RV-10 WIRING HARNESS INSTALLATION

INSTRUCTIONS

- **INSTALLATION DRAWINGS AND TEXT**
- **WIRING HARNESS KIT CONTENTS LIST/BAG CONTENTS LIST**

ES WH 10 KIT I(O)-540

RV-10A WIRING HARNESS

CONTENTS

1.000 WH-10	**HARNESS I(O)-540**
1.000 ES WH-SK	**HARNESS INSTALLATION SUPPLEMENT**
1.000 ES WH-SW 10	**CIRCUIT BREAKER SET RV-10A**
1.000 DOC ES HARNESS-10	**WIRING DRAWINGGS AND TEXT**
1.000 F-10110-L	WIRE COVER
1.000 F-10111	ANGLE BRACKETS
1.000 WH-800A	TERMINAL BLOCK BASE
1.000 WH-800B	TERMINAL BLOCK TOP
1.000 WH-801	RT.CONSOLE TEMPLATE
1.000 WH-P13	BUSS BAR JUMPER #8
1.000 WH-P17	#2 ELEC.CABLE 37.25"
2.000 WH-P25	#2 AWG BRAIDED 7.25"
1.000 WH-P27	#2 AWG ELEC.CABLE
1.000 WH-P4F	#2 ELEC.CABLE 7.75"
1.000 WH-P5	#2 ELEC.CABLE 11"
1.000 BAG 970	
1.000 BAG 971	
1.000 BAG 972	
1.000 BAG 995	WIRING KIT HW
1.000 BAG 997	SPARE WIRE LABELS

ES WH-SK
HARNESS INSTALLATION SUPPLEMENT
CONTENTS

20.000	PLASTIC TIE WRAP 4	4" PLASTIC TIE WRAP
55.000	WIRE M22759/16-18	#18 GAUGE ELECT WIRE
55.000	WIRE M22759/16-16	#16 GAUGE ELECT WIRE
25.000	WIRE M22759/16-14	#14 GAUGE ELECT WIRE
25.000	WIRE M22759/16-22	22 GA ELECT WIRE $/FT
12.000	ES 36152	TERMINAL #20 WR #6 TR
35.000	ES 31890	#18 TERMINAL
5.000	ES 36154	TERMINAL #20WR #10STD
20.000	ES 320565	#14-16 TERMINAL
1.000	ES 324082	#8 RING/ 1/4 STUD
8.000	ES 320559	#18 SPLICE
7.000	ES 320562	#14-16 SPLICE
1.000	ES HST-3/8X1'	HEAT SHRINK TUBE
1.000	ES HST-3/16X1'	HEAT SHRINK TUBE
1.000	ES HST-1/4X1'	HEAT SHRINK TUBE
2.000	ES BUSS BAR-063X.5	1/16X1/2X12 COPPER BR
25.000	DUCT NT5/8	NYLON 5/8 TUBE ($/FT)
4.000	MS25171-1S	NIPPLE (BOOT) SMALL
7.000	MS25171-3S	NIPPLE (BOOT) LARGE
6.000	BUSHING SB750-10	SNAP-IN 5/8 ID 3/4 OD
4.000	BUSHING SB437-4	SNAP-IN 1/4ID 7/16 OD
1.000	TAPE UHMW 3"X12"	INSULATING TAPE
1.000	ES 324044	#8L TERMINAL

ES WH-SW 10
BREAKER SET RV-10A
CONTENTS

2.000	ES PBB-5	TOGGLE SWITCH BREAKER
3.000	ES PBB-10	TOGGLE SWITCH BREAKER
1.000	ES PBB-20	TOGGLE SWITCH BREAKER
1.000	ES PBB-5A CB	PLAIN CIRCUIT BREAKER
1.000	ES PBB-10A CB	PLAIN CIRCUIT BREAKER
1.000	ES CB 1648-009-060	60 AMP CIRCUIT BRKER
1.000	ES 2GK54-73 SWITCH	DPST SWITCH (ON/OFF)

