

## BASIC DIGITAL FLIGHT INSTRUMENT, KIT INSTALLATION INSTRUCTIONS

### MODELS: BELL 212

Read all of the Instructions for Continuing Airworthiness thoroughly prior to performing any activities relating to this product

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**Notes**

1. If changes to this document are required, Alpine Aerotech LP shall revise all pages and reissue the entire document.
2. Alpine Aerotech LP shall make any subsequent revisions of this document available free of charge upon request. Alpine Aerotech LP also recommends that the end user of this product periodically verify the revision level of this document.

**SECTION 1 DESCRIPTION**

The following information provides a functional description of the Basic Digital flight Instrument, Kit as defined in Alpine Aerotech LP authority dataset AAL-280-040-901/-902/-903.

The AAL Basic Digital Flight Instrument, Kit allows for the replacement of the OEM mechanical attitude and heading instruments with standalone digital instruments. Three different configurations are available: pilot (RHS) only instrumentation, co-pilot (LHS) only instrumentation and combined pilot and co-pilot instrumentation.

## **SECTION 2    INSTALLATION & REMOVAL INSTRUCTIONS**

### **Applicability**

The Basic Digital Flight Instrument, Kit (AAL-280-040-901/902/-903) is applicable to all serial numbers including aircraft equipped with co-pilot instrumentation per 212-SI-1 and 212-SI-41.

### **Weight & Balance**

<u>Part Number</u>	<u>Description</u>	<u>Weight</u>	<u>Long. Arm</u>	<u>Lat. Arm</u>
AAL-280-040-901	Basic Digital Instrument, Kit	4.56* 2.07 (Kg)	30.62 .778 (m)	-1.47 LBL -.037 (m)
AAL-280-040-902	Basic Digital Instrument, Kit, RHS	2.77* 1.26 (Kg)	31.94 .811 (m)	5.76 RBL .146 (m)
AAL-280-040-903	Basic Digital Instrument, Kit, LHS	2.77* 1.26 (Kg)	30.04 .763 (m)	-10.56 LBL -.268 (m)

\* Represents total weight of applicable kit only. Subtract weight of all items removed and recalculate C of G as appropriate.

### **General Notes**

1. All Installation Instructions shall be accomplished in accordance with (IAW) standard aircraft practices. Refer to the current revision of the FAA Advisory Circular AC 43.13-1 and AC 43.13-2 for details on standard aircraft practices.
2. Torque fasteners IAW the tension type torque limits indicated in the current revision of the FAA Advisory Circular AC 43.13-1, Table 7-1 unless otherwise specified.
3. All Dimensions are in imperial measures (inches/pounds).
4. Refer to ICA document AAL-280-045-701, Section 2: Maintenance Manual Supplement for instructions on maintenance for the item(s) referenced within this section.
5. Refer to ICA document AAL-280-045-701, Section 4: Illustrated Parts Breakdown for the part numbers of the item(s) referenced within this section.

## Installation Notes

1. Handle the instruments with extreme care. Do not drop, jar or shake the instruments. Avoid touching the screen. For proper care and handling instructions refer to Kelly Manufacturing publication No. 1401-5 for the Heading Indicator and No. 1401-3 for the Attitude Indicator.
2. Cable and wire routing shown is recommended, deviation from routing shown is permitted to accommodate individual aircraft configuration.
3. Secure cables wiring harnesses IAW standard aircraft practices detailed in BHT-ELEC-SPM. Cable clamps are not provided and must be procured locally.
4. For installation on aircraft engaged in day VFR operation only, the installer may omit Steps 3, and 4 and identify Attitude and Heading circuit breakers with locally fabricated "PLT ATT", "PLT HDG", and/or "CPLT ATT" and "CPLT HDG" labels as applicable. Circuit breakers must be identified as being connected to an essential 28 VDC bus. Refer to Appendix B for more information regarding electrical installation.



Typical item number for all like items in this view unless otherwise specified.



Mark lit overlay panels IAW SAE-AS7788, Class 1-W, Type 4.

Font: Futura Demi Bold

Size: .125 (switch labels), .156 (section headings)



When the roof structure contains existing holes or doublers from prior modifications/installations, it is permitted to locally fabricate a doubler to accommodate the existing holes. Fabricate the doubler using standard aircraft practices as detailed in the most current revision of FAA publication AC-43.13.

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## **Installation Instructions** (AAL-280-040-901 pilot/co-pilot sides)

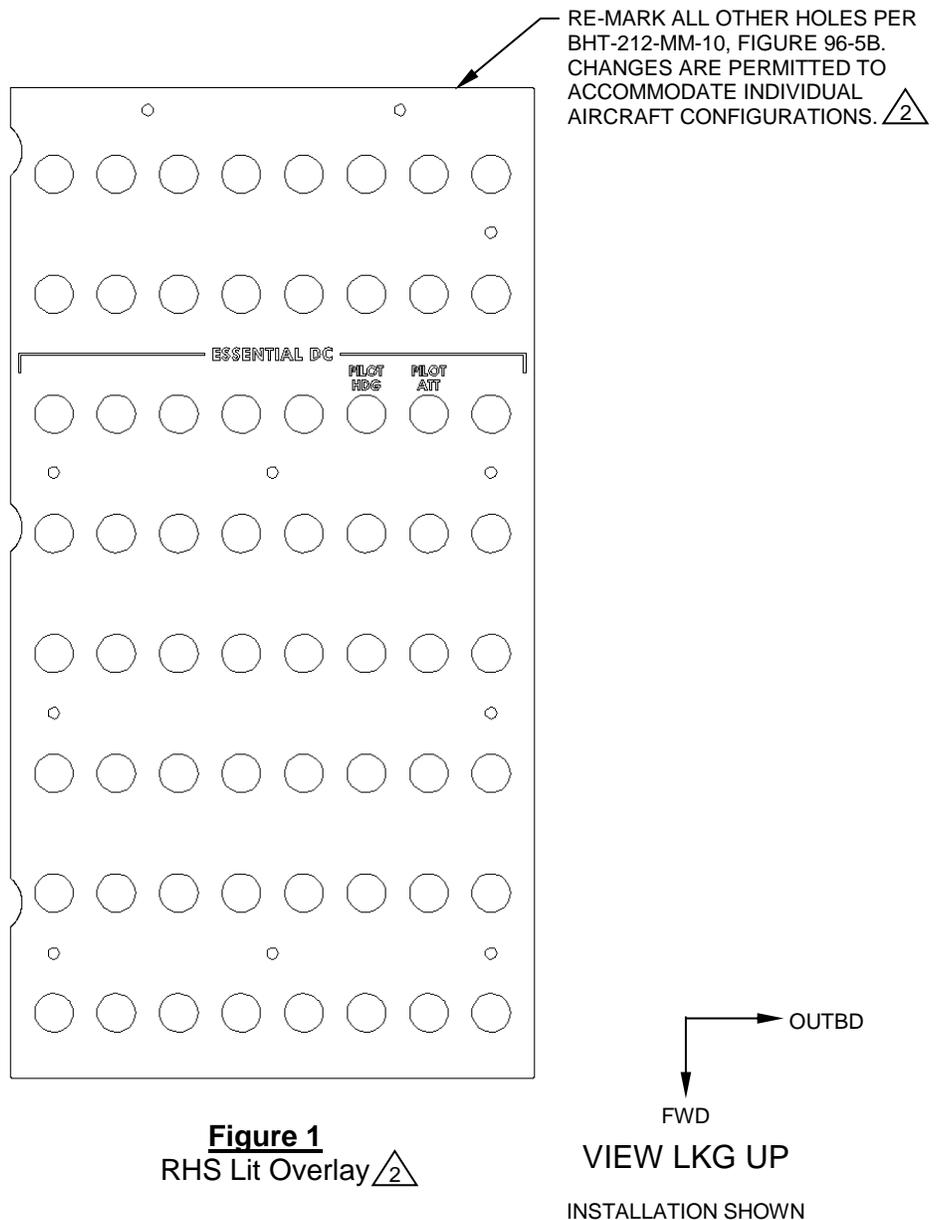
1. Gain access to the aircraft and make the aircraft ready for maintenance.
2. Prior to installation, remove the following instruments and equipment as applicable based on aircraft serial number and aircraft configuration.
  - i. Pilot attitude indicator
  - ii. Co-pilot attitude indicator (if so equipped)
  - iii. Pilot rate gyro
  - iv. Co-pilot rate gyro (if so equipped)
  - v. Gyro, pitch roll (if so equipped)
  - vi. Gyro, rate switching (if so equipped)
  - vii. Pilot horizontal situation indicator
  - viii. Co-pilot horizontal situation indicator (if so equipped)
  - ix. Pilot tarsyn gyro
  - x. Co-pilot tarsyn gyro (if so equipped)
  - xi. Pilot tarsyn mounting tray
  - xii. Co-pilot tarsyn mounting tray (if so equipped)
  - xiii. Pilot flux valve
  - xiv. Co-pilot flux valve (if so equipped)
  - xv. Pilot compass control
  - xvi. Co-pilot compass control (if so equipped)
  - xvii. Dual remote compensator
  - xviii. Radio magnetic indicator (if so equipped)
  - xix. Flux valve transmitter (if so equipped)
  - xx. Flux valve compensator
  - xxi. Overhead circuit breaker panel bus bar (30-006-8-26) on LHS only

