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Install Manual/Service Letter

Doc No: NC-19-039
Revision: C
Issue Date: 2/22/2021

EFFECTIVITY

Tecnam Aircraft Type: P2010

REVISION HISTORY

REV	DESCRIPTION	DATE
A	Initial Release, see ECN 19-031	7/8/2020
B	See ECN 20-017	9/14/2020
C	See ECN 21-006	2/22/2021

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PURPOSE

For installation of Air Conditioning System.

APPROVAL

FAA approval has been obtained on all technical data in this Installation Manual that affects type design.

RESOURCES

100 hours of labor are required to comply with this Installation Manual.

SYSTEM OVERVIEW

The Air Conditioning System consists of an electric hermetically sealed compressor, condenser and evaporator located in the tail cone. The system is operated through temperature selection and a climate controller located on the instrument panel. There is both a fan mode only and a cooling mode. R-134a is used as a refrigerant for the system.

The power for the Air Conditioning System is tapped off the battery terminal of the upgraded alternator.

MATERIAL INFORMATION

The Kelly Aerospace Thermal Systems (KATS) document NC-19-038 lists the materials required for compliance with this Installation Manual. Parts can be obtained from KATS.

INSTRUCTIONS

1. **Preparation**

   A. Ensure all documentation is at the appropriate revision based on NC-19-037 Drawing List supplied with the kit.

   B. Conduct a parts inventory to ensure all required items are present.

   C. Remove the battery, located on the left side of the aircraft tail fuselage per the P2010 Aircraft Maintenance Manual (AMM) and store securely.

   D. Secure external power receptacle to prevent unwanted power on aircraft busses (e.g. tape over receptacle with non-metallic masking tape with label warning of hazard).

2. **General Instructions**

   A. For all references to wire stripping, crimping and tying procedures refer to AC 43.13-1B chapter 11.

   B. For all references to riveting procedures refer to AC 43.13-1B chapter 4.

   C. Consumables to be procured locally

      1) Paint, as required for touch up and re-coloring N numbers

      2) Masking tape

      3) Assorted sizes of tie wraps

      4) M22759/16 wire or equivalent in the sizes of AWG 6, 8, 10, 16 and 18

      5) Devcon 14265 Epoxy

      6) Hysol EA 9360 Epoxy (1 qt. Epoxy with 1 pt. Hardener is enough for approximately two complete installations)

      7) Black Silicone RTV

D. Torque Specifications

Unless otherwise specified, use the following torque values.	
6-32 UNC	7 - 9 inch-lbs.
8-32 UNC	17 - 19 inch-lbs.
10-24 UNC	20 - 22 inch-lbs.
10-32 UNF	28 - 31 inch-lbs.
1/4-20 UNC	70 - 75 inch-lbs.
1/4-28 UNF	90 - 94 inch-lbs.
5/16-24 UNF	120 -145 inch-lbs.
3/8-24 UNF	200 - 250 inch-lbs.
7/16-20 UNF	520 -630 inch-lbs.

Table 1 – Fastener Torque Specifications

E. A/C Hose Specifications

Unless otherwise specified, use the following torque values.	
5/8-18 UNF	15 - 20 ft.-lbs.
3/4-16 UNF	21 - 27 ft.-lbs.
7/8-14 UNF	28 - 33 ft.-lbs.
7/8-18 UNS	28 - 33 ft.-lbs.

Table 2 – A/C Hose Fitting Torque Specifications

#6 Reduced Barrier A/C Hose	1”
#8 Reduced Barrier A/C Hose	1 ½”
#10 Reduced Barrier A/C Hose	2 ½”

Table 3 – Minimum Bend Radius when Routing A/C Hose

3. **Remove the following components utilizing the AMM and store securely:**
   A. F2, F3 & F8 Fuselage Inspection Cap Opening Covers
   B. Left and right crew seats.
   C. Left and right passenger seats.
   D. Baggage Compartment Panel FWD
   E. Baggage Compartment Panel RWD
   F. Baggage Net
   G. Baggage Coverage Assy

4. **Alternator Upgrade**

   A. The Tecnam P2010 alternator needs to be upgraded to a 150 amp Plane-Power ALT-FLX-7 alternator upgrade kit.

5. **Doubler Installation & Rear Support Structure Bonding**

   A. Reference AC-02181 P2010 Hot Side Installation Details (Figure 3 and Figure 4) and (Views 2A and 2B).

      1) Locate and install the AC-02285 Belly Doubler around the F8 opening as shown in Figure 4, the sheet 2 notes and NC-20-037 KATS Procedure. See Figure 1 below.

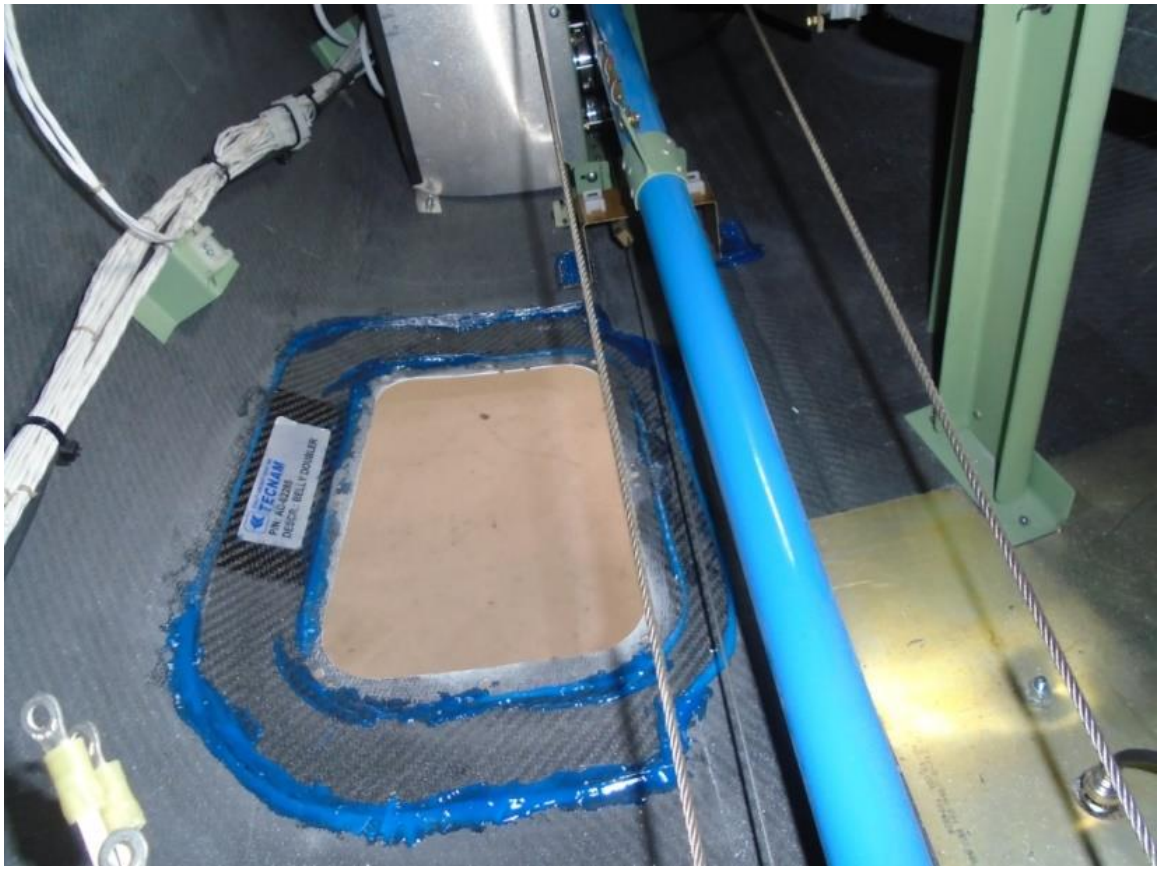


Figure 1 – Belly Doubler Installation

2) Locate and install the AC-02274 Side Doubler and AC-02097 Condenser Support Assembly around the F2 opening as shown in Figure 3, View 2A and 2B, the Sheet 2 notes and NC-20-037 KATS Bonding Procedure for EA 9360. See Figure 2 below.

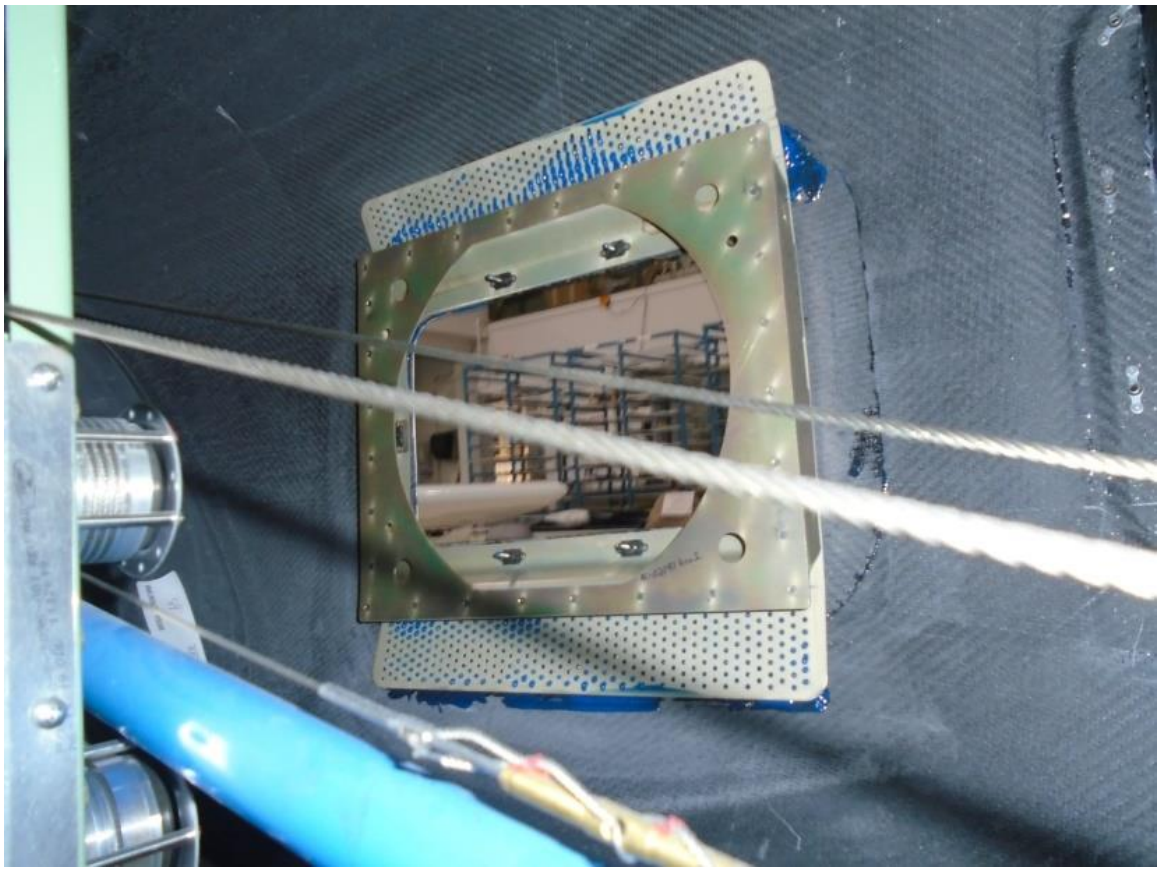


Figure 2 – Side Doubler and Condenser Support Assembly Installation

B. Reference AC-02105 Evaporator Installation Details.

1) Install the AC-02307 Evaporator Doubler per the instructions on Note 1 and NC-20-037 Bonding Procedure. See Figure 3 below.

