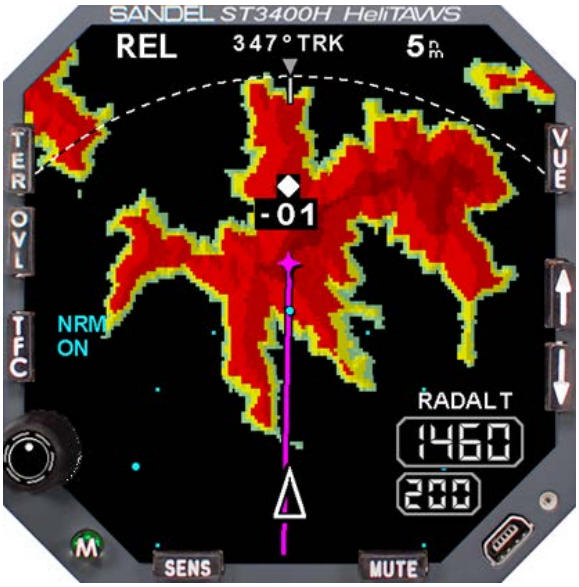
SANDEL®

ST3400H

HeliTAWS™

Helicopter
Terrain Awareness
Warning System



Installation Manual

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Revision History

Revision	Date	Comments
K	10-14-2016	Revised IAW AR 2363 Section 8.1: Updated to add note regarding required software versions when using non-WAAS Garmin 400/500 series GPS. Section 12: Updated List of Effective Drawings to reflect update to installation drawing 82046-10 sheet 3. Section 12: Updated installation drawing 82046-10 sheet 3 to add note regarding required software versions when using non-WAAS Garmin 400/500 series GPS. Notes 3,4,5 updated for clarity. Note references updated for clarity and consistency.
J	8/19/2015	REVISED IAW AR 2107 Section 6.8: Updated to include APN-209. Cal note updated. Section 8.3: Updated to include APN-209 Section 12: List of effective drawings updated.
H	07-06-2015	REVISED IAW AR 1477 Section 1.2: Added notes to limitations regarding installation location and electrical interconnection information. Section 1.4.1: Removed user-defined obstacle provision statement. Section 1.6: Formatting updated. Section 1.6.1: Approval data updated. ETSO data added. Section 1.6.2: Weight spec updated. Section 1.7: Formatting updated. Section 2: Updated section title to Installation Planning and Procedures. Section 2.2: Updated to include equipment Section 2.2.1: Updated to include equipment. Added Audio system. Section 2.2.3: Added note describing North Up display with no heading and track while in maintenance mode. Section 2.3 Reformatted. Added additional steps to Pre-Installation Planning. Section 2.4 Added Installation Section 2.5: Was Section 2.4 - Added additional Post Installation steps. Section 3.3: Added note describing North Up display with no heading and track while in maintenance mode. Section 4.3.2: Updated human factors section. Section 4.3.3: Changed the word diagrams to drawings. Section 4.3.4: New section: Mounting locations.

		Section 4.4: Reformatted. Updated ground bonding note. Section 5.4: Updated to show that the CM functionality is reserved for future use. Added text to advise leaving CM plugged in. Section 5.5: Updated to show that the CM functionality is reserved for future use. Section 6: Retitled to “System Configuration.” Section 6.11: Added note for when to configure the ST3400H using the (SW) setting. Section 6.14: Added text for Mode 1 arming altitude. Corrected axis titles on Standard Mode-1 curve. Section 7: Added return to service statement at beginning of chapter. Section 7.8: Heading clarified as “Optional Interface”. N/A column added. Section 7.9: Heading clarified as “Optional Interface”. N/A column added. Clarified Result text for Heading Value. Section 7.10: Heading clarified as “Option Configuration”. Text added to indicate NVIS may require additional installation approval. Additional inputs added. N/A Column added. Section 7.11: Heading clarified as “Optional Interface”. N/A column added. Section 7.12: Heading clarified as “Optional Interface”. N/A column added. Section 7.13: Heading clarified as “Required”. Sections 7.14: Heading clarified as “Optional Interface”. N/A column added. Section 7.15: Heading clarified as “Optional Interface”. N/A column added. Clarified Result text to add that audio should also be heard. Section 7.16: Heading clarified as “Optional Interface”. Section formatting updated. Section 7.17: Heading clarified as “Optional Interface”. Section formatting updated. Section updated for new SENS mode functionality. Section 7.18: Section formatting updated. Section 7.19: Heading clarified as “Optional Interface”. Section formatting updated. Section 7.20: Section formatting updated. Section 7.21: Test step updated for clarity. Section formatting updated. Section 7.22: Test step updated. Section formatting updated. Section 7.23: Section formatting updated.

		Section 7.24: New content. Section 7.25: New content. Section 8.2: Changed KLN-90 to KLN-90B (ARINC 429). Section 8.3: Added KRA-405B. Removed ARINC 552 equipment. Section 8.4: Added Bendix King KSG105, Chelton ADAHRS, Litef LCR 92, and Sagem APIRS. Clarified XYZ is ARINC 407. Section 8.5: Added Bendix/King 634A. Added /W and Analog interface to GNS430/530. Added Analog interface to GTN 650/750. Added Bendix/King KX155A. Section 8.6: Added Chelton ADAHRS. Added Thales/Sextant ADU3000. Removed AEL MOD 8, 10, 12. Section 8.7: Changed all from ARINC 429 to ARINC 429H. Removed Skywatch. Changed Goodrich Skywatch 497 to Skywatch (Sky 497). Removed Garmin GDL-90. Section 8.8 Added Equipment Approval Basis Table. Section 8.9: Was 8.8. Section 10.1: AML reference added. Section 11: Added text referencing FAA accepted ICA. Section 12: List of effective drawings updated.
G	25-AUG-2014	REVISED IAW AR 1416 Section 1.2: Added note to Limitations regarding display of DME arcs, holding patterns, and procedure turns. Section 3.4: updated to include 400' mandatory callout when in HIG-SENS. Section 3.9.1: Updated notes for TAWS INH and OFF-APT mode selection. Page 6-1: Screenshot updated. Section 6.1: Screenshot updated. Section 6.2: System information updated to display Patch Level. Section 6.14: Maintenance page renamed to OPTIONS. Screen shot and table update for HIGH SENS configuration selections. Added STD and RUS Mode-1 curves. Section 7.7: Updated. Callouts page renamed Options. New fields for Mode-1 options. Section 7.8: Air data input checkout procedure and tolerance updated. Section 8.6: Added SAC 7-35 ADC. Section 10: STC Information updated to include Part 27 and Part 29 AML STCs. Section 12: Updated List of Effective Drawings
F	12-DEC-2013	Revised IAW AR1418 Section 1.9: 32062 and 32063 Positronic part numbers

		corrected. Added Flush mount shim to Installation Kit Section 2.2.2: Removed Collective down as an optional sensor. Section 3.12: Minimum OS requirement updated from Windows 98 to Windows XP Section 5.3: Section reference corrected (changed from 0 to 8). Section 6.10: Screenshots updated. Section 6.16: Screenshot updated. Sections 8.1 and 8.2 updated for addition of Garmin GTN-6XX/7XX equipment selections. Section 12: List of effective drawings updated. Sheet 1 updated to show additional power and ground pins on connector P2. Sheets 2 & 8 updated for addition of Garmin GTN-6XX/7XX equipment selections. Sheet 7 – missing LOC pin numbers added. Sheet 11 Removed TCAS II references.
E	02-JUL-2013	Revised IAW AR1349 Section 4: Added human factors installation considerations. Added Section 7.23: Accessibility and Operation
D	05-OCT-2011	Revised IAW AR1189 Section 4.6 Rename P2-2 Corrected discrete labels. Section 6.2, new System page image. Configuration Field table updated. Section 6.9, new FMS page image Section 12, updated list of drawings.
C2	27-MAY-2011	Revised IAW AR1186 Removed section 1.3 NVIS Export Control Notice. Revised Table 8.1 to include Garmin GPS Non WAAS Revised Table 8.7 to include Garmin GDL-90 Traffic sensor Section 10.2, added Part 27 STC certificate and letter. Section 12, updated list of drawings.
C1	13-DEC-2010	Revised IAW AR1155 Revised 3.6 to include reference to MOD-1 and SIL 3400H-01. Revised table 4.5 and 4.6 for consistency with table 4.9. Revised table 4.9 account for surge protection Corrected Table 12 List of Effective Drawings
C	24-SEP-2010	Revised for S/W version 1.01 Corrected Ground test procedures.

		Updated section 12 drawing list, 82046-10 sheets 3 & 7.
B	05-AUG-2010	Initial Release

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1 GENERAL INFORMATION

1.1 Introduction

The information contained within this Installation Manual describes the features, functions, technical characteristics, components, approval procedures, installation considerations, setup procedures, checkout procedures and instructions for continued airworthiness for the Sandel Avionics ST3400H Helicopter Terrain Awareness Warning System. For an explanation of the operating controls of the ST3400H, refer to the Pilot's Guide for the ST3400H, Sandel Avionics P/N 82046-PG.

Sandel Avionics ST3400H HTAWS may be covered by one or more U.S. and foreign patents and pending patent applications, including U.S. Patent Nos. 6,507,288, 6,489,916, and 6,259,378.

1.2 LIMITATIONS

The following stipulation as presented is required by the Federal Aviation Administration for articles approved under Technical Standard Order. This statement does not preclude multiple installation and operational approvals in regard to specific aircraft make, model, or type:

The conditions and tests required for TSO approval of this article are minimum performance standards. Those installing this article, on or in a specific type or class of aircraft, must determine that the aircraft installation conditions are within TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only according to 14 CFR Part 43 or applicable airworthiness requirements.

Display of DME arcs, Holding Patterns, and Procedure Turns is not currently supported in the ST3400H.

Any installation location is acceptable provided the ST3400H is installed adjacent to the helicopter primary displays, it's display and annunciations are visible to the pilot, and it's controls are reachable by the pilot or are suitably remote controlled.

Interconnection of the DC electrical supply to the ST3400H shall be via a non-essential bus for installation in IFR rotorcraft unless replacing an existing instrument already approved on the essential bus.

1.3 Radalt Indicator Replacement

The ST3400H Radalt function is provided to allow the ST3400H to replace an existing Radar Altitude display. Both the current Radar altitude and the selected Minimums alerting altitude are displayed in digital format.

If a Radar altimeter is not installed in the helicopter, the Radar Altitude will not be displayed on the screen. The MINS display will be present and may be used by the pilot as a reference.

1.4 Equipment Description

The Sandel ST3400H is a self-contained HTAWS (Terrain Awareness Warning System) solution specifically for helicopters that includes an advanced HTAWS computer and an integrated full-color screen built within a standard 3-inch instrument chassis.

The ST3400H uses Sandel's patented rear-projection display technology. The projector uses a miniature active-matrix LCD display that produces a high-resolution image that is rear-projected directly to the face of the instrument. This technology allows the displayed image to extend to the edges of the instrument's bezel. The advantage of this edge-to-edge technology is that it eliminates the unusable area surrounding conventional LCD and CRT displays. Even though the Sandel display is in a 3-inch form factor, its image is near the size of a 4" primary display, and can remain directly in the pilot's field-of-view.

It can be used as a direct replacement for a currently installed Radar altimeter indicator. It includes a MINS setter, MINS discrete output, and a Radalt Test discrete output.

The ST3400H includes built-in warning and caution annunciation. The unit also supports optional external warning or caution annunciation as well as optional collective mounted momentary switches to control certain functions such as alert muting and modes.

The ST3400H may be installed in a single or dual installation.

The ST3400H has an internal recorder that automatically records approximately twenty hours of flight data. This data can be reviewed for content in the event of a system malfunction.

1.4.1 Features

HTAWS is the enhanced terrain warning technology for helicopters that uses GPS position along with databases of terrain and obstacles to reduce or eliminate CFIT accidents. It is similar to the Sandel ST3400 fixed-wing TAWS, with feature enhancements specific to helicopter operations close to the ground.

- Increased vertical accuracy
- Separate obstacle database
- On-screen obstacle display
- 3 arc-second terrain data

The following 5 standard GPWS functional modes (modified for helicopter) are provided for when equipped with supported Radar altimeter and airdata computer:

- ERD (excessive rate of descent)
- ALAT (altitude loss after takeoff)
- FITNL (flight into terrain when not in landing configuration)
- EDGSD (excessive downward glide slope deviation).
- 400 feet and below Voice Callouts

1.4.2 FAA HTAWS Requirement

The ST3400H exceeds the FAA requirements for HTAWS alerting, annunciation, and display for installation in Part 27 and Part 29 helicopters

1.5 Databases

1.5.1 Coverage area

The internal Terrain and Obstacle databases include terrain, charted man-made obstacles, airports, and heliports.

The Terrain and Airport databases are provided by geographical area. The coverage area of the database installed in the ST3400H is shown as part of the sign-on screen after a power cycle.

Remember, there is no guarantee that every obstacle is charted or that every charted obstacle is in the terrain data.

1.5.2 Keeping the databases current

Updates to the databases can be obtained from the Sandel web site and loaded into the equipment using a Windows loader program and a laptop computer. This is done through a high-speed USB port located on the front right corner. Loading instructions are supplied along with the applicable database.

The databases can be updated during normal maintenance to the helicopter.

1.6 Technical Specifications

The following section describes the technical characteristics, which include the appliance approval basis, physical and electrical properties, electrical connector pin allocation which details function and gradient or equipment protocol, and ARINC label support. Also included is the description of the ST3400H installation components, other equipment and installation requirements. A review of the installation approval procedures is provided for filing with authorities.

1.6.1 Approval Data

Technical Standard Orders (TSO and ETSO):	TSO-C87 / ETSO-2C87 Airborne Low-Range Radio Altimeter (Incomplete – ST3400H provides display only)
	TSO-C113 / ETSO-C113 Airborne Multipurpose Electronic Display
	TSO-C118 / ETSO-C118 Traffic Alert and Collision Avoidance System (TCAS-I) (Incomplete – ST3400H provides display only)
	TSO-C194 / ETSO-C194 Helicopter Terrain Awareness and Warning System (HTAWS)
Software Certification:	DO-178B Level C
Environmental:	DO-160F
Databases:	DO-200A

1.6.2 Physical Dimensions

The ST3400H is enclosed in an ARINC 408, 3ATI form factor enclosure and is mounted to an instrument panel.

Form Factor:	3ATI (ARINC 408)
Width:	3.175 inches
Height:	3.175 inches
Length:	9.5 inches
Weight:	2.77 pounds with configuration module. (Cable weight not included)
Mounting:	3 ATI Clamp
Display:	200dpi

1.6.3 Operational Characteristics

Temperature/Altitude:	-20° C to +70° C / up to 55,000 F
Power Input:	28VDC nominal, 40 watt maximum. Operating range 22VDC – 33VDC
Cooling Requirements:	Internal fan. Requires ambient air at fan input along the four corners of the 3ATI case.

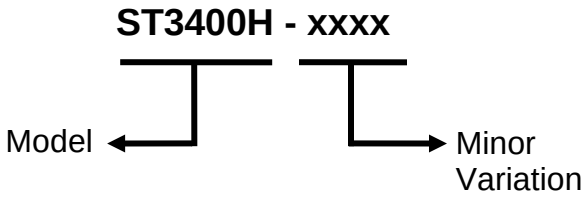
1.7 Interface Characteristics

The ST3400H is software configurable and configuration data is stored internally and in an optional airframe-resident configuration module.

Configuration Module:	Rear mounted inside 9-pin 'D' connector shell
Data Loading:	Front panel USB
GPS Position:	ARINC 429 or RS232
GPS Flight plan:	ARINC 429 or RS232
Air Data:	ARINC 429 or Analog
Heading:	ARINC 429 or ARINC 407 (XYZ)
Gear:	Discrete: active high or low
Glideslope:	ARINC 429 or low-level deviation and flag
Localizer:	ARINC 429 or low-level deviation and flag
Audio Outputs:	4 to 8 ohm speaker, 5 watt max
	500 ohm, 25mw or 125mw configurable via strap
External Annunciators:	Open/GND (Open Drain) GND=Active
	250ma maximum (installation optional)
External Switches:	Momentary action, Open/GND
	GND to activate (installation optional)
Radar Altimeter:	ARINC 429 or Analog
Traffic:	ARINC 429

1.8 System Part Number

The part number for the Sandel HTAWS is comprised of two parts. The basic Model designation "ST3400H" and a dash number, ST3400H-xxx. The dash number designates minor product variations, bezel color and/or NVIS support.



1) ST3400H-000, Gray Bezel
2) ST3400H-001, Black Bezel
3) ST3400H-000N, Gray Bezel with NVIS support
4) ST3400H-001N, Black Bezel with NVIS support

1.9 Installation Kit Part Number

An installation kit is available for the ST3400H.

ST3400H INSTALLATION KIT (P/N 90254-IK)			
Qty	**Sandel P/N**	**Positronic P/N**	**Description**
1	32063	DD44F10JVL0	Connector 44 pin Plastic Hood/Slide Lock and Contacts
1	32062	SD15F10JVL0	Connector 15 pin Plastic Hood/Slide Lock and Contacts
1	32111	SD9F10JVL0-15	Connector 9 pin Plastic Hood/Slide Lock and Contacts
1	61044	N/A	Flush mount shim
1	61062	N/A	3ATI Clamp

1.10 License Requirements

None.

1.11 Installation and Operational Approval Procedures

The Environmental Qualification Form for the ST3400H included in section 9 of this Installation Manual should be referenced to the categories appropriate to the aircraft type and environment into which the ST3400H is to be installed. The environmental category for the ST3400H should be stipulated on the STC form.

A “Functional Ground Test Procedures/Report” included in section 7 of this manual should be used as a basis for validating the ST3400H equipment configuration and to verify proper installation and functional performance. A permanent copy of the STC form must be filed and maintained by the installing agency. Another copy must be presented to the aircraft owner for entry into the aircraft maintenance records, as well as a copy forwarded to Sandel Avionics along with the Warranty Registration Form, to be filed after completion and installation acceptance.

If any difficulty is experienced with the functionality or operational performance of the ST3400H, contact Sandel for assistance.

2 INSTALLATION PLANNING AND PROCEDURES

The ST3400H has been designed to ensure maximum interoperability with external avionics. Contact Sandel with any questions about interfacing to specific avionics equipment not covered in the installation drawings in this manual.

2.1 General Information

To simplify installation, after signals are wired to the ST3400H pins, on-screen setups are used in a post-installation procedure. Maintenance menu pages provide a function selection capability. For most equipment, selections are made by equipment make and model.

Refer to the installation schematics section 12 of this manual, for details on connecting required components.

2.2 Supported Sensor/Equipment Configurations

2.2.1 Required Sensors/Equipment

- GPS position
- Gear (only if the helicopter has retractable gear).
- Audio system with available unswitched input.

2.2.2 Optional Sensors

- Heading — Display: Provides no-track terrain display
- GPS Flight plan — Display: displays flight plan line
- Radar Altitude — GPWS: Provides callouts;
- Airdata — GPWS: improves accuracy of certain modes
- LOC/GS — GPWS: adds Glideslope alert

2.2.3 Recommended Optional Sensors

A Heading Sensor is highly recommended; without a heading system no terrain will be presented on the display during hover operations or on-ground. When in maintenance mode, with no heading system and track invalid, unit displays North Up.

Radar Altitude is highly recommended. This not only supplies numerous GPWS alerts, but provides altitude callouts which provide an additional safety benefit.

2.3 Pre-installation Planning

The installation planning steps are summarized as follows:

1) Confirm the aircraft model is listed on the Approved Model List Supplemental Type Certificate (AML STC). See section 10 for the AML STC details.

   YES → Go to step 2.

   NO 

   Contact Sandel Avionics for guidance. Additional FAA approval will be required.

2) Identify mounting location on instrument panel. Is the intended location listed in section 4.3.4 of this Installation Manual?

   YES → Go to step 3.

   NO 

   Contact Sandel Avionics for guidance. Additional FAA approval may be required.

3) Determine that the aircraft has the minimum required sensors & equipment See section 2.2.1 of this IM.

   YES → Go to step 4.

   NO 

   The ST3400H cannot be installed.

4) Compile an equipment list for the helicopter. Complete Installation Worksheet. Worksheet can be found at: http://www.sandel.com/st3400h/st3400h-support. Determine that the sensors to be interface to the ST3400H are supported / approved. Reference Section 8 (Sensor Compatibility)

   YES → Go to step 5.

   NO 

   Contact Sandel Avionics for guidance. Additional FAA approval may be required.

5) Determine that the aircraft electrical system has sufficient excess capacity for additional load added from installation of the ST3400H. Reference Section 1.6.3 “Operational Characteristics”.

YES → Go to step 6.

NO 

Remove non-required electrical loads in order to make available sufficient electrical capacity or the ST3400H cannot be installed.

6) Determine that the installation of the ST3400H will result in the aircraft remaining within acceptable weight and balance limits. Reference section 1.6.2 “Physical Dimensions”.

YES → Go to step 7.

NO 

Adjust aircraft equipment loading as required to accommodate installation of ST3400H.

7) Review the installation drawings to determine a basic installation and interconnect scheme and check for conflicts. Reference section 12. Are there any conflicts?

NO → Go to step 8.

YES 

Contact Sandel Avionics for guidance.

8) Obtain the required installation tools. Recommended crimp tools are given in the following table.

Recommended Crimp Tools					
		High Density 22-28 AWG		Standard Density 20-24 AWG	
Manufacturer	Hand Crimping Tool	Positioner	Insertion/ Extraction Tool	Positioner	Insertion/ Extraction Tool
Military P/N	M22520/2-01	M22520/2-09	M81969/1-04	M22520/2-08	M81969/1-02
Positronic	9507	9502-3	M81969/1-04	9502-5	M81969/1-02
ITT Cannon	995-0001-584	995-0001-739	N/A	995-0001-604	980-2000-426
AMP	601966-1	601966-6	91067-1	601966-5	91067-2
Daniels	AFM8	K42	M24308/18-1	K13-1	M24308/1-02
Astro	615717	615725	M81969/1-02	615724	M81969/1-02

2.4 Installation

Using the information in section 2.3 and section 4, install the ST3400H.

2.5 Post Installation Procedures

Post installation procedures are summarized as follows:

- Prior to power-up, review correct wiring by using industry accepted ohmmeter and voltage checks. Pay particular attention to presence of +28V on only the correct pins; 0 ohm resistance check on ground pins to airframe ground; and presence of inverter 400Hz (if used) only on the appropriate pins.

- Review any special items particular to the subject helicopter installation.

- Power up the ST3400H in maintenance mode (reference to Section 5) and sequentially access each maintenance page to select the installed equipment (reference to Section 6).

- Check proper cooling airflow as follows:
  - Allow the unit to operate for 30 minutes.
  - Check the internal temperature readout on the appropriate maintenance page for an approximate temperature rise (approximately 10°C or 18°F over ambient).

- Perform Ground Test procedures (Checkout) specified in Section 7.

- Complete all required installation documentation. Possible documents may include:
  a. Log book entries
  b. FAA Form 337
  c. RFMS
  d. Weight and balance update
  e. Electrical load analysis

- For Continued Airworthiness information refer to Instructions for Continued Airworthiness in Section 11.

3 INTERFACE FUNCTIONS

3.1 Power

The primary power is 28 volt dc on J-2 and is supplied from the aircraft avionics buss through a circuit breaker. Ground is provided on J-2 and should be attached to an approved airframe ground.

A 26 volt 400Hz excitation input is available at J-16. It is only used in the case of an XYZ heading source. If the installation of the ST3400 does not use an XYZ (ARINC407) signal source, the inverter input is not required and should be grounded.

3.2 GPS/FMS

A GPS position input is required. The port is configurable in the Maintenance Menu pages for High or Low speed ARINC and RS232. A list of supported labels is listed in section 8.8 .

A separate GPS flight plan input is normally connected but is optional.

In the case where all information is coming from the same 429 source, the single receiver is fed to both inputs.

> **Note**: In the case of the Garmin GNS series, the position input is connected to the receiver's RS232 output, and the Flight plan data is connected to the receiver's GAMA ARINC 429 output.

3.3 Heading System

A Heading input is not required. However, without a heading system the terrain display will be removed at low groundspeeds. When the heading input is present the terrain display remains on the screen even during hover operations. It is highly recommended.

When in maintenance mode, with no heading system and track invalid, unit displays North Up.

3.4 Radar Altimeter

The ST3400H has provisions for a Radar Altimeter input. Radar Altimeter input may be from an ARINC 429 or DC analog sources. The Radar Altimeter input is used to obtain height above terrain for GPWS alerting and for altitude callouts.

