

STRATUS

by APPAREO

Stratus ESG Installation Instructions (Experimental)

Revision 1.4

STRATUS ESG

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Warranty

To view the Stratus ESG warranty, log into the Appareo Dealer Portal or visit www.appareo.com/resources.

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Warnings

- The pilot must read the Stratus ESG Pilot's Guide (600890-000049) before their first flight.
- Squawk codes 7500 (hijacking), 7600 (radio failure), and 7700 (emergency) are reserved for emergencies. There may be other reserved codes, depending on the region you are flying in. It is the pilot in command's responsibility to comply with their jurisdiction's operating rules and regulations.

Record of Revision

Revision Number	Change Description	Revision Date	Inserted By
1.0	Initial release	12/10/15	AAL
1.1	CM 19444	3/01/16	AAL
1.2	CM 19840	5/09/16	AAL
1.3	CM 20412	6/29/16	AAL
1.4	Included link to warranty; re-ordered table of contents/figures/tables; added alternate parts in 1.5; updated antenna install procedures in 1.6; clarified unit install instructions in 2.3 and Appendix B; updated cabling and wiring specs in 3.1; updated BIT failures in 4.19.9; updated drawings in Appendix A; updated software update procedure in Appendix B; updated troubleshooting in Appendix B; general clerical items	3/21/18	AAL

Vendor Information

Part	Vendor	Contact Information
42G15A-XT-1 (GPS antenna)	ANTCOM	Antcom Corporation 367 Van Ness Way, Suite 602 Torrance, California 90501 Phone: (310) 782-1076 www.antcom.com/
AV-74 (transponder antenna)	RAMI	Rami 14500 168th Avenue P.O. Box 858 Grand Haven, MI 49417 Phone: (616) 842-9450 www.rami.com/

Abbreviations, Terms, and Definitions

Abbreviation	Term	Definition
AC	Advisory Circular	Document provided by the FAA that provides airworthiness recommendations.
ACO	Aircraft Certification Office	Branch of the FAA that works with the applications for certifications.
ADS-B	Automatic Dependent Surveillance - Broadcast	Technology implemented by the FAA to provide surveillance and improved situational awareness to both pilots and air traffic controllers.
ATC	Air Traffic Control	Service that directs aircraft on the ground and through controlled airspace.
BIT	Built In Test	A series of tests performed on start up to monitor the function of the equipment.
CFR	Code of Federal Regulations	Codification of the general and permanent rules and regulations published in the Federal Register by the executive departments and agencies of the United States Federal government.
ESG		Part of the marketing name for Stratus ESG.
FAA	Federal Aviation Administration	Agency of the United States Department of Transportation with authority to regulate and oversee all aspects of civil aviation in the United States.
GPS	Global Positioning System	Satellite-based navigation system that provides location and time information.
Hz	Hertz	Unit of frequency based upon cycles per second.
IDENT	IDENT (Identification)	Transponder feature that allows for aircraft to be uniquely identified by Air Traffic Control by pulsing the aircraft's reply on ATC's monitors for 18 seconds.
MHz	Megahertz	1,000,000 hertz.
SBAS	Satellite-Based Augmentation System	System of satellites that augments existing satellite systems and provides increased position accuracy.
STC	Supplemental Type Certificate	Type Certificate issued when an applicant has received FAA approval to modify an aircraft from its original design.
TSO	Technical Standard Order	Minimum performance standard for specified materials, parts, and appliances used on civil aircraft (FAA definition).
VFR	Visual Flight Rules	A set of regulations for flying in which the pilot flies without using instruments in generally clear meteorological conditions
WAAS	Wide Area Augmentation System	System of ground-based antennas whose precisely known locations are used to correct satellite signals and provide greater positional and integrity of service to aircraft in flight.

1. About Stratus ESG

1.1. Overview

Stratus ESG by Appareo is a panel-mounted level 2els Class 1 Extended Squitter transponder. It is a Class B1S transponder which is ADS-B Out compliant. To support the ADS-B Out function, Stratus ESG contains a Class Beta 1 GPS/WAAS receiver. Stratus ESG responds to legacy Mode A/C interrogations and Mode S interrogations from both ground radar and airborne collision avoidance systems.

The most recent version of this document and other Stratus ESG documentation can be found on the Appareo Dealer Portal or at www.appareo.com/resources.

1.2. Applicable Regulations

Stratus ESG (153510-000018) meets the performance requirements of TSO-C166b and TSO-C112e.

Stratus ESG has an FCC ID of 2AETC-1505005.

1.3. Equipment specifications

1.3.1. Equipment dimensions

Characteristic	Dimension
Bezel Width	6.38 inches (162 mm)
Bezel Height	1.69 inches (43 mm)
Rack Width	6.32 inches (160.4 mm)
Rack Height	1.65 inches (42 mm)
Depth from back of bezel to end of strain relief on rack (not compensating for wire bend radius)	10.75 inches (273 mm)

Table 1: Equipment dimensions

1.3.2. Equipment weight

Component	Weight
Stratus ESG Unit Weight	2.8 lbs. (1.3 kg)
Stratus ESG Total Installed Weight (Transponder with rack and connectors)	3.3 lbs. (1.5 kg)

Table 2: Equipment weight

1.3.3. Electrical specifications

Characteristic	Specification
Altitude	Up to 25,000 ft
External Suppression Input	Low ≤ 0.5 V High ≥ 5 V (suppressed)
Mode A Capability	4096 Identification Codes
Mode C Altitude Capability	Parallel altitude encoder: up to 62,700 ft Serial altitude encoder: up to 126,700 ft
Mode S Capability	Parallel altitude encoder: up to 62,700 ft Serial altitude encoder: up to 126,700 ft
Operational Temperature Range	-20°C to +55°C
Receiver Frequency	1030 MHz
Receiver Sensitivity	-74 dBm nominal for 90% replies
Transmitter Frequency	1090 MHz ± 1 MHz
Transmitter Power	310 Watts nominal

Table 3: Electrical specifications

1.3.4. Power requirements

Characteristic	Specification
Input Voltage Range	11 to 36 VDC
Nominal Current Draw	0.28 A at 28 VDC 0.5 A at 14 VDC
Power Input	8 W Typical 59.5 W Max

Table 4: Power requirements

1.4. Required tools

The following tools are needed for installation of Stratus ESG.

Tool	Part Number	Used For
3/32" hex driver		Securing locking mechanism through the faceplate
External retaining ring pliers		RF pass through adapter
Crimp tool	M22520/2-01	DSUB pins
Positioner	M22520/2-08	DSUB pins
Insertion/Extraction tool	M81969/39-01	DSUB pins

Table 5: Required tools

1.5. Required hardware

The following parts are required for the installation of Stratus ESG.

Supplied parts:

Item	Appareo Part Number	Commercial Part Number	Quantity
Backplate	153510-000015	-	1
Transponder	153510-000018	-	1
Stratus ESG Rack	153540-000027	-	1
37 Pin DSUB Connector	251015-000074	M24308/2-4F	1
RF TNC Pass Through Adapter	251015-000077	-	1
RF BNC Pass Through Adapter	251015-000078	-	1
Screw	356060-000007	- (ALT: MS51957-13)	6
Strain Relief Backshell	356070-000006	M85049/48-1-4F	1

Table 6: Required hardware (supplied parts)

Additional parts:

Item	Appareo Part Number	Commercial Part Number	Quantity
#6-32 x 100° Flat Head SS Screw	-	MS24693C, AN507R or other approved fastener	6
Metal Hex Stop Nut *	-	MS21042-06	6
Monadnack Clip Nut 6-32*	-	294667	6

Table 7: Required hardware (additional parts)

*These parts are identified as usable components, but are not identified as the only components that can be used. Installer must determine if the part is appropriate for specific installation or if an alternate part is required.

1.6. Compatible equipment

Stratus ESG requires input from a GPS antenna, transponder antenna, and altitude encoder. This section describes the requirements for the antennas and altitude encoders that must be installed on the aircraft.

Inputs from systems described below may be pre-existing. If these systems do not exist or have specifications outside those described, selection of new equipment will be required. These installation instructions do not cover the installation of the antennas or other input sources, and they should be installed per manufacturer's instructions.

1.6.1. Antennas

The GPS and transponder antennas should be installed using the antenna manufacturer's instructions. Wiring must be installed in accordance with FAA AC 43.13-1B and AC 43.13-2B.

1.6.1.1. GPS antenna

Stratus ESG requires an active antenna with the specifications of either TSO-C190 or TSO-C144.

If meeting the specifications of TSO-C190, the GPS antenna must meet the following:

- Powered at 5 Volts
- Gain of 30 dB $\pm$ 5 dB
- Qualified DO-160E Lightning, Zone 2A
- Qualified DO-160E Icing, Category C

Alternatively, the following TSO-C144 antenna is compatible:

Manufacturer	Part Number
AntCom	42G15A-XT-1

Table 8: Compatible GPS antenna

The antenna should be installed using the antenna manufacturer's instructions. The antenna must also be installed at least 2 feet away from any other comm transmitter or transmitter antenna in a location that does not break line of sight with satellites. Typical installation locations are on the top of the aircraft or on the empennage with consideration for line of sight with satellites.

Keep the antenna away from any protruding metal such as engines, propellers, other antenna masts, landing gear (and/or doors), and access doors; breaks in the antenna's ground plane; or anything that can affect the reception pattern. If mounted on a composite aircraft, a conductive ground plane should be added to the aircraft. Additional information regarding location and mounting of antenna can be found in FAA AC 43.13-2B, Chapter 3.

All wiring should have a cable loss of minimum 2 dB and maximum 7 dB. The standard installation has 3 BNC/TNC connections. Any additional BNC/TNC connections should estimate a 0.2 dB loss per connection and be taken into consideration for maximum dB loss.

NOTE: Using RG400 the minimum cable length is 10 feet and the maximum length is 37 feet. If the installation requires you to go outside of these length specifications, the selection of coax should be 50 ohm.

These instructions do not cover the installation in a pressure vessel. If the manufacturer of the antenna has installation approval on the aircraft, follow the manufacturer's approved instructions. Otherwise, seek other approval. Other provisions could be made by contacting your Regional Aircraft Certification Office (ACO).

1.6.1.2. Transponder antenna

Stratus ESG requires a passive antenna with the specifications of TSO-C74() or TSO-C66(). The following antenna is an example of an antenna that meets these specifications. The installation is not limited to this antenna.

Manufacturer	Part Number
Rami	AV-74

Table 9: Compatible transponder antenna

The antenna should be installed using the antenna manufacturer's instructions using cabling with a maximum of 2 dB loss. The antenna should be mounted vertically on the bottom of the aircraft and a minimum of:

- 6 feet away from DME antenna
- 3 feet away from ADF antenna or any other communication antenna
- 3 feet away from TCAS antenna
- 3 feet away from Stratus ESG itself to prevent self-interference

Keep the antenna away from any protruding metal such as engines, propellers, other antenna masts, landing gear (and/or doors), and access doors; breaks in the antenna's ground plane; or anything that can affect the radiation pattern. If mounted on a composite aircraft, a conductive ground plane should be added to the aircraft in order for the radiation pattern of the antenna to be maximized. Additional information regarding location and mounting of antenna can be found in FAA AC 43.13-2B, Chapter 3.