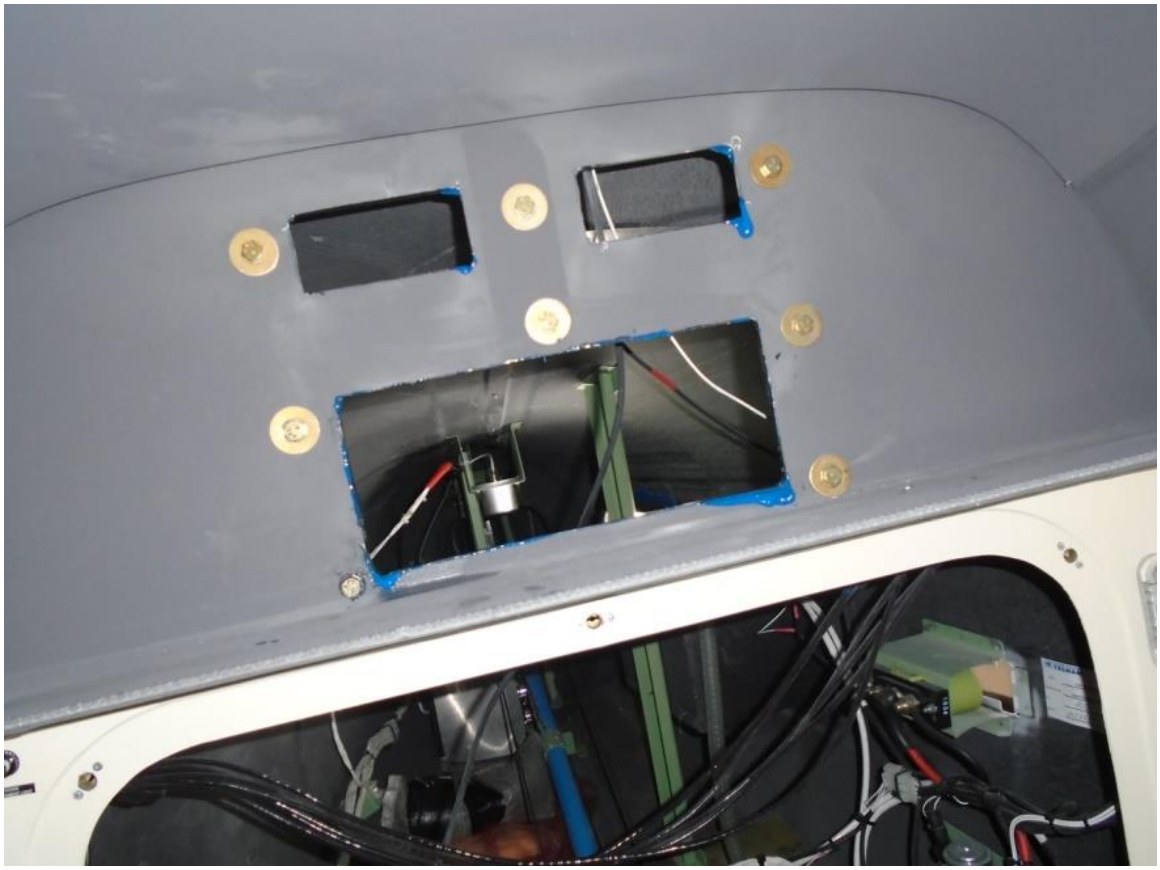


Figure 3 – Evaporator Doubler Installation

C. Allow the three doublers to cure for 24 hours before continuing in those areas.

1) Place the AC-02139 Condenser Inlet Assembly on top of the F8 Fuselage Inspection Opening. Align the AC-02167 Drain Bridge Assembly with the drain tee in the Condenser Inlet Assembly and straddling the control cables along the floor of the aircraft. Bond Drain Bridge Assembly to the floor as described in Notes 3.1. through 3.3 and the Sheet 2 Bonding Notes, Surface Preparation Notes & Bonding Procedure. See example in Figure 4.

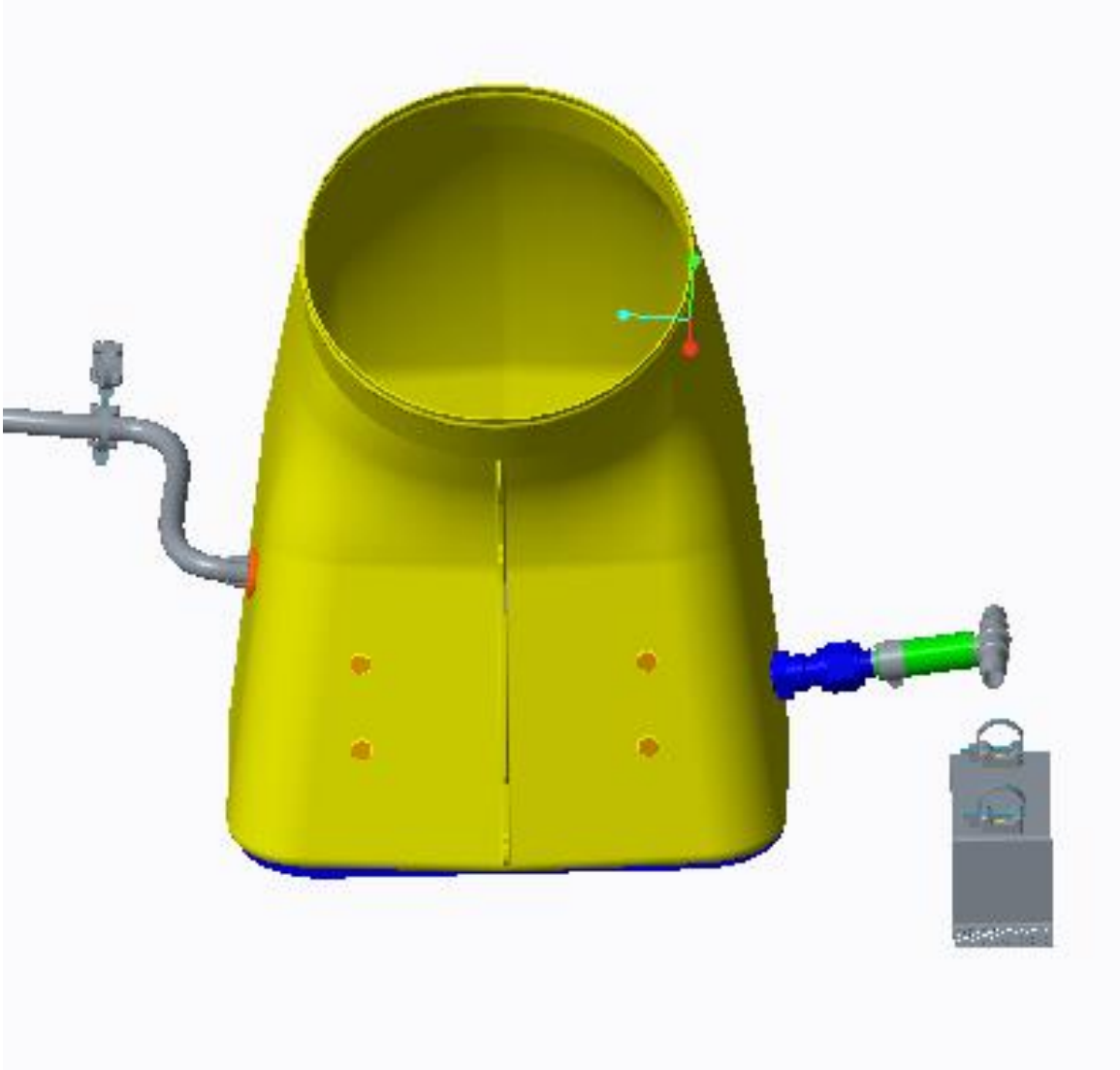


Figure 4 – Locate and Bond Drain Bridge

6. **Magnetometer Relocation**

A. The existing magnetometer bracket, see Figure 5, needs to be relocated in order to make room for the air conditioning duct.

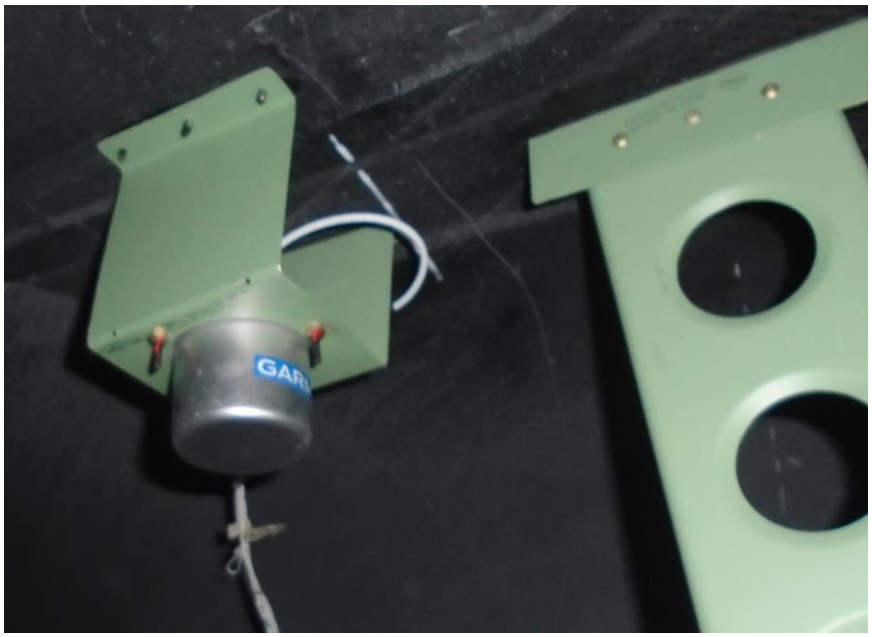


Figure 5 - Original Magnetometer Location

1) Cut the bracket off leaving about an inch of material from the ceiling. Round the corners and deburr the edges so the remaining attached pieces do not cause a ripping hazard for the AC duct that will be installed in future steps. See Figure 6.

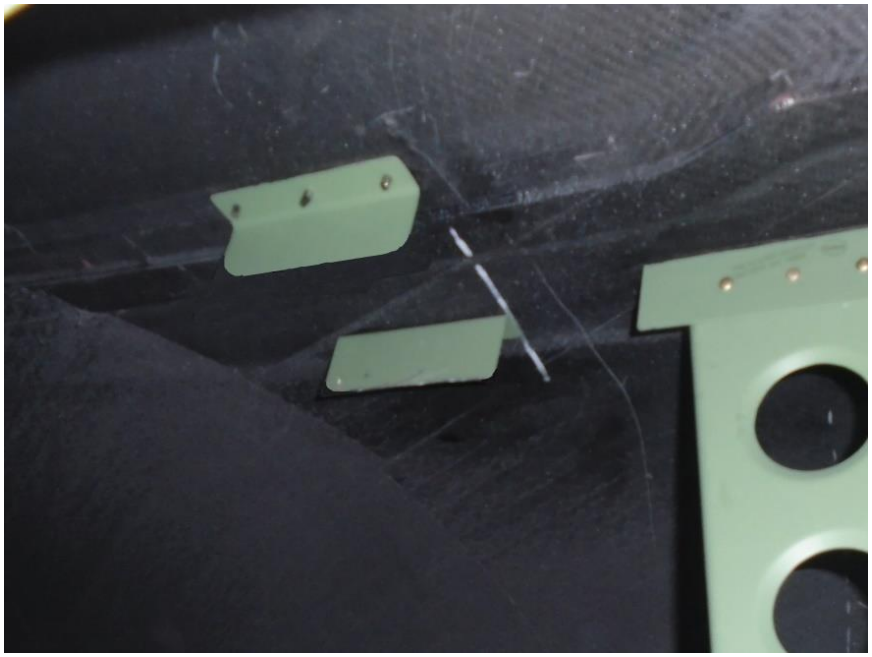


Figure 6 - Trimmed Magnetometer Brackets

2) Reference AC-02440 P2010 GMU-44 Relocation Details. Relocate the GMU-44 Magnetometer per the drawing and Figure 7 through Figure 13 below.