The Radar altimeter always produces a single '300' or '100' mandatory audio callout, depending on NORM/LOW sensitivity selected by the pilot. When in HIGH-SENS, a '400' mandatory audio callout will be produced. Optionally the installer may enable any or all of the following additional audio callouts:

300', 200', 100', 50', 40', 30', 20', 10'

These callouts are a great safety feature and their use is encouraged.

When the Radalt is lower than the MINS setting a MINS discrete output is activated and an audio callout “MINIMUMS” occurs.

When the Radar Altimeter is not configured, the MINS setting is retained on the display for use as a visual reference by the pilot. The MINS discrete and callout will be disabled.

The MINS setting knob on the front panel has a push button function. This operates the momentary discrete on J3, RADALT TEST.

3.5 Glideslope

This input provides the GPWS mode-5 glideslope alert. ARINC 429 or low level analog inputs for Glideslope deviation, Glideslope flag status, and Localizer and Localizer Flag are provided.

An additional discrete input is available for Back Course from the HSI, which acts to disable Glideslope alerting while on a Back Course approach.

3.6 Air Data Computer

Airdata input is recommended. ARINC 429 airdata is supported as well as analog pressure altitude. Use of analog pressure altitude requires ST3400H with MOD-1 installed per SIL 3400H-01.

3.7 Traffic

The ST3400H supports Traffic input via single ARINC 429 input. Traffic data is overlaid on terrain.

Some traffic processors require remote switches. See Traffic interface drawings in this manual for these requirements.

3.8 Landing Gear

The ST3400 has provisions on J-1 for Gear Down input discrete to indicate that the gear is in the “DOWN” position for helicopters equipped with retractable landing gear.

The configuration is performed in the Maintenance Menu pages given in the Setup Procedures section of this manual. If the system is installed in a helicopter without retractable landing gear, select “NONE” on maintenance page configuration item.

3.9 External Switches and Annunciators

All external switches and annunciators are optional.

External switches are momentary contact OPEN/GND, normally open.

External annunciators, if used, must be properly labeled and colored.

Discrete outputs are OPEN/GND and capable of sinking a maximum of 250milliamps to ground when active. They can drive incandescent lamps and/or relays. Dimming of external annunciators is accomplished by sourcing the annunciators from the helicopter day/night bus.

3.9.1 External Switch + Annunciator Functions

These switch/annunciator functions are on J2. The external switches perform the same functions as their related front panel switches.

- GS Inh
- Mute Momentary press mutes an active Caution
- Mute Press and hold invokes TAWS INH function
- Sensitivity Momentary press toggles sensitivity selections.
- Sensitivity Press and hold invokes OFF-APT mode

3.9.2 External Annunciator-Only Functions

These annunciator discrete outputs are available on J2:

- Caution Alert
- Warning Alert
- Taws Inhibit

3.9.3 External Control Discrete Outputs

These control outputs are available:

- Radalt Test
- TCAS Inhibit

3.9.4 Annunciator Default Functions

ANNUNCIATORS		
Marking	**Color**	**Description**
G/S INH	YELLOW	Same function as on-screen G/S INH annunciation.
MUTE	YELLOW	Same function as on-screen MUTE annunciation.
SENS	WHITE OR CYAN	Alert sensitivity is LOW SENSE.
TAWS	YELLOW	Same as on-screen TAWS Yellow Caution.
TAWS	RED	Same as on-screen TAWS Red Warning.
TAWS INH	YELLOW	TAWS INH function has been enabled or one or more alerts have been disabled due to a fault.

CONTROL OUTPUTS	
Signal	**Description**
RADALT TEST	GND when the RA TEST pushbutton has been activated
TCAS INH	GND when either CAUT or WARN are active. Used to mute the TCAS audio.

3.10 NVIS Control

The NVIS CTRL discrete is an OPEN/GND input which controls the NVIS mode and is intended to be connected to a sustained toggle or sustained pushbutton switch. In the default configuration GND=NVIS ON and OPEN=NVIS OFF. In this configuration a wire break to the switch would result in NVIS OFF.

The input configuration can be changed by the installer in the SYSTEM maintenance page to reverse the logic so that GND=NVIS OFF and OPEN=NVIS ON. In this configuration a wire break to the switch would result in NVIS ON.

3.11 Audio Output

The audio output produces all advisories and alerts which utilize audio.

Two types of outputs are provided, a speaker output and headphone output. The outputs are located on J3 and connection to at least one of these outputs is required.

The headphone output, if used, must connect to the un-switched input of the helicopter audio system. This output is selectable to a nominal level of 25mw or 150mw output by strapping jumpers on J3. If no jumper is installed the headphone output is disabled.

The speaker output, if used, must be directly connected to a dedicated 4 or 8 ohm cockpit speaker.

A volume level trim adjustment which affects both outputs simultaneously is present on the AUDIO maintenance page.

3.12 Uploading Equipment

A USB interface is available on the front of the ST3400H to upload system software, terrain data, obstacle data, airport data, and configuration data into memory and to download configuration data from memory.

Data is loaded from a PC or laptop computer with Microsoft Windows XP (or later) operating system software to the ST3400H. Drivers, the loader program, and loading instructions are supplied with the applicable software or data.

3.13 Display Dimming

The ST3400H screen dimmer is controlled from the front panel knob using the PULL position.

External annunciator dimming may be accomplished using the existing aircraft day/night buss by connecting the high-side of the annunciator lamps day/night buss.

4 INSTALLATION

The ST3400H should be installed in accordance with standards established by the customer's installing agency, and existing conditions as to unit location and type of installation.

4.1 Unpacking and Inspecting Equipment

Exercise extreme care when unpacking the equipment. Make a visual inspection of the unit for evidence of damage incurred during shipment. If a claim for damage is made, save the shipping container to substantiate the claim. The claim should be promptly filed with the carrier. It would be advisable to retain the container and packaging material after all equipment has been removed in the event that equipment storage or reshipment should become necessary.

4.2 Cooling Considerations

The ST3400H contains its own ventilation fan for internal component cooling and does not require a forced air cooling system. However, it is important that the perforated area at the four corners (air intakes) be kept clear of any objects which would restrict the inflow of air at cabin ambient temperature.

Cooling should be verified in the post-installation checkout by monitoring the temperature on the POWER maintenance page. For additional cooling or special requirements, air from an external avionics blower may be directed near the corner air inlets.

In helicopter installations, it may be desirable to introduce a small amount of cooled (air conditioner) air into the avionics bay if it is completely sealed. In these installations it is not uncommon for the internal ambient temperature of the avionics bay to exceed the ratings of the equipment if cooling air is not supplied.

4.3 Mechanical Installation Considerations

4.3.1 Instrument Location in the Cockpit

The Sandel ST3400H is a direct replacement for a currently installed 3 ATI Radar altimeter indicator. Installation should conform to customer requirements and airworthiness standards affecting the location and type of installation.

4.3.2 Human Factors

Unit must be located to provide convenient operation and to prevent confusion and inadvertent operation. Unit must be located and arranged with respect to the pilot's seats so that there is full and unrestricted movement of each control without interference when pilots 5'-2" to 6'-0" in height are seated to ensure that while in flight, any pilot interaction with the ST3400H will not result in any unplanned changes to the aircraft flight path.

The minimum flight crew must be established so that it is sufficient for safe operation, considering:

- The workload on individual crewmembers.
- The accessibility and ease of operation of necessary controls by the appropriate crewmember.

4.3.3 Assembly and Mounting Instructions

Refer to the ST3400H Installation Drawings for specific assembly and mounting instructions and appropriate notes.

4.3.4 Mounting Locations

The ST3400H may be installed as a replacement for or in a location provisioned for a radar altimeter or other suitable location as defined as follows:

NOTE: Any installation location is acceptable provided the ST3400H is installed adjacent to the helicopter primary displays (no greater than 6" between the edges of the bezels) , its display and annunciations are visible to the pilot, and its controls are reachable by the pilot or are suitably remote controlled."

Reference drawing 82046-0177 for acceptable installation location criteria.

The following views identify approved mounting locations for installation of the ST3400H.

If it is desired to install the ST3400H in locations other than described herein, additional FAA approvals may be required.

The ST3400H is installed as a replacement to or in a location provisioned for a radar altimeter.

Earlier S/N aircraft without VEMD installed.

Later S/N aircraft with VEMD installed.

Figure 4–1 Airbus AS350 Series

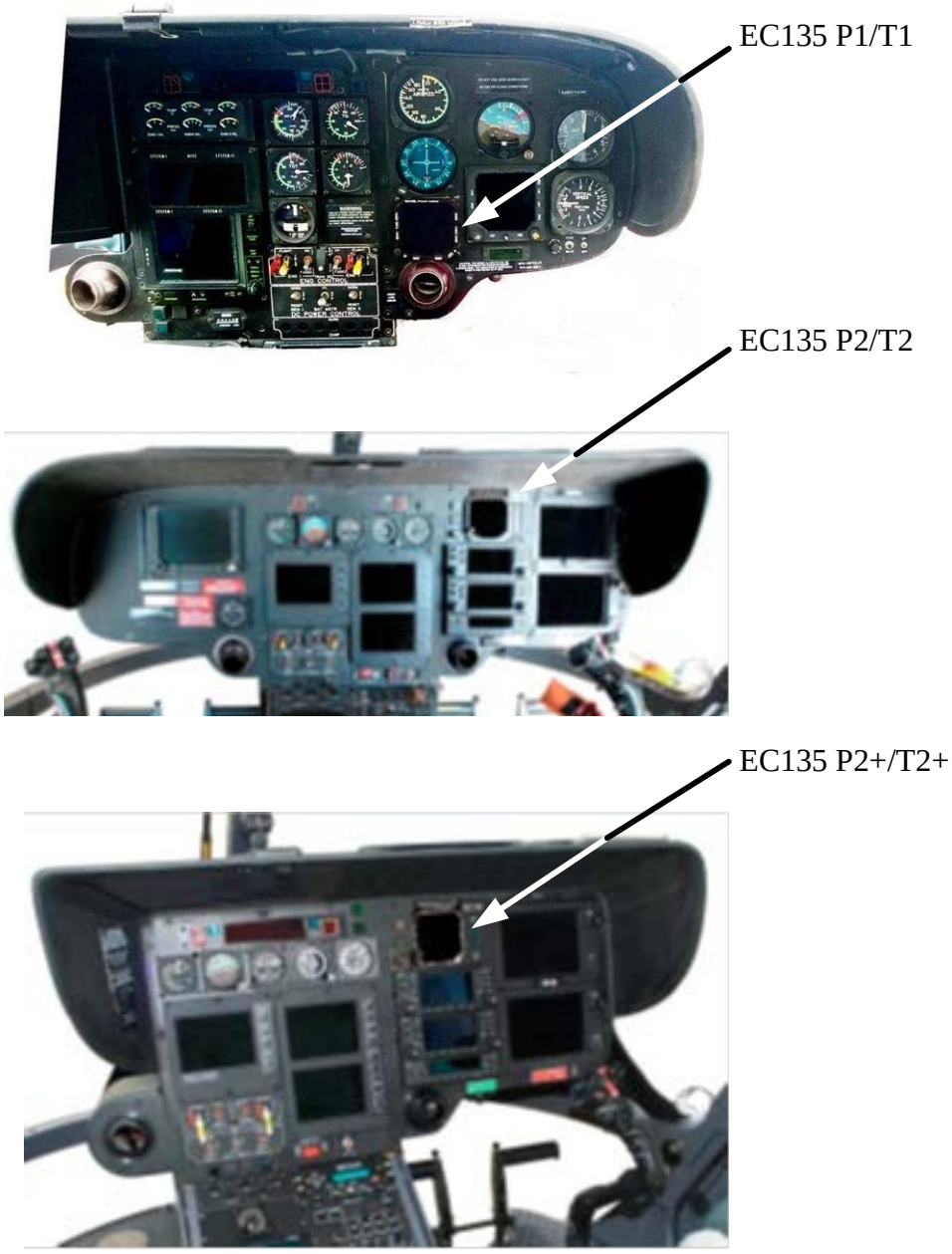


Figure 4–2 EC135 Series

Figure 4–3 Bell 412 Series

4.4 Electrical Installation Considerations

The installing agency fabricates and supplies all wiring harnesses. Refer to the ST3400H Interconnect Wiring Diagrams for detailed wiring information and appropriate notes.

1) Refer to the Functional Pinout Descriptions for explanations of pin functions.
2) The length and routing of wires must be carefully planned before starting the installation.
3) Avoid sharp bends in the harness.
4) Do not locate the harness near aircraft controls.
5) Observe all recommended wire sizes and types and subscribe to appropriate FAR Parts 23, 25, 27, and 29, as well as AC 43.13-1(B) and –2(A).
6) MIL-C27500 shielded wire and MIL-W-22759 single conductor wire is recommended. The use of ferrules or grounding blocks for signal ground and digital ground returns is satisfactory; however, each ground return must be electrically separated.
7) In order to ensure optimum performance, the ST3400H and associated wiring must be kept a minimum of three feet from high noise sources and not routed with cables from high power sources.
8) Prior to installation, verify proper wiring by completing a point-to-point continuity check of the wiring harness.
9) Use the Functional Pinout Descriptions to determine installation requirements.

Ground Bonding. Bonding of the ST3400H shall be in accordance with AC 43.13-1B, Chapter 11, Section 15. After installation, bonding shall be measured and the result shall be 10 milliohms or less between the ST3400H case and the instrument panel.

Power Wiring. To assure that the ST3400H will operate properly down to its rated minimum input voltage, ensure that two power wires of at least the recommended size are connected in accordance with the installation drawings.

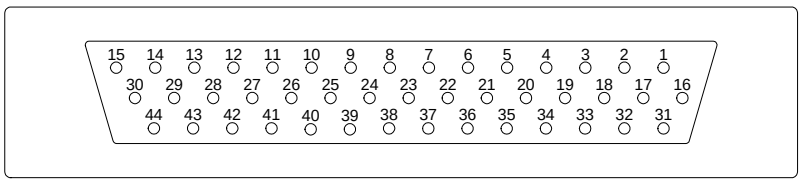
4.5 Connector P1

For electrical characteristics, see the table in section 4.9 by referencing the signal type indicated in *italics.* Signal types enclosed in parentheses indicate functionality that is reserved.

PIN #			Name	Signal Type (dependent on system configuration)	
	16		**Inverter Exc.**	In	
				Inverter	26Vac Hdg Excitation (optional)
1			**Shield Gnd**		
		31	**GPS Flight plan A**	In	
				*A429 **	A side 429
				(RS422)*	+ side 422
				(RS232)	Ground side
	17		**GPS Flight plan B**	In	
				A429'*	B side 429
				(RS422)*	- side 422
				(RS232)	Rx
2			**Radalt A**	In	
				*A429***	A side 429
				Radalt	Analog DC+ [ALT 50/55, ARINC 552, RT220/300, RT200]
		32	**Radalt B**	In	
				*A429***	B side 429
				Radalt	Analog DC- [ALT 50/55, ARINC 552, RT220/300, RT200]
	18		**Radalt Valid**	In	
				Discrete Valid	Programmable OPEN/GND or OPEN/+28 Note: Not used when 429 is data source
3			**Hdg A**	In	
				*A429 **	A side 429
				A407	Synchro X [Z grounded]
		33	**Hdg B**	In	
				*A429 **	B side 429
				A407	Synchro Y [Z grounded]
	19		**Hdg Valid**	In	
				Discrete Valid	Programmable OPEN/GND or OPEN/+28 Note: Not used when 429 is data source.
4			**GPS Position A**	In	
				*A429 **	A side 429
				*RS232**	Ground side
		34	**GPS Position B**	In	
				*A429**	B side 429
				*RS232**	Rx

PIN #			Name	Signal Type (dependent on system configuration)	
	20		**RS422+ Out Spare**	Out	+
5			**RS422- Out Spare**	Out	-
		35	**TCAS A**	In *A429**	A side 429
	21		**TCAS B**	In *A429 **	B side 429
6			**Vert LL Flag In+**	In *Vert LL Flag*	DC+ Note: For use with external SUPERFLAG requires resistor
		36	**Vert LL Flag In-**	In *Vert LL Flag*	DC-
	22		**Vert LL Dev In +FLY UP**	In *Vert LL Dev*	DC+ Polarity: + indicates above glideslope, fly-down indication.
7			**Vert LL Dev In –FLY_UP**	In *Vert LL Dev*	DC- Polarity: + indicates below glideslope, fly-up indication
		37	**Lat LL Flag In+**	In *Lat LL Flag* *(429)*	DC+ Note: For use with external SUPERFLAG requires resistor A side 429
	23		**Lat LL Flag In-**	In *Lat LL Flag* *(429)*	DC- B side 429
8			**Lat LL Dev In +Right**	In *Lat LL Dev* *(A429)*	DC+ Polarity: + indicates left deviation; fly-right Also used as Nav A side 429
		38	**Lat LL Dev In -Right**	In *Lat LL Dev* *(A429)*	DC- Polarity: + indicates right deviation; flight left Also used as Nav B side 429
	24		**Reserved**	Do not connect	
9			**Reserved**	Do not connect	
		39	**Reserved**	Do not connect	
	25		**Reserved**	Do not connect	
10			**429-2 Out A**	Out *A429*	A side 429
		40	**429-2 Out B**	Out *A429*	B side 429

PIN #			Name	Signal Type (dependent on system configuration)	
	26		**Airdata A**	In *A429** *(R422*)* *(R232)* *(Ana)*	 A side 429 + side 422 Ground side DC+
11			**Airdata B**	In *A429** *(R422*)* *(R232)* *(Ana)*	 B side 429 - side 422 Rx DC-
		41	**Reserved**	Do not connect	
	27		**Reserved**	Do not connect	
12			**Spare Discrete 1**	In *Discrete*	n/c Programmable OPEN/GND or OPEN/+28
		42	**429-1 Out A**	Out *A429*	 A Side - Alert output to FDR - High Speed (100Kbps)
	28		**429-1 Out B**	Out *A429*	 B Side - Alert output to FDR - High Speed (100Kbps)
13			**RS232TxD**	Out *R232*	Spare
		43	**Air Data Valid**	In *Discrete*	 Programmable OPEN/GND or OPEN/+28
	29		**BC In**	In *Discrete*	 Programmable OPEN/GND or OPEN/+28
14			**Gear In**	In *Discrete*	 Programmable OPEN/GND or OPEN/+28
		44	**NVIS Ctrl**	In *Discrete*	 OPEN/GND. GND turns NVIS OFF unless sensing is reversed in SYSTEM maintenance page, when GND turns NVIS ON.
	30		**Spare Sw Discr**	In *Discrete*	 OPEN/GND
15			**Radalt Fail In**	In *Discrete*	 >9VDC nom = Radalt Valid



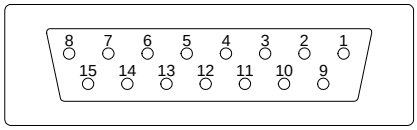
Outside View (Mating Connector)

4.6 Connector P2

For electrical characteristics, see the table in section 4.9 by referencing the signal type indicated in *italics.* Signal types enclosed in parentheses indicate functionality that is reserved.

PIN #		Name	Signal Type (dependent on system configuration)	
1		**Aircraft Power**	In	Aircraft Power
	9	**Aircraft Power**	In	Aircraft Power
2		**Selectable Discrete*** **Reduced Sensitivity Annunciator (default)** **TCAS Altitude Mode**	Out *Open Drain*	
	10	**Selectable Discrete*** **Radalt Test (default)** **TCAS Test Mode**	Out *Open Drain*	
3		**Aircraft Ground**	In	System Ground
	11	**Aircraft Ground**	In	System Ground
4		**Selectable Discrete*** **Glideslope INH Annunciator (default)** **TCAS Inhibit**	Out *(Open Drain)*	
	12	**Selectable Discrete*** **TAWS INH Annunciator (default)** **Radalt MINS Annunciator**	Out *Open Drain*	
5		**GS INH Switch In**	In *Discrete*	OPEN/GND Momentary Switch
	13	**Mute Switch In**	In *Discrete*	*OPEN/GND Momentary Switch*
6		**Sensitivity Switch In**	In *Discrete*	*OPEN/GND Momentary Switch*
	14	**Selectable Discrete*** **Warning Annunciator (default)** **TCAS Operate Mode**	Out *Open Drain*	
7		**Selectable Discrete*** **Caution Annunciator (default)** **TCAS Test Mode**	Out *Open Drain*	
	15	**Selectable Discrete*** **Mute Annunciator (default)** **Radalt Test**	Out *Open Drain*	
8*		**Selectable Discrete*** **TCAS Inhibit (default)** **GPWS Fail Annunciator**	Out *Open Drain*	

Note: Selectable discrete outputs sink 50ua of current when off. If used as TCAS Inhibit to a TCAS processor, this connection may require an external 30k-50k pull-up resistor in order for the discrete input of the TCAS to be at the proper 'high' (unasserted) voltage. If necessary, check with a voltmeter during installation.



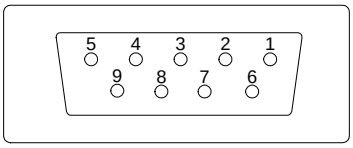
Outside View (Mating Connector)

4.7 Connector P3

For electrical characteristics, see the table in section 4.9 by referencing the signal type indicated in *italics.* Signal types enclosed in parentheses indicate functionality that is reserved.

PIN #		Name	Signal Type (dependent on system configuration)
1		**Reserved**	Do not connect
	6	**Strapping Common**	500 Ohm out Strapping Common
2		**Reserved**	Do not connect
	7	**Reserved**	Do not connect
3		**150 mw Strap**	* Strap to pin 6 for 150mW nominal level on 500 ohm out
	8	**25 mw Strap**	* Strap to pin 6 for 25mW nominal level on 500 ohm out
4		**Speaker Audio Out**	Out *4 or 8 Ohm Speaker Output*
	9	**Headphone Audio Out**	Out *500 Ohm Headphone Output*
5		**Audio Output Common**	In *Audio Ground*

***Note**: strap either pin 3 or pin 8 but not both.



Outside View (Mating Connector)

4.8 Configuration Module Connector

Accepts ST3400H Configuration Module.

The configuration module holds all installation data and is specific to the aircraft. If the ST3400H is swapped, re-using the configuration module will automatically reconfigure the new unit to the original aircraft configuration.

The ST3400 will may be operated with or without a configuration module connected. If no configuration module is present the ST3400H will operate but the pilot will receive an advisory message.

4.9 Electrical Characteristics by Signal Type

Inputs

Signal Type	Nom Range	Absolute Max	Z (Ω – Power Off)
A429	+/- 5Vdc	5.5Vdc	>100K
A429*	+/- 5Vdc	14Vdc	>100K
A429**	+/- 5Vdc	33Vdc	>100K
RS232	+/- 10Vdc	14Vdc	>100K
RS422	+/- 5Vdc	5.5Vdc	>100K
RS422*	+/- 5Vdc	14Vdc	>100K
A407 (AC Synchro)	11.8Vac rms +/- 20%	14Vdc	>100K
Discrete Valid (High)	>14.0Vdc[Note 4]	33Vdc	>500K
Discrete Valid (Low)	<3.5Vdc [Note 4]	33Vdc	>500K
Discrete (High)	>1.2Vdc	33Vdc	50K
Discrete (Low)	<8Vdc	33Vdc	50K
Vert LL Dev	+/- 225mv FS	14Vdc	>300K[Note 2]
Lat LL Dev	+/- 225mv FS	5.5Vdc	>300K[Note 2]
Vert LL Flag	Unflagged > 225mv	14Vdc	>300K[Note 2]
Lat LL Flag	Unflagged > 225mv	5.5Vdc	>300K[Note 2]
Inverter	26Vac rms 400Hz nom 320Hz-480 Hz limits	42Vac	>50K
Power	+22 to +30.3Vdc[Note 1]	7Adc	NA
Radalt	+/- 30Vdc	33Vdc	>100K
Ana	+/- 13Vdc	14Vdc	>100K

Outputs

Signal Type	Nom Range	Absolute[Note 3] Max	Load (Ω)
A429	+/- 5Vdc	70mAdc	2K (Minimum)
RS232	+/- 5Vdc	70mAdc	500 (Minimum)
Speaker Output	2W Nom	5W	4-8
Headphone Output	25mw/125mw	50mw/250mw	>500
Open Drain	1Ω or High Impedance (over current protected)	250mAdc	>350K

Notes:

1. At +28Vdc, nominal current is 1.25Adc +/- 10%, 1 minute after start up.
2. Power On Load = 60.4K. For Vert/Lat Deviation there may need to be a 1K load somewhere else in the system to meet the receiver load requirements. Check installation instructions for the interfaced receiver.
3. Outputs are protected against shorts to ground. Shorts to power supply may cause damage to components.

