# SANDEL®

# **SN3500** Primary Navigation Display

with Reversionary Attitude Mode And LNAV Roll Steering



# **Installation Manual**

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# **Table of Contents**

| 1 Ger         | neral Information                                       | 1-1          |
|---------------|---|--------------|
| 1.1 In        | troduction  | 1-1          |
| 1.1.1         | EXPORT CONTROL NOTICE                                   | 1-1          |
| 1.2 Ed        | aupment Description                                     |              |
| 121           | Features  | 1_1          |
| 1.2.1         |   |              |
| 1.3 IN        |   |              |
| 1.3.1         | Installation Planning Cycle                             |              |
| 1.3.2         |   |              |
| 1.4 In        | terface Planning  | 1-3          |
| 1.4.1         | Compass System  | 1-3          |
| 1.4.2         | Autopilot Switching                                     | 1-4          |
| 1.4.3         | Autopilot Course and Heading Datum                      | 1-5          |
| 1.4.4         | GPS Annunciators Internal NAV Converter                 | 1-5<br>1 5   |
| 1.4.5         | VLOC Navigation – External NAV Converter                | 1-5<br>1-5   |
| 1.4.7         | Marker Beacon   |              |
| 1.4.8         | Bearing Pointers (VOR, ADF, and TACAN)                  |              |
| 1.4.9         | ARINC Channels  | 1-7          |
| 1.4.10        | DME Interface   | 1-7          |
| 1.4.11        | Special Considerations for GARMIN GNS430/530/GTN6XX/7XX | 1-7          |
| 1.4.12        | Special Considerations for UPS GXXX                     | 1-9          |
| 1.4.13        | Brightness Control                                      | 1-9          |
| 1.4.14        | Data Link Weather Ontion                                | 1-9-1<br>1_0 |
| 1 4 16        | TACAN Ontion  | 1-10         |
| 1.4.17        | Night Vision Support Option                             |              |
| 1.4.18        | Reversionary Attitude Option                            | 1-10         |
| 1.4.19        | Roll Steering Option                                    | 1-10         |
| 1.5 Di        | sclaimer  |              |
|               |   |              |
| 2 Tec         | hnical Information                                      | 2-1          |
| 2.1 G         | eneral  | 2-1          |
| 22 D          | art Numbers   | 2_1          |
| <b>2.2</b> Fo |   |              |
| 2.2.1         | Installation Kit and Accessories                        | 2-2          |
| 2.2.2         | Bill of Materials – SN3500 Install Kit                  | Z-Z          |
| 2.3 Aj        | oproval Summary   | 2-2          |
| 2.3.1         | License Requirements                                    | 2-2          |
| 2.3.2         | Approval Data   | 2-2          |
| 2.3.3         | Technical Standard Order Stipulation                    | 2-3          |
| 2.3.4         | Installation and Operational Approval Procedures        | 2-3          |
| 2.4 Pł        | nysical, and Electrical Properties                      | 2-5          |
| 2.4 1         | Physical Dimensions                                     | 2-5          |
| 2.4.2         | Summary Operational Characteristics                     | 2-5          |

| 2.5  | Connector Summary  | 2-5                             |
|--|--|---------------------------------|
| 25   | 5.1 Connector P1   | 2-6                             |
| 2.5  | 5.2 Connector P2   | 2-9                             |
| 2.5  | 5.3 Connector P3   | 2-12                            |
| 2.5  | 5.4 Signal Characteristics Table   | 2-13                            |
| 2.6  | ARINC 429  | 2-15                            |
| 26   | ARINC 419/429 Serial Data Receivers Interfaces   | 2-15                            |
| 2.6  | 6.2 ARINC 419/429 Serial Transmitter Interfaces  | 2-17                            |
| 3 I  | Installation   | 3-1                             |
| 3.1  | General  | 3-1                             |
| 3.1  | 1.1 Unpacking and Inspecting Equipment   | 3-1                             |
| 3.2  | Installation Considerations  | 3-1                             |
| 3.2  | 2.1 General Considerations   |                                 |
| 3.2  | 2.2 Cooling Considerations   |                                 |
| 3.2  | 2.3 Mechanical Installation Considerations   | 3-1                             |
| 3.2  | 2.4 Electrical Installation Considerations   | 3-2                             |
| 3.3  | Signal Details   | 3-4                             |
| 33   | Connector P-1 Pinout Description   | 3-4                             |
| 3.3  | 3.2 Connector P-2 Pinout Descriptions  |                                 |
| 3.3  | 3.3 Connector P-3 Pinout Descriptions  |                                 |
| 4 9  | Setup Procedures   | 4-1                             |
| •  |  |                                 |
| 4.1  | General  | 4-1                             |
| 42   | Accessing the Maintenance Menus  |                                 |
| 7.4  | Accessing the Mantenance Menus   | 4-1                             |
| 4.3  | Equipment/Configuration Selections   | 4-1                             |
| 4.3  | Equipment/Configuration Selections   | 4-1                             |
| 4.3<br>5 (   | Equipment/Configuration Selections   | 4-1<br>4-1<br>5-1               |
| 4.3<br>5 (<br>6  | Equipment/Configuration Selections<br>Operating Details<br>Instructions For Continued Airworthiness  | 4-1<br>                         |
| 4.3<br>5 (<br>6  | Equipment/Configuration Selections<br>Operating Details<br>Instructions For Continued Airworthiness  | 4-1<br>4-1<br>                  |
| 4.3<br>5 (<br>6  <br>6.1   | Equipment/Configuration Selections<br>Operating Details<br>Instructions For Continued Airworthiness<br>General   | 4-1<br>4-1<br>                  |
| 4.3<br>5 (<br>6  <br>6.1<br>7 /  | Equipment/Configuration Selections<br>Operating Details<br>Instructions For Continued Airworthiness<br>General<br>Appendix A: Post-Installation Procedures   | 4-1<br>5-1<br>6-1<br>6-1<br>7-1 |
| 4.3<br>5 (<br>6  <br>6.1<br>7 /<br>7.1   | Equipment/Configuration Selections   Operating Details   Instructions For Continued Airworthiness   General   Appendix A: Post-Installation Procedures   1.1 Page 1: INDEX   | 4-1<br>4-1<br>                  |
| 4.3<br>5 (<br>6  <br>6.1<br>7 <i>J</i><br>7.1<br>7.1   | Equipment/Configuration Selections   Operating Details   Instructions For Continued Airworthiness   General   Appendix A: Post-Installation Procedures   1.1 Page 1: INDEX   1.2 Page 2: SYSTEM  |                                 |
| 4.3<br>5 (<br>6 1<br>6.1<br>7 <i>1</i><br>7.1<br>7.1   | Equipment/Configuration Selections   Operating Details   Instructions For Continued Airworthiness   General   Appendix A: Post-Installation Procedures   1.1 Page 1: INDEX   1.2 Page 2: SYSTEM   1.3 Page 3: COMPASS SYSTEM   |                                 |
| 4.3<br>5<br>6<br>1<br>6.1<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>1<br>7.1<br>7.1<br>7.1                              | Equipment/Configuration Selections   Operating Details   Instructions For Continued Airworthiness   General   Appendix A: Post-Installation Procedures   1.1 Page 1: INDEX   1.2 Page 2: SYSTEM   1.3 Page 3: COMPASS SYSTEM   1.4 Page 4: ADF/TACAN/ MKR  |                                 |
| 4.3<br>5<br>6<br>1<br>6.1<br>7<br>7<br>7<br>7<br>7<br>7<br>1<br>7.1<br>7.1<br>7.1<br>7.1                                 | Equipment/Configuration Selections   Operating Details   Instructions For Continued Airworthiness   General   Appendix A: Post-Installation Procedures   1.1 Page 1: INDEX   1.2 Page 2: SYSTEM   1.3 Page 3: COMPASS SYSTEM   1.4 Page 4: ADF/TACAN/ MKR   1.5 Page 5: NAV/ILS/DME 1  |                                 |
| 4.3<br>5<br>6<br>1<br>6.1<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7 | Equipment/Configuration Selections   Operating Details   Instructions For Continued Airworthiness   General   Appendix A: Post-Installation Procedures   1.1 Page 1: INDEX   1.2 Page 2: SYSTEM   1.3 Page 3: COMPASS SYSTEM   1.4 Page 4: ADF/TACAN/ MKR   1.5 Page 5: NAV/ILS/DME 1   1.6 Page 6: NAV/ILS/DME 2  |                                 |
| 4.3<br>5 (<br>6 1<br>6.1<br>7 1<br>7.1<br>7.1<br>7.1<br>7.1<br>7.1<br>7.1<br>7.1<br>7.1<br>7.1<br>7.                     | Equipment/Configuration Selections   Operating Details   Instructions For Continued Airworthiness   General   Appendix A: Post-Installation Procedures   1.1 Page 1: INDEX.   1.2 Page 2: SYSTEM.   1.3 Page 3: COMPASS SYSTEM   1.4 Page 4: ADF/TACAN/ MKR   1.5 Page 5: NAV/ILS/DME 1   1.6 Page 6: NAV/ILS/DME 2   1.7 Page 7: GPS1   1.8 Page 8: GPS2  |                                 |
| 4.3<br>5<br>6<br>1<br>6.1<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7 | Equipment/Configuration Selections   Operating Details   Instructions For Continued Airworthiness   General   Appendix A: Post-Installation Procedures   1.1 Page 1: INDEX   1.2 Page 2: SYSTEM   1.3 Page 3: COMPASS SYSTEM   1.4 Page 4: ADF/TACAN/ MKR   1.5 Page 5: NAV/ILS/DME 1   1.6 Page 6: NAV/ILS/DME 2   1.7 Page 7: GPS1   1.8 Page 8: GPS2   1.9 Page 9: ECS EMULATION  |                                 |
| 4.3<br>5<br>6<br>1<br>6.1<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>1<br>7.1<br>7.1<br>7.1<br>7.1<br>7             | Equipment/Configuration Selections   Operating Details   Instructions For Continued Airworthiness   General   Appendix A: Post-Installation Procedures   1.1 Page 1: INDEX   1.2 Page 2: SYSTEM   1.3 Page 3: COMPASS SYSTEM   1.4 Page 4: ADF/TACAN/ MKR   1.5 Page 5: NAV/ILS/DME 1   1.6 Page 6: NAV/ILS/DME 1   1.7 Page 7: GPS1   1.8 Page 8: GPS2   1.9 Page 9: FCS EMULATION   1.0 Page 10: OBS / RELAY / CDI                           |                                 |
| 4.3<br>5<br>6<br>1<br>6.1<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7 | Equipment/Configuration Selections   Operating Details   Instructions For Continued Airworthiness   General   Appendix A: Post-Installation Procedures   1.1 Page 1: INDEX.   1.2 Page 2: SYSTEM.   1.3 Page 3: COMPASS SYSTEM   1.4 Page 4: ADF/TACAN/ MKR   1.5 Page 5: NAV/ILS/DME 1   1.6 Page 6: NAV/ILS/DME 2   1.7 Page 7: GPS1   1.8 Page 8: GPS2   1.9 Page 9: FCS EMULATION   1.10 Page 10: OBS / RELAY / CDI   1.11 Page 11: WX-500 |                                 |
| 4.3<br>5<br>6<br>1<br>6.1<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7 | Equipment/Configuration Selections   Operating Details   Instructions For Continued Airworthiness   General   Appendix A: Post-Installation Procedures   1.1 Page 1: INDEX.   1.2 Page 2: SYSTEM.   1.3 Page 3: COMPASS SYSTEM   1.4 Page 4: ADF/TACAN/ MKR   1.5 Page 5: NAV/ILS/DME 1   1.6 Page 6: NAV/ILS/DME 2   1.7 Page 7: GPS1   1.8 Page 8: GPS2   1.9 Page 10: OBS / RELAY / CDI   1.1 Page 11: WX-500   1.1 Page 12: Traffic        |                                 |

| 7.1.14   | Page 14: BRT/DATA BLK  | 7-25                |
|----------|--|---------------------|
| 7.1.15   | Page 15: Power   | 7-27                |
| 7.1.16   | Page 16: Software CRC  | 7-28                |
| 8 App    | endix B: Environmental Qualification Form  | 8-1                 |
| 9 App    | endix C: Sample FAA Form 337   | 9-1                 |
| 10 App   | endix D: Sample Airplane Flight Manual Supplement  |                     |
|          | a production of the second sec | -                   |
| 11 App   | endix E: Checkout Procedures   | 11-1                |
| 11.1 Fu  | nctional Ground Test Procedures/Report   | 11-1                |
| 11.1.1   | Introduction   | 11-3                |
| 11.1.2   | Test Procedures and Results  | 11-3                |
| 11.1.3   | Physical Installation  |                     |
| 11.1.4   | Wiring Verification and Initial Power-Up   |                     |
| 11.1.5   | System Configuration   |                     |
| 11.1.6   | System Functions   |                     |
| 11.1.7   | Compass System Intenace  |                     |
| 11.1.0   | LOC/GS Deviation   | 11-5<br>11_6        |
| 11.1.9   | BRG Source Selection   | 11-0<br>11-6        |
| 11 1 11  | DME Selection  | 11-6                |
| 11.1.12  | GPS Interface and Control  |                     |
| 11.1.13  | Marker Beacon Interface  |                     |
| 11.1.14  | Flight Control System Interface  |                     |
| 11.1.15  | Stormscope ® Interface   |                     |
| 11.1.16  | Traffic  |                     |
| 11.1.17  | NVIS Control   | 11-10               |
| 11.1.18  | Reversionary Display Control   | 11-10               |
| 11.1.19  | Additional Testing   | 11-10               |
| 11.2 EN  | I/RFI Test Procedures  | 11-10               |
| 11.2.1   | Nav/Com Testing  |                     |
| 11.2.2   | General Testing  |                     |
| 11.2.3   | Additional Testing   |                     |
| 11.3 Op  | erational Flight Test Procedures/Report  | 11-13               |
| 11.4 Int | roduction  | 11-15               |
| 115 To   | st Procedures  | 11-15               |
|          |  |                     |
| 11.5.1   | Pre-Departure Operations   |                     |
| 11.5.2   |  |                     |
| 11.5.3   | GPS Approach Operations  |                     |
| 11.5.4   | I ADAM APPIDDUI OPEIDIUMS  | /                   |
| 11.5.5   | Additional Testing   | / ۱ = ۱ ۱<br>11_1 ی |
| 11.5.0   |  |                     |
| 12 App   | endix F: List of Effective Drawings and Attachments  |                     |

# **Revision History**

| Revision | Date       | Comments  |
|----------|------------|---|
| R        | 01/27/2015 | Updated for AR1617<br>Section 1.1.1: Updated ITAR Note<br>Section 1.2.1: Updated ITAR note for TACAN display option.<br>Section 7.1.3.1: Added PTCH CAL field to table.   |
| Ρ        | 10/30/2013 | Updated for AR 1378<br>Section 1.4.4: GTN series added.<br>Section 1.4.6: GTN6XX/7XX added. Series resistor note removed from<br>second paragraph.<br>Section 1.4.11: Table added for GTN6XX/7XX.<br>Section 2.2.2: Removed USB cable from Installation Kit BOM<br>Section 2.5.1 Connector P-1 description: Removed the word "series" from Pins<br>6 and 37. Removed Superflag note.<br>Section 3.3.1: P1-6, P1-36, P1-37, and P1-23: removed the word "series".<br>Section 7.1.3.1: Typo corrected "HSI"<br>Section 12: Updated Effective Drawing list due to revision of 82006-10 sheet<br>27 to show new equipment selection for GTN6XX/7XX.<br>Section 12: Update to DWG 82005-10 sheet 28 to show new equipment<br>selection for GTN6XX/GTN7XX.<br>Section 42: Sheet 42 Added for NAV/GS Superflags. |
| N        | 08/21/2013 | Updated for AR 1357 Section 3.3.1:<br>Corrected ARINC 429 designations for P1-39 from 429B to 429A and P1-25<br>from 429A to 429B.<br>Corrected Environmental Test Credit Analysis document number in<br>Environmental Qual Form for LED Models from 82009-0144 to 82005-0091.<br>Section 7.1.15: Maintenance page screenshot updated to reflect new internal<br>power supply voltage requirements.<br>Section 12: Updated Effective Drawing list due to revision of 82005-10 sheet<br>19.<br>Section 12: Correction to DWG 82005-10 sheet 19 – Pin number P1-7 was<br>incorrectly shown as P1-22 and pin number P1-22 was incorrectly shown as<br>P1-7.  |
| М        | 03/02/2012 | Updated for software version 4.05 AR1221<br>Section 1.4.13: Added external brightness control.<br>Section 7.1.10: Added LED backlight requirement for Roll Steering.  |
| L        | 11/09/2011 | Updated for software version 4.04 AR1207<br>Section 1.3.1: Correction to positioner and extraction tool part numbers.<br>Section 1.4.19: New Roll Steering<br>Section 2.2: SN3500 part numbers added.<br>Section 2.6.1: Added label 121 to table.<br>Section 7.1.2: Added Loc/GS pointer selection option.<br>Section 7.1.10: Added instructions for roll steering key entry.<br>Section 10.0: Added Sample AFMS LNAV/Roll Steering text.   |
| К        | 11/30/2010 | Updated for software version 4.03 AR1154<br>Section 1.1.1: Added TACAN ITAR Export Notice. Removed NVIS notice.<br>Section 1.3.1: Added list of recommended crimp tools.<br>Section 2.2.2: Positronics P/Ns added for connectors<br>Section 2.6.1: Updated 429 Label Description table.<br>Section 2.6.2: Table formatting updated.<br>Section 7.1.14: Changes to maintenance page 14: added procedure for<br>calibrating the minimum brightness when an external brightness control is<br>used.  |

| Revision | Date     | Comments   |
|----------|----------|--|
| J        | 05/27/10 | Updated for software version 4.02 AR1110.<br>Corrected TOC<br>Section 3.3.2: Updated P2-3/35 pin description and added note for composite<br>LOC DEV calibration procedure.<br>Section 7.1.2: New TACAN Relay out pin configuration.<br>Section 7.1.3: New Reversionary Attitude Enable pin configuration.<br>Section 7.1.5: Added composite LOC DEV calibration procedure. Added<br>reference to cal procedure and added GAIN selection to table. Updated figure.<br>Section 7.1.6: Added reference to cal procedure and added GAIN selection to<br>table. Updated figure.<br>Section 7.1.14: New Dimmer Control configuration.<br>Section 11.1.9: Added LOC/GS deviation test. Following sections<br>renumbered.<br>Section 12: DWG 82005-10 sheet 41  |
|          | N/A      | Intentionally skipped.   |
| Н        | 8/24/09  | Updated for software version 4.01 AR1087.<br>Section 3.3.1 change inverter range from 360 - 440Hz. to 240 - 560 Hz.<br>Section 3.3.2 change inverter range from 360 - 440Hz. to 240 - 560 Hz.<br>Section 7.1.1 corrected reference from ST3400 to SN3500.  |
| G        | 3/2/09   | Updated for software version 4.00 AR1055.<br>Page vi: Updated revision history.<br>Section 1.2.1: Added Optional Reversionary Display.<br>Section 1.4.17: Added NVIS paragraph<br>Section 1.4.18: New Reversionary Display paragraph.<br>Section 2.3.2: added TSO-C3d, and –C4c.<br>Section 2.5.3: Added REV CNTRL Label to connector pin 6.<br>Section 2.6.1: Added ARINC labels for Roll, Pitch, and Lateral Acceleration.<br>Section 3.3.3: Added Reversionary Control signal to connector P3 pin 6.<br>Section 7.1.3: Updated compass maintenance page for Reversionary Attitude.<br>Section 7.1.4: Added TACAN 1 & 2 Multi-Channel selection.<br>Section 7.1.5: Added DME1 Multi-Channel selection.<br>Section 7.1.6: Added DME2 Multi-Channel selection.<br>Section 11.1.17: Added ground test procedure.<br>Section 12: Added 82005-41 to drawing list. |
| F        | 8/26/08  | Updated for software version 3.05, AR1032.<br>Page 2-12: Assigned P3-13 to NVIS Control<br>Page 3-12: Added NVIS P3-13 description<br>Page 7-20: Modified Maint. Page 14. (NVIS control monitor)<br>Page 11-10: Added NVIS ground test step<br>Page 12-2: Added 82005-10 pp 40, updated revisions.   |

| Revision | Date            | Comments   |  |  |
|----------|-----------------|--|--|--|
| E        | Date<br>6/16/08 | Comments   Updated for software version 3.04 and TACAN support   Page 1-1: Added export control notice.   Page 1-2: TACAN added.   Page 1-6: TACAN added to bearing pointer inputs.   Page 1-8: NVIS Display Brightness / [M] button LED operation note added.   Page 1-8: TACAN added   Page 2-1: Low voltage operation support note added   Page 2-1: Update part number definition   Page 2-2: USB cable added to Bill of Materials   Page 2-6: TACAN added   Page 2-6: TACAN added   Page 2-9: TACAN added   Page 3-4: TACAN added to pinout description   Page 3-7: TACAN added to pinout description   Page 7-20: Page updated for NVIS brightness/ M button LED status   Page 11-6: TACAN added to bearing source selection   Page 11-6: TACAN added to pervect the status  |  |  |
| D1       | 01/31/08        | Page 11-16: TACAN approach operations added.   A/R 958   Updated Effective drawing list.   Modified 82005-10 sheet 28.   Added 82005 10 sheet 28.  |  |  |
| D        | 11/15/07        | Added 82005-10 sheet 38<br>A/R 924<br>Page 1-1: Updated applicable TSOs and ETSO.<br>Page 2-1: Lamp kit added.<br>Page 2-2: Updated applicable TSOs and ETSO<br>Pages 3-9 & 3-10: Clarify pin description P2-28, P2-13.<br>Clarify composite input connection with analog NAVs.<br>Page 3-9: Clarify P2-10 HDG/CRS Excitation connection when not connected.<br>Page 5-1: Added reference to 82005-PG (SN3500 Pilot's Guide) for light<br>source identification and data color coding details.<br>Page 7-1: Updated INDEX maintenance page image.<br>Pages 7-10 & 7-12: Added selections for ARINC 429 on GPS 1 and GPS 2<br>maintenance pages.<br>Page 7-11: Updated GPS-2 maintenance page image.<br>Pages 7-11 & 7-12: Added selections for GPS Approach Mode Active Status<br>on GPS1 and GPS2 maintenance pages.<br>Page 7-15: Added definition for lateral and vertical deviation output calibration<br>in maintenance pages.<br>Page 7-18: KTA-810 configuration note added.<br>Page 7-19: Updated BRT/DATA BLK maintenance page image.<br>Page 8-2: RTCA/DO-160E Environmental Qualification Form added. |  |  |
| C1       | 12/16/05        | A/R 824 Updated following pages: Page iv, revision; Page 2-4, weight in kg;<br>Pages 2-6 and 3-5, deviation left/right; Pages 3-9 and 7-13, FCS selection;<br>Page 3-12, P3-10 NAV menu typo; Pages 12-1 and 12-2, drawing rev<br>updates. Pages 1, 33 & 36 of installation drawings updated.  |  |  |
| С        | 11/17/2005      | A/R 806 & A/R 820 Updated for software version 2.01, version 3.00, and minor corrections. Sample AFMS updated including FIS-B weather.   |  |  |
| В        | N/A             | Skipped  |  |  |
| A3       | 06/06/2005      | A/R 782 Minor doc changes for production release   |  |  |
| A2       | 05/06/2005      | A/R 782 Minor doc changes and pin-out corrections  |  |  |

| Revision | Date       | Comments                          |
|----------|------------|-----------------------------------|
| A1       | 04/21/2005 | A/R 780 minor doc and dwg changes |
| A        | 03/31/2005 | Initial release                   |

#### **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 SN3500 Primary Navigation Display.

The SN3500 is the industry's most capable electronic HSI. It can be used to directly replace a mechanical DG or HSI as a primary display, or the SN3500 can be used as a replacement or upgrade for an existing Sandel SN3308 navigation display. It is signal (but not plug) compatible with the SN3308, and is an upgrade in performance with both an improved display and added features.

#### **1.1.1 EXPORT CONTROL NOTICE**

Prior to 20 January, 2015 - The TACAN display option software key (p/n 90143-TCN) is subject to the licensing jurisdiction of the Department of State in accordance with the International Traffic in Arms Regulations (ITAR) (22 CFR 120 – 130). It may not be exported (sent, transferred, disclosed or otherwise released to a foreign person) without a license issued by DDTC.

#### **1.2 Equipment Description**

#### 1.2.1 Features

The Sandel SN3500 Primary Navigation Display is an advanced microprocessor controlled airborne multipurpose electronic display which is FAA approved under technical standard order TSO C6d, C34e, C35d, C36e, C40c, C41d, C113, C118, and C119b. The SN3500 is also EASA approved under ETSO C113. The SN3500 employs a patented active matrix liquid crystal (AMLCD) projection display. It is designed to combine the functions of:

- Basic Horizontal Situation Indicator (HSI)
- Long-Range Navigation (GPS or FMS) Map Display
- WX-500 Stormscope® Display
- DME Readout
- Marker Beacon Indicator
- NAV Converter
- Autopilot Switching
- GPS Annunciators and External Mode Switches
- Optional Traffic Display
- Optional FIS-B Data Link weather display (software version 3.00 and later)
- Optional Class B Night Vision (NVIS) Compatible (Software 3.04 and later)
- Optional Reversionary Attitude Display (Software 4.00 and later)
- Optional TACAN Display (Prior to 20 January, 2015 ITAR Export Controlled)
- Optional Roll Steering Command output to Autopilot (Software 4.04 and later)

Outputs of heading and course datum and bootstrap heading output are provided, as well as L/R and U/D deviation output and flags. The versatile digital and analog interface properties of the unit provide for compatibility with most VHF navigation receivers, ADF's, TACAN's, DME's, GPS's, remote gyros and flux gates.

The SN3500 is designed to display the flight plan data from a connected GPS receiver. The moving map database for the SN3500 as well as the internal operating system software are field loadable through the use of a portable computer equipped with a USB port and a USB capable version of Microsoft Windows.

Although simple, retrofit replacement of most existing three-inch PNI's or HSI's is possible without additional features, we strongly encourage complete installation of the unit with all compatible peripheral equipment interconnected to maximize its functional capability.

## **1.3 Installation Planning**

Sandel Avionics has taken many equipment interface possibilities into consideration during the design of the SN3500 to ensure maximum interoperability with other avionics. Contact the factory with any questions about interfacing to specific avionics equipment not covered in the installation drawings.

To simplify installation and installation planning, signals are wired to the SN3500 pins per the installation diagrams and software setups are used in a post-installation procedure to assign protocols/gradients to each pin based on the equipment connected. There are separate maintenance menu pages for each equipment function and in most cases the selections are made by equipment make/model.

#### **1.3.1 Installation Planning Cycle**

- 1) Compile an equipment list for the aircraft.
- 2) Study the feature list below, and determine the desired functional characteristics for the installation.
- 3) Study the installation drawings to determine a basic interconnect scheme and check for conflicts.
- 4) Develop the specific wiring diagrams unique to the aircraft.
- 5) Assemble required tools. Recommended crimp tools are given in the following table.

| Recommended Crimp Tools |                       |  |             |                               |                               |  |
|-------------------------|-----------------------|--|-------------|-------------------------------|-------------------------------|--|
|                         |                       | High Density<br>22-28 AWG                |             | Standard Density<br>20-24 AWG |                               |  |
| Manufacturer            | Hand Crimping<br>Tool | Insertion/<br>Positioner Extraction Tool |             | Positioner                    | Insertion/<br>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                  | K41                                      | M81969/1-04 | K13-1                         | M24308/1-02                   |  |
| Astro                   | 615717                | 615725                                   | M81969/1-02 | 615724                        | M81969/1-02                   |  |

#### 1.3.2 Post Installation Summary

- Prior to power-up review correct wiring by using standard ohmmeter and voltage checks. Insure the correct orientation and positioning of the three SN3500 'D' connectors. The connector numbers are printed on the back of the SN3500 for reference.
- 2) Review special items such as connection of the NAV receiver resolver wiring.
- 3) Apply power to the SN3500, bring up in maintenance mode and sequentially access each SN3500 maintenance page to correctly select the installed equipment.
- 4) Perform Ground Test procedures
- 5) Perform Flight Test procedures.