<b>NOTE</b>
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**When removing the above referenced equipment, removal of all unused portions of the wiring harness is preferred. However, it is permissible to stow the affected portion(s) of the wiring harness that are no longer used. Recalculate weight and balance accordingly.**

**Installation Instructions** (AAL-280-040-901 pilot/co-pilot sides)

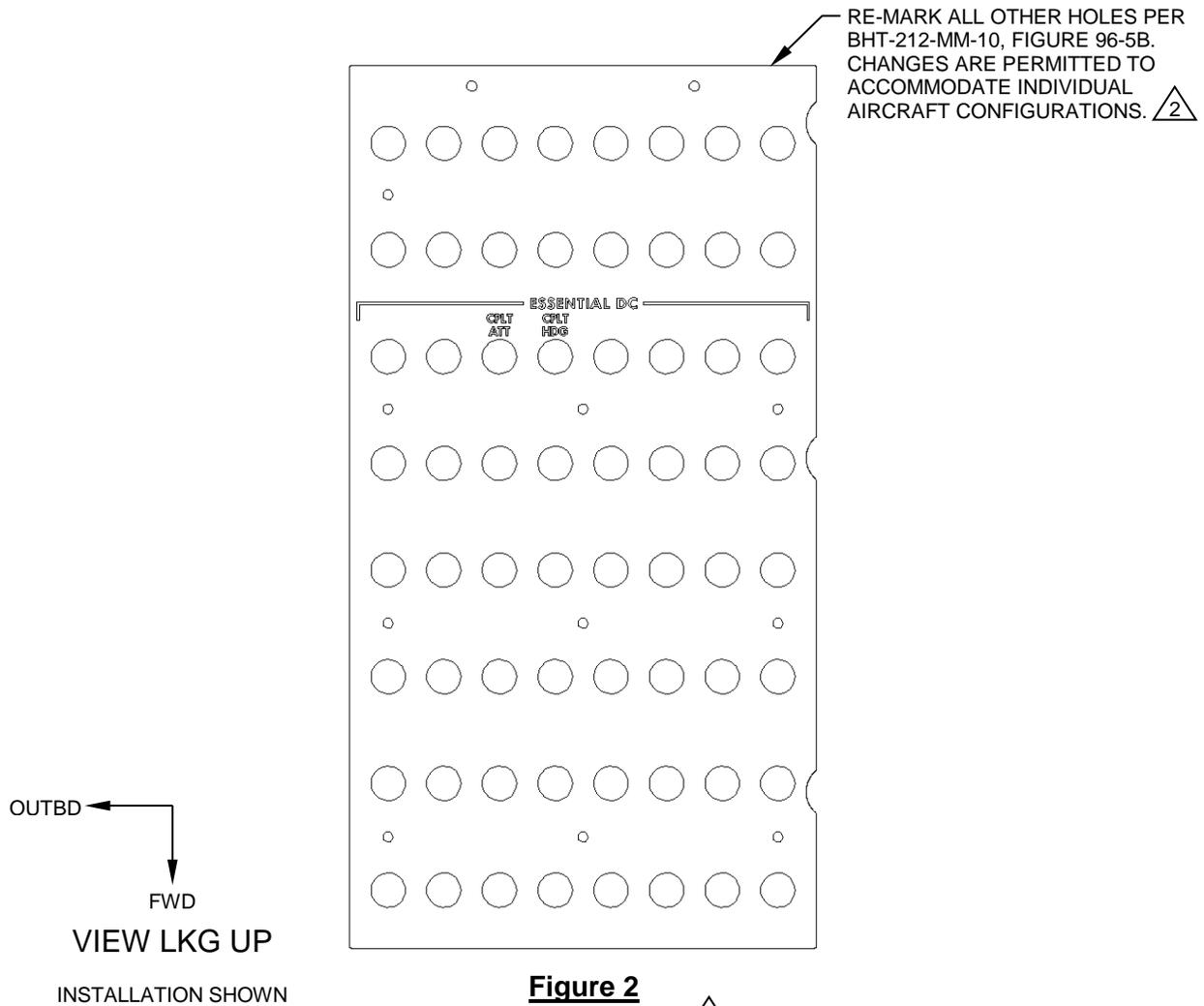
- Remove the lit overlay on the RHS overhead breaker panel and have it re-marked as shown. Alternately, if only day VFR operations are anticipated, it is permissible to identify Attitude and Heading circuit breakers with locally fabricated "PLT ATT" and "PLT HDG labels. Reference Figure 1. Changes to the layout are permitted to accommodate individual aircraft configurations.