4. Discrete inputs actively pulled to 27.5v through 30k ohms when selected ‘active low’ or actively pulled to 0v through 30k ohms when selected ‘active high’ in the maintenance pages. This ensures the input is in the ‘inactive’ state if an external connection fails. If interfacing to discrete signals which do not supply a “hard” 0Vdc/27.5Vdc transition, any input network may be used that ensures that the discrete input pin is not within 1.0v from its nominal threshold shown in the table either in the active or inactive state.
5. All discrete outputs sink 50ua current when off.

5 SETUP PROCEDURES

5.1 General

Setup procedures for the ST3400H are described along with the Maintenance menu below. The Maintenance Menu is accessed and addressed through the use of pushbuttons and the BRT/MINs knob. No external connector programming is required.

5.2 Accessing Maintenance Menus

To access the Maintenance Menus perform the following operations:

- Prior to applying power to the ST3400H, depress and hold the [MUTE] and [SENS] pushbuttons, then apply power to the unit. Continue to hold until the first maintenance menu appears.

- Once the Maintenance Menu is entered, press the [NEXT] or [PREV] soft-keys to cycle the MAINTENANCE MENU pages. To jump to a specific page, from the INDEX page, press the [UP] or [DOWN] soft-keys or rotate the BRT/MINS knob to move the cursor. Press the [SELECT] soft-key to jump to that page. On some menus additional soft-key legends will appear as prompts.

- Escape the maintenance menus by pressing and holding the “M” button. This will allow normal operation of the unit to test the effects of the settings. Re-enter the maintenance pages by pressing and holding the “M” button.

To disable the maintenance menu operation, power down and restart normally. All configured items are stored in non-volatile memory.

5.3 Equipment/Configuration Selections

The choices of compatible equipment contained in the ST3400H menus are listed in section 8. For types not listed, consult the factory.

5.4 Configuration Module – (Reserved for future use)

The Configuration Module (CM) stores installation configurations. The physical Configuration Module is directly mounted to the rear of the instrument. Configuration module can be used when replacing an existing ST3400H. Data stored in the configuration module can be copied directly to the replacement unit. It is advisable to leave the configuration module plugged into the unit to avoid misplacing it.

5.5 Configuration Module Status Page - (Reserved for future use)

“CONFIG MODULE STATUS” page may appear during initial turn on and programming of a unit. This page will only appear again if there is a mismatch between the configuration information saved in the Configuration Module and the ST3400H. The mismatch identified

with the configuration information is shown at the top of this page, along with the actions that may be taken.

The options displayed on the **"CONFIG MODULE STATUS"** page are as follows.

"DISABLE CM" (~~CM~~)
When this option is selected no stored data will be read from or written to the Configuration Module. Selecting "Disable CM" will allow the installer to go directly to the Maintenance Index page 1.

Note "**~~CM~~**" will appear in the upper right corner to indicate that the configuration module is not operational.

"ST3400H TO CM": stored
The current ST3400H configuration is written to the configuration module and stored.

> **NOTE:** When selecting this option ST3400H configuration data will be written TO the configuration module and overwrite any existing configuration data in the Configuration Module.

"CM TO ST3400H": Selecting
Stored Configuration Module data is written to the ST3400H.

> **NOTE:** When selecting this option data FROM the configuration module will overwrite any existing configuration data in the ST3400H. The configuration module is unaffected.

As part of the configuration, an aircraft identifier (Tail Number) should be entered on the systems settings page.

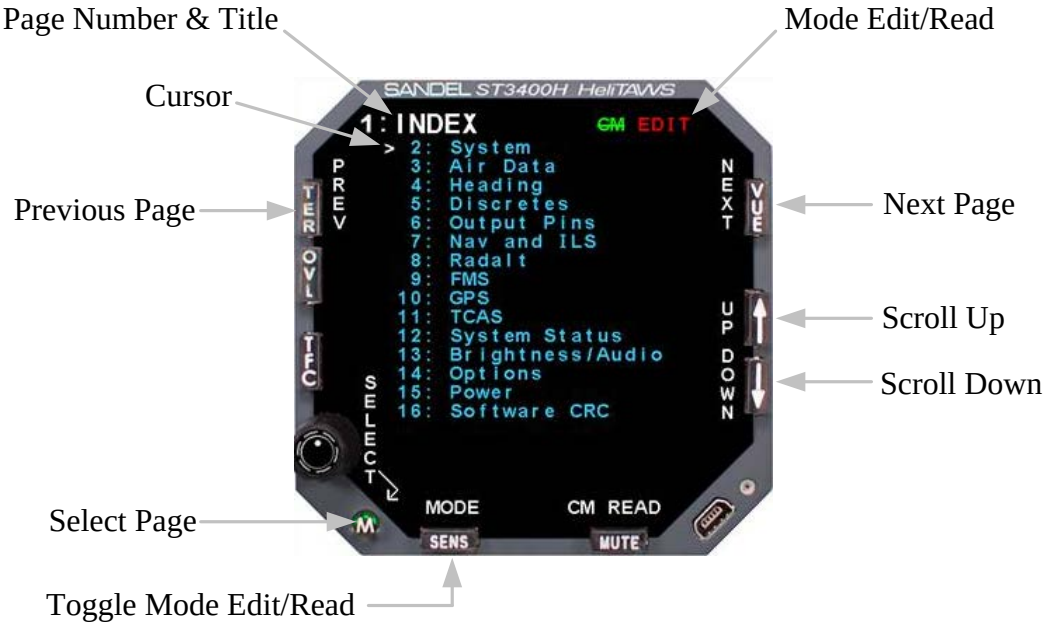
6 SYSTEM CONFIGURATION

After all wiring has been verified and the ST3400H has been installed into the panel, the maintenance pages must be accessed to properly configure the ST3400H for the installed equipment. Prior to applying power to the ST3400H, press and hold the [MUTE] and [SENS] buttons, and then apply power to the unit. Continue to press the buttons until the first maintenance menu appears.

Once the Maintenance Menu is entered, press the [NEXT] or [PREV] soft-keys to cycle the MAINTENANCE MENU pages. To jump to a specific page, from the INDEX page, press the [UP] or [DOWN] soft-key or rotate the knob to move the cursor. Press the [SELECT] soft-key to jump to that page. On some menus additional soft-key legends will appear as prompts.

Escape the maintenance menus by pressing and holding the “M” button. This will allow normal operation of the unit to test the effects of the settings. Re-enter the maintenance pages by pressing and holding the “M” button.

To disable the maintenance menu operation, power down and restart normally. All configured items are stored in non-volatile memory.



The Maintenance Page Number/Title is displayed on every maintenance page showing the maintenance page number and title.

The Cursor points to the item, which may be modified or selected. If there are no selectable items on the currently displayed maintenance page, the Current Line Indicator is not displayed.

- The [UP] and [DOWN] soft-keys are used to move the through the list.
- The soft-keys are labeled to convey the context sensitive function of each button as required.

COMMON Maintenance Page Soft-Keys	
Name	**Description**
PREV	Returns to the prior maintenance page. When the first maintenance page is being displayed, moves to the last maintenance page.
NEXT	Advances to the next maintenance page. When the last maintenance page is being displayed, then moves to the first maintenance page.
SELECT	From the index page, jump directly to the indicated page.
OPER	From a maintenance page, When pressed once, will jump to the Maintenance Index page. When pressed and held in, will transition into the Flight Operation display.
MAINT	From a flight operations, return to the Maintenance Index page. The Cursor will point to the maintenance page listing that was displayed prior to transitioning to the Flight Operation display.
UP	Moves the Cursor to the previous (up) selectable item. Hold key down to automatically repeat. When there are no selectable items, the key is disabled.
DOWN	Moves the Cursor to the next (down) selectable item. Hold key down to automatically repeat. When there are no selectable items, the key is disabled.
VALUE	Provides access to read secondary data from a piece of equipment. The [DOWN]/[UP] soft-keys will scroll through each Data Value that is available. When secondary data is not available, the soft-key is not displayed.
TYPE	Returns function of [DOWN]/[UP] soft-keys back from VALUE selection monitoring into TYPE selection.
MODEL	Returns function of [DOWN]/[UP] soft-keys back from VALUE selection monitoring into Model selection.
MODE	Toggles the Edit/Read mode for all maintenance pages. Only displayed on the maintenance index page.
(-)	If the maintenance item is a numeric value, this key will decreases the value. When the maintenance item is a multiple-choice entry, then pressing the soft-key will move to the previous choice. Hold to repeat.
(+)	If the maintenance item is a numeric value, this key will increase the value. When the maintenance item is a multiple-choice entry, then pressing the soft-key will move to the next choice. Hold to repeat.

6.1 Page 1: INDEX

The Maintenance Index page is a multiple–choice list that provides an index of all other maintenance pages and allows the operator to jump to a particular page. First scroll the Cursor to point to the desired maintenance page listing using the [Up] soft-key or [Down] soft-key or the BRT/MINS. The [SELECT] soft-key is then pressed to jump to this page. When in the Maintenance pages, press the [OPER] soft-key to return to the Maintenance Index page. The [PREV] or [NEXT] soft-keys may also be used to reach a particular maintenance page sequentially.

The [MODE] soft-key is used to toggle the ST3400H between READ and EDIT mode.

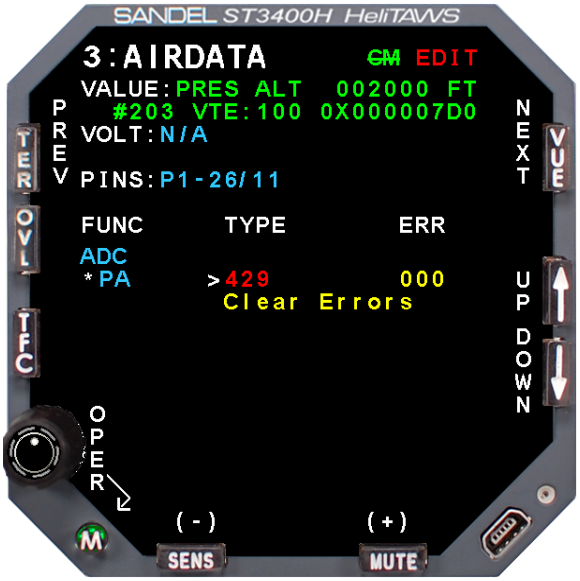
Note: The ST3400H must be in the EDIT mode to make configuration changes on the following maintenance pages.

6.2 Page 2: SYSTEM

The System page provides information that identifies the unit.

Configuration Field	Options	Comment
Serial Number	None	Displays unit serial number.
PATCH	None	Display patch level.
FPGA	None	Displays FPGA revision.
CPLD	None	Displays CPLD revision.
UPS CCA Rev	None	Displays UPS CCA revision.
CPU CCA Rev	None	Displays CPU CCA revision.
Software Rev	None	Displays software revision number.
Terrain Rev	None	Displays terrain database revision number.
Obstacle Rev	None	Displays obstacle database revision number.
Airport Rev	None	Displays airport database revision number.
Overlay Rev	None	Displays overlay database revision number.
Aircraft Ident	7 Characters	Enter aircraft identification for reference.

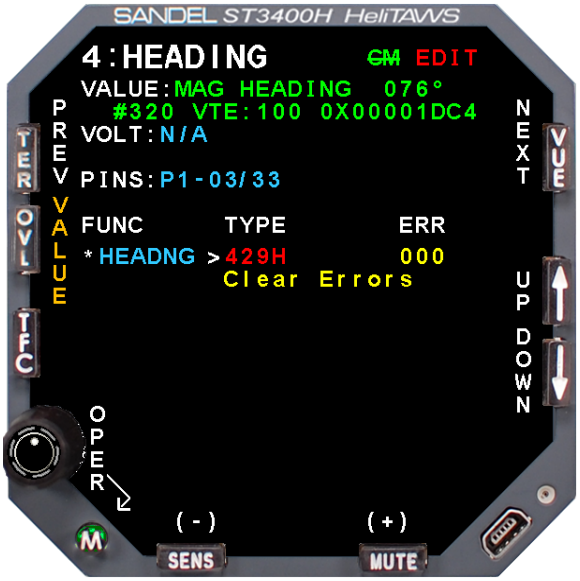
6.3 Page 3: AIR DATA



The Air Data page contains the setup information for the Airdata system. Use the [UP] or [DOWN] soft-keys to select a setup item. This will move the Cursor to the appropriate line and display the current input data value, input voltage (if applicable) and pin-pairs of the selected signal.

Configuration Field	Options	Comment
PA	NONE 429 429H	Configures the air data PA source.
	Type I (Analog)	DC voltage inversely linear with pressure Range = -1,000 to 41,000 feet Scale = -0.3264 Vdc/inHg absolute (Ps) Reference = -9.766 Vdc at 29.921 inHg
	Type II (Analog)	DC voltage linear with altitude Range = -1500 to 20,000 (0 to 10.00 volts) Scale = 0.4651mv / foot

6.4 Page 4: HDG



The HDG page contains the setup information for the HDG system. Use the [UP] or [DOWN] soft-keys to select a setup item. This will move the Cursor to the appropriate line and display the current input data value, input voltage (if applicable) and pin-pairs of the selected signal.

When selecting analog inputs, a VALID select will be present. If no valid signal is available for the interconnected equipment, set this to NONE which will treat the signal inputs as always valid. If a VALID signal is available, set appropriately to VALID HIGH or VALID LOW. The effect of these settings will be immediately shown as a VALID or INVALID data value at the top of the screen

Configuration Field	Options	Comment
HEADING	NONE 429 429H XYZ XYZ-	Selects the gyro input to the ST3400H.
VALID	NONE HIGH LOW	Not shown if 429 or 429H is selected for heading.

6.5 Page 5: DISCRETES

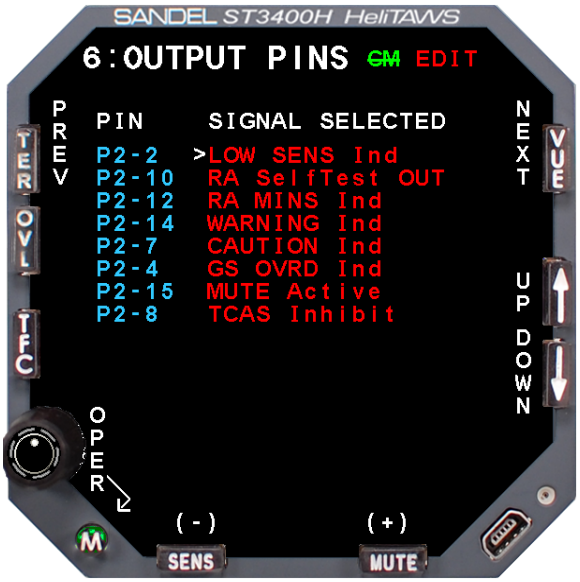
The Discretes page shows all the discrete inputs.

A Discrete may be VALID-LOW or VALID-HIGH. In either case a 30K resistor is connected to pull the signal to the invalid state (ground or aircraft power) as applicable unless the valid signal is applied.

Back Course (from the HSI) discrete input may be ACTIVE-LOW or ACTIVE-HIGH (Valid Sense). This is used to inhibit the Glideslope alert GPWS mode 5.

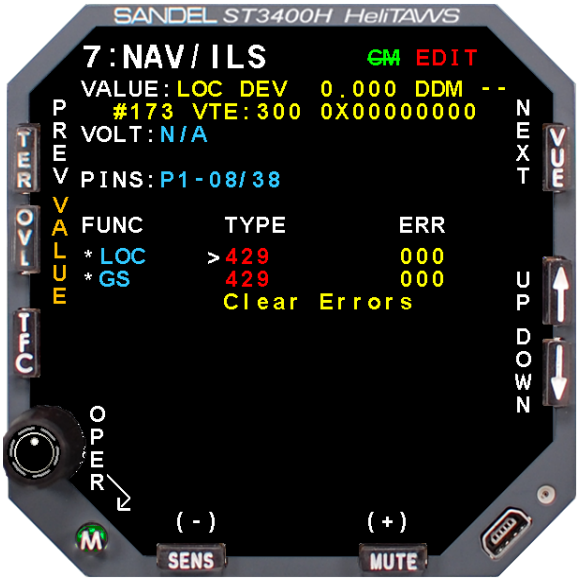
Configuration Field	Options	Comment
BCKCRS	NONE ACTIVE L ACTIVE H 429	Configures the back course input discrete.
GEAR	NONE DOWN L DOWN H 429	Configures the gear input discrete.
NVIS	NONE ACTIVE L ACTIVE H 429	Configures the NVIS enable discrete. Only available on units equipped with NVIS capability.

6.6 Page 6: OUTPUT PINS



Configuration Field	Options	Comment
P2-2	NONE LOW SENS Ind TCAS ALT SEL SW	
P2-10	NONE RA Self Test OUT TCAS S-Test SW	
P2-12	NONE TAWS INH Ind RA MINS Ind	
P2-14	NONE WARNING Ind TCAS Mode SW	
P2-7	NONE CAUTION Ind TCAS S-Test SW	
P2-4	NONE GS Inhibit Ind TCAS Inhibit	
P2-15	NONE MUTE Active RA Self Test OUT	
P2-8	NONE TCAS Inhibit GPWS Fail Ind	

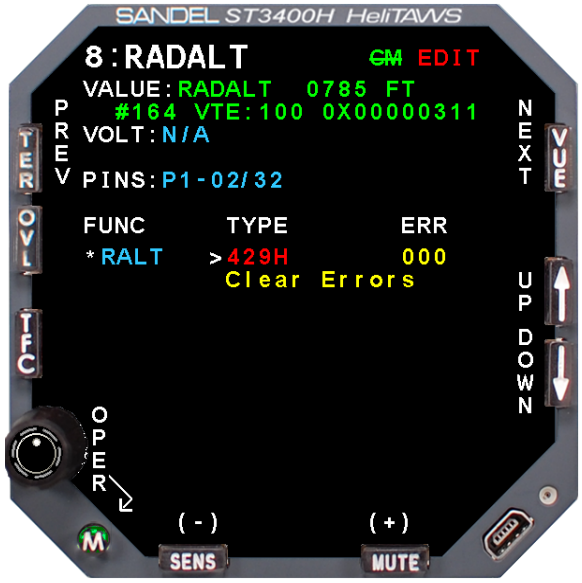
6.7 Page 7: NAV / ILS



The NAV/ILS page selects the configuration of NAV receiver Vertical/Lateral Deviation inputs. When the input is selected to 429, the glideslope uses the same 429 port as the NAV. When analog, these two signals are selected separately. Once a selection is made, the port configuration for NAV will be automatically made based on the selection chosen and data will appear in the data VALUE area. The data VALUE shows only a single data item. This page has an additional soft-key labeled [VALUE] which can be used to scroll through all of the NAV and ILS data coming from the receiver. Use the [UP]/[DOWN] soft-keys to scroll through the various data items. Press the [TYPE] soft-key to exit the "Value" scroll function.

Configuration Field	Options	Comment
LOC	NONE 429 429H ANALOG	Selects localizer signal input
GS	NONE 429 429H ANALOG	Selects glideslope signal input.

6.8 Page 8: RADALT



The Radalt page selects the configuration of Radar altimeter input. If no Radar altimeter is installed set configuration of RALT to NONE.

Radar altimeters are selected by equipment type, i.e. ALT55 for Collins ALT55 altimeter, etc.

Once the equipment is selected, the Radar altitude can be read from the data VALUE line to check for correct operation.

For analog inputs, a corresponding VALID input is present. Ensure that this item is VALID during normal operation and INVALID during TEST of the RA or when the RA is powered off.

Configuration Field	Options	Comment
RALT	NONE 429 429H ALT50 ALT55 KRA405 RT220/300 FF RA 429 FF RA 429H	Selects the Radar Altimeter source.
	RT804	MIL-81296D(AS) -8mv/Ft Range: 0 to 5,000 ft. Flags @ < -46.7V
	RT805	MIL-81296D(AS) -40mv/Ft Range: 0 to 1,000 ft. Flags @ < -46.7V
	APN-209	-7mv/Ft Range: 0 to 1,500 ft. Flags @ < -11.275V
VALID	NONE HIGH LOW	Not shown when 429, 429H, FF RA 429, FF RA 429H, or NONE is configured.
CAL		Displays below the RALT function when Radar altimeter is installed and configured. Adjustable from +25.0 to -25.0 feet. Only shown for analog sources.

6.9 Page 9: FMS (Flight plan)

6.10 Page 10: GPS (Position)

There are two GPS pages for selection of Position and Flight plan inputs respectively. The Position input is used only for position data and all other labels are ignored. The Flight plan input is used solely to display the Flight plan line and determination of User Landing Zones. The multiple–choice list allows the operator to specify the type of GPS/FMS connected to the Position and Flight plan ports. Select the desired receiver using the [UP]/[DOWN] soft-keys and use the [SET] soft-key to make the selection.

Once a selection is made, the port configuration will be automatically made based on the selection chosen and data will appear in the data VALUE area.

The data VALUE shows only a single data item. This page has an additional soft-key labeled VALUE which can be used to scroll through all of the GPS/FMS DATA coming from the receiver. Use the [UP]/[DOWN] soft-keys to scroll through the various data items. Press the [MODEL] soft-key to exit the VALUE scroll function.

The MORE Indicator indicates more choices than the listings currently displayed on the screen. An arrow pointing down indicates that more choices exist below the last listing currently being displayed.

Configuration Field	Options	Comment
GPS	Select from list	Select the appropriate model of GPS from the list. Press the SET soft key (SENS button) to program.

6.11 Page 11: TCAS

The TCAS page shows selections available for Traffic.

The multiple–choice list allows the operator to specify the type of Traffic processor connected to the Traffic port. Select using the [UP]/[DOWN] soft-keys and use the [SET] soft-key to make the selection.

Once a selection is made, the port configuration for Traffic will be automatically made based on the selection chosen and data will appear in the data VALUE area.

This page has an additional soft-key labeled VALUE which can be used to scroll through all of the TCAS DATA coming from the processor. Use the [UP]/[DOWN] soft-keys to scroll through the various data items. Press the [MODEL] soft-key to exit the VALUE scroll function.

The MORE Indicator indicates more choices than the listings currently displayed on the screen. An arrow pointing down indicates that more choices exist below the last listing currently being displayed.

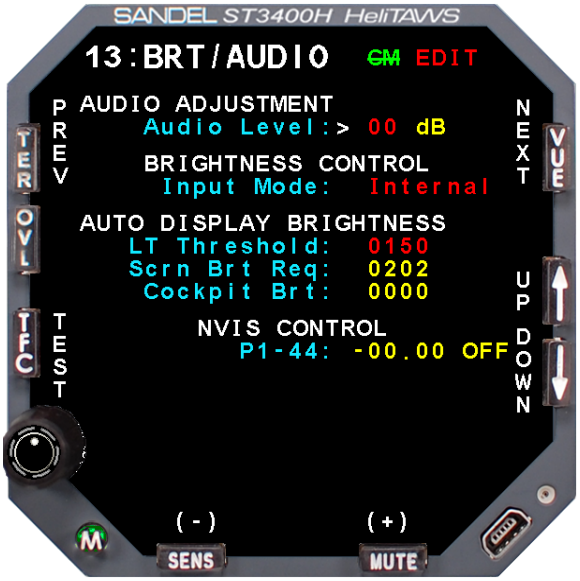
Configuration Field	Options	Comment
TCAS KEY	Blank by default	Enter the purchased 11 character key code to enable traffic. Use the MUTE and SENS keys to select the character and the OVLY and TFC keys to move the cursor.
TCAS Model	Collins TCAS 4000 Goodrich Skywatch Goodrich Skywatch (SW) Goodrich SkywatchHP Goodrich SkywatchHP (SW) Goodrich TCAS791/A Goodrich TCAS791/A (SW) Honeywell CAS-66 Honeywell CAS-67 Honeywell CAS-81 Ryan 9900BX TAS	Select the appropriate model of GPS from the list. Press the SET soft key (SENS button) to program.

Note: The Goodrich TFC Displays include push buttons to control the TFC processor (Skywatch, Skywatch HP, and TCAS791). If it is desired to use the ST3400H as the TFC display; those button functions need to be retained. This can be accomplished by either using a panel mounted set of buttons or configuring the ST3400H to support 'soft-key' labeled buttons by selecting the proper choice that includes the (SW) reference.

6.12 Page 12: STATUS

The Status page shows a composite status of all the ST3400H inputs.

6.13 Page 13: BRT / AUDIO



This page is used to allow the installer to specify the nominal and maximum audio levels for the low level audio output and trim the output level of the speaker audio output with respect to the low level output. The low level output acts as master gain. Initiate an audio level test by selecting the desired volume level and pressing the TEST soft-key. This may be used to show the result of changing the audio level adjustments.