NOTE: A determination should be made whether the current cabling is acceptable for the installation. Using RG400, the maximum cable length is 14 feet with a maximum of 2 dB loss. If the installation requires more length, select other 50 ohm coax that will not exceed the maximum of 2 dB loss.

1.6.2. Altitude encoder

Stratus ESG requires input from an independent altitude encoder. Stratus ESG will connect to an encoder that has a Gillham (gray code) connection or a serial altitude encoder output on a RS232 port. The altitude encoder must meet the performance requirements of TSO-C88 (a or b). Serial altitude encoders must have Trimble/Garmin or Shadin/RMS protocol.

The altitude encoder should be installed using the altitude encoder manufacturer's instructions.

NOTE: The altitude encoder might have a longer power up time than Stratus ESG. While the altitude encoder powers up, the altitude field will be replaced by dashes. If the altitude encoder has not powered up within five minutes, an error message will appear. Once the altitude encoder is completely powered on and transmitting data, the error message will disappear.

2. Installing Stratus ESG

2.1. Limitations for installation

The following limitations should be taken into consideration when installing Stratus ESG.

Aircraft

Stratus ESG may not be acceptable for installation on all aircraft makes and models.

Cooling air

Stratus ESG does not require an air cooling system, nor does it have a duct to port air for a system. Do not install Stratus ESG near a heat source. An alternate method of cooling is required if the unit must be installed near a heat source.

GPS

Stratus ESG cannot be used as a GPS position source for navigation for LNAV approaches outside of SBAS coverage.

2.2. Backplate and rack installation

If the aircraft does not have a location already designated or a transponder has not been removed for this installation, refer to FAA AC 43.13-2B, Chapter 2.

Refer to the installation drawings and wiring diagrams in Appendix A to assemble the mounting rack with the hardware specified in Table 6. Mount the rack to the aircraft using the six holes on the side of the rack with the hardware specified in Table 7.

Refer to Section 1.3 for dimensions and weight information.

NOTE: For an optimal fit, mounting brackets may be required, but are not supplied. If additional brackets are needed, they should be fabricated for each individual installation.

NOTE: Ensure that the unit is supported in the back. This may require additional support.

2.3. Unit installation

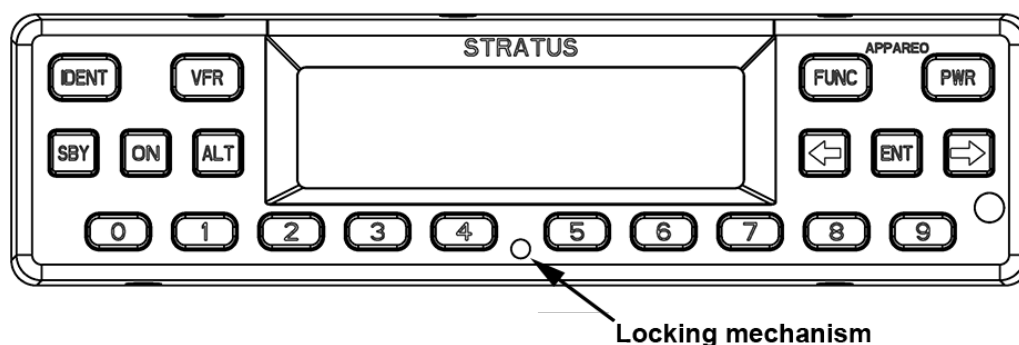


Figure 1: Locking mechanism location

1. Adjust the locking mechanism on Stratus ESG using a 3/32 hex wrench so that the front lobe is in a vertical position. Insert the unit by hand until it comes to a stop. This occurs when the front lobe contacts the clearance slot of the install rack.
2. Tighten the locking mechanism clockwise with the 3/32 hex wrench until it is tight and the connectors have mated. Do not overtighten. If the mechanism will not tighten, verify that Stratus ESG is properly seated in the rack. The unit is fully seated when the unit does not move back when tightening the locking mechanism.

NOTE: Ensure that the transponder is seated as far back as possible against the backplate so that there is a secure connection between the transponder and the connectors.

To remove the Stratus ESG assembly:

Turn the 3/32 hex wrench counter-clockwise on the locking mechanism through the front of the transponder to loosen the lock until the transponder connectors disconnect. Keep loosening the unit until it stops sliding out of the install rack. Do not loosen any further. Pull out the transponder by hand.

2.4. Cleaning

Use a dry cloth to clean Stratus ESG. If necessary, you can use a lightly damp cloth with a solution of mild detergent. Do not use cleaners containing ammonia, acetone, or other strong acids or bases to clean the Stratus ESG display or faceplate.

2.5. Circuit protective device marking

If Stratus ESG is replacing an existing transponder, ensure that the circuit protective device is sufficiently marked.

If Status ESG is a new installation, ensure that the labeling is in accordance with AC 43.13-2B, Chapter 2, Section 207, Sub-Section f., Paragraph (4).

3. Cabling and wiring

This section describes cabling and wiring specifications, pin-out information, and antenna connection procedures.

3.1. Cabling and wiring specifications

Wiring is not supplied by Appareo. Use 22 gauge wire and install wiring in accordance with FAA AC 43.13-1B and AC 43.13-2B. Wire length and routing will vary by installation. See Appendix A for exact specifications.

Re-use of existing wiring is permitted, but it must be in compliance with these installation instructions and with the wiring diagrams in Appendix A.

NOTE: Previously installed equipment may have additional components inline that could impede the function of Stratus ESG. Removal of those components is required.

CAUTION: Remove aircraft power before wiring to avoid damaging the device.

3.2. Pins

The following are the pin assignments and pin-out for Stratus ESG.

NOTE: Not all pins will be used for all configurations. See the sub-sections below to determine which pins will be used for your installation.

Pin #	Pin Name	I/O
1	Aircraft Ground	-
2	Aircraft Power	-
3	RS232-RX Maintenance	In
4	-	-
5	RS232-RX Altitude	In
6	RS232-TX GPS 1PPS	Out
7	External Standby	In
8	Software Update Enable	In
9	Altitude A1	In
10	Altitude A4	In
11	Altitude B2	In
12	Altitude C1	In
13	Altitude C4	In
14	External Suppress In	In
15	28V Lighting Bus HI	In
16	-	-
17	AUX +5V Power	Out
18	AUX Ground	-
19	AUX +5V Power	Out
20	Aircraft Ground	-
21	Aircraft Power	-
22	RS232-TX Maintenance	Out
23	RS232-TX AUX	Out
24	RS232-TX Altitude	Out
25	External IDENT	In
26	External Squat Switch	In
27	Altitude D4	In
28	Altitude A2	In
29	Altitude B1	In
30	Altitude B4	In
31	Altitude C2	In
32	External Suppress I/O	I/O
33	14V Lighting Bus HI	In
34	-	-
35	-	-
36	Aux +5V Power	Out
37	Altitude Common (GND)	-

Table 10: Pin assignments

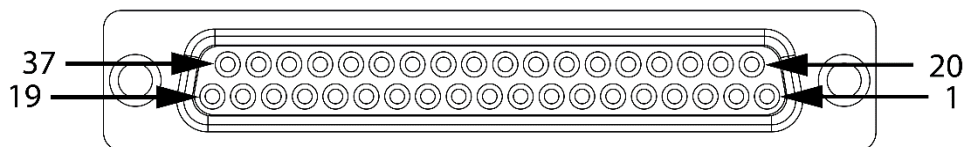


Figure 2: Pin-out

Refer to the wiring diagrams in Appendix A to complete wiring. The sections below describe the function of each pin in more detail.

3.2.1. Power

Stratus ESG requires a 5 amp circuit breaker. A minimum of 2 ground pins should be tied.

Pin #	Pin Name	I/O
1	Aircraft Ground	-
2	Aircraft Power	-
18	Aircraft Ground	-
20	Aircraft Ground	-
21	Aircraft Power	-

Table 11: Power pin assignments

3.2.2. Altitude

Stratus ESG can be connected to either a parallel or serial altitude encoder. The pins utilized will depend on the type of altitude encoder.

For parallel altitude encoders:

Pin #	Pin Name	I/O
9	Altitude A1	In
10	Altitude A4	In
11	Altitude B2	In
12	Altitude C1	In
13	Altitude C4	In
27	Altitude D4	In
28	Altitude A2	In
29	Altitude B1	In
30	Altitude B4	In
31	Altitude C2	In
37	Altitude Common (GND)	-

Table 12: Parallel altitude encoder pin assignments

For serial altitude encoders:

Pin #	Pin Name	I/O
5	RS232-RX Altitude	In

Table 13: Serial altitude encoder pin assignments

NOTE: Pin 24 (RS232 TX Altitude) can be used as a serial altitude source for other equipment.

3.2.3. Suppression

The External Suppression pins are used to suppress signals from a shared antenna, DME, or other source of interference.

Pin #	Pin Name	I/O
14	External Suppress In	In
32	External Suppress I/O	I/O

Table 14: Suppression pin assignments

NOTE: Only one suppression may be connected.

3.2.4. Lighting

Stratus ESG can be connected to the aircraft lighting bus to control the brightness with a panel control. To connect to the lighting bus, connect **one** of the following pins, depending if the aircraft runs at 28V or 14V.

Pin #	Pin Name	I/O
15	28V Lighting Bus HI	In
33	14V Lighting Bus HI	In

Table 15: Aircraft lighting bus pin assignments

To control brightness with the ambient light sensor, do not connect these pins and select the ambient light sensor during backlight source configuration. Use the ambient light sensor if the aircraft lighting bus does not provide full bus voltage when the lighting bus is turned off.

3.2.5. External IDENT

External IDENT can be wired to an external switch to transmit an IDENT response.

Pin #	Pin Name	I/O
25	External IDENT	In

Table 16: External IDENT pin assignment

3.2.6. External standby

External Standby is used in case of a dual transponder setup. Use this to suppress the Stratus ESG when not in use. To put Stratus ESG into standby mode, ground pin 7.

Pin #	Pin Name	I/O
7	External Standby	In

Table 17: External standby pin assignment

3.2.7. Squat switch

The Squat Switch input is connected when the aircraft has a squat switch. The configuration you select in Section 4.9 will determine if the squat switch is closed when on the ground or closed when airborne.

Pin #	Pin Name	I/O
26	External Squat Switch	In

Table 18: Squat switch pin assignment

3.3. Connecting antennas

After antennas have been installed according to manufacturer's instructions, use the wiring specified in Section 1.6.1 to connect the GPS and transponder antennas to the back of Stratus ESG, following the installation drawings and wiring diagrams in Appendix A.

4. Configuring Stratus ESG

If it is the first time the transponder has been configured, press the **PWR** key. It will automatically enter into configuration mode.

