ST 32
Aircraft Signal Conditioner

Installation Manual
Record of Revisions

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<th>Date</th>
<th>Description</th>
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<td>DRN 365</td>
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<td>ECN3991</td>
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ST 32
Aircraft Signal Conditioner

SECTION 1
GENERAL DESCRIPTION

1.1 INTRODUCTION
This sheet describes the installation of the ST 32 Aircraft Signal Conditioner. It is intended for use by FAA certified repair stations and original equipment manufacturers (OEM’s) to install the ST 32 and includes both mechanical and electrical installation information. The installer should insure that the ST 32 is operating according to its intended function.

1.2 PRODUCT DESCRIPTION
The ST 32 is dual function signal conditioner. It converts four channels of the sinusoidal output of Tach Generators and one channel of analog strain gauge pressure to a digital signal that can be used by aircraft display and/or control systems.

1.2.1 PRODUCT VARIATIONS
The -00 is original Variation
The -01 in a minor change to the input Power Pins. Both Oinbs 1 and 20 have sseparate revese portection diodes to allow the ST 32 to be powered form independent power buses.

1.3 TECHNICAL CHARACTERISTICS
1.3.1 PHYSICAL CHARACTERISTICS
Width 4.80” Height 1.00”
Depth 4.80” Weight 0.62 lb

1.3.2 OPERATIONAL CHARACTERISTICS
Operating Voltage 18-32.2Vdc
Current Less Than 1A (Heater On)
Less Than 100mA (Heater Off)
Operating Temp -55°C to +70°C
Max Operating Altitude 55,000 Feet

1.3.3 Approved Equipment
1.3.3.1 Tach Input Requirements
The ST 32 requires the following input from the on-board Tach Generator.
Signal: Sinusoidal 3 Phase or Monopole
Signal Frequency Range, Sinusoidal 3 Phase: 1-30,000Hz
Signal Frequency Range Monopole: 50-30,000Hz
Signal Amplitude Range: 0.4Vpp-150Vpp

1.3.3.2 Approved Tachometers include:
Globe 22A703
AAE 32005-007
Electro-Mech EM-8001
MS28054-1 Two Pole, Three Phase Tach Generators
MIL-G-26611 Two Pole, Three Phase Tach Generators
1.3.3.3 Tach Input Requirements
The ST 32 requires the following input from the on-board strain gauge pressure transducer:

- **Excitation Voltage**: 9.0 Vdc-10.5Vdc
- **Signal Voltage**:
  - **Common Mode**: 2Vdc to Aircraft Voltage -2Vdc
  - **Differential Mode**: 0mVdc - 100mVdc

1.3.3.4 Approved strain gauge pressure transducers are:
- Kulite APT-20-1000 or Equivalent

1.3.3.5 The ST 32 digital output signal is:
- **Totem Pole outputs to Aircraft Power**
- **Rise time**: 5 usec
- **Fall time**: 5 usec
- **Low voltage**: < 1.9 Vdc
- **High Voltage**: Aircraft Power

**Voltage to Frequency Conversions**

**Signal Conversion**:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 mVdc</td>
<td>20KHz</td>
<td>0.1% Full Scale</td>
</tr>
<tr>
<td>100mVdc</td>
<td>100KHz</td>
<td>0.1% Full Scale</td>
</tr>
</tbody>
</table>

**Excitation Conversion**:

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.0 Vdc</td>
<td>20KHz</td>
<td>0.1% Full Scale</td>
</tr>
<tr>
<td>10.5Vdc</td>
<td>100KHz</td>
<td>0.2% Full Scale</td>
</tr>
</tbody>
</table>
**NOMENCLATURE:** TACH- AND PRESSURE ADAPTER  
**TYPE/MODEL/PART NO:**  
ST 32/305952-[XX]  
Tray/306057-[XX]