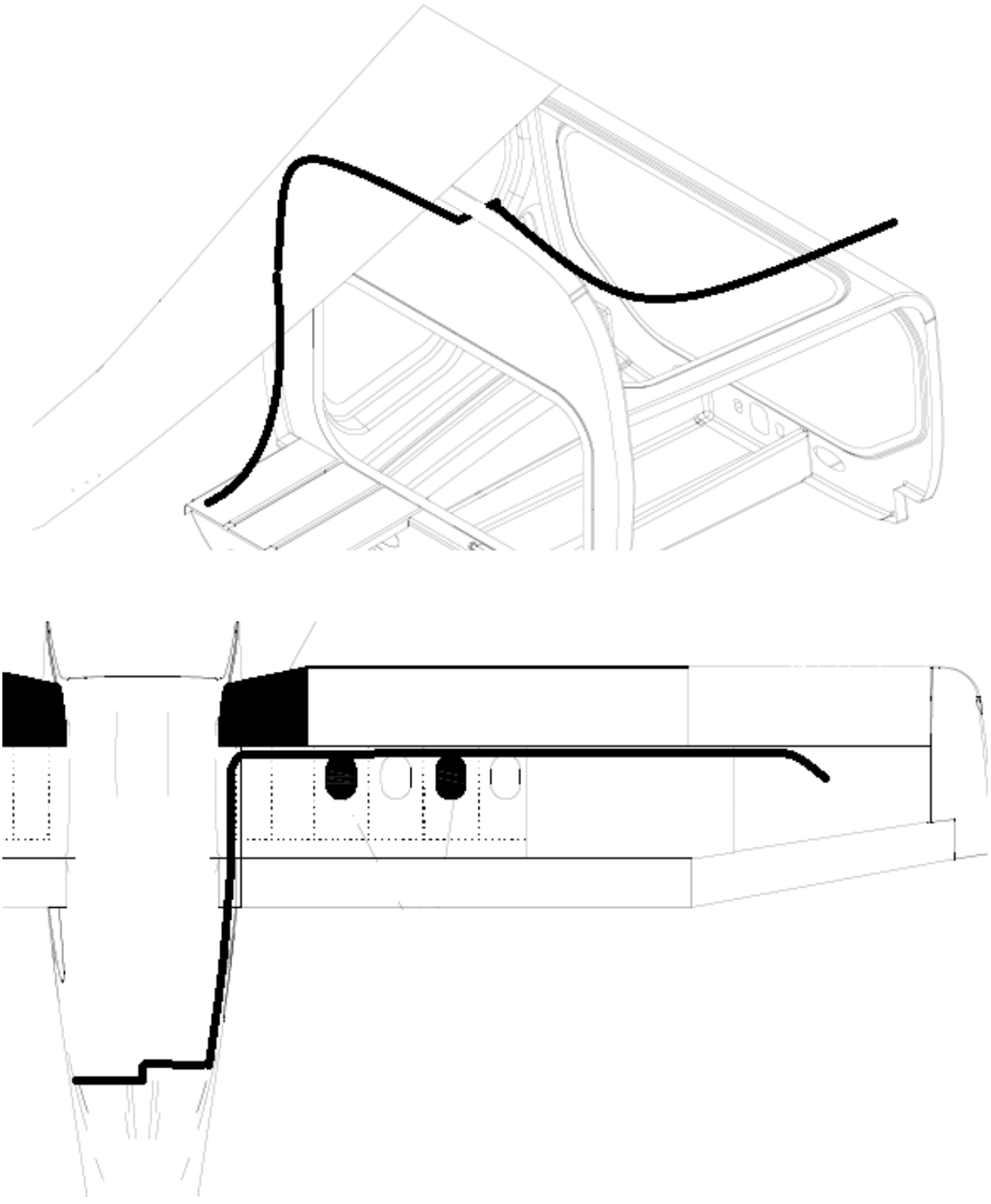


Figure 7 – GMU-44 General Wire Routing

View A
Behind baggage compartment (Looking Back)

View B
Looking back at left hand wall

View C
Behind baggage compartment behind bulkhead
(Looking Forward)

View D
Back of baggage compartment in front of bulkhead
(Looking Right)

Figure 8 – GMU-44 Wire Routing Aft Bulkhead

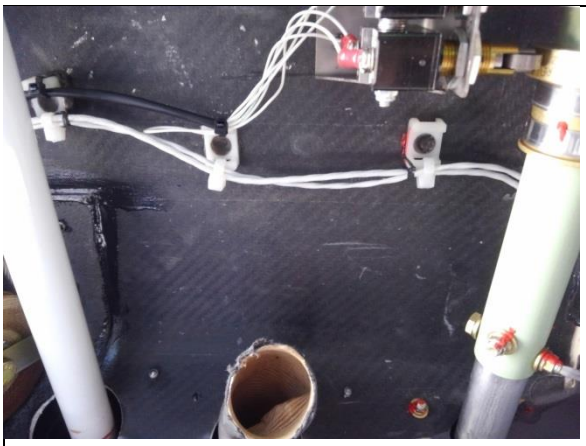
View E
Baggage Compartment (Looking Back)

View F
Baggage Compartment (Looking Right)

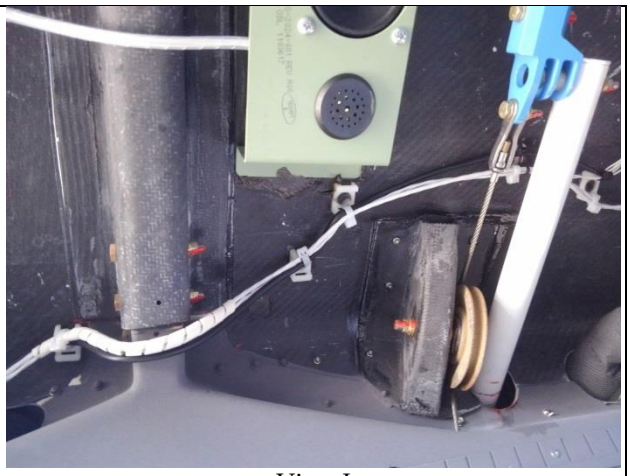
View G
Fuselage (Looking Top Right)

View H
Fuselage (Forward in Front of View G)

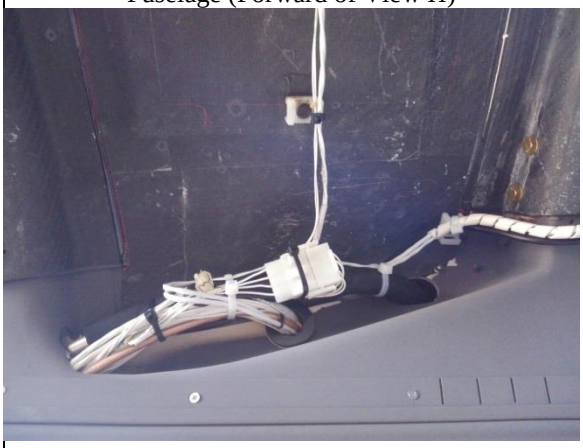
Figure 9 – GMU-44 Wire Routing Aft Fuselage



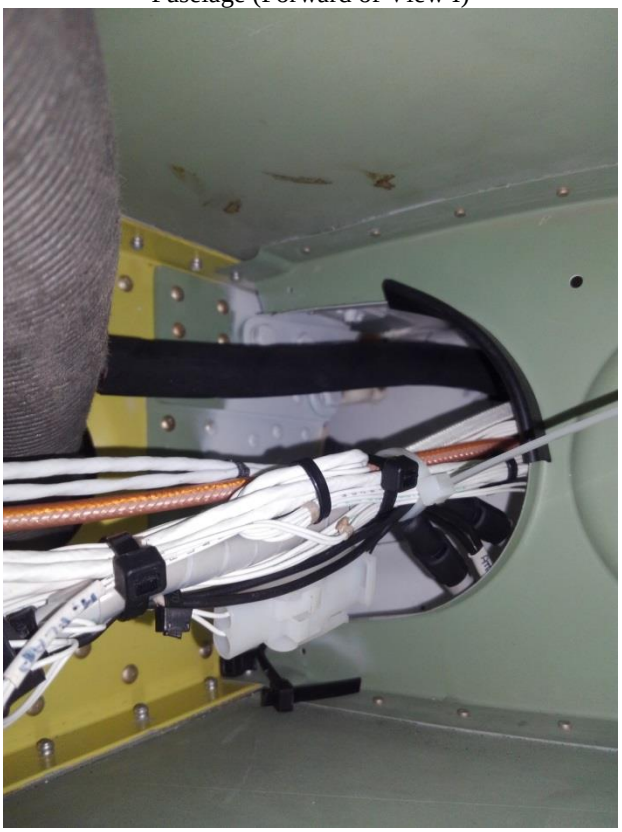
View I
Fuselage (Forward of View H)



View J
Fuselage (Forward of View I)



View K
Fuselage (Forward of View J)
(Passing into Wing)



View L
Following Main wire Bundle
(Right Wing at Fuselage)

Figure 10 – GMU-44 Aft Fuselage to Wing

View M
Right Wing (Following Main Bundle)

Veiw N
Right Wing (Outboard of View M)

View O
Right Wing (Outboard of View M)

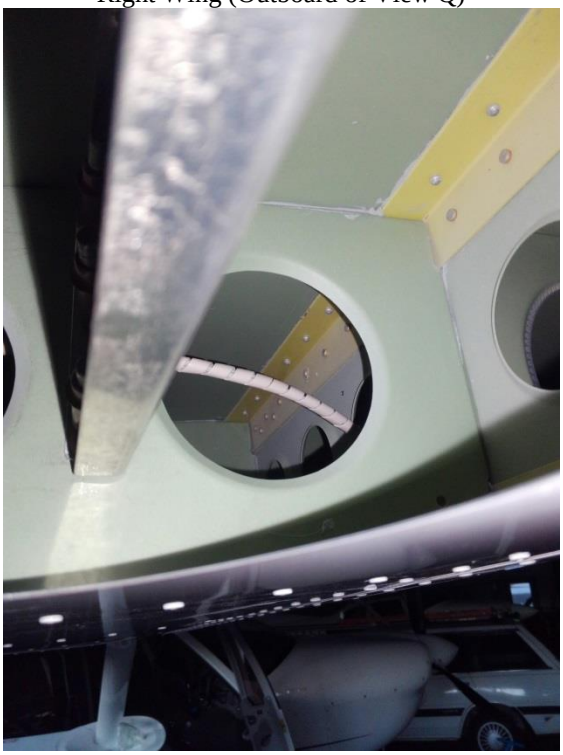
View P
Right Wing (Outboard of View O)

Figure 11 – GMU-44 Routing Through Wing

View Q
Right Wing (Outboard of View P)

View R
Right Wing (Outboard of View Q)

View S
Right Wing (Outboard of View R)



View T
Right Wing (Outboard of View S)

Figure 12 – GMU-44 Routing Through Wing

View U
Right Wing (Outboard of View S)

View W
Right Wing (Outboard of View U)

Figure 13 – GMU-44 Routing Through Wing

7. **Inspection Cap Cover Modification, F8, F2 & F3**

   A. Reference AC-02138 P2010 F8 Tail Cone Cover Modification Detail

      1) Cut the F8 Tail Cone Cover and bond the screen in place as shown on the drawing. See Figure 14.

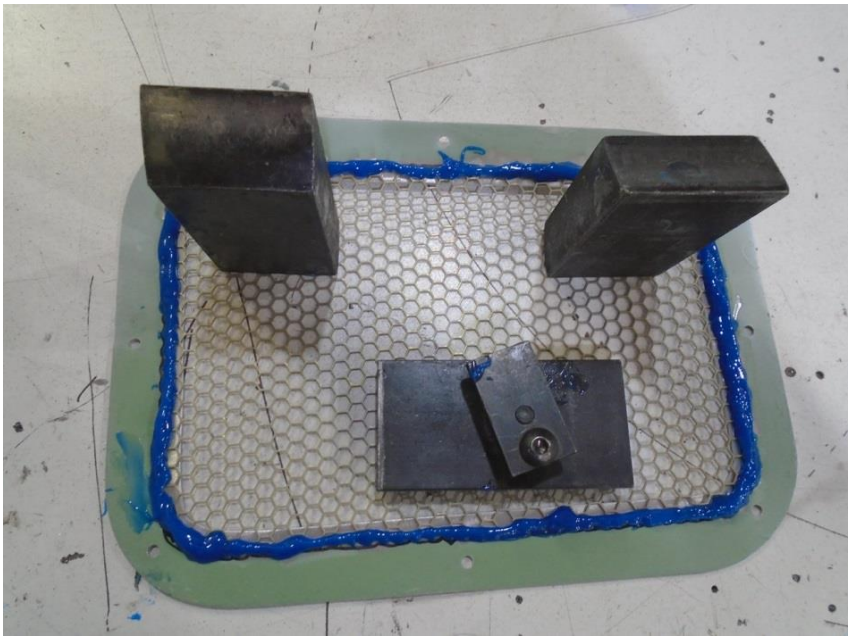


Figure 14 – AC-02138 F8 Tail Cone Cover Modification

   B. Reference AC-02177 P2010 F2 Tail Cone Cover Modification Detail

      1) Remove the water dam & louver; then cut the F2 Tail Cone Cover and bond the screen in place as shown on the drawing. See Figure 15.