To enter into configuration mode during subsequent configurations, while Stratus ESG is off, hold the **FUNC** key. Then, press and release the **PWR** key.

NOTE: Stratus ESG must be powered off to enter into configuration mode.

While in configuration mode, use the following keys:

Key	Function
FUNC	Cycle through the configuration screens
	Cancel an input
ENT	Edit a configuration
	Confirm an input
Arrow keys	Cycle through the configuration screens
	Cycle through selections within configurations

Number keys	Input numbers, letters, or spaces
PWR	Exit configuration mode

Table 19: Keys used during configuration

Sometimes, a textual or non-numerical input will be required. If this is the case, press the number that is associated with the letter group you want to input, according to the graphic on the screen. To cycle through the letters associated with each number, press the number key repeatedly until the letter you want to input appears. You can input a space after cycling through all of the letters for a particular number key. Once the correct character is selected, use the right arrow key to advance to the next field to enter the next character in the sequence.

4.1. ICAO address

Enter the aircraft's 6 digit hex code. You can look up your code on the FAA's N-Number Inquiry webpage.

4.2. VFR squawk

Enter the VFR squawk code. The default factory setting is 1200.

NOTE: If you enter an emergency squawk code (7500—hijacking, 7600—radio failure, or 7700—emergency), a warning will appear. Press **ENT** to clear the warning and enter a new squawk code.

4.3. Aircraft registration

Enter the aircraft's tail number (registration number).

4.4. Aircraft airspeed category

Select the range of numbers that includes the aircraft's maximum airspeed.

4.5. Aircraft category

Select the category that best describes the aircraft:

- Light (<15,550 lbs)
- Small (15,500-75,000 lbs)
- Rotorcraft

4.6. Aircraft length

Select the range of numbers that includes the aircraft's length.

4.7. Aircraft width

Select the range of numbers that includes the aircraft's width (wingspan).

4.8. Altitude format

Select the pilot's preferred unit to display altitude in:

- Flight Level
- Feet
- Meters

4.9. Squat switch

Select the squat switch options:

- **None:** the aircraft does not have a squat switch
- **Low when on ground:** the squat switch is closed when on the ground
- **Low when airborne:** the squat switch is closed when airborne

4.10. Altitude source

Select the altitude source based on the type of altitude encoder in the aircraft:

Configuration	Type	Protocol	Used when
Parallel	Parallel	--	--
Serial—trim/gar	Serial	Trimble/Garmin	Altitude encoder resolution is 25 ft or worse (e.g. 100 ft).
Serial—trim/gar-25 ft	Serial	Trimble/Garmin	Altitude encoder resolution is 25 ft or better (e.g. 10 ft)
Serial—shad/rms	Serial	Shadin/RMS	Altitude encoder resolution is 25 ft or worse (e.g. 100 ft).
Serial—shad/rms-25 ft	Serial	Shadin/RMS	Altitude encoder resolution is 25 ft or better (e.g. 10 ft)

Table 20: Altitude sources

4.11. Backlight source

Select the pilot's preferred backlight source.

- Ambient light sensor
- Lighting bus

4.12. Backlight slope

Adjust the backlight control slope to a number between 0 and 100. A low number will brighten the display when there is a large ambient light change, and a high number will brighten the display when there is a small ambient light change.

4.13. Backlight offset

Adjust the backlight control offset to a number between 0 and 100. A low number will cause the backlight to display dimmer, and a high number will cause the backlight to display brighter.

4.14. Backlight response time

Adjust the backlight control response time to a number between 0 and 100. A low number will cause the backlight to adjust to ambient light changes more quickly, and a high number will cause the backlight to adjust to ambient light changes more slowly.

4.15. GPS antenna lateral offset

Select the measurement that most closely represents the distance from the lateral center of the aircraft to the GPS antenna to the nearest two meters.

- 2M L
- 4M L
- 6M L
- 0M
- 2M R
- 4M R
- 6M R

4.16. GPS antenna longitudinal offset

Select the measurement that most closely represents the distance from the front of the aircraft to the GPS antenna to the nearest two meters.

- 2M
- 4M
- 6M
- 8M
- ...
- 54M
- 56M
- 58M
- $\geq 60M$

4.17. ADS-B In capability

Select the ADS-B In capability of the aircraft, installed or portable.

- UAT
- 1090 ES
- UAT and 1090 ES
- None

Example: If using a Stratus 1 or 1S set the capability to UAT. If using a Stratus 2 or 2S set the capability to UAT and 1090 ES.

NOTE: There are currently no known ADS-B In solutions that provide only 1090 ES.

4.18. SBAS service provider

Select the SBAS service provider:

- WAAS (North America)
- EGNOS (Europe)
- MSAS (Japan)
- GAGAN (India)
- SDCM (Russia)
- Automatic (automatically chooses service provider based on location)

Choose **Automatic** if the pilot might change regions during the operation of Stratus ESG.

4.19. Diagnostic screens

The following screens are used for diagnostic purposes only and usually do not require any input from the installer.

4.19.1. GPS week number rollovers

The GPS week number rollovers screen tracks the number of GPS rollovers, which occur every 1024 weeks (19.7 years). The screen should display the following values, depending on the year:

Dates	Rollover number
August 22, 1999 – April 6, 2019	1
April 7, 2019 – November 20, 2038	2

Table 21: GPS week number rollovers

If the value shown on the screen is incorrect, edit the configuration and select the correct rollover number.

4.19.2. Altitude input diagnostic

The altitude input diagnostic screen shows the current gray code altitude input from the parallel altitude encoder and also displays the current altitude. You can use this screen to verify that a parallel altitude encoder is properly connected. If a serial altitude encoder is connected, or there is no altitude encoder connected, the altitude input will display all 0's.

4.19.3. External inputs diagnostic

The external digital inputs diagnostic screen shows if the IDENT and standby modes are active or inactive. It also shows if the squat switch is indicating that the aircraft is ground, airborne, or unknown. You can use this screen to verify that the squat switch settings are properly configured.

4.19.4. Analog inputs diagnostic

The analog inputs diagnostic screen shows the current reading of the lighting bus and ambient light sensor to the nearest percentage, and the current reading of the internal temperature sensor to the nearest degree Celsius.

4.19.5. GPS receiver diagnostic

The GPS receiver diagnostic screen shows the current reading of the GPS latitude, GPS longitude, and Navigation Integrity Category (NIC).

4.19.6. GPS CN0 diagnostic

The GPS CN0 diagnostic screen shows the current value of GPS CN0 for all 12 channels.

4.19.7. Software versions diagnostic

The software versions diagnostic screen shows the DSC part number, version number, and flash checksum.

4.19.8. Complex hardware versions diagnostic

The complex hardware versions diagnostic screen shows the FPGA part number, version number, and flash checksum.

4.19.9. BIT diagnostic

The BIT diagnostic screen displays any Built In Test failure codes. If the screen displays all zeros, no BIT failure has been detected. Otherwise, a “1” will display.

Each number corresponds with a specific failure, depending on its position in the string of numbers on the screen—failure position 1 being the leftmost space, and failure position 20 being the rightmost space. Reference the table below to determine which BIT has failed. Once all BIT failures have been resolved, press **ENT** to clear all codes.

NOTE: The following BIT failure positions are applicable to software (DSC) version R07. For version R06, the first 2 BITs are not present. For earlier versions, the first 3 BITs are not present.

Failure Position	BIT Failure	Display Message	Corrective Action
1 (left)	Transmitter Failure	TRANSMITTER FAILURE CHECK CONNECTION	Verify that the connection between Stratus /ESG and the transponder antenna is secure.
2	Transmitter PLL	TRANSMITTER FAILURE	Contact Appareo
3	GPS Failure (Stratus ES only)	-	-
4	Transmitter	TRANSMITTER FAILURE	Contact Appareo

5	Display	none	Contact Appareo
6	GPS Failure	GPS RECEIVERFAILURE	Contact Appareo
7	Altitude Source	ALTITUDE INPUT FAILURE	Use the altitude diagnostic screen to troubleshoot the altitude encoder connection
8	Internal Temperature	OVERHEATED	Let the transponder cool down.
9	Single Event Upset	none	Contact Appareo
10	Stuck Key	KEY STUCK	Try to unstick the stuck key
11	Stuck External IDENT	EXTERNAL IDENT STUCK	Use the external inputs diagnostic screen to check correctness of external IDENT polarity
12	Suppression	SUPPRESSED	Check correctness of suppression input polarity
13	FPGA Checksum	none	Contact Appareo
14	EEPROM Checksum	MEMORY READ FAILURE	Re-configure Stratus ESG, if necessary. Verify that the GPS Week Number Rollover is set to the correct value.
15	Squitter Rate	SQUITTER FAILURE	Contact Appareo
16	Mode S Address	ICAO ADDRESS CHANGE	Contact Appareo
17	GPS Failure	GPS RECEIVER FAILURE	Contact Appareo
18	1030 MHz RX VCO Lock	1030 MHZ RECEIVER FAILURE	Contact Appareo
19	DSC RAM	RAM FAILURE	Contact Appareo
20	FPGA RAM	none	Contact Appareo
21	GPS Failure	GPS RECEIVER FAILURE	Contact Appareo
22 (right)	GPS Failure	GPS RECEIVER FAILURE	Contact Appareo

Table 22: BIT diagnostic codes

5. Functional tests

When installed in accordance with these installation instructions, Stratus ESG complies with 14 CFR Part 91.227.

Final installation checks for Stratus ESG are the responsibility of the installer. The installer must ensure that Stratus ESG operates in accordance with the appropriate regulations.

After installation is complete, verify operation as identified in 14 CFR Part 43, Appendix F. The IFR6000 with OPT3 (manufactured by Cobham AvComm – formerly Aeroflex Test Solutions) or equivalent test set can be used to determine compliance.

Additional testing requirements can be found in Chapter 4 of Advisory Circular (AC) 20-165B. Additional functional tests may be required.

When installed correctly, Stratus ESG complies with 14 CFR Part 91.215 & 91.225. While in airspace specified in 14 CFR Part 91.215, Stratus ESG must be maintained to 14 CFR Part 91.413. Additional maintenance information can be found in the Instructions for Continued Airworthiness (Appendix B).

If Stratus ESG was installed within 0.4 meters of a magnetic compass, evaluate the necessity of a swing test.

In addition to maintaining compliance to the regulations above, perform the following operational tests after configuration.

NOTE: Tests should be executed in an area where the aircraft has an unimpeded view of the sky so that a proper GPS fix can be established.

5.1. Power bus

Turn on power to the aircraft. Verify that the unit powers on.

5.2. Discrete inputs

NOTE: Depending on the installation, the functional tests for the following discrete inputs are optional.