Configuration Field	Options	Comment
Audio Level		Used to adjust audio output. Adjustable from -20 to +6 dB.
Input Mode	Internal	
LT Threshold		Adjustable from 0010 to 1000

6.14 Page 14: OPTIONS

The Options page allows enabling Radar Altitude audio callouts and the SENS modes. Use the [UP] or [DOWN] soft-keys to select a setup item, this will move the Cursor to the appropriate line. [+] and [-] select “ON” or “OFF for each callout.

Radar Altimeter input is required for the Callouts to function.

NORMAL SENS is always configured to be enabled.

Table 1 below shows the Standard Mode-1 curve (STD).

Table 2 below shows the Russian Mode-1 curve (RUS) for conformity with Russian certification.

Mode 1 arms at 1800’ AGL for both curves.

Configuration Field	Options	Comment
300’	ON / OFF	
200’	ON / OFF	
100’	ON / OFF	
50’	ON / OFF	
40’	ON / OFF	
30’	ON / OFF	
20’	ON / OFF	
10’	ON / OFF	
HIGH	ENABLE / DISABLE	Used to enable or disable HIGH sensitivity mode.
LOW	ENABLE / DISABLE	Used to enable or disable LOW sensitivity mode.
TACTICAL	ENABLE / DISABLE	Used to enable or disable TACTICAL sensitivity mode.
OBST-ONLY	ENABLE / DISABLE	Used to enable or disable OBST-ONLY sensitivity mode.
Mode-1 Curve	STD / RUS	Used to select GPWS Mode-1 curve – Standard (STD) or Russian (RUS). The RUS curve is for conformity with Russian certification. If RUS is selected, the Key field will display allowing entry of the purchased key code.
Key	Blank by default	Enter the purchased 11 character key code to enable RUS GPWS Mode-1 curve. Use the MUTE and SENS keys to select the character and the OVLY and TFC keys to move the cursor. If an invalid key code is entered, RUS will display with a red line through the text. In this event, the system will revert to the Standard Mode-1 curve.

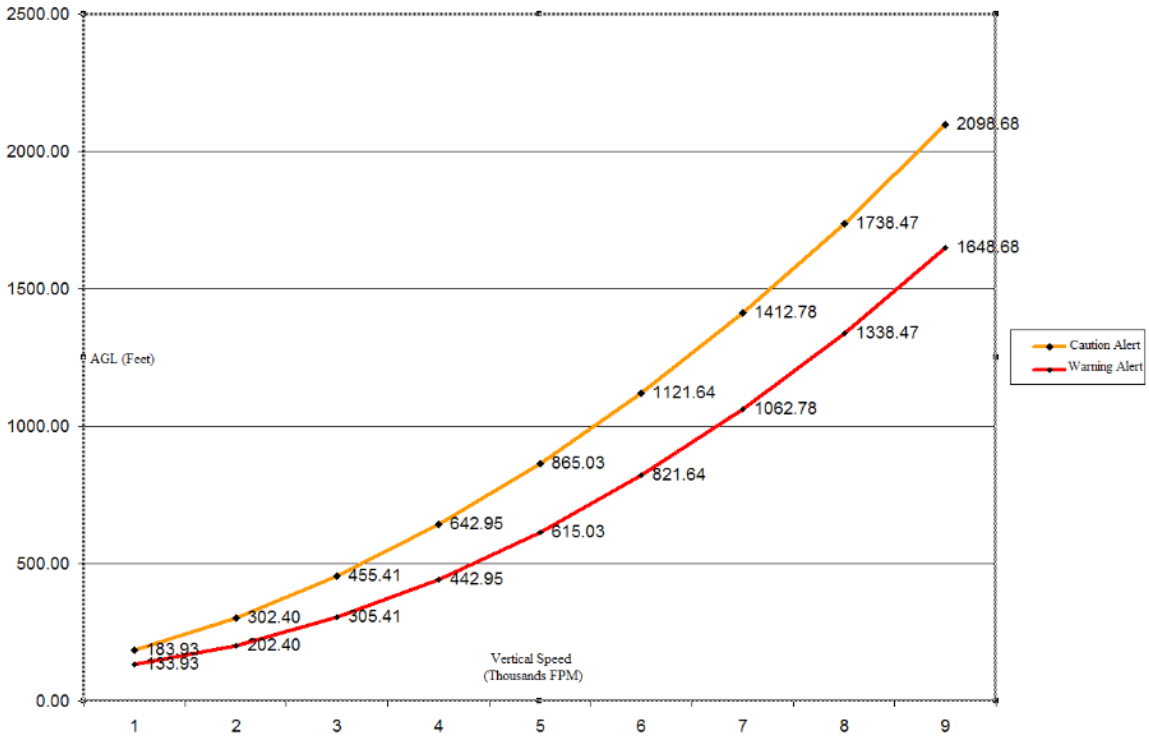


Table 1 - Standard (STD) Mode-1 Curve

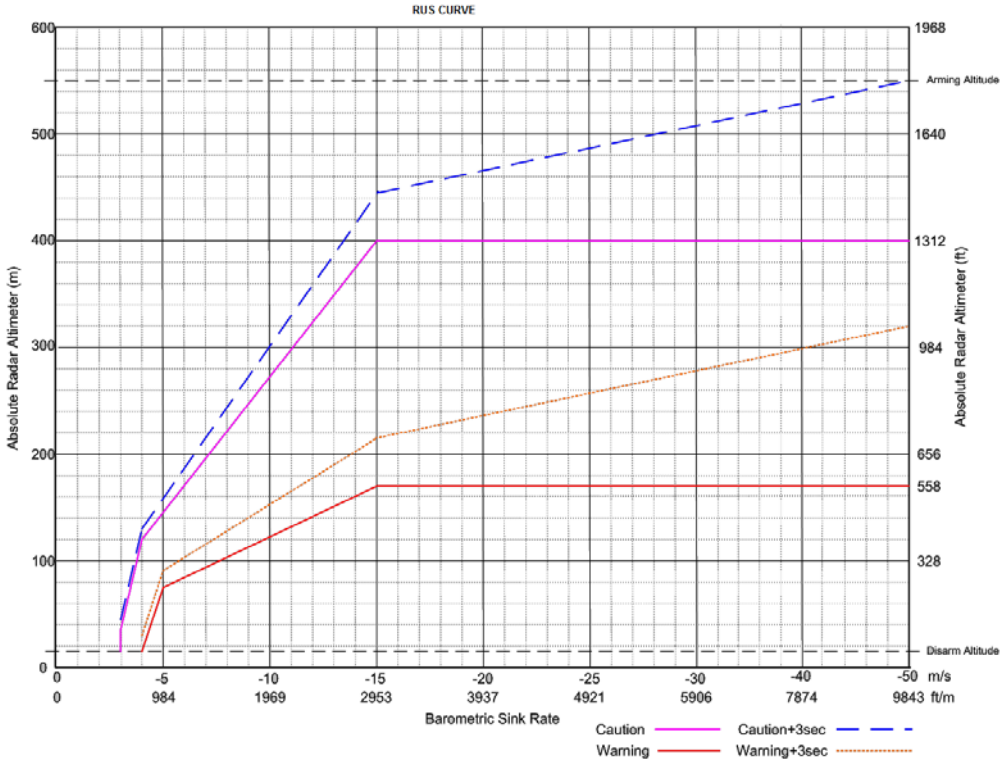


Table 2 - Russian (RUS) Mode-1 Curve

6.15 Page 15: POWER

The Power maintenance page consists of readouts that monitor the unit's internal environment and the unit's power measurements for reference.

Any of these items that are outside normal operating limits will post an on-screen error by way of the systems built-in-test processes.

6.16 Page 16: SFTWR CRC

Displays CRC values for the software and databases. Press the [UPDATE] soft-key to recalculate. Contact Sandel if "**FAIL**" is annunciated for any of the values.

7 CHECKOUT PROCEDURES

Perform all of the following tests. All tests must pass (or be not applicable) for return to service.

7.1 Power-On Self-Test

The Power-On Self-Test capability is an automatic test of equipment condition. It executes during the power-up sequence and reports any internal errors via on-screen readouts. The failure of the display itself is a major failure and will result in the inability to show further system-level error messages.

7.2 ST3400H TAWS

Verify DC Power, AC Power and Ground inputs to the ST3400H connectors before installing the ST3400H.

7.3 Install Sandel ST3400H TAWS into aircraft

Enter the maintenance mode by press and holding the SENS and MUTE buttons while applying power to the ST3400H. Continue to hold until the ST3400H screen is active.

7.4 Record the following Aircraft Information

Aircraft Make: _____ Aircraft Model: _____

Aircraft S/N: _____ Aircraft Registration: _____

7.5 Record the following system information:

Date:	_____
ST3400H S/N:	_____
Software Rev:	_____
Terrain Database Area and Rev:	_____
Obstacle Database Area and Rev:	_____
Airport Database Area and Rev:	_____

7.6 Required Test Equipment:

- ILS Ramp Test Set
- Multi-meter
- Radar Altimeter with Test button, or Radar Altimeter Test Set

7.7 ST3400H Configuration

Configure and record configuration information from the ST3400H Maintenance and Summary pages

Note: Meet all approved maintenance and safety conditions. Use of appropriate ground power for the aircraft is required.

Note: Aircraft must be in the view of the GPS satellites for a valid GPS Position. FMS may show invalid (depending on model) until valid Groundspeed is achieved.

RECORD ST3400H TAWS CONFIGURATION

PAGE	EQUIPMENT	FUNCTION	DATA TYPE
3	AIRDATA	PA	
4	HEADING	HDG	
		VALID	
5	DISCRETES	BCKCRS	
		GEAR	
		NVIS	
6	OUTPUTS		
	P2-2		
	P2-10		
	P2-12		
	P2-14		
	P2-7		
	P2-4		
	P2-15		
	P2-8		
7	NAV/ILS	LOC	
		GS	
8	RADIO ALTIMETER	RALT	
		VALID	
		CAL VALUE	
9	FMS (Flight Plan)	SELECTION	
10	GPS (Position)	SELECTION	
11	TCAS	SELECTION	
		TCAS KEY	
14	OPTIONS	300’	
		200	
		100	
		50	
		40	

PAGE	EQUIPMENT	FUNCTION	DATA TYPE
		30	
		20	
		10	
		HIGH	
14	OPTIONS	LOW	
		TACTICAL	
		OBST-ONLY	
		Mode-1 Curve	
		Key	

7.8 Air Data Input (Optional Interface)

Follow Aircraft Manufacturer's instructions and connect Pitot/Static test box to the aircraft Pitot/Static system.

Select ST3400H to Maintenance Page 3: AIRDATA monitor the air data input.

SIGNAL	FUNCTION	TOLERANCE	RECORD VALUE	PASS	FAIL	N/A
Pressure Altitude	PA	Verify pressure altitude is within +/- 500 Feet of current pressure altitude.				
Pressure Altitude Change	PA	Vary pressure altitude input by 500' and verify that change on pressure altitude value is 500' +/- 50'.				

7.9 Heading Input (Optional Interface)

Select ST3400H to Maintenance Page 4: HEADING

SIGNAL	FUNCTION	RESULT	PASS	FAIL	N/A
Heading Value.	HDG	Verify the Magnetic Heading value matches the aircraft heading displayed on HSI or wet compass within +/-4 Degrees.			
Heading Valid pull circuit breaker to go invalid	HDG VALID	Verify value of Mag Heading Valid indicates, "INVALID DATA".			
Heading Valid, reset circuit breaker.	HDG VALID	Verify value of HDG Valid indicates, "VALID".			

7.10 Discrete Inputs (Optional Configuration)

Check all discrete inputs that are interfaced to Sandel ST3400H. See Sandel ST3400H installation wiring diagrams for aircraft. NVIS feature may require additional installation approval.

Select ST3400H to Maintenance Page 5: DISCRETES.

SIGNAL	FUNCTION	RESULT	PASS	FAIL	N/A
NVIS	NVIS	Verify that the NVIS display annunciation goes on and off with operation of the switch			
Back Course	BCKCRS	Verify BCKCRS operates when back course is selected or the HSI course pointer is >90 degrees from the lubber line.			

SIGNAL	FUNCTION	RESULT	PASS	FAIL	N/A
Landing Gear	GEAR	Verify value indicates “GEAR DOWN” on ground. Test Gear up during flight test.			
Alert Mute	MUTE	Momentary press operates MUTE function.			
TAWS INH	TAWS INH	Press and hold for 2 seconds invokes TAWS INH function. Terrain is removed from the display.			
GS Override	GS INH	Verify GS INH is displayed on pilot menu when external GS INH switch is pressed momentarily.			
Sensitivity Select	Sensitivity Select	Momentary press operates SENS mode function.			
Off Airport	Off Airport	Press and hold for 2 seconds invokes Off Airport mode.			

7.11 NAV& ILS Input (Optional Interface)

Select ST3400H to Maintenance Page 7: NAV / ILS.

SIGNAL	FUNCTION	RESULT	PASS	FAIL	N/A
ILS Receiver, generate external Localizer signal, vary the input deviation. Test at 0, ± 0.046 and ± 0.093DDM	NAV	Nav value should indicate “ILS TUNED” and “LOC DEV DDM” deviation should match generated signal.			
ILS Receiver, generate external Glideslope signal, vary the input deviation. Test at 0, ± 0.046 and ± 0.093DDM	GS	GS value for “GS DEV DDM” deviation should match generated signal.			

7.12 Radar Altimeter (Optional Interface)

Note: The Radar Altimeter test may be performed by pressing the Radar Altimeter self-test button, or by utilizing a Radar Altimeter test set. This manual references the use of the Radar Altimeter self-test button and does not provide the information in the use of a Radar Altimeter test set. When using a Radar Altimeter Test Set, consult the Radar Altimeter Test Set manufacturer for Test Set operating instructions. The tests that will be performed to validate the ST3400H operation with the Radar Altimeter will be tests defined below.

Select ST3400H to Maintenance Page 8: RADALT

SIGNAL	FUNCTION	RESULT	PASS	FAIL	N/A
Radar Altimeter R/T. Activate Radalt Self-Test	RA	Radar Altimeter Value should indicate within +-5 feet of Radalt test output.			
Radar Altimeter Fail, pull circuit breaker to go invalid.[1]	RA FAIL INPUT P1-18	Verify value of Radar Altimeter Fail indicates, “P1-18 < +9VDC”.			
Radar Altimeter Fail reset circuit breaker.[1]	RA FAIL INPUT P1-18	Verify value of Radar Altimeter Fail indicates, “P1-18 > +11VDC”.			
Radar Altimeter Valid	RA VALID	Verify value of Radar Altimeter Valid indicates, “INVALID DATA”.			
Radar Altimeter Valid reset circuit breaker.	RA VALID	Verify value of Radar Altimeter Valid indicates, “VALID”.			
Rotate the MIN Knob through Decision Height	Decision Height	Aural callout “MINIMUMS”			

[1] Applies to analog Radar Altimeters only.

7.13 GPS Position (Required)

Select ST3400H to Maintenance Page 10: GPS

SIGNAL	FUNCTION	RESULT	PASS	FAIL
GPS position receiver locked on with valid signal	GPS POSITION	GPS Lat and Long value displayed should match position on GPS		
Turn off position GPS receiver.	GPS POSITION	GPS position value Lat and Long will not be displayed.		
GPS position receiver locked on with valid signal	GPS ALTITUDE	GPS Altitude should match altitude displayed on GPS receiver.		

Note: Press "VALUE" soft-key and then UP/DOWN soft-keys to access to additional parameters and GPS Altitude.

7.14 FMS Flight Plan (Optional Interface)

Select ST3400H to Maintenance Page 9: FMS

SIGNAL	FUNCTION	RESULT	PASS	FAIL	N/A
Flight plan GPS receiver locked on with valid signal.[2]	FLIGHT PLAN	Verify ST3400H flight plan matches navigator flight plan			

7.15 Traffic (Optional Interface)

Check traffic if interfaced to ST3400H. Perform checkout per Traffic manufacturer's installation manual.

SIGNAL	FUNCTION	RESULT	PASS	FAIL	N/A
Put Traffic device in self-test mode	TRAFFIC	Traffic test pattern should display on the ST3400H traffic page and corresponding audio should be heard on cockpit speakers or headset			

[2] May require ground speed greater than 5 knots to display flight plan.

7.16 MUTE switch (Optional Interface)

If installed, verify that the external MUTE pushbutton operates the MUTE and TAWS INH function.

SIGNAL	FUNCTION	RESULT	PASS	FAIL	N/A
MUTE	MUTE / TAWS INH	A momentary press should invoke the MUTE function. If the MUTE button is pressed when a CAUTION alert is not present, the text "NO ACTION" will display on the screen. Hold the MUTE pushbutton for 2 seconds. Terrain will be removed from the display.			

7.17 Sensitivity switch (Optional Interface)

If installed, verify that the external Sensitivity pushbutton operates the Sensitivity mode function and OFF APT function. Holding the Sensitivity pushbutton for 2 seconds will change the mode to "Off Airport".

SIGNAL	FUNCTION	RESULT	PASS	FAIL	N/A
SENS	SENS / OFF APT	Momentary presses should toggle through configured SENS modes. If all SENS modes other than normal are inhibited, the text "NO ACTION" will display on the screen. Hold the SENS pushbutton for 2 seconds. OFF APT should annunciate.			

7.18 HTAWS self-test

Verify aural annunciations are acceptable in clarity and volume (both loudspeaker and headphone aural annunciations).

SIGNAL	FUNCTION	RESULT	PASS	FAIL
Pilot menu TEST softkey	Self-Test	Aural annunciations are acceptable in clarity and volume (both loudspeaker and headphone aural annunciations.		

7.19 External Annunciators (Optional Interface)

Check operation of any external annunciators.

SIGNAL	FUNCTION	RESULT	PASS	FAIL	N/A
Pilot menu TEST softkey	External annunciators	External annunciators illuminate when required.			

7.20 Display

Verify display is viewable under all expected cockpit ambient light conditions (this test should be performed in bright daylight, and again at night or in a simulated dark cockpit).

	PASS	FAIL
COMPLETED		

Comments

7.21 Manual brightness

Pull the knob and turn to adjust the brightness. Verify manual display brightness lighting control is operating. The brightness is shown above the knob as a number from 0-100. 100 is full brightness.

	PASS	FAIL
COMPLETED		

Comments

7.22 Visibility

Verify visibility of the ST3400H display from the pilot's seat. View the display from normal, expected viewing angles. This should include viewing the display from all viewing angles that might be encountered during normal cockpit operations.

	PASS	FAIL
COMPLETED		

Comments

7.23 Accessibility and Operation

Ensure the unit is located with respect to the pilot's seat positions so that there is full and unrestricted access to the buttons and knobs without interference to the flight controls when pilots from 5'-2" to 6'-0" in height are seated.

	PASS	FAIL
COMPLETED		

Comments

7.24 EMC TEST PROCEDURE

NOTE: This test must be conducted with the aircraft engines operating and rotors turning (100% rotor speed at flat pitch).

For additional guidance on conducting EMC testing, refer to AC 43.13-1B Chapter 11, Section 8.

With the ST3400H in normal operation, evaluate all of the aircraft equipment for proper operation to ensure that there is no interference from the ST3400H. Evaluate each equipment item for spurious operation; i.e unexpected needle deflection, unexpected changes in data, or other erroneous operation. Additional space is provided for equipment not listed.

EQUIPMENT TYPE (Victim)	PASS	FAIL	N/A
GPS			
LOC/GS			
HEADING			
GPS FLIGHT PLAN			
RADAR ALTIMETER			
AIR DATA			

7.25 AUDIO TEST

NOTE: This test must be conducted with the aircraft engines operating and rotors turning (100% rotor speed at flat pitch).

NOTE: Aural alerts for situations requiring immediate action by the flight crew should have priority in situations where conditions for multiple alerts may occur. Older aircraft audio system architectures may not prioritize aural alerts for multiple alerting systems. If such is the case, an aural prioritization scheme may not be available. However, if simultaneous alerts can be given, then the alerts must be understandable and distinguishable.

While operating the self-test on the ST3400H, evaluate the audio for clarity, and appropriate volume level.

	PASS	FAIL
COMPLETED		

Comments

While operating the self-test on the ST3400H, ensure that higher priority audio signals (such as low rotor warning, master warning, etc) are not masked by the ST3400H audio. For this test, each higher priority audio signal shall be tested separately and determined to be understandable and distinguishable.

	PASS	FAIL
COMPLETED		

Comments

While operating the self-test on the ST3400H, ensure that lower or equivalent priority audio signals (such as traffic, nav audio, etc.) do not mask the higher HTAWS ST3400H audio alerts. For this test, each lower priority audio signal shall be tested separately.

	PASS	FAIL
COMPLETED		

Comments

8 SENSOR COMPATIBILITY

Note: Current equipment list is being constantly updated. Please contact factory if equipment for your installation is not listed.

The following information may be added to and superseded by additional compatibility information in the future without invalidating the other information in this manual.

8.1 Position

MFG	MODEL	INTERFACE TYPE
Freeflight	1201	RS-232
Garmin *Use with non-WAAS 400/500 series requires software 1.06 (non Mod-A ST3400H) / A1.07 (Mod-A ST3400H) or higher.*	GPS/GNS/GNC 400/400W, 420/420W, 430/430W, 500/500W, 530/530W GTN6XX/7XX	RS-232

8.2 FMS Flight Plan

MFG	MODEL	INTERFACE TYPE
Freeflight	2101	ARINC 429
Garmin	GPS/GNS/GNC 400/400W, 420/420W, 430/430W, 500/500W, 530/530W GTN6XX/7XX	ARINC 429
Honeywell	KLN-89	RS-232
Honeywell	KLN-90B	ARINC 429
Honeywell	KLN-94	RS-232

8.3 Radar Altimeter

MANUFACTURER	MODEL	INTERFACE TYPE
Bendix/King	KRA405	ANALOG
Bendix/King	KRA405B	ARINC 429
Collins	ALT50	ANALOG
Collins	ALT50A	ANALOG
Collins	ALT55	ANALOG
Freeflight	RA-4500	ARINC 429
Sperry	RT-220/300	ANALOG
Mil - 81296d (As)	RT804/805	ANALOG
Honeywell	APN-209	ANALOG
Various	ARINC 429 Type	ARINC 429

8.4 Heading System / AHRS

MFG	MODEL	INTERFACE TYPE
Sandel	SG102	ARINC 429
Bendix/King	KCS 55A (KI525A)	XYZ (ARINC 407)
Bendix/King	KCS 305 KSG105	XYZ (ARINC 407)
Chelton	ADAHRS	ARINC 429
Collins	MCS 65 (DGS 55)	XYZ (ARINC 407)
Litef	LCR 92	ARINC 429
Sagem (Sfim)	APIRS	ARINC 429
Sperry	C14A	XYZ (ARINC 407)

8.5 Navigation Receiver

MANUFACTURER	MODEL	INTERFACE TYPE
Bendix/King	KN-40	ARINC 429
Bendix/King	KX155A	ANALOG
Bendix/King	KX165	ANALOG
Bendix/King	KNR634	ANALOG
Bendix/King	634A	ANALOG / ARINC 429
Collins	VIR30/31/32	ANALOG
Collins	VIR432	ARINC 429
Garmin	GNS430/530/W	ANALOG / ARINC 429
Garmin	GTN 650/750	ANALOG / ARINC 429

8.6 Airdata

MFG	MODEL	INTERFACE TYPE
Chelton	ADAHRS	ARINC 429
Collins	ADC85	ARINC 429
Honeywell	AM-250	ARINC 429
Honeywell	AZ-252	ARINC 429
Honeywell	AZ-810	ARINC 429
IS&S	ADDU	ARINC 429
Penny & Giles	90004-()	ARINC 429
Shadin	ADC 2000	ARINC 429
Sandia	SAC 7-35	ARINC 429 (High Speed Only)
Honeywell	AZ-649	ANALOG (Type I) DC voltage inversely linear with pressure Range = -1,000 to 41,000 feet Scale = -0.3264 Vdc/inHg absolute (Ps) Reference = -9.766 Vdc at 29.92 inHg

Thales/Sextant	ADU3000	ARINC 429

8.7 Traffic

MFG	MODEL	INTERFACE TYPE
Goodrich L-3	TCAS 791/A	ARINC 429H
Goodrich L-3	Skywatch HP	ARINC 429H
Goodrich L-3	Skywatch (Sky 497)	ARINC 429H
Honeywell	CAS 66, 67, 81	ARINC 429H
Avidyne/Ryan	9900BX	ARINC 429H
Collins	TCAS 4000	ARINC 429H

8.8 Equipment Approval Basis

Interface Equipment Type	Required Input	Applicable TSO of I/F Equip.	Interface Type(s)	Sandel Approval Required?
GPS Position	YES	TSO-C145/146	RS-232	YES
FMS Flight Plan	NO	TSO-C15	ARINC 429 RS-232	NO
Radar Altimeter	NO	TSO-C87	Analog ARINC 429	NO
Heading	NO	TSO-C6	ARINC 429 ARINC 407 (XYZ)	NO
NAV Receiver VOR/LOC/GS	NO	TSO-C36 TSO-C34 TSO-C40	Analog (150mV) ARINC 429	NO
AirData	NO	TSO-C106	ARINC 429 Analog Type I/II	YES
Traffic	NO	TSO-C118 TSO-C147 TSO-C119 - (Secondary Only)	ARINC 429 High Speed Only	NO
Audio	YES	TSO-C139	Analog	NO

8.9 ARINC 429 Master Label List

When an interface uses Arinc 429 digital serial data, the following applicable labels are processed.