# 1.4 Interface Planning

#### 1.4.1 Compass System

Determine whether the SN3500 is to be used internally slaved or unslaved. Unslaved operation would be appropriate when the SN3500 is bootstrapped to an already slaved compass system or is being slaved to a panel mounted DG with bootstrap output.

Plan for:

 High Resolution Digital Output from a Mid-Continent 4305 series DG with gyro valid output, flux gate 10 Vac Fluxgate Excitation and Internal 26Vac Inverter (internal slaving)

- Quadrature stepper motor drive input from a Bendix/King KG 102 series DG with compass valid output and flux gate connected directly to SN3500 (internal slaving).
- 3-wire ARINC 407 synchro DG with or without gyro valid output and fluxgate. (internal slaving)
- 3-wire ARINC 407 synchro remote or panel mounted DG self-slaved with or without gyro valid output. (SN3500 unslaved)
- ARINC 429 Heading Input from AHRS. Sandel monitors for Label 320, Magnetic Heading Data and Label 270 System Status (SN3500 unslaved)

Internal slaving requires connection of the flux gate excitation to the SN3500 flux gate reference input P2-24. This input is used only to demodulate the flux gate signals.

DG's with XYZ bootstrap outputs require the master 400Hz inverter to be connected to the SN3500 400Hz reference input on P1-16. This input is used to lock all 400Hz inputs on P1 and 400Hz outputs in the SN3500. This input presents no loading to the source.

Follow the information on the installation drawings, and plan to set up the appropriate compass selections on the compass system maintenance page.

Internal slaving does not require the use of an external slaving accessory. Compass calibration is performed using the SN3500 Compass maintenance page. The SN3500 will provide standby heading operation from the flux gate alone in the event of directional gyro (DG) failure.

The SN3500 has a 3-wire ARINC 407 synchro bootstrap compass output if required which is capable of driving electronic loads.

#### 1.4.2 Autopilot Switching

The SN3500 has low level deviation and flag outputs intended to drive an autopilot. These outputs feed from the pilot selected navigation source. These outputs may eliminate the need for an external autopilot switching relay.

However if an external switching relay is used (for instance for compatibility with an existing installation) the SN3500 has protected Open Drain relay output discretes intended to drive external switching relays. These outputs have 250ma maximum current and pull to within 1 ohm of ground.

NAV1 selection is the default selection and no relay driver output discrete is available. The NAV2, GPS-1, or GPS-2 outputs can be used to operate a switching relay for each source, allowing the pilot to control the NAV source selection from the front panel of the SN3500. This is referred to as "master" mode and it is the preferred mode of installation. In this configuration an additional remote switch/annunciator panel for a GPS receiver is not required.

In the event the aircraft has an existing GPS switch/annunciator panel or it is desired that one be installed, the "GPS SELECTED-" input on the SN3500 is used to remote

sense the selection of the GPS1 and annunciate the selection. This is referred to as "slave" mode. It allows annunciation of the selection on the SN3500 but does not use the front panel NAV switch to select the GPS receiver. This mode is only available for use with a single GPS.

Master/Slave mode selection is done in the NAV maintenance page.

When any relay is used, the SN3500 uses a wraparound RELAY SENSE input, which provides feedback of failure of the switching relay. A pole on the external relay is used to ground an SN3500 input pin when the relay is in the energized position. If the low signal is not detected, the SN3500 annunciates the relay failure by redlining the NAV source display.

#### 1.4.3 Autopilot Course and Heading Datum

Course and heading datum outputs are provided. These can be selected to be AC or DC in the Flight Control System (FCS) maintenance page and depending on whether Datum Excitation is connected. The direction sense of these signals can be reversed as required.

A Back-course discrete output is provided for annunciation or AFCS reverse-course control when required. This operates during LOC operation when the aircraft is flying with the tail of the Course Pointer up.

For older Century autopilots a Datum Excitation (5Khz) input is provided. However, an external transformer coupler must be fabricated. See installation drawings.

#### 1.4.4 GPS Annunciators

For receivers without serial communication capability, discrete annunciator inputs are provided for ARM, ACT, WPT or HLD, MSG, OBS/LEG Mode, and Parallel Track. Connect the pins appropriate to the installed receiver and select the receiver type on the LNAV maintenance page. See GPS/SWITCH/ANNUNCIATORS Installation drawing for the complete matrix of outputs and annunciators.

Discrete control outputs are provided for APPR ARM, OBS Mode (King KLN90) and HOLD (II Morrow). These are open-drain outputs.

The Garmin GNS/GTN receivers use ARINC 429 for the annunciator functions so no discrete connections are used.

#### 1.4.5 VLOC Navigation – Internal NAV Converter

For new installations that do not already have an external NAV converter, the SN3500 supports *internal* demodulation of composite NAV and Localizer to supply the display and autopilot outputs with L/R deviation and course selection. See the appropriate installation drawings.

#### 1.4.6 VLOC Navigation – External NAV Converter

The SN3500 has a single, conventional set of low level analog inputs for deviation, flags, etc. from a primary NAV receiver. See the installation diagram for details. These inputs are not used when the Garmin GNS430/530/GTN6XX/7XX ARINC NAV receiver, which uses ARINC 429 only, is being used. If more than one receiver is used which has analog signaling, this will require switching relays to feed the single set of SN3500 inputs. Deviation only NAV converters not providing bearing information are supported.

There are only low level flag inputs. If it is desired to use a Superflag instead of a lowlevel flag from the NAV receiver, see the installation drawings.

Optional ILS lockout of the GPS selection is provided by an ILS Energize 1/2 input pins. This feature can be disabled on the NAV maintenance page. In the Master mode this will cause the SN3500 to revert to and annunciate NAV1 when an ILS is tuned on NAV1, or NAV2 when an ILS is tuned on NAV2. Disabling of ILS lockout is called for when the customer does not want ILS lockout operation, or when a GPS receiver with vertical guidance is used to drive the ILS Energize pin during GPS operation. In this situation NAV1/GPS1 use ILS Energize 1, and NAV2/GPS 2 use ILS Energize 2 to display vertical guidance.

For analog receivers, two types of resolvers are supported.

a) An electronic OBS resolver with rotor input and SIN/COS outputs is provided. An associated DC reference pin must be connected to the stator low-side connection of the NAV receiver. This may be ground but may also be a DC reference voltage of approximately 4.5vdc. WARNING: You must check the NAV receiver wiring before installation planning and before applying power to the system to prevent NAV receiver damage from inadvertent miswiring. Refer to the Sandel installation drawing.

This resolver will operate from 30Hz to 500Hz and is calibrated in the NAV maintenance page.

b) An electronic 400Hz differential resolver is provided for use with 400Hz receivers such as Collins VIR-30A. This interconnect uses SIN/COS inputs (Z-ground referenced) and SIN/COS outputs (Z-ground referenced).

#### 1.4.7 Marker Beacon

Three inputs are provided for a Marker Beacon repeater. These are DC levelsensitive inputs. The thresholds and logic levels are adjusted by selection of the appropriate equipment type on the MKR maintenance page. Lamp load resistors are internal.

The SN3500 can also monitor label 222 when marker beacon data is provided from an ARINC 429 source.

#### 1.4.8 Bearing Pointers (VOR, ADF, and TACAN)

The bearing pointers can derive their information from any of the connected navigation receivers, including two composite NAV inputs, ADF's, TACAN's, and the long range navigation receivers through the serial ports.

ADF's can be connected as ARINC 407 synchro or DC SIN/COS inputs. See the installation drawings for interconnection data and select the appropriate format from the ADF maintenance page.

The composite NAV inputs accept standard 0.5v ARINC inputs. For 3v inputs a series resistor is required, please see the appropriate installation drawing. Selection of 0/180 phase is made by the appropriate maintenance page calibration.

#### 1.4.9 ARINC Channels

The SN3500 contains universal inputs capable of communicating with ARINC 429, ARINC 419, RS232 and Analog. All equipment capable of ARINC compatibility (such as GPS/FMS, Navigation, Traffic, etc) can be directly connected to the appropriate signal input. There are a total of 17 compatible ARINC inputs.

#### 1.4.10 DME Interface

DME inputs support ARINC 429, ARINC 568, King serial, or analog (40mV/mile) inputs. Analog DME is supported only in software versions 2.01 or higher.

#### 1.4.11 Special Considerations for GARMIN GNS430/530/GTN6XX/7XX

| Required SN3500 Setup Items |  |  |  |
|-----------------------------|--|--|--|
| Maintenance<br>Page Items   | Study the Sandel Maintenance Page Items on the appropriate GNS430 installation drawings, and set as indicated. |  |  |
| Relay Mode                  | MASTER   |  |  |
| ILS Lockout                 | OFF  |  |  |

| Required GARMIN GNS430 Setup Items, Receiver 1 |           |                          |                      |  |  |
|--|-----------|--------------------------|----------------------|--|--|
| Software                                       |           | Main 1.00 or later       |                      |  |  |
| Main ARINC 429                                 | IN 1:     | Low, Sandel SN3500       |                      |  |  |
| Configuration                                  | OUT:      | Low, GAMA 429 Grph w/Int | Note: NOT ARINC 429! |  |  |
|  | SDI:      | LNAV1                    | SDI1                 |  |  |
| VOR/LOC/GS                                     | Speed RX: | Low                      |                      |  |  |
| ARINC 429<br>Configuration                     | Speed TX: | Low                      |                      |  |  |
|  | SDI:      | VOR/ILS 1                | SDI1                 |  |  |

| Required GARMIN GNS430 Setup Items, Receiver 2 |           |                          |                      |  |
|--|-----------|--------------------------|----------------------|--|
| Software Main 1.00 or later                    |           |                          |                      |  |
| Main ARINC 429                                 | IN 1:     | Low, Sandel SN3500       |                      |  |
| Configuration                                  | OUT:      | Low, GAMA 429 Grph w/Int | Note: NOT ARINC 429! |  |
|  | SDI:      | LNAV2                    | SDI2                 |  |
| VOR/LOC/GS                                     | Speed RX: | Low                      |                      |  |
| ARINC 429<br>Configuration                     | Speed TX: | Low                      |                      |  |
|  | SDI:      | VOR/ILS 2                | SDI2                 |  |

| Required Garmin GTN 6xx/7xx Setup Items, Receiver 1 |   |      |  |  |  |
|---|---|------|--|--|--|
| Software  | Main 5.0 or later                                   |      |  |  |  |
| Main ARINC 429                                      | IN 1: EFIS Format 4                                 |      |  |  |  |
| Configuration                                       | OUT: GAMA Format 3                                  |      |  |  |  |
|   | SDI LNAV1   | SDI1 |  |  |  |
| VOR/LOC/GS<br>ARINC 429                             | Speed RX: Low or High as needed                     |      |  |  |  |
| Configuration                                       | Speed TX: Low or High as needed                     |      |  |  |  |
|   | SDI: VOR/ILS1                                       | SDI1 |  |  |  |
| Required Garmi                                      | Required Garmin GTN 6xx/7xx Setup Items, Receiver 2 |      |  |  |  |
| Software  | Main 5.0 or later                                   |      |  |  |  |
| Main ADING 420                                      | IN 1: EFIS Format 4                                 |      |  |  |  |
| Configuration                                       | OUT: GAMA Format 3                                  |      |  |  |  |
|   | SDI LNAV1   | SDI2 |  |  |  |
| VOR/LOC/GS<br>ARINC 429                             | Speed RX: Low or High as needed                     |      |  |  |  |
| Configuration                                       | Configuration Speed TX: Low or High as needed       |      |  |  |  |
|   | SDI: VOR/ILS2                                       | SDI2 |  |  |  |

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#### 1.4.12 Special Considerations for UPS GXXX

| Configuration Notes:  |   |  |
|---|---|--|
| GX Series Notes: In Setup, enable Extended MovMap Data Format |   |  |
| SN3500 Unit:  | Set LNAV selection to IIMorrow GX (RS-232 ENH)<br>Vertical deviation (if desired) requires the ILS ENG input pin pulled low.  |  |
| Testing   | The GX unit will not output RS-232 data in manual test mode<br>Upon power on, the GX will go through IFR Output Test Mode and the<br>following test can be observed:<br>CDI & Flags<br>VDI & Flags (if enabled on Sandel)<br>Annunciators |  |

#### 1.4.13 Brightness Control

Brightness control is internal through a pilot's menu or external through a remote dimming control. Configuration is on the BRT/DATA BLK maintenance page.

External brightness control is referenced to the 14V or 28V DC aircraft power input. A broken connection between the dimmer bus and the SN3500 will result in reverting to internal brightness control.

See the SN3500 Pilot's Guide for a complete description of the operation of the display and button brightness control.

#### 1.4.14 Traffic Option

The SN3500 supports Traffic input via single ARINC 429 High Speed Input on software version 2.01 and above. Purchase of a key code to enable the Traffic display is required.

Some remote traffic processors may require remote switches, see the Traffic interface drawings in this manual for these requirements.

When interfaced to a TCAS II remote processor, the SN3500 can only be used as a secondary display as it will not display vertical guidance for the purpose of resolution advisories.

#### 1.4.15 Data Link Weather Option

The SN3500 supports Flight Information Services-Broadcast (FIS-B) data link weather (precipitation and lightening), input via a single RS-232 Input from a WSI Data Link receiver in software version 3.00 and above. Purchase of a key code to enable the weather display is required. See the WSI Data Link Receiver interface drawings in this manual for interface wiring requirements.

The SN3500 can be configured to operate as the sole weather display or a listener when another display is installed and configured to command the WSI receiver.

When the SN3500 is the sole display, the WSI receiver RS-232 interface must be configured as "NO FLOW CONTROL", see the WSI receiver manual for details regarding receiver configuration.

#### 1.4.16 TACAN Option

The SN3500 supports TACAN input via ARINC 419, ARINC 429, and Arinc 407 Synchro (XYZ). A TACAN key code is not required for maintenance page setup however, purchase of a key code to enable the TACAN display is required. When configured, TCN will not appear as a NAV source selection or on the bearing pointer source list if the TACAN key is not valid. See the TACAN interface drawings in this manual for interface wiring requirements.

#### 1.4.17 Night Vision Support Option

For NVIS capable units NVIS mode is enabled by a closure to ground through an external toggle switch or maintained pushbutton switch. NVIS mode is annunciated onscreen so an external annunciator is not required.

The input will always pull up to the de-activated state when disconnected .

#### 1.4.18 Reversionary Attitude Option

The SN3500 supports a Reversionary Attitude Display when interfaced to a Attitude Heading Reference System supplying Roll, Pitch, Heading, and lateral acceleration data via Arinc 429. An optional key code is required to enable this feature. See the Reversionary Control interface drawing in this manual for interface wiring requirements. This option is not available when the SN4500 is interfaced to an analog DME.

#### 1.4.19 Roll Steering Option

An optional Roll Steering option has been added with software version 4.04 or later which adds the capability for the GPS navigator to precisely fly a GPS flight plan including high angle course intercepts and holding patterns. The GPS must support sending Arinc 429 label 121. There are no additional installation considerations to the autopilot other than previously mentioned. An optional key code is required to enable this feature.

#### 1.5 Disclaimer

Sandel Avionics does not assume any risk for nor accept any responsibility for the interface descriptions contained within this Installation Manual. It is the responsibility of the installer to ensure that such equipment is compatible with the SN3500 as described, and to ensure that the installation of the SN3500 is accomplished with such equipment using the specific equipment manufacturer's installation and technical instructions. No other representations are expressed herein.

### 2 Technical Information

#### 2.1 General

The SN3500 is enclosed in an ARINC 408, 3ATI form factor enclosure and is mounted to an instrument panel using a standard ATI clamp. A black or grey bezel is provided.

The SN3500 operates on an input voltage from 22 to 33 Volts DC (11 to 33 volts DC on units with serial number 5-2500 or higher), nominal 35 watts. One or two 26 Volts AC, 400 Hertz reference excitation inputs with a current requirement of less than 1 milliampere is required when the functions of AC synchro inputs or outputs are required for use with peripheral equipment. This reference excitation signals must be obtained from the aircraft inverter source. A third inverter input ('Datum Excitation' is available specifically used in situations where the autopilot uses an additional inverter or the autopilot inverter frequency is higher than 400Hz.

The following section describes the technical characteristics that 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 SN3500 installation components, other equipment and installation requirements. A review of the installation approval procedures is provided for filing with authorities.

# 2.2 Part Numbers

The part number for the standard Sandel SN3500 is:



The part number for the Sandel SN3500 with NVIS support is:



The current version of software is displayed on the power-up screen.

| Part Number | Description                         |  |  |
|-------------|-------------------------------------|--|--|
| SN3500-000  | Black, Military, High Vibration     |  |  |
| SN3500-001  | Gray, Military, High Vibration      |  |  |
| SN3500-002  | Black                               |  |  |
| SN3500-003  | Gray                                |  |  |
| SN3500-004  | Black, High Vibration               |  |  |
| SN3500-005  | Gray, High Vibration                |  |  |
| SN3500-010N | Black, High Vibration NVIS, Class B |  |  |
| SN3500-011N | Gray, High Vibration NVIS, Class B  |  |  |

#### 2.2.1 Installation Kit and Accessories

| SPN      | Description                                  |  |  |
|----------|--|--|--|
| 90143-IK | SN3500 installation kit                      |  |  |
| 90124    | Bezel Adapter Kit KI-525 Flush (Used to fill |  |  |
|          | non-standard sized hole in installations     |  |  |
|          | replacing a KI-525 indicator.)               |  |  |

#### 2.2.2 Bill of Materials - SN3500 Install Kit

| SPN      | Description  |   |
|----------|--|---|
| 32062    | Conn., D- 15 with pins (Positronics P/N SD15F10JVLO) | 1 |
| 32063    | Conn., D-44 with pins (Positronics P/N DD44F10JVLO)  | 2 |
| 60144    | Shim Flush Mounting                                  |   |
| 61062    | 3ATI Mounting Clamp                                  | 1 |
| 82005-IM | Installation Manual, SN3500                          | 1 |

# 2.3 Approval Summary

#### 2.3.1 License Requirements

None.

#### 2.3.2 Approval Data

| Technical Standard Order: | TSO-C113, "Airborne Multipurpose Electronic Displays" |
|---------------------------|---|
|                           | TSO-C3d, "Turn and Slip Instrument"                   |
|                           | TSO-C4c, "Bank and Pitch Instruments"                 |
|                           |   |

TSO-C6d, "Direction Instrument, Magnetic (Gyroscopically Stabilized)

TSO-C34e, "ILS Glide Slope Receiving Equipment Operating Within The Radio Frequency Range of 328.6-335.4 Megahertz"

TSO-C35d, "Airborne Radio Marker Receiving Equipment"

TSO-C36e, "Airborne ILS Localizer Receiving Equipment Operating Within The Radio Frequency Range of 108-112 Megahertz"

TSO-C40c, "VOR Receiving Equipment Operating within the Radio Frequency Range of 108-117.95 Megahertz (MHz)"

TSO-C41d, "Airborne Automatic Direction Finding (ADF) equipment"

TSO-C118, "Traffic Alert and Collision Avoidance System (TCAS) Airborne Equipment, TCAS I"

TSO-C119b, "Traffic Alert and Collision Avoidance system (TCAS) Airborne equipment, TCAS II"

| Software Certification:   | RTCA/DO-178, Level C |
|---------------------------|----------------------|
| Environmental Categories: | RTCA/DO-160D/E       |

#### 2.3.3 Technical Standard Order Stipulation

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. It is the responsibility of those installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standard. TSO articles must have separate approval for installation in an aircraft. The article may be installed only if performed under 14 CFR part 43 or the applicable airworthiness requirements.

#### 2.3.4 Installation and Operational Approval Procedures

For the purpose of seeking installation approval, declarations should be made in the "Description of Work Accomplished" section of a Federal Aviation Administration (FAA) Form 337 or other field approval, or other limited supplemented type certification form. A sample Form 337 is included in the Appendix. The basis of approval is for use as a <u>primary navigation display</u> for the functions of basic directional and navigational information. Moving map operations of the SN3500 is to be approved as <u>supplemental means</u> for VFR or IFR navigation, consistent with the approval of the long-range navigation system. See appropriate FAA Advisory Circular (AC) or other guidance on Loran-C, GPS, FMS, or INS for approval methods of such equipment. Applicable Federal Aviation Regulations (FAR) must be adhered to.

Flight Standards Information Bulletin, FSAW 95-09()(Amended), titled: "Electronic Horizontal Situation Indicator (EHSI) Approvals" was originally published for the purpose of assisting Aviation Safety Inspectors with approval authority and methods for conducting a field approval for electronic HSI's. This FSIB describes the qualification of displays intended for use as essential, not critical, to preclude the need to conducting additional testing to substantiate immunity to high intensity radiated fields (HIRF) requirements.

The Environmental Qualification Form for the SN3500 is included in the Appendix, and should be referenced to the categories appropriate to the aircraft type and environment into which the SN3500 is to be installed. The environmental category for the SN3500 should be stipulated on the FAA Form 337, or other approval form.

A "Functional Ground Test Procedures/Report" and an "Operational Flight Check Procedures/Report" is also included in the appendix, and should be used as a basis for validating the SN3500 equipment configuration and for verifying proper installation and functional performance. A copy of this form <u>should</u> be submitted along with the FAA Form 337, or other approval or certification form. A permanent copy <u>must</u> be filed and maintained by the installing agency. Another copy <u>must</u> 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, Part Number 10129, to be filed after completion and installation acceptance. If any difficulty is experienced with the functionality or operational performance of the SN3500, contact Sandel Avionics for assistance.

# 2.4 Physical, and Electrical Properties

#### 2.4.1 Physical Dimensions

| Form Factor:          | 3ATI (ARINC 408)                                     |
|-----------------------|--|
| Width:                | 3.175 in. (8.04 cm.)                                 |
| Height:               | 3.175 in. (8.04 cm.)                                 |
| Length:               | 10.17 in. (25.83 cm.) overall flush to bezel;        |
|                       | 9.82 in (24.94 cm) measured from rear of bezel.      |
| Weight:               | 2.88lbs (1.31 Kg.) LED models / (3.0 lbs. (1.36 Kg.) |
|                       | Lamp models  |
| CG:                   | 5.1" from rear of bezel.                             |
| ATI Clamp:            | Sandel Avionics P/N 61062                            |
| Cooling Requirements: | Internal fan requiring ambient air at fan input.     |

#### 2.4.2 Summary Operational Characteristics

| -20° C to +70° C - up to 55,000 feet                    |
|---|
| 22 to 33 Vdc (40 watts maximum at startup for Lamp      |
| units / 33 watts maximum at startup for LED units)      |
| 11 to 33 volts DC on units with serial number 5-2500 or |
| higher.   |
| 27.5 Vdc @ 1.4A nominal (38.5 watts) Lamp Units         |
| 27.5 Vdc @ 1.2A nominal (33 watts) LED Units            |
| 14.0 Vdc @ 2.4A nominal (33 watts) LED Units            |
|   |

#### 2.5 Connector Summary

The SN3500 was designed to interface and operate with several generations of avionics equipment. It is compatible with DC analog and/or ARINC standard synchro and serial digital signals, as well as industry standard and adopted AC and DC sine, cosine, and discrete input and output voltages. The SN3500 design and operation is optimized for efficient adaptability to both new and existing avionics equipment and systems.

The lists on the following pages reflect the configurable input and output signal types for various equipment types. See "SETUP PROCEDURES" on page 4-1 for more information on maintenance setup pages.

