**

This action informs the pilot that a malfunction has occurred and the selected target altitude is no longer displayed or attainable by using the Altitude Selector / Alerter. If the autopilot is in "Dual Mode" (**ALT** and **VS** selected on the autopilot), the autopilot will revert to **"VS"** mode because there no longer is a valid target.

If altitude data or the RS-422 link is restored during the flight, the encoded altitude will display dashes instead of the **FAIL** indication. The Altitude Selector / Alerter can now be used again, if desired.

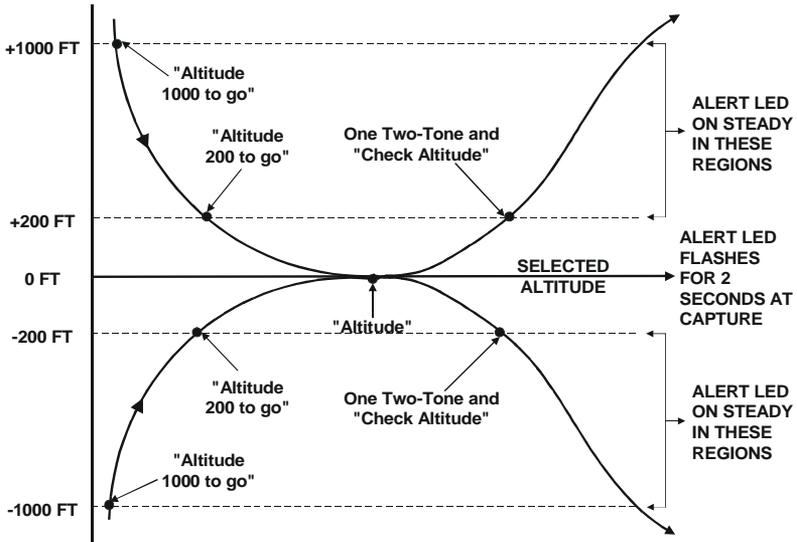*Fig. 4-1. Altitude Selector / Alerter Fail Indication*

Fig. 4-2. Altitude Selector / Alerter Annunciation Flight Profile

4.3   Pre-Flight Procedures

The following pre-flight procedure provides an operational test of the entire system, including the altimeter, the Altitude Selector / Alerter **(ASA)** and the autopilot. A successful test is indicated by the autopilot switching from **VS** Mode to **ALT** Hold Mode as the selected altitude is matched to field elevation.

1.   Autopilot Master Switch - **ON**

2.   Altitude Selector / Alerter Power - **ON   (If a separate switch)**

3.   Insure Encoding Altimeter or **EFIS** - **ON.**

NOTE: If the Altitude Selector / Alerter is not receiving a valid signal, the ASA display will show **FAIL** followed by a chime. A period of time should be allowed for the Encoding Altimeter or **EFIS** to initialize.

4.   Set altimeter to local altimeter setting or field elevation, as appropriate.

5.   Altitude Selector / Alerter -

A.   The self test cycle is complete when dashes cease rotating.

    B. Rotate the **ALT-SEL** input knob to set the altitude 300 - 400 ft. higher than the indicated altitude on the Altimeter.

6. Autopilot - When autopilot indicates ready "**RDY**."

    A. Engage **HDG** Mode.

    B. Simultaneously depress **VS** and **ALT** switches on the autopilot programmer computer (**VS** and **ALT** annunciations will both illuminate).

    C. Rotate the altitude selector knob **CCW** to change selected altitude to match field elevation. **VS** annunciation on the autopilot programmer computer should extinguish when the **ALT-SEL** setting on the Altitude Selector/Alerter is within 100 ft. of the indicated altitude on the altimeter and has remained unchanged for 3 seconds. Extinguishing of the **VS** annunciation with the **ALT** remaining on indicates the altitude hold mode has been engaged.

7. Disengage Autopilot - Adjust Altitude Selector/Alerter for desired altitude to be used after takeoff and during climb out.

8. Conduct autopilot preflight per the **FAA/DAS** approved Pilots Operating Handbook and Airplane Flight Manual Supplement for the autopilot system installation.

4.4   In-Flight Procedures

1. Ensure Encoding Altimeter is **ON** (with an adequate warmup).

NOTE: Adequate warmup is indicated by rotating the small knob. When all dashes are displayed, one click verifies that the displayed altimeter matches the Encoding Altimeter's altitude within 100 ft.

2. Check baro setting, adjust as necessary.

3. Select desired target altitude.

4. For autopilot coupling, simultaneously depress the **VS** and **ALT** switches on the autopilot programmer computer. This will engage the **VS** modeand arm the altitude hold mode. Select the desired vertical speed on the autopilot programmer. Extinguished **VS** indicates altitude capture.

5. The pilot can level off at an intermediate altitude on the way to the target altitude, if desired, by manually pressing the **ALT** button on the autopilot. The climb/descent can be resumed by pressing **ALT** and **VS** buttons simultaneously. The desired vertical speed must be re-selected at this time.

NOTE: As the aircraft approaches the target altitude, the vertical speed closure rate will be automatically reduce for a smooth capture.

NOTE: Pressing the **ALT-SEL** knob will erase the displayed altitude and the unit will annunciate dashes. Pressing the knob again, will cause the previously displayed target to reappear. With dashes displayed, rotating either knob one click will cause the displayed altitude to synchronize with the existing aircraft altitude. Rotating the knobs further will permit the selection of a new altitude.

NOTE: If the wrong **VS** polarity (+/-) is selected to capture a target altitude, the aircraft will respond as commanded but will flash the **VS** Display on the autopilot to alert the pilot of the error.

Example: The pilot wishes to climb to an altitude above the aircraft and selects a negative **VS** command (in this case **-500 FPM VS**). The display (**VS -5**) will continuously flash to alert the pilot of the incorrect **VS** command.

4.5   Emergency Procedures

The Altitude Selector / Alerter provides only data information to the autopilot and cannot contribute to an autopilot malfunction. If for any reason, the ASA does not function properly, push the **ALT-SEL** knob to disable the altitude target and the aural and visual indications. This will completely remove the Altitude Selector / Alerter from the autopilot system. Do not attempt further use of the **ASA** until the fault has been corrected. The Altitude Selector / Alerter, powered by the autopilot circuit breaker, is a low power device which is essentially dormant unless actually in use (by selection of the **VS** and **ALT** modes on the autopilot simultaneously).

NOTE: The SA-200 can only detect invalid encoder states and loss of encoder power.

SECTION 5
APPENDICES

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Specifications

Altitude Selector/Alerter

Power required	14/28 VDC (Automatically selected in ASA)
Weight	0.62 lbs
Dimensions	1.60 x 3.42 x 5.59 in.
TSO	C9c

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SECTION 6
GLOSSARY

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6.0   Glossary

Term	Meaning
ALT	Altitude
ASA	Altitude Selector Alerter
BARO	Barometric
CCW	Counter Clockwise
CW	Clockwise
DAS	Designated Alteration Station
ED	Edition
FAA	Federal Aviation Administration
FPM	Feet Per Minute
FT	Feet
HDG	Heading
IN.	Inches
LBS	Pounds
POH	Pilot Operating Handbook
SEL	Select
VDC	Volts Direct Current
VS	Vertical Speed

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