**Figure 1**  
RHS Lit Overlay 2

**Installation Instructions** (AAL-280-040-901 pilot/co-pilot sides)

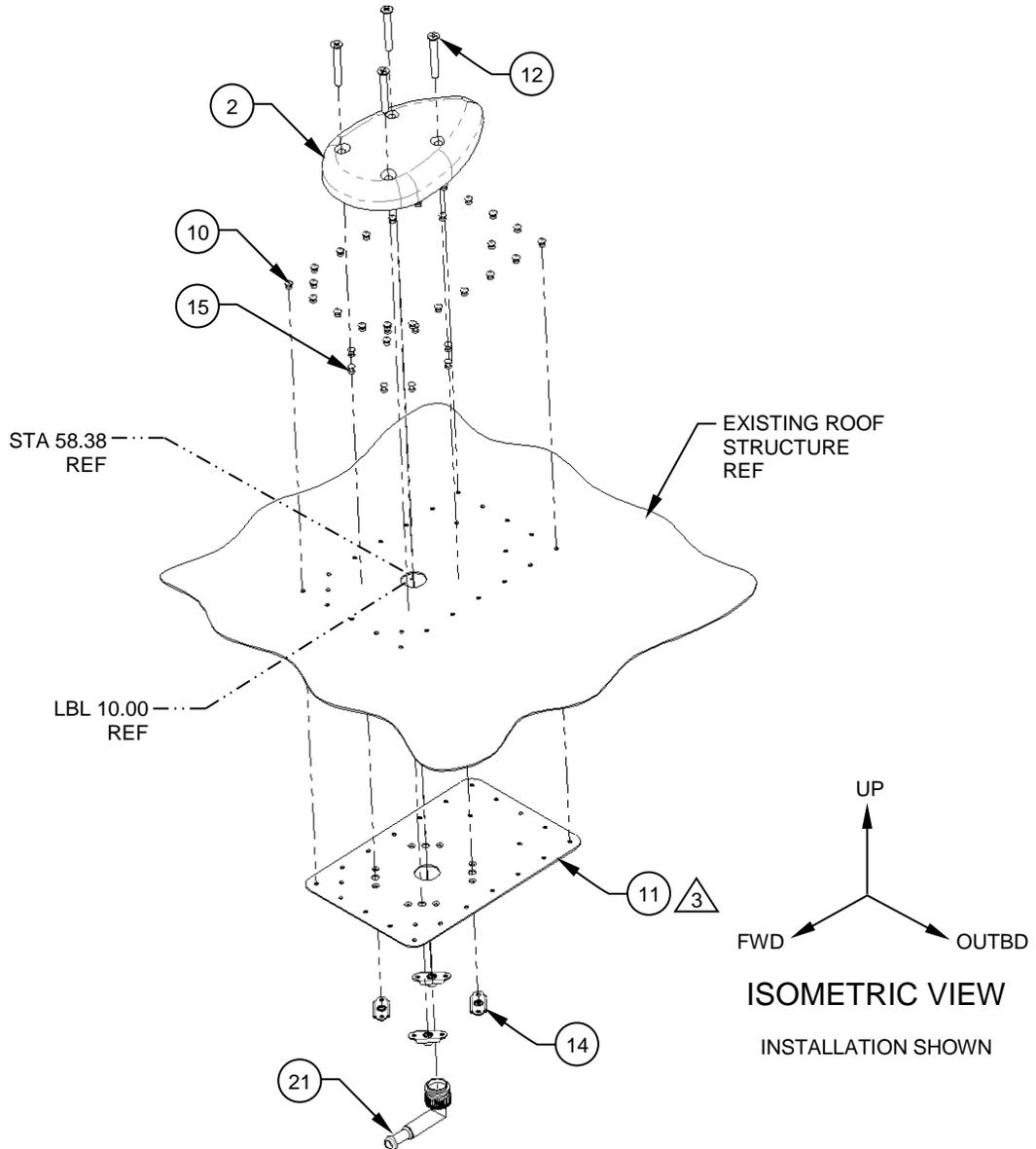
- Remove the lit overlay on the LHS overhead breaker panel and have it re-marked as shown. Alternately, if only day VFR operations are anticipated, it is permissible to identify Attitude and Heading circuit breakers with locally fabricated “CPLT ATT” and “CPLT HDG” labels. Reference Figure 2.



**Figure 2**  
LHS Lit Overlay 2

- Install the Doubler, Detail (Item 11) as shown in preparation for mounting the GPS Antenna (Item 2). Reference Figure 3. When installing the Doubler, Detail (Item 11), ensure that provisions are made to electrically bond/ground the antenna as per the requirements of BHT-ELEC-SPM, chapter 8.

**Installation Instructions** (AAL-280-040-901 pilot/co-pilot sides)

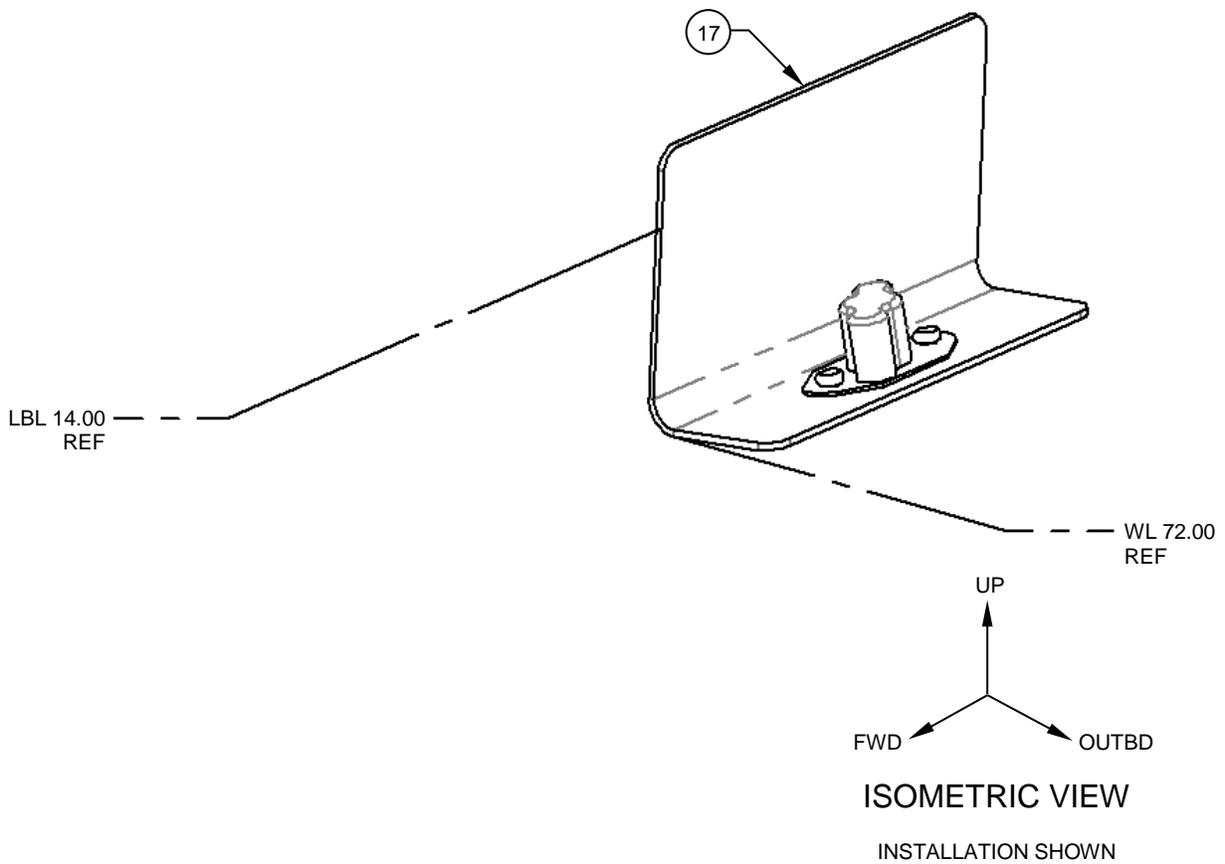


**Figure 3**  
Doubler  /Antenna Installation

- Install the GPS Antenna (Item 2) with the provided fasteners. Ensure that the GPS Antenna is electrically bonded/grounded per the requirements of BHT-ELEC-SPM, chapter 8. Reference Figure 3. Apply a fillet of Sealant, Corrosion Inhibitive (Item C01) around the base of the GPS Antenna. If required after installation, coat the area surrounding the GPS antenna (Item 2) with high solids epoxy primer per MIL-PRF-2377, Type 1, Class C2 and polyurethane paint in the appropriate color. Do not coat the GPS antenna.