# IMPORTANT: Connectors P1 and P2 are not interchangeable. Damage to the SN3500 may result if the connectors are reversed.

| Pin # |    | Ł  | Name              | Signal Type (dependent on maintenance page selection)     |  | Signal Type (dependent on maintenance page selection) |  |
|-------|----|----|-------------------|---|--|---|--|
|       | 16 |    | Inverter Exc.     | In<br>Inverter  | Note: May be same or different than P2-16 inverter source.<br>26Vac Excitation for items on connector P1 |   |  |
| 1     |    |    | Shield Gnd        |   |  |   |  |
|       |    | 31 | TCAS 1A           | In<br>A429<br>(RS422)<br>(RS232)                          | A side 429<br>+ side 422<br>Ground side  |   |  |
|       | 17 |    | TCAS 1B           | In<br>A429<br>(RS422)<br>(RS232)                          | B side 429<br>- side 422<br>Rx   |   |  |
| 2     |    |    | Data link 1A      | In<br><i>A4</i> 29  | A side 429   |   |  |
|       |    | 32 | Data link 1B      | In<br><i>A4</i> 29  | B side (429)   |   |  |
|       | 18 |    | N/C               |   |  |   |  |
| 3     |    |    | Hdg1A             | In<br><i>A429</i><br><i>A407</i><br>Stepper A             | A side 429<br>Synchro X [Z grounded]<br>Bendix/King stepper Phase A                                      |   |  |
|       |    | 33 | Hdg1B             | In<br><i>A429</i><br><i>A407</i><br>Stepper C             | B side 429<br>Synchro Y [Z grounded]<br>Bendix/King stepper phase C                                      |   |  |
|       | 19 |    | Hdg1 Valid        | In<br>Discrete Valid                                      | Hdg Analog, Note: Not used when 429 is data source.  |   |  |
| 4     |    |    | ADF1A<br>TACAN 2A | In<br><i>A429</i><br>A419<br><i>DC Sin</i><br><i>A407</i> | A side 429<br>A side 419 (TACAN only)<br>DC Sine (ADF Only)<br>Synchro X [Z grounded]                    |   |  |
|       |    | 34 | ADF1B<br>TACAN 2B | In<br>A429<br>A419<br>DC Cos<br>A407                      | B side 429<br>B side 419 (TACAN only)<br>DC Cosine (ADF Only)<br>Synchro Y [Z grounded]                  |   |  |
|       | 20 |    | ADF1 DC Ref       | In<br><i>ADF Ref</i>                                      | ADF DC, Note: Not used when 429 or XYZ is data source.   |   |  |
| 5     |    |    | ADF1 Valid        | In<br>Discrete Valid                                      | ADF Discrete, Note: Not used when 429 is data source   |   |  |
|       |    | 35 | WX500 1A          | In<br>A429<br>(RS422)<br>(RS232)                          | A side 429<br>+ side 422<br>Ground side  |   |  |
|       | 21 |    | WX500 1B          | In<br>A429<br>(RS422)<br>(RS232)                          | B side 429<br>- side 422<br>Rx   |   |  |

| Pin # |    |    | Name                              | Signal Type (dependent on maintenance page selection) |   |
|-------|----|----|-----------------------------------|---|---|
| 6     |    |    | GS1 LL Flag In+                   | In<br><i>Flag</i>                                     | Differential pair to pin 36<br>Note: For use with external SUPERFLAG see installation<br>drawing for resistor required. |
|       |    | 36 | GS1 LL Flag In-                   | ln<br><i>Flag</i>                                     | Differential pair to pin 6.   |
|       | 22 |    | GS1 LL Dev In<br>+FLY DOWN        | In  | Differential pair to pin 7.<br>Polarity: + indicates above glideslope, fly-down indication                              |
| 7     |    |    | GS1 LL Dev In<br>+FLY UP          | In  | Differential pair to pin 22.<br>Polarity: + indicates below glideslope, fly-up indication.                              |
|       |    | 37 | LAT1 LL Flag In+                  | In<br><i>Flag</i>                                     | Differential pair to pin 23<br>Note: For use with external SUPERFLAG see installation<br>drawing for resistor required. |
|       | 23 |    | LAT1 LL Flag In-                  | In<br><i>Flag</i>                                     | Differential pair to pin 37.  |
| 8     |    |    | LAT1 LL Dev In<br>+FLY RIGHT      | In  | Differential pair to pin 8.<br>Polarity: + indicates left of course, fly-right indication                               |
|       |    | 38 | LAT1 LL Dev In<br>+FLY LEFT       | In  | Differential pair to pin 38.<br>Polarity: + indicates right of course, fly-left indication.                             |
|       | 24 |    | To/From In+                       | In<br><i>Flag</i>                                     | Differential pair to pin 9  |
| 9     |    |    | To/From In-                       | ln<br><i>Flag</i>                                     | Differential pair to pin 24.  |
|       |    | 39 | DME 2 CLK                         | In<br><i>A568</i>                                     |   |
|       | 25 |    | DME 2 DATA                        | In<br>A568  |   |
| 10    |    |    | DME 2 SYNC                        | In<br><i>A56</i> 8                                    |   |
|       |    | 40 | DME 2 Hold                        | In<br>Discrete Valid                                  |   |
|       | 26 |    | External<br>Brightness<br>Control | (In)<br>(A429)<br>(R422)<br>(R232)<br>(A407)          | n/c<br>A side 429<br>+ side 422<br>Ground side<br>Synchro X   |
| 11    |    |    | Spare 1                           | (In)<br>(A429)<br>(R422)<br>(R232)<br>(A407)          | n/c<br>B side 429<br>- side 422<br>Rx<br>Synchro Y  |

|       | FIC | onne |              | lin previous page)  |
|-------|-----|------|--------------|---|
| Pin # |     |      | Name         | Signal Type (dependent on maintenance page selection)   |
|       |     | 41   | IM           | Marker In   |
|       | 27  |      | ММ           | Marker In   |
| 12    |     |      | ОМ           | Marker In   |
|       |     | 42   | 429 Out A    | Out (Spare for future use)<br>A429 A Side   |
|       | 28  |      | 429 Out B    | Out (Spare for future use)<br>A429 B Side   |
| 13    |     |      | RS232TxD     | (Out<br>(R232)  |
|       |     | 43   | WPT          | In<br>Discrete  |
|       | 29  |      | MSG          | In<br>Discrete  |
| 14    |     |      | ACT          | In<br>Discrete  |
|       |     | 44   | ARM          | In<br>Discrete  |
|       | 30  |      | Audio LL Out | Out<br><i>Audio LL</i> Low Level Audio output, requires external amplifier.<br>(future provision not currently supported) |
| 15    |     |      | OBS/LEG      | In<br>Discrete  |

#### P1 Connector (continued from previous page)

- Note 1: 3 volt composite inputs require the use of a series resistor. See installation drawings.
- For XYZ inputs Z is signal ground P1-1. Note 2:



Outside View (Mating Connector)

# 2.5.2 Connector P2

| Pin # |    |               | Name                         | Signal Type (dependent on maintenance page selection)     |  |
|-------|----|---------------|------------------------------|---|--|
|       | 16 | Inverter Exc. |                              | In<br>Inverter  | Note: May be same or different than P1-16 inverter source.<br>26Vac Excitation for items on connector P2 |
| 1     |    |               | Shield Gnd                   |   |  |
|       |    | 31            | FMS 1A                       | In<br>A429<br>(RS422)<br>(RS232)                          | A side 429<br>+ side 422<br>Ground side  |
|       | 17 |               | FMS 1B                       | In<br>A429<br>(RS422)<br>(RS232)                          | B side 429<br>- side 422<br>Rx   |
| 2     |    |               | FMS 2A                       | In<br><i>A4</i> 29<br><i>(RS232)</i>                      | A side 429<br>Ground Side  |
|       |    | 32            | FMS 2B                       | In<br><i>A429</i><br>(RS2 <i>32)</i>                      | B side 429<br>Rx   |
|       | 18 |               | ILS Energize1<br>Discrete In | In<br>Discrete Valid                                      | Discrete Open/Gnd or Open/+28Vdc   |
| 3     |    |               | NAV1A                        | In<br><i>A429</i><br><i>A407</i><br>A710                  | A side 429<br>Synchro X [Z grounded]<br>Composite Video  |
|       |    | 33            | NAV1B                        | In<br><i>A429</i><br><i>A407</i>                          | B side 429<br>Synchro Y [Z grounded]   |
|       | 19 |               | ILS Energize2<br>Discrete In | In<br>Discrete Valid                                      | Discrete Open/Gnd or Open/+28Vdc   |
| 4     |    |               | ADF 2A<br>TACAN 1A           | In<br><i>A429</i><br>A419<br><i>DC Sin</i><br><i>A407</i> | A side 429<br>A side 419 (TACAN only)<br>DC Sine (ADF only)<br>Synchro X [Z grounded]                    |
|       |    | 34            | ADF 2B<br>TACAN 1B           | In<br>A429<br>A419<br>DC Cos<br>A407                      | B side 429<br>B side 419 (TACAN only)<br>DC Cosine (ADF only)<br>Synchro Y [Z grounded]                  |
|       | 20 |               | ADF 2 DC Ref                 | In<br>ADF Ref   | ADF DC, Note: Not used when 429 or XYZ is data source.   |
| 5     |    |               | ADF 2 Valid                  | In<br>Discrete Valid                                      | ADF Discrete, Note: Not used when 429 is data source   |
|       |    | 35            | NAV2A                        | In<br>( <i>RS422</i> )<br>( <i>RS232</i> )<br>A710        | A429 A side 429<br>+ side 422<br>Ground side<br>Composite Video  |
|       | 21 |               | NAV2B                        | In<br>A429<br>(RS422)<br>(RS232)                          | Note: For composite inputs see P2-42<br>B side 429<br>- side 422<br>Rx                                   |

#### P2 Connector (continued from previous page)

| Pin # |    |    | Name                        | Signal Type (dependent on maintenance page selection) |   |  |
|-------|----|----|-----------------------------|---|---|--|
| 6     |    |    | DME 1 DATA                  | In<br><i>A568</i><br>Analog                           | DC+   |  |
|       |    | 36 | DME 1 CLK                   | In<br><i>A568</i><br>Analog                           | DC-   |  |
|       | 22 |    | DME 1 SYNC                  | In<br><i>A568</i>                                     |   |  |
| 7     |    |    | DME 1 Hold                  | In<br>Discrete Valid                                  |   |  |
|       |    | 37 | OBS Resolver<br>DC Ref      | In<br><i>Resolver DC</i>                              |   |  |
|       | 23 |    | OBS Resolver H              | ln<br>Resolver H                                      |   |  |
| 8     |    |    | OBS Resolver<br>X/Sin out   | Out<br>Resolver Out                                   |   |  |
|       |    | 38 | OBS Resolver<br>Y/Cos out   | Out<br>Resolver Out                                   |   |  |
|       | 24 |    | Fluxgate<br>Excitation      | In<br>Fluxgate Excitat                                | ion   |  |
| 9     |    |    | Fluxgate X                  | In  |   |  |
|       |    | 39 | Fluxgate Y                  | In  |   |  |
|       | 25 |    | Fluxgate Z (Gnd)            | In  |   |  |
| 10    |    |    | Hdg Crs/Datum<br>Excitation | In  | 3 <sup>rd</sup> inverter input used specifically if autopilot inverter is not inverter connected to P1-16 or is not 400Hz |  |
|       |    | 40 | Course Datum                | Out   | Locked to P1-16 or P2-10  |  |
|       | 26 |    | Hdg Datum                   | Out   | Locked to P1-16 or P2-10  |  |
| 11    |    |    | Hdg X Out                   | Out   | Bootstrap, locked to inverter on <u>P1</u>  |  |

| F2 CC | P2 Connector (continued noin previous page) |    |                           |   |  |  |
|-------|---|----|---------------------------|---|--|--|
| Pin # |   |    | Name                      | Signal Type (dependent on maintenance page selection) |  |  |
|       |   | 41 | Hdg Y Out                 | Out   | Bootstrap, locked to inverter on <u>P1</u> |  |
|       | 27  |    | FCS ILS<br>Energize Out   | Out   | Active Low                                 |  |
| 12    |   |    | FCS Lat Flag+             | Out   | LL Out (gnd ref)                           |  |
|       |   | 42 | FCS Vert Flag+            | Out   | LL Out (gnd ref)                           |  |
|       | 28  |    | FCS Lat Dev<br>+RIGHT     | Out   | LL Out (gnd ref)                           |  |
| 13    |   |    | FCS Vert Dev<br>+UP       | Out   | LL Out (gnd ref)                           |  |
|       |   | 43 | FCS Lat<br>Superflag Out  | Out   | Superflag Out                              |  |
|       | 29  |    | FCS Vert<br>Superflag Out | Out   | Superflag Out                              |  |
| 14    |   |    | RS232-2 Out               | Out   | RS232                                      |  |
|       |   | 44 | Spare                     |   |  |  |
|       | 30  |    | 429-2A                    | Out<br><i>A429</i>                                    | A side 429                                 |  |
| 15    |   |    | 429-2B                    | Out<br><i>A429</i>                                    | B side 429                                 |  |

#### P2 Connector (continued from previous page)

Note 1: For XYZ inputs Z is signal ground P1-1. For XYZ Outputs Z is power ground.



Outside View (Mating Connector)

# 2.5.3 Connector P3

| Pin # |    | Name                                  | Signal Type (de             | pendent on maintenance page selection) |
|-------|----|---------------------------------------|-----------------------------|--|
| 1     |    | Aircraft Pwr                          | In<br>Power                 | +22 to +33Vdc                          |
|       | 9  | Aircraft Pwr                          | In<br><i>Power</i>          |  |
| 2     |    | GPS OBS/HOLD<br>or<br>TACAN Relay Out | (Out)<br>(Open Drain)       |  |
|       | 10 | GPS APPR ARM<br>or<br>TACAN Relay Out | (Out)<br>(Open Drain)       |  |
| 3     |    | Aircraft Ground                       | In                          | System Ground                          |
|       | 11 | Aircraft Ground                       | In                          | System Ground                          |
| 4     |    | GPS1 Relay<br>Sense / Selected        | In<br>Discrete Valid        |  |
|       | 12 | GPS2 Relay<br>Sense                   | In<br><i>Discrete Valid</i> |  |
| 5     |    | NAV2 Relay<br>Sense                   | In<br><i>Discrete Valid</i> |  |
|       | 13 | NVIS Ctrl<br>or<br>REV Control        | In – Active Low<br>Discrete |  |
| 6     |    | Analog DME Valid<br>or<br>REV Control | In<br>Discrete Valid        |  |
|       | 14 | FCS BACK<br>COURSE                    | Out<br>(Open Drain)         |  |
| 7     |    | GPS1 Relay                            | Out<br>Open Drain           |  |
|       | 15 | GPS2 Relay                            | Out<br>Open Drain           |  |
| 8     |    | NAV2 Relay                            | Out<br>Open Drain           |  |

 $\begin{smallmatrix} 8 & 7 & 6 & 5 & 4 & 3 & 2 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 15 & 14 & 13 & 12 & 11 & 10 & 9 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \end{smallmatrix}$ 

Outside View (Mating Connector)

| Inputs                |                                 |                         |                         |
|-----------------------|---------------------------------|-------------------------|-------------------------|
| Signal Type           | Nom Range                       | Absolute Max            | Z (Ω – Power Off)       |
| A429                  | +/- 5Vdc                        | 100Vdc                  | >100K                   |
| A568                  | 0 / +10Vdc                      | 100Vdc                  | >100K                   |
| RS232                 | +/- 10Vdc                       | 100Vdc                  | >100K                   |
| RS422                 | +/- 5Vdc                        | 100Vdc                  | >100K                   |
| A710 (ILS)            | .5Vac rms +/- 20%               | 70Vac                   | >100K                   |
| A711 (VOR)            | .5Vac rms +/- 20%               | 70Vac                   | >100K                   |
| A407                  | 0 to 11.8Vac                    | 70Vac                   | >100K                   |
| DC SIN/COS            | +/- 20Vdc                       | 100Vdc                  | >100K                   |
| A407 (AC Synchro)     | 11.8Vac rms +/- 20%             | 100Vdc                  | >100K                   |
| ADF_REF               | 10Vdc +/- 50%                   | 60Vdc                   | >100K                   |
| Alt DC Coarse         | 0 to 15Vdc                      | 100Vdc                  | >100K                   |
| Analog DME            | 0 to 8Vdc                       | 75Vdc <sup>Note 5</sup> | 180K                    |
| Discrete Valid (High) | >14.0Vdc <sup>Note 4</sup>      | 60Vdc                   | >500K                   |
| Discrete Valid (Low)  | <3.5Vdc Note 4                  | 40Vdc                   | >500K                   |
| Discrete (High)       | >1.2Vdc                         | 32Vdc                   | 50K                     |
| Discrete (Low)        | <8Vdc                           | 32Vdc                   | 50K                     |
| GS                    | +/- 225mv FS                    | 60Vdc                   | >300K <sup>Note 2</sup> |
| GS Flag               | Unflagged > 225mv               | 60Vdc                   | >300K <sup>Note 2</sup> |
| Inverter              | 26Vac rms                       | 200Vac                  | >50K                    |
| Power                 | +22 to +33Vdc <sup>Note 1</sup> | 7Adc                    | NA                      |

# 2.5.4 Signal Characteristics Table

| Outputs     |  |              |                   |
|-------------|--|--------------|-------------------|
| Signal Type | Nom Range  | Absolute Max | Z (Ω – Power Off) |
| A429        | +/- 5Vdc   | 70mAdc       | 2K (Minimum)      |
| RS232       | +/- 5Vdc   | 70mAdc       | 500 (Minimum)     |
| A575        | 3.54 mA +/-1%  | 25mA         | 500               |
| Open Drain  | $1\Omega$ or High Impedance (over current protected) | 250mAdc      | >350K             |

Notes:

- 1. At +28Vdc, nominal current is 1.4Adc for lamp equipped units and 1.2Adc for LED equipped units, 1 minute after start up.
- 2. Power On Load = 60.4K. For Glideslope 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" 0v/27.5 volt 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. Value is for maximum non-sustained input voltage, maximum sustained voltage is 10.8vdc.

# 2.6 ARINC 429

#### 2.6.1 ARINC 419/429 Serial Data Receivers Interfaces

The ARINC 419/429 serial data bus interface provides an information link between the SN3500 and peripheral avionics equipment. The bus conforms to 419/429 specifications for electrical characteristics, receiving, and transmission interval.

The SN3500 is capable of receiving the following ARINC 419/429 long-range NAV, ADF, TCAS, or DME inputs for processing and display as follows:

| LABEL | DESCRIPTION                                    |  |  |  |
|-------|--|--|--|--|
|       | ADF  |  |  |  |
| 162   | ADF Bearing                                    |  |  |  |
|       | Gyro/ AHRS                                     |  |  |  |
| 155   | Maintenance Words (Sandel SG102 Only)          |  |  |  |
| 270   | AHRS Status Information (when available)       |  |  |  |
| 320   | Magnetic Heading                               |  |  |  |
| 324   | Pitch  |  |  |  |
| 325   | Roll   |  |  |  |
| 332   | Lateral Acceleration                           |  |  |  |
| 350   | Maintenance Words (Sandel SG102 Only)          |  |  |  |
| 351   | Maintenance Words (Sandel SG102 Only)          |  |  |  |
| 352   | Maintenance Words (Sandel SG102 Only)          |  |  |  |
| 353   | Maintenance Words (Sandel SG102 Only)          |  |  |  |
| 354   | Maintenance Words (Sandel SG102 Only)          |  |  |  |
|       | TCAS   |  |  |  |
| 013   | Control Word for TCAS/Mode S                   |  |  |  |
| 015   | Altitude Select Limits for TCAS / Mode S       |  |  |  |
| 016   | Control Word for TCAS/Mode S                   |  |  |  |
| 130   | Intruder Range                                 |  |  |  |
| 131   | Intruder Altitude                              |  |  |  |
| 132   | Intruder Bearing                               |  |  |  |
| 203   | Altitude (1013.25 mB)                          |  |  |  |
| 204   | Baro Corrected Altitude                        |  |  |  |
| 320   | Magnetic Heading                               |  |  |  |
| 371   | General Aviation Equipment Identifier          |  |  |  |
| 377   | Equipment Identification                       |  |  |  |
| 357   | Request To Send (RTS) / End Transmission (ETX) |  |  |  |
|       | NAV  |  |  |  |
| 034   | VOR/ILS Frequency                              |  |  |  |
| 173   | Localizer Deviation                            |  |  |  |
| 174   | Glideslope Deviation                           |  |  |  |
| 222   | VOR Omnibearing                                |  |  |  |
| 371   | General Aviation Equipment Identifier          |  |  |  |
| 004   | TACAN  |  |  |  |
| 201   | TACAN Distance                                 |  |  |  |
| 202   |  |  |  |  |
| 222   |  |  |  |  |
| 246   | TACAN Station ID (Characters 1-2)              |  |  |  |
| 247   | I ACAN Station ID (Characters 3-4)             |  |  |  |
| 362   | 362   TACAN Range Rate                         |  |  |  |

| LABEL | DESCRIPTION                                 |  |  |  |  |
|-------|---|--|--|--|--|
| DME   |   |  |  |  |  |
| 035   | DME Frequency                               |  |  |  |  |
| 202   | DME Distance                                |  |  |  |  |
|       | GPS/FMS                                     |  |  |  |  |
| 076   | GNSSS Altitude                              |  |  |  |  |
| 100   | Selected Course #1                          |  |  |  |  |
| 114   | Desired Track                               |  |  |  |  |
| 115   | Waypoint Bearing                            |  |  |  |  |
| 116   | Cross Track Distance                        |  |  |  |  |
| 117   | Vertical Deviation                          |  |  |  |  |
| 121   | Horizontal Command (Roll Steering Commands) |  |  |  |  |
| 125   | Universal Time Coordinated (UTC)            |  |  |  |  |
| 147   | Magnetic Variation                          |  |  |  |  |
| 150   | Time  |  |  |  |  |
| 251   | Distance To Go                              |  |  |  |  |
| 260   | Date  |  |  |  |  |
| 261   | GPS Discrete Word (GAMA)                    |  |  |  |  |
| 266   | FMC Nav Mode                                |  |  |  |  |
| 275   | Status Word (GAMA)                          |  |  |  |  |
| 310   | Present Position – Latitude                 |  |  |  |  |
| 311   | Present Position – Longitude                |  |  |  |  |
| 312   | Ground Speed                                |  |  |  |  |
| 313   | Track Angle – True                          |  |  |  |  |
| 326   | Lateral Scale-Factor                        |  |  |  |  |
| 327   | Vertical Scale-Factor                       |  |  |  |  |
| 377   | Equipment Identification                    |  |  |  |  |
| 303   | Message Length / Type / Num                 |  |  |  |  |
| 075   | Active Waypoint From / To Data              |  |  |  |  |
| 074   | Flight Plan Header                          |  |  |  |  |
| 275   | Status Word (GAMA)                          |  |  |  |  |
| 113   | Message Checksum                            |  |  |  |  |
| 300   | Station Type, Class                         |  |  |  |  |
| 304   | Message Characters 1-3                      |  |  |  |  |
| 305   | Message Characters 4-6                      |  |  |  |  |
| 306   | Waypoint Latitude                           |  |  |  |  |
| 307   | Waypoint Longitude                          |  |  |  |  |
| 340   | L/R Procedure Turn Azimuth                  |  |  |  |  |
| 335   | L/R Holding Pattern Azimuth                 |  |  |  |  |
| 330   | Arc Inbound Course                          |  |  |  |  |
| 331   | Arc Radius                                  |  |  |  |  |
| 332   | Arc Change Angle                            |  |  |  |  |

# 2.6.2 ARINC 419/429 Serial Transmitter Interfaces

The SN3500 is capable of transmitting the following low or high speed ARINC 429 data:

| LABEL | DESCRIPTION          |
|-------|----------------------|
| 1000  | Selected Course      |
| 1000  | (Using extended SDI) |
| 320   | Magnetic Heading     |
# 3 Installation

# 3.1 General

This section provides general suggestions and information to consider before installing the SN3500 including interconnect diagrams, mounting dimensions and information pertaining to installation. Close adherence to these suggestions will assure optimum performance.

# 3.1.1 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 to be 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.

# 3.2 Installation Considerations

# 3.2.1 General Considerations

The SN3500 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. However, the following considerations should be heeded before installing the SN3500. Close adherence to these considerations will assure a more satisfactory performance from the equipment. The installing agency will supply and fabricate all external cables. The required connectors and associated hardware are supplied by Sandel Avionics.

### 3.2.2 Cooling Considerations

The SN3500 Navigation Display contains its own ventilation fan for internal component cooling and therefore, does not require a forced air cooling system. Any questions concerning cooling can be verified in the post-installation checkout by monitoring the SN3500 Internal temperature on the System maintenance page.

### 3.2.3 Mechanical Installation Considerations

The SN3500 installation should conform to customer requirements and airworthiness standards affecting the location and type of installation. §25.1321(a) stipulates that: "Each flight, navigation, and power plant instrument for use by any pilot must be plainly visible to him from his station with the minimum practicable deviation from his normal position and line of vision when he is looking forward along the flight path."

§ 25.1321(b) stipulates: "The flight instruments required by §25.1303 must be grouped on the instrument panel and centered as nearly as practicable about the vertical plane of the pilot's forward vision." In addition - §25.1321(b)(4) states: "The instrument that most effectively indicates direction of flight must be adjacent to and

directly below the instrument in the top center position." Similar regulations apply to FAR Part 29 Transport Category Rotorcraft and to Part 23 Small Airplanes.

Refer to Sandel Avionics, Drawing No. 82005 titled, "Layout - SN3500 Installation" for specific assembly and mounting instructions.

## 3.2.4 Electrical Installation Considerations

Connections and functions of the SN3500 are described in this section. Refer to the SN3500 Interconnect Wiring Diagrams for detailed wiring information and appropriate notes. Refer to the Functional Pinout Descriptions for explanations of pin functions.

- A. The installing agency will supply and fabricate all wiring harnesses. The length and routing of wires must be carefully measured and planned before the actual installation is attempted. Avoid sharp bends in the harness or locating the harness near aircraft controls. 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() and -2().
- B. The use of MIL-C-27500 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.
- C. When an existing installation of a navigation source selection relay unit is installed to provide mode control switching and annunciation for a GPS or other long-range navigation system, the SN3500 may not perform these functions simultaneously. This does not preclude the SN3500 from annunciating such mode control functions.
- D. In order to ensure optimum performance the SN3500 and associated wiring must be kept at least a minimum of three feet from high noise sources and not routed with cables from high power sources.
- E. Prior to installing the SN3500, a point-to-point continuity check of the wiring harness should be accomplished to verify proper wiring. See FUNCTIONAL GROUND TEST PROCEDURES/REPORT in the appendix for verification of this step and other checks.
- F. The Functional Pinout Descriptions on the following pages will assist you in determining installation requirements. Adhere to all notes within these descriptions and on installation wiring diagrams.
- G. Special caution must be taken to observe 30 Hz OBS resolver connections in order to prevent possible damage to the installed VOR/localizer converter. See Installation Wiring Diagrams and the MAINTENANCE MENU, Configuration Instructions for notes pertaining to these considerations.

- H. **Ground Bonding.** In order to assure installation characteristics match the DO-160 RF and Lightning test conditions, ensure that <u>two</u> ground wires of at least the recommended size are installed in accordance with the installation drawings and these wires are connected to a bonded aircraft ground. Ensure that shielded wiring is used to the Flux Gate (if installed), Gyro Reference, and Gyro XYZ (if installed).
- Power Wiring. To assure that the SN3500 will operate properly down to its rated minimum input voltage of 22Vdc, ensure that <u>two</u> power wires of at least the recommended size are connected from the SN3500 circuit breaker to the SN3500 in accordance with the installation drawings.

# 3.3 Signal Details

The following information is in the same order as the summary pin description list in the prior section.

# 3.3.1 Connector P-1 Pinout Description

# P1-1: Signal Ground Return Input

This common Signal Ground Return is used for P1 analog signal grounds such as the Z lead of synchros, and analog signal shield grounds. See the installation wiring diagrams for details. Do not use this pin to connect digital signal ground return shields or use this for power ground return.

# P1-16: Primary AC Excitation Input for P1 inputs

Connection to this pin is required only if functions of ARINC 407 synchro or 400Hz AC sine and cosine inputs are used on P1. NOTE: This is also the reference for synchro referenced **outputs** on the opposite connector P2. The input requirements are 26Vac nominal 400Hz. Input frequency is 560 Hz. maximum and 240 Hz. minimum. Input impedance is  $220K\Omega$ . 24 AWG shielded wire is recommended for this function.

# P1-31: TCAS 429 A

P1-17: TCAS 429 B

Optional ARINC 429 input for traffic.

# P1-2: Data link A

# P1-32: Data link B

Optional input for FIS-B data link (Software Rev. 3.0 and above).

# P1-3: Hdg X; Hdg 429A; DG Stepper A Input

# P1-33: Hdg Y; Hdg 429B; DG Stepper C Input

Master HDG inputs.

For XYZ type directional gyro, ground the Z leg to signal ground P1-1. This input is referenced to the 26Vac/400Hz reference on P1-16. This function is selected on the Compass maintenance page.

Stepper connections are used exclusively for connections to the Bendix/King KG-102 or Mid-Continent series Directional Gyro when selected in the Compass maintenance page. For slaved operation see fluxgate descriptions. 24 AWG twisted shielded pair wire is recommended for this connection.

# P1-19: Hdg Valid Input

Connect to the (DG) valid output if available. Not used for 429 sources. Selection of the logic level of this pin is in the Compass maintenance page.

# P1-4: ADF-1 AC-X or DC-SIN Input / TACAN 2 429/419 A

P1-34: ADF-1 AC-Y or DC-COS Input / TACAN 2 429419 B

Inputs from ADF-1 Receiver. Selection of AC/DC operation is on the ADF maintenance page. For DC use P1-20 as the DC reference input. For AC inputs Z is grounded. 24 AWG twisted shielded pair wire is recommended for these functions.

## P1-20 ADF-1 DC Ref

Used when DC SIN/COS inputs are used

## P1-5 ADF-1 Valid

Discrete ADF Valid input used if available.

## P1-35: WX500 Ground

## P1-21: WX500 RS232

Connection to WX-500 Stormscope. Use 24AWG twisted pair.

## P1-6: Glideslope +FLAG

## P1-36: Glideslope -FLAG

Low level GS receiver flag inputs. Superflags can be supported with a resistor, see the installation drawings.

## P1-7: Glideslope +UP Deviation Input

# P1-22: Glideslope +DOWN Deviation Input

GS deviation input. Two-dot deflection is  $\pm 150 \text{ m}_{\text{Vdc}}$ . 24 AWG twisted shielded pair wire is recommended for these functions.