**MANUFACTURER’S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION:** 305952-[XX]

**MANUFACTURER:** SANDIA AEROSPACE

**ADDRESS:**  
3700 OSUNA RD. NE, SUITE 711  
ALBUQUERQUE, NM  87109

**REVISION & CHANGE NUMBER OF DO-160:** REV F

**DATE OF TEST:** 201101 - 201103. Additional testing Dec 2012 and March 2013

<table>
<thead>
<tr>
<th>CONDITIONS</th>
<th>SECTION</th>
<th>DESCRIPTION OF TESTS CONDUCTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature and Altitude</td>
<td>4.0</td>
<td>Tested to Category [A2F2]</td>
</tr>
</tbody>
</table>
| Low Temperature                 | 4.5.1, 4.5.2 | -55°F Ground/-55°C Short  
                                |         | -55°C Operating                          |
| High Temperature                | 4.5.3, 4.5.4 | +85°C Ground/+70°C Short  
                                |         | +70°C Operating                          |
| Loss of Cooling                 | 4.5.5   | Not Applicable                            |
| Altitude                        | 4.6.1, 4.6.2, 4.6.3 | 55,000'  
                                |         | 55,000'                                   |
| Decompression                   |         | -15,000'                                  |
| Overpressure                    |         |                                           |
| Temperature Variation           | 5.0     | Tested to Category S1 15° C/min           |
| Humidity                        | 6.0     | Tested to Category B                      |
| Operational Shock and Crash Saftey| 7.0  
                                |         | Tested to Category B                      |
| Sustained Crash Saftey          | 7.3.2   |                                           |
| Vibration                       | 8.0     | Tested to Category S, curves B and M with Tray  
                                |         | Tested to Category U curve G without Tray |
| Explosion                       | 9.0     | Equipment identified as Category H        |
| Waterproofness                  | 10.0    | Equipment identified as Category W        |
| Fluids Susceptibility           | 11.0    | Equipment identified as Category X, no test performed |
| Sand and Dust                   | 12.0    | Equipment identified as Category X, no test performed |
| Fungus                          | 13.0    | Equipment identified as Category X, no test performed |
| Salt Spray                      | 14.0    | Equipment identified as Category X, no test performed |
| Magnetic Effect                 | 15.0    | Tested to Category Z, Less than 0.3 deflection |
| Power Input                     | 16.0    | Tested to Category A, Note 1              |
| Voltage Spike                   | 17.0    | Tested to Category A                      |
| Audio Frequency Susceptibility  | 18.0    | Tested to Category Z                      |
| Induced Signal Susceptibility   | 19.0    | Tested to Category [ZC]                   |
| Radio Frequency Susceptibility  | 20.0    | Tested to Category [RR]                   |
| Radio Frequency Emissions       | 21.0    | Tested to Category M                      |
| Lightning Induced Transient Susceptibility | 22.0  
                                |         | Tested to Category [AZF33], Note 2       |
| Lightning Direct Effects        | 23.0    | Equipment identified as Category X, no test performed |
| Icing                           | 24.0    | Equipment identified as Category X, no test performed |
| Electrostatic Discharge         | 25.0    | Equipment identified as Category A        |
| Fire, Flammability              | 26.0    | Equipment identified as Category X, no test performed |

Note 1: Tested to Category Z with the exception that for momentary power interruption the system meets Category A requirements of 200mS interruptions.

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**Figure 1-1**  
DO-160F Environmental Test Chart
Note 2: Initial pin injection performed without series impedance. Input series was impedance added to the following pins and waveforms during the pin injection tests. All other pins meet pin injection without and resistance placed in series with the generator.

<table>
<thead>
<tr>
<th>Pin Group</th>
<th>Circuit</th>
<th>Impedance Added (Ohms)</th>
<th>Waveform</th>
</tr>
</thead>
<tbody>
<tr>
<td>26, 29, 32, 35</td>
<td>Tach Outputs</td>
<td>75</td>
<td>3</td>
</tr>
<tr>
<td>26, 29, 32, 35</td>
<td>Tach Outputs</td>
<td>1K</td>
<td>4</td>
</tr>
<tr>
<td>3, 21</td>
<td>VFC Outputs</td>
<td>75</td>
<td>3</td>
</tr>
<tr>
<td>3, 21</td>
<td>VFC Outputs</td>
<td>1K</td>
<td>4</td>
</tr>
<tr>
<td>22</td>
<td>Discrete Output</td>
<td>75</td>
<td>3</td>
</tr>
<tr>
<td>22</td>
<td>Discrete Output</td>
<td>1K</td>
<td>4</td>
</tr>
</tbody>
</table>
ST 32
Aircraft Signal Conditioner