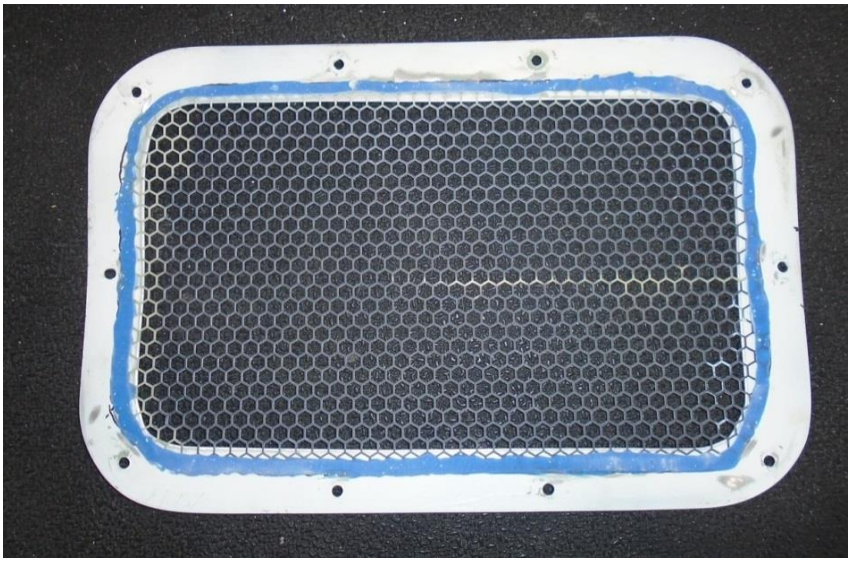


Figure 15 – AC-02177 F2 Tail Cone Cover Modification

C. Reference AC-02155 P2010 F3 Tail cone Vent Modification and Moving Details

1) Cut the F3 Tail Cone Cover and bond the louver in place as shown on the drawing. See Figure 16.

Figure 16 – F3 Tail Cone Vent Modification

2) Bond the AC-02158 Vent Waterdam in the tail cone as described and shown on the drawing. See Figure 17.

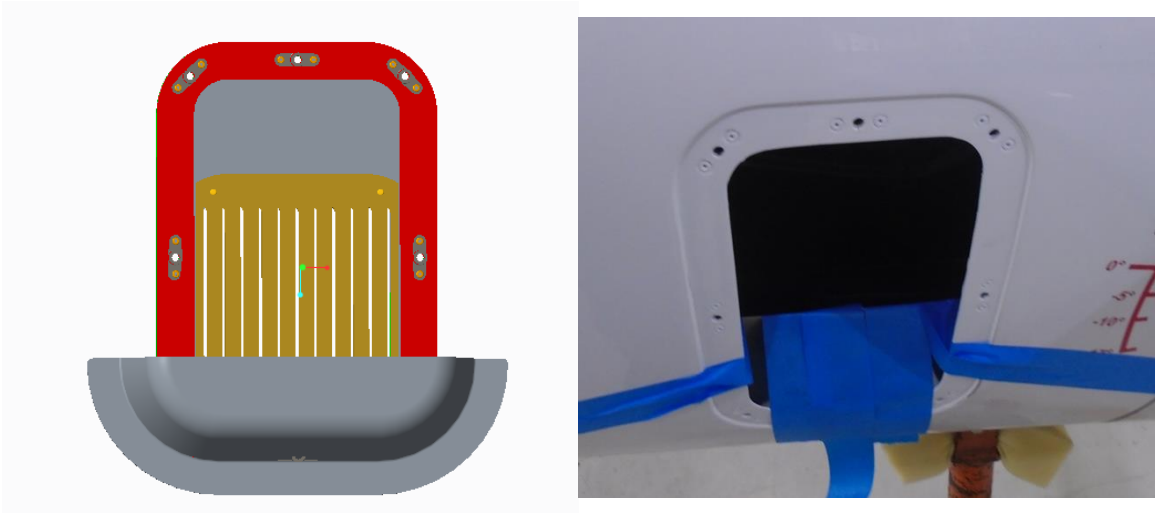


Figure 17 – F3 Tail Cone Vent Waterdam

8. **Condenser Mounting**

A. Reference AC-02181 P2010 Hot Side Installation Details Sheet 2.

1) The entire AC-02133 Condenser Plenum Assembly may be too bulky to fit past all the cables and controls in the back. If required, remove the plenum cover from the rest of the assembly by removing the (6) bolts shown in Figure 18 below. Remove the bottom and right side bracket next. Then slide the plenum assembly out.

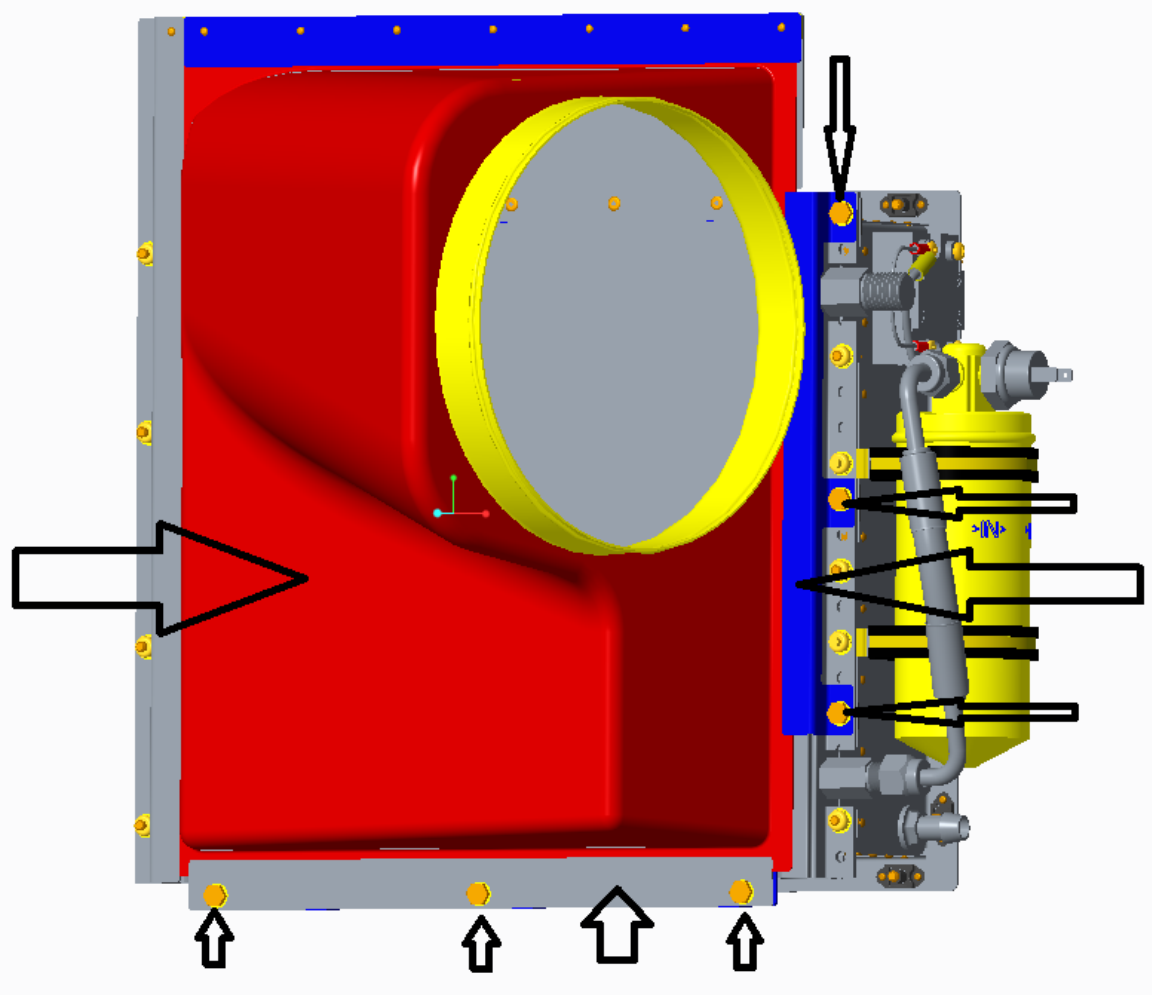


Figure 18 – Plenum Removal

2) Install the condenser assembly per View 2C and 2D; see Figure 19 and Figure 20 below.

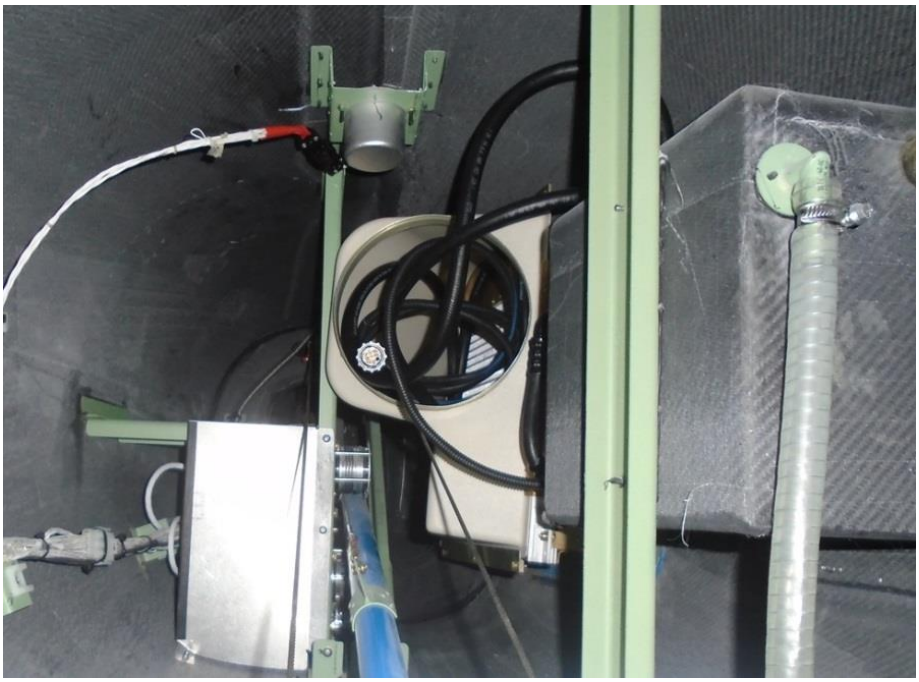


Figure 19 – Condenser Mounting

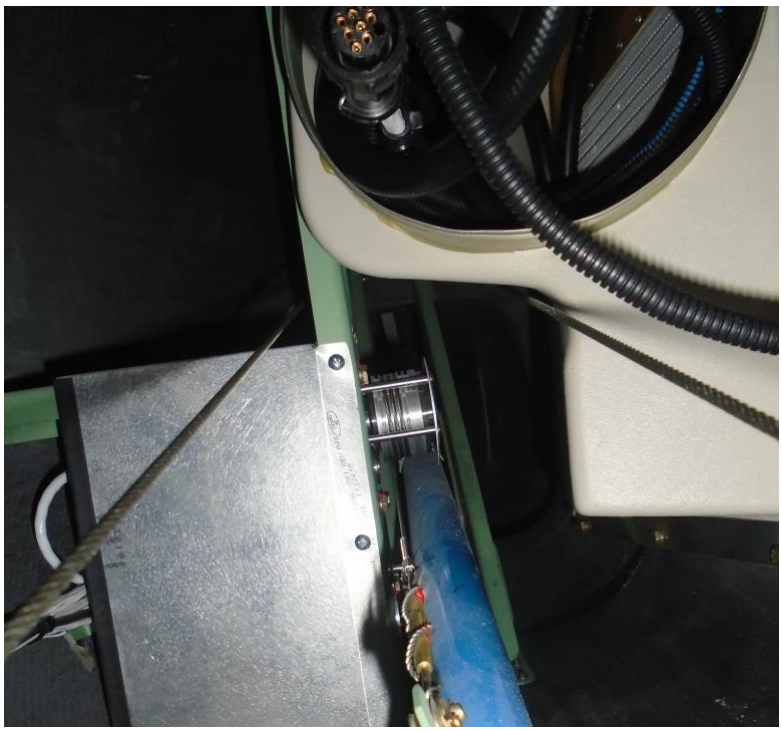


Figure 20 – Condenser Mounting

Verify no control cable interference

9. **Condenser Inlet Assembly**

   A. Reference AC-02181 P2010 Hot Side Installation Details Sheet 3.

      1) Install the AC-02139 Condenser Inlet Assembly per the notes and views. See Figure 21 through Figure 23. Depending on aircraft wire routing, a notch may need to be cut in the flange as shown in Figure 21.

      2) Test fit the AC-02138 Cover over the opening and cut a drain hole per the notes and views. See Figure 22.