# P1-37: VOR-LOC +FLAG

# P1-23: VOR-LOC -FLAG

Used when an external NAV converter or analog output GPS is used. Differential Low level NAV Flag inputs. Superflags are supported with a resistor, see the installation drawings. Flag out of view requires greater than 215 mVdc on +FLAG with respect to -FLAG input. 24 AWG twisted shielded pair wire is recommended for these functions.

# P1-8: VOR-LOC +RIGHT Deviation Input

## P1-38: VOR-LOC +LEFT Deviation Input

Used when an external NAV converter or analog output GPS is used. Analog lateral deviation from the VHF navigation receiver or long-range navigation receiver +LEFT and +RIGHT deviation outputs. Two-dot deflection is  $\pm 150$  mVdc. 24 AWG twisted shielded pair wire is recommended for these functions.

# P1-24: VOR +TO Pointer Input

### P1-9: VOR +FROM Pointer Input

Used when an external NAV converter or analog output GPS is used. Differential input supports VHF NAV or long-range navigation +TO pointer and +FROM pointer outputs. In-view is greater than 40 mVdc (to) and -40mVdc (from). 24 AWG twisted shielded pair wire is recommended functions.

- P1-39: DME 2 CLK/429A
- P1-25: DME 2 Data/429B
- P1-10: DME 2 Sync ARINC 568 Sync or King Clk/Data/Sync (DME REQ) signal input. <u>NOTE:</u> <u>This is DME 2.</u>

## P1-26: External Brightness Control

Broken Wire Detection 0 to 0.5VDC, revert to internal control. Full Dim 1.5VDC Full Bright 14V Aircraft: A/C power minus 2VDC 28V Aircraft: A/Ct power minus 4VDC

## P1-40: DME 2 Hold

Discrete HOLD input signal for on-screen annunciator

P1-41: Inner Marker Beacon Input

# P1-27: Middle Marker Beacon Input

## P1-12: Outer Marker Beacon Input

Marker beacon receiver inputs. Normally connected to the external lamp drivers on the marker beacon receiver, see the installation drawings. Most marker beacon receivers use "DC" ground referenced outputs driven by transistor drivers. All such receivers are compatible as shown on the installation drawings. Some very old designs may use transformer outputs which are AC coupled. These may not be compatible.

## P1-42: ARINC1 429-A Output

# P1-28: ARINC1 429-B Output

Low or high speed ARINC 429 output, spare. (Future use.)

# P1-13: Ch1 RS-232 TX Output

RS-232 serial data outputs. TXD-2 is used to support WX-500 Stormscope® . 24 AWG shielded wire is required for each of these functions.

# P1-43: WPT Annunciator input

- P1-29: MSG Annunciator input
- P1-14: ACT (Approach Active) Annunciator Input

# P1-44: ARM (Approach Arm) Annunciator Input

Active-low inputs for GPS/LRN on-screen annunciators.

### P1-15: OBS-/LEG, HLD-/AUTO or PAR TRK- Annunciator Input

For selected GPS-1 receiver with OBS/LEG mode (or HOLD/AUTO), this input when low senses and annunciates OBS or HOLD on the SN3500 display and changes the mode of the course pointer from auto-slew to manual control. Otherwise, this is used as a PAR TRK input for other types of receivers, based on the selection in the LNAV maintenance page.

# P1-30: Audio Out

LL audio output to the audio panel for optional callouts alerts. (Future use, not currently supported.)

# 3.3.2 Connector P-2 Pinout Descriptions

# P2-1: Signal Ground Return Input

This common Signal Ground Return is used for P2 analog signal grounds such as the Z lead of synchros, and analog signal shield grounds. See the installation wiring diagrams for details. Do not use this pin to connect digital signal ground return shields or use this for power ground return.

## P2-16: AC Excitation Input for P2 inputs

Connection to this pin is required only if functions of ARINC 407 synchro or 400Hz AC sine and cosine inputs on P2. It does NOT apply to <u>outputs</u> on P2. The input requirements are 26Vac nominal 400Hz. Input frequency is 560 Hz. maximum and 240 Hz. minimum. Input impedance is  $220K\Omega$ . 24 AWG shielded wire is recommended for this function.

## P2-31: GPS1/FMS 1 429A/422+/232 Gnd

P2-17: GPS1/FMS 1 429B/422-/232 Signal Main input from GPS/FMS 1.

# P2-2: GPS2/FMS 2 429A/422+/232 Gnd

P2-32: GPS2/FMS 2 429B/422-/232 Signal Main input from GPS/FMS 2.

# P2-18: VHF Nav-1 ILS Energize Input

This pin controls the Vertical Deviation Bar when selected to NAV1. These signals also control the ILS Lockout logic so the SN3500 can sense when a GPS receiver is inappropriately selected as the primary NAV source when ILS Lockout is not disabled on the NAV maintenance page. Connections to these pins are from the respective VHF navigation receiver and optionally by the GPS receiver. The logic level of these inputs is selected on the NAV maintenance page, and is normally active-low.

### P2-3: VHF NAV1 429A/Composite

# P2-33: VHF NAV1 429B

Primary 429 input from VHF NAV1, or composite input from analog receiver for VOR bearing pointer. Composite is normally .5v VOR / .33v LOC. For 3V inputs a series resistor is required, see the installation drawings. When using the composite input for LOC deviation, the calibration procedure found in section 7.1.5 must be followed for each specific LOC input. 24 AWG shielded wire is recommended for these connections. Note: When using the composite signal for the localizer deviation input, the calibration procedure found in section 7.1.5 must be performed after the installation prior to release for flight.

# P2-4: ADF-2 AC-X or AC/DC-SIN Input / TACAN 1 429/419 A

# P2-34: ADF-2 AC-Y or AC/DC-COS Input / TACAN 1 429/419 B

Inputs from ADF2 Receiver. Selection of AC/DC operation is on the ADF maintenance page. For DC use P2-20 as the DC reference input. For AC inputs Z is grounded. 24 AWG twisted shielded pair wire is recommended for these functions.

## P2-20: ADF2 DC Ref

Used when DC Sin/Cos inputs are used.

# P2-5: ADF2 Valid

Discrete ADF Valid input used if available.

# P2-19: VHF Nav2 ILS Energize Input

Control the enabling of the Vertical Deviation Bar when NAV2 selected

## P2-35: VHF NAV2 429A/Composite

# P2-21: VHF NAV2 429B

Primary 429 input from VHF NAV2, or composite input from analog receiver for VOR bearing pointer. Composite is normally .5v VOR / .33v LOC. For 3V inputs a series resistor is required, see the installation drawings. When using the composite input for LOC deviation, the calibration procedure found in section 7.1.5 must be followed for each specific LOC input. 24 AWG shielded wire is recommended for these connections. Note: When using the composite signal for the localizer deviation input, the calibration procedure found in section 7.1.5 must be performed after the installation prior to release for flight.

# P2-6: DME1 Data, Analog DME DC+/429A

# P2-36: DME1 CLK, Analog DME DC-/429B

P2-22: DME1 Sync

# P2-7: DME1 Hold

Serial data inputs for either ARINC 429 / 568 serial protocols to support ARINC DME's as selected within the DME Maintenance page (Low speed only), Bendix/King DME's using King Serial Digital protocol. See the installation drawings. 24 AWG twisted shielded triple conductor is required for these functions. <u>Note: This is DME1.</u>

Analog DME input (40mV/mile) may also be used.

- P2-37: OBS Resolver DC ref Input
- P2-23: OBS Resolver H Input
- P2-8: OBS Resolver SIN Output

# P2-38: OBS Resolver COS Output

OBS resolver connections for NAV or GPS receivers. The input frequency range is 20Hz to 500Hz, and calibration is done on the NAV maintenance page. The resolver is electrically zeroed at zero degrees plus the calibration value in the NAV maintenance page. For normal use this calibration value will be –60 degrees (equaling 300 degrees electrical zero). This is the factory

default. A different calibration value setting is used for each possible NAV source selectable on the SN3500. 24 AWG twisted shielded pair conductor is recommended for these functions. Please see the warnings on the installation drawings concerning DC REF, which must not be inadvertently grounded.

# P2-24: Flux Gate Excitation Input

This connection is made to the 400 Hz AC flux gate excitation source voltage. A 24 AWG shielded wire is recommended for this function. Note: the phase of this excitation voltage is <u>not</u> required to be the same as that supplied to the Primary AC Excitation input on P1 or P2.

P2-9: Flux Gate X Input

# P2-39 Flux Gate Y Input

# P2-25: Flux Gate Z Input

Referenced to P2-24 Excitation input. Connections to these pins are made directly from the heading system flux gate if internal slaving is selected on the compass maintenance page. If a Bendix/King KI-525 PNI or Rockwell/Collins 331A-3() HSI is being removed, the respective slaving accessory, should be bypassed. See the installation drawings for details. 24 AWG twisted shielded triple conductor is recommended for these signals.

# P2-10: HDG/CRS Datum Excitation

This is a *ground referenced* 400-5Khz excitation input for the HDG Datum and CRS Datum outputs only. This input is only used if referenced on the applicable installation drawing. If unused, Connect P2-10 to 28vdc P3-1.

# P2-40: Course Datum Output

# P2-26: Heading Datum Output

These function are either AC or DC Course Datum and Heading Datum for the flight control system. If AC signals, the excitation reference is <u>P2-10</u>. Selection of AC/DC, gain, and direction of rotation are accomplished on the FCS maintenance page. 24 AWG single conductor shielded wire is recommended for each of these functions.

# P2-11: HDG Bootstrap X out

# P2-41: HDG Bootstrap Y out

Z Ground. NOTE: Referenced to <u>P1-16</u>. This function may be used to provide "bootstrap" output to an RMI or other directional instrument in the form of ARINC 407 synchro 24 AWG twisted shielded pair wire is recommended for these functions. Drive only electronic loads with this output – limited to 60ma max.

# P2-27: FCS ILS Energize Out

Active-low open drain output to FCS when selected navigation source vertical deviation is enabled.

# P2-12: FCS Lateral Flag Output+

Low Level flag output derived from selected NAV source, referenced to Ground. Connect corresponding '-' input to P2-1 (Gnd)

# P2-42: FCS Vertical Flag Output+

Low Level flag output derived from selected NAV source, referenced to Ground. Connect corresponding '-' input to P2-1 (Gnd)

### P2-28: FCS Lateral Deviation Output +Right

LL lateral +deviation from selected NAV source. Connect corresponding '-' deviation input to P2-1 (Gnd)

### P2-13: FCS Vertical Deviation Output +UP

LL vertical +deviation from selected NAV source. Connect corresponding '-' deviation input to P2-1 (Gnd)

### P2-43: FCS Lateral Superflag Output

Superflag output derived from selected NAV source.

### P2-29: FCS Vertical Superflag Output

Superflag output derived from selected NAV source.

## P2-14: RS-232 TX Output2

RS-232 serial FIS-B data link output (Software Rev 3.0 and above).

## P2-30: ARINC2 429-A Output

# P2-15: ARINC2 429-B Output

Low or high speed ARINC 429 output which transmits selected course and selected heading for ARINC 429 Long Range NAV receivers. 24 AWG twisted shielded pair wire is required for these functions.

# 3.3.3 Connector P-3 Pinout Descriptions

# P3-1 &

### P3-9: Display Primary Power Input

(22-33Vdc). Connection to both pins is required using two 20AWG wires and a 5 ampere circuit breaker. Maximum power required is 35 watts. Connection to the avionics bus is recommended to reduce voltage fluctuations during engine start.

### P3-3 &

# P3-11: Display Power Return Input

Pins 3 and 11 are the aircraft ground input connections. Connection to both pins is required using two 20 AWG wires. Either pin should also be used for the digital signal ground (shields) return, as required. The number of shields will vary depending upon the functions wired to Connector P3.

## P3-2: GPS OBS- or HOLD- Command Discrete Output or TACAN Relay Out

Open Drain active-low output used to operate the OBS function of Bendix/King KLN-90 GPS receivers or the HOLD function of the II Morrow and Garmin GPS receivers. Accessible during normal use from the pilots GPS MODE soft key.

Can also be used to operate a switching relay, or external annunciator whenever a TACAN is selected by the NAV pushbutton. The TACAN receiver(s) are configured on the NAV maintenance pages.

#### P3-4: GPS1 Relay Sense / GPS SELECTED Input

This input is used when the SN3500 is set up for slave mode so an *external* GPS switch can be used to switch to an external GPS receiver. Causes proper mode switching and annunciation on the SN3500 display. This input is active only when enabled in the OBS / RELAY / CDI maintenance page 10.

#### P3-5: NAV2 Relay Sense

Feedback from NAV2 relay, if used. When replacing a SN3308 with the SN3500, see configuration page 7-14.

#### P3-6: Analog DME Valid or REV Control

Discrete input for Analog DME valid or Reversionary Display On/OFF control.

For Reversionary Attitude Display units the Reversionary Display is enabled by a closure to ground through an external toggle switch or maintained pushbutton switch.

#### P3-7: GPS1 Switching Relay Discrete Output

Can be used to operate a switching relay whenever GPS1 (or Loran1) is selected by the NAV pushbutton. The receiver type is selected on the LNAV1 maintenance page.

#### P3-8: VHF NAV2 Switching Relay Discrete Output

Can be used to operate a switching relay whenever VHF NAV2 is selected by the NAV pushbutton. VHF NAV2 is enabled on the NAV2 maintenance page.

#### P3-10: GPS APPR ARM Discrete Output or TACAN Relay Out

Open Drain active-low output used to select APPR ARM mode of the external GPS receiver. Accessible during normal use from the pilots NAV menu operation.

Can also be used to operate a switching relay, or external annunciator whenever a TACAN is selected by the NAV pushbutton. The TACAN receiver(s) are configured on the NAV maintenance pages.

#### P3-12: GPS2 Relay Sense

Feedback from GPS2 relay, if used.

#### P3-13: NVIS Ctrl or REV Control

For NVIS capable units NVIS mode is enabled by a closure to ground through an external toggle switch or maintained pushbutton switch. NVIS mode is annunciated onscreen so an external annunciator is not required. For Reversionary Attitude Display units the Reversionary Display is enabled by a closure to ground through an external toggle switch or maintained pushbutton switch.

The input will always pull up to the de-activated state when disconnected.

### P3-14: AFCS Back Course Discrete Output

Open Drain. Used to feed the back course sensing input of an AFCS. When the Course Select rotates either direction passing 90° clockwise or counterclockwise from the lubber line of the SN3500 will generate an opendrain closure. An external relay may be required to make this signal activehigh.

### P3-15: GPS2 Switching Relay Discrete Output

Can be used to operate a switching relay whenever GPS2 (or Loran2) is selected by the NAV pushbutton. The receiver type is selected on the LNAV-2 maintenance page.

# 4 Setup Procedures

# 4.1 General

Setup procedures for the SN3500 are described along with the Maintenance Menu below. The Maintenance Menu is accessed and addressed through the use of pushbuttons and the Selected Heading knob. No external connector pin programming is required.

# 4.2 Accessing the Maintenance Menus

To access the Maintenance Menus perform the following operations:

- A. Prior to applying power to the SN3500, depress and hold the [BRG] and the [MEM] pushbuttons, <u>then</u> apply power to the unit. Continue to hold until the first maintenance menu appears. This protocol insures that maintenance menus cannot be called up accidentally during flight.
- B. Once the Maintenance Menu is entered, press the [NEXT] or [PREV] softkeys to cycle the MAINTENANCE MENU pages. Use the UP/DOWN arrow keys for selections, and rotate the right knob to adjust and select. On some menus additional soft key legends will appear as prompts.
- C. Escape the maintenance menus by pressing and holding the course pointer knob (left knob). This will allow normal operation of the unit to test the effects of settings. Re-enter the maintenance pages pressing and holding the course pointer knob (left knob).
- D. To disable maintenance menu operation, power down and restart normally. All configured items are stored in non-volatile memory.

# 4.3 Equipment/Configuration Selections

The choices of compatible equipment contained in the SN3500 menus are listed in the Appendix. For types not listed, consult the factory.

# **5** Operating Details

For an explanation of the operating details of the SN3500, refer to the Pilot's Guide for the SN3500, Sandel Avionics P/N 82005-PG, and to the Airplane Flight Manual Supplement.

The SN3500 may utilize either an LED light source or a lamp light source. The pilots guide (P/N 82005-PG, revision F or later) should be referenced for light source identification and applicable data color coding information.

# 6 Instructions For Continued Airworthiness

# 6.1 General

The following is a summary of the Instructions for Continued Airworthiness prepared under the guidelines of FAA Advisory Circulars 23.1309-1() and 25.1309-1() which identifies potential failure modes of the Sandel Avionics Model SN3500 Navigation Display. The assumption made is that all functions of the SN3500 will be used in an essential (primary) navigation function.

Replace the SN3500 backlight lamp, when necessary, utilizing instructions in the SN3500 Component Maintenance Manual, document number 82005-0133.

# 7 Appendix A: Post-Installation Procedures

After all wiring has been verified and the SN3500 has been installed into the panel, the maintenance pages must be accessed to properly configure the SN3500 for the installed equipment. Prior to applying power to the SN3500, depress and hold the [BRG] and the [MEM] keys, <u>and then</u> apply power to the unit. Continue to hold until the first maintenance menu appears. This protocol insures than maintenance menus cannot be called up accidentally during flight.

Once the Maintenance Menu is entered, press the [NEXT] or [LAST] softkeys to cycle the MAINTENANCE MENU pages. Use the UP/DOWN arrow keys for selections, and rotate the right knob to adjust and select. On some menus additional soft key legends will appear as prompts.

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

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

NOTE: When configuring ARINC 429 inputs, select '429' for low-speed and '429H' for high-speed.

Each maintenance page, the options for each, and a brief description of each option are detailed below:

| 7.1.1 | Page 1: | INDEX  |  |  |
|-------|---------|--|--|--|
|       |         | SANDEL   |  |  |
|       |         | Í: INDEX   | READ   |  |
|       |         | <ul> <li>2: System</li> <li>3: Compass</li> <li>4: ADF/TAC</li> <li>5: NAV/ILS</li> <li>6: NAV/ILS</li> <li>7: GPS-1</li> <li>8: GPS-2</li> <li>9: FCS Emu</li> <li>10: OBS/REL</li> <li>11: WX-500</li> <li>12: Traffic</li> <li>13: System</li> <li>14: Brightn</li> <li>15: Power</li> <li>16: Softwar</li> </ul> | System<br>AN/MKR<br>/DME 1<br>/DME 2<br>lation<br>AY/CDI<br>Stormscope<br>/WXDL<br>Status<br>ess/Data BIk<br>e CRC |  |

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. The [SELECT] Soft key is then pressed to jump to this page. Once 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 SN3500 between READ and EDIT mode. Note: The SN3500 must be in EDIT mode to make configuration changes on the following maintenance pages.

82005-IM-R

#### SANDE READ 2:SYSTEM Serial Number 12345678 NA V RE ZEX CPU CCA FPGA 09 09 099 I/O CCA.FPGA PWR CCA Rev Comp NAV Rev 0 99 MAP ware Rev Boot Rev Map Rev Software X4.04B 27SEP07 M Rmt Swtch Annun TCN Discr Out Install Position NO Ċ NONE PLT ONLY ORANGE O Hdg Bug Color Loc/GS Pointer BAR craft Ident Ai BRG MEM

The System page provides information that identifies the unit and the unit's hardware and software.

| Configuration Field | Options                          | Comment   |
|---------------------|----------------------------------|---|
| Rmt Switch Annun    | NO<br>YES                        | Set to yes to allow SN3500 to control<br>GPS switch inputs (LEG/OBS<br>switching, APPR ARM etc.) through<br>Pilot's Menu. Available options will<br>depend on the model of GPS selected<br>on the GPS maintenance page. |
| TCN Discr Out       | None<br>P3-2<br>P3-10            | Selects which pin connector pin is assigned to TACAN Relay Out Signal.  |
| Install Position    | PLT ONLY<br>PLT DUAL<br>COP DUAL | Set to adjust color of on-side/cross-side NAV information.  |
| Hdg Bug Color       | Orange<br>White                  | Heading bug color selection.  |
| Loc/GS Pointer      | Bar<br>Triangle                  | Selects style of Loc/GS pointer. With<br>Triangle Loc/GS pointers selected,<br>inner VDI will not be displayed.   |
| Aircraft Ident      | 7 characters                     | Enter aircraft identification for reference.  |

# 7.1.2 Page 2: SYSTEM

7.1.3 Page 3: COMPASS SYSTEM



The Compass System page configures the gyro and fluxgate (if applicable) to the SN3500.

| Configuration Field | Options   | Comment   |
|---------------------|---|---|
| HEADING             | NONE<br>429<br>429H<br>XYZ<br>XYZ-<br>MID CONT<br>KG102 | Selects the gyro input to the SN3500.                                 |
| VALID               | NONE<br>HIGH<br>LOW                                     | Not shown if 429 or 429H is selected for heading.                     |
| FLXGATE             | NONE<br>KMT112<br>COLLINS<br>HONEYWELL<br>STEC 6446     | Selects model of fluxgate input when slaving is performed internally. |
| QUAD                | 0.0°<br>90.0°<br>180.0°<br>270.0°                       | Set automatically when fluxgate is selected.                          |
| PEAK                | 0 - 7   | Set automatically when fluxgate is selected                           |

| CAL N<br>CAL E<br>CAL W | -25.0° - 25.0° | Calibration settings for fluxgate inpu<br>See below. | ıt. |
|-------------------------|----------------|--|-----|
| CAL S                   |                |  |     |

#### 7.1.3.1 Compass Calibration (Applies to installations using a fluxgate input)

When a flux gate is *first selected* the quadrant and peaking adjustments will be automatically set.

The magnetic heading shown in the value field at the top of the page should be within  $\pm$ -20° of the aircraft's wet compass reading. The magnetic heading reading should also increase and decrease as appropriate when the aircraft is turned. If this is not the case, the following troubleshooting procedure can be used to diagnose fluxgate problems:

a) Align the aircraft to north. Set the CAL settings to 0.0°. Adjust the quadrant setting until the magnetic heading is +/-20° of north. If it is not possible to come within +/-20° of north then the XYZ connections the fluxgate may actually be 'YZX' or 'ZXY'. Take all three wires off the fluxgate and move them one terminal 'clockwise' and retest as above. It may be necessary to repeat this step. Once the magnetic heading reads within +/-20° of north then the correct Z leg has been identified and should not be changed

Note: When installing to existing wiring, ensure that the fluxgate center tap that exists on some Honeywell/Sperry and Collins fluxgates is not connected.

b) Ensure that the compass card rotation is correct by observing that the magnetic heading reading increases/decreases properly as the aircraft is turned. Reverse the XY inputs from the fluxgate to correct for reverse rotation if necessary.

Compass calibration is completed by aligning the aircraft at each cardinal heading and adjusting the corresponding calibration value until the magnetic heading reading observed on the compass maintenance page, matches the actual aircraft heading. After the four cardinal points have been adjusted and verified, a final check of the systems should be done by power cycling the SN3500 into normal mode and ensuring the compass rose is correct for each cardinal heading.

NOTE: Changes to the compass calibration settings may take up to two minutes to take effect when observing the compass card in normal operational mode. Therefore It is recommended to make these calibration adjustments on the compass maintenance page where the compass readings are instantaneous and not affected by the slaving logic in the SN3500.

### Reversionary Attitude Configuration (ARINC 429 Low/High speed only)

When the HEADING source is configured as ARINC 429, an optional Reversionary Attitude Mode is available for activation via a valid key entry. Once configured and valid, The assigned input discrete connected to an external switch controls the switching between HSI Mode and Reversionary Attitude Mode.



| Configuration Field | Options                                     | Comment  |
|---------------------|---|--|
| ATT Key             |   | Enter the Reversionary attitude key.   |
| ATT Pin             | None<br>Active L (P3-6)<br>Active L (P3-13) | Connector pin values do not appear in the ATT Pin selection field. The appear above in the PINS field. |
| PTCH CAL            | d.dd  | Pitch Adjustment of Reversionary<br>Attitude display +/- 5.00  |

## 7.1.4 Page 4: ADF/TACAN/ MKR



The ADF page allows the selection for ADF1, ADF2, TACAN 1, TACAN 2, and Marker sources.

| Configuration Field | Options   | Comment  |
|---------------------|---|--|
| ADF1                | NONE<br>429<br>429H<br>XYZ<br>XYZ-<br>S/C DC<br>S/C DC- | Selects type of ADF signal input. If bearing indication is off by 180°, change selection to opposite polarity. |
| VALID               | NONE<br>LOW<br>HIGH                                     | Not shown if 429 or 429H is selected for ADF source.   |
| ADF2                | NONE<br>429<br>429H<br>XYZ<br>XYZ-<br>S/C DC<br>S/C DC- | Selects type of ADF signal input. If bearing indication is off by 180°, change selection to opposite polarity. |
| VALID               | NONE<br>LOW<br>HIGH                                     | Not shown if 429 or 429H is selected for ADF source  |

| TCN Key | Blank by default   | Enter the purchased 11 character key code to enable TACAN. Use the BRG and MEM keys to select the character and the MAP and TFC keys to move the cursor. |
|---------|--|--|
| TCN1    | NONE<br>429<br>429H<br>429-MC<br>429H-MC<br>XYZ<br>XYZ-<br>419 | Selects type of TACAN signal input. If bearing indication is off by 180°, change selection to opposite polarity.   |
| VALID   | NONE<br>HIGH   | Not shown unless XYZ or XYZ- is selected for TACAN source.   |
| TCN2    | NONE<br>429<br>429H<br>429-MC<br>429H-MC<br>XYZ<br>XYZ-<br>419 | Selects type of TACAN signal input. If bearing indication is off by 180°, change selection to opposite polarity.   |
| VALID   | NONE<br>HIGH   | Not shown unless XYZ or XYZ- is selected for TACAN source.   |
| MARKERS | NONE<br>ACTIVE L<br>ACTIVE H<br>429<br>429H                    | Selects type of input from the marker beacon receiver.   |
| THOLD   | Default 003  | Used to adjust the signal voltage threshold when ACTIVE L or ACTIVE H is selected for the marker beacon input.   |



The NAV/ILS/DME1 page allows the selection of the NAV1 and DME1 sources.

| Configuration Field | Options       | Comment                                  |
|---------------------|---------------|--|
| NAV                 | NONE          | Selects NAV signal input.                |
|                     | 429 TO        | For 429 interfaces, the standard setting |
|                     | 429H TO       | is 'TO'. Change to 'FR' if the received  |
|                     | 429 FR        | bearing information is 'from' the VOR    |
|                     | 429H FR       | station.                                 |
|                     | COMP          |  |
|                     | NO BRG        |  |
| CAL                 | Default 17.0° | Only used when COMP is selected for      |
|                     |               | the NAV signal input. A VOR test set     |
|                     |               | should be used to accurately calibrate   |
|                     |               | the displayed bearing pointer reading.   |
| ENRGZ               | NONE          | Selects ILS Energize input.              |
|                     | 429           |  |
|                     | 429H          |  |
|                     | ACTIVE H      |  |
|                     | ACTIVE L      |  |

| LOC DV  | NONE<br>429<br>429H<br>ANALOG<br>COMP         | Selects localizer signal input. The<br>SN3500 has a built-in NAV converter to<br>decode localizer validity and deviation<br>from a composite signal input.<br>If COMP is selected see following<br>"Composite LOC Calibration<br>procedure". |
|---------|---|--|
| GAIN    |   | Used to calibrate LOC DV COMP  |
| GS DV   | NONE<br>429<br>429H<br>ANALOG                 | Selects glideslope signal input.   |
| OBS CAL | DEFAULT 0.0°                                  | Calibrates NAV1 OBS.   |
| DME     | NONE<br>429<br>429-MC<br>568<br>KSD<br>ANALOG | Selects DME signal input.  |
| HOLD    | NONE<br>ON HIGH<br>ON LOW                     | Selects DME HOLD discrete input to active high or low.   |
| ZERO    | DEFAULT 000                                   | Present only if Analog DME is selected.<br>Use to set zero point of DME input if<br>necessary.   |
| SCALE   | DEFAULT 1.00                                  | Present only if Analog DME is selected.<br>Use to calibrate DME if necessary.  |

#### 7.1.5.1 OBS Calibration (Does not apply to 429 or 400HZ Differential Resolvers)

Note: Maintenance mode and operational mode can be toggled by pressing and holding the CRS knob.