**Installation Instructions** (AAL-280-040-901 pilot/co-pilot sides)

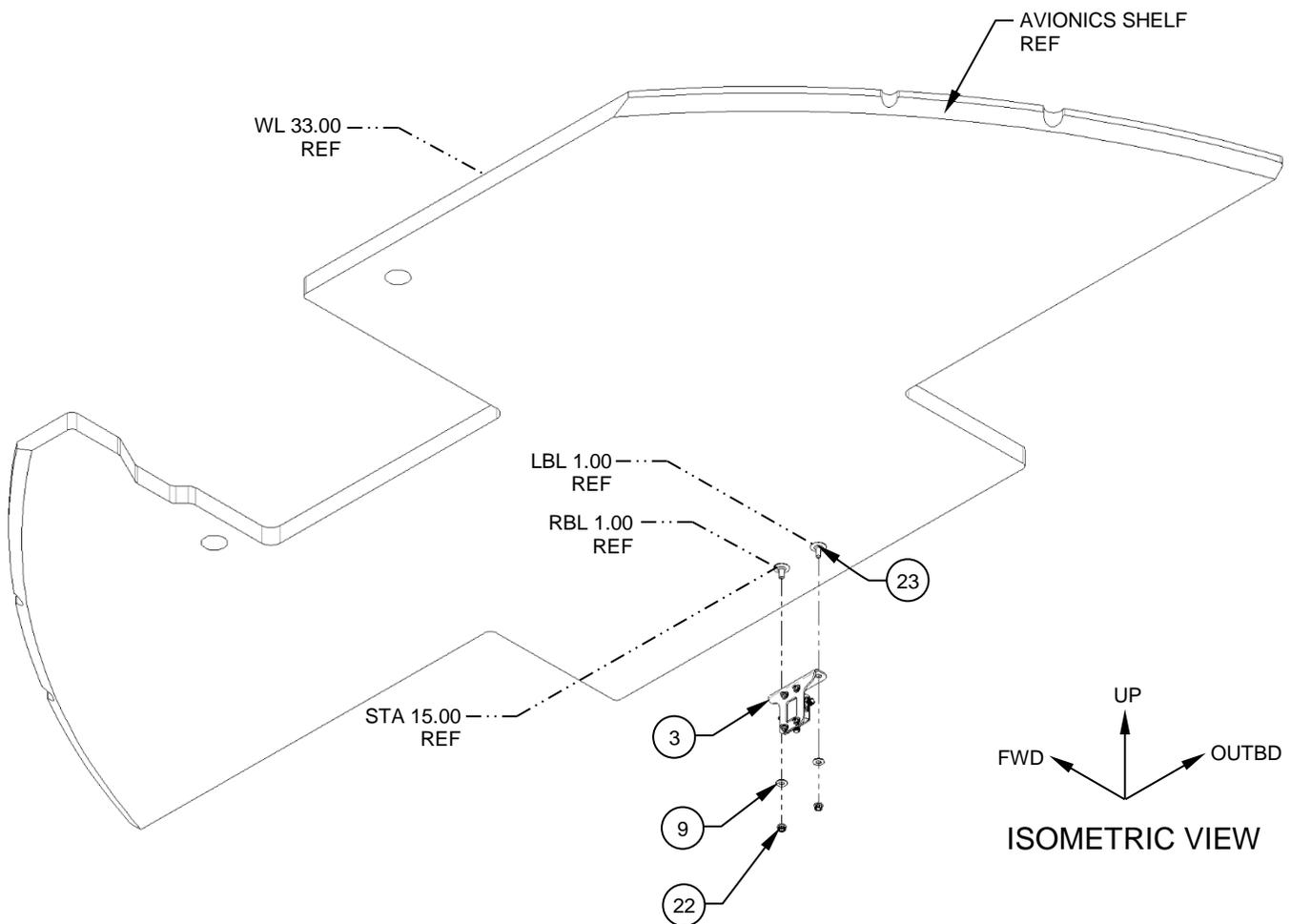
- 7. Remove the existing spare bulb holder clip (205-030-617-037) and replace with the Clip, Assy (Item 20). Back-drill the Clip, Assy (Item 17) from the existing holes making sure that the clip is positioned to keep the spare bulbs from contacting the Coax Cable, Assy (Item 13). Rivet in place with MS20470AD(X)-(X) rivets. Reference Figure 4.



**Figure 4**  
Clip, Assy (Item 17)  
Installation shown

**Installation Instructions** (AAL-280-040-901 pilot/co-pilot sides)

- Install the Stud, Adhesive Mounted (Item 23) in the locations shown. Reference Figure 5. Installation of the studs shall be performed as per the instructions detailed in Appendix A. The position shown is the preferred location however, deviation is permitted to accommodate individual aircraft configurations. Recalculate weight and balance accordingly.

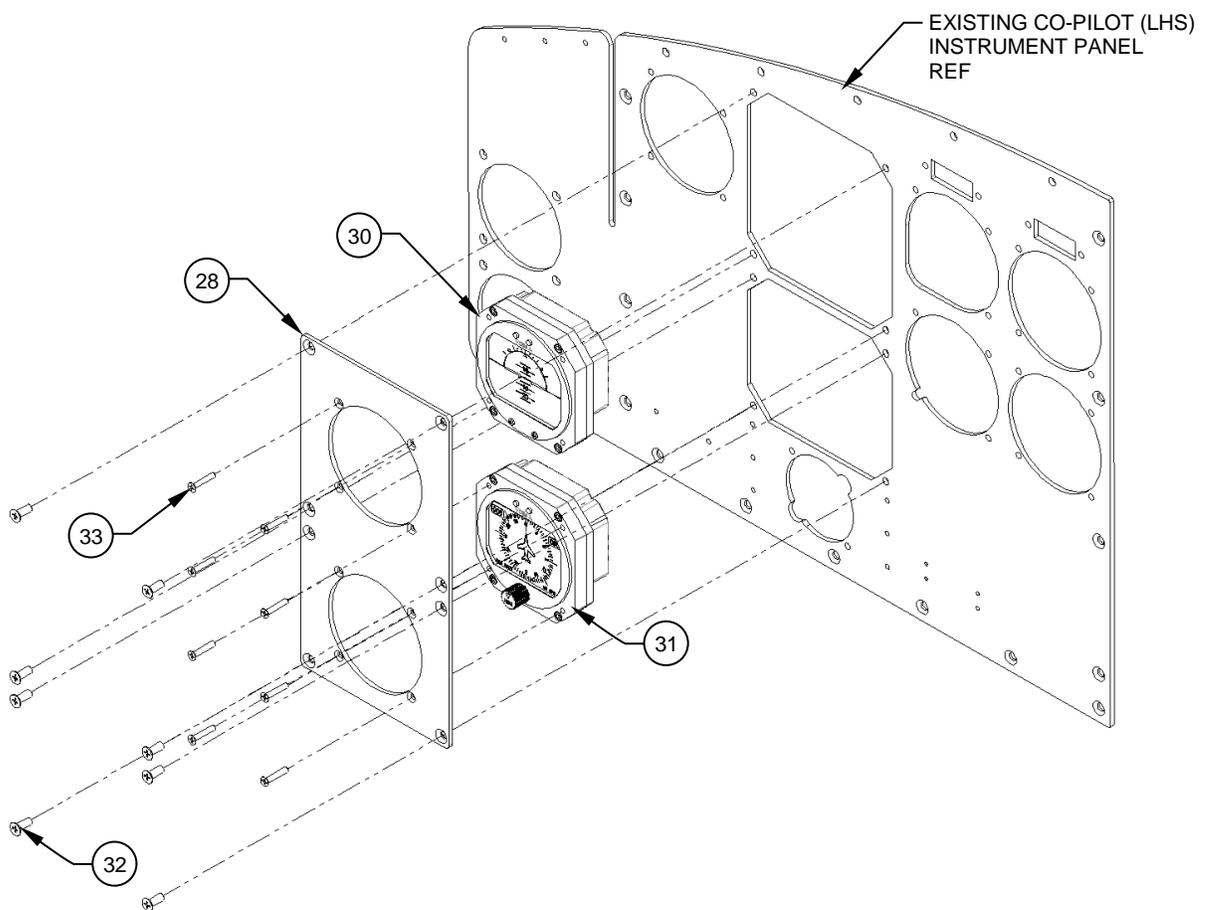


**Figure 5**  
Insert/Slider, Assy Installation

- Install the Splitter, Assy (Item 3) with the supplied fasteners as shown. Reference Figure 5.

**Installation Instructions** (AAL-280-040-901 pilot/co-pilot sides)

10. Attach the Adaptor, Details (Item 28) to the pilot and co-pilot instrument panels in the locations that previously housed the HSI and ADI using the provided fasteners (Items 32 & 33). Reference Figures 6 & 7. If the aircraft has a serial number of 30596 or earlier, then install Adaptor, Details (Item 29 (not shown)) instead and install the Heading Indicator (Item 31) directly into the standard 3 inch hole in the existing instrument panel. Reference Figure 6 & 7.