Label	Description
Airdata	
203	Uncorrected Altitude
212	Vertical Rate
GPS/FMS	
074	Flight Plan
075	Waypoint Header
076	GPS Altitude
101	HDOP
102	VDOP
113	Waypoint Checksum
115	WYPT BEARING
136	VFOM
147	Magnetic Variation
150	Time HH:MM:SS
165	GPS Vertical Speed
167	ANP
247	HFOM
260	DATE
261	GPS Discrete
275	LRN Integrity
303	Waypoint Type
304	Waypoint ID LSB
305	Waypoint ID MSB
306	Waypoint Latitude
307	Waypoint Longitude
310	Present Position Latitude
311	Present Position Longitude
312	Ground Speed
313	Ground Track
Heading / AHRS	
270	Discrete
320	Magnetic Heading
325	Roll Angle
NAV	
173	Localizer Deviation

174	Glideslope Deviation
034	Loc Tuned
Radar Altimeter	
164	Radio Altitude
Traffic	
013	DITS Control
015	Altitude Select Limits
016	DITS Control
130	Intruder Range
131	Intruder Altitude
132	Intruder Bearing
203	Pressure Altitude
204	Corrected Barometric Altitude
320	Own Aircraft Heading
270	Vertical Resolution Advisory
350	Fault Summary
357	End of Transmission
377	Equipment ID

9 ENVIRONMENTAL QUALIFICATION FORM

NAMEPLATE NOMENCLATURE: [A3F1Z]BBB[UU2]XXXXXXZZAZ[ZW][WW]M[A3G33]XXAX

TYPE/MODEL NO: ST3400H **TSO NUMBERS:** C194, C113, C87, C118

MANUFACTURER'S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION:

MANUFACTURER: Sandel Avionics, Inc.

ADDRESS: 2401 Dogwood Way
Vista, CA 92081

REVISION & CHANGE NOS. OF D0-160: Revision F **DATE TESTED:**

CONDITIONS	SECTION	DESCRIPTION OF TESTS CONDUCTED
Temperature & Altitude	4.0	Equipment tested to Categories A3F1
Low Temperature	4.5.1 & 4.5.2	
Ground Survival		-55C, EUT Post-Operational
Operational		-40C, EUT Operational
High Temperature	4.5.3 & 4.5.4	
Ground Survival		+85C, EUT Post-Operational
Operational		+85C EUT Operational
In-Flight Loss of Cooling	4.5.5	Equipment tested to Category Z, >300 min
Altitude	4.6.1	Equipment tested to Category F1, 55k ft MSL
Decompression	4.6.2	Equipment tested to Category A2, 8K/55k ft MSL
Overpressure	4.6.3	Equipment tested to Category A2, -15k ft MSL
Temperature Variation	5.0	Equipment tested to Category B, 5 C/min
Humidity	6.3.2	Equipment tested to Category B, 65C, ≥95% RH
Operational Shock and Crash Safety	7.0	Equipment tested to Category B, DO-160F Table 7-1 Helicopters and all fixed wing Random Orientation
Vibration	8.0	Equipment tested to Categories U, U2, Helo SoR Vib test curve G, unknown Helo freq. Test Curves F, F1
Explosion	9.0	Equipment identified as Category X, no test performed.
Waterproofness	10.0	Equipment identified as Category X, no test performed.
Fluids Susceptibility	11.0	Equipment identified as Category X, no test performed.
Sand and Dust	12.0	Equipment identified as Category X, no test performed.
Fungus	13.0	Equipment identified as Category X, no test performed.
Salt Spray	14.0	Equipment identified as Category X, no test performed.
Magnetic Effect	15.0	Equipment tested to Category Z, less Than 0.3m, EUT Op
Power Input	16.0	Equipment tested to Category Z, VSG Systems, EUT Op; return to normal Op in less than 1 sec. after power interrupt
Voltage Spike	17.0	Equipment Tested to Category A, 600 Volts Protection, EUT Op

Audio Frequency Susceptibility	18.0	Equipment Tested to Category Z, DC System Protection, EUT Op
Induced Signal Susceptibility	19.0	Equipment Tested to Category ZW, VSG Systems Protection, EUT Op
Radio Frequency Susceptibility	20.0	Equipment tested to Category WW
Radio Frequency Emission	21.0	Equipment tested to Category M, EM Protection, EUT Op
Lightning Induced Transient Susceptibility	22.0	Equipment tested to category A3G33, Transient Protection, EUT Op, return to normal Op
Lightning Direct Effects	23.0	Equipment identified as Category X, no test performed.
Icing	24.0	Equipment identified as Category X, no test performed.
Electrostatic Discharge	25.0	Equipment tested to Category A, ESD Protection, EUT Op; return to normal Op
Fire, Flammability	26.0	Equipment identified as Category X, no test performed.

10 SUPPLEMENTAL TYPE CERTIFICATE

10.1 STC Permission

Please contact Sandel Avionics, Inc. for permission to use these STC’s and to obtain the most recent Approved Model List (AML)

10.2 Part 27 AML STC

United States Of America
Department of Transportation - Federal Aviation Administration

Supplemental Type Certificate

Number **SR02314LA**

This Certificate issued to Sandel Avionics, Inc.
2401 Dogwood Way
Vista, CA 92081

certifies that the change in the type design for the following product with the limitations and conditions thereto as specified hereon meets the airworthiness requirements of Part *27 *of the Federal Aviation Regulations.*
(*Certification basis is set forth in Type Certificate Data Sheet)

Original Product Type Certificate Number: * See Attached FAA Approved Model List (AML)

Make: No SR02314LA for list of approved aircraft

Model: Models and applicable airworthiness regulations

Description of Type Design Change: Installation of Sandel Avionics ST3400H HeliTAWS (Helicopter Terrain Awareness Warning System), in accordance with FAA approved Sandel Avionics "Master Drawing List", Document No. 82046-STC27-01, Rev. "B," dated Aug. 19, 2010, or later FAA approved revision. FAA approved Sandel Avionics Rotorcraft Flight Manual Supplement to the Eurocopter France AS350B2 Flight Manual, Document No. 82046-STC27-09, Rev. "ORIG," dated August 27, 2010 is required as part of this installation.

Additional FAA approved Master Drawing List (MDL), Rotocraft Flight Manual Supplement (RFMS) and later approved revisions are identified in attached AML.

Limitations and Conditions: This approval should not be incorporated in any rotorcraft unless it is determined that the interrelationship between this installation and any previously approved configuration will not introduce any adverse effect upon the airworthiness of the rotorcraft.

If the holder agrees to permit another person to use this certificate to alter the product, the holder shall give the other person written evidence of that permission.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked or a termination date is otherwise established by the Administrator.

Date of application: October 16, 2009

Date of issuance: September 3, 2010

Date reissued:

Date amended: February 7, 2014

By direction of the Administrator

(Signature)
Manager, Systems & Equipment Branch, Los Angeles Aircraft Certification Office

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

FAA Form 8110-2(10-68) Page 1 of 2 *This certificate may be transferred in accordance with FAR 21.47.*

Approved Model List (AML)

STC Number SR02314LA

Sandel Avionics
For
Installation of a Sandel Avionics HeliTAWS (Helicopter Terrain Awareness Warning System) ST3400H

Issued Date: February 7, 2014

Item	Aircraft Make	Aircraft Model	Type Certificate Number	Certificate Basis for Alteration	FAA Approved Master Drawing List		FAA Approved Rotocraft Flight Manual Supplement		AML Approval Date
					Number	Revision/Date	Number	Revision/Date	
1	Eurocopter France	AS350, B, BA, B1, B2, B3, C, D, D1	H9EU	14 CFR Part 27	82046-AMLSTC27-01	Rev. D / 12-13-13	82046-AMLSTC27-09	ORIG/1-14-14	February 7, 2014

FAA Approved:
Manager, Systems and Equipment
Los Angeles Aircraft Certification Office

U.S. Department
of Transportation
**Federal Aviation
Administration**

Transport Airplane Directorate
Los Angeles Aircraft
Certification Office

3960 Paramount Boulevard
Lakewood, California, 90712-4137

FEB 12 2014

In reply refer to: 130L-14-43

Mr. Gerry Block
Sandel Avionics, Inc.
2401 Dogwood Way
Vista, CA 92081

Dear Mr. Block:

Subject: Amended Supplemental Type Certificate (STC) No. SR02314LA
for the Installation of Sandel Avionics Terrain Awareness and Warning (TAWS) on Eurocopter models AS350, B, BA, B1, B2, B3, C, D, D1
Project Number SA15576LA-R

We have completed our evaluation of the subject change in type design and are enclosing your Amended Supplemental Type Certificate (STC) No. SR02314LA. Also enclosed is FAA Approved Rotorcraft Flight Manual Supplement (RFMS) document No. 82046-AMLSTC27-09, Revision Original, Dated January 14, 2014 and Master Drawing List (MDL) document No. 82046 AMLSTC27-01, Revision D, Dated December 13, 2013.

The subject STC is amended to add additional rotorcraft models and issued as Approved Model List (AML) STC No. SR02314LA.

Sandel ICA document No. 82046-AMLSTC27-05, Revision B, Dated September 4, 2013 is accepted by the Rotorcraft Aircraft Evaluation Group (AEG).

This certificate signifies approval of the type design change and authorizes modification of the rotorcraft models listed on the certificate. A copy must be included with each kit you issue or each time you make the data available to other persons who intend to make the subject alteration. The certificate may be transferred or made available to others by means such as a licensing agreement in accordance with Title 14 Code of Federal Regulations (CFR) part 21.47.

For your information, you are required to maintain an updated file related to this STC. If you plan to manufacture replacement or modification parts for sale in conformance with approved data listed on the certificate, you are required to comply with the 14 CFR §§ 21.303 and 45.15. Application for Parts Manufacturer Approval (PMA) should be made in writing with reference to this STC and addressed to: the Los Angeles Manufacturing Inspection District Office (MIDO), 3960 Paramount Blvd. Lakewood, Suite, 100CA 90712.

Please note that § 21.309(a) specifies that the FAA does not issue a PMA if the manufacturing facility for the part is located outside of the United States, unless a determination is made that the location of the manufacturing facility places no undue burden on the FAA in administering the applicable airworthiness requirements.

In accordance with § 21.3, and as a recipient of this certificate, you are required to report any failure, malfunction, or defect, except as provided in § 21.3(d), in any product or part manufactured by you or your contracted suppliers, and which you have determined has resulted or could result in any occurrences listed in § 21.3(c). The report must be communicated initially by telephone to the Manager, Systems and Equipment Branch, Los Angeles Aircraft Certification Office (LAACO), phone number (562) 627-5330, within 24 hours after it has been determined that the failure, malfunction, or defect required to be reported has occurred and followed up with a written notice to the address shown above. FAA Form 8010-4 (Malfunction or Defect Report) or other appropriate format is acceptable in transmitting the required details.

You, as the STC holder, are responsible for any design changes necessary to correct unsafe conditions as well as for submitting those design changes to this office for approval. This requirement is contained in § 21.99. In addition, you are required to advise this office of any change in address.

Also, § 21.50 requires that Instructions for Continued Airworthiness, as applicable to this change in type design, be made available to the operator at the time the aircraft is returned to service.

By accepting this certificate, you acknowledge that you have read and understand your responsibilities as an STC holder.

Sincerely,

Manager, Systems and Equipment Branch

Enclosures

10.3 Part 29 AML STC

United States Of America
Department of Transportation - Federal Aviation Administration

Supplemental Type Certificate

Number **SR02355LA**

This Certificate issued to

Sandel Avionics, Inc.
2401 Dogwood Way
Vista, CA 92081

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part *29 *of the Federal Aviation Regulations.*
(*Certification basis is set forth in Type Certificate Data Sheet)

Original Product Type Certificate Number: * See Attached FAA Approved Model List (AML)

Make: No SR02355LA for list of approved aircraft

Model: Models and applicable airworthiness regulations

Description of Type Design Change: Installation of Sandel Avionics ST3400H Helicopter Terrain Awareness Warning System (HTAWS), in accordance with FAA Approved Sandel Avionics "Master Drawing List", Document No. 82046-AMLSTC29-01, Rev. "A", dated May 6, 2011, or later FAA approved revision. FAA approved Sandel Avionics Rotorcraft Flight Manual Supplement to the Bell 412EP Flight Manual, Document No. 82046-STC29-09, Rev. "ORIG," dated June 17, 2011, or later FAA approved revision is required as part of this installation.

Additional FAA approved Master Drawing List (MDL), Rotocraft Flight Manual Supplement (RFMS) and later approved revisions are identified in attached AML

Limitations and Conditions: This approval should not be incorporated in any rotorcraft unless it is determined that the interrelationship between this installation and any previously approved configuration will not introduce any adverse effect upon the airworthiness of the rotorcraft.

If the holder agrees to permit another person to use this certificate to alter the product, the holder shall give the other person written evidence of that permission.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked or a termination date is otherwise established by the Administrator

Date of application: September 15, 2009

Date of issuance: June 17, 2011

Date reissued:

Date amended: February 7, 2014

By direction of the Administrator

(Signature)

Manager, Systems & Equipment Branch,
Los Angeles Aircraft Certification Office

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

FAA FORM 8110-2(10-68) Page 1 of 2 *This certificate may be transferred in accordance with FAR 21.47.*

Approved Model List (AML)

STC Number SR02355LA

Sandel Avionics
For
Installation of a Sandel Avionics HeliTAWS (Helicopter Terrain Awareness Warning System) ST3400H

Issued Date: February 7, 2014

Item	Aircraft Make	Aircraft Model	Type Certificate Number	Certificate Basis for Alteration	FAA Approved Master Drawing List		FAA Approved Rotocraft Flight Manual Supplement		AML Approval Date
					Number	Revision/Date	Number	Revision/Date	
1	Bell Helicopter	412, EP, CF	H4SW	14 CFR Part 29	82046-AMLSTC29-01	Rev. E /12-13-13	82046- AMLSTC29-09	ORIG/1-14-14	February 7, 2014

FAA Approved:
Manager, Systems and Equipment
Los Angeles Aircraft Certification Office

U.S. Department
of Transportation
**Federal Aviation
Administration**

Transport Airplane Directorate
Los Angeles Aircraft
Certification Office

3960 Paramount Boulevard
Lakewood, California, 90712-4137

FEB 19 2014

In reply refer to: 130L-14-44

Mr. Gerry Block
Sandel Avionics, Inc.
2401 Dogwood Way
Vista, CA 92081

Dear Mr. Block:

Subject: Amended Supplemental Type Certificate (STC) No. SR02355LA
for the Installation of Sandel Avionics Terrain Awareness and Warning (TAWS) on Bell helicopter models 412, 412EP, 412CF
Project Number SA15576LA-R

We have completed our evaluation of the subject change in type design and are enclosing your Amended Supplemental Type Certificate (STC) No. SR02355LA. Also enclosed is FAA Approved Rotorcraft Flight Manual Supplement (RFMS) document No. 82046-AMLSTC29-09, Revision Original, Dated January 14, 2014 and Master Drawing List (MDL) document No. 82046-AMLSTC29-01, Revision Rev. E, Dated December 13, 2013.

The subject STC is amended to add additional rotorcraft models and issued as Approved Model List (AML) STC No. SR02355LA.

Sandel ICA document No. 82046-STC29-05, Revision B, Dated September 4, 2013 is accepted by the Rotorcraft Aircraft Evaluation Group (AEG).

This certificate signifies approval of the type design change and authorizes modification of the rotorcraft models listed on the certificate. A copy must be included with each kit you issue or each time you make the data available to other persons who intend to make the subject alteration. The certificate may be transferred or made available to others by means such as a licensing agreement in accordance with Title 14 Code of Federal Regulations (CFR) part 21.47.

For your information, you are required to maintain an updated file related to this STC. If you plan to manufacture replacement or modification parts for sale in conformance with approved data listed on the certificate, you are required to comply with the 14 CFR §§ 21.303 and 45.15. Application for Parts Manufacturer Approval (PMA) should be made in writing with reference to this STC and addressed to: the Los Angeles Manufacturing Inspection District Office (MIDO), 3960 Paramount Blvd. Suite 100, Lakewood, CA 90712. Please note that § 21.309(a) specifies that the FAA does not issue a PMA if the manufacturing facility for the part is located outside of the United States, unless a determination is made that the location of the manufacturing facility places no undue burden on the FAA in administering the applicable airworthiness requirements.

In accordance with § 21.3, and as a recipient of this certificate, you are required to report any failure, malfunction, or defect, except as provided in § 21.3(d), in any product or part manufactured by you or your contracted suppliers, and which you have determined has resulted or could result in any occurrences listed in § 21.3(c). The report must be communicated initially by telephone to the Manager, Systems and Equipment Branch, Los Angeles Aircraft Certification Office (LAACO), phone number (562) 627-5330, within 24 hours after it has been determined that the failure, malfunction, or defect required to be reported has occurred and followed up with a written notice to the address shown above. FAA Form 8010-4 (Malfunction or Defect Report) or other appropriate format is acceptable in transmitting the required details.

You, as the STC holder, are responsible for any design changes necessary to correct unsafe conditions as well as for submitting those design changes to this office for approval. This requirement is contained in § 21.99. In addition, you are required to advise this office of any change in address.

Also, § 21.50 requires that Instructions for Continued Airworthiness, as applicable to this change in type design, be made available to the operator at the time the aircraft is returned to service.

By accepting this certificate, you acknowledge that you have read and understand your responsibilities as an STC holder.

Sincerely,

Manager, Systems and Equipment Branch

Enclosures

11 INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

The instructions contained in this section are for general reference. The FAA AEG accepted Instructions for Continued Airworthiness are contained in the STC data package (reference Sandel document 82046-STC27-05).

Normal maintenance activities performed on the ST3400H should follow standard industry practices. Re-programming the Configuration Module and updating the Databases, are addressed in specific sections of this installation manual.

11.1 Periodic Maintenance

The ST3400H is designed to detect internal failures. A thorough self-test is executed automatically upon application of power to the unit, and Built-In-Test (BIT) is continuously executed. Detected errors are indicated on the equipment via failure messages and maintenance is on-condition. Operation of the ST3400H is not permitted unless an inspection as described in this section has been completed within the preceding 12 calendar months. Conduct a visual inspection on the ST3400H and its wire harness to insure installation integrity:

- Inspect the unit for security of attachment.
- Inspect buttons for legibility.
- Inspect condition of wiring, routing and attachment/clamping.
- Inspect knob operation.
- Inspect front panel and clean as necessary

11.2 Cleaning the Front Panel

The front bezel, keypad, and display can be cleaned with a soft cotton cloth dampened with “Edmund Scientific TECH SPEC Lens Cleaner” or equivalent. Care should be taken to avoid scratching the surface of the display.

11.3 Display Light Source

The display light source is rated by the manufacturer as having a usable life of 80,000 hours. This life may be more or less than the rated time depending on the operating conditions of the ST3400H. Over time, the light source may dim and the display may not perform as well in direct sunlight conditions. The user must determine by observation when the display brightness is not suitable for its intended use. Contact the Sandel Customer Service if the light source requires service.

11.4 Trouble Shooting Information

If the ST3400H fails to properly operate, consult a local authorized Sandel dealer for repair. The ST3400H does not contain any user serviceable components.

11.5 Removal and Replacement

If the ST3400H is removed for repair and reinstalled, or removed and replaced with a different ST3400H, follow Post Installation Configuration and Checkout Procedures contained in the manual.

If any work has been done on the aircraft that could affect the system wiring or interconnected equipment, verify the ST3400H operates properly, follow the Post Installation Configuration and Checkout Procedures contained in this manual.

To remove the ST3400H from the mounting clamp, use a standard #2 Philips screwdriver to loosen the clamping screws until the ST3400H can be freely pulled from the panel.

The ST3400H is installed by connecting the three (3) cable harnesses and then sliding it straight in the clamping mechanism until the front bezel meets the aircraft instrument panel. Tighten all four (4) clamp screws.

11.6 Database Updates

Database updates are not required. Information regarding new database releases and the content details of the databases may be obtained by visiting the Sandel website (www.sandel.com). Database updates may be ordered on-line. It is up to the ST3400H customer to determine if a specific database is applicable to their operations.

11.7 Software Updates

Software updates are released via a Service Information Letter (SIL) or a Service Bulletin (SB). The SIL or SB will contain links to the software and the related software installation files and instructions necessary to perform the update. Software updates must be performed by a Sandel authorized dealer or repair station.

It is the user/owners responsibility to periodically check for SIL’s and or SB’s relating to the ST3400H. SIL’s and SB’s can be found at: www.sandel.com under “Support”.

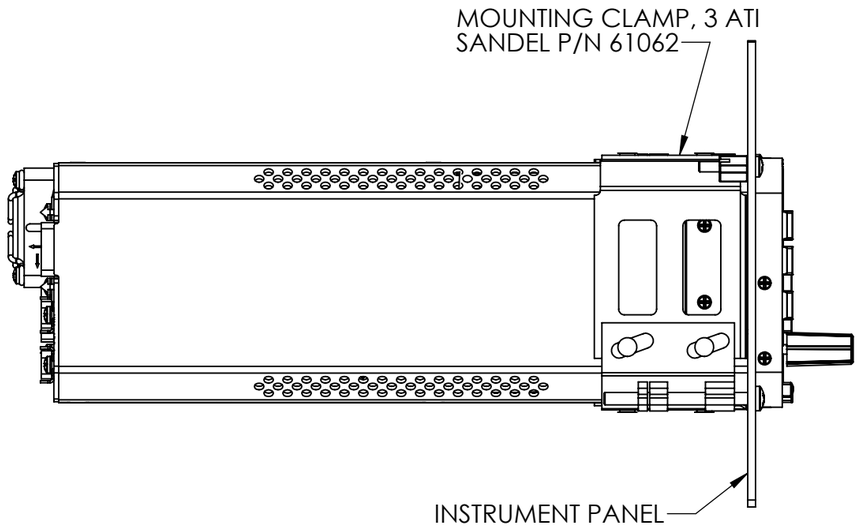
12 LIST OF EFFECTIVE DRAWINGS AND ATTACHMENTS

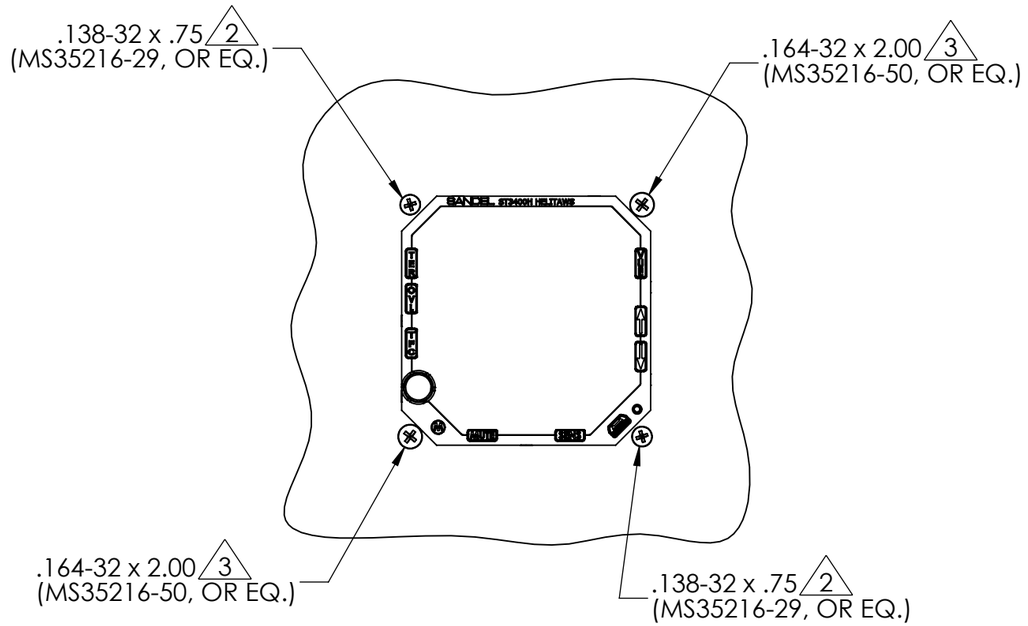
Drawing	Rev	Title
82046-05	A	LAYOUT, ST3400H INSTALLATION
82046-07	A	ENVELOPE, ST3400H
82046-0177	A	INSTALL LOCATION CRITERIA, ST3400H
82046-10 sheet 1	A	NOTES
82046-10 sheet 2	D	POWER & AUDIO
82046-10 sheet 3	E	GPS INTERFACE
82046-10 sheet 4	D	RADALT ANALOG
82046-10 sheet 5	B	RADALT ARINC 429
82046-10 sheet 6	B	HEADING ARINC 429
82046-10 sheet 7	C	HEADING XYZ
82046-10 sheet 8	D	NAV & LOC ANALOG
82046-10 sheet 9	A	NAV & LOC ANALOG (Continued)
82046-10 sheet 10	C	NAV & LOC ARINC 429
82046-10 sheet 11	B	ANALOG AIRDATA
82046-10 sheet 12	C	AIRDATA ARINC 429
82046-10 sheet 13	D	ANNUNCIATORS
82046-10 sheet 14	C	TCAS / TRAFFIC
82046-10 sheet 15	B	DISCRETE INPUTS

REVISIONS					
REV.	ZONE	DESCRIPTION	A/R	DATE	APPROVED
A		INITIAL RELEASE	108	02/26/10	TCM/MK

NOTES:

1. LOCATE PANEL CUTOUT/3ATI CLAMP WITH SUFFICIENT CELARANCE ALL AROUND (REF. ARINC SPECIFICATION 408A
2. ATTACH CLAMP TO INSTRUMENT PANEL USSING 2 EA .138-32 X .75 PAN HEAD MACHINE SCREW, CROSS RECESSED (MS35216-29, OR EQ)
3. INSTALL 2 EA ADJUSTING SCREWS, .164-32 X 2.00 PAN HEAD MACHINE SCREW, CROSS RECESSED (MS35216-50).
4. COMPLETE INSTALLATION PER INSTALLATION MANUAL, SANDEL PART NUMBER 82046-IM (CURRENT REVISION).