- a) In operational mode set the SN3500 course pointer (OBS) to zero degrees. Set the NAV test set to zero degrees.
- b) In Maintenance Mode, adjust the OBS CAL setting to center the deviation needle.
- c) Set the test set to 45 degrees. Turn the course pointer to re-center the deviation needle. If it is with a few degrees of 45 degrees, then proceed. Otherwise if it is about 90 degrees out, change the OBS ROT setting on Maintenance Page 10 to REVERSED and return to step a.
- d) Check the to/from flag on the SN3500 display. If to/from is reversed (and correct wiring has been verified) adjust the OBS CAL 180 degrees from the current setting.

e) Check the course pointer at 30 degree increments and verify calibration.

#### 7.1.5.2 Composite LOC Calibration Procedure

The following procedure applies to SN3500 installations that have been configured to use the SN3500 internal localizer converter.

LOC DV COMP

This procedure does <u>not</u> apply for any other LOC DV setting such as Arinc 429 or Analog from an external LOC converter.

Ramp or Bench Test:

Perform the following procedure using the respective aircraft receiver. This test may be performed with a ramp test set, or may be performed on the bench with a signal generator at nominal RF signal level (25uV or greater).

- 1. On the SN3500 NAV maintenance page, select LOC DV and change to COMP to select Composite Localizer.
- 2. Select GAIN.
- 3. Set 0 DDM (STD) on the test set, and tune the receiver to match the LOC frequency on the test set.
- 4. Adjust the SN4500 GAIN value so the average value of LOC AMPL reads 100.0 +/- 2.5.
- 5. Exit the SN3500 maintenance page to the normal pilot's LOC display.
- 6. On the test set remove both 90Hz and 150Hz simultaneously and verify the SN3500 display flags within 2 seconds.
- 7. On the test set select .155 DDM Left and verify that removing either tone individually will flag the SN3500 display within 5 seconds.
- 8. On the test set select .155 DDM Right and verify that removing either tone individually will flag the SN3500 display within 5 seconds.

Perform any other LOC performance tests desired.

# 7.1.6 Page 6: NAV/ILS/DME 2



The NAV/ILS/DME2 page allows the selection of the NAV2 and DME2 sources.

| Configuration Field | Options  | Comment   |
|---------------------|--|---|
| NAV                 | NONE<br>429 FR<br>429H FR<br>429 TO<br>429H TO<br>COMP<br>NO BRG | Selects NAV signal input.<br>For 429 interfaces, the standard setting<br>is 'TO'. Change to 'FR' if the received<br>bearing information is 'from' the VOR<br>station. |
| CAL                 | Default 17.0°  | Only used when COMP is selected for<br>the NAV signal input. A VOR test set<br>should be used to accurately calibrate<br>the displayed bearing pointer reading.       |
| ENRGZ               | NONE<br>429<br>429H<br>ACTIVE H<br>ACTIVE L                      | Selects ILS Energize input.   |

| LOC DV  | NONE<br>429<br>429H<br>ANALOG<br>COMP                           | Selects localizer signal input. The<br>SN3500 has a built-in NAV converter to<br>decode localizer validity and deviation<br>from a composite signal input.<br>If COMP is selected see "Composite<br>LOC Calibration procedure" in the<br>previous section.  |
|---------|---|---|
| GAIN    |   | Used to calibrate LOC DV COMP   |
| GS DV   | NONE<br>429<br>429H<br>ANALOG                                   | Selects glideslope signal input.  |
| OBS CAL | DEFAULT 0.0°  | Calibrates NAV2 OBS. See OBS calibration instructions for NAV1 in section 7.1.5.1.  |
| DME     | NONE<br>429<br>429-MC<br>568<br>KSD<br>LO FR DME1<br>HI FR DME1 | Selects DME signal input.<br>For installations with a single DME<br>receiver used by NAV1 and NAV2,<br>select LO FR DME1 (if low on DME2<br>Hold P1-40 indicates NAV2 selection)<br>or HI FR DME1 (if high on DME2 Hold<br>P1-40 indicates NAV2 selection). |
| HOLD    | NONE<br>ON HIGH<br>ON LOW                                       | Selects DME HOLD discrete input to active high or low. Not shown if above DME selection is LO FR DME1 or HI FR DME1.  |

# 7.1.7 Page 7: GPS1



The GPS1 page allows the selection and configuration of the GPS1 input.

| Configuration Field | Options                                | Comment  |
|---------------------|--|--|
| ANNUN               | NONE<br>ACTIVE L<br>SERIAL             | Automatically configured when GPS is selected from list below.   |
| LAT DV              | NONE<br>ANALOG<br>SERIAL               | Automatically configured when GPS is selected from list below.   |
| VERT DV             | NONE<br>ANALOG<br>SERIAL               | Automatically configured when GPS is selected from list below.   |
| VERT ENA            | NONE<br>ACTIVE H<br>ACTIVE L<br>SERIAL | Automatically configured when GPS is selected from list below.   |
| OBS CAL             | DEFAULT 0.0°                           | Automatically configured when GPS is<br>selected from list below. May require<br>adjustment if the GPS receiver uses an<br>RS-232 interface and has a resolver<br>connected. |
| ARINC - 429         | 429<br>429H                            | Not shown when selected GPS does not have ARINC 429 output.  |

| APR ACTV | NONE<br>ANNUN IN<br>ACTIVE L<br>ACTIVE H | GPS approach active source select.   |
|----------|--|--|
| GPS      | Select from list                         | Select the appropriate model of GPS from the list. Press the SET soft key (CLR button) to program. |

# 7.1.8 Page 8: GPS2

| SANDEL SN3500  |      |
|--|------|
| 8:GPS-2 READ   |      |
| N P VALUE:MAG VAR 013°<br>#147 VTE:010 0X00000526<br>VOLT:                                       | N YU |
| A ANNUN SERIAL<br>A LAT DV SERIAL<br>- VERT DV NONE  | ÷Ĕ   |
| E - VERT ENA NONE<br>OBS CAL 0.0°<br>ARINC-429 429<br>- APR ACTV NONE                            |      |
| W P GARMIN 300 (ARINC)<br>GARMIN 300XL(ARINC)<br>GARMIN ‡ GNS430 (ARINC)<br>GARMIN GNS500 (ARINC | W N  |
|  |      |
|  |      |

The GPS2 page allows the selection and configuration of the GPS2 input.

| Configuration Field | Options                                | Comment  |
|---------------------|--|--|
| ANNUN               | NONE<br>ACTIVE L<br>SERIAL             | Automatically configured when GPS is selected from list below.   |
| LAT DV              | NONE<br>ANALOG<br>SERIAL               | Automatically configured when GPS is selected from list below.   |
| VERT DV             | NONE<br>ANALOG<br>SERIAL               | Automatically configured when GPS is selected from list below.   |
| VERT ENA            | NONE<br>ACTIVE H<br>ACTIVE L<br>SERIAL | Automatically configured when GPS is selected from list below.   |
| OBS CAL             | DEFAULT 0.0°                           | Automatically configured when GPS is<br>selected from list below. May require<br>adjustment if the GPS receiver uses an<br>RS-232 interface and has a resolver<br>connected. |
| ARINC – 429         | 429<br>429H                            | Not shown when selected GPS does not have ARINC 429 output.  |

| APR ACTV | NONE<br>ANNUN IN<br>ACTIVE L<br>ACTIVE H | GPS approach active source select.   |
|----------|--|--|
| GPS      | Select from list                         | Select the appropriate model of GPS from the list. Press the SET soft key (CLR button) to program. |

| 7.1.9 Page 9: FCS EMULATION  |  |  |  |
|--|--|--|--|
| SANDEL   |  |  |  |
| 9:FCS EMULATION READ<br>VOLT: 00.00 00.00  |  |  |  |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$  |  |  |  |
| P       MIN       V       00.000       00.000         MAX       V       00.000       00.000         REF       V       00.000       00.000       U         T       CRS       DAT       +RIGHT       +RIGHT       P  |  |  |  |
| F       SCL       V/D       00.020       00.020       00.020         MIN       V       00.000       00.000       00.000       00.000         MAX       V       00.000       00.000       00.000       00.000         W       P       REF       V       00.000       00.000       W |  |  |  |
| X E BENDIX IN-831<br>KING KI-525   |  |  |  |
| M CLR BRG [MEM]  |  |  |  |

The FCS Emulation allows the selection and configuration of the FCS interface.

| Configuration Field | Options         | Comment  |
|---------------------|-----------------|--|
| SIGNAL              | DC<br>AC        | Automatically configured when FCS is selected from list below. |
| HDG DAT             | +RIGHT<br>+LEFT | Automatically configured when FCS is selected from list below. |
| SCL V/D             |                 | Default settings reset when FCS is selected from list below.   |
| MIN V               |                 | Default settings reset when FCS is selected from list below.   |
| MAX V               |                 | Default settings reset when FCS is selected from list below.   |
| REF V               |                 | Default settings reset when FCS is selected from list below.   |
| CRS DAT             | +RIGHT<br>+LEFT | Automatically configured when FCS is selected from list below. |
| SCL V/D             |                 | Default settings reset when FCS is selected from list below.   |
| MIN V               |                 | Default settings reset when FCS is selected from list below.   |

| MAX V |                  | Default settings reset when FCS is selected from list below.  |
|-------|------------------|---|
| REF V |                  | Default settings reset when FCS is selected from list below.  |
| FCS   | Select from list | Select the appropriate emulation from<br>the list. Press the SET soft key (CLR<br>button) to program. |

HDG V/D and CRS V/D increase or decrease the gain of the course or heading error relative to the lubber line, and normally match the volts/degree input of the associated autopilot computer. These values default when the FCS selection is initially set, but can be adjusted in-flight if necessary, in VFR conditions, as follows:

- a) Engage the autopilot in HDG mode. After the aircraft is established on the desired heading, move the heading bug knob a large amount and ensure that the aircraft turns to the heading bug and rolls out normally without instability, overshooting or undershooting to the desired heading. To correct for overshooting or instability, reduce the HDG V/D setting. To correct for undershooting, increase the HDG V/D setting.
- b) Engage the autopilot in NAV mode and turn off the NAV receiver to provide a zero course error. Repeat the tests and adjustments above using the course pointer and adjust the CRS V/D setting as appropriate.
- c) Use the REF V adjustment to center the heading and course rollout if not precisely on the lubber line. This will rarely be required.

HDG DAT and CRS DAT allow the direction sensing to be reversed during installation. Changing these settings is identical to reversing H/C on a synchro control transformer.

The other settings on this page are not for installer adjustment except on advice of the factory, service bulletin, or service information letter.

Note that the adjustments are shown in the left column of values. The right column shows the default values for reference purposes.

Page 10: OBS / RELAY / CDI

| SAN  | IDEL                      |  |               |                           |
|--|---------------------------|--|---------------|---------------------------|
| 10:0   | BS/RE<br>-10,88           | LAY/CDI                                      | READ          |                           |
| A<br>E<br>PINS:<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C<br>C | P2-08/8<br>ROT >          | 8/37/23<br>NORMAL<br>NONE                    |               | <b>&gt;∋</b><br>N III X T |
| P - SE<br>NS G   | ODE<br>NSE<br>IPS2<br>LCK | MASTER<br>NONE<br>GPS2<br>DISABLE            |               | N ▼                       |
|  | DEV<br>SET<br>DV<br>SET   | O: CDI/F/SF<br>00 mv<br>O: CDI/F/SF<br>00 mv | =/BC<br>=/ILS |                           |
|  | BAK<br>STR                | L&V: CDI/F/<br>32PSD0TWE6                    | SF<br>BR      |                           |
|  | CLR                       | (BRG) (MEM                                   | ר 🌾           | 2                         |

| <b>Configuration Field</b> | Options   | Comment  |
|----------------------------|---|--|
| OBS ROT                    | NORMAL<br>REVERSED<br>DIFF A  | Adjusts rotation of OBS.<br>Select DIFF A when interfaced to<br>400HZ differential resolver.   |
| BTSTRP                     | NONE<br>NORMAL<br>REVERSE   | Enables bootstrap synchro heading output.  |
| MODE                       | MASTER<br>SLAVE   | Selects NAV/GPS switching mode.<br>In MASTER mode, the SN3500's<br>NAV button is used to switch<br>between NAV and GPS sources. In<br>SLAVE mode a remote switch is<br>used.                               |
| SENSE                      | NONE<br>GPS1<br>GPS2<br>GPS1/GPS2<br>NAV2<br>GPS1/NAV2<br>GPS2/NAV2<br>G1/G2/N2 | Enables relay sense input to verify<br>relay switching. If a low is not<br>detected on the relay sense input, the<br>corresponding NAV source will be<br>redlined on the pilot's display when<br>selected. |

| NS GPS2<br>(software version<br>3.00 and above)                                    | GPS2<br>NAV2 & GPS2 | Normal operation of sense lines as<br>described above in Sense selections.<br>When replacing a SN3308 with a<br>SN3500, use this selection and<br>"NAV2" in Sense selections for<br>installations with dual Garmin GNS<br>Receivers where both receivers (All<br>four NAV sources) are made<br>available as NAV sources. This is the<br>sense input (P3-5) for a relay which<br>is wired to both the NAV-2 and GPS-<br>2 relay outputs. Ref: SN3308 install<br>manual 90106-IM-G (4), dual Garmin<br>install sheet #26. |
|--|---------------------|---|
| ILS LCK  | DISABLE<br>ENABLE   | Enables/disables ILS Lockout feature of the ILS input for NAV1/NAV2.  |
| LAT DEV  | n/a                 | Monitors FCS voltage outputs.   |
| OFFSET   | n/a                 | Adjusts zero offset of the lateral deviation output. *  |
| VERT DV  | n/a                 | Monitors FCS voltage outputs.   |
| OFFSET   | n/a                 | Adjusts zero offset of the vertical deviation output. *   |
| FEEDBAK  | n/a                 |   |
| ROLL STR<br>(Software version<br>4.04 and later and<br>requires LED<br>backlight.) | Blank by default    | Enter the purchased 11 character<br>key code to enable roll steering. Use<br>the BRG and MEM keys to select the<br>character and the MAP and TFC<br>keys to move the cursor.  |

• \* This adjustment may be used to fine tune the autopilot localizer or glide slope tracking if the SN3500 lat and vertical deviation outputs have been connected to the autopilot.
7.1.11 Page 11: WX-500 SANDEL 11: WX - 500 READ VALUE: VOLT:



| Configuration Field | Options  | Comment  |
|---------------------|--|--|
| SOURCE              | NONE<br>232  | Set to 232 to enable WX-500 interface.   |
| MODE IS             | n/a  | Displays current mode of the WX-500.   |
| MODE RQ             | WEATHER<br>STRIKE TEST<br>DEMO<br>NOISE MONITOR<br>SELF TEST | Selects mode of WX-500. Select WEATHER for normal operation.   |
| ANT IS              | n/a  | Displays current antenna configuration.  |
| ANT RQ              | TOP<br>BOTTOM<br>UNKNOWN                                     | Software selection of antenna location.<br>Normally not used as the antenna<br>location is set by jumpers on the WX-<br>500. |
| INFO RQ             | FAULT LIST<br>CONFIGURATION<br>ENVIRONMENT                   | Requests information from WX-500.<br>Information will be shown at the bottom<br>of the display.                              |

7.1.12 Page 12: Traffic

| SANDEL                                     |          |                         |
|--|----------|-------------------------|
| 12:TFC & WXDL READ                         |          |                         |
| VALUE: PRODUCTS 0000000                    |          |                         |
| A R PINS:P1-02/32 P2-14                    | Ν        | $\overline{\mathbf{v}}$ |
|  | Ë        | Ý                       |
| DATA LINK >WSL w/TX 000                    | Ť        | ٢                       |
| DLNK Key 30R4353S63P                       |          |                         |
| TCAS Key 20R4E15067P                       | u        |                         |
| Collins TCAS 4000                          | P        | Τ                       |
| C Goodrich Skywatch HP                     | DO       |                         |
| W O Honeywell CAS-66                       | W        |                         |
| X P Honeywell CAS-67<br>F Honeywell CAS-81 | Ν        |                         |
| Ryan 9900BX TAS                            | (d)      |                         |
|  |          |                         |
|  |          |                         |
| CLR BRG MEM                                | <u>e</u> |                         |

Configuration Field Options

Comment

| 3   |  |  |
|---|--|--|
| DATA LINK<br>(Software version<br>3.00 and above) | WSI w/TX<br>WSI no TX  | SN3500 is sole display.<br>SN3500 is wired as receive only,<br>another display is connected to the<br>WSI receiver.  |
| DLINK KEY<br>(Software version<br>3.00 and above) | Blank by default   | Enter the purchased 11 character<br>key code to enable data link weather.<br>Use the BRG and MEM keys to<br>select the character and the MAP<br>and TFC keys to move the cursor.         |
| TCAS KEY  | Blank by default   | Enter the purchased 11 character<br>key code to enable traffic. Use the<br>BRG and MEM keys to select the<br>character and the MAP and TFC<br>keys to move the cursor.                   |
| TCAS Model  | Collins TCAS 4000<br>Goodrich Skywatch HP<br>Goodrich TCAS791/A<br>Honeywell CAS-66<br>Honeywell CAS-67<br>Honeywell CAS-81<br>Ryan 9900BX TAS | Select the appropriate model of<br>TCAS from the list. Press the SET<br>soft key (CLR button) to program.<br>NOTE: Users of Honeywell KTA-810<br>systems should configure as CAS-<br>66. |



Sensor summary status.

| 7.1.14 | Page 14: BRT/DATA BL   | ¢         |
|--------|--|-----------|
|        | SAINDEL SN3500   |           |
|        | 14:BRT/DATA BLK READ   |           |
|        | PR<br>V BRIGHTNESS CONTROL<br>Selection : EXTERNAL<br>P1-26: -00.00<br>Min Brt V Norm: 10.00 | N U X T   |
|        | DATA RECORD BLK<br>Version: 000<br>Start Block: 00<br>Active Block: 00<br>End Block: 23      | Z K OU UN |
|        | CLR BRG (MEM)  | 0         |

| Configuration Field | Options              | Comment   |
|---------------------|----------------------|---|
| Selection           | INTERNAL<br>EXTERNAL | Selects the brightness control to be external or internal.  |
| P1-26               | NONE                 | Monitors external brightness bus voltage. Not shown when brightness control selection is set to INTERNAL.   |
| Min Brt V Norm      |                      | Adjusts the external brightness bus to<br>the desired night-brightness voltage.<br>Adjustable from 1.5 volts to 15.0 volts.<br>Not shown when brightness control<br>selection is set to INTERNAL.                                     |
| Min Brt V NVIS      |                      | Adjusts the external brightness bus to<br>the desired NVIS brightness voltage.<br>Adjustable from 1.5 volts to 15.0 volts.<br>Not shown when brightness control<br>selection is set to INTERNAL. Not<br>applicable to non-NVIS units. |
| DATA RECORD BLK     | None                 | For factory use.  |

Calibrating the external brightness control minimum brightness:

BEFORE performing calibration:

Select the "BRT" maintenance page, select EXTERNAL for brightness control.

To calibrate minimum brightness, set aircraft to NVIS OFF and do the following from BRT maintenance page. Please note: The maintenance page always displays at 100% brightness. You need to exit MAINT by pressing and holding the left knob to see the resulting brightness adjustment.

1. Select "Min Brt V Norm" with up/down arrow keys

2. Set the aircraft external brightness bus at the desired night-brightness voltage. This voltage will be displayed on-screen.

3. Press "SET" softkey. This will set Vzero (see graph below) at the current bus voltage minus 2.00 volts

4. Exit MAINT by pressing and holding the left knob and check the brightness balance with the rest of the cockpit. If you need further adjustment, re-enter BRT maintenance page by pressing and holding the left knob and trim the "Min Brt V Norm" setting using "+/- softkeys. A lower voltage setting number will INCREASE the brightness.

Repeat steps 1,2,3,4 with external NVIS selected

NOTE: From this point on the pilot will be able to trim the minimum brightness, if desired, using the 'M' button to enter the pilot's menu.





Monitors power inputs to the SN3500 including the #1 and #2 inverters.



Displays CRC values for the software and database programs. Press the [UPDATE] soft key to re-calculate. Contact Sandel if FAIL is annunciated for any of the values.

#### Appendix B: Environmental Qualification Form 8

#### RTCA/D0-160D Environmental Qualification Form (Lamp Models)

| NAMEPLATE NOMENCLATURE:   | [(A2)(F1)]ZBA   | B[(H)(R)]XXX         | XXXZBAB   | BE[WW]M[XXF2]XXA  |
|---|---|----------------------|---|---|
| TYPE/MODEL NO: SN3500   | TSO NUMBERS: C113   |                      |   |   |
| MANUFACTURER'S SPECIFICATIO   | ON AND/OR   | OTHER APPLI          | CABLE SF  | PECIFICATION:   |
| a.) Design Requirements & Objectives  | For SN3500 EHS  | l, document nu       | mber 8200   | 6-0010  |
| b.) RTCA D0-160D Environmental Plan   | For Sandel SN35   | 500 EHSIdocume       | ent numbe   | r 82006-0090  |
| MANUFACTURER: Sandel Avior  | nics, Inc.  |                      |   |   |
| ADDRESS: 2401 Dogwood Wa  | JV  |                      |   |   |
| Vista, CA 92083   |   |                      |   |   |
| REVISION & CHANGE NOS. OF I   | <b>00-160</b> : Revi  | sion D. Char         | nae   | DATE TESTED:  |
| Nos. 1 & 2  |   |                      | .9-   | From: 06/04   |
|   |   | For single and       |   | Natao   |
| TESTS   | 160D<br>SECTION   | Test<br>Category     |   | Notes   |
| Temperature & Altitude<br>Temperature Variation (combined):<br>Low Temperature<br>- Ground Survival<br>- Operational<br>High Temperature<br>- Ground Survival<br>- Operational<br>Altitude<br>- Decompression<br>- Overpressure | 4.0<br>5.0<br>4.5.1<br>4.5.2 & 4.5.3<br>4.6<br>4.6.2<br>4.6.3 | [(A2)(F1)B]          | PASS  |   |
| In-Flight Loss of Cooling   | 4.5.4   | [(A2)Z]              | PASS  |   |
| Humidity  | 6.0   | A                    | PASS  |   |
| Operational Shock and Crash Safety<br>Vibration   | 7.0<br>8.0  | <u>В</u><br>[(H)(R)] | PASS<br>PASS:<br>RESONAN<br>Section 8.<br>Pre-Sc<br>Post-Si<br>Section 8.<br>Pre-Sc<br>Post-Si<br>Section 8.<br>Pre-Sc<br>Post-Si | T FREQUENCIES:<br>7.2, Step a. and d.:<br>an: X: 195Hz, Y: 500Hz, Z: 160Hz<br>can: X: 195Hz, Y: 450Hz, Z: 150Hz<br>8.1.3, Steps a. and e.:<br>an: X: 190Hz, Y: 425Hz, Z: 145Hz<br>can: X: 190Hz, Y: 625Hz, Z: 145Hz<br>8.1.3, Steps b. and d.:<br>an: X: 190Hz, Y: 390Hz, Z: 150Hz<br>can: X: 190Hz, Y: 625Hz, Z: 150Hz |
| Explosion   | 9.0   | Х                    |   |   |
| Water-proofness   | 10.0  | X                    |   |   |
| Fluids Susceptibility   | 11.0  | Х                    |   |   |

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22.0

23.0

24.0

25.0

Sand and Dust

Magnetic Effect

Power Input

Voltage Spike

Lightning Direct Effects

Audio Frequency Susceptibility

Lightning Induced Transient Susceptibility

Induced Signal Susceptibility Radio Frequency Susceptibility

Radio Frequency Emission

Electrostatic Discharge

Fungus

Icing

Salt Spray

#### RTCA/DO-160E Environmental Qualification Form (LED Models)

#### NAMEPLATE NOMENCLATURE: [A2F1Z]BBB[H(R)R(BB1G)]XXXXXZBABBC[WWJM[XXE2F2X]XXAX

TYPE/MODEL NO: SN3500

**TSO NUMBERS:** C113, C5e, C6d, C34e, C35d, C36e, C40c, C41d, C52b, 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 E

DATE TESTED: From: 8/29/07 To: 10/25/07

| ENUUD CNIMENT OF   | DICOLDO    | E         | Natas  |
|--|------------|-----------|--|
| ENVIRONMENTAL  | RICAYDO-   | Equipment | Notes  |
| TESTS  | DO-160E    | lest      |  |
| Tourses and the Statistical  | SECTION    | Category  | Dace   |
| lempelature & Antrode  | 40         | AZH       | P ASS  |
| Low lemperatule  | 45.1 0 452 |           |  |
| - Ground Survival  |            |           |  |
| - Operational  | 450 0 454  |           |  |
| High Temperature   | 4538454    |           |  |
| - Ground Survival  |            |           |  |
| - Operational  | 455        | _         | B 4 6 6  |
| In-Hight Loss of Cooling   | 455        | 1         | PASS   |
| Altifude   | 46.1       | FI        | PASS   |
| -Decompression   | 462        | A2        | Credit per Sandel Doc. No. 82005-0091          |
|  | 463        | AZ        | PASS   |
| Temperature Variation  | ຽມ         | в         | PASS:  |
| Humidity   | 6.3.1      | В         | PASS   |
| Operational Shock and Crash Safety   | 7.0        | В         | PASS   |
| Vibration  | 80         | THR       | PASS:  |
|  |            | 20 12     | RESONANT FREQUENCIES:                          |
|  |            |           | Section 8.7.2, Step a. and d.:                 |
|  |            |           | Pre-Sc an: X: 175Hz, Y: 550Hz, Z: 190Hz        |
|  |            |           | Post-Scan: X: 180Hz Y: 395Hz Z: 190Hz          |
|  |            |           | Section 8.8.1.3, Steps a. and e.:              |
|  |            |           | Pre-Scan: X: 180Hz, Y: \$\$0Hz, Z: 175Hz       |
|  |            |           | Post-Scan: X: 173Hz Y: 273Hz Z: 130Hz          |
|  |            |           | Section 6.6.1.8, Steps D. and d.:              |
|  |            |           | Post-Scan: X: 175Hz Y: 245Hz Z: 150Hz          |
| Explosion  | 9.0        | X         | n/a  |
| Water-proofness  | 10.0       | X         | n/a  |
| Ruids Susceptibility   | 11.0       | X         | n/a  |
| Sand and Dust  | 12.0       | X         | n/a  |
| Fungus   | 13.0       | X         | n/a  |
| Salt Soray   | 140        |           | nia  |
| Accuratio Effect   | 150        | 7         | Credit per Sandel Doc. No. 22005-0004          |
| Preservice de la contra de la c | 12.0       | -         | DACE   |
|  | 16.0       | P         | F ASS  |
| Voltage Spike  | 17.0       | A         | PASS   |
| Audio Requency Susceptibility  | 18.0       | В         | PASS   |
| Induced Signal Susceptibility  | 19.0       | BC        | Credit per Sandel Doc. No. 82005-0091          |
| Radio Requency Susceptibility  | 20.0       | [WW]      | PASS- RF Radiated Susceptibility, 160E section |
|  |            | 10. 57    | 20.5/Credit per Sandel Doc. No. 82005-0091     |
| Radio Frequency Emission   | 21.0       | M         | PASS- RF Radiated Emission, 160Esection        |
| N 61   |            |           | 21.4/Credit per Sandel Doc. No. 82005-0091     |
| Lightning Induced Transient  | 22.0       | [XXE2F2X1 | Credit per Sandel Doc. No. 22005 0004          |
| Susceptibility   |            | [         | 02005-0091                                     |
| Lightning Direct Rifects   | 23.0       | Ŷ         | nia  |
|  | 240        | Ŷ         | nica<br>pla                                    |
| Restructurio Disoborno   | 24.0       | A         | DACC   |
| Sectosiano Discharge   | 25.0       | ×         | F M35  |
| Hre, Hammability   | 26.0       | Å         | n/a  |

## 9 Appendix C: Sample FAA Form 337

### NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished

(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

- A. Installed the following equipment and components:
  - 1. Sandel Avionics, Inc., SN3500 Navigation Display (or as appropriate), Part Number SN3500-000 (or as appropriate)
  - 2. Sandel Avionics LLC, Clamp Fixture 3ATI, Part Number 61062.
- B. The Sandel Avionics SN3500 is interfaced to the following equipment:
  - 1. Garmin International, GPS165, GPS Navigation Receiver (Approved for En route, Terminal, and Non-precision Approach). (or as appropriate)
  - 2. AlliedSignal Electronics and Avionics, KX 165 Communications and Navigation Receiver. *(or as appropriate)*
  - 3. AlliedSignal Electronics and Avionics, KX 155 Communications and Navigation Receiver. *(or as appropriate)*
  - 4. AlliedSignal Electronics and Avionics, KRA 10A Radar Altimeter System. (or as appropriate)
  - 5. AlliedSignal Electronics and Avionics, KR 22 Marker Receiver. (or as appropriate)
  - 6. AlliedSignal Electronics and Avionics, KG 102A Directional Gyro. (or as appropriate)
  - 7. AlliedSignal Electronics and Avionics, KMT 112 Magnetic Azimuth Transmitter. (or as appropriate)

(By example state the following functional interface properties)...