WIRING HARNESS BAG CONTENTS LIST

BAG 970

1.000	AN3-4A	BOLT
3.000	AN3-3A	BOLT
1.000	AN365-428	NUT,STOP 1/4-28
12.000	AN365-832A	NUT,STOP 8-32
2.000	AN4-4A	BOLT
1.000	AN4-5A	BOLT
1.000	AN509-10R12	SCREW,FLT HD STRUCT
1.000	AN509-8R8	SCREW,FLT HD STRUCT
10.000	AN515-8R8	SCREW,ROUND HD
2.000	AN526C832R8	SCREW,TRUSS HD SS
2.000	AN5-4A	BOLT

BAG 971

4.000	AN960-10L	WASHER, THIN
4.000	AN960-416	WASHER 1/4
2.000	AN960-516L	WASHER (032) 5/16
12.000	AN960-8	WASHER #8
2.000	K1000-08	PLATENUT 8-32
4.000	MS21042-3	1032 ALL METAL L/NUT
2.000	MS21045-5	HW PINCH NUT 5/16
2.000	MS21919DG12	CUSHIONED CLAMP
7.000	MS21919DG2	1/8" CUSHION CLAMP
5.000	MS21919DG4	1/4" CUSHION CLAMP
5.000	MS21919WDG6	3/8" CUSHION CLAMP
1.000	MS21919DG8	CUSHIONED CLAMP
1.000	MS21919DG10	CUSHIONED CLAMP
3.000	MS21919WDG3	3/16" CUSHIONED CLAMP
1.000	MS35206-248	832X3/4 PAN HD SCREW
1.000	MS35206-250	832X1 1/4 PAN HD SCR.