-	ST3400H
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
DECIMALS .XX ± .01 .XXX ± .005
ANGLES ±.5°

MATERIAL -

FINISH -

DO NOT SCALE DRAWING

CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE

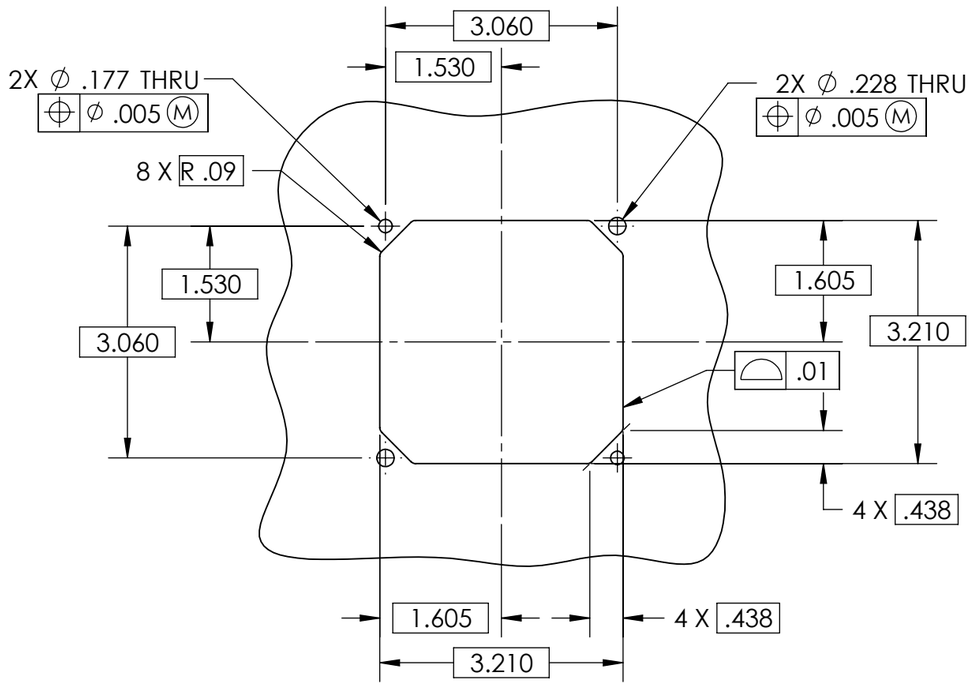
APPROVALS	DATE
DRAWN T. MORRISON	02/26/10
CHECKED	
RESP ENG T. MORRISON	02/26/10
MFG ENG	
APPROVAL	

SANDEL® VISTA, CA

TITLE
LAYOUT, ST3400H INSTALLATION

SIZE	CAGE CODE	DWG. NO.	CATEGORY	REV.
B	3T1Z4	82046	05	A

SCALE 1/2 & NOTED | CAD FILE: 82046-05 INSTALLATION, ST3400H | SHEET 1 OF 2



SUGGESTED PANEL CUT OUT
(REF. ARINC SPECIFICATION 408A)

SANDEL® VISTA, CA

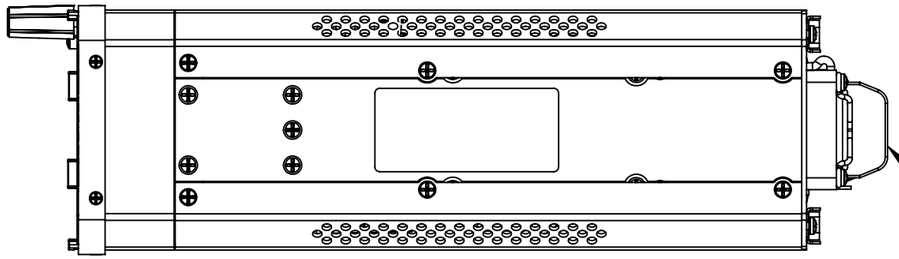
SIZE	CAGE CODE	DWG. NO.	CATEGORY	REV.
B	3T1Z4	82046	05	A

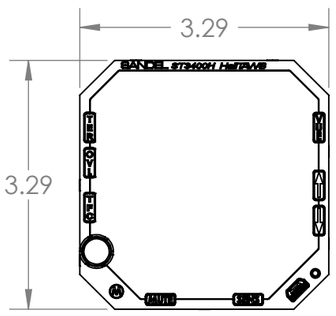
SCALE 1:2 & NOTED | CAD FILE: 82046-05 INSTALLATION, ST3400H | SHEET 2 OF 2

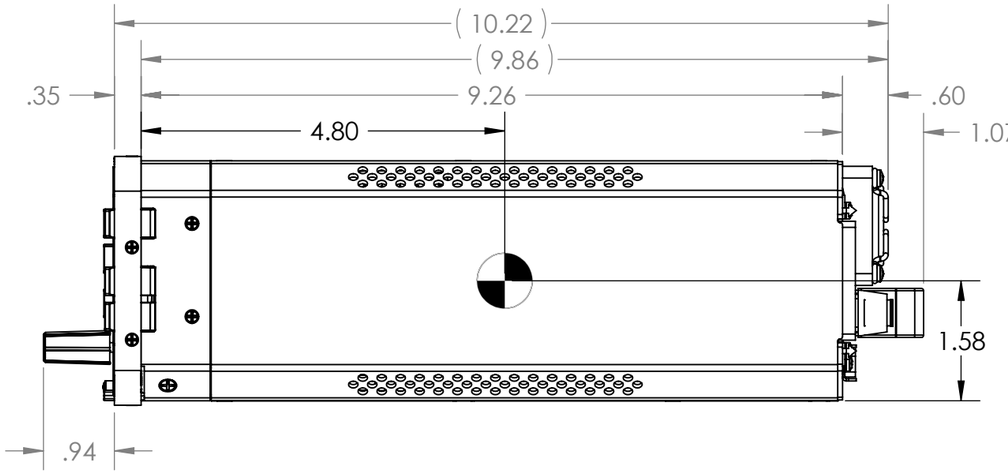
NOTES: UNLESS OTHERWISE SPECIFIED

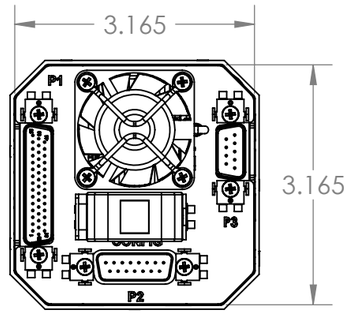
1. ASME Y14.5M - 1994 APPLIES.
2. UNIT WEIGHT: 2.77 LBS.

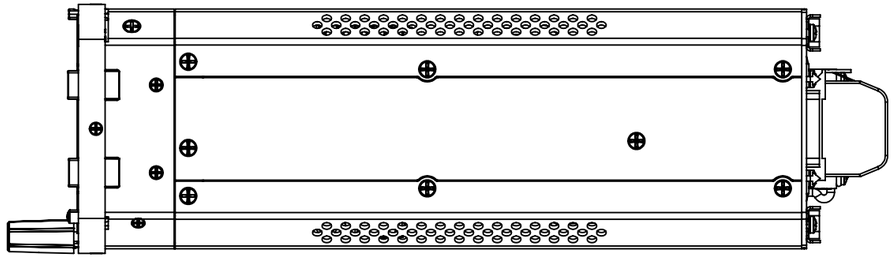
REVISIONS					
REV.	ZONE	DESCRIPTION	A/R	DATE	APPROVED
A		INITIAL RELEASE	1085	02/25/10	TCM/MK











-	ST3400H
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
DECIMALS .XX ± .01 .XXX ± .005
ANGLES ±.5°

MATERIAL -

FINISH -

DO NOT SCALE DRAWING

CAD GENERATED DRAWING, DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN T. MORRISON	02/25/10
CHECKED	
RESP ENG T. MORRISON	02/25/10
MFG ENG	
APPROVAL	

SANDEL® VISTA, CA

TITLE

ENVELOPE, ST3400H

SIZE	CAGE CODE	DWG. NO.	CATEGORY	REV.
B	3T1Z4	82046	07	A

SCALE 1:2 & NOTED | CAD FILE | 82046-07 LAYOUT, ST3400H | SHEET 1 OF 1

REVISIONS		
LTR	DESCRIPTION	DATE
A	Initial Release	07/06/2015

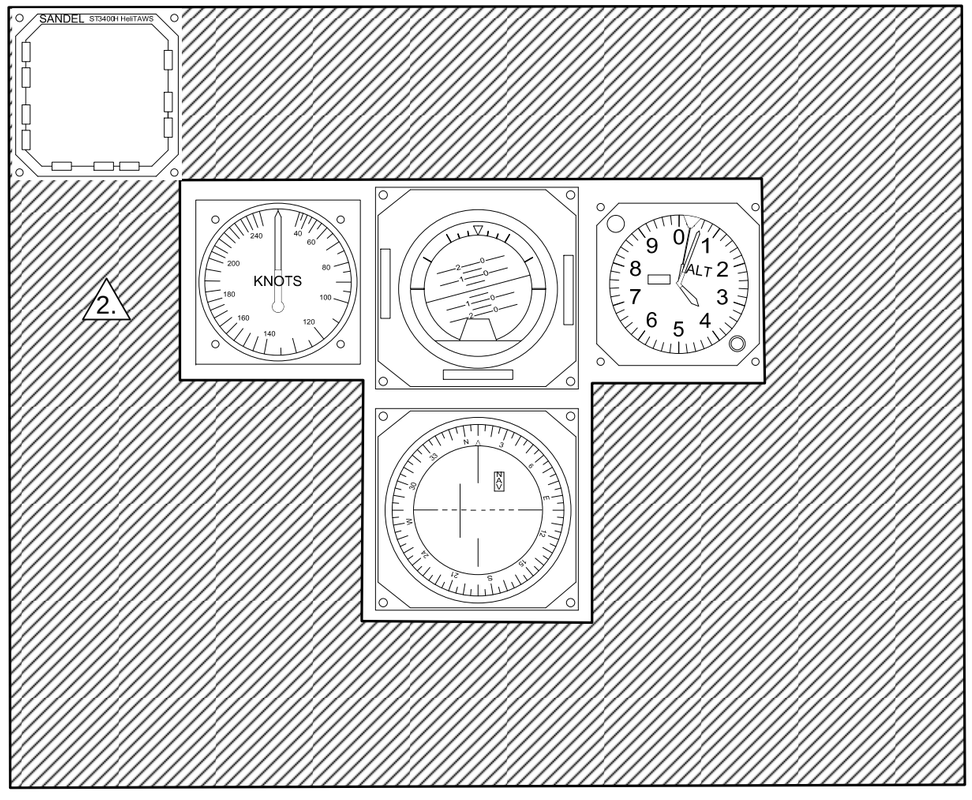
COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

NOTES: UNLESS OTHERWISE SPECIFIED

1. INTERPRET DRAWING PER MIL-STD-100

2. THE ST3400H MAY BE INSTALLED IN THE AREA ADJACENT TO THE PRIMARY FLIGHT DISPLAYS.

3. ANY OTHER INSTALLED LOCATION MAY BE ACCEPTABLE IF THE ST3400H DISPLAY IS VISIBLE, IT'S CONTROLS ARE ACCESSIBLE, OR ARE SUITABLY REMOTE CONTROLLED. CONTACT THE LOCAL FAA FOR GUIDANCE.



SANDEL®		2401 DOGWOOD WAY VISTA, CA 92081 USA	
CATEGORY	ST3400H		
TITLE	INSTALL LOCATION CRITERIA, ST3400H		
SIZE: B	CAGE CODE: 3T1Z4	DWG NO.: 82046-0177	REV: A
SCALE: NONE	MOD	SHEET 1 OF 1	

REVISIONS		
LTR	DESCRIPTION	DATE
A	Initial Release – New Sheet 1 (AR1477)	03/31/2015

COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

NOTES: UNLESS OTHERWISE SPECIFIED

1. INTERPRET DRAWING PER MIL-STD-100

2. USE EXISTING GROUNDS WHENEVER POSSIBLE. INSTALL NEW GROUNDS IF REQUIRED PER FAA AC 43.13 -1B/2A CHAPTER 11 PARA 452 (PG 188-1, 189-1 THRU 193).

3. USE MIL-W-22759 (OR EQUIVALENT) FOR NEW SINGLE CONDUCTOR WIRE

4. USE MIL-C-27500 (OR EQUIVALENT) FOR NEW MULTIPLE CONDUCTOR AND SHIELDED WIRE

5. MARK NEW WIRE & CABLE USING ONE OR COMBINATION OF METHODS AS PRACTICAL (INDIRECT OR INDIRECT HOTSTAMPING) IAW FAA AC 43.13-1B CHG 1 CH 11 SEC 16.

6. IAW FAA POLICY STATEMENT NO. ANM-01-04, WIRING FABRICATION AND INSTALLATION SHALL MEET THE INTENT OF 14 CFR 21.31(A) AMDT. 21-90 BY USING THE FOLLOWING:

   AC43.13-1B CHG 1, CH 11:
   - SEC 3 Inspection of Equipment Installation, (11-31, -36)
   - SEC 4 Inspection of Circuit Protection Devices. (11-49, -50)
   - SEC 5 Electrical Wire Rating (11-66)
   - SEC 7 Table of Acceptable Wire (11-85)
   - SEC 8 Wiring Installation and Inspection Requirements (11-96)
   - SEC 9 Environmental Protection and Inspection (11-116 THRU 11-126)
   - SEC 10 Service Loop Harnesses (11-135, THRU 11-139)
   - SEC 11 Clamping (11-146, -147)
   - SEC 12 Wire Insulation and Lacing (11-155)
   - SEC 15 Grounding and Bonding (11-185, -186, -187)
   - SEC 16 Wire Marking (11-205 THRU 11-222)
   - SEC 17 Connectors (11-230, -236)

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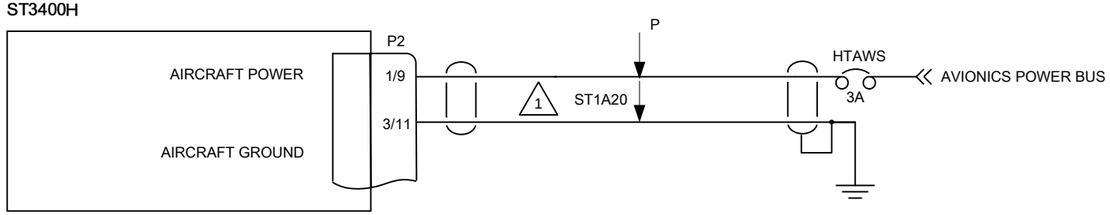
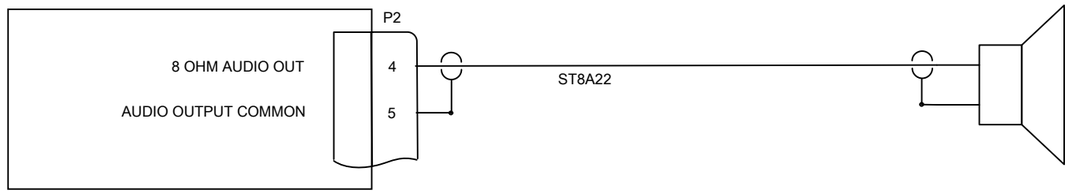
CATEGORY: ST3400H INSTALLATION DRAWING			
TITLE: NOTES			
SIZE: B	CAGE CODE: 3T1Z4	DWG NO.: 82046-10	REV: A
SCALE: NONE	MOD	SHEET: 1 OF 15	

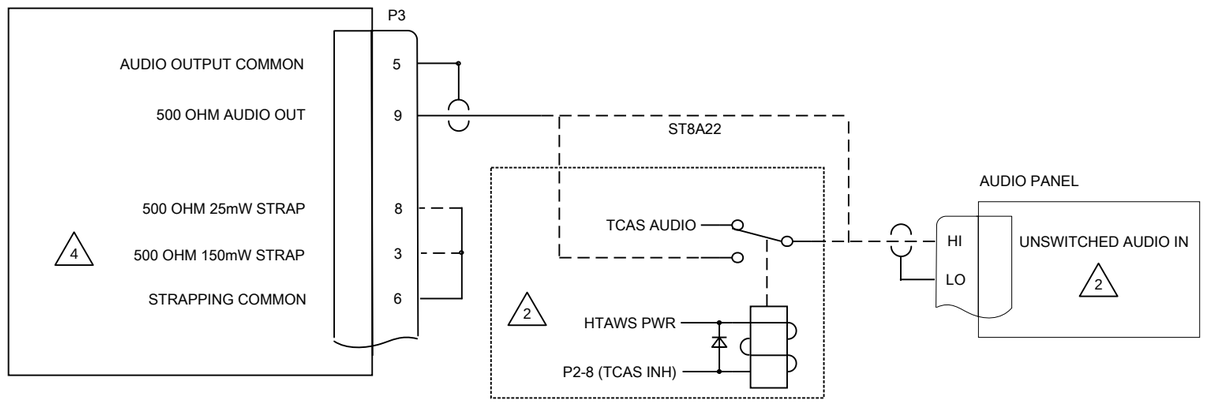
Primary Power
ST3400H



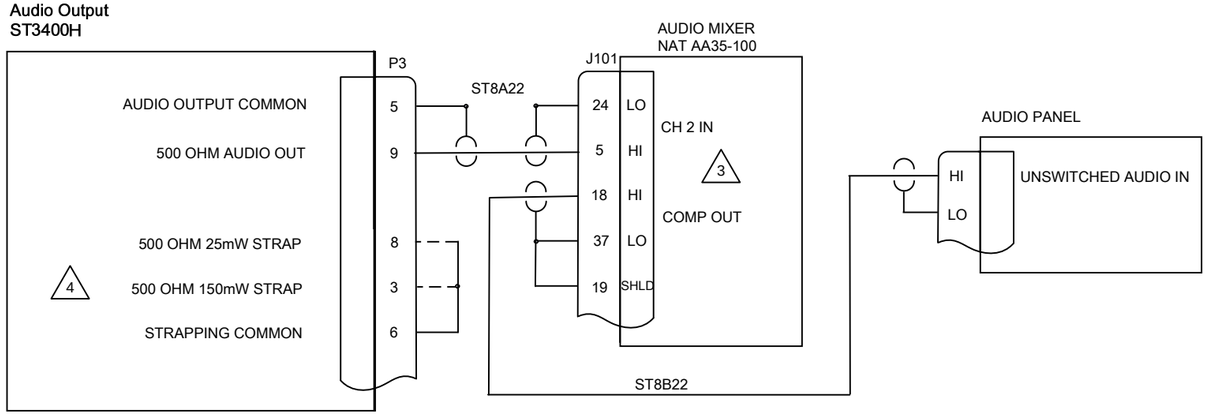
Audio Output
ST3400H



Audio Output
ST3400H



Audio Output
ST3400H



REVISIONS

LTR	DESCRIPTION	DATE
A	Initial Release	04/12/2010
A1	Title Block Format Change. AR1189	07/30/2011
B	Added P2-9 as a power pin. Added P2-11 as a ground pin. AR1418	12/12/2013
C	AR1416 Typos corrected	08/25/2014
D	REDRAWN (AR1477) – Was Sheet 1 Added Wire Numbers (various) Removed “POWER” by CB, changed Note 1, added shield ground, and twisted pair (Zone D-3) Separated Speaker Interface (Zone C-4) Removed note and added reference to note 2. (Zone B-3) Changed and revised Note 2 (Zone B-1/2) Added Interconnection to audio mixer and strapping (Zone A-3) Changed Note 3 To Note 4 (Zone A-4) for strapping Added New Note 3 (Zone A-3) Note 4 (Zone A-1) is now the strapping note. Ref (Zones B-4 & A-4)	03/31/2015

COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

NOTES:

1. USE 20AWG SHIELDED WIRE
2. IF THE AIRCRAFT AUDIO SYSTEM DOES NOT HAVE A SPARE UNSWITCHED INPUT, AND THE OTHER AUDIO SIGNALS ARE OF THE SAME PRIORITY, ADD A 470-680 OHM RESISTER IN SERIES WITH EACH SOURCE FOR ISOLATION OR USE A RELAY.
3. IF THE AIRCRAFT AUDIO SYSTEM DOES NOT HAVE A SPARE UNSWITCHED INPUT, AND THE OTHER AUDIO SIGNALS ARE OF HIGHER OR DIFFERENT PRIORITY (I.E. LOW ROTOR RPM) USE AN AUDIO MIXER THAT PROVIDES ADJUSTMENT FOR EACH AUDIO IN ORDER TO ELIMINATE MASKING OF HIGHER PRIORITY WARNING SIGNALS
4. WHEN USING THE 500 OHM STRAP USE 25mW OR 500mW PINS TO STRAPPING BUT NOT BOTH

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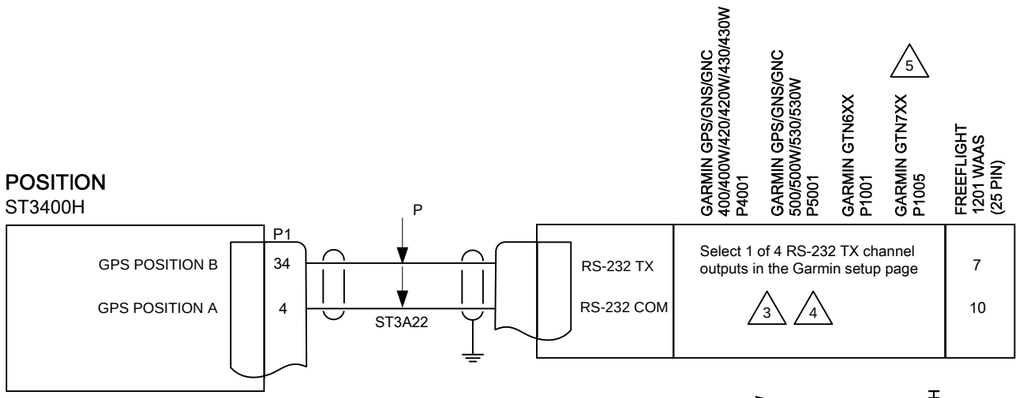
CATEGORY: ST3400H INSTALLATION DRAWING