Figure 21 – Condenser Inlet Modification

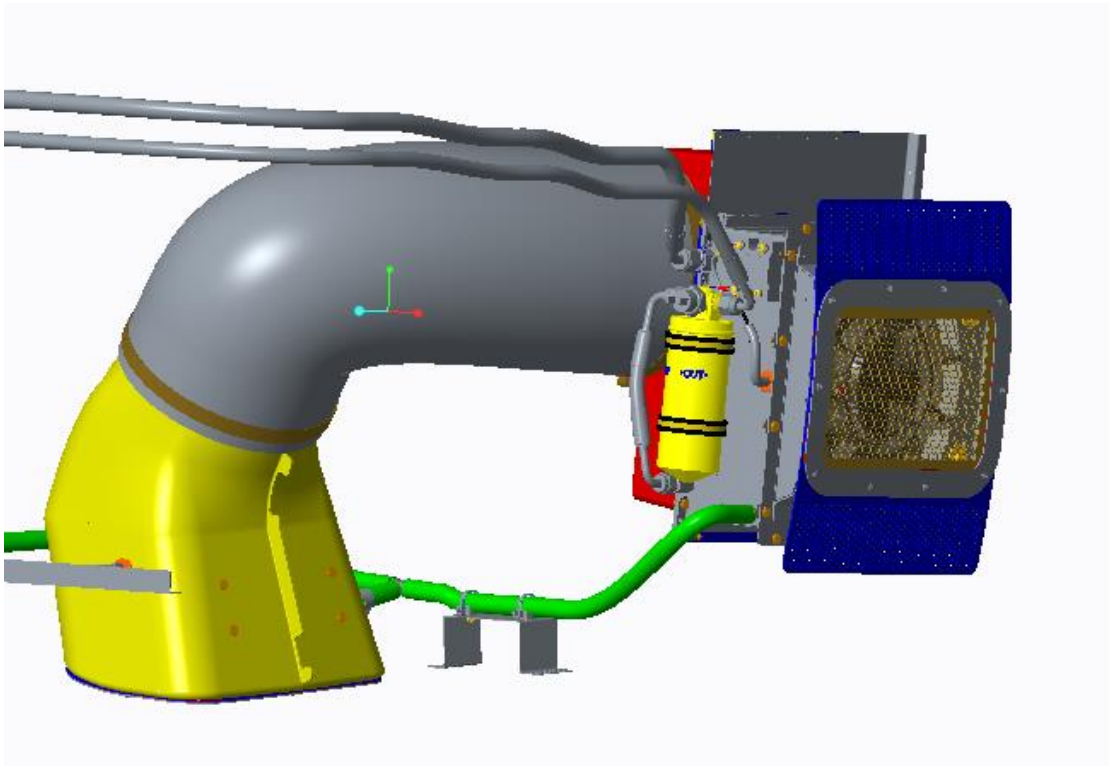


Figure 22 – Condenser Inlet Installation

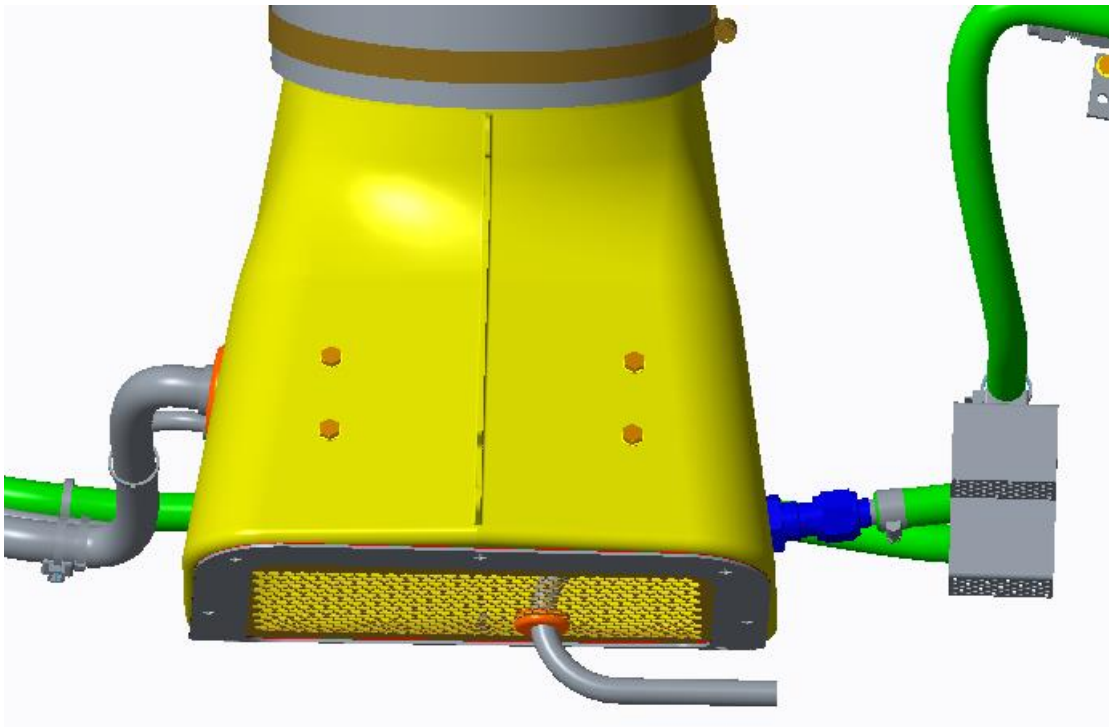


Figure 23 – Condenser Inlet & Drain Installation

10. **Compressor Installation**

A. Reference AC-02181 P2010 Hot Side Installation Details Sheet 3.

1) Install the AC-02137 Compressor Doubler on the battery shelf per View 3B and the notes on Sheet 3, see Figure 24. Match drill and install the AC-02134 Circuit Breaker Assembly and MS27212-4-2 Terminal Board as shown on the drawing.

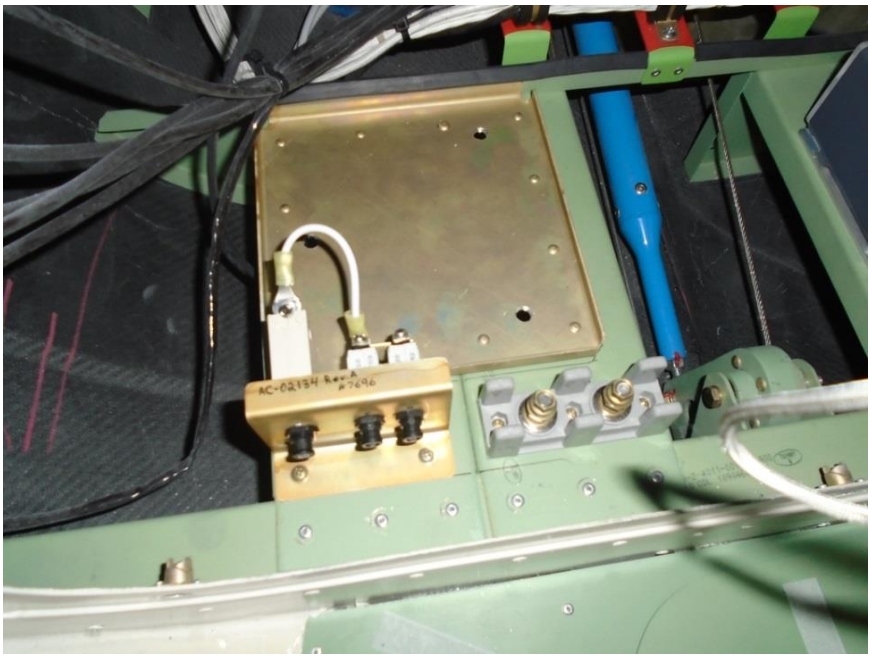


Figure 24 – Compressor Support Structure

2) Secure the Compressor to the Structure per View 3A and the notes on Sheet 3. Bond TM3S8-C tie mounts as required to direct the drain hoses and electrical wires to the proper connection. See Figure 25.

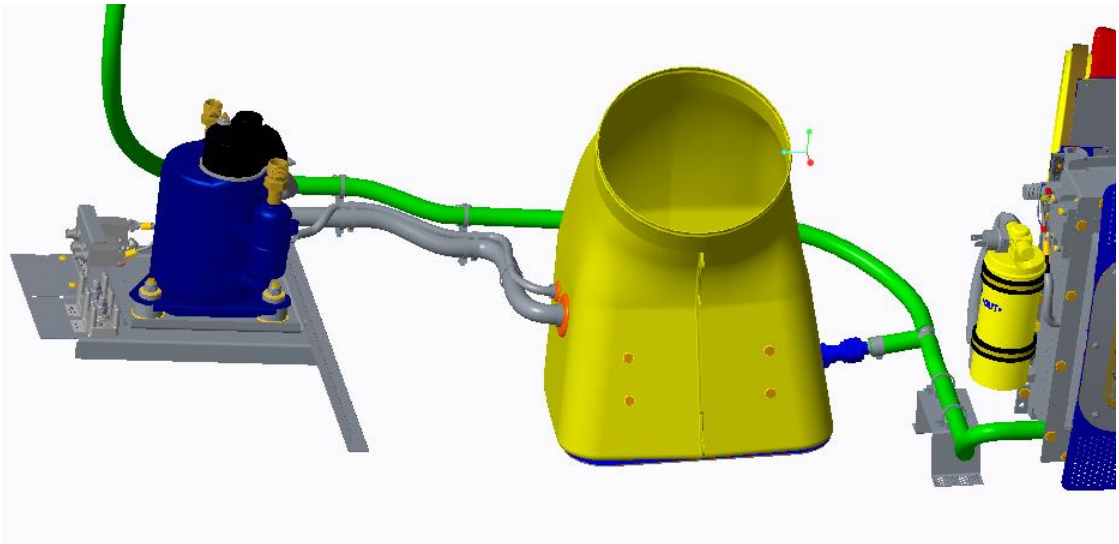


Figure 25 – Compressor Installation

11. **Final Hot Side Connections**

A. Reference AC-02181 P2010 Hot Side Installation Details Sheet 4.

1) Connect the 8” duct hose with the hose clamps as shown in View 4B.

2) Referencing Figure 50and View 4A and 4B, connect the refrigerant hoses.

3) Reference Schematic AC-02165. Make electrical connections referencing the appropriate sheet.

4) Bond TM3S8-C tie mounts to the sidewall as required directing the hoses and electrical wires to the proper connection. See Figure 26 and Figure 27.

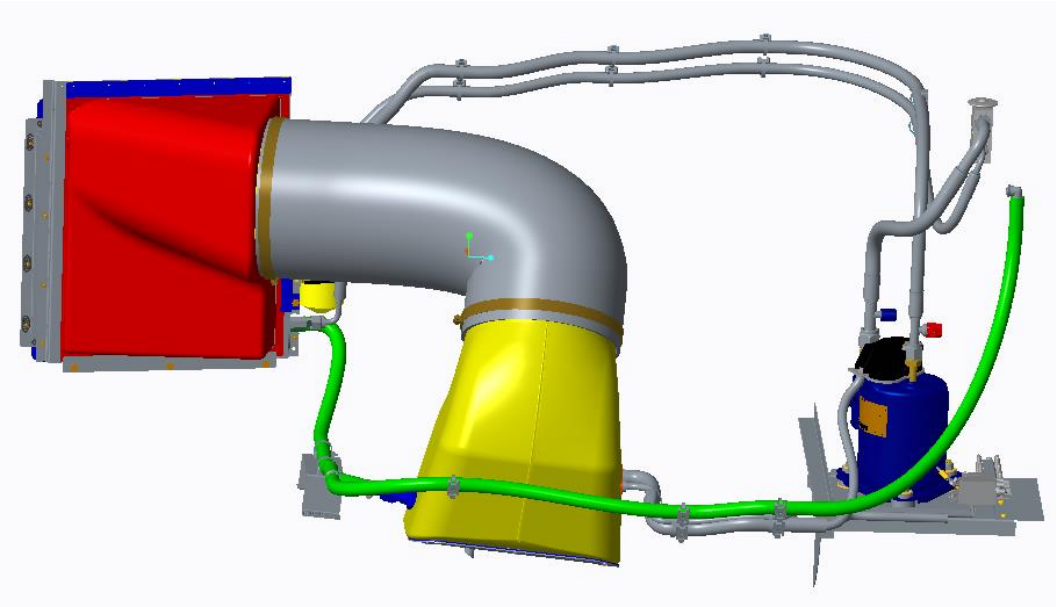


Figure 26 – Hot Side Connections

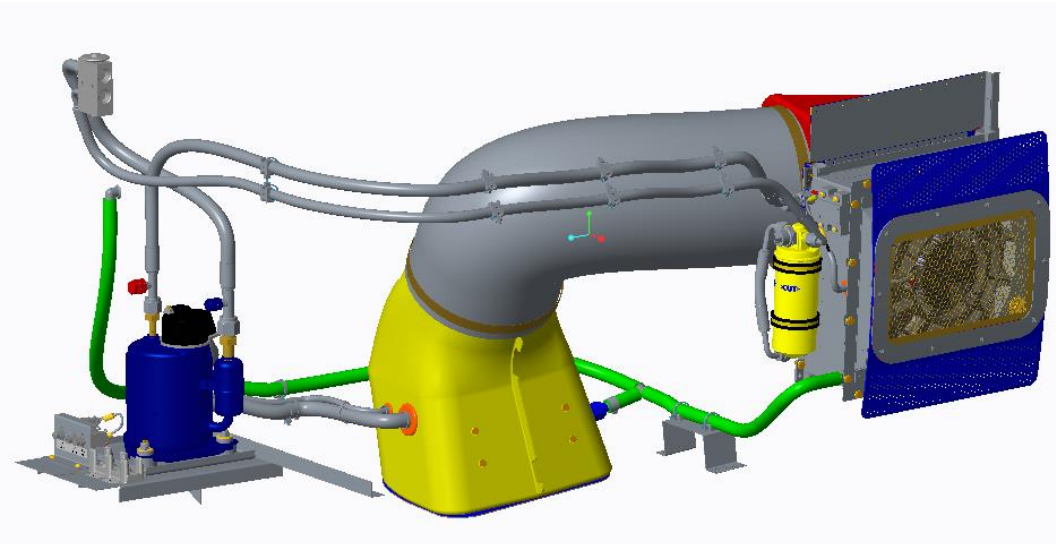


Figure 27 – Hot Side Connections

5) Install the AC-02177 F2 Tail Cone Cover and F3 AC-02155 F3 Tail Cone Vent as shown on the drawing. See Figure 28.