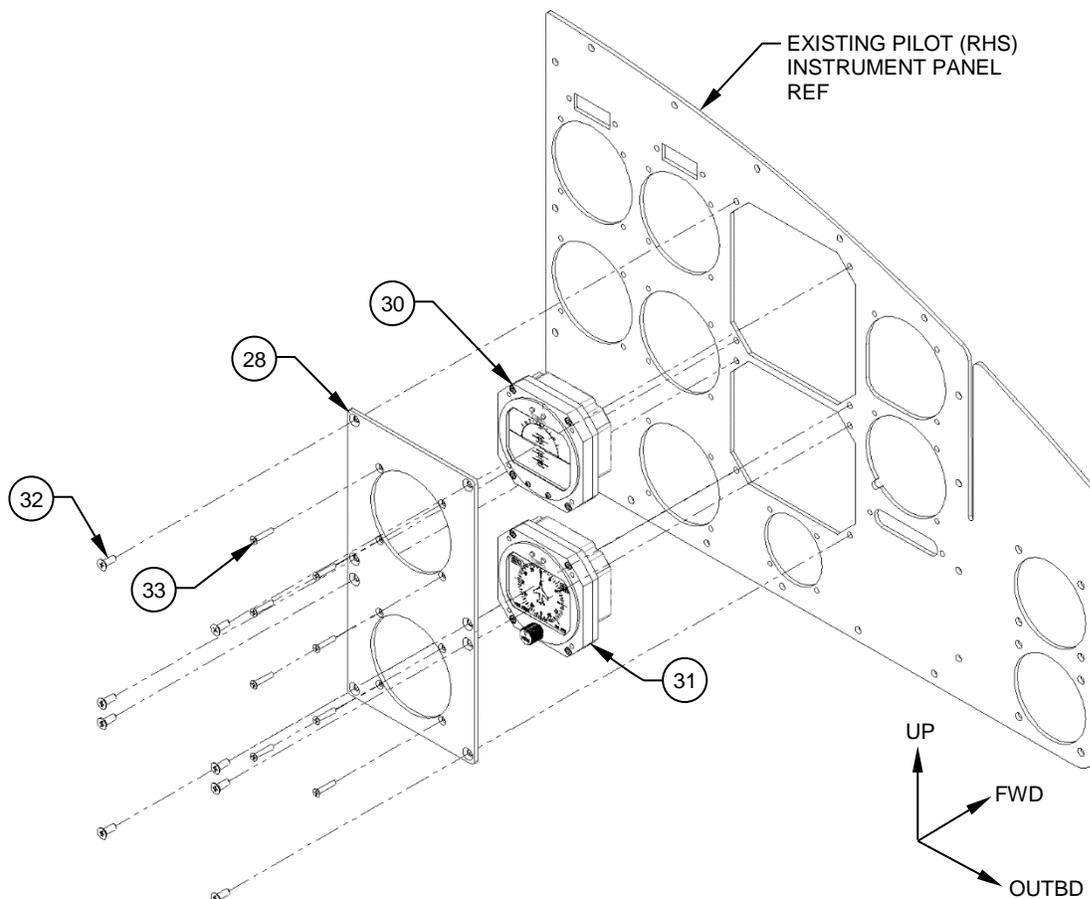
**Figure 6**  
Co-pilot (LHS) Adaptor, Detail &  
Instrument installation shown

**Installation Instructions** (AAL-280-040-901 pilot/co-pilot sides)

11. Install the Attitude Indicator (Item 30) and Heading Indicator (Item 31) into the Adaptor, Detail (Item 28) on both pilot and co-pilot instrument panels. Reference Figure 7. If installing on an aircraft with a serial number earlier than 30596 install the Attitude Indicator (Item 30) in the Adaptor, Detail (Item 29 (not shown)) and the Heading Indicator (Item 31) directly into the instrument panel in the existing standard three-inch hole.

**CAUTION**

**Use extreme care when handling the instruments and avoid touching the screen if at all possible. For proper care and handling refer to Kelly Manufacturing publication No. 1401-5 for the Heading Indicator and No. 1401-3 for the Attitude Indicator.**

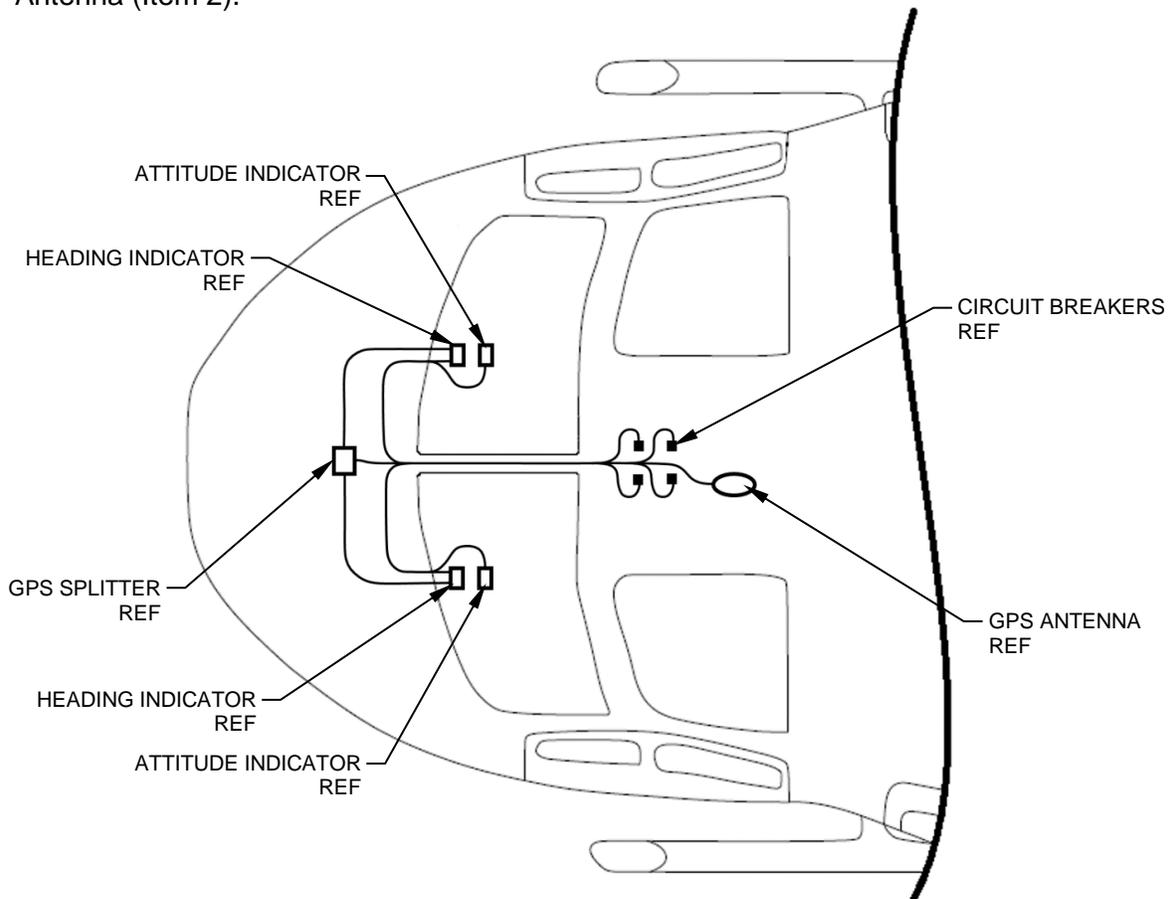


**Figure 7**  
Pilot (RHS) Adaptor, Detail & Instrument installation shown

ISOMETRIC VIEW

**Installation Instructions** (AAL-280-040-901 pilot/co-pilot sides)

12. Install the Coax Cable, Assy (Item 13) by fastening the SMA connector to the to the “IN” port of the Splitter (Item 5). Drill Ø.437” holes through frames 205-030-617-099/205-030-617-041 and 205-030-617-029 as applicable. Coat the inside of each hole with primer per MIL-PRF-23377, Type 1, Class C2 and install Grommet, Rubber (Item 25) in each hole once primer has cured. Route the Coax Cable, Assy (Item 13) through the grommets and secure with Cable Tie Mounts (Item 26) and Tie Straps (Item 16). Position the cable tie mounts to avoid interference with 204-030-636-003 Handle, Assy Reference Figures 3, 8 & 9 and Appendix B. Cut the un-terminated end of the cable to length and terminate the end with the provided TNC Connector (Item 21) at the GPS, Antenna (Item 2) Reference Figure 3. Connect the newly terminated end to the GPS, Antenna (Item 2).