C. The SN3500 receives and processes GPS navigation information for digital and waypoint display from the GPS165. These operations are considered supplemental navigation.

- D. The SN3500 receives and processes VOR, localizer, and glideslope deviation and composite audio for bearing display from the KX 165. These operations are considered primary means of navigation.
- E. The SN3500 receives and processes glideslope deviation and composite audio for bearing display from the KX 155.
- F. The SN3500 receives and processes marker beacon receiver information for illumination from the KR 22.
- G. The SN3500 receives and processes magnetic heading for digital and graphic display from the KG 102A and KMT 112.
- H. Interference and functional tests and inspections were accomplished with reference to Advisory Circular 23.1311. (or as appropriate).
- I. A system design and analysis was conducted with reference to Advisory Circular 2X.1309-1(). (or as appropriate).
- J. Federal Aviation Regulations, 2X.1301, 2X.1309(a), (b) and (d), 23.1311, 2X.1321(a), (b) and (d), 2X.1322, 2X.1327(a), 2X.1331, 2X1351, 2X.1357(a)-(d), 23.1365, 2X.1381, 2X.1529, and 2X.1581 (or as appropriate), were the basis of compliance.
- K. Installation approval is sought with reference to Flight Standards Information Bulletin, FSAW 95-09() (Amended), titled "Electronic Horizontal Situation Indicator (EHSI) Approvals".
- L. The aircraft equipment list, and weight and balance were revised and recorded within the aircraft maintenance records.
- M. All pertinent records of this alteration are on file at *(State your repair station name and number)*.

----- End ------

### 10 Appendix D: Sample Airplane Flight Manual Supplement

The following is being provided for installations in which the local FSDO requires an Airplane Flight Manual Supplement. This Sample is simply being provided for the convenience of the installer. Note that the cover page, table of contents and log of revisions has not been included here, and will be specific to your installation. The text is specific to the installed equipment, and also specifies ILS LOCKOUT operation. This text must be modified by the installation facility to be compatible with the installed equipment.

#### **SECTION I - GENERAL**

The Sandel Avionics SN3500 Primary Navigation Display (PND) is a compact three-inch instrument that performs the functions of a traditional Horizontal Situation Indicator combined with a two-pointer RMI. The SN3500 also displays a moving map, Stormscope® data, FIS-B data link weather, traffic information, marker beacon and GPS annunciators if the aircraft is appropriately equipped and configured.

#### Add following shaded text if Data Link Weather is installed:

FIS-B Weather Data is intended for the purpose of assisting in long-range strategic flight planning only. Please note that its delayed updating and lack of sufficient resolution makes it unsuitable for tactical maneuvering of the aircraft. It also differs significantly from on-board weather radar (which scans a narrow vertical angle) since it portrays radar returns from multiple ground stations extending from the surface up to the highest flight levels. For these reasons it may not even directly reflect the current flight conditions.

#### SECTION II LIMITATIONS

The system must utilize software version X.XX or later FAA approved version.

The SN3500 Navigation Display Pilots Guide, SPN 82005-PG (or applicable revision corresponding to the software version) must be immediately available to the flight crew.

The "CRC Self Test Failed" message must not appear on power-up if flight operations are predicated on the use of the SN3500 Primary Navigation Display.

#### Add following shaded text if Data Link Weather is installed:

The FIS-B weather display shall not be used for tactical maneuvering of the aircraft.

#### SECTION III EMERGENCY PROCEDURES

If the SN3500 fails to operate, use the magnetic compass as a heading source.

If the remote directional gyro (DG) becomes inoperative, the magnetic fluxgate will provide the heading, and the resulting heading display will respond much more slowly than normal. The compass rose changes color from white to amber, and digital heading numbers will be redlined.

If the fluxgate fails, the SN3500 Navigation Display will continue to display heading based on the directional gyro (DG) input. The compass rose changes color from white to amber, heading numbers will be redlined.

#### Add following shaded text if FCS outputs are <u>Used:</u>

If the "FCS FDBCK ERR" message appears when in autopilot coupled NAV or APPR mode, immediately monitor the lateral and vertical deviation indicators. If they are not tracking properly, immediately disable the autopilot and flight director NAV or APPR mode for the duration of the flight. HDG mode may still be used if the autopilot tracks the SN3500 HDG bug properly.

#### Add following shaded text if FCS outputs are <u>not used</u>:

If the "FCS FDBCK ERR" message appears it has no effect on the autopilot system and no pilot action needs to be taken.

### SECTION IV NORMAL PROCEDURES

The SN3500 NAV pushbutton selects the primary navigation source NAV1, NAV2 or GPS1. The selected source will drive the SN3500 deviation indicator and the autopilot.

ILS override will prevent selection of the GPS as long as an ILS frequency is tuned on NAV1 or NAV2. This will be annunciated on the SN3500 Navigation Display.

The SN3500 BRG pushbutton selects the bearing pointer 1 / 2 / both. The 'M' pushbutton followed by the BRG pushbutton selects the bearing pointer sources NAV1, NAV2, GPS1, GPS2, or ADF.

Annunciation of all GPS modes is accomplished by messages on the GPS receiver as well as on-screen annunciation on the SN3500.

#### Add following shaded text if Traffic is installed:

The traffic display mode is annunciated next to the TFC button. There are three different modes available which control how the traffic targets are displayed. Press the TFC button repeatedly to cycle through the different modes.

ON: Enables display of all targets within the selected map range (limited by the maximum range of the installed traffic system).

M: Manual mode. Traffic will be displayed at the selected map range only when alerting traffic is present, without auto ranging. Display range can be changed manually.

A: Auto mode. Traffic will be displayed at the selected map range only when alerting traffic is present, except that the map range will auto-scale to an appropriate range to show the traffic on-screen.

Manual (M) or Auto (A) modes do not display non-alerting traffic.

#### Add following shaded text if Data Link Weather is installed:

The SN3500 can display two types of weather information, precipitation and lightning. Lightning may be displayed from two independent sources, WX-500 Stormscope® or a FIS-B data link receiver. Both sources of lightning may be displayed simultaneously.

The SN3500 WX pushbutton selects the type weather to be displayed:

- PL: Precipitation & Lightning
- P: Precipitation only
- L: Lightning only

The 'M' pushbutton followed by the WX pushbutton selects the lightning display data source, either WX500, WSI, or both. The number to the right of the WX annunciation displays the time in minutes since the last FIS-B precipitation data was received from the data link receiver.

Weather graphics depicted on the SN3500 data link weather display may differ significantly from the on-board weather radar or from out of the cockpit observations for one or more of the following reasons.

- Vertical strata information is not provided by the FIS-B weather service. The FIS-B weather data originates from NEXRAD ground based weather radar observations that include weather measurements up to 30,000 feet above the radar facility. The on-board weather radar is measuring returns relative to the current flight level.
- The FIS-B weather display is not exactly real time. Under certain circumstances the time from when the NEXRAD radar observations were made to when the data is displayed on the SN3500 can be as high as 40 minutes. During this time the position of the weather may have significantly changed or moved relative to the aircraft position.
- The graphic representation of precipitation is predicated on the level of reflected energy from moisture in the air mass (the more moisture in the air mass, the higher level of energy returned to the radar antenna). This may result in graphic presentation of precipitation on the SN3500 display when no visible moisture can be seen.
- Virga precipitation: the precipitation may be at a higher flight level and evaporating before reaching the current aircraft flight level.

#### Add following shaded text if LNAV/Roll Steering is installed:

The LNAV (GPS roll steering) function is an extension of the of the SN3500 heading bug function. To operate LNAV, the NAV source must be GPS and the autopilot is kept in the HDG mode.

Press and hold the heading bug knob to select LNAV ARM. Leave the autopilot in HDG mode.

Use the heading bug to turn the aircraft to a track that will intercept of the active leg of the GPS flight plan. The dotted track line emanates from the airplane present position on the map display, depicting the current track. Intercept will occur where the dotted track line crosses the GPS course line.

During LNAV ARM the heading bug will remain color-filled and operational, until leg capture occurs. When capture occurs the heading bug goes to outline form and mode annunciation changes to LNAV in magenta. The steering commands are then output on the HDG output of the SN3500, and the heading bug is disconnected from the HDG output.

Press and hold the heading bug knob to exit from LNAV or LNAV ARM back to HDG. The heading bug fill color will be restored and the heading bug will be connected to the HDG output of the SN3500. The GPS Steering command is disconnected.

The circuit breaker for the SN3500 Navigation Display is located on the lower right circuit breaker panel labeled EHSI 1.

Refer to the SN3500 Primary Navigation Display Pilot's Guide for other procedures, error messages, alerts and more detailed FIS-B data link weather information.

#### SECTION V PERFORMANCE DATA

No Change to AFM.

## 11 Appendix E: Checkout Procedures

## **11.1 Functional Ground Test Procedures/Report**

The "Functional Ground Test Procedures/Report" below is for the purpose of simplifying ground tests of the SN3500. A copy of this report (and the "Operational Flight Check Procedures/ Report") <u>must</u> be retained by the installing agency and a copy <u>must</u> be installed in the aircraft maintenance records. A copy <u>must</u> also be forwarded to Sandel Avionics, Inc. along with the Warranty Registration Form, Part Number 10235, which should be mailed after operational acceptance.

| Repair Station Name: |             |  |
|----------------------|-------------|--|
| Number:              |             |  |
| Address or Location: |             |  |
| City                 | _ ST ZIP    |  |
| A/C Make:            | A/C Model:  |  |
| A/C Serial No:       |             |  |
| Work Order No.:      | Technician: |  |
| Date Performed:      |             |  |

COMPANY NAME COMPANY ADDRESS TELEPHONE/FAX

## **Ground Test Procedures/Report**

For

## Sandel Avionics SN3500

Installed in

{aircraft make and model}

Registration No. \_\_\_\_\_

SN3500 Serial No. \_\_\_\_\_

Document No. \_\_\_\_\_

Rev. -, Date

#### 11.1.1 Introduction

The following ground test procedures are to be performed after the SN3500 has been properly configured in the "Post-Installation Procedures", but prior to performing flight test procedures. Successful completion of both the Ground Test and Flight Test procedures is necessary to support the claim that the SN3500, as installed, performs its intended function and is compatible with all aircraft systems. The ground test procedures contained herein will include testing of interfaces to other systems. Therefore, this ground test must be conducted in conjunction with, or subsequent to ground testing of other systems.

The following external system interfaces will be tested:

- Heading input from directional gyro
- Compass input from fluxgate sensor (if installed)
- Navigation data inputs: VOR/ILS/GS, ADF, DME, GPS and FMS (if installed)
- Annunciator inputs from a marker beacon receiver (if installed)
- Annunciator inputs from a GPS receiver (if installed)
- Lightning-strike inputs from a WX-500 Stormscope® sensor (if installed)
- Remote NAV source switching relays and/or indicators (if installed)
- External NVIS control switch (if installed)

#### 11.1.2 Test Procedures and Results

#### 11.1.3 Physical Installation

Verify that the SN3500 clamp tray has been properly installed in accordance with the manufacturer's instructions, that any external switches affecting SN3500 operation have been clearly labeled, and that a trip-free resetable circuit breaker labeled "EHSI" is clearly visible. Ensure that cooling air intake is not obstructed.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.1.4 Wiring Verification and Initial Power-Up

Perform a 100% continuity check of all aircraft wiring to verify in accordance with installation wiring diagrams.

Power check all wiring to ensure that 28 Vdc and 26 Vac (if applicable) are applied to the proper pins and nowhere else.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Install the SN3500 into the clamp tray and verify <u>full connector mating</u> and that the unit installs without obstruction.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Activate the aircraft master switch and avionics master switch, if installed. Verify that the SN3500 display illuminates within 30 seconds.

Switch on all equipment interfaced to the SN3500 such as NAV receivers, gyros, and marker beacon receivers.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.1.5 System Configuration

If not previously accomplished, perform the "Post-Installation Procedures" included in the Appendix of the SN3500 Installation Guide. These procedures describe how to configure the SN3500 for compatibility with installed systems.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.1.6 System Functions

#### 11.1.7 Compass System Interface

Power up the system and verify that within 3 minutes the compass card is displayed in white and agrees with the heading on a magnetic compass.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Disable the fluxgate excitation to the SN3500. Verify that within 10 seconds the compass digital heading is flagged. Restore the fluxgate excitation and verify that within 10 seconds the display is fully restored. Note: If fluxgate excitation and gyro are interconnected, remove both signals simultaneously and look for simultaneous failure indications.)

Remove power to (or otherwise disable) the remote directional gyro. Verify that the compass card is displayed in amber AND that a warning message is displayed on the SN3500 which requires operator acknowledgement.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.1.8 NAV Source Selection

#### If the SN3500 is configured in "master" mode (no external NAV/GPS switch):

Press the [NAV] button repeatedly and verify that the screen legend next to the button cycles correctly through the configured NAV sources, i.e. NAV1, NAV2, GPS1, GPS 2, TACAN 1, TACAN 2 (or as configured). For each NAV source, create valid and invalid NAV conditions and verify correct display of the SN3500 NAV flag for each receiver (the large red "X" through the CDI). For each VOR/LOC source, verify that tuning an ILS frequency causes the glideslope (vertical deviation) scale to display on the screen, even if it is flagged.

#### Completed \_\_\_\_\_ Comment \_\_\_\_\_

[If ILS Lockout is enabled] Press the [NAV] button and select a source other than NAV1, such as GPS or NAV2 (if configured). Tune NAV1 to an ILS frequency, and verify that after a one-second delay, the selected NAV source automatically reverts to NAV1. Verify that as long as NAV1 is tuned to an ILS frequency, pressing the [NAV] button will not change the NAV source, but instead will display the message "NAV1 TUNED TO LOC". Verify that upon *de-tuning* the ILS frequency from NAV1, the NAV source selection returns to its original state.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

If NAV2 is configured, tune both NAV1 and NAV2 to an ILS frequency and verify that NAV1 remains selected. Detune the ILS frequency on NAV1 and verify that the display reverts to NAV2.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

If the SN3500 is configured in "slave" mode (using external NAV/GPS switch):

Verify that pressing NAV does not change the selected NAV source, but instead displays an advisory message.

Verify that the external NAV/GPS switch arrangement correctly controls the selected NAV source on the SN3500, including any ILS lockout scheme, if implemented.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.1.9 LOC/GS Deviation

Using a ILS test signal generator verify proper deviation of the LOC/GS deviation indicators on the SN3500. Tune the NAV1 to match the ILS test signal generator frequency (usually 108.1 MHz.). Select LOC 1 on the SN3500. Adjust the signal generator to verify the following indications on the SN3500 LOC deviation indicator, center, 2 dots fly left, 2 dots fly right, and LOC flagged. Adjust the signal generator to verify the following indications on the SN3500 GS deviation indicator, center, 2 dots fly down, and GS flagged. Repeat for NAV2.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.1.10 BRG Source Selection

Press M and then press BRG on the SN3500 and verify that all installed NAV sources are presented for *each* bearing pointer (NAV1, NAV2, ADF1, ADF2, TACAN 1, TACAN 2, GPS1, GPS2 as installed). In addition, bearing pointer 1 will have "AUTO" listed as a choice.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Select each available NAV source for each pointer, and verify in turn that the depicted bearing corresponds to the actual bearing shown on the NAV source.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.1.11 DME Selection

If two DME receivers are installed and configured:

Verify that pushing NAV to select between NAV1 and NAV2 also switches the appropriate DME readout on the SN3500 distance display. Press M and then BRG to configure bearing pointer 1 to be NAV1 and bearing pointer 2 to be NAV2. Press BRG to display both pointers simultaneously. Verify that the correct DME data is displayed in each bearing pointer data block.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

If a single DME receiver is installed and is not switchable between NAV1 and NAV2:

Verify that pushing NAV to select between NAV1 and NAV2 causes the DME readout to be displayed when NAV1 is selected, and the DME readout to be removed when NAV2 is selected. Press M and then press BRG to configure bearing pointer 1 to be NAV1 and bearing pointer 2 to be NAV2. Press BRG to display both pointers simultaneously. Verify that DME data is displayed in the bearing pointer 1 data block, and that no distance data is displayed in the bearing pointer 2 data block.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

If a single DME receiver is installed and is switchable between NAV1 and NAV2:

Verify that pushing NAV to select between NAV1 and NAV2 causes either the correct DME readout to be displayed or a "none" indication, depending on the position of the external DME select switch (if installed). Press M and then press BRG to configure bearing pointer 1 to be NAV1 and bearing pointer 2 to be NAV2. Press BRG to display both pointers simultaneously. Verify that DME data is displayed in the bearing pointer 1 data block when DME is externally switched to NAV1. Verify that when DME is externally switched to NAV2, an arrow (" $\rightarrow$ ") appears in the DME portion of the pointer 1 data block. Press BRG to deselect pointer 1 and only display pointer 2. Verify that proper DME data is now displayed in the bearing pointer 2.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

If an external DME HOLD control is configured:

Verify that enabling DME HOLD displays the "H" symbol for each installed DME receiver so equipped.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.1.12 GPS Interface and Control

For each GPS receiver installed and configured:

Allow the receiver to acquire a valid position fix, and press NAV on the SN3500 to select that receiver as a NAV source. Enter either a single destination waypoint or a flight plan on the GPS receiver and select normal (LEG) navigation mode. Verify that the course pointer automatically rotates to the desired track, and that groundspeed and waypoint ID are displayed on the SN3500.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Press M and then press BRG and assign either bearing pointer to the selected GPS receiver. Verify that the bearing pointer corresponds to the bearing-towaypoint, and that the distance displayed matches the display on the actual receiver.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

If the GPS is equipped with an OBS mode (Bendix/King) or a HOLD mode which enables course resolver input (Garmin), select the OBS or HOLD mode and verify that rotating the course select knob turns the course pointer. Verify that the needle centers on the correct bearing to waypoint.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Enter the "CDI and Annunciator Test" mode of the GPS if available. Verify proper response of the GPS annunciators, if configured to display on the SN3500. If external mode selection is enabled on the SN3500, verify that the GPS pushbutton softkeys accessed in NAV menu control the proper GPS functions.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.1.13 Marker Beacon Interface

If a marker beacon receiver is interfaced to the SN3500:

With a marker beacon test set, generate outer, middle, and inner marker signals respectively. Verify that the appropriate annunciation appears on the SN3500.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Press "TEST" mode on the marker beacon receiver, and verify that the "MT" symbol appears on the SN3500.

### 11.1.14 Flight Control System Interface

If the SN3500 is interfaced to a flight control system (FCS):

Place the FCS mode selector in heading (HDG) mode. Verify that the aircraft controls respond correctly as the heading knob is turned and the heading bug moves around the SN3500 display.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Place the FCS mode selector in nav-coupled (NAV) mode. Verify that the aircraft controls respond correctly as the course select knob is turned and the course pointer moves around the SN3500 display.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Switch sequentially through all the NAV sources and verify that the autopilot L/R and U/D (if applicable) signals responds correctly to the selected receiver.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.1.15 Stormscope ® Interface

If the SN3500 is interfaced to a WX-500 remote lightning sensor:

Enable the Stormscope® display by within the WX menu. Verify that "WX" is annunciated on the SN3500 display.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Press M and then WX and select "WX TEST". Verify that the word "TEST" is annunciated on the SN3500 display for approximately 10 seconds, and is then replaced by "WX".

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.1.16 Traffic

If the SN3500 is interfaced to a traffic processor.

Activate the TEST function on the traffic processor and verify that the test pattern is displayed on the SN3500.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.1.17 NVIS Control

If the SN3500 supports NVIS compatibility, (SN3500-XXXN).

Activate the external NVIS control switch and verify "NVIS" is annunciated on the lower right of the screen.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

### 11.1.18 Reversionary Display Control

If the SN3500 is configured to support the Reversionary Attitude Display.

Activate the external 'REV' control switch and verify the SN3500 displays a representative horizon and compass arc for the attitude of the aircraft. Place the 'REV' control switch back in the normal position and verify the SN3500 switches back to the normal HSI display.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.1.19 Additional Testing

Perform any additional tests deemed necessary.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

### **11.2 EMI/RFI Test Procedures**

11.2.1 Nav/Com Testing

Apply power to the avionics bus and ensure that all electrical equipment, including the SN3500, is operating normally. Open the squelch on the primary communications radio and tune the radio to each whole megahertz frequency sequentially. Attempt to discern any interference caused by the SN3500. Pull the SN3500 breaker if interference is noted, to verify that the SN3500 is the source.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Repeat for the secondary communications radio.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Tune the primary navigation radio to 112 MHz and enable the audio output. Attempt to discern any audible interference cause by the SN3500.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Repeat for the secondary navigation radio.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Transmit on the frequencies 118.000 MHz, 126.975 MHz, and 135.975 MHz on the primary communications radio and attempt to discern any changes in the SN3500 display.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Repeat for the secondary communications radio.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.2.2 General Testing

Observe any unusual interaction between the transponder, DME, ADF or Marker Beacon receivers, and the SN3500 when switching power to any equipment.

## 11.2.3 Additional Testing

Perform any additional EMI/RFI-related tests deemed necessary.

## **11.3 Operational Flight Test Procedures/Report**

The following "Operational Flight Check Procedures/Report" is for the purpose of simplifying the in-flight operational check of the SN3500. A copy of this report (and the "Functional Ground Test Procedures/ Report") <u>must</u> be retained by the installing agency and a copy <u>must</u> be installed in the aircraft maintenance records. A copy <u>must</u> also be forwarded to Sandel Avionics along with the Warranty Registration Form, Part Number 10235, which should be mailed after operational acceptance.

## COMPANY NAME COMPANY ADDRESS TELEPHONE/FAX

## **Flight Test Procedures/Report**

for

## Sandel Avionics SN3500

## Installed in

# {aircraft make and model}

Registration No. \_\_\_\_\_

Serial No. \_\_\_\_\_

Document No. \_\_\_\_\_

Rev. -, Date

### 11.4 Introduction

The Flight Test Procedures described below are to be performed after both the Post-Install Procedures and the Ground Test Procedures are performed. Successful completion of the Flight Test Procedures will then satisfy the criteria for operational acceptance of the SN3500 installation.

Specific procedures are not provided for many of the tests herein, due to differences in installed options and aircraft configurations. Refer to the SN3500 Pilot's Guide and the proposed Airplane Flight Manual Supplement for operational details of the equipment.

Each test item is followed by a space for the initials of the person performing the procedure, and a space for a description of any observations or anomalies. Determination of a successful flight test is made after analysis of these observations.

## 11.5 Test Procedures

#### 11.5.1 **Pre-Departure Operations**

Apply power to the SN3500 and all associated equipment. Determine that all equipment initializes and functions normally.

Verify that the SN3500 internal brightness control can control the brightness of the SN3500 and that a satisfactory brightness level can be attained.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Evaluate the display of the SN3500 for readability.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Evaluate the intensity properties of the SN3500 display under both direct and indirect sunlight conditions, and in nighttime operation conditions.

Check the function of all buttons and knobs, and confirm that all controls are operational.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.5.2 Enroute Operations

Cycle various aircraft electrical equipment such as lights, landing gear, radar, windscreen heat, and anti-icing boots. Verify that none causes interference on the SN3500 display.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Verify proper operation of one or both VHF NAV receivers (as installed), both as NAV sources and as bearing pointer sources. Simultaneously verify proper channeling and display of one or both DME sources, as installed.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Verify proper operation of one or both long-range NAV receivers (as installed), both as NAV sources and as bearing pointer sources. Include verification of map display of waypoints.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Verify proper operation of one or both TACAN receivers (as installed), both as NAV sources and as bearing pointer sources.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Verify proper operation of one or both ADF sources as bearing pointers if installed.

For each NAV source, verify proper operation of the flight control system, both in NAV (coupled) mode and in heading mode.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

Verify proper operation of the WX-500 Stormscope® sensor, if installed.

| Completed | _ Comment |  |
|-----------|-----------|--|
|-----------|-----------|--|

#### **11.5.3 GPS Approach Operations**

If installed, configure each approach-capable GPS receiver for a non-precision approach. Conduct the approach and evaluate proper operation of:

- CDI sensitivity and deflection
- Resolver interface in OBS or HOLD mode
- GPS annunciator display on the SN3500 (as installed)
- External GPS mode control switches on the SN3500 (as installed)
- Waypoint display when map is enabled on the SN3500

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.5.4 TACAN Approach Operations

If installed, conduct at least one TACAN approach (in VFR conditions). Conduct the approach and evaluate proper operation of:

• CDI sensitivity and deflection

Completed \_\_\_\_\_ Comment \_\_\_\_\_

#### 11.5.5 ILS Approach Operations

Conduct at least one fully coupled ILS approach (in VFR conditions) for each VHF NAV receiver installed. During the approach, verify proper operation of:

- Lateral deviation display (CDI) in both ARC and 360 modes
- Vertical deviation display in both ARC and 360 modes

- Marker beacon annunciation on the SN3500, if installed
- Flight control system operation.

Completed \_\_\_\_\_ Comment \_\_\_\_\_

### 11.5.6 Additional Testing

Perform any additional flight testing deemed necessary.