Figure 28 – F2 & F3 Access Covers

12. **Evaporator Installation**

A. Reference AC-02105 P2010 Evaporator Installation Details for CB-2 or Toggle Switch controls. Reference AC-02188 P2010 Evaporator Installation Details for A1235 controller.

1) Clear or re-route items on the back side of the bulkhead that may interfere with Evaporator installation.

2) Cut inlet/outlet windows and (8) Ø.500 holes in the bulkhead per note 1. See Figure 29.

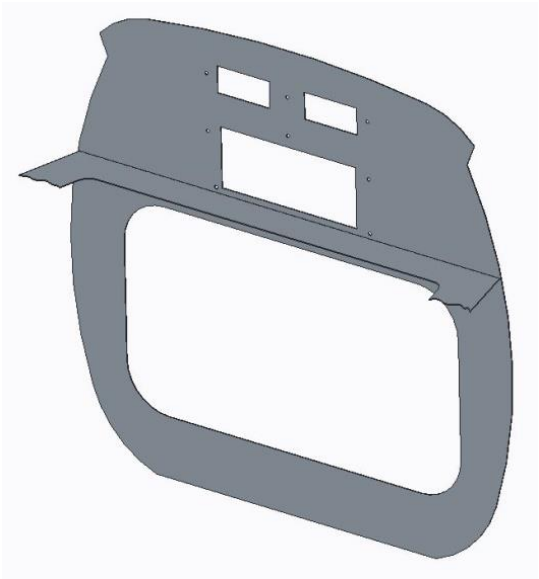


Figure 29 – Cut Bulkhead

3) Bond the Evaporator Doubler per note 2 and NC-20-037. Allow bonding to completely cure before continuing the Evaporator installation.

4) Mount the Evaporator per notes 3 through 5. See Figure 30.

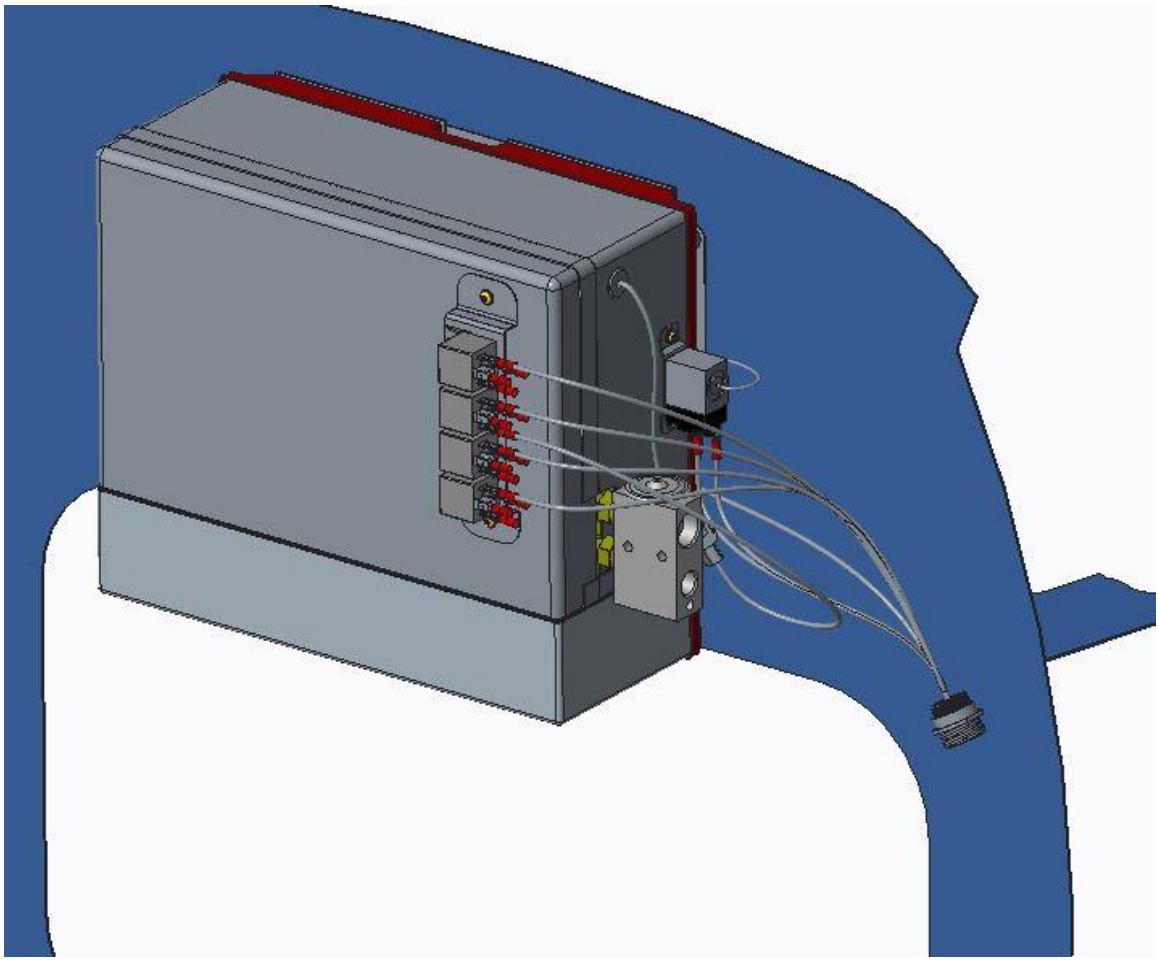


Figure 30 - Mount Evaporator

5) Attach AC-02169 #10 Hose Assembly and AC-02171 #6 Hose Assembly to the expansion block on the Evaporator. Thoroughly wrap the connection where the hoses attach to the expansion block with 4217-W3 Cork Insulation Tape.

6) Connect the drain hose to the bottom of the Evaporator. Use MS3367-1-9 Straps and TM3S8-C Tie Mounts glued to the fuselage as required to secure harness, hose and tube routing to the aircraft wall.

7) Locate either the AC-02193 Junction Harness for CB-2 or Toggle Switch controls or AC-02194 Junction Harness for A1235 controller in the tailcone. Secure with MS3367-1-9 Straps and TM3S8-C Tie Mounts glued to the fuselage. Make all electrical connections for the Junction Harness referencing AC-02165 Schematic.

13. **Cabin Ducting Installation**

A. Remove the overhead console assembly and transfer lights and controls to AC-02121 Forward Duct Cover Assembly.

1) Remove the overhead console assembly per the AMM and set the 3 screws used to secure the console to the ceiling brackets aside for re-use. Label mating jacks and plugs for reference.

2) Detach the lights, switches and front seat dual light placard from the overhead console for transfer to AC-02121 Forward Duct Cover Assembly. The dual backseat lights *will not* be re-used, backseat lighting will be replaced by the single light just aft of the sunglass holder. Secure the backseat wire harnesses that will not be re-used.

3) Seat the original light placard and AC-02196 Light Placard Assembly in the Duct Cover Assembly and match drill holes for the control knobs. Place AC-02103 and AC-02345 Light Doublers centered on the backside of the opposing recessed wall (with the single hole UP) and match drill holes into the Duct Cover. Attach the knobs using AC-02104 and AC-02346 Knob Doublers, ensuring the knobs are installed so that the "OFF" position aligns with their respective placard. Attach the lights ensuring there is enough slack in the wiring to allow full movement of the map lights. See Figure 31.

Figure 31 - Transferred Items to AC-02121

B. Install the Duct Hangers.

1) Remove the rear section of the headliner per the AMM. Bond AC-02147 Rear Duct Support Assembly to the ceiling with EA 9360 adhesive per NC-20-037 so that the nutplates align with AC-02069 Rear Duct Hanger when it is placed against the back wall centered to the outlet cutouts. Position the AC-02342 Rear Duct Support Assembly so that it straddles the antennae plate and aligns with the forward slots of the Duct Hanger. Mark the slots and attach the provided nutplates to the Duct Support, then bond that completed assembly into place. Please note; it may be helpful to have some type of support (such as dowel rods) ready to help prop up the brackets in place against the ceiling while they cure. See Figure 32.

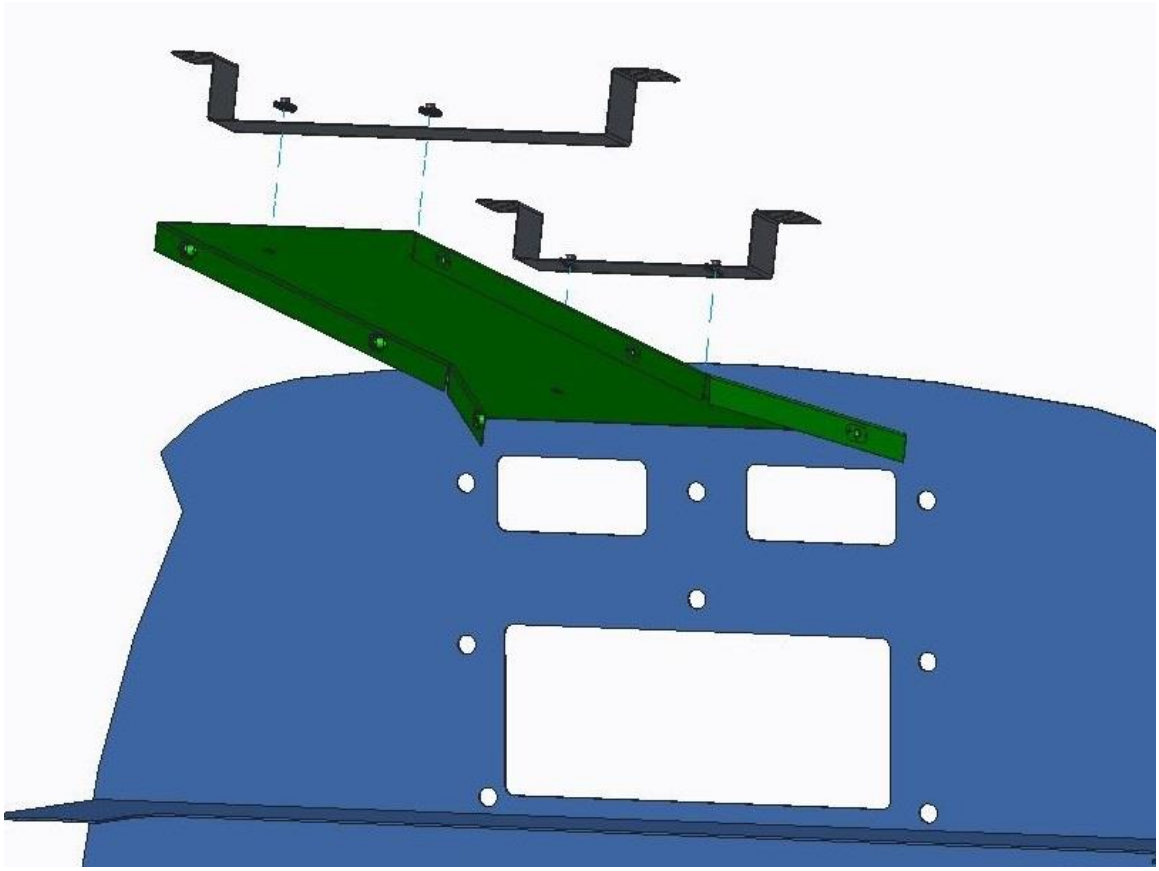


Figure 32 – Duct Support Mounting

2) Bond AC-02149 Duct Support Assembly so that it will be aligned with AC-02071 Angled Duct Hanger Assembly when it is seated into the ceiling contour (with the tab on the short end tucking beneath the Rear Duct Hanger).