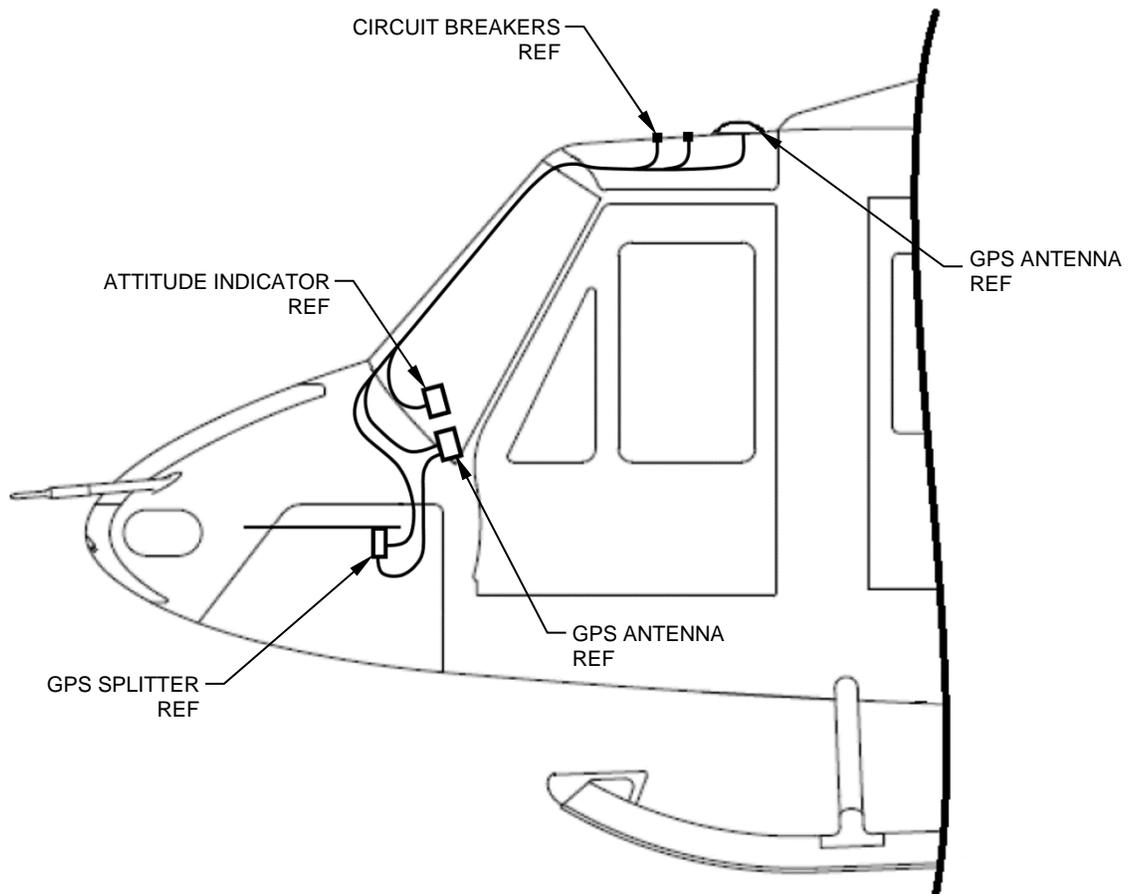


**Figure 8**  
Recommended Wire Routing  
Top view shown

13. Install the Coax Cable, Assy (Item 48) by fastening the Coax Cable, Assy to the back of the pilot (RHS) Heading indicator (Item 31) and route the cable as shown. Reference Figures 8, 9 & 10 and Appendix B. Fasten the opposite end of the coax cable to the “OUT 2” port of Splitter (Item 5) Reference Figure 5. If not installing on the LHS as well, connect the coax cable to the “OUT 1” port.

**Installation Instructions** (AAL-280-040-901 pilot/co-pilot sides)

14. Install the Coax Cable, Assy (Item 37) by fastening the Coax Cable, Assy to the back of the co-pilot (LHS) Heading Indicator (Item 31) and route the cable as shown. Reference Figures 8, 9 & 11 and Appendix B. Fasten the opposite end of the coax cable to the “OUT 1” port of the Splitter (Item 5) Reference Figure 5.

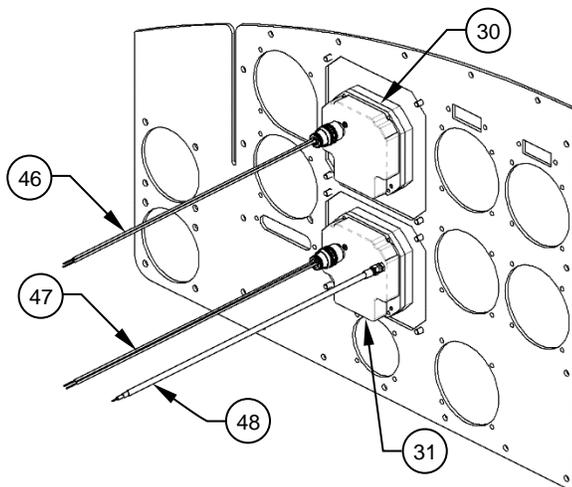


**Figure 9**  
Recommended Wire Routing  
LHS view shown

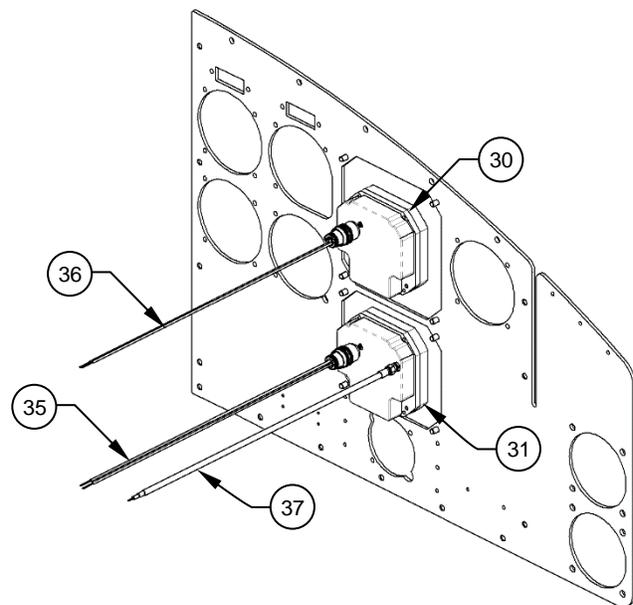
15. Install Circuit Breaker, Details (Items 41, 42, 52 & 53) in the locations shown. The Circuit Breaker locations shown are preferred, however changes to the breaker locations are permitted to accommodate individual aircraft configuration. Reference Figures 1 & 2 and Steps 3 & 4. Install Cap-plug, Plastic (Items 44 & 55) in any un-used breaker holes.
16. Install the re-marked lit overlays onto the overhead breaker panels or label circuit breakers as detailed in Steps 3 & 4. Reference Figures 1 & 2 and Steps 3 & 4.