TITLE: POWER & AUDIO

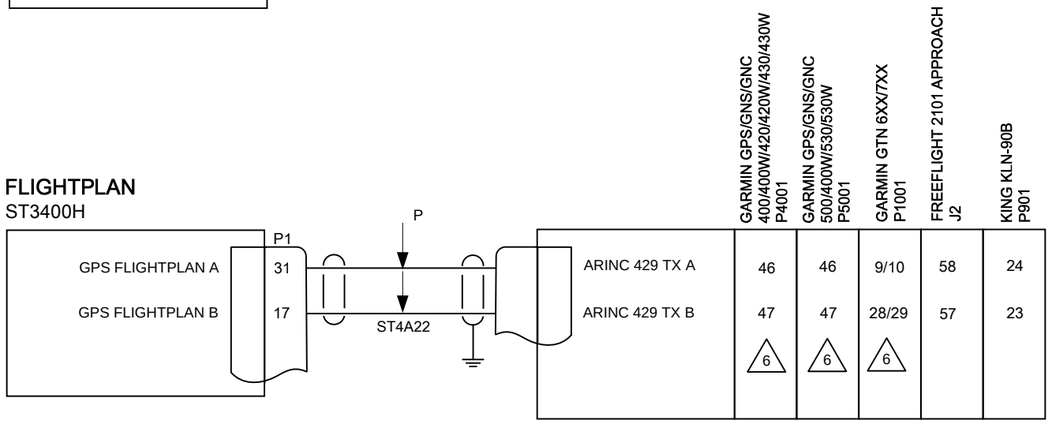
SIZE	CAGE CODE	DWG NO.	REV
B	3T1Z4	82046-10	D

SCALE NONE | MOD | SHEET 2 OF 15

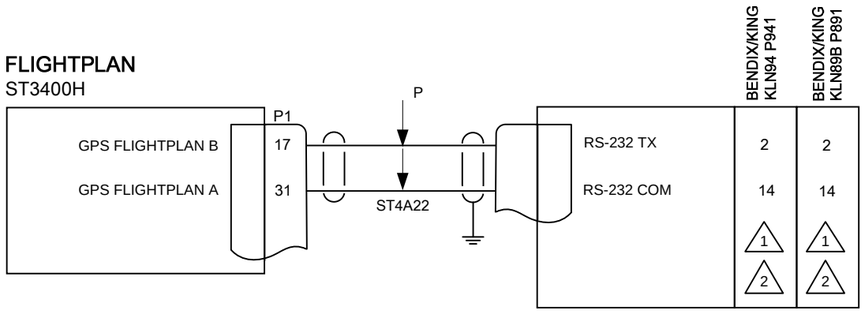
POSITION
ST3400H



FLIGHTPLAN
ST3400H



FLIGHTPLAN
ST3400H



REVISIONS

LTR	DESCRIPTION	DATE
A	Initial Release	04/12/2010
B	IAW AR1186 Provision for TSO-C129 GPS Position	05/27/2011
B1	Corrected Note 1. title bock format change, AR1189	07/30/2011
C	Updates for AR1418. Garmin GTN 6XX/7XX Equipment Selection added. Notes Updated for GTN 6XX/7XX.	12/09/2013
D	REDRAWN (AR1477) - Was sheet 2 Changed Connector designation from P2 to P1 (Zones A-4 & B-4) Added shield grounds on each interface (Zones A-3 thru D-3) Freeflight Pin was “23” changed to “10” (Zone D-3) Added “J2” CALLOUT TO Freeflight 2101 (Zone C-3) Changed note references to triangle notes 3, 4, 5 & 6 associated with Garmin (Zones D-3 and B-3) Added wire numbers & twisted pair ref on each interface (4 places) Removed schematic for Trimble RS-422 and reference in note 1. Added reference to notes 1 & 2 for B-K (Zone A-3)	03/31/2015
E	Updates for AR2363 Updated Note 4 to include requirement to specify ST3400H software versions when using non-WAAS Garmin 400/500 series GPS. Revised Notes 3,4,& 6 for clarity. Updated note references in zone D-3 & B-3.	10/14/2016

COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

NOTES:

1. BENDIX KING KLN-89/89B/90/90B/94, SUPPORTED IN FUTURE ST3400H SOFTWARE VERSION 1.4 OR HIGHER.
2. KLN94 MUST HAVE SOFTWARE VERSION 0106 OR ABOVE INSTALLED
3. REFER TO CURRENT INSTALLATION MANUAL FOR RS-232 PINS.
4. For GPS/GNS/GNC SERIES SELECT THE OUTPUT FOR “HW-EGPWS”
   FOR GTN SERIES SELECT THE OUTPUT FOR “EXTERNAL GPS”

   USE WITH NON-WAAS GARMIN 400/500 SERIES GPS REQUIRES SOFTWARE VERSION 1.06 (NON MOD-A ST3400H) / A1.07 (MOD-A ST3400H) OR HIGHER.
5. GARMIN GTN 7XX HAS ADDITIONAL CHANNELS 5 & 6 ON P1005
6. FOR GARMIN GTN 6XX/7XX ARINC 429 CONNECT TO ONE PORT ONLY (9/28) OR (10/29).

   GARMIN GTN SETUP:
   SELECT GAMA FORMAT 3 FOR THE ARINC GPS 429 OUT
   SELECT HIGH OR LOW SPEED AS DESIRED

   GPS/GNS/GNC:
   SELECT GAMA 429 GRAPHICS W/INT
   SELECT HIGH OR LOW SPEED AS DESIRED

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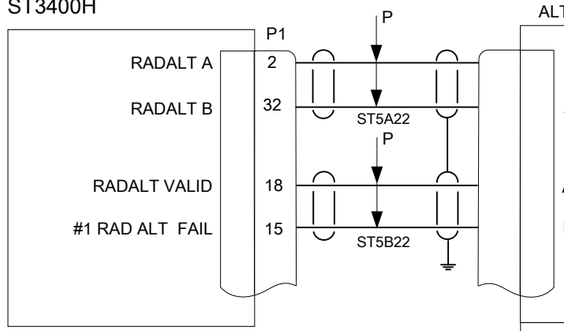
CATEGORY	ST3400H INSTALLATION DRAWING
TITLE	GPS INTERFACE
SIZE	B
CAGE CODE	3T1Z4
DWG NO.	82046-10
REV	E
SCALE	NONE
MOD	
SHEET	3 OF 15

REVISIONS		
LTR	DESCRIPTION	DATE
A	Initial Release	04/12/2010
B	Corrected Sperry RT300 pin numbers W and N.	09/24/2010
B1	Title Block format change. AR1189	07/30/2011
C	REDRAWN (AR1477) - Was sheet 3 Added ground to shields and twisted pairs (Zones B-4 & C-4) Note below diagram became Note 3. Added wire numbers. Removed ARINC 552 Models	03/31/2015
D	A/R 2107 Updated to include APN-209. Added note 4.	08/19/2015

COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

Radar Altimeter Analog

ST3400H



ANALOG RADAR ALTIMETER	Bendix King KRA 405 P4051	Collins ALT-50/50A P1	Collins ALT-55B P-1	Collins 339H-414A Indicator	Collins DRI-55 Indicator	Sperry RT220/RT221/RT300 (Precision) P1	Honeywell APN 209 J1-B
ANALOG +	b	57	57	A	23	W	64
ANALOG -	K	59	59	B	22	N	63
ANALOG VALID	d	8	8	--	--	Y	58
Pwr or Ref	L	49	49	H	20	c	See note 4
SOFTWARE SELECT	KRA 405	ALT-50	ALT-55	ALT 50 or ALT 55 Based on R/T		RT220/ 300	APN 209

NOTES:

1. SIGNALS MAY BE OBTAINED FROM R/T OR INDICATOR, AS REQUIRED
2. CONNECT ANALOG SIGNALS AS REQUIRED
3 USE CAUTION IN SPECIFYING, CONFIGURING, AND TESTING ANALOG RADAR ALTIMETERS. ARINC 552 MAY PRODUCE THE SAME READINGS AS OTHER CONFIGURATIONS BELOW 480' AND DIFFERENT READINGS ABOVE 480'. THEREFORE, IF CONFIGURATION IS MIS-SET A SIMPLE GROUND TEST IS NOT A COMPLETE TEST OF ALL ALTITUDES. IF ANY QUESTION EXISTS ABOUT THE SUITABILITY OF AN INSTALLATION, PERFORM A FLIGHT TEST IN VFR CONDITIONS A REVIEW THE RA ALTITUDE READOUT ON THE RA MAINTENANCE PAGE TO VERIFY THE DATA MATCHES THE PILOT'S RADAR ALTIMETER INDICATOR THROUGHOUT THE ENTIRE USEABLE RANGE OF 0-2000' OR 0-2500'.
4. FOR APN 209: REQUIRES ACTIVE HI VOLTAGE THAT IS AN ENERGIZED SOURCE FROM THE RAD ALT. IT COULD BE FROM THE CIRCUIT BREAKER DIRECTLY OR FROM J1-9 ON THE COPILOTS R/T.

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CATEGORY: ST3400H INSTALLATION DRAWING

TITLE: RADALT ANALOG

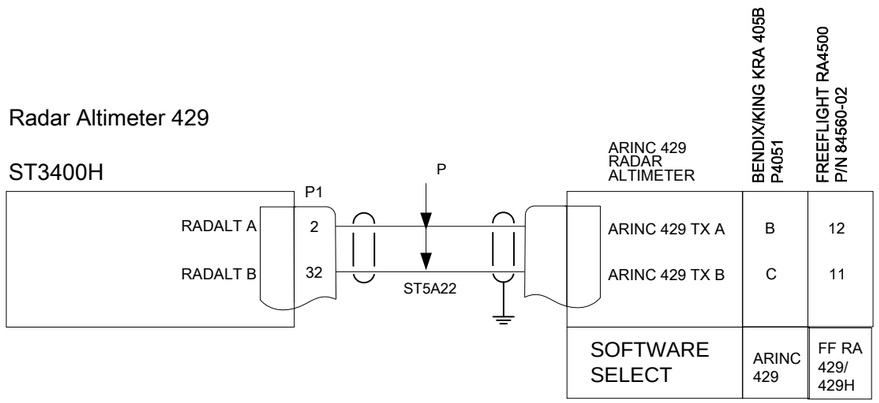
SIZE	CAGE CODE	DWG NO.	REV
B	3T1Z4	82046-10	D

SCALE NONE | MOD | SHEET 4 OF 15

REVISIONS		
LTR	DESCRIPTION	DATE
A	Initial Release	04/12/2010
A1	Corrected note 1, title block format change. AR1189	07/30/2011
B	REDRAWN (AR1477) - Was sheet 4 Added ground to shield and twisted pair (Zone C-3) Added wire numbers (Zone C-3) Removed Collins RAC-870. Updated Software Select for Freeflight RA4500	03/31/2015

Radar Altimeter 429

ST3400H



COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

NOTES:

1. COLLINS AND BENDIX/KING RADAR ALTIMETERS SUPPORTED IN ST3400H SOFTWARE VERSION 1.1 OR HIGHER
2. SIGNALS MAY BE OBTAINED FROM R/T OR INDICATOR, AS REQUIRED.
3. CONNECT DIGITAL SIGNALS AS REQUIRED.

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CATEGORY: ST3400H INSTALLATION DRAWING

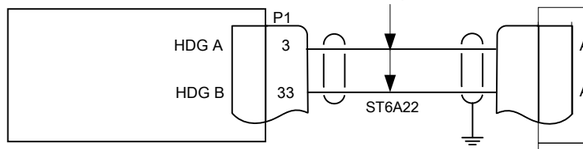
TITLE: RADALT ARINC 429

SIZE	CAGE CODE	DWG NO.	REV
B	3T1Z4	82046-10	B

SCALE NONE | MOD | SHEET 5 OF 15

HEADING 429

ST3400H



ARINC COMPASS SYSTEM OUTPUT	CHELTON ADAHRS J1	SANDEL SG102 P1	LITEF LCR 92 J4	Sagem (Sfim) APIRS F201
ARINC 429 TX A	5	20	28	17
ARINC 429 TX B	6	12	48	12
SOFTWARE SELECT	ARINC 429			

REVISIONS		
LTR	DESCRIPTION	DATE
A	Initial Release	04/12/2010
A1	Title block format change. AR1189	07/30/2011
B	REDRAWN (AR1477) - Was sheet 5 Added ground to shield, twisted pair & wire Nos. (Zone C-3) Added Connector Pins and Ident of equipment (Chelton, Sandel, Litef, & Sagem) (ZoneS C-2 & C-3)	03/31/2015

COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

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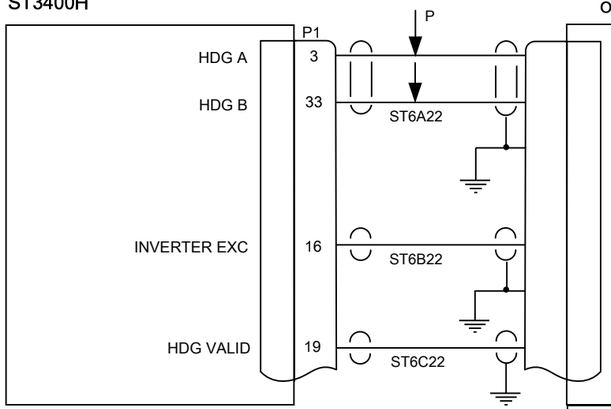
VISTA, CA 92081 USA

CATEGORY: ST3400H INSTALLATION DRAWING			
TITLE: HEADING ARINC 429			
SIZE: B	CAGE CODE: 3T1Z4	DWG NO.: 82046-10	REV: B
SCALE: NONE	MOD	SHEET 6 OF 15	

REVISIONS		
LTR	DESCRIPTION	DATE
A	Initial Release	04/12/2010
A1	Title block format change. AR1189	07/30/2011
B	AR1416 Typo corrected	08/25/2014
C	REDRAWN (AR1477) - Was sheet 6 Added ground to shields, twisted pair and wire Nos. (Zone C-3)	03/31/2015

COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

HEADING XYZ
ST3400H



COMPASS SYSTEM OUTPUT	BENDIX/KING KCS 55A KI525 P2	BENDIX/KING KCS 305 KSG105 P1		COLLINS MCS 65 DGS 65 P1	SPERRY C-14A P1	
			OR			OR
HEADING X	s	Z	L	25	L	a
HEADING Y	v	W	H	40	M	b
HEADING Z	t	T	D	24	K	Z
EXCITATION HI	r	P	c	6	H	X
EXCITATION LO	u	d	f	5	J	Y
HEADING VALID	P	V	V	50	e	e
SOFTWARE SELECT	XYZ OR XYZ-180 HEADING VALID HI or LOW AS REQ'D					

REQUIRES AC REFERENCE INPUT

NOTES:

1. ARINC 407 SYNCRO (XYZ) HEADING SYSTEMS SUPPORTED IN ST3400H SOFTWARE VERSION 1.1 OR HIGHER.

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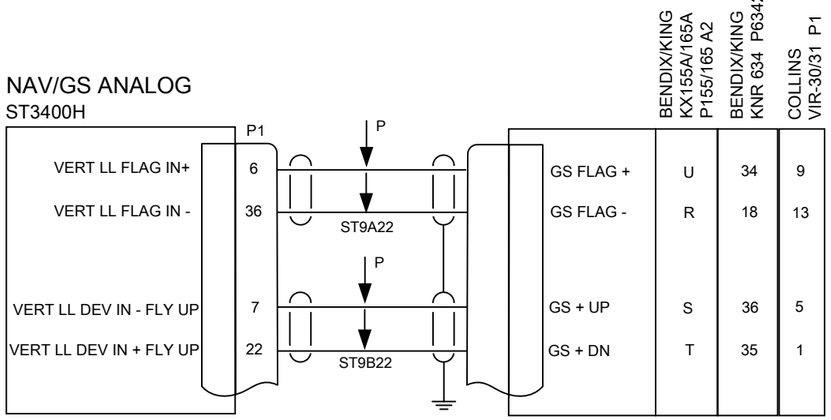
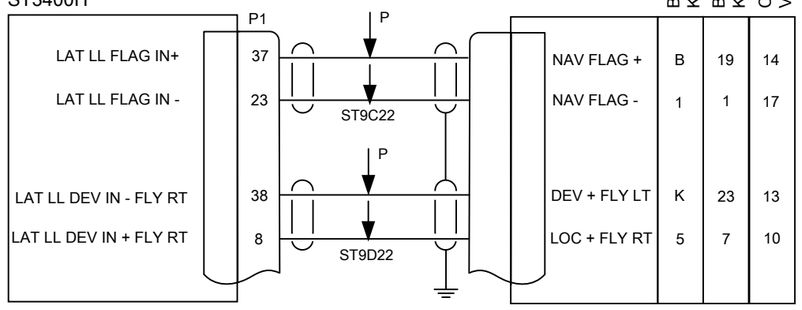
CATEGORY	ST3400H INSTALLATION DRAWING		
TITLE	HEADING XYZ		
SIZE	CAGE CODE	DWG NO.	REV
B	3T1Z4	82046-10	C
SCALE NONE	MOD	SHEET 7 OF 15	

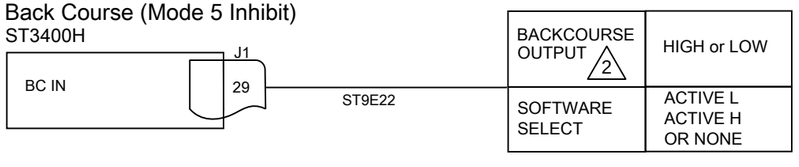
NAV/GS ANALOG
ST3400H



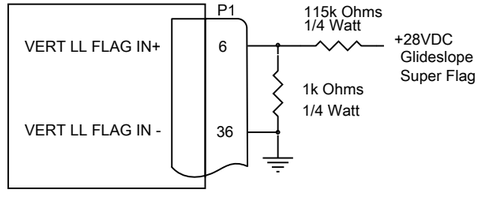
NAV/LOC ANALOG
ST3400H



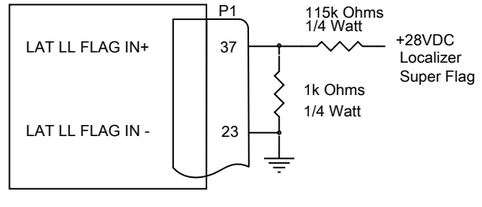
Back Course (Mode 5 Inhibit)
ST3400H



Superflag (Alternate)
ST3400H



ST3400H



REVISIONS

LTR	DESCRIPTION	DATE
A	Initial Release	04/12/2010
B	Corrected Backcourse input connector from J2 to J1	09/24/2010
B1	Corrected note 3, title block format change. AR1189	07/30/2011
C	Updates for AR1418. Garmin GTN 6XX/7XX Equipment Selection added. Notes Updated for GTN 6XX/7XX.	12/10/2013
D	REDRAWN (AR1477) - Was sheet 7 Added shield ground & minor signal name and connector designation changes per the B/K IM (Zone D-3) Removed VIR-32 (Zone D-3) Added shield ground & sig name and conn designation changes, removed KX155, per the B/K IM (Zone B-3) Corrected Pinouts for LOC Flag and Course Dev signals per B/K and Collins IMs (Zone B-3) Changed to twisted pairs and added wire numbers (Zones A-4 Thru D-4) Changed Note 2 to triangle (Zone B-2) and reference (Zone A-3)	03/31/2015

COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

NOTES:

1. ILS ENERGIZE IS NOT REQUIRED

2 MAY COME FROM HSI OR FCS ANNUNCIATOR

3. ANALOG LOC AND GS SUPPORTED IN ST3400H SOFTWARE VERSION 1.1 OR HIGHER

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CATEGORY: ST3400H INSTALLATION DRAWING

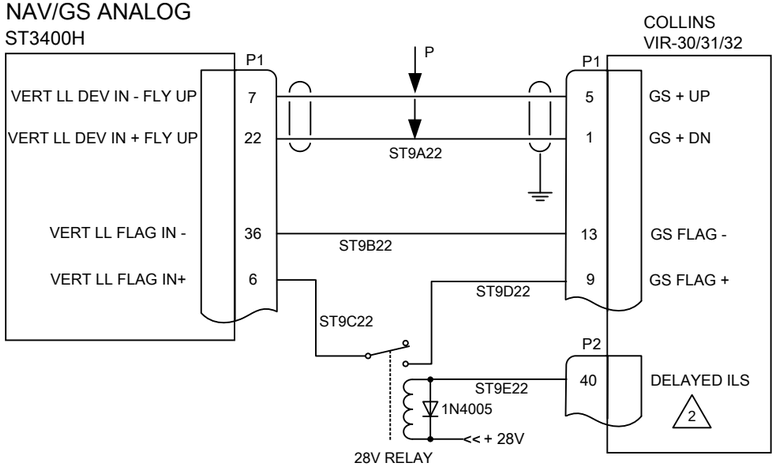
TITLE: NAV AND LOC ANALOG

SIZE	CAGE CODE	DWG NO.	REV
B	3T1Z4	82046-10	D

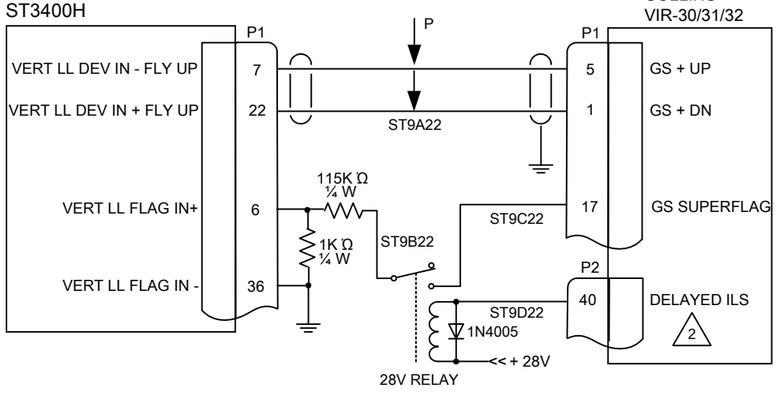
SCALE: NONE | MOD | SHEET 8 OF 15

REVISIONS		
LTR	DESCRIPTION	DATE
A	Initial Release – New Sheet (Continuation of Sheet 8)	03/31/2015

NAV/GS ANALOG
ST3400H



NAV/GS ANALOG (Superflag)
ST3400H



COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

NOTES:

1. ANALOG LOC AND GS SUPPORTED IN ST3400H SOFTWARE VERSION 1.1 OR HIGHER

2 FOR INTERCONNECTION TO J2-40: ILS MODE SINKS 250MA (GROUND); OPEN (HIGH RESISTANCE TO GROUND) IN VOR MODE.

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CATEGORY: ST3400H INSTALLATION DRAWING

TITLE: NAV AND LOC ANALOG (cont)

SIZE	CAGE CODE	DWG NO.	REV
B	3T1Z4	82046-10	A

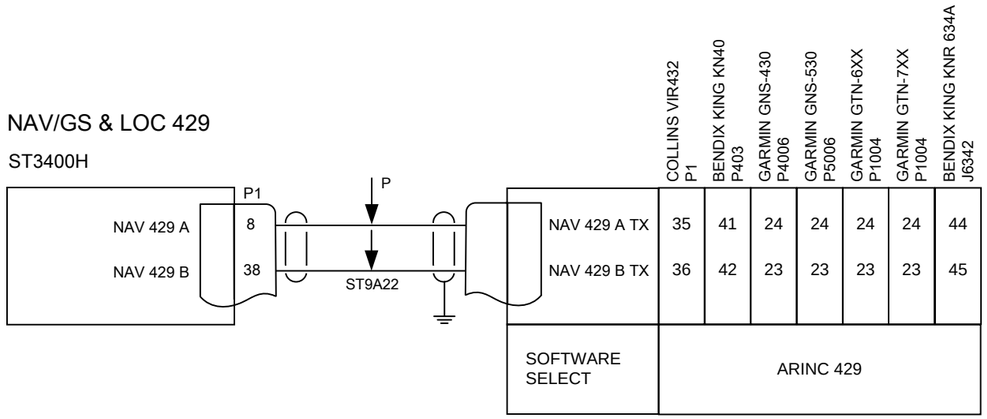
SCALE NONE | MOD | SHEET 9 OF 15

REVISIONS		
LTR	DESCRIPTION	DATE
A	Initial Release	04/12/2010
A1	Title Block format change. AR1189	07/30/2011
B	Updates for AR1418. Equipment selections added for Garmin GTN-6XX/7XX	12/09/2013
C	REDRAWN (AR1477) - Was sheet 8 Added shield ground, twisted pair and wire No. (Zone C-3) Changed “King” to “Bendix King” (Zone C-3) Added Bendix King KNR 634A to table (Zone C-3)	03/31/2015

COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

NAV/GS & LOC 429

ST3400H



	COLLINS VIR432 P1	BENDIX KING KN40 P403	GARMIN GNS-430 P4006	GARMIN GNS-530 P5006	GARMIN GTN-6XX P1004	GARMIN GTN-7XX P1004	BENDIX KING KNR 634A J6342
NAV 429 A TX	35	41	24	24	24	24	44
NAV 429 B TX	36	42	23	23	23	23	45

NOTES:

1. ARINC 429 NAV RECEIVERS SUPPORTED IN ST3400H SOFTWARE VERSION 1.1 OR HIGHER

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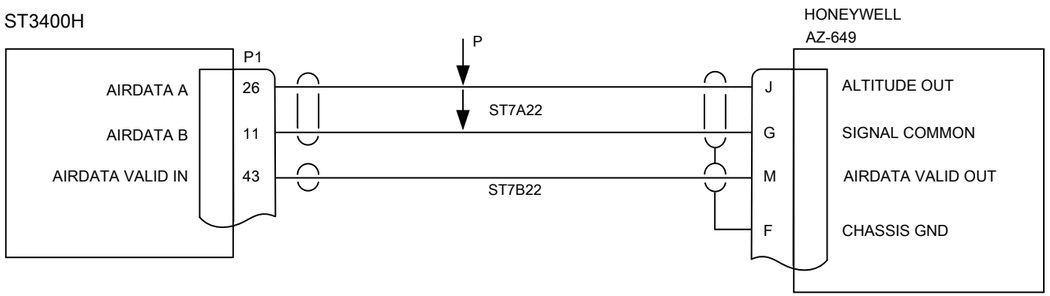
CATEGORY: ST3400H INSTALLATION DRAWING			
TITLE: NAV & LOC ARINC 429			
SIZE: B	CAGE CODE: 3T1Z4	DWG NO.: 82046-10	REV: C
SCALE: NONE	MOD	SHEET: 10 OF 15	

REVISIONS		
LTR	DESCRIPTION	DATE
A	Initial Release	04/12/2010
A1	Title block format change. AR1189	07/30/2011
B	REDRAWN (AR1477) - Was sheet 9 – Changed Title Added shield grounds, twisted pair and wire Nos. (Zone C-3)	03/31/2015

COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

PRESSURE ALTITUDE ANALOG AIRDATA



NOTES:

1. ANALOG AIRDATA AZ-649 SUPPORTED IN ST3400H SOFTWARE VERSION 1.1 OR HIGHER.

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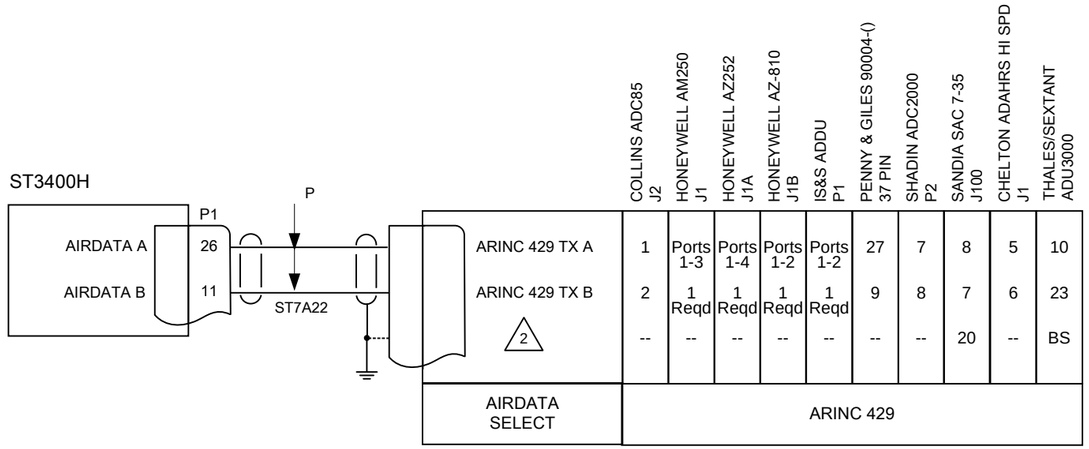
CATEGORY: ST3400H INSTALLATION DRAWING			
TITLE: AIRDATA ANALOG			
SIZE: B	CAGE CODE: 3T1Z4	DWG NO.: 82046-10	REV: B
SCALE: NONE	MOD	SHEET: 11 OF 15	

REVISIONS		
LTR	DESCRIPTION	DATE
A	Initial Release	04/12/2010
A1	Corrected note 1. Title block format change. AR1189	07/30/2011
B	Added SAC 7-35 ADC. AR1416	08/25/2014
C	REDRAWN (AR1477) - Was sheet 10 Added ground provision for shield and note 2. (Zone C-3) Added Note 2. (Zone B-1) Added twisted pair and wire number (Zone C-4) Added Chelton ADAHRS & Thales ADU 3000 and added Pin 20 (Shield Gnd) to Sandia ADC (Zones C-2 & C-3)	03/31/2015

COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY



NOTES:

1. SHADIN ADC2000 SUPPORTED IN ST3400H SOFTWARE VERSION 1.0 OR HIGHER ALL OTHERS CONTAINED ON THIS DRAWING SUPPORTED IN ST3400H SOFTWARE VERSION 1.4 OR HIGHER.

2 USE LOCAL GND FOR SHIELD (--) UNLESS PIN IS DESIGNATED OR TERMINATE TO BACKSHELL (BS)

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VISTA, CA 92081 USA

CATEGORY: ST3400H INSTALLATION DRAWING			
TITLE: AIRDATA ARINC 429			
SIZE: B	CAGE CODE: 3T1Z4	DWG NO.: 82046-10	REV: C
SCALE: NONE	MOD	SHEET 12 OF 15	

ANNUNCIATORS AND EXTERNAL SWITCHES

ST3400H

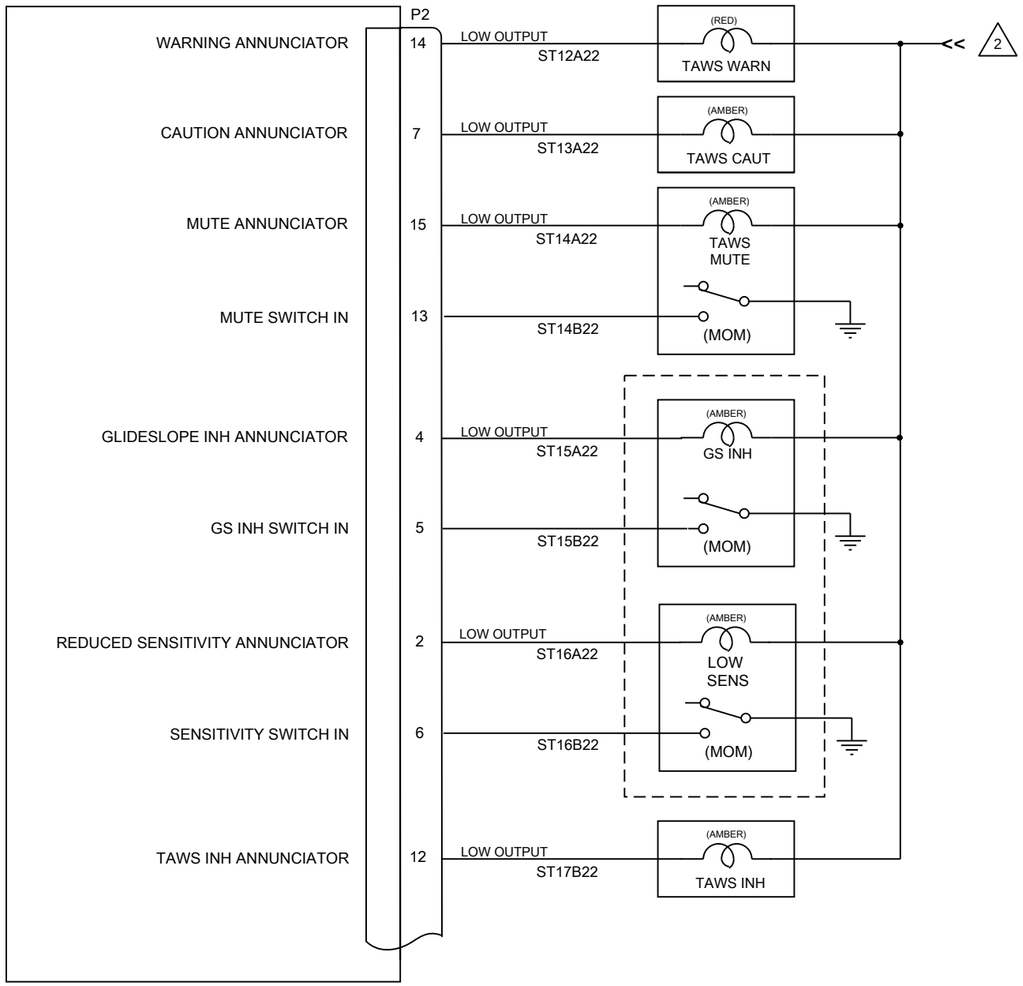
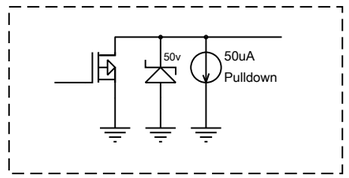
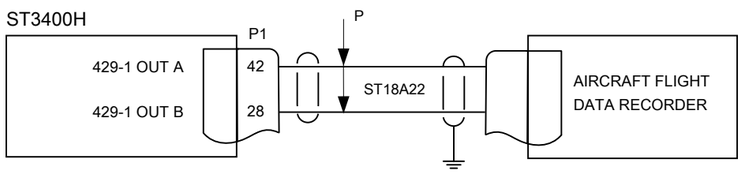


Diagram of each ST3400H Discrete Output (for reference)



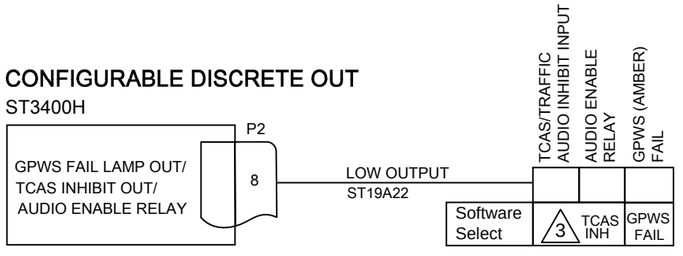
FLIGHT DATA RECORDER

ST3400H



CONFIGURABLE DISCRETE OUT

ST3400H



REVISIONS

LTR	DESCRIPTION	DATE
A	Initial Release	04/12/2010
A1	Revised P2-2 text. Title block format change. AR1189	07/30/2011
B	AR1418 – Removed TCAS II References. Changed ST3400 to ST3400H in discrete output circuit.	08/25/2014
C	AR1416– Corrected page reference for Configurable Discrete Out note.	08/25/2014
D	REDRAWN (AR1477) - Was sheet 11 Changed Note 2 ref. and note (Zones D-2, B-2) Change note * to Note 3 ref (Zone A-2) and added to notes (Zone B-1) Added wire numbers (various)	03/31/2015

COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

NOTES:

1. Annunicators and switches are optional
2. Annunicator power should be connected to Day/Light switch or photocell. Do Not connect to panel lighting
3. TCAS INH selection may be used to drive a 'TAWS audio enable' relay if desired. (See Sheet 2)

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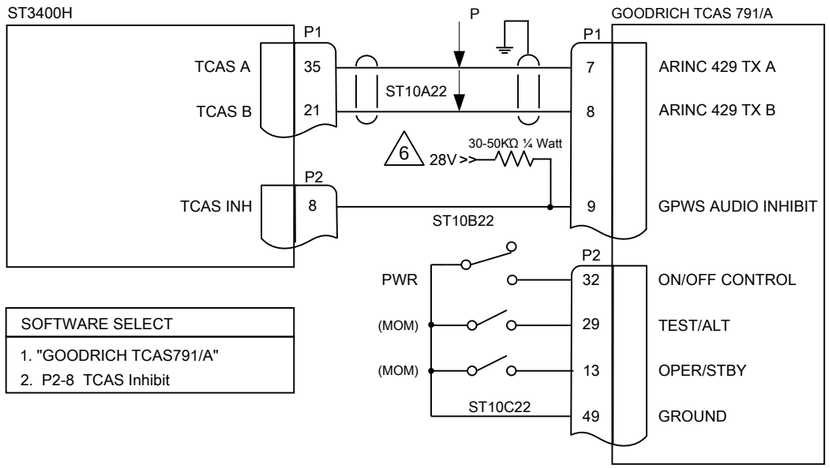
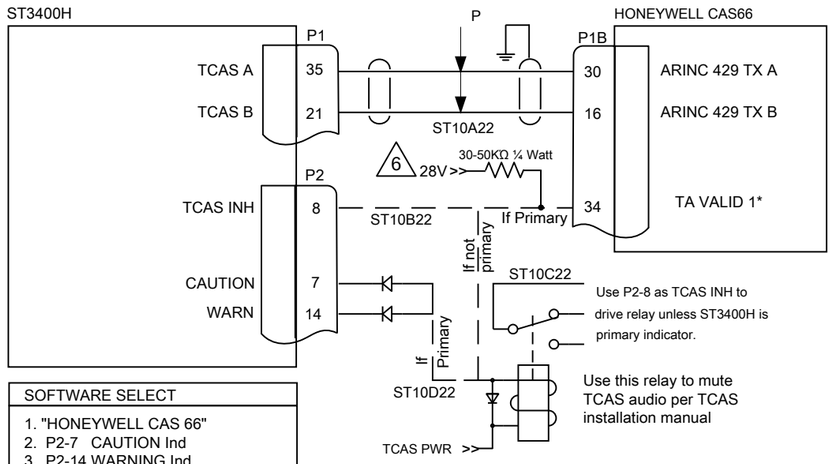
CATEGORY: ST3400H INSTALLATION DRAWING			
TITLE: ANNUNCIATORS (OPTIONAL)			
SIZE: B	CAGE CODE: 3T1Z4	DWG NO.: 82046-10	REV: D
SCALE: NONE	MOD	SHEET: 13 OF 15	

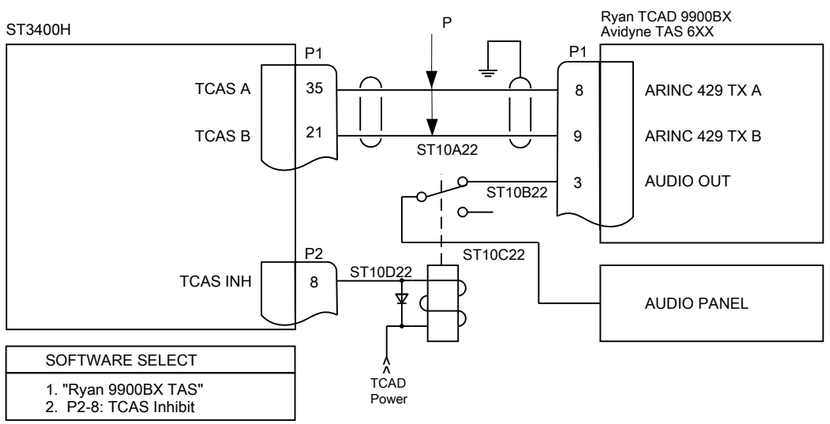


TCAS 791/A SETUP
DISPLAY TYPE: SET TO "ARINC735 TYPE II"

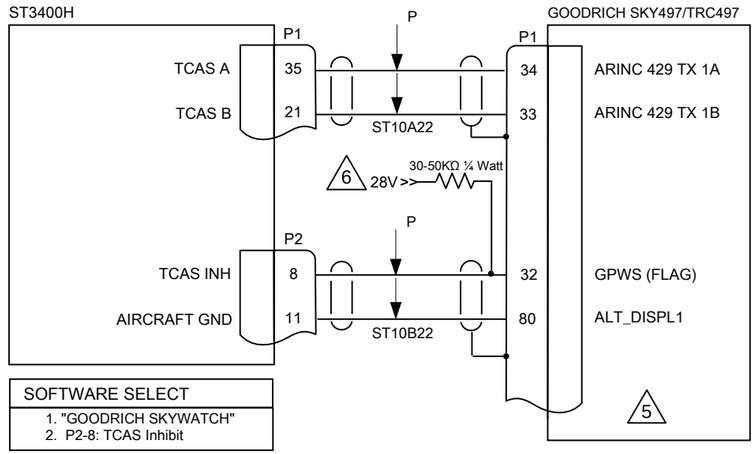
SOFTWARE SELECT
1. "GOODRICH TCAS791/A"
2. P2-8 TCAS Inhibit



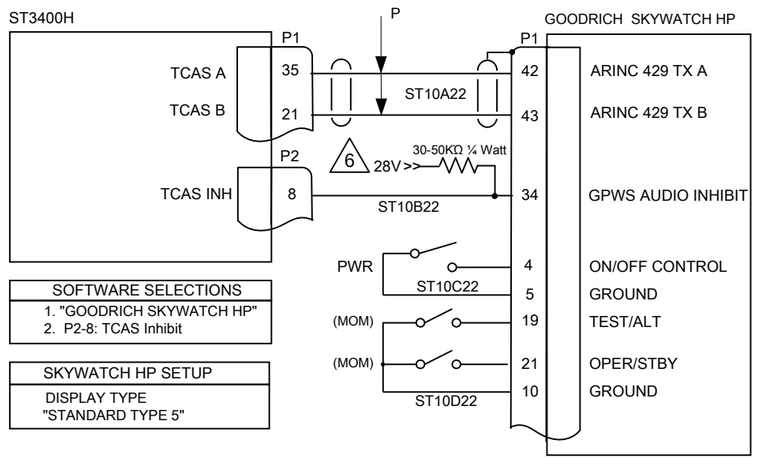
SOFTWARE SELECT
1. "HONEYWELL CAS 66"
2. P2-7 CAUTION Ind
3. P2-14 WARNING Ind



SOFTWARE SELECT
1. "Ryan 9900BX TAS"
2. P2-8: TCAS Inhibit



SOFTWARE SELECT
1. "GOODRICH SKYWATCH"
2. P2-8: TCAS Inhibit



SOFTWARE SELECTIONS
1. "GOODRICH SKYWATCH HP"
2. P2-8: TCAS Inhibit

SKYWATCH HP SETUP
DISPLAY TYPE "STANDARD TYPE 5"

REVISIONS

LTR	DESCRIPTION	DATE
A	Initial Release	04/12/2010
A1	Title block format change. AR1189	07/30/2011
B	AR1416 Typos corrected	08/25/2014
C	REDRAWN (AR1477) - Was sheet 12 Added Shield Grounds (Zones D-3, C-3, B-3 & B-2) Added Interconnect Dia. Goodrich SKY-497 (Zones B/C -2/3) Added wire numbers and twisted pairs (various) Added Note 5 and ref. for SKY-497 (Zone B-2) Added 30-50K Ω pull up resistor and Note 6. (4 places) for TAS/TCAS interface with P2-8 TCAS INH Corrected Software Select Notes (Zones C-4, B-4, A-4, B-3 and A-3)	03/31/2015

COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY

NOTES:

1. INTERCONNECT SHOWN WITH SANDEL AS PRIMARY TRAFFIC DISPLAY.
2. SEE MANUFACTURERS INSTALLATION MANUALS FOR COMPLETE WIRING INTERFACE.
3. ST3400H P2-8 OUTPUT IS CONFIGURED ON THE MAINTENANCE PAGE.
4. TCAS TRAFFIC SUPPORTED ON ST3400H SOFTWARE VERSION 1.1 OR HIGHER

5 THE SKY 497 SOFTWARE VERSION MUST BE 1.4 OR LATER VERSION.

6 WHEN TCAS INH IS USED TO INHIBIT A TCAS PROCESSOR A 30-50K Ω 1/4W RESISTOR SHOULD BE ADDED TO PULL UP TO +28V. PROTECT WITH SHRINK TUBING.

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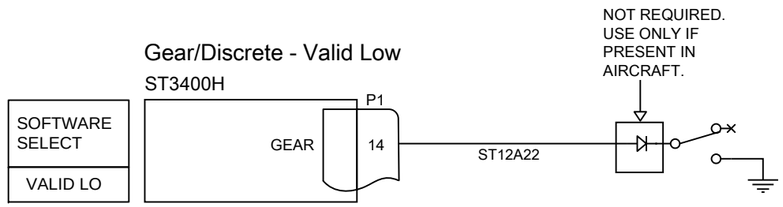
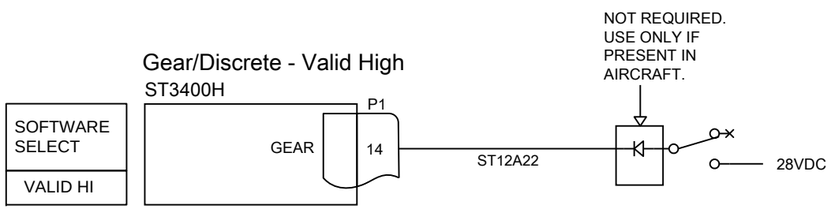
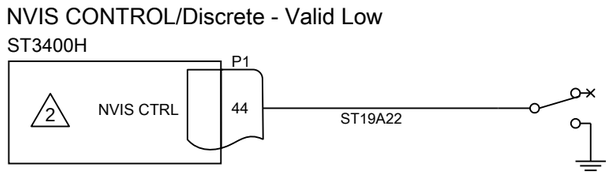
CATEGORY	ST3400H INSTALLATION DRAWING		
TITLE	TCAS/TRAFFIC		
SIZE	CAGE CODE	DWG NO.	REV
B	3T1Z4	82046-10	C
SCALE NONE	MOD	SHEET 14 OF 15	

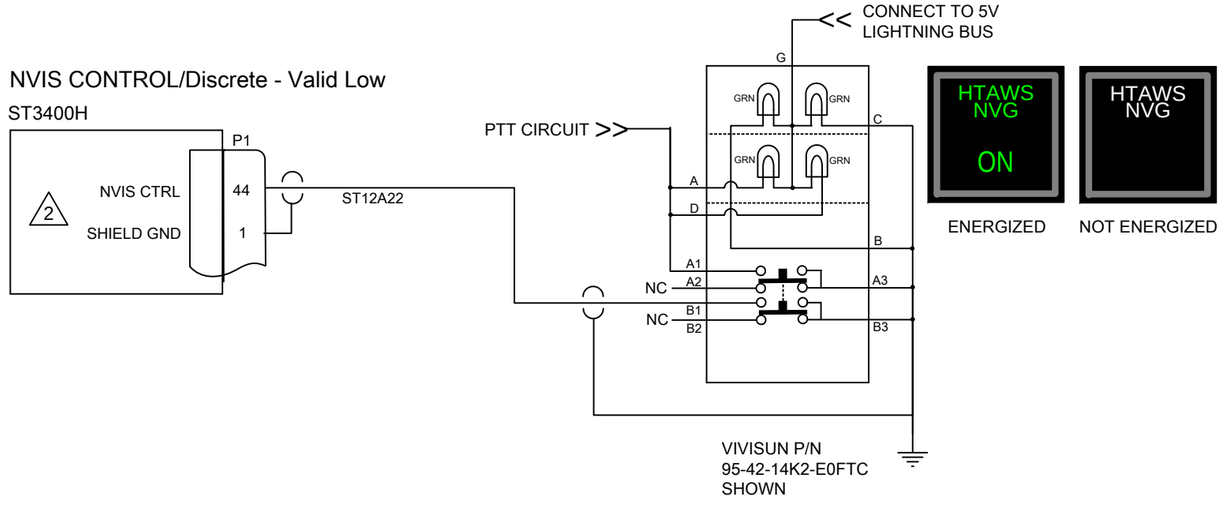
REVISIONS		
LTR	DESCRIPTION	DATE
A	Initial Release	04/12/2010
A1	Title block format change. AR1189	07/30/2011
B	REDRAWN (AR1477) - Was sheet 13 Added Alternate Action PBA for NVIS Control (Zones B-2 Thru B-4) Added Note 2 (Zone B-1) and Refs. (Zones B-4 & C-4) Added wire numbers (various)	03/31/2015

COMPUTER CONTROLLED DRAWING
DO NOT REVISE MANUALLY









NOTES:

1. NVIS SUPPORTED IN ST3400H SOFTWARE VERSION 1.1 OR HIGHER

2 INSTALLATION OF NVIS AND OPERATION REQUIRES SEPARATE APPROVALS

SANDEL®
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VISTA, CA 92081 USA

CATEGORY: ST3400H INSTALLATION DRAWING			
TITLE: DISCRETE INPUTS			
SIZE: B	CAGE CODE: 3T1Z4	DWG NO.: 82046-10	REV: B
SCALE: NONE	MOD	SHEET: 15 OF 15	