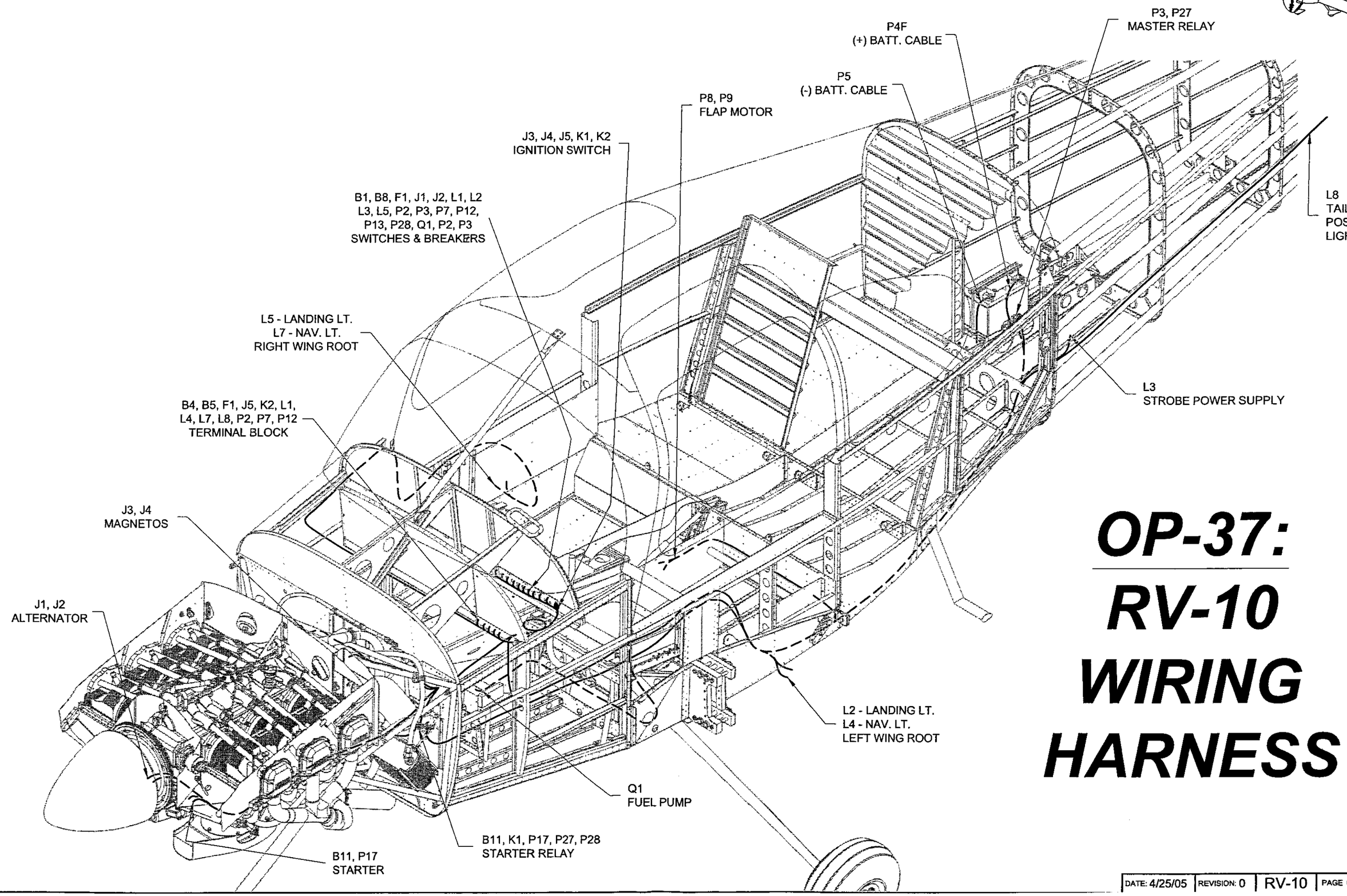
BAG 972

6.000	BUSHING SB375-3	SNAP-IN 3/16ID 3/8 OD
4.000	BUSHING SB500-6	SNAP-IN 3/8 ID 1/2 OD
2.000	BUSHING SB625-8	SNAP-IN 1/2ID 5/8 OD
6.000	BUSHING SB750-10	SNAP-IN 5/8 ID 3/4 OD
12.000	RIVET LP4-3	POP RIVET
2.000	BUSH AL-058X5/16X1	ALUMINUM BUSHING -8
2.000	C-606	LINK
2.000	F-1016H	GUIDE BRACKET

WIRING HARNESS BAG CONTENTS LIST

BAG 995		**WIRING KIT HW**
20.000	AN365-832A	NUT,STOP 8-32
5.000	MS35206-248	832X3/4 PAN HD SCREW
7.000	MS35206-250	832X1 1/4 PAN HD SCR.
17.000	AN960-8	WASHER #8
1.000	AN5-5A	BOLT
1.000	AN960-516	WASHER 5/16
1.000	AN365-524	NUT,STOP 5/16-24
4.000	MS35333-39	3/16 INT TOOTH L/W

BAG 997		**SPARE WIRE LABELS**
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL F1
1.000	WH SM35-3/8-9X0.5J	SHRINK LABEL J1
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL J2
1.000	WH SM35-1/8-9X.25J	HEAT SHRINK LABEL
1.000	WH SM35-1/8-9X.25J	HEAT SHRINK LABEL
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL J5
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL K1
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL K2
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL L1
1.000	WH SM35-1/8-9X0.5L	SHRINK LABEL L2
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL L3
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL L4
1.000	WH SM35-1/8-9X0.5L	SHRINK LABEL L5
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL L6
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL L7
1.000	WH SM35-3/8-9X0.5P	SHRINK LABEL P1
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL P2
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL P3
1.000	WH SM35-1/8-9X0.5P	SHRINK LABEL P7
1.000	WH SM35-1/8-9X0.5P	SHRINK LABEL P8
1.000	WH SM35-1/8-9X0.5P	SHRINK LABEL P9
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL P12
1.000	WH SM35-3/32-9X0.5	SHRINK LABEL Q1
1.000	WH SM35-3/32-9X.25	



OP-37: RV-10 WIRING HARNESS

NOTE: This manual describes the installation of the wiring harness. However stall warning, wing tip lighting and flap position light installation are not covered.

OVERVIEW

This kit provides the basic electrical circuits common to most aircraft. It provides guidance in routing and connecting the electrical system and is adaptable to a variety of builder needs. It is a good starting point that will allow the builder to get over the hump. However, the builder will not be able to screw on a few connectors and go flying since there are too many configuration possibilities which the designer cannot anticipate and therefore must limit the scope of the design.

This manual covers four general and overlapping phases of installation:

- Hardware (drill routing holes, mount terminal block and switches, etc.)
- Installation (route the