**Installation Instructions** (AAL-280-040-901 pilot/co-pilot sides)

17. Install the Wiring Harness, Assy (Item 47) by fastening the connector to the back of the pilot Heading Indicator (Item 31) and route the wires as shown. Reference Figures 8, 9 & 10. Cut the un-terminated end of the wires to length and terminate with the provided ring terminals (Items 49 & 50) as per the wiring diagram. Reference Appendix B. Connect the newly terminated end to the Circuit Breakers (Items 52 & 53) as per the wiring diagram and connect ground wires to existing ground stud or ground block if available. If new ground studs or ground blocks are required, install IAW BHT-ELECT-SPM, Chapter 8. Reference Appendix B.
18. Install the Wiring Harness, Assy (Item 35) by fastening the connector to the back of the co-pilot Heading Indicator (Item 31) and route the wires as shown. Reference Figures 8, 9 & 11. Cut the un-terminated end of the wires to length and terminate with the provided ring terminals (Items 38 & 39) as per the wiring diagram. Reference Appendix B. Connect the newly terminated end to the Circuit Breakers (Items 41 & 42) as per the wiring diagram and connect ground wires to existing ground stud or ground block if available. If new ground studs or ground blocks are required, install IAW BHT-ELECT-SPM, Chapter 8. Reference Appendix B.
19. Install the Wiring Harness, Assy (Item 46) by fastening the connector to the back of the pilot Attitude Indicator (Item 30) and route the wires as shown. Reference Figures 8, 9 & 10. Cut the un-terminated end of the wires to length and terminate with the provided ring terminals (Items 49 & 50) as per the wiring diagram and connect ground wires to existing ground stud or ground block if available. If new ground studs or ground blocks are required, install IAW BHT-ELECT-SPM, Chapter 8. Reference Appendix B. Connect the newly terminated end to the Circuit Breakers (Items 52 & 53) as per the wiring diagram. Reference Appendix B.



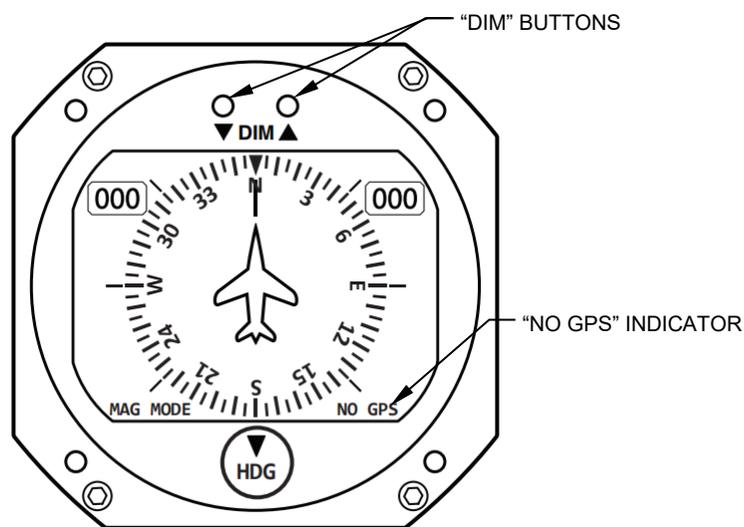
**Figure 10**  
Pilot (RHS) Installation  
Shown



**Figure 11**  
Co-pilot (LHS) Installation  
Shown

**Installation Instructions** (AAL-280-040-901 pilot/co-pilot sides)

20. Install the Wiring Harness, Assy (Item 36) by fastening the connector to the back of the co-pilot Attitude Indicator (Item 30) and route the wires as shown. Reference Figures 8, 9 & 11. Cut the un-terminated end of the wires to length and terminate with the provided ring terminals (Items 38 & 39) as per the wiring diagram and connect ground wires to existing ground stud or ground block if available. If new ground studs or ground blocks are required, install IAW BHT-ELECT-SPM, Chapter 8. Reference Appendix B. Connect the newly terminated end to the Circuit Breakers (Items 41 & 42) as per the wiring diagram. Reference Appendix B.



**Figure 12**  
Heading Indicator

21. Perform a General Inspection of all items to ensure proper installation and function.
22. Connect aircraft to external power and power up instruments. On initial start-up the instruments will show a blue "Self-Test" screen that will display a list of data including the instrument serial number. Record the serial number(s) in the ICA document as well as the logbook for future reference. After roughly 30 seconds the "Self-Test" will be cleared from the displays and a prominent red "X" will be displayed across the screens while the instrument initializes. The red "X" should not be present on the screens for more than 3 minutes.
23. Confirm that the instrument readings are stable.
24. Move the aircraft outside to allow the Heading Indicator(s) to acquire a GPS signal. The "NO GPS" indicator should extinguish once the signal is established. Reference Figure 12.
25. Cycle power to the instruments one at a time using the associated circuit breakers in the overhead breaker panel to ensure proper breaker function.

**Installation Instructions** (AAL-280-040-901 pilot/co-pilot sides)

- 26. Perform magnetic calibration procedure as detailed in the Instructions for Continued Airworthiness (Airworthiness (Doc. No.: AAL-280-045-701), Section 7 -- General.
- 27. Update the aircraft logbook for the installation of the Basic Digital Instrument, Kit.
- 28. Installation complete. Record instrument serial numbers below for future reference.

Pilot (RHS) Attitude S/N		Co-pilot (LHS) Attitude S/N	
Pilot (RHS) Heading S/N		Co-pilot (LHS) Heading S/N	

**Installation Instructions** (AAL-280-040-902 pilot side only)

- 29. All aspects of the installation procedure for the AAL-280-040-902 pilot side (RHS) Basic Digital Flight Instrument, Kit is the same as for the AAL-280-040-901 (pilot/co-pilot) kit except for the following omissions.
  - i. Do not remove and re-mark/re-label the co-pilot (LHS) lit overlay panel. Reference Figure 2 and Step 4.
  - ii. Do not remove existing instruments and equipment associated to the co-pilot (LHS) instrument panel. Reference Step 2.
  - iii. All components in the Instrument, Kit (Item 27) are not required for installation on the co-pilot (LHS) side instrument panel.
  - iv. All components in the Wiring Harness, Kit, LHS (Item 34) and associated steps are not required for this installation

**Installation Instructions** (AAL-280-040-903 co-pilot side only)

- 30. All aspects of the installation procedure for the AAL-280-040-903 co-pilot side (LHS) Basic Digital Flight Instrument, Kit is the same as for the AAL-280-040-901 kit except for the following omissions.
  - i. Do not remove and re-mark/re-label the pilot (RHS) lit overlay panel. Reference Figure 1 and Step 3.
  - ii. Do not remove existing instruments and equipment associated to the pilot (RHS) instrument panel. Reference Step 2.
  - iii. All components in the Instrument, Kit (Item 27) are not required for installation on the pilot (RHS) side instrument panel.
  - iv. All components in the Wiring Harness, Kit, RHS (Item 45) and associated steps are not required for this installation.

### **Removal Instructions**

1. Remove the lit overlays from the overhead breaker panels and re-mark/re-label them as per the prior breaker configuration. Reference Figures 1 & 2, Installation Note 4 and Flag note 2 ( $\triangle_2$ ).
2. Remove the instruments and all of the associated wiring, coax cables and circuit breakers associated with the Basic Digital Instrument, Kit.
3. Remove the Adaptor, Details (Item 28) or (Item 29) as applicable and all of the associated hardware.
4. Remove the Splitter, Assy (Item 3) and the associated hardware.
5. Remove the GPS Antenna (Item 2) and locally fabricate a blanking plate to cover the mounting hole IAW standard aircraft practices as detailed in FAA publication AC43.13. Coat the blanking plate with high solids epoxy primer per MIL-PRF-2377, Type 1, Class C2 prior to installation. After installation of the blanking plate, apply a fillet of Sealant, Corrosion Inhibitive (Item C01) around the base of the blanking plate. Coat the blanking plate and the surrounding area with polyurethane paint in the appropriate color.
6. Re-install all instruments and equipment removed during installation procedure including any associated wiring and bracketry. Reference Step 2 of installation procedure.
7. Re-install the re-marked/re-labeled lit overlays on the overhead breaker panels.
8. Perform a General Inspection of all items to ensure proper installation and function.
9. Update the aircraft logbook for the removal of the Basic Digital Instrument, Kit.