3) After the three Duct Support Assembly bonds have cured, re-install the rear headliner and cut small holes that align with the nutplates in the three brackets. Mount the Rear Duct Hanger and Angled Duct Hanger (with the Angled Hanger tab tucked under Rear Hanger) using (6) AN3-3A #10 bolts and (6) AN960-10L washers. See Figure 33.

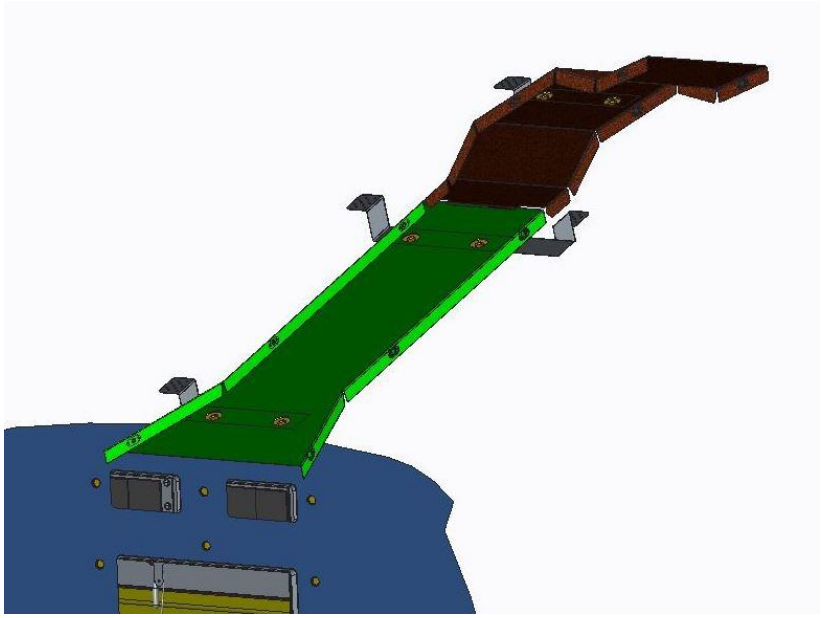


Figure 33 - Mount Rear and Angled Duct Hangers

4) Align the AC-02073 Forward Duct Hanger with the other Duct Hangers. Mark the mounting holes where the overhead console was attached and match drill holes into the Forward Duct Hanger. See Figure 34.

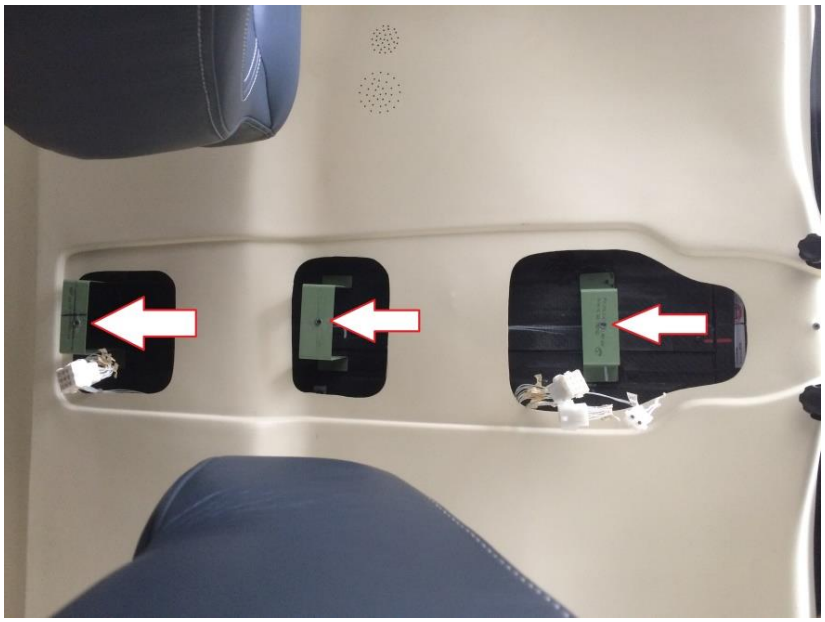


Figure 34 - Existing Attachment Points

5) Cut the existing brackets in the aircraft and shorten them as necessary so that the Forward Duct Hanger sits level with the other Hangers. See Figure 35.

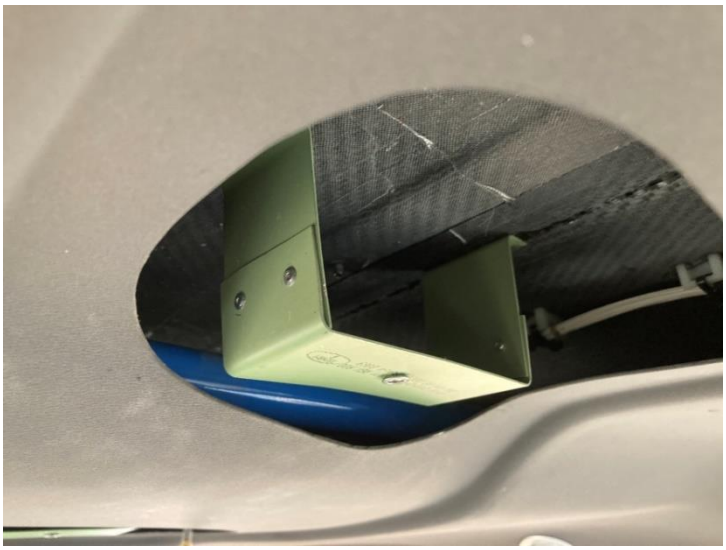


Figure 35 - Modified Bracket

6) Remove the plug from the single light wire harness and route it through the grommet in the Forward Duct Hanger. Re-attach the plug. Fasten the Hanger with the original 3 screws from those brackets. See Figure 36.

Figure 36 - Duct Hangers

C. Install the Forward and Rear Ducts.

1) Trim the AC-02066 Rear Duct Cover as necessary for a clean fit, then cosmetically apply 8507K52 Edge Trim all around. Attach the Duct Cover with (6) AN525-832R8 Washer Head Screws. Seal the skirt of the Duct Cover where it connects with the Evaporator outlets with 8694K68 Foam and Edge Trim. See Figure 37.

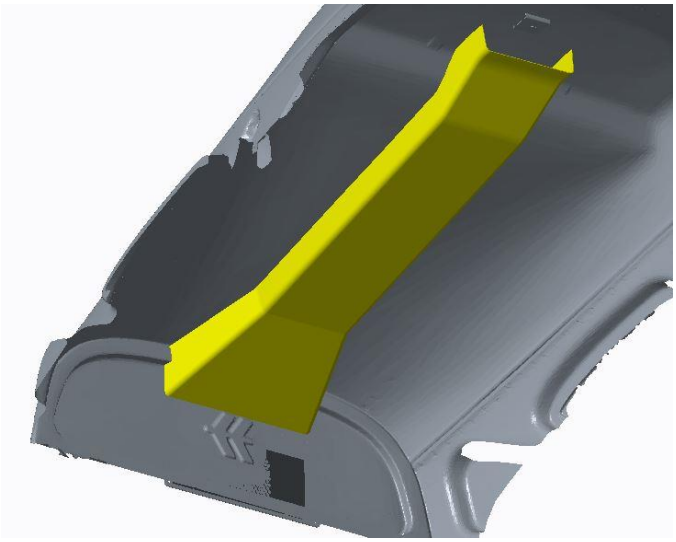


Figure 37 - Mount Rear Duct Cover

2) Connect the transplanted light and switch harnesses in the Forward Duct Assembly to the aircraft. Test each light to ensure proper wiring before mounting the Duct Assembly.

3) Attach the Forward Duct Assembly with (6) AN525-832R8 Washer Head Screws. Use Edge Trim cosmetically all around and where the Forward and Rear Ducts meet. Seal any gaps as necessary. See Figure 38.

Figure 38 - Mount Ducting

4) Cut the AC-02164 Blockoff Cover to fit around the Rear Duct base and remove any original Velcro on the blockoff that may interfere with Cover installation. Affix 9776K84 Velcro to the Blockoff Cover and aircraft blockoff, then push the Cover into place. See Figure 39.

Figure 39 - Install Blockoff Cover

14. **Firewall Forward**

A. An alternator upgrade will be required. Replace the existing 70 amp alternator and bracket with a 150 amp ALT-FLX-7 Kit.

B. Aircraft with an IO-360 Engine will require a modified spring bracket on the Alternate Air Valve Box. The spring bracket will need to be replaced by the AC-02094 Spring Bracket Assembly in order to prevent interference with the new alternator. See Figure 40.

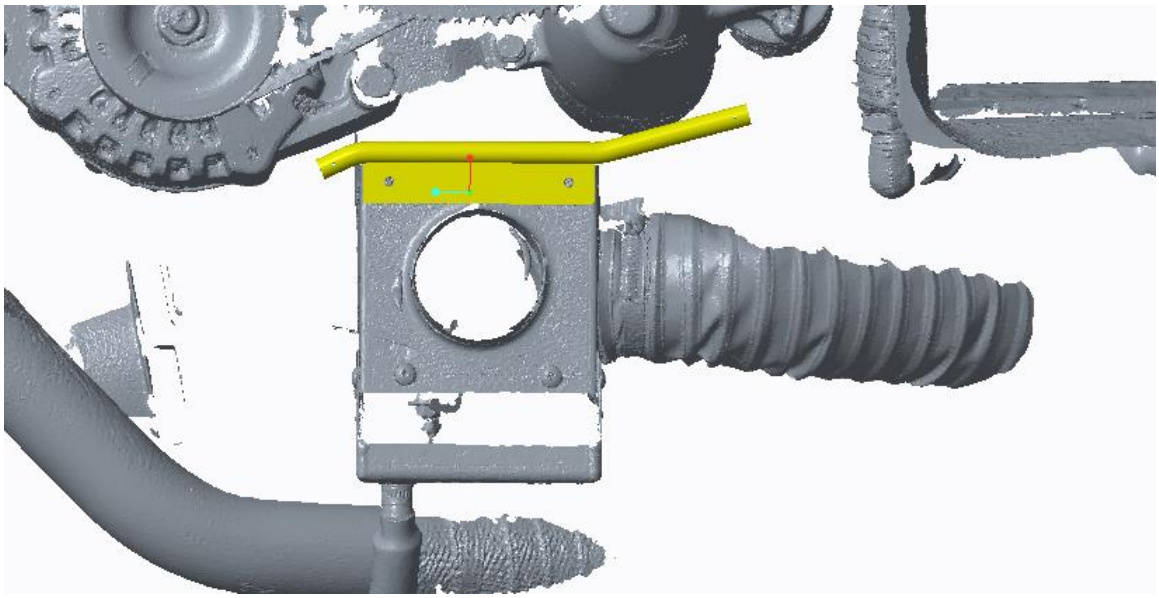


Figure 40 – New Spring Bracket Location

C. Reference Schematic AC-02165. Connect AC-2200 Wire (ALT) to the alternator battery terminal and AC-02199 Harness (Alt Ground) to the alternator ground terminal. Connect the 70 amp fuse and inline fuse holder to the (Cur Limit) side of the two harnesses. Run the AC-02199 Harness along with the other alternator wires through the firewall then run the harness beneath the floorboards to the terminal block in front of the compressor. See Figure 41 and Figure 47.

Figure 41 – Firewall Routing

15. **Front Seat Controls**

A. Install Climate Controller in instrument panel where space permits. See Figure 42 for CB-2 Controller or Figure 43 for A-1235 Controller below for cutout dimensions. See Figure 44 & Figure 45 for Toggle Switch dimensions and placard illustration.