## 12 Appendix F: List of Effective Drawings and Attachments

| Drawing        | Rev | Title  |
|----------------|-----|--|
| 82005-07       | Α   | LAYOUT, SN3500                               |
| 82005-05       | Α   | Layout, SN3500 INSTALLATION                  |
| 82005-10 pp 1  | D   | POWER AND INVERTER                           |
| 82005-10 pp 2  | С   | FCS DEVIATION (INT RELAY)                    |
| 82005-10 pp 3  | С   | FCS DEVIATION (EXT RELAY)                    |
| 82005-10 pp 4  | С   | FCS GENERIC CRS/HDG DATUM                    |
| 82005-10 pp 5  | С   | BENDIX AUTOPILOTS                            |
| 82005-10 pp 6  | С   | BENDIX /KING AUTOPILOTS                      |
| 82005-10 pp 7  | В   | CENTURY IV AUTOPILOTS                        |
| 82005-10 pp 8  | A1  | CENTURY 1C388 COUPLERS                       |
| 82005-10 pp 9  | A1  | S-TEC AUTOPILOTS                             |
| 82005-10 pp 10 | В   | KING KG102A – SN3500 SLAVING                 |
| 82005-10 pp 11 | В   | KCS55 – BOOTSTRAP XYZ                        |
| 82005-10 pp 12 | В   | S-TEC (AERONETICS) GYRO                      |
| 82005-10 pp 13 | В   | XYZ GYRO (GYRO SELF SLAVED)                  |
| 82005-10 pp 14 | В   | XYZ GYRO                                     |
| 82005-10 pp 15 | С   | XYZ GYRO WITH KMT112                         |
| 82005-10 pp 16 | С   | COLLINS PN101 UPGRADE                        |
| 82005-10 pp 17 | В   | MID-CONTINENT 4305                           |
| 82005-10 pp 18 | С   | SN3500 COMPASS BOOTSTRAP                     |
| 82005-10 pp 19 | В   | KCS-55 REMOVAL (REF)                         |
| 82005-10 pp 20 | С   | NAV-1RS-232 GPS (EXT RELAY)                  |
| 82005-10 pp 21 | С   | NAV-1 RS-232 GPS (INT RELAY)                 |
| 82005-10 pp 22 | C2  | NAV-1 / ARINC-429 GPS (EXT RELAY)            |
| 82005-10 pp 23 | С   | NAV-1 / ARINC-429 GPS (INT RELAY)            |
| 82005-10 pp 24 | В   | NAV-2, GPS-2 (RS232)                         |
| 82005-10 pp 25 | В   | RESOLVER INTERCONNECT                        |
| 82005-10 pp 26 | A1  | GPS SWITCH / ANNUNCIATORS                    |
| 82005-10 pp 27 | D   | SINGLE SN3500 / SINGLE GNS430/530 GTN6XX/7XX |
| 82005-10 pp 28 | E   | SINGLE SN3500 / DUAL GNS430/530 GTN6XX/7XX   |
| 82005-10 pp 29 | A1  | ADF  |

| Drawing        | Rev | Title  |
|----------------|-----|--|
| 82005-10 pp 30 | С   | MARKER BEACON                                |
| 82005-10 pp 31 | С   | DME, KING SERIAL                             |
| 82005-10 pp 32 | A1  | DME: ARINC 568                               |
| 82005-10 pp 33 | C1  | WX-500                                       |
| 82005-10 pp 34 | С   | TCAS/TRAFFIC                                 |
| 82005-10 pp 35 | С   | TCAS II                                      |
| 82005-10 pp 36 | C1  | SINGLE SN3500 GNS480                         |
| 82005-10 pp 37 | Е   | WSI Data Link Receiver                       |
| 82005-10 pp 38 | В   | SN3500 with SG102 ARINC 429 or 407 Interface |
| 82005-10 pp 39 | А   | SN3500 with TACAN                            |
| 82005-10 pp 40 | А   | NVIS Control                                 |
| 82005-10 pp 41 | В   | Reversionary Attitude Control                |
| 82005-10 pp 42 | Α   | NAV/GS Superflags                            |

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SN3500 input power requires 11 to 33 VDC.

See Note 4.



NOTES:

**REQUIRED.** 

TO P2.

MODELS.



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| Ι | DA     | DATE RE |    | COMMENTS  |  |
| I |        |         | Α  | INITIAL RELEASE   |  |
|   |        |         | С  | A/R 806 NEW PAGE NUMBER. ADDED INVERTER 2.<br>CORRECTED NOTE 2.       |  |
|   | JAN 12 | , 2006  | C1 | A/R 824 ADDED ADDITIONAL TEXT TO EMPHASIZE POWER REQUIREMENTS.        |  |
|   |        |         |    | MODIFIED NOTE 2 TO INCLUDE CLARIFICATION<br>FOR AUTOPILOT CONNECTION. |  |
|   | JUL 18 | , 2008  | D  | UPDATED FOR 14 VOLT AIRCRAFT AND<br>NOTE 4. AR 1023                   |  |
|   |        |         |    |   |  |



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|              |                    | С        | A/R 806 M                | inor change, co             | orrected sign              | al ground line.   |   |
|              |                    |          | names.                   | pinout for excit            |                            | ophot signal      |   |
|              |                    |          | Added opti               | onal superflag              | connection f               | or reference      |   |
|              |                    |          | and note 5               | . Modified note             | 4 for clarity.             |                   |   |
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|              | NOTES:             |          |                          |                             |                            |                   |   |
|              | 1. IN THIS         | S CONFI  | GURATION                 | THE SN3500 A                | ACTS AS TH                 | E                 |   |
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|              | 3. THIS S          | IMPLIFIE | S INSTALL                | ATIONS WITH                 | A SINGLE A                 | NALOG             |   |
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|              | 4. INVER           |          |                          |                             | ED WITH AU                 | TOPILOTS          |   |
|              | USED, SI           | ELECT D  | C SIGNAL C               | ON FCS MAINT                | ENANCE P                   | AGE.              |   |
|              | 5. IF AC (         | COURSE   | AND HEAD                 | ING DATUMS                  | ARE USED                   | WITHOUT           |   |
|              | USING E.           | TED TO   | L EXCITATIO<br>P1-16 AND | ON ON P2-10,<br>TO AUTOPILC | 400 HZ AC I<br>DT EXCITATI | NUST BE<br>ON IN. |   |
|              | SELECT             | AC SIGN  | AL ON FCS                | MAINTENANO                  | CE PAGE.                   |                   |   |
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|      | A   | INITIAL RELEASE   |
|      | С   | A/R 806 MINOR DOC CHANGE P1-22 AND P1-7<br>REVERSED, P2-37 WAS P2-7 |

# **BLOCK DIAGRAM SHOWS USE OF EXTERNAL** AUTOPILOT SWITCHING RELAY USING SN3500 CONVENTIONAL LOW LEVEL INPUTS

NOTES:

- IN THIS CONFIGURATION THE SN3500 ACTS AS AN INDICATOR, 1: FOLLOWING THE RECEIVER SELECTED WITH AN EXTERNAL RELEAY.
- 2. THIS IS A GENERIC ILLUSTRATION. REFER TO THE SPECIFIC DETAIL DRAWINGS FOR YOUR INSTALLATION.
- 3. THIS INSTALLATION IS THE SAME AS ORIGINAL SN3308 CONFIGURATION.





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| DATE | REV | COMMENTS   |
|      | В   | INITIAL RELEASE  |
|      | С   | A/R 806 Minor change, corrected pinout for excitation. |
|      |     | COMPUTER CONTROLLED DRAWING                            |

### NOTES:

1. IF INSTALLATION ALREADY CONTAINS A KING KA52/57 AUTOPILOT ADAPTER IT MAY REMAIN IN THE SYSTEM. TREAT THE SN3500 AS A KI525.

2. SN3500 DATUM OUTPUTS ARE REFERENCED TO SIGNAL GROUND.

3. CHECK AUTOPILOT INTERNAL SCHEMATIC TO INSURE THAT THE SN3500 IS DRIVING THE SIGNAL INPUTS AND THAT IT IS PERMISSABLE TO GROUND 'C' OR 'Y' AS SHOWN. IN SOME CASES 'C' MAY BE SIGNAL AND 'H' MAY BE GROUND. CALL FACTORY WITH ANY QUESTIONS.

4. WHEN BC OUTPUT NOT REQUIRED LEAVE UNCONNECTED.

5. BC OUTPUT IS AN OPEN COLLECTOR. RELAY REQUIRED IF BACK COURSE INPUT TO AUTOPILOT REQUIRES +28V TO ACTIVATE. OTHERWISE CONNECT SN3500 BC OUTPUT DIRECTLY TO AUTOPILOT BC INPUT.

6. IF CRS/HDG WORK BACKWARDS, EITHER a) USE OPPOSITE PHASE OF AC EXCITATION SOURCE; b) CHANGE LEFT/RIGHT DATUM SETTING ON FCS EMULATION MAINTENANCE PAGE.





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| DATE | REV | COMMENTS  |
|      | А   | INITIAL RELEASE   |
|      | A1  | A/R 780 MINOR DOC CHANGES                                       |
|      | С   | A/R 806 Minor change, added connection for autopilot exitation. |
|      |     |   |

NOTES

SELECT PN101 FOR HSI EMULATION ON THE FCS MAINTENANCE PAGE.
 SELECT IN831 FOR HSI EMULATION ON THE FCS MAINTENANCE PAGE.
 ANY COMMERCIAL 75MW OR GREATER AUDIO TRANSFORMERS MAY BE USED SUCH AS MAGNA-TEK TY-141P OR EQUIVALENT









# **CENTURY IV INTERCONNECT (5KHZ AC VERSION)**



**CENTURY IV INTERCONNECT (DC VERSION)** 



NOTES 1 & 2

| NOTES   | :      |               |                 |                 |                     |         |              |
|---|--------|---------------|-----------------|-----------------|---------------------|---------|--------------|
| <ol> <li>SELECT NSD-360DC ON FCS EMULATION MAINTENANCE PAGE.</li> <li>ON FCS-EMULATION MAINTENANC PAGE, ADJUST HDG-GRADIENT (AND<br/>CRS-GRADIENT IF USED) TO HIGHEST VALUE THAT DOES NOT OVER-SHOOT<br/>THE LUBBER LINE DURING HDG-MODE AND NAV-MODE COURSE CHANGES<br/>RESPECTIVELY. EXCEPT FOR KI-525 THESE VALUES WILL BE IDENTICAL.</li> </ol> |        |               |                 |                 |                     |         |              |
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|   | В   | INITIAL RELEASE |  |  |
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| COMPUTER CONTROLLED DRAWING<br>DO NOT REVISE MANUALLY |     |                 |  |  |

D



JW Miller PN:9250-276 or Equiv

CENTURY 1C-388-C, 1C388-MC RADIO COUPLERS



(ABOVE COUPLERS DO NOT SUPPORT COURSE DATUM.)

**CENTURY 1C-388-2 RADIO COUPLER** 



**CENTURY 1C-388-3 RADIO COUPLER** 



|      |     | E  |
|------|-----|--|
| DATE | REV | COMMENTS   |
|      | Α   | INITIAL RELEASE                                  |
|      | A1  | A/R 780 MINOR DOC CHANGES                        |
|      |     | IPUTER CONTROLLED DRAWING<br>NOT REVISE MANUALLY |

NOTES:

1. SELECT NSD-360DC ON THE FCS MENU.

2. ON FCS EMULATION MAINTENANCE PAGE, ADJUST HDG-GRADIENT (AND CRS-GRADIENT IF USED) TO HIGHEST VALUE THAT DOES NOT OVER-SHOOT THE LUBBER LINE DURING HDG-MODE AND NAV-MODE COURSE CHANGES RESPECTIVELY. NORMALLY THESE VALUES WILL BE THE SAME.

3. GROUND CONNECTIONS TO SN3500 SIGNAL GROUND.

4. DO NOT GROUND ANY CENTURY II/III SIGNALS EVEN DURING TROUBLESHOOTING. THIS COULD DAMAGE THE AUTOPILOT. SEE THE

CENTURY INSTALLATION MANUAL FOR DETAILS.

5. ANY COMMERCIAL 75MW OR GREATER AUDIO TRANSFORMERS MAY BE USED. MAGNA-TEK TY-141P OR EQUIVALENT.





| DATE | REV         | COMMENTS                                       |
|------|-------------|--|
|      | Α           | INITIAL RELEASE                                |
|      | A1          | A/R 780 MINOR DOC CHANGES                      |
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|   |      | A1  | A/R 780 MINOR DOC CHANGES |  |  |  |
|   |      | В   | REMOVED NON-GYRO ITEMS    |  |  |  |
| COMPUTER CONTROLLED DRAWING<br>DO NOT REVISE MANUALLY |      |     |                           |  |  |  |



BENDIX/KING KI525A BOOTSTRAP MASTER WITH NO INTERNAL SN3500 SLAVING. (NOTES 1 AND 2)



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| DATE | REV | COMMENTS        |
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# COMPUTER CONTROLLED DRAWING DO NOT REVISE MANUALLY

- 1. SELECT NONE FOR FLUXGATE TYPE.
- TYPE.
   THIS CONFIGURATION IS USED WHEN BOOTSTRAPPED FROM AN EXISTING KCS55 SLAVED COMPASS SYSTEM. THIS MIGHT BE DESIRED WHERE AN EXISTING IS MOVED TO THE COPILOTS SIDE AND AN SN3500 IS INSTALLED ON THE PILOTS SIDE. UNDER THIS CONDITION THE SN3500 CAN BE DRIVEN BY THE BOOTSTRAP OUTPUT OF THE COPILOTS HSI.





1 SYNCHRO LOAD MAXIMUM.

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|      | A1  | A/R 780 MINOR DOC CHANGES                             |  |  |  |  |  |
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|      |     | COMPUTER CONTROLLED DRAWING<br>DO NOT REVISE MANUALLY |  |  |  |  |  |

NOTES

1. THE STEC/AERONETICS GYRO DOES NOT ALLOW THE USE OF AN EXTERNAL 400HZ INVERTER FOR ITS XYZ OUTPUTS. IF AN EXTERNAL INVERTER IS NEEDED TO DRIVE OTHER SYSTEMS WHICH ARE CONNECTED TO THE SN3500, THIS GYRO IS NOT COMPATIBLE.

2. THE 2200 OHM RESISTORS ARE RECOMMENDED (NOT REQUIRED) TO REDUCE RINGING FROM THE INTERNAL INVERTER. THE SN3500 APPLIES NO LOAD TO THE GYRO.

3. EARLY MODELS OF AERONETICS GYROS OPERATE AT 600HZ AND ARE NOT COMPATIBLE WITH THIS SYSTEM. CONTACT STEC FOR S/N INFORMATION.

| S         | ANE                        | )EL°                       | Vista, Ca.   |
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| Category  | ŚN3500 INS                 | TALLATION DI               | RAWING       |
| Title     | S-TEC (AEF                 | RONETICS) GY               | RO           |
| Size<br>B | Document Number            | 82005-10                   | ) Rev        |
| Create: T | uesday, September 19, 2000 | Mod: Friday, October 11, 2 | 013 Sheet 12 |



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| DATE | REV | COMMENTS   |
|      | Α   |  |
|      | A1  | A/R 780 MINOR DOC CHANGES                            |
|      | В   | REMOVED NON GYRO COMPONENTS. GYRO Z PIN<br>CORRECTED |
|      |     |  |

NOTES:

® Vista, Ca. Category SN3500 INSTALLATION DRAWING Title XYZ GYRO (GYRO SELF SLAVED) Size B Document Number B 82005-10 Create: Friday, September 22, 2000 Mod: Friday, October 11, 2013 Sheet 13

1. SELECT NONE FOR FLUXGATE TYPE.



| NOTES:   |   |
|--|---|
| 1. ANY TSO'D XYZ FLUX GATE IS PERMISSABLE, INSTAL<br>MANUFACTURERS RECOMMENDATION. IF FLUX GAT<br>THAN 26VAC USE A PAIR OF SERIES RESISTORS (2 W<br>DRIVE LEAD TO PROVIDE THE CORRECT DRIVE VOLT | L ACCORDING TO<br>E REQUIRES LESS<br>VATT) ONE IN EACH<br>'AGE. |
| SANDEL®  | Vista, Ca.  |
| Category SN3500 INSTALLATION DRA   | AWING   |
| Title XYZ GYRO   |   |
| B Document Number 82005-10   | Rev<br>B  |
| Create:Wednesday, May 18, 2005 Mod: Friday, October 11, 201  | 3 Sheet 14  |

|      |     | E   |
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| DATE | REV | COMMENTS  |
|      | В   | INITIAL RELEASE                                       |
|      |     |   |
|      |     | COMPUTER CONTROLLED DRAWING<br>DO NOT REVISE MANUALLY |



SANDEL SN3500

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|                | DATE       | REV<br>B |  |            |   |
|                |            | С        | A/R 806 TYPO P1-16 WAS P1-4                      | 4          |   |
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| 54             | <b>N</b> N | IL       |  | Vista, Ca. | 1 |
| Category SN    | 3500       | INS      | STALLATION DRAV                                  | WING       |   |
| Title XY       | Z GY       | 'RO      | WITH KMT112                                      |            |   |
| Size Docu<br>B | iment Nu   | mber     | 82005-10   | Rev        |   |
| Create:Wednes  | sday, Ma   | y 18, 2  | 005 Mod: Friday, October 11, 2013                | Sheet 15   |   |

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| B       | 2000  | 8                  | 32005-10                      |      |
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| Create: | Wedne | sday, May 18, 2005 | Mod: Friday, October 11, 2013 | She  |
|         |       |                    |                               | <br> |

LEAVING INSTALLED BUT BYPASSING THE SLAVING FUNCTION OF THE COLLINS 328A-3G SLAVING ACCESSORY WHEN UPGRADING A PN101 SYSTEM. SEE NOTES



NOTES

|      | Ε   |                                  |  |  |  |  |  |  |
|------|-----|----------------------------------|--|--|--|--|--|--|
| DATE | REV | COMMENTS                         |  |  |  |  |  |  |
|      | A   | INITITAL RELEASE                 |  |  |  |  |  |  |
|      | A1  | A/R 780 MINOR DOC CHANGES        |  |  |  |  |  |  |
|      | В   | NOTES CHANGED                    |  |  |  |  |  |  |
|      | C   | A/R 806 REVISED GYRO CONNECTIONS |  |  |  |  |  |  |
|      |     |                                  |  |  |  |  |  |  |

COMPUER CONTROLLED DRAWING DO NOT REVISE MANUALLY

1. THIS CONFIGURATION DOES NOT ALLOW FOR AN ADDITIONAL INVERTER DRIVING THE SN3500.

2. THIS CONFIGURATION DISABLES THE 328A-3G SLAVING ACTION. SLAVING IS PERFORMED INSIDE THE SN3500.

## 3. THE 328A-3G PROVIDES A HEADING FLAG OUTPUT TO THE SN3500.

4. THIS CONFIGURATION ALLOWS THE USE OF A COLLINS 332-E4 WITHOUT USING THE SLAVING FUNCTION OF THE 328A-3G SLAVING ACCESSORY.

5. THE 2200 OHM RESISTORS ARE RECOMMENDED (NOT REQUIRED) TO REDUCE RINGING FROM THE INTERNAL INVERTER. THE \$N3500 APPLIES NO LOAD TO THE GYRO.

YOU MUST REMOVE THE 323A-3G FLUX COMPENSATOR LOCATED ON TOP OF THE FLUX VALVE.





|      | E   |                           |  |  |  |  |  |  |  |
|------|-----|---------------------------|--|--|--|--|--|--|--|
| DATE | REV | COMMENTS                  |  |  |  |  |  |  |  |
|      | A   | INITIAL RELEASE           |  |  |  |  |  |  |  |
|      | A1  | A/R 780 MINOR DOC CHANGES |  |  |  |  |  |  |  |
|      | В   | NON GYRO ITEMS REMOVED    |  |  |  |  |  |  |  |
|      |     |                           |  |  |  |  |  |  |  |

NOTES:

® Vista, Ca. Category <sup>'</sup>SN3500 INSTALLATION DRAWING Title MID-CONTINENT 4305 Size B Document Number Rev **B** 82005-10

Mod: Friday, October 11, 2013

Sheet 17

1. SELECT STEC 6446 FOR FLUXGATE TYPE

Create: Wednesday, October 18, 2000





|      |     | E   |
|------|-----|---|
| DATE | REV | COMMENTS  |
|      | Α   | INITIAL RELEASE                                       |
|      | С   | A/R 806 MINOR DOC CHANGE                              |
|      |     |   |
|      |     | COMPUTER CONTROLLED DRAWING<br>DO NOT REVISE MANUALLY |

NOTE 1 1. SELECT NORMAL OR REVERSE FOR BOOTSTRAP SETTING ON FCS EMULATION PAGE.





NOTES:

1: THE SYSTEM 400HZ INVERTER WILL NORMALLY BE CONNECTED TO THE HEADING SYNCHRO 'H' TERMINAL. THIS WIRE CAN BE USED TO DRIVE THE SN3500 REFERENCE INPUT. IN AN UNUSUAL CASE THE SYNCHRO MIGHT HAVE BEEN WIRED IN UPSIDE DOWN AND THE 400HZ REFERENCE MAY BE ON THE 'C' TERMINAL.

2: IF AN EXISTING CONVERTER IS INSTALLED SUCH AS A KA 52 OR KA 57, LEAVE UNIT INSTALLED AND SELECT KI525 ON FCS EMULATION PAGE.

4. WHEN CONVERTING KCS-55 SYSTEM INSTALLATIONS THE KA-51 SLAVING ACCESSORY IS NOT USED. THE FLUXGATE EXCITATION SIGNAL CAN BE PICKED UP FROM THE EXISTING KA-51 CONNECTORS AS SHOWN

5. PRIOR TO INSTALLING THE SN3500, ENSURE THAT THIS WIRE IS COMING FROM THE FLIGHT CONTROL SYSTEM GROUND AND THAT NO VOLTAGE IS PRESENT ON THIS PIN WITH POWER APPLIED TO ALL AVIONICS. IF VOLTAGE IS PRESENT, CONNECT SN3500 P1-1 TO FCS GROUND AT THE ROLL COMPUTER WITH A NEW WIRE. IF PRIMARY POWER IS APPLIED TO SN3500 P1-1 DAMAGE MAY OCCUR TO THE SN3500 RESULTING IN AN OPEN CIRCUIT AT P1-1. THIS CAN BE CHECKED WITH AN OHM METER.

|         |     | Ε   |
|---------|-----|---|
| DATE    | REV | COMMENTS  |
|         | Α   | INITIAL RELEASE   |
|         | A1  | A/R 780 MINOR DOC CHANGES                                 |
| 08/21/1 | 3 B | A/R 1357 P1-7 CHANGED TO P1-22.<br>P1-22 CHANGED TO P1-7. |

COMPUTER CONTROLLED DRAWING DO NOT REVISE MANUALLY

3. SHOWN IS THE 30HZ RESOLVER INTERCONNECT. CHECK APPROPRIATE NAV RECEIVER SCHEMATICS BEFORE APPLYING POWER. TYING PINS E/G TOGETHER AS SHOWN ASSUMES THEM TO BE THE NAV RECEIVER VREF. THESE ARE NORMALLY TIED TOGETHER INSIDE THE NAV RECEIVER AND GO TO SIGNAL GROUND OR AN INTERNAL DC REFERENCE VOLTAGE. IF THESE DO NOT TIE INTERNALLY PLEASE CALL SANDEL FOR ASSISTANCE.

6. RESISTOR MAY BE REQUIRED. SEE RESOLVER INTERCONNECT SHEET TO DETERMINE PROPER CONNECTION.









### NOTES:

1. CONNECT OBS "H" FROM RECEIVER "H" or "C" WHICHEVER IS THE ACTIVE OUTPUT. CHECK APPROPRIATE NAV RECEIVER SCHEMATICS. CONNECT "SIN OUT" and "COS OUT" TO THE ACTIVE RETURN PINS, USUALLY D/F. CONNECT "OBS VREF" TO EITHER STATOR RETURN PIN (REF OR GROUND) USUALLY E or G. THE LOAD RESISTOR SIMULATES À SYNCHRO.

2. THESE CONNECTIONS FOR KX165 OR KNX80/81 PREVENT THE RECEIVER FROM FLAGGING THE NAV SIGNAL WHEN THE RESOLVER IS BEING USED BY THE GPS. CONSULT THE APPROPRIATE KING DOCUMENTATION FOR FURTHER INFORMATION.

3. SEE ARINC-429 INSTALLATION PAGE WHICH DOES NOT REQUIRE THE RESOLVER SWITCHING RELAY (WHERE APPLICABLE).

4. THE PREFERRED INSTALLATION IS THE SN3500 P3-7 CONTROLLING AN EXTERNAL SWITCHING RELAY. IF AN EXISTING SWITCH CONTROL BOX IS INSTALLED AND IT IS DESIRED TO LEAVE IT OPERATIONAL, USE P3-4 TO SENSE GPS MODE AND SELECT SLAVE FOR THE MODE SETTING ON THE OBS/RELAY/CDI MAINTENANCE PAGE.

1 MASTER: SN3500 CONTROLS THE NAV/GPS SWITCHING (PREFERRED) 2 SLAVE: EXTERNAL NAV/GPS SWITCH CONTROLS THE SN3500

5. CHECK MANUFACTURERS DOCUMENTATION FOR ANY ADDITIONAL INSTALLATION SPECIFIC RELAY POLES WHICH MAY ALSO BE NEEDED.

6. FOR 3V COMPOSITE NAV SOURCES INSERT A 470K SERIES RESISTOR LOCATED AT THE SN3500 CONNECTOR. NOT REQUIRED FOR .5V SOURCE

7. ONLY USED WHEN SN3500 IS IN MASTER MODE. SELECT GPS1 FOR SENSE ON OBS/RELAY/CDI MAINTENANCE PAGE.





|      |     | E   |
|------|-----|---|
| DATE | REV | COMMENTS  |
|      | А   | INITIAL RELEASE   |
|      | A1  | A/R 780 MINOR DOC CHANGES   |
|      | с   | A/R 806 429 TX OUT PIN CORRECTIONS,<br>P1-22 AND P1-7 REVERSED.                             |
|      | C2  | ADDED KLN90B SDI-1/2 CONNECTION. ADDED<br>NOTE 9 AND MODIFIED NOTE 5 TO INCLUDE<br>SDI-1/2. |
|      |     | DATE REV<br>A<br>A1<br>C<br>C2  |

## NAV-1 AND ARINC 429 GPS INTERCONNECT. **KLN90-B SHOWN FOR REFERENCE**

1. CONNECT OBS "H" FROM RECEIVER "H" or "C" WHICHEVER IS THE ACTIVE OUTPUT. CHECK APPROPRIATE NAV RECEIVER SCHEMATICS. CONNECT "SIN OUT" and "COS OUT" TO THE ACTIVE RETURN PINS, USUALLY D/F. CONNECT "OBS VREF" TO EITHER STATOR RETURN PIN (REF OR GROUND) USUALLY E or G. THE LOAD RESISTOR SIMULATES A SYNCHRO.

2. THE APPROACH ACTIVE OUTPUT FROM THE GPS TO THE AUTOPILOT MAY HAVE TO BE AN ADDITIONAL RELAY. SEE THE MANUFACTURERS INSTALLATION DIAGRAMS.

3. THE PREFERRED INSTALLATION IS THE SN3500 P3-7 CONTROLLING AN EXTERNAL SWITCHING RELAY. IF AN EXISTING SWITCH CONTROL BOX IS INSTALLED AND IT IS DESIRED TO LEAVE IT OPERATIONAL, USE P3-4 TO SENSE GPS MODE AND SELECT SLAVE FOR THE MODE SETTING ON THE OBS/RELAY/CDI MAINTENANCE PAGE.