### **SECTION 3 CONFIGURATION SETTINGS**

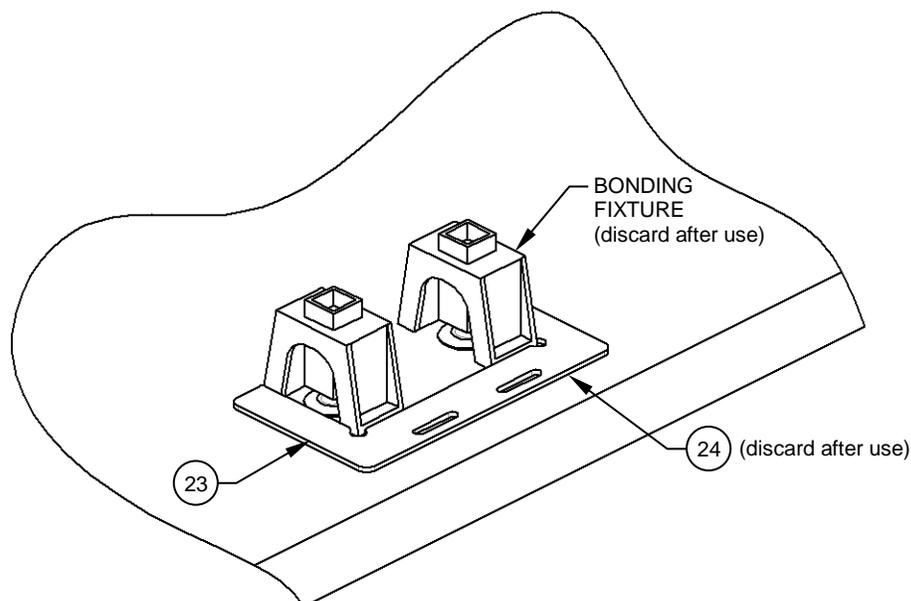
1. Reference Instructions for Continued Airworthiness (Doc. No.: AAL-280-045-701) Section 7 – General, for all configuration settings.

## **APPENDIX: A**

### **Stud Installation Procedure**

This appendix outlines the procedures associated with the installation of Adhesive Mounted (Click Bond®) Studs (Item 23).

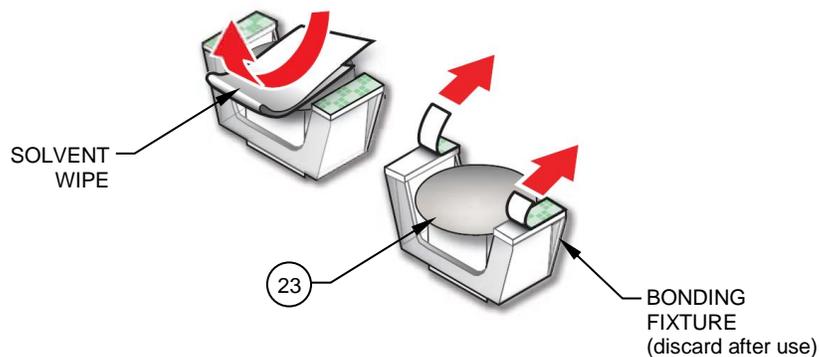
1. Determine installation location for the Stud, Adhesive Mounted (Item 23) per step 8 and Figure 5 of the Installation Instructions.
2. Prepare the substrate as follows:
  - a. Solvent wipe the mounting surface to remove all debris and surface contaminants using a clean, lint free cloth saturated with acetone, MEK or denatured alcohol.
  - b. Abrade the substrate to bare metal where the studs are to be installed with 150-180 grit sandpaper using a random motion.
  - c. Solvent wipe the mounting surface again to remove all contaminants generated by sanding. Always use a new clean cloth for each wipe and wipe from the center out using a single rolling motion. Never wipe with the same side of the cloth more than once. Keep wiping the surface with clean cloths until no residue is present on the cloth after wiping. Allow the solvent time to flash-off prior to bonding.
3. Locate the Template, Detail (Item 24) on the avionics shelf and temporarily secure in place with masking tape. Reference Figure A-1.



**Figure A-1**

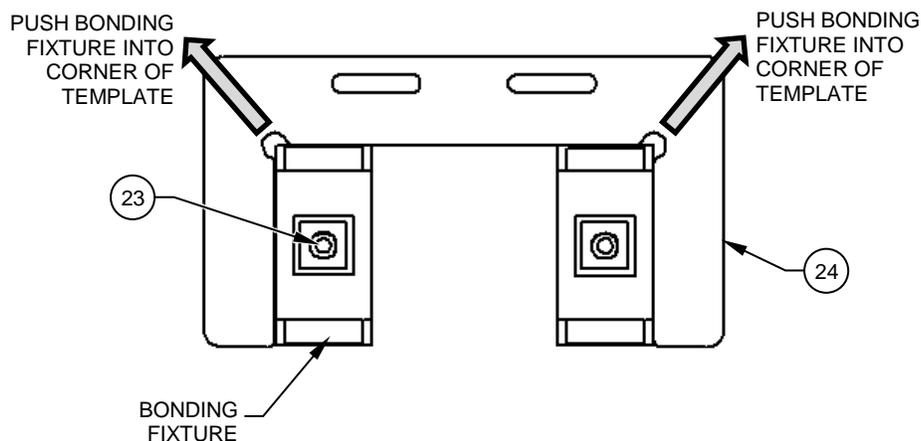
**APPENDIX: A** (continued)

4. Solvent wipe the base of the Stud, Adhesive Mounted (Item 23) in one rolling motion. Allow the solvent to flash-off.
5. Remove the adhesive backing being careful not to touch the base of the stud. Reference Figure A-2.



**Figure A-2**

6. Apply Hysol Epoxy Paste Adhesive (Item C02) to center of stud base. Use enough adhesive to produce a small uniform amount of squeeze-out around the base of the stud.
7. Position the bonding fixtures so that they are pushed into the corners of the Template, Detail (Item 24). This will ensure correct stud spacing. Push down on the outside edges of the bonding fixtures to adhere the fixtures to the substrate. Reference Figure A-3.



**Figure A-3**

8. Apply pressure on the center portion of the bonding fixture until it clicks, no additional pressure is needed on fixture. Make sure adhesive squeeze-out is present around the entire stud base. Do not wipe away squeeze-out.

**APPENDIX: A** (continued)

9. Allow adhesive to cure per adhesive manufacturer's instructions. Do not disturb the fixtures during the cure period.
10. Once adhesive is cured, remove the Template, Detail (Item 24) and bonding fixtures and discard. To remove bonding fixtures pull them vertically away from the substrate. Do not pull to the side as this may damage the stud.
11. Touch up coatings as applicable.

## **APPENDIX: B**

### **Electrical Notes**

This appendix outlines the electrical details associated with the installation of the Basic Digital Flight Instrument, Kit and includes the wiring schematic.

1. Unless otherwise specified, all wiring terminations at connectors shall be IAW BHT-ELECT-SPM Chapters 4, 5 and 7 and the connector manufacturer's instructions or applicable military or commercial standard for stripping procedures, crimping procedures and required tooling.
2. Use existing ground stud or ground block if available. If new ground studs or ground blocks are required, install IAW BHT-ELECT-SPM, Chapter 8.
3. All wiring shall be routed and secured IAW BHT-ELECT-SPM, Chapter 6. Particular attention to minimum bend radii, clamp spacing, service loop separation from control, and fluid and oxygen system must be observed.
4. Refer to ICA document AAL-280-045-701, Section 4: Illustrated Parts Breakdown for the part numbers of the item(s) referenced within this appendix.



When installing one side only (pilot or co-pilot) always connect Coax Cable, Assy (Item 37 or 48 as applicable) to the "OUT 1" port on the Splitter, GPS (Item 5).

1. Wiring Schematic