1. Turn off Stratus ESG and enter into configuration mode (while holding the **FUNC** key, press and release the **PWR** key).
2. Press **FUNC** or the arrow keys to advance to the external input diagnostics screen. The screen displays the real-time state of the external standby, external IDENT, and squat switch inputs.
3. Activate and deactivate each discrete input and verify that the proper state is reflected on the display.
 - External standby: Ground each transponder's external standby pin and verify that the state is "inactive."
 - External IDENT: Activate the external switch and verify that the state is "active."
 - Squat switch: Activate the squat switch and verify that the correct state is shown.

5.3. Analog inputs

1. Enter into configuration mode on Stratus ESG.
2. Press **FUNC** or the arrow keys to advance to the analog input diagnostics screen. The screen displays the real-time values read from the lighting bus and ambient light sensor.
3. Block the ambient lighting sensor input. Verify that the signal percentage drops.

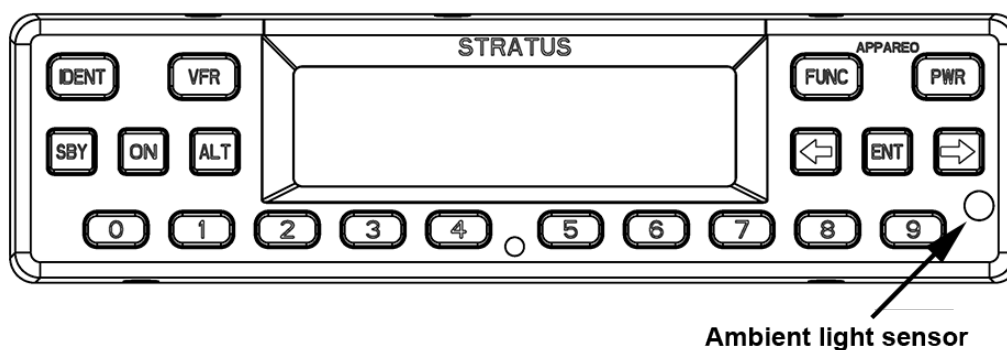


Figure 3: Ambient light sensor location

4. Shine a light on the ambient light sensor. Verify that the signal percentage increases.
5. If you are using the 14V or 28V lighting bus: Adjust the lighting bus input to minimum. Verify that the displayed value is 0%.
6. If you are using the 14V or 28V lighting bus: Adjust the lighting bus input to maximum. Verify that the displayed value is 100%.

5.4. GPS

1. Turn off all avionics except Stratus ESG.
2. Enter into configuration mode on Stratus ESG.
3. Press **FUNC** to advance to the GPS receive diagnostic screen and wait for the NIC value to stabilize at or above zero.
4. Turn on one avionic at a time. Verify that the NIC value does not drop below 7.

5.5. Altitude

1. Enter into configuration mode on Stratus ESG.
2. Press **FUNC** or the arrow keys to advance to the altitude diagnostic screen.
3. Verify that the altitude displayed is correct to your geographic location.

6. Using Stratus ESG

See the Stratus ESG Pilot's Guide (600890-000049) for a full description of Stratus ESG's function.

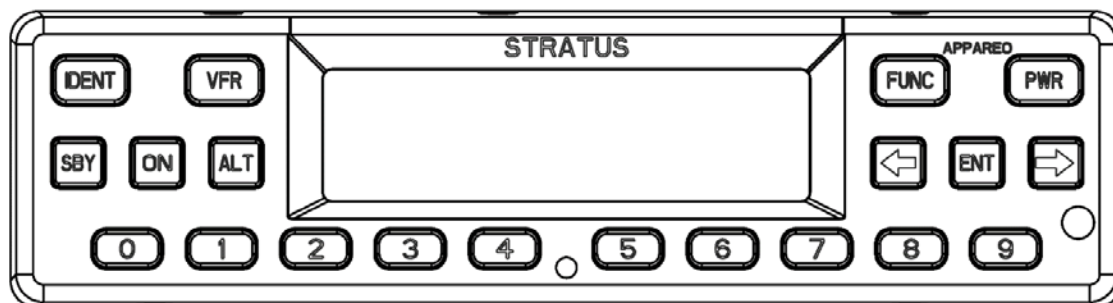


Figure 4: Stratus ESG front panel

6.1. Mode selection keys

The table below describes each transponder mode. These modes will automatically transition for various phases of flight. Unless otherwise instructed, no action is needed.

Mode	Key	Description
Off	PWR	Stratus ESG is powered off.
Standby	SBY	Stratus ESG is powered on and does not send responses to any ATC interrogations.
Altitude	ALT	Stratus ESG is powered on and responds to all Mode A/C/S interrogations. Altitude is reported.
Ground	(none)	Stratus ESG is powered on and in ALT or On mode, but does not report altitude. Ground mode is automatically detected. Press the ALT or ON key to override Ground mode. Press SBY to remove this override.
On	ON	Stratus ESG is powered on and responds to all Mode A/C/S interrogations, but altitude reporting is suppressed.

Table 23: Mode selection keys

6.2. Event indicators

When certain events occur, an indicator will appear on your Stratus ESG display. The table below describes each indicator's meaning.

Indicator	Meaning
	ADS-B transmission contains GPS position information with a radius of containment under 1 nautical mile.
	A response was transmitted from a mode A/C/S interrogation. The indicator will time out if another reply does not occur within one second.
	A built-in-test (BIT) has failed. See Section 4.19.9 of this document and the Stratus ESG Pilot's Guide for more information about BIT failures.

Table 24: Event indicators

6.3. FUNC key

Press the **FUNC** key or the arrow keys, to switch from the Default screen to the Pressure Altitude screen, GPS screen, Flight ID screen, and Brightness screen. These screens are described below:

Pressure Altitude screen: Displays the current pressure altitude. If no valid altitude is detected or Stratus ESG is in On mode, the altitude field will be replaced by dashes.



Figure 5: Pressure Altitude screen

GPS screen: Displays the aircraft's GPS position in degrees latitude and longitude. If no GPS signal is being received, the latitude and longitude fields will be replaced by dashes.



Figure 6: GPS screen

Flight ID screen: Displays the currently entered Flight ID.



Figure 7: Flight ID screen

Brightness screen: Allows for adjustment of screen brightness while in flight. Press **ENT**, then the left or right arrow keys to adjust brightness. Press **ENT** again to confirm the new setting.



Figure 8: Brightness screen

6.4. Other keys

6.4.1. Arrow keys

Use the arrow keys to advance forward and backward when entering numbers or letters and to cycle through options in Configuration mode. They can also be used for cycling through the display screens.

6.4.2. Numerical keys

Use the numerical keys to enter information such as the flight ID or squawk code. See Section 6.5 for directions for how to enter the squawk code for your aircraft's flight, and see Section 6.6 for instructions on how to enter a flight ID.

Sometimes, a textual or non-numerical input will be required. If this is the case, press the number that is associated with the letter group you want to input, according to the graphic on the screen. To cycle through the letters associated with each number, press the number key repeatedly until the letter you want to input appears. You can input a space after cycling through all of the letters for a particular number key. Once the correct character is selected, use the arrow keys to advance to the next field to enter the next character in the sequence.

6.4.3. Identification (IDENT) key

If you are instructed by Air Traffic Control (ATC) to IDENT, press the **IDENT** key on your Stratus ESG. Pressing **IDENT** will make your aircraft's reply pulse on ATC's monitors for 18 seconds. "IDENT" will be shown on the display while IDENT is activated.

6.4.4. VFR key

Press the **VFR** key to broadcast the VFR squawk code. The factory-set VFR code is 1200, but the default number may be reconfigured.

6.4.5. Power (PWR) key

The **PWR** key is used to power Stratus ESG on and off. When Stratus ESG is powered on, it retains the last used squawk code and operation mode.

6.5. Entering a squawk code

While on any screen that the squawk code is shown, press the appropriate number keys (0 through 7) to enter the squawk code. The new digits will be shown on the display screen. Five seconds after the fourth digit is entered, Stratus ESG will automatically save the entered squawk code.

NOTE: If you incorrectly enter a number before the code is automatically saved, press the left arrow key and then press the correct number key.

WARNING: Squawk codes 7500 (hijacking), 7600 (radio failure), and 7700 (emergency) are reserved for emergencies. There may also be other reserved codes, depending on the region the pilot is flying in. It is the pilot in command's responsibility to comply with their jurisdiction's operating rules and regulations.

6.6. Entering the flight identification number

To enter your flight identification number:

1. Press **FUNC** or the arrow keys until "Flight ID" appears. The registration number will be displayed in the Flight ID screen.
2. Press **ENT**.
3. Use the number keys to overwrite the registration number. Use the left and right arrow keys to change the cursor position. See Section 6.4.2 for instructions on how to enter non-numerical input.

NOTE: If the new flight ID is less than 8 digits and there are characters from the registration number remaining after the new flight ID has been entered, insert spaces in those fields to overwrite the characters.

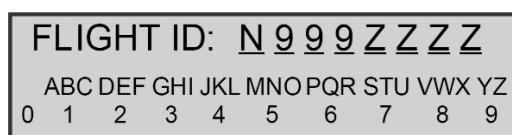


Figure 9: Flight ID entry screen

4. Press **ENT** to confirm the new flight ID.

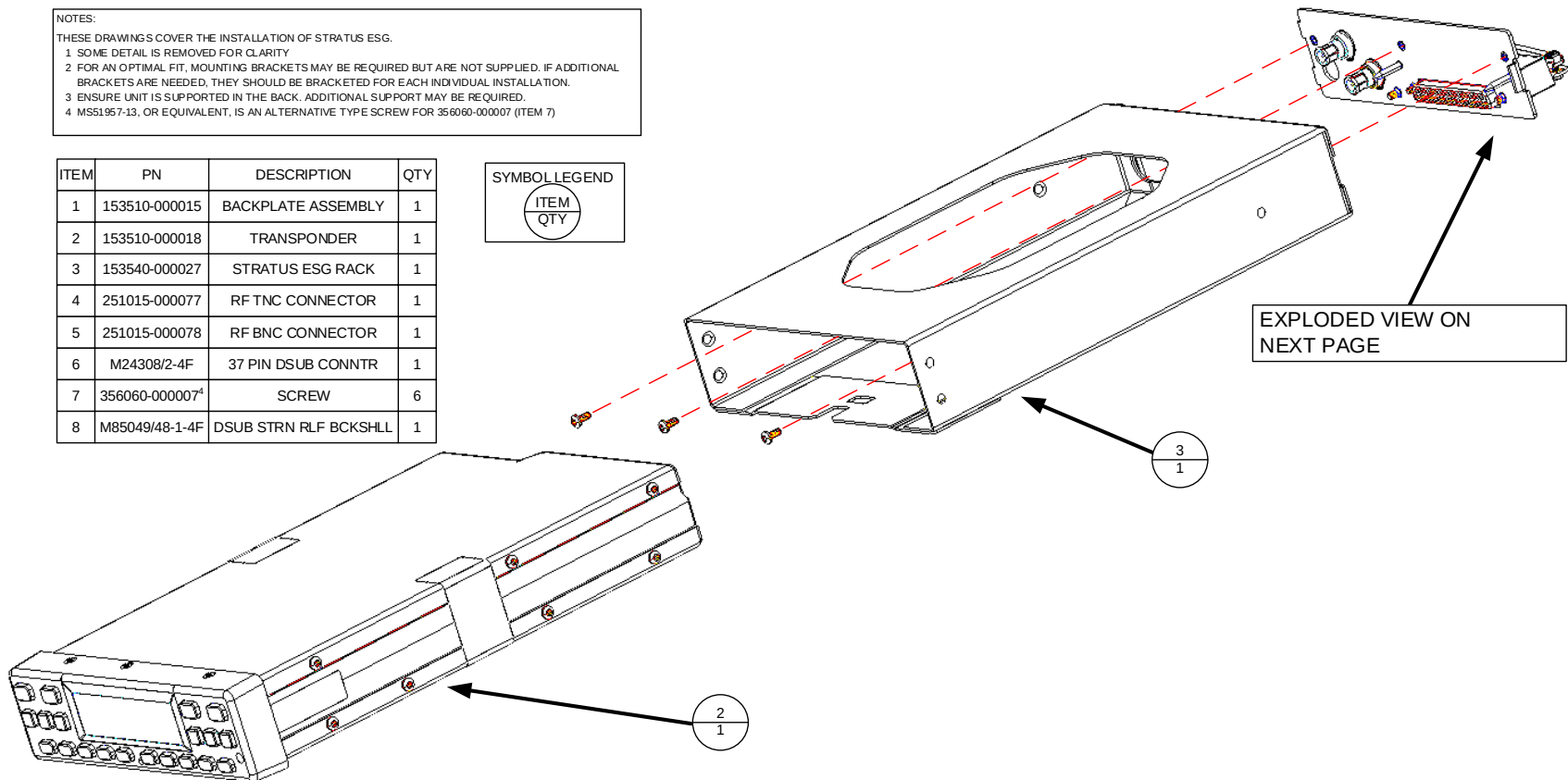
Appendix A: Installation drawings and wiring diagrams