SN3500 CONTROLS THE NAV/GPS SWITCHING (PREFERRED)

EXTERNAL NAV/GPS SWITCH CONTROLS THE SN3500

4. CHECK MANUFACTURERS DOCUMENTATION FOR ANY ADDITIONAL INSTALLATION SPECIFIC RELAY POLES WHICH MAY ALSO BE NEEDED.

5. KLN-90B PINOUTS SHOWN. CERTAIN CONNECTIONS SUCH AS GPS DISPLAYED. SDI-1/2, AND OBS/LEG ARE SPECIFIC TO KLN-90B.

6. MSG AND WPT ANNUNCIATORS ARE COMMUNICATED ON THE ARINC 429 SERIAL

7. FOR 3V COMPOSITE NAV SOURCES INSERT A 470K SERIES RESISTOR LOCATED AT THE SN3500 CONNECTOR. NOT REQUIRED FOR .5V SOURCE.

8. ONLY USED WHEN SN3500 IS IN MASTER MODE. SELECT GPS1 FOR SENSE ON OBS/RELAY/CDI MAINTENANCE PAGE.

9. IF KLN90B IS USED FOR GPS1, LEAVE SDI-1/2 PIN 3 OF KLN90B OPEN. IF KLN90B IS WIRED FOR GPS2, THEN CONNECT SDI-1/2 PIN 3 OF KLN90B TO GROUND.





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|------|-----|---|--|--|--|--|--|--|
| DATE | REV | COMMENTS  |  |  |  |  |  |  |
|      | Α   | INITIAL RELEASE   |  |  |  |  |  |  |
|      | A1  | A/R 780 MINOR DOC CHANGES                                       |  |  |  |  |  |  |
|      | С   | A/R 806 429 TX OUT PIN CORRECTIONS,<br>P1-22 AND P1-7 REVERSED. |  |  |  |  |  |  |

# NAV-1 AND ARINC 429 GPS INTERCONNECT. KLN90-B SHOWN FOR REFERENCE

NOTES:

1. CONNECT OBS "H" FROM RECEIVER "H" or "C" WHICHEVER IS THE ACTIVE OUTPUT. CHECK APPROPRIATE NAV RECEIVER SCHEMATICS. CONNECT "SIN OUT" and "COS OUT" TO THE ACTIVE RETURN PINS, USUALLY D/F. CONNECT "OBS VREF" TO EITHER STATOR RETURN PIN (REF OR GROUND) USUALLY E or G. THE LOAD RESISTOR SIMULATES A SYNCHRO.

2. THE APPROACH ACTIVE OUTPUT FROM THE GPS TO THE AUTOPILOT MAY HAVE TO BE AN ADDITIONAL RELAY. SEE THE MANUFACTURERS INSTALLATION DIAGRAMS.

3. THE PREFERRED INSTALLATION IS THE SN3500 P3-7 CONTROLLING AN EXTERNAL SWITCHING RELAY. IF AN EXISTING SWITCH CONTROL BOX IS INSTALLED AND IT IS DESIRED TO LEAVE IT OPERATIONAL, USE P3-4 TO SENSE GPS MODE AND SELECT SLAVE FOR THE MODE SETTING ON THE OBS/RELAY/CDI MAINTENANCE PAGE.

1 MASTER: SN3500 CONTROLS THE NAV/GPS SWITCHING (PREFERRED) 2 SLAVE: EXTERNAL NAV/GPS SWITCH CONTROLS THE SN3500

4. CHECK MANUFACTURERS DOCUMENTATION FOR ANY ADDITIONAL INSTALLATION SPECIFIC RELAY POLES WHICH MAY ALSO BE NEEDED.

5. KLN-90B PINOUTS SHOWN. CERTAIN CONNECTIONS SUCH AS GPS\_DISPLAYED AND OBS/LEG ARE SPECIFIC TO KLN-90B.

 ${\rm 6.}\,$  MSG AND WPT ANNUNCIATORS ARE COMMUNICATED ON THE ARINC 429 SERIAL CHANNEL.

7. FOR 3V COMPOSITE NAV SOURCES INSERT A 470K SERIES RESISTOR LOCATED AT THE SN3500 CONNECTOR. NOT REQUIRED FOR .5V SOURCE.

8. ONLY USED WHEN SN3500 IS IN MASTER MODE. SELECT GPS1 FOR SENSE ON OBS/RELAY/CDI MAINTENANCE PAGE.





| DATE       REV COMMENTS         A       INITIAL RELEASE         A1       A/R 780 MINOR DOC CHANGES         B       ADDED NAV2 SENSE. OTHER MINOR CHANGES         COMPUTER CONTROLLED DRAWING<br>DO NOT REVISE MANUALLY | DATE RE | V COM | MEN | IS E  |   |
|--|---------|-------|-----|---|---|
| A       INITIAL RELEASE         A1       A/R 780 MINOR DOC CHANGES         B       ADDED NAV2 SENSE. OTHER MINOR CHANGES         COMPUTER CONTROLLED DRAWING<br>DO NOT REVISE MANUALLY                                 |         | DATE  | REV | COMMENTS  | ] |
| A1       A/R 780 MINOR DOC CHANGES         B       ADDED NAV2 SENSE. OTHER MINOR CHANGES         COMPUTER CONTROLLED DRAWING<br>DO NOT REVISE MANUALLY   |         |       | Α   | INITIAL RELEASE                                       |   |
| B       ADDED NAV2 SENSE. OTHER MINOR CHANGES         COMPUTER CONTROLLED DRAWING         DO NOT REVISE MANUALLY   |         |       | A1  | A/R 780 MINOR DOC CHANGES                             |   |
| COMPUTER CONTROLLED DRAWING<br>DO NOT REVISE MANUALLY  |         |       | В   | ADDED NAV2 SENSE. OTHER MINOR CHANGES                 |   |
|  |         |       |     | COMPUTER CONTROLLED DRAWING<br>DO NOT REVISE MANUALLY |   |

NOTES:

1. FOR 3V COMPOSITE NAV SOURCES INSERT A 470K SERIES RESISTOR LOCATED AT THE SN3500 CONNECTOR. NOT REQUIRED FOR .5V SOURCE.

2. ILS ENERGIZE AND RELAY SWITCHING OUTPUT ARE ONLY REQUIRED IF NAV-2 IS TO BE USED AS A SECOND PRIMARY VHF NAV RECEIVER. IN THIS CONFIGURATION A 2ND SWITCHING RELAY IS ADDED TO SWITCH THE DBAR AND FLAG INPUTS FROM THE 2ND RECEIVER IN THE SAME MANNER AS THE GPS SWITCHING RELAY SHOWN FOR NAV-1 ON THE PREVIOUS PAGE.





# CONNECTION TO OLDER RECEIVERS SUCH AS COLLINS 51R8, 51RV-1, KING KNR660 AND SIMILAR RECEIVERS. SEE NOTE 1.



United LXF10VB222M or equivalent.

## **ARINC NAV RECEIVERS KNR634 AND COLLINS VIR-30A** (FOR VIR-30M SEE ABOVE) SEE NOTE 2.



| E    |     |                           |  |  |
|------|-----|---------------------------|--|--|
| DATE | REV | COMMENTS                  |  |  |
|      | Α   | INITIAL RELEASE           |  |  |
|      | A1  | A/R 780 MINOR DOC CHANGES |  |  |
|      | В   | MINOR CHANGES             |  |  |
|      |     |                           |  |  |

COMPUTER CONTROLLED DRAWING DO NOT REVISE MANUALLY

NOTES:

1. THE SN3500 REQUIRES DC FLAG SIGNALS. SOME VERY OLD RECEIVER DESIGNS OUTPUT UNSMOOTHED DC DUE TO A LACK OF FILTERING CAPACITORS. THE SN3500 WILL SHOW UNSTABLE FLAG OPERATION UNLESS SMOOTHING CAPACITORS ARE ADDED AS SHOWN. THE CAPACITORS CAN BE MOUNTED ON A TERMINAL BLOCK NEAR THE RECEIVERS. CONSULT THE RECEIVER SERVICE MANUAL SCHEMATICS AS REQUIRED.

2. FOR ARINC NAV RECEIVER USING 400HZ DIFFERENTIAL RESOLVER: a) THE NAV RCVR AND SN3500 MUST BE ON THE SAME INVERTER. b) ON OBS/RELAY/CDI MAINTENANCE PAGE SET OBS TYPE TO "DIFF A".



| II<br>MORROW | GARMIN<br>150/250<br>150XI /250XI | GARMIN    | GARMIN<br>155XL/300/<br>300XI |         |         |     |         |               |     | SN3500           |
|--------------|-----------------------------------|-----------|-------------------------------|---------|---------|-----|---------|---------------|-----|------------------|
|              |                                   | 155/105   |                               | KLIN09  | INLIN90 |     | IRINBLE |               | _P1 |                  |
| MSG          | MSG                               | MSG       | MSG                           | MSG     | MSG     | GPS | MSG     | * NOTE 4      | 29  | MSG ANNUNCIATORS |
| PTK          | WPT                               | WPT       | WPT                           | WPT     | WPT     | WPT | WPT     | * NOTE 4      | 43  | WPT              |
| APPR         |                                   | ACTV      | ACTV                          | ACTV    | ACTV    |     | APR     | •             | 44  | APPR ARM         |
| ACTV         |                                   | ARM       | ARM                           | ARM     | ARM     |     |         |               | 14  | APPR ACTIVE      |
| HOLD         |                                   | HOLD/AUTO | HOLD/AUTO                     |         | OBS/LEG | NAV |         |               | 15  | OBS/HOLD/PTK     |
|              |                                   |           |                               |         |         |     |         | NOTE 1 NOTE 2 | P3  | COMMANDS         |
|              |                                   | ARM CMD   | ARM CMD                       | ARM CMD | ARM CMD |     |         | •             | 10  | APPR ARM         |
| HOLD CMD     |                                   | HOLD CMD  | HOLD CMD                      |         | OBS CMD |     |         | <b>-</b>      | 2   | OBS or HOLD      |
|              |                                   |           |                               |         |         |     |         |               |     |                  |

## **GPS SWITCH ANNUNCIATOR MATRIX**

| E    |     |                           |
|------|-----|---------------------------|
| DATE | REV | COMMENTS                  |
|      | Α   | INITIAL RLEASE            |
|      | A1  | A/R 780 MINOR DOC CHANGES |
|      |     |                           |

COMPUTER CONTROLLED DRAWING DO NOT REVISE MANUALLY

NOTES:

D

1: USED ONLY ON GARMIN 155/165 WHICH REQUIRED LATCHED ARM COMMANDS.

2. USED ON GARMIN AND KING RECEIVERS WHICH REQUIRE LATCHED MODE COMMANDS BUT NOT ON II-MORROW RECEIVERS.

3. SELECT APPROPRIATE RECEIVER ON THE SN3500 GPS MAINTENANCE PAGE. IF INSTALLED RECEIVER IS NOT SHOWN ON THIS MATRIX USE NEAREST COMPATIBLE SETTING OF THE SAME MANUFACTURER AND INSURE THE TEXT AND COLORS OF THE ON-SCREEN ANNUNCIATORS ARE ACCEPTABLE.

4. MSG AND WPT ANNUNCIATOR DISCRETES ARE NOT REQUIRED WITH ARINC-429 RECEIVERS.

5. GARMIN GNS-430 (NOT SHOWN) DOES NOT REQUIRE ANY DISCRETE ANNUNCIATOR WIRING.





|            |     | E   |
|------------|-----|---|
| DATE       | REV | COMMENTS  |
|            | Α   | INITIAL RELEASE   |
|            | A1  | A/R 780 MINOR DOC CHANGES   |
|            | В   | PINS CHANGED. NOTES UPDATED   |
|            | С   | A/R 806 MINOR DOC CHANGE  |
| 10/25/13 D |     | A/R 1357 Garmin GTN 6XX/7XX added.<br>Notes updated for GTN6XX/7XX. |

**Connection to One Port ONLY!** (48/49) OR (50/51) for GNS430/530 (47/66) OR (48/67) for GTN6XX/7XX

For GTN6XX/7XX - Connection to One Port ONLY!

THIS 6-WIRE INTERCONNECT PERFORMS THE FOLLOWING **GPS/VLOC AUTOPILOT SWITCHING** 





|                        |  |   | F  |   |
|------------------------|--|---|--|---|
|                        | DATE                                     | REV   | COMMENTS   | 1 |
|                        |  | A<br>A1   | A/R 780 MINOR DOC CHANGES  |   |
| x                      |  | В   | RELAY REMOVED. PIN NUMBERS INSERTED  |   |
|                        | 26-JAN-07                                | С   | ADDED CONNECTIONS FOR GNS ILS/GPS APPROACH   |   |
|                        | 09-FEB-07                                | D   | RELAY SENSE CONNECTIONS & SETTINGS   |   |
|                        | 12-DEC-07                                | D1  |  |   |
|                        | 25-OCT-13                                | Е   | GTN 6XX/7XX ADDED<br>Notes updated for GTN6XX/7XX  |   |
| EMS                    | 3. So<br>(P10)<br>availa<br>to se<br>GTN | ftware<br>01-48<br>able Al<br>ction 4<br>-6XX/7     | main 5.00 or later: If the ARINC 429 IN 1 Port<br>& -67) is already used for another purpose, then any<br>RINC 429 IN Port may be connected instead. Refer<br>of the current Garmin Installation Manual for the<br>XX systems. | 4 |
|                        | 4. Se<br>GPS<br>AN<br>LA                 | t Main<br>-2 curr<br>INUN<br>T DV                   | tenance page 7: GPS-1 and Page 8:<br>ent selection to Garmin GTN 6XX/7XX (ARINC).<br>SERIAL<br>SERIAL  |   |
| 30 (ARINC), GNS        | 500 AF                                   | RT EN<br>RINC 4<br>R AC                             | VA SERIAL<br>29 429 or 429H as needed<br>TV ANNUN IN (if autopilot is interfaced to P2 - 27).  |   |
| NS 430 (ARINC)<br>/7XX | Se<br>pa<br>Ni<br>El<br>G                | et mair<br>age 6:<br>AV<br>NRGZ<br>DC DV<br>/S DEV  | ntenance page 5: NAV/ILS/DME-1 and<br>NAV/ILS/DME-2 as follows:<br>429 FR of 429H FR as needed.<br>429 or 429H as needed.<br>429 or 429H as needed.<br>429 or 429H as needed.  | 3 |
|                        | 5. Ga<br>S<br>S<br>S<br>S<br>S           | armin (<br>elect "<br>elect "<br>elect "<br>elect " | GTN setup:<br>EFIS Format 4" for the ARINC 429 input.<br>High" or "Low" speed as needed.<br>GAMA FORMAT 3" for the ARINC GPS 429 out.<br>High" or "Low" speed as needed.<br>LNAV 1" for #1 GTN & "LNAV 2" for #2 GTN.          |   |
|                        | S<br>S                                   | elect o<br>peed:<br>DI: VC                          | on VOR/LOC/GS Configuration Page:<br>Low or High as needed.<br>)R/ILS 1 for #1 GTN SDI: VOR/ILS 2 for #2 GTN.  | ◀ |
| NRECEIVER 1:           |  |   |  |   |
| ics w/Int<br>I1)       |  |   |  |   |
| JRATION:               |  |   |  |   |
| רוע)                   |  |   |  |   |
| NRECEIVER 2:           |  |   |  | 2 |
| ics w/Int<br>II2)      |  |   |  |   |
| JRATION:               |  |   |  |   |
| 012)                   |  |   |  |   |
|                        |  |   |  |   |
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| Title SINC             | GLE SN35                                 | 500 E   | UAL GNS430(W)/530(W) /GTN6XX/7XX   |   |
| Size D<br>B            | Ocument Nu                               | mber  | 82005-10   |   |
| Create:Thu             | irsday, Janua                            | ary 07,   | 1999 Mod: Friday, November 01, 2013 Sheet 28   |   |







|      |     | E  |
|------|-----|--|
| DATE | REV | COMMENTS   |
|      | Α   | INITIAL RELEASE                                  |
|      | A1  | A/R 780 MINOR DOC CHANGES                        |
|      | С   | A/R 806 Correct KR22 SN3500 connection P2 to P1. |
|      |     |  |

NOTES:

1. THESE LOAD RESISTORS ARE REQUIRED FOR PS ENGINEERING MARKER RECEIVERS. RECOMMENDED FOR OTHER RECEIVERS TO PREVENT FAILURE OF THE SN3500 INDICATION IF THE ASSOCIATED MARKER LIGHT BULB FAILS.

2. SET MARKERS TO ACTIVE H OR ACTIVE L ON ADF1/ADF2/MKR MAINTENANCE PAGE





DUAL KING SERIAL DIGITAL DME'S.





|  | E  |   |
|--|--|---|
|  |  |   |
| ROLLER   | A1 A/R 780 MINOR DOC CHANGES   |   |
|  | C A/R 806 ADDED ANALOG DME   |   |
| L SN3500   | COMPUTER CONTROLLED DRAWING<br>DO NOT REVISE MANUALLY  |   |
|  |  |   |
| Buss   |  | 4 |
| Buss   |  |   |
| Request  |  |   |
| 1 Nav 2<br>E 1)  |  |   |
| AV 1   |  | - |
| Buss<br>Buss<br>Request<br>Common  |  |   |
| AV 2   |  | 3 |
| Buss<br>Buss<br>Request  |  |   |
|  |  | ┥ |
| NOTES:<br>1. IN A SINGL<br>HOLD AND NA<br>DME READOU<br>SELECTION.<br>PIN UNCONNI<br>SET DME TO I<br>ENABLE NAV2<br>2. IN A DUAL<br>HOLD. IT ALV<br>NAV-2.<br>3. THE SN350<br>CONNECT AS<br>THE KN62/64<br>ANNUNCIATIO | E DME CONFIGURATION THE SN3500 DETECTS BOTH DME<br>IV-1/NAV-2 ASSIGNMENT. WHEN NAV-2 IS CHANNELED THE<br>IT WILL ASSOCIATE WITH THE BEARING POINTER NAV-2<br>IF THE DME IS NOT ASSIGNABLE LEAVE THE CORRESPONDING<br>ECTED.<br>O FR DME1 ON NAV/ILS/DME 2 MAINTENANCE PAGE TO<br>2 DME DISPLAY.<br>DME CONFIGURATION THE SN3500 CAN ONLY DETECT DME<br>/AYS ASSOCIATES DME-1 WITH NAV-1 AND DME-2 WITH<br>10 WILL SUPPORT REMOTE DISPLAY OF KN62/64 DME'S.<br>SHOWN, TAKING "DME REQ" FROM REAR CONNECTOR PIN-N.<br>DO NOT HAVE A HOLD OUTPUT THEREFORE NO HOLD<br>DN IS POSSIBLE. | 2 |
| Category<br>SN<br>Title<br>DM<br>Size<br>B   | Vista, Ca.<br>3500 INSTALLATION DRAWING<br>E, KING SERIAL AND ANALOG<br>1000 Rev C   | 1 |
| Create:Sunday  | 7, May 03, 1998 Mod: Friday, October 11, 2013 Sheet 31   |   |



DUAL ARINC 568 DME'S. COLLINS DME-40 SHOWN FOR REFERENCE



|      |     | E                         |
|------|-----|---------------------------|
| DATE | REV | COMMENTS                  |
|      | A   | INITIAL RELEASE           |
|      | A1  | A/R 780 MINOR DOC CHANGES |
|      |     |                           |

COMPUTER CONTROLLED DRAWING DO NOT REVISE MANUALLY

### NOTES:

D

1. IN A SINGLE DME CONFIGURATION THE SN3500 DETECTS BOTH DME HOLD AND NAV-1/NAV-2 ASSIGNMENT FROM THE INSTALLED SWITCHING RELAYS. WHEN NAV-2 IS CHANNELED THE DME READOUT WILL ASSOCIATE WITH THE BEARING POINTER NAV-2 SELECTION. IF THE DME IS NOT ASSIGNABLE LEAVE THE CORRESPONDING PIN UNCONNECTED. SET DME TO LO FR DME1 ON NAV/ILS/DME 2 MAINTENANCE PAGE TO ENABLE NAV2 DME DISPLAY.

2. IN A DUAL DME CONFIGURATION THE SN3500 CAN ONLY DETECT DME HOLD. IT ALWAYS ASSOCIATES DME-1 WITH NAV-1 AND DME-2 WITH NAV-2.






# CAS66



# SKYWATCH 497 SN3500 TCAS/TRAFFIC 429 A INPUT TCAS/TRAFFIC 429 B INPUT SOFTWARE SELECTIONS 1. "GOODRICH TCAS 791/A" (MOM) (MOM) (MOM) (MOM)

**RYAN TAS** 



#### NOTES:

1. SEE MANUFACTURERS INSTALLATION MANUALS FOR COMPLETE WIRIING INTERFACE.

2. TRAFFIC INTERFACE REQUIRES SN3500 SOFTWARE 2.01 OR HIGHER AND PURCHASE OF KEY CODE

3. SWITCHES REQUIRED IF SN3500 IS PRIMARY DISPLAY.

4. THE SN3500 MAY BE USED AS A SOURCE OF MAGNETIC HEADING IF REQUIRED BY THE TCAS PROCESSOR. REFER TO COMPASS BOOTSTRAP DRAWING FOR INTERFACE.







#### NOTE:

1. SEE MANUFACTURERS INSTALLATION MANUALS FOR COMPLETE WIRING INTERFACE.

2. SN3500 CAN ONLY BE USED AS A SECONDARY DISPLAY.

3. TRAFFIC INTERFACE REQUIRES SN3500 SOFTWARE 2.01 OR HIGHER AND PURCHASE OF KEY CODE.

| E    |     |                         |  |  |  |
|------|-----|-------------------------|--|--|--|
| DATE | REV | COMMENTS                |  |  |  |
|      | С   | A/R 806 INITIAL RELEASE |  |  |  |
|      |     |                         |  |  |  |

COMPUTER CONTROLLED DRAWING DO NOT REVISE MANUALLY





| 6/9/98 | A   | E                                      |
|--------|-----|--|
| DATE   | REV | COMMENTS                               |
|        | С   | A/R 806, INITIAL RELEASE               |
|        | C1  | A/R 824 CORRECTED PIN NUMBERING SN3500 |
|        |     | +LEFT AND +RIGHT DEV INPUT.            |
|        |     |  |
|        |     |  |

COMPUTER CONTROLLED DRAWING DO NOT REVISE MANUALLY

1. GNS 480 SERIAL PORT SETUP ITEMS: SERIAL SETUP (RX / TX) SERIAL PORT 2: XXX / MAPCOM (9600) CH2 IN: AHRS LOW

GPS SELECT: IIMORROW GX (RS-232-ENH) ANNUN = SERIALLAT DEV = ANALOG

NAV = COMPENRGZ = ACTIVE LLOC DV = ANALOG GS DV = ANALOG

MODE = MASTER SENSE = GPS1

3. THE INSTALLER IS RESPONSIBLE TO INCLUDE IN THE AFMS THE FOLLOWING TEXT: " DME ARCS AND HOLDING PATTERNS WILL NOT BE DISPLAYED ON THE SN3500 EHSI."

4. IN THIS CONFIGURATION A RELAY SENSE ERROR WILL BE DISPLAYED ON THE SN3500 WHEN THE GNS480 IS SET TO NAV AND THE SN3500 IS SELECTING







Note:

WSI mode must be set to "No Flow Control". See WSI manual for instructions.

WSI Receiver with SN3500 as secondary display device, listen only.



| 1   |     |                                  |  |  |  |
|---|-----|----------------------------------|--|--|--|
| DATE  | REV | COMMENTS                         |  |  |  |
|   | С   | INITIAL RELEASE                  |  |  |  |
|   | D   | Added WSI AV-300/350 connections |  |  |  |
| E Correct pin #'s AV-300/350 TX and Ground (AR tbd) |     |                                  |  |  |  |

## COMPUTER CONTROLLED DRAWING DO NOT REVISE MANUALLY





## NOTES UNLESS OTHERWISE SPECIFIED

1. Unless otherwise noted, all signal wiring is 22 to 24 AWG.



|               |        | 1                                |
|---------------|--------|----------------------------------|
| DATE          | REV    | COMMENTS                         |
| 12-DEC-07     | A      | INITIAL RELEASE                  |
| 27-AUG-08     | В      | Correct SG102 429 pin #. (ARtbd) |
| COMPUTER CO   | NTROLI | ED DRAWING                       |
| DO NOT REVISE | MANU   | ALLY                             |
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Notes

1. For dist Arinc 407 T interface o



### ARINC 429/419 TACAN

|                         | DA<br>18-            | TE<br>JUL-08    | REV<br>A        | 1<br>COMMENTS<br>INITIAL RELEASE | AR 1023  |   |
|-------------------------|----------------------|-----------------|-----------------|----------------------------------|----------|---|
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| ance and                | range :              | rate            | when            | using                            |          | • |
| 'ACAN, use<br>n associa | e approp<br>ated cha | priato<br>annel | e SN<br>·       | 3500 DME                         |          |   |
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| Category SN             |                      | STALLA          |                 |                                  | G        |   |
| Title SN                | 13500 wit            | h TAC/          | ٩N              |                                  |          |   |
| Size Doc<br>B           | ument Number         | 820             | 05-             | 10                               | Rev A    |   |
| Create:Friday,          | July 18, 2008        | Mod             | : Friday, Oc    | tober 11, 2013                   | Sheet 39 | ] |



|                             | · ·                    |     |                         |  |  |
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|                             | DATE                   | REV | COMMENTS                |  |  |
|                             | 27-AUG-08              | A   | INITIAL RELEASE AR 1032 |  |  |
|                             |                        |     |                         |  |  |
| COMPUTER CONTROLLED DRAWING |                        |     |                         |  |  |
|                             | DO NOT REVISE MANUALLY |     |                         |  |  |
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#### Notes:

1. Use 24 AWG stranded shielded 1 or 2 conductor wire as required.

2. TYCO P/N TT13A9T1/404 toggle switch or equivalent. A push-on/push-off pushbutton switch may be used. Annunciator not required.

3. Use closest available airframe ground.

4. In the event of a broken wire fault the SN3500 will default to daylight (non NVIS) mode.





|     | 1  |
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| REV | COMMENTS   |
| 1   |  |
| А   | INITIAL RELEASE AR1055   |
| В   | REVISED NOTE 8 AND ADDED CALLOUT TO NOTE<br>8. ADDED P3-13 REV ATT CONTROL, AR1110 |
|     | REV<br>A<br>B  |

COMPUTER CONTROLLED DRAWING DO NOT REVISE MANUALLY

1. Use 24 AWG stranded shielded 1 or 2 conductor wire as required.

2. TYCO P/N TT13A9T1/404 toggle switch or equivalent. A push-on/push-off pushbutton switch may be used. Annunciator not

4. Locate switch and placard nearest position available to SN3500.

5. Assure adequate illuminatin of switch and placard for night

6. Use closest available airframe ground.

7. In the event of a broken wire fault the SN3500 will default to normal

8. Standard configuration is to use P3-6 for REV CNTRL. If P3-6 is needed for Analog DME Valid (see section 2.5.3 page 2-12), use P3-13. NVIS/REV ATT/DME Analog Valid may not all be used









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| I | DATE     | REV | COMMENTS        |  |
| Ľ | 10/30/13 | Α   | INITIAL RELEASE |  |
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COMPUTER CONTROLLED DRAWING DO NOT REVISE MANUALLY

## NOTES: NONE