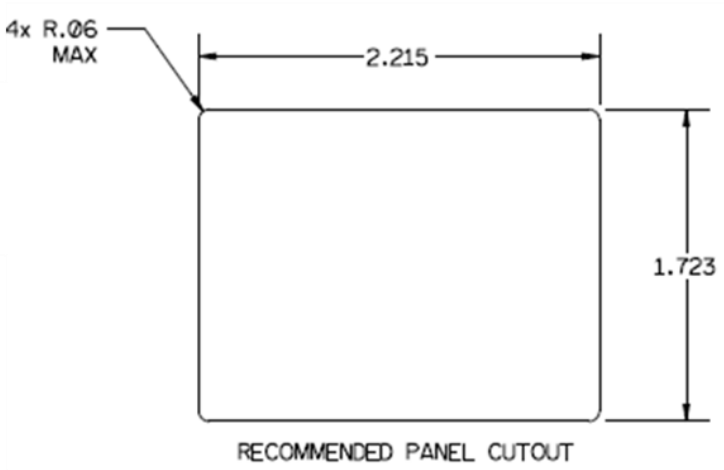


Figure 42 – CB-2 Panel Cutout Dimensions

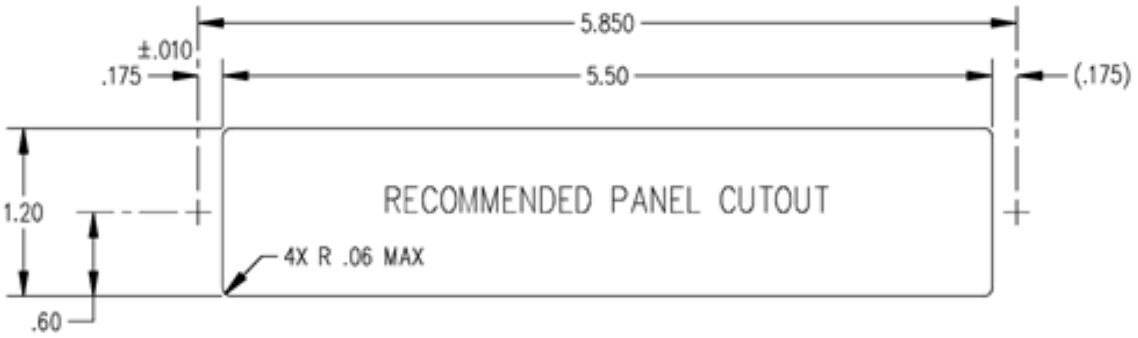


Figure 43 – A1235 Panel Cutout Dimensions

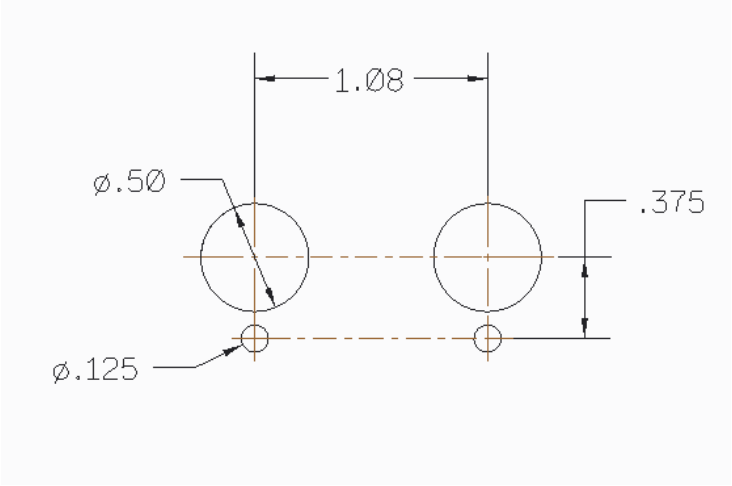


Figure 44 – Toggle Switch Control Drilling Pattern

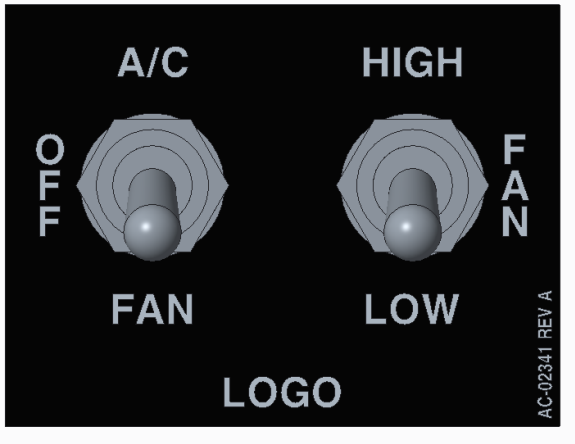


Figure 45 – Toggle Switch Control with Placard

16. **Route Climate Control Extension Harness**

A. Connect AC-02190 Harness to the controller or toggle switch harness. Use the provided splices and wired ring terminals to connect the AC-02190 Harness to the 1A circuit breaker and ground per AC-02165 Schematic. Apply AC-02348 Circuit Breaker Placard, and then mount the 1A circuit breaker. Reference Figure 46 for an example of placement.

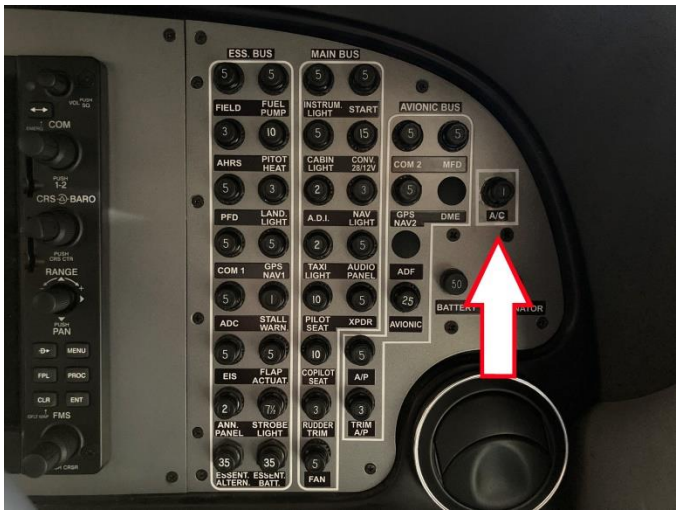


Figure 46 - Install Placard and Circuit Breaker

B. Route the harness behind the instrument panel to the passenger's side, down to beneath the floorboards, and then follow the existing electrical bundles back to the rear of baggage compartment. See Figure 47.

Figure 47 – Wire Routing

17. **Electrical Connections**

A. Reference AC-02165 Schematic for electrical connections.

B. Connect the wire from AC-02202 Power Harness labeled A/C Relay to the A/C Ground Power Relay terminal.

C. Connect the wire from AC-02202 Power Harness labeled (Ground Stud) to the ground location.

D. Then route the AC-02202 Power Harness to the terminal block in front of the compressor. See Figure 48.

Figure 48 – Wire Routing

E. Locate the 124-903 A/C Ground Power Relay approximately as shown on the radio shelf just aft of the cargo area. Connect the relay to the shelf with (2) AN4-5A Bolts, (4) AN960-416L Flat Washers and (2) AN365-1032A Nuts. See Figure 49 below.

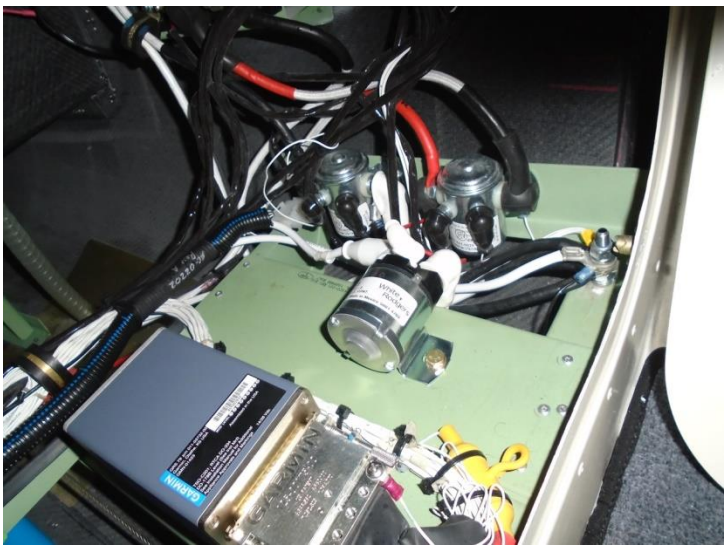


Figure 49 – A/C Ground Power Relay

18. **Wiring**
    A. Reference Schematic AC-02165 for all electrical systems.
        1) ENSURE NO CONTROL CABLE INTERFERENCE
        2) Sufficient wire bundle length has been provided to accommodate variations in wire routing.
19. **Modification of existing components**
    A. Paint reworked areas per AMM as required.
20. **Servicing**
    A. Only qualified personnel with proper equipment may service this Air Conditioning System.
    B. Connect condenser, evaporator, and compressor hoses per Figure 50 below:

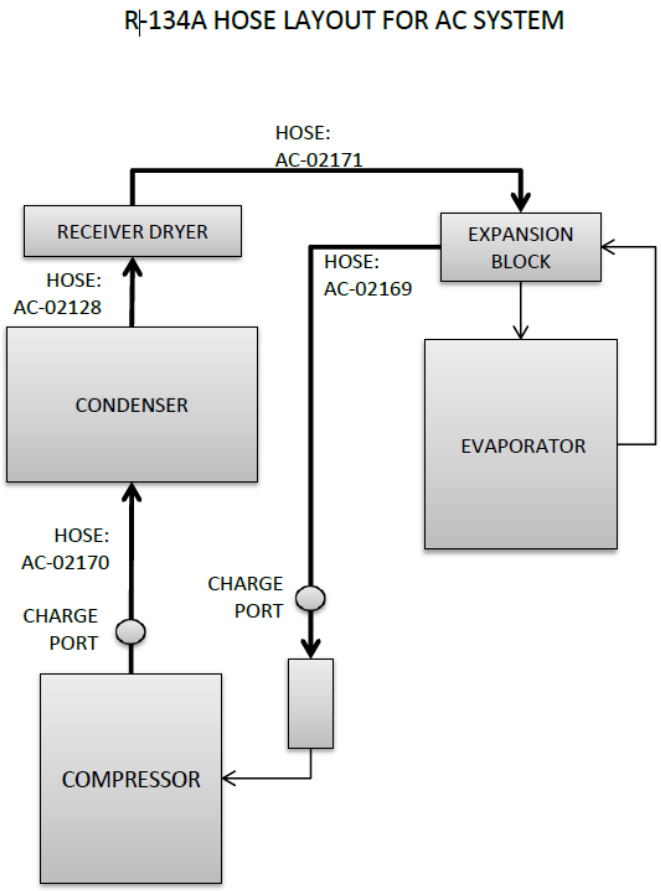


Figure 50 – Hose Layout

    C. Wrap lines where required (near expansion block) to prevent sweating with cork insulation tape P/N 4217-W3.
    D. Evacuate system and ensure no system leakage prior to charging with R-134a.
    E. Charge system with 16oz. +/- 2 oz. of R-134a.

21. **Reassembly of aircraft**

    A. Reinstall aircraft battery per the AMM.

22. **Perform operational tests of air conditioning system (CB-2 or A1235)**

    A. Plug in external power and energize.

    B. Turn Master switch on.

    C. Turn Climate Controller on.

    D. Cabin temperature should be displayed.

    E. Select fans up and fan speed should correspond.

    F. Drive cabin temperature requested below ambient temperature by at least 10 degrees F.

    G. Outlets should flow air 20-30 degrees cooler than ambient.

    H. Check that water is coming from evaporator drain line. Water will not be present only if atmosphere is extremely dry, so if no water is flowing check for hose continuity to evaporator plenum.

    I. If any items do not operate as described, troubleshoot system and correct discrepancies.

    J. Turn Climate Controller off.

    K. Aircraft will need to be located in a run up area to complete this section.

    L. Utilizing qualified personnel operate the aircraft engine per the Pilot Operating Handbook.

    M. If further assistance is needed contact Kelly Aerospace Thermal Systems technical support at (440) 951-4744.

23. **Perform operational test of air conditioning system (Toggle Switches)**

    A. Plug in external power and energize.

    B. Turn AC/Fan Switch to Fan.

    C. Toggle Fan Speed switch between High and Low; fan speed should correspond.

    D. Turn AC/Fan Switch to AC.

    E. Toggle Fan Speed switch between High and Low; fan speed should correspond.

    F. Leave Fan Speed switch on High.

    G. Outlets should flow air 20-30 degrees cooler than ambient.

    H. Check that water is coming from evaporator drain line. Water will not be present only if atmosphere is extremely dry, so if no water is flowing check for hose continuity to evaporator plenum.

    I. If any items do not operate as described, troubleshoot system and correct discrepancies.

    J. Turn AC/Fan Switch of Off.

    K. Aircraft will need to be located in a run up area to complete this section.

    L. Utilizing qualified personnel operate the aircraft engine per the Pilot Operating Handbook.

    M. If further assistance is needed contact Kelly Aerospace Thermal Systems Technical support at 440-951-4744.

24. **Return to service**

A. Update aircraft Weight and Balance records.

B. Install Approved Flight Manual Supplement.

C. Complete FAA form 337.

D. Make aircraft log book entry.