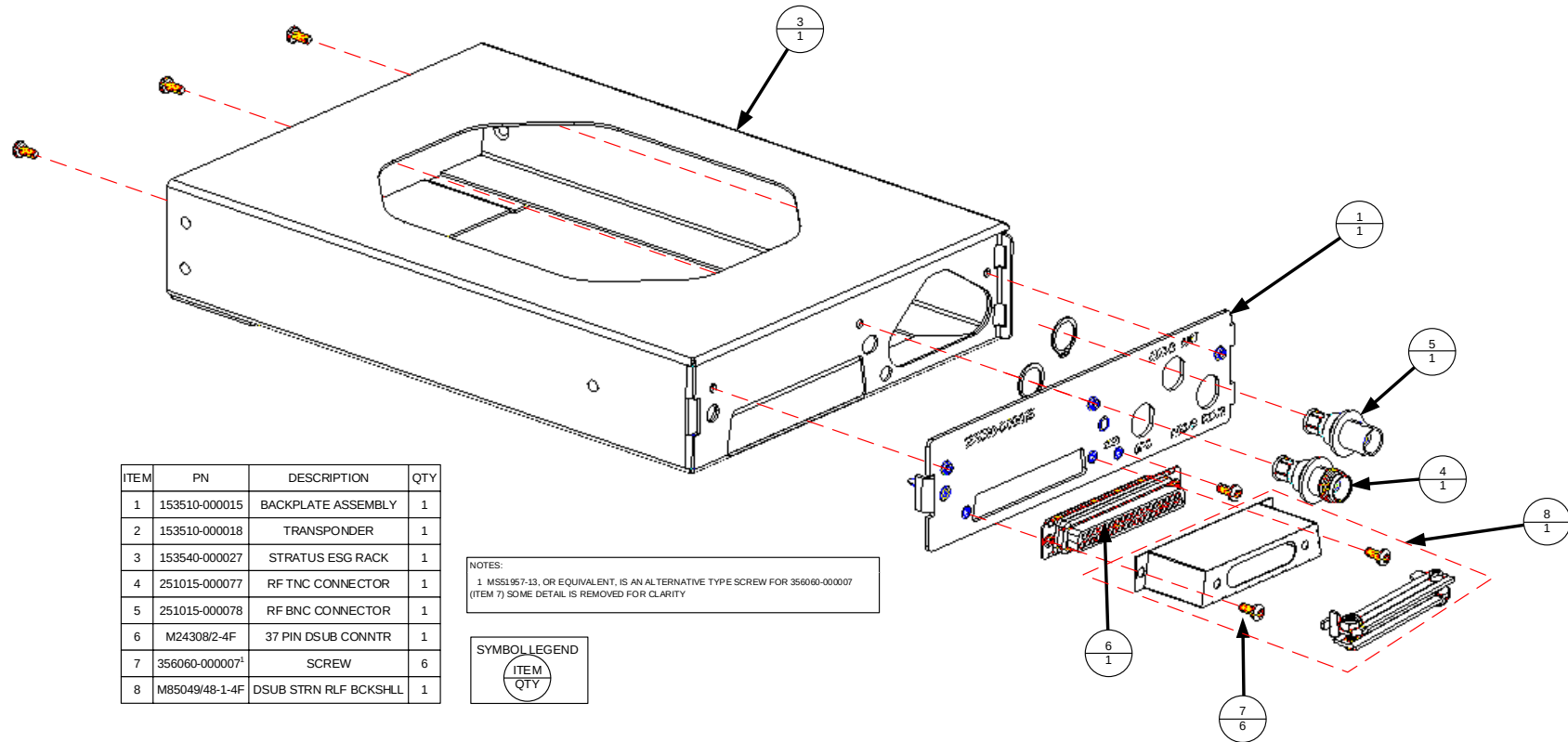
NOTES:

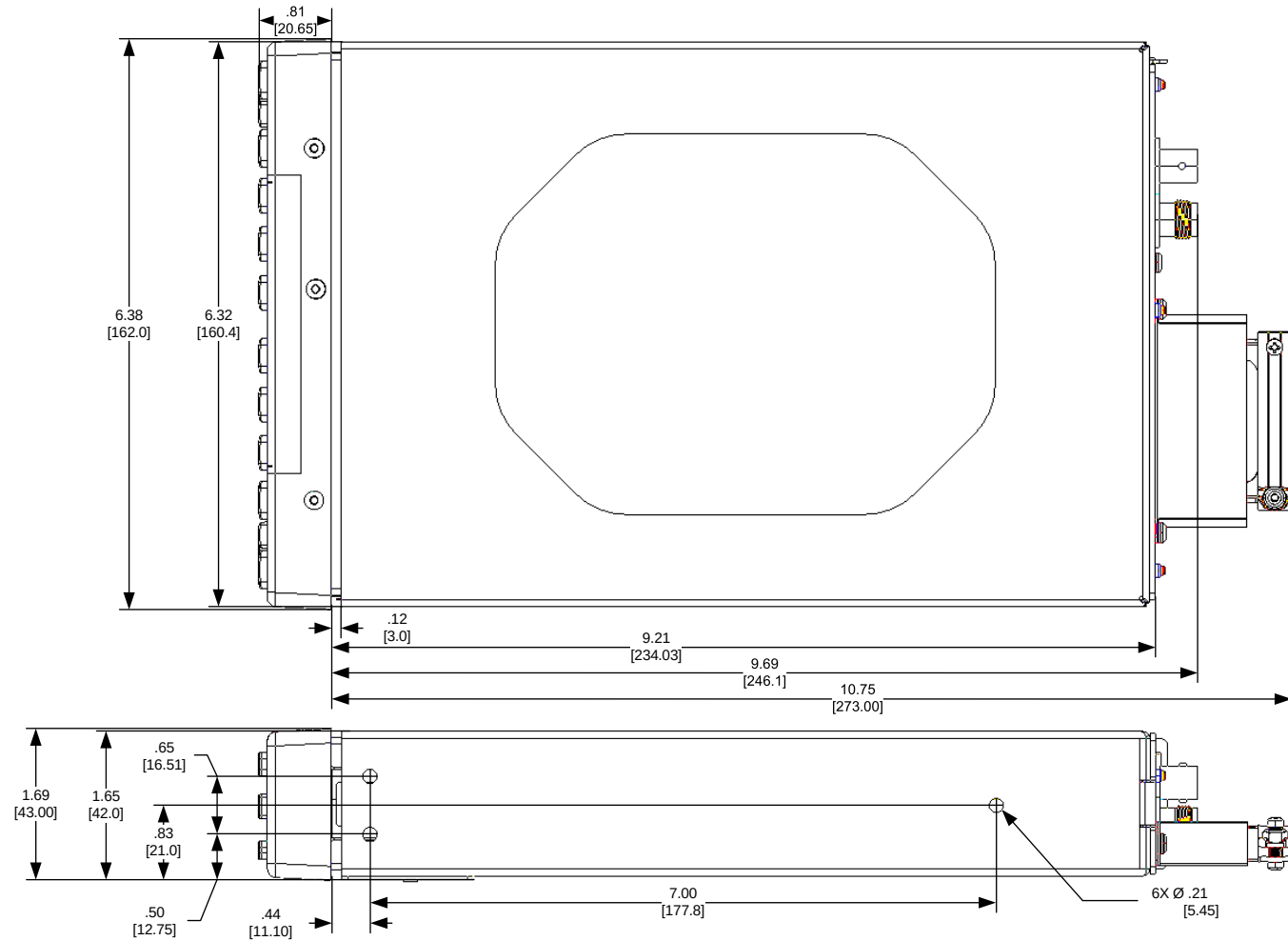
THESE DRAWINGS COVER THE INSTALLATION OF STRATUS ESG.
1 SOME DETAIL IS REMOVED FOR CLARITY
2 FOR AN OPTIMAL FIT, MOUNTING BRACKETS MAY BE REQUIRED BUT ARE NOT SUPPLIED. IF ADDITIONAL BRACKETS ARE NEEDED, THEY SHOULD BE BRACKETED FOR EACH INDIVIDUAL INSTALLATION.
3 ENSURE UNIT IS SUPPORTED IN THE BACK. ADDITIONAL SUPPORT MAY BE REQUIRED.
4 M551957-13, OR EQUIVALENT, IS AN ALTERNATIVE TYPE SCREW FOR 356060-000007 (ITEM 7)

ITEM	PN	DESCRIPTION	QTY
1	153510-000015	BACKPLATE ASSEMBLY	1
2	153510-000018	TRANSPONDER	1
3	153540-000027	STRATUS ESG RACK	1
4	251015-000077	RF TNC CONNECTOR	1
5	251015-000078	RF BNC CONNECTOR	1
6	M24308/2-4F	37 PIN DSUB CONNTR	1
7	356060-000007 ⁴	SCREW	6
8	M85049/48-1-4F	DSUB STRN RLF BCKSHLL	1