1.3.4 Certification
TSO C49b (Incomplete System)
TSO C47a (Incomplete System)
DO 160F

“The conditions and test required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install the article either on or within a specific type or class of aircraft to demonstrate that the aircraft installation conditions are within the TSO standards. The article may be installed only if installation of the article is approved by the Administrator”
SECTION 2
INSTALLATION CONSIDERATIONS

2.1 INTRODUCTION

The ST 32 has been designed to covert four channels of sinusoidal and monopole outputs of approved Tach Generators and one channel of strain gauge pressure to a digital output that can be used by onboard navigation systems.

2.2 MOUNTING

The ST 32 can be mounted in any axis either inside or outside the pressure vessel. To ensure protection against lightning strikes, the case should be grounded to airframe ground. This can be most easily accomplished by mounting the case on a grounded surface. An option mounting tray, Sandia part number 305057-00 is available as an option. Bonding of the case to airframe ground shall be less than 2.5 mohms.

2.3 COOLING

The ST 32 does not require external Cooling.

2.4 ELECTRICAL

The ST 32 operates on 18-32.2 Vdc. Power to the ST 32 should be protected by a 1.5 Amp breaker or circuit protection can be shared with the interfaced display unit using the appropriate breaker size (refer to the installation manual of the system being interfaced). The ST 32 can be wired to use from one to four channels depending upon system interface requirements. All twisted pairs are #22 AWG. Power and ground are single wires and should be #22 AWG or larger.
SECTION 3
INSTALLATION PROCEDURES

3.1 GENERAL
The ST 32 is supplied with a mounting connector and twenty-five crimp contacts. The ST 32 can be hard mounted using four (4) number 6 or 8 screws or with an optional mounting tray. If the optional mounting tray options selected it is mounted using four (4) number 6 or 8 screws.

3.2 EQUIPMENT REQUIRED
3.2.1 Supplied

<table>
<thead>
<tr>
<th>Equipment</th>
<th>P/N</th>
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<tbody>
<tr>
<td>ST 32 P/N 305952-00 (Garmin Model GSC 46, P/N 013-00337-00)</td>
<td>305952-00</td>
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<tr>
<td>or P/N 305952-01 (Garmin Model GSC46, P/N 013-00337-10)</td>
<td>305952-01</td>
</tr>
</tbody>
</table>

Electrical Installation Kit
Connector DSUB, 37 POS, w/crimp pins
Connector Clamp

3.2.2 REQUIRED BUT NOT SUPPLIED
Four (4) Number 6-32, 8-32 or equivalent mounting screws

3.2.3 Optional
Mounting Tray, Sandia Aerospace Part Number 306057-00, Garmin P/N 011-02599-01

3.3 MOUNTING
The ST 32 mounts with four (4) number 6-32 or 8-32 or equivalent machine screws.

Figure 3-1
ST 32 Dimensional Drawing
Figure 3-2
Optional Mounting Tray Dimensions
3.4 **Electrical**

The ST 32 operates on 18-32.2Vdc. Power to ST 32 should be protected by a 1.5 amp breaker or circuit protection can be shared with the display unit being interfaced (see installation manual of unit being interfaced). All twisted pairs are #22 AWG. Power and ground are single wires and should be #22 AWG or larger. Figure 2 shows the interconnect of the ST 32 to the Garmin system.

**Figure 3-3**
Interconnect Diagram

3.5 **Operating Instructions and Limitations**

Refer to the display unit(s) being interfaced for operation and limitations.

3.6 **Calibration**

No field calibration is required.

3.7 **Continued Airworthiness**

Maintenance of the ST 32 is on condition only. No scheduled maintenance is required.