ITEM QTY
3 1



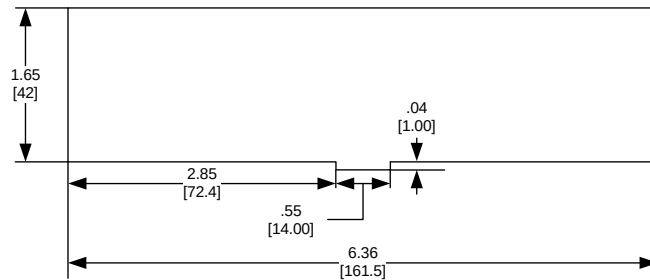




SYMBOL LEGEND	
ITEM	QTY

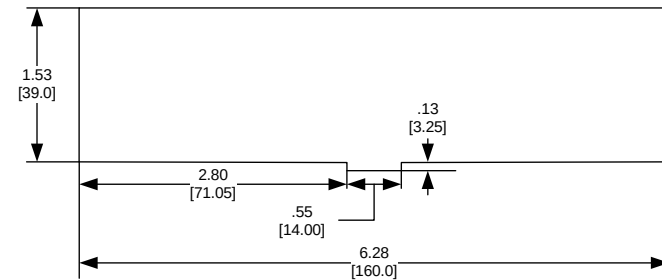
X.XX INCHES
[X.XX] MILLIMETERS

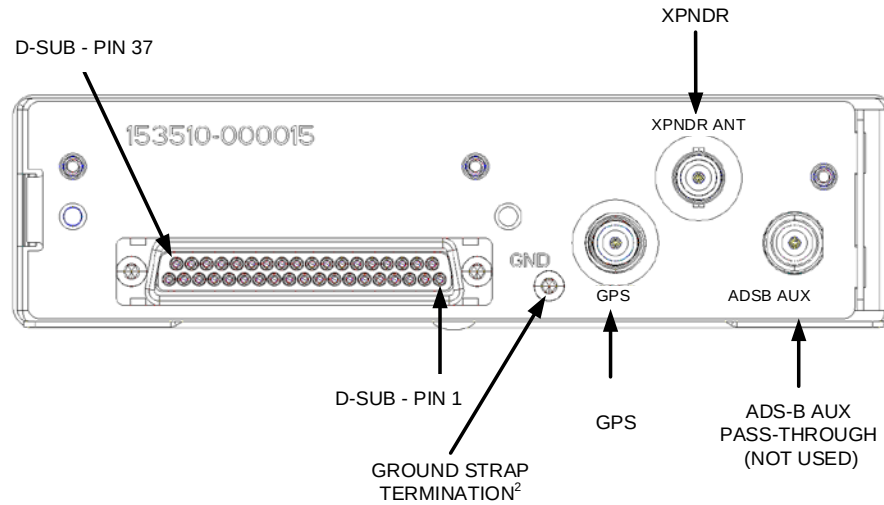
RADIO CUT OUT
RACK MOUNTED IN FRONT OF PANEL



X.XX Inches
[X.XX] Millimeters

RADIO CUT OUT
RACK MOUNTED BEHIND PANEL
MAX PANEL THICKNESS .12 [3.0mm]

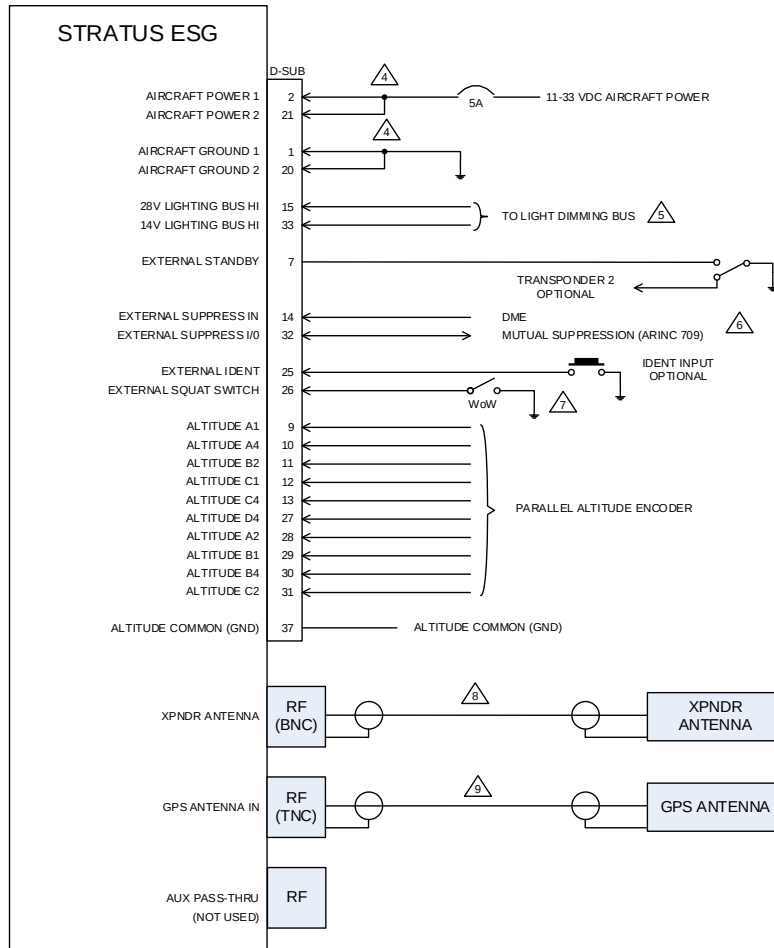




NOTES:
SOME DETAIL IS REMOVED FOR CLARITY
1 MAX CURRENT DRAW COMBINED FOR AUX +5V POWER IS 1.25 AMP. THIS WILL RESULT IN AN INCREASE OF 0.25 AMP @ 28VDC AND 0.47 AMP @ 14VDC
2 BOND IMPEDENCE BETWEEN AIRCRAFT GROUND AND UNIT CHASSIS MUST BE LESS THAN 2.5 MILLIOHMS. PROVIDED FOR TERMINATION IS A #4-40 THREADED GROUNDING POINT.

Stratus ESG D-SUB PINOUT DESCRIPTIONS					
PIN	DESCRIPTION	I/O	PIN	DESCRIPTION	I/O
1	AIRCRAFT GROUND		20	AIRCRAFT GROUND	
2	AIRCRAFT POWER		21	AIRCRAFT POWER	
3	RS232-RX MAINTENANCE	IN	22	RS232-TX MAINTENANCE	OUT
4	-		23	RS232-TX AUX	OUT
5	RS232-RX ALTITUDE	IN	24	RS232-TX ALTITUDE	OUT
6	RS232-TX GPS 1PPS	OUT	25	EXTERNAL IDENT	IN
7	EXTERNAL STANDBY	IN	26	EXTERNAL SQUAT SWITCH	IN
8	SOFTWARE UPDATE ENABLE	IN	27	ALTITUDE D4	IN
9	ALTITUDE A1	IN	28	ALTITUDE A2	IN
10	ALTITUDE A4	IN	29	ALTITUDE B1	IN
11	ALTITUDE B2	IN	30	ALTITUDE B4	IN
12	ALTITUDE C1	IN	31	ALTITUDE C2	IN
13	ALTITUDE C4	IN	32	EXTERNAL SUPPRESS I/O	I/O
14	EXTERNAL SUPPRESS IN	IN	33	14V LIGHTING BUS HI	IN
15	28V LIGHTING BUS HI	IN	34	-	
16	-		35	-	
17	AUX +5V POWER	OUT	36	AUX +5V POWER	OUT
18	AUX GROUND		37	ALTITUDE COMMON (GND)	
19	AUX +5V POWER	OUT			

Typical ESG Interconnect (Parallel Altitude Encoder)



NOTES:

SOME DETAIL IS REMOVED FOR CLARITY

1 ALL WIRING TO BE PERFORMED IN ACCORDANCE WITH AC 43.13-2B (AS AMENDED), UNLESS OTHERWISE SPECIFIED, ALL WIRING TO BE DONE WITH 22 AWG WIRING

2 DRAWING DEPICTS INSTALLATION WITH A PARALLEL ALTITUDE ENCODER. SEE NEXT PAGE FOR SERIAL ENCODER WIRING

3 PIN 24 (RS232 TX ALTITUDE) CAN BE USED AS A SERIAL ALTITUDE SOURCE FOR OTHER EQUIPMENT

4 FROM SPlice TO UNIT, WIRE LENGTH SHOULD NOT EXCEED 6 INCHES

5 CONNECT ONLY 1 INPUT TO LIGHTING BUS

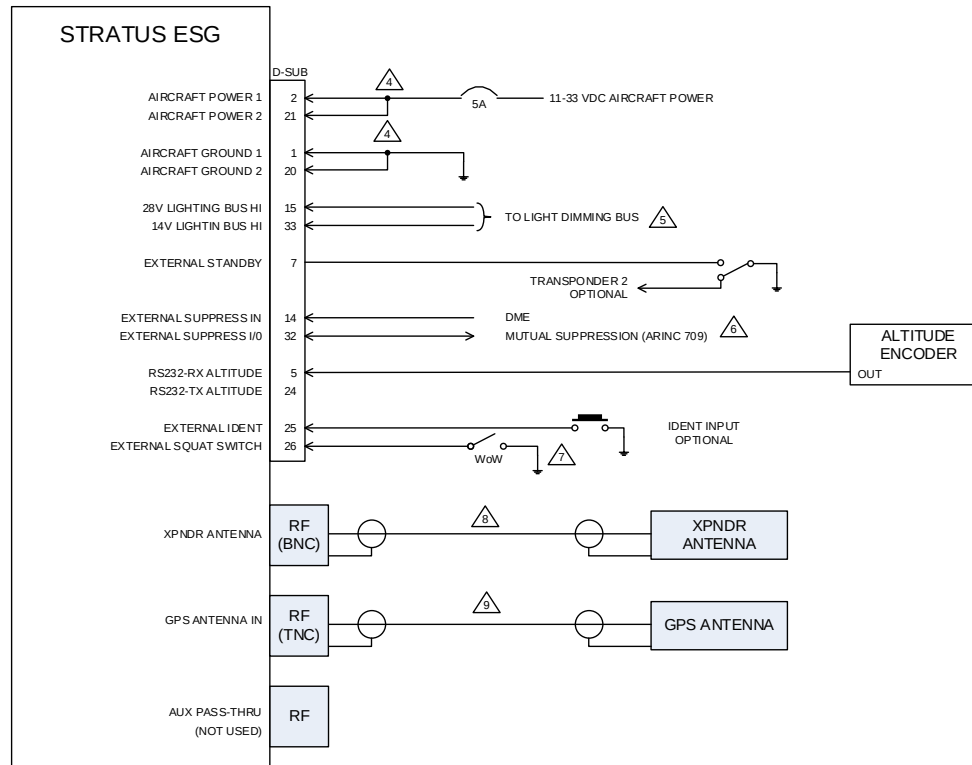
6 TO CONTROL BRIGHTNESS WITH THE AMBIENT LIGHT SENSOR, DO NOT CONNECT THESE PINS AND SELECT THE AMBIENT LIGHT SENSOR DURING BACKLIGHT SOURCE CONFIGURATION

7 ONLY ONE SUPPRESSION SOURCE MAY BE CONNECTED AT ONE TIME (OPTIONAL)

8 USING RG400, THE MAXIMUM CABLE LENGTH IS 14 FEET WITH A MAXIMUM OF 2 dB LOSS. IF THE INSTALLATION REQUIRES MORE LENGTH, SELECT OTHER 50 OHM COAX THAT WILL PROVIDE A MAXIMUM 2 dB LOSS.

9 ALL WIRING SHOULD HAVE A MINIMUM OF 2 dB LOSS AND A MAXIMUM OF 7 dB LOSS. EACH BNC OR TNC CONNECTION IS ESTIMATED TO HAVE A 0.2 dB LOSS

ESG Interconnect (Serial Altitude Encoder)



NOTES:

SOME DETAIL IS REMOVED FOR CLARITY

1 ALL WIRING TO BE PERFORMED IN ACCORDANCE WITH AC 43.13-2B (AS AMENDED), UNLESS OTHERWISE SPECIFIED, ALL WIRING TO BE DONE WITH 22 AWG WIRING

2 DRAWING DEPICTS INSTALLATION WITH A SERIAL ENCODER. SEE PREVIOUS PAGE FOR PARALLEL ENCODER WIRING

3 PIN 24 (RS232 TX ALTITUDE) CAN BE USED AS A SERIAL ALTITUDE SOURCE FOR OTHER EQUIPMENT

4 FROM SPLICE TO UNIT, WIRE LENGTH SHOULD NOT EXCEED 6 INCHES

5 CONNECT ONLY 1 INPUT TO LIGHTING BUS

6 TO CONTROL BRIGHTNESS WITH THE AMBIENT LIGHT SENSOR, DO NOT CONNECT THESE PINS AND SELECT THE AMBIENT LIGHT SENSOR DURING BACKLIGHT SOURCE CONFIGURATION

7 ONLY ONE SUPPRESSION SOURCE MAY BE CONNECTED AT ONE TIME (OPTIONAL)

8 OPTIONAL INSTALLATION. TYPICALLY CONNECTED TO WEIGHT ON WHEELS SWITCH. REFER TO AIRCRAFT MANUAL TO DETERMINE APPLICABILITY.

9 USING RG400, THE MAXIMUM CABLE LENGTH IS 14 FEET WITH A MAXIMUM OF 2 dB LOSS. IF THE INSTALLATION REQUIRES MORE LENGTH, SELECT OTHER 50 OHM COAX THAT WILL PROVIDE A MAXIMUM 2 dB LOSS.

10 ALL WIRING SHOULD HAVE A MINIMUM OF 2 dB LOSS AND A MAXIMUM OF 7 dB LOSS. EACH BNC OR TNC CONNECTION IS ESTIMATED TO HAVE A 0.2 dB LOSS

Appendix B: Maintenance Manual

1. Introduction

1.1. PURPOSE

This document provides guidance for how to create a maintenance manual for the recommended and required maintenance practices to maintain the Appareo Systems Stratus ESG system.

1.2. SYSTEM DESCRIPTION

Stratus ESG by Appareo is a panel-mounted level 2els Class 1 Extended Squitter transponder. It is a Class B1S transponder which is ADS-B Out compliant. To support the ADS-B Out function, Stratus ESG contains a Class Beta 1 GPS/WAAS receiver. Stratus ESG responds to legacy Mode A/C interrogations and Mode S interrogations from both ground radar and airborne collision avoidance systems.

1.2.1. Operation of Stratus ESG

See the Stratus ES/ESG Pilot's Guide (600890-000049) for a full description of Stratus ESG's function.

1.2.2. Stratus ESG parts catalog

See Section 1.5 of the beginning of this document for the parts that are required for the installation of Stratus ESG.

Stratus ESG also requires input from a GPS antenna, transponder antenna, and altitude encoder. See Section 1.6 of the beginning of this document for antenna and altitude encoder requirements.

1.3. REQUIRED TOOLS

See Section 1.4 of the beginning of this document for required tools.

1.4. WEIGHT AND BALANCE INFORMATION

See Section 1.3.2 of the beginning of this document for weight and balance information.

1.5. EQUIPMENT DIMENSIONS

See Section 1.3.1 of the beginning of this document for equipment dimensions.

2. AIRWORTHINESS LIMITATIONS

There are no airworthiness limitations associated with this type design change.

3. INSPECTION REQUIREMENTS AND OVERHAUL (ATA CHAPTER 5)

Requirement	Inspection	
	Special Inspection	Inspection Term
1. Inspect Stratus ESG for damage.	NOTE: 1, 2, 3	12 months
2. Inspect Stratus ESG wiring and connectors for security.	NOTE: 1, 2, 3	12 months
3. Inspect Stratus ESG connector contacts and attachment hardware for corrosion.	NOTE: 2	12 months
4. Clean Stratus ESG.		As necessary
5. In accordance with 14 CFR 91.411 and 91.413, inspect and test Stratus ESG for the interface with each static pressure system, altimeter instrument, automatic pressure altitude reporting system, or any other integrated system using the tests and specifications in 14 CFR Part 43, Appendix E and F.		24 months or After any maintenance performed on integrated systems including maintenance performed on Stratus ESG where data correspondence error could be introduced

Table 1: Scheduled maintenance

NOTES:

1. This item requires inspection following a hard landing event
2. This item requires inspection following a lightning strike event
3. This item requires inspection following a propeller strike event

3.1. GENERAL INSPECTION INFORMATION

Removal and installation instructions are found in this document. Manufacturer's installation manuals and basic aircraft maintenance manuals should be used for additional reference material. Component maintenance on Stratus ESG must be completed by an authorized repair facility. Refer to Section 10: Servicing later in this document. If for any reason during inspection Stratus ESG fails inspection or is otherwise not working properly, read the instructions contained in this manual before removing any Stratus ESG components. If difficulty is encountered, seek assistance by contacting the manufacturer. Maintenance must be performed to 14 CFR Part 91.225.

4. DIMENSIONS AND ACCESS (ATA CHAPTER 6)

4.1. COMPONENT LOCATIONS

Stratus ESG: Stratus ESG is panel mounted.

GPS antenna: Typical GPS antenna installation locations are on the top of the aircraft or on the empennage with consideration for line of sight with satellites.

Transponder antenna: The transponder antenna should be mounted vertically on the bottom of the aircraft.

Altitude encoder: The altitude encoder should be installed using the manufacturer's instructions and recommendations.

4.2. MAINTENANCE INSTRUCTIONS

The following instructions are in addition to the standard practices used to maintain the aircraft structure, the wiring described in the aircraft manufacturer's maintenance manual, and FAA Advisory Circular 43.13-1B.

4.2.1. Stratus ESG System Removal

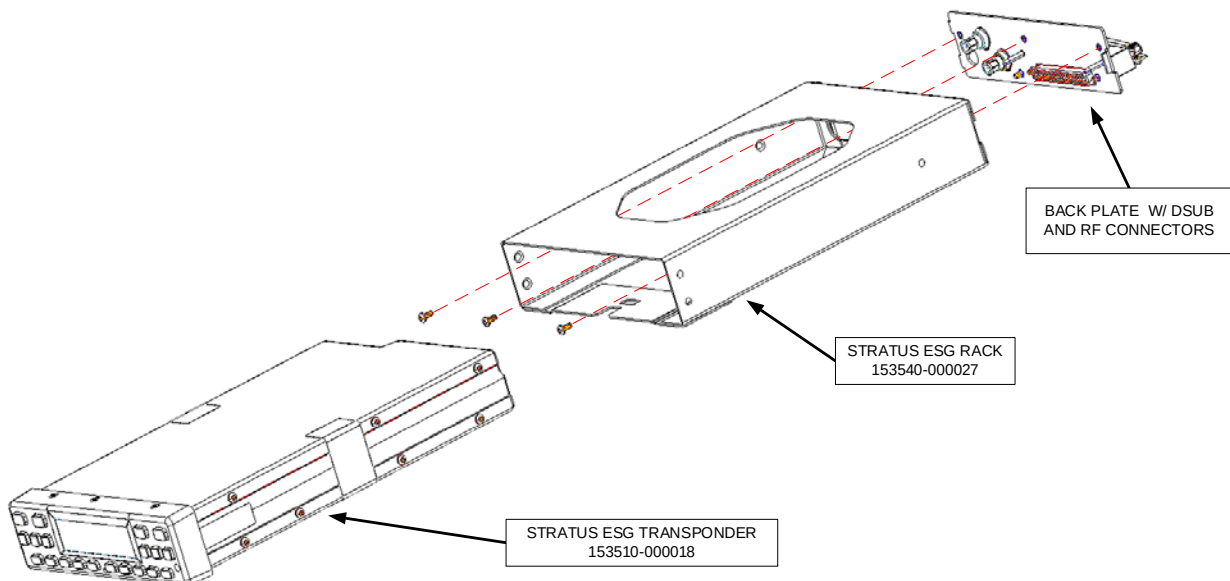


Figure 1: Stratus ESG installation diagram

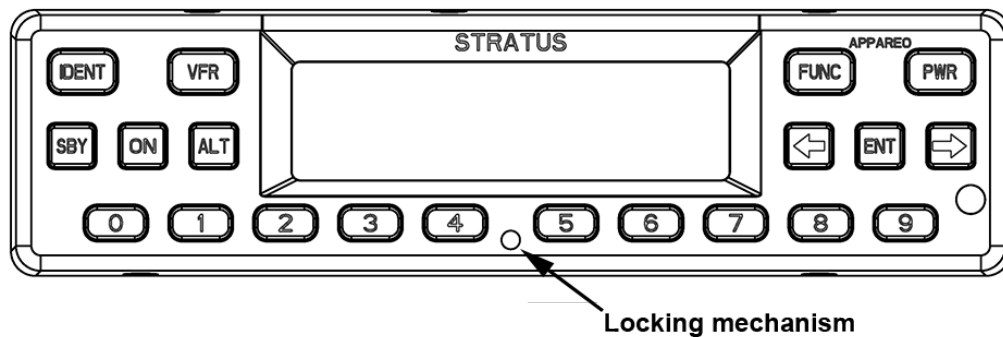


Figure 2: Locking mechanism location

To remove the Stratus ESG assembly:

Turn the 3/32 hex wrench counter-clockwise on the locking mechanism through the front of Stratus ESG to loosen the lock until the transponder connectors disconnect. Keep loosening the unit until it stops sliding out of the install rack. Do not loosen any further. Pull out Stratus ESG by hand.

4.2.2. Stratus ESG System Replacement

To replace the Stratus ESG assembly:

1. Adjust the locking mechanism on Stratus ESG using a 3/32 hex wrench so that the front lobe is in a vertical position. Insert the unit by hand until it comes to a stop. This occurs when the front lobe contacts the clearance slot of the install rack.
2. Tighten the locking mechanism with the 3/32 hex wrench until it is tight and the connectors have mated. Do not overtighten. If the mechanism will not tighten, verify that Stratus ESG is properly seated in the rack. The unit is fully seated when the unit does not move back when tightening the locking mechanism.

NOTE: Ensure that the transponder is seated as far back as possible against the backplate so that there is a secure connection between the transponder and the connectors.

NOTE: Conduct the applicable functional tests in Section 5 of the installation instructions after replacing the Stratus ESG assembly.

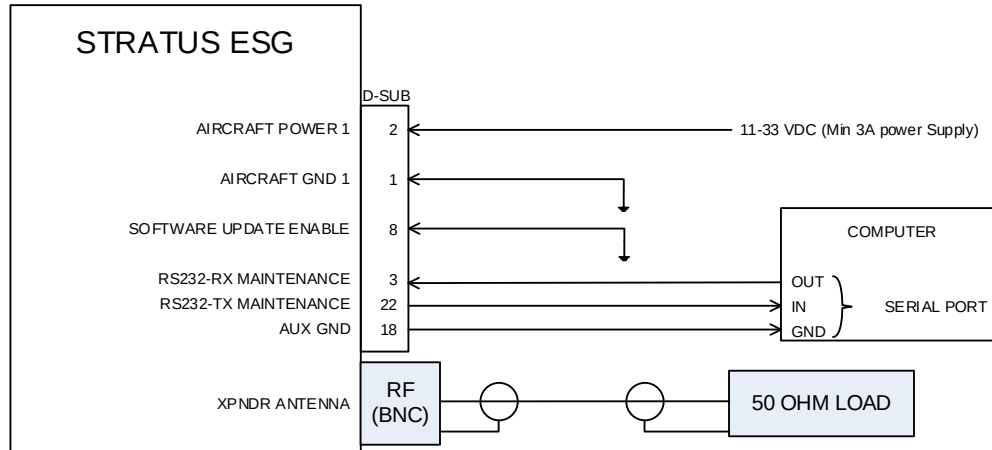
4.2.3. Software Update

The following equipment is required to perform a software update:

- Portable computer with Windows operating system
- Stratus ESG Software Update Tool desktop software (See Step 4)
- Stratus ESG software/embedded hardware update (See Step 4)
- 3 amp power supply
- D-sub wiring harness
- Serial to USB adapter (optional)

To perform a software/embedded hardware update, complete the following steps:

1. Use the following diagram to wire the transponder for a software update.



NOTES:

SOME DETAIL IS REMOVED FOR CLARITY

1 UNLESS OTHERWISE SPECIFIED, ALL WIRING TO BE DONE WITH 22 AWG WIRING

Figure 3: Software update wiring diagram

2. Plug the serial port connector into the computer. A serial to USB adapter may be required. If the adapter requires you to install drivers, install them.
3. Power on Stratus ESG. It will enter into software update mode.

NOTE: The screen will be black, but the keypad will illuminate.

4. Apply the software/embedded hardware update.
 - a. Download the Stratus ES/ESG Update Tool and update file.
 - i. **Dealers:** Log in to the Appareo Dealer Portal, then navigate to appareo.com/dealer-portal/service-bulletins.
 - Experimental pilots:** Navigate to www.appareo.com/resources and click "Service Bulletins."
 - ii. Download the Stratus ESG Update Tool (if you have not already done so) and the update file for Stratus ESG. When prompted, install the software by following the on-screen prompts.
 - b. Open the Stratus ES/ESG Update Tool.
 - c. Click the box below "Update File" and navigate to the update file that was downloaded in Step 4.a.iii.

- d. Use the "Port" drop-down menu to select the computer port that is connected to Stratus ESG.
 - e. Click **Update**. A pop-up box will appear when the update begins and completes.
5. Verify that the software/embedded hardware update has applied correctly.
 - a. Remove the grounding pin (pin 8).
 - b. Turn off Stratus ESG and enter into configuration mode (while holding the **FUNC** key, press and release the **PWR** key).
 - c. Press **FUNC** or the arrow keys to advance to the software versions diagnostic screens and verify that the most recent programmed configuration appears. Refer to the service bulletin alerting you of the software update for the most recent programmed configuration.

4.2.4. Stratus ESG Configuration

See Section 4 of the beginning of this document for instructions for how to configure Stratus ESG.

4.3. FUNCTIONAL TESTS

See Section 5 of the beginning of this document for functional test instructions and applicable regulations if a replacement has been installed or the unit is new to this aircraft.

5. LIFTING AND SHORING (ATA CHAPTER 7)

5.1. LIFTING INFORMATION

5.1.1. Jacking Information

No change to basic aircraft Instructions for Continued Airworthiness (Maintenance Manuals)

5.1.2. Lifting Information

No change to basic aircraft Instructions for Continued Airworthiness (Maintenance Manuals)

5.2. SHORING INFORMATION

No change to basic aircraft Instructions for Continued Airworthiness (Maintenance Manuals)

6. LEVELING AND WEIGHING (ATA CHAPTER 8)

6.1. LEVELING INFORMATION

No change to basic aircraft Instructions for Continued Airworthiness (Maintenance Manuals)

6.2. WEIGHING INFORMATION

No change to basic aircraft Instructions for Continued Airworthiness (Maintenance Manuals)

7. TOWING AND TAXIING (ATA CHAPTER 9)

7.1. TOW INSTRUCTIONS

No change to basic aircraft Instructions for Continued Airworthiness (Maintenance Manuals)

7.2. TAXIING INSTRUCTIONS

No change to basic aircraft Instructions for Continued Airworthiness (Maintenance Manuals)

8. PARKING, MOORING AND STORAGE (ATA CHAPTER 10)

8.1. MOORING INFORMATION

No change to basic aircraft Instructions for Continued Airworthiness (Maintenance Manuals)

8.2. PARKING INFORMATION

No change to basic aircraft Instructions for Continued Airworthiness (Maintenance Manuals)

8.3. STORAGE LIMITATIONS

No change to basic aircraft Instructions for Continued Airworthiness (Maintenance Manuals)

9. PLACARDS AND MARKINGS (ATA CHAPTER 11)

Ensure that the labeling is in accordance with AC 43.13-2B, Chapter 2, Section 207, Sub-Section f., Paragraph (4).

10. SERVICING (ATA CHAPTER 12)

10.1. SERVICING INFORMATION

The Stratus ESG system has a number of internal self-test features. See Section 10.1.2 below for a troubleshooting guide.

10.1.1. Component Repair

Equipment determined in need of repair must be returned to a properly rated repair facility that is trained and qualified.

Appareo provides repair services and has an authorized repair station.

To utilize Appareo's repair services, contact Appareo support for a Return Merchandise Authorization (RMA) number. Return all defective and suspected defective components to the following address for repair and replacement.

Appareo Systems, LLC
Attn: [RMA Number]
1830 NDSU Research Circle North
Fargo, ND 58102

For additional information, contact Appareo Systems at +1-701-356-2200.

10.1.2. Troubleshooting

Use the table below to troubleshoot possible problems with Stratus ESG.

Problem	Troubleshooting Steps
GPS information is not being received	1. Verify that the aircraft is in clear view of the sky. 2. Verify that the antenna connections and cables are not loose. 3. Verify that the coax cable is connected to the correct port. NOTE: Initial GPS fix could take up to 20 minutes.
GPS antenna signal quality is reduced	1. Turn off all avionics except the GPS/transponder. 2. Enter into configuration mode on Stratus ESG. 3. Go to the CN0 diagnostic screen and wait for the CN0 values to populate. 4. Turn on one avionic at a time. If the CN0 values drop by 2 dB or more, there might be an interference problem. The avionic causing the interference might need to be relocated in the cockpit, antennas might need to be moved farther apart, or filters might need to be added to the avionic.
Transponder is not receiving the squat switch position	1. Check the connections and the pin-out of the transponder to verify that the squat switch port is correctly connected. 2. Verify that the squat switch works independent of the transponder.

The power key does not power on Stratus ESG	1. Verify that the power key is not stuck. 2. Verify that the circuit breaker has not tripped. If it has tripped: Reset the circuit breaker switch and try the power key again. NOTE: If the circuit breaker opens it may be reset only once. If it did not trip: Verify that the electrical connection to the transponder is secure. Verify that the voltage at the input to the unit is between 11 VDC and 36 VDC.
The altitude displayed is incorrect	1. Enter into configuration mode on Stratus ESG and verify that the altitude source is set as the currently used altitude source. If the altitude source is a serial connection, verify that the correct encoding option was selected. 2. Verify that the correct connections are made to the transponder. 3. Use an altitude simulator to verify the cabling. 4. Verify that there is not a problem with the altitude source.
The screen displays a “transmitter failure” error message	This message appears when one of the following issues occurs: improper impedance between antenna and transponder, improper connection on connectors, improper seating of transponder into tray. 1. Verify that the transponder is completely seated in the rack. Ensure back plate has been properly installed to rack. 2. Verify that the transponder antenna is connected to the port labeled XPNDR ANT and that the GPS antenna is connected to the port labeled GPS. 3. Check all connectors to ensure they are properly mated. Check these connectors for opens or shorts. 4. Verify that the maximum loss from the transponder connector to the antenna connector is 2 db. 5. Inspect the transponder antenna to ensure functionality and adherence to requirements identified in the transponder antenna section. 6. Inspect wiring to ensure cabling integrity.

The screen displays a Built in Test (BIT) failure The display screen will display a warning message and a degraded state indicator  if any of Stratus ESG's BITs fail.	The Stratus ESG screen might display a warning message with the following instructions below. Below is guidance regarding how to assess the failure: • PRESS FUNC TO CLEAR: A non-critical error has been detected. The transponder will run in a degraded state until the error is resolved. Contact Appareo for further assistance. • PLEASE RESTART UNIT: A critical error has been detected. Restarting the unit may fix the error. If the message returns after restarting, contact Appareo for further assistance. • PLEASE SHUTDOWN UNIT: A critical error has been detected. Power off the unit and do not turn it back on. Contact Appareo for further assistance. • OVERHEATED: Stratus ESG has overheated. Stratus ESG's function will resume when it cools down. • WAITING TO BE UNSTUCK: A key has been depressed for more than 20 seconds. If a key is stuck, try to unstuck the key. • WAITING FOR RELEASE: The external suppression input is constantly in a suppressed state. Contact Appareo for further assistance. • ATTEMPTING TO RECOVER: A squitter rate error has been detected. The transponder may recover itself, but if it does not, restart the unit. If the message returns after restarting, contact Appareo for further assistance.
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Table 2: Troubleshooting guide

10.2. LUBRICATION INFORMATION

No change to basic aircraft Instructions for Continued Airworthiness (Maintenance Manuals)

10.3. EQUIPMENT REQUIRED FOR SERVICING

No change to basic aircraft Instructions for Continued Airworthiness (Maintenance Manuals)

10.4. CONSUMABLE MATERIALS

No change to basic aircraft Instructions for Continued Airworthiness (Maintenance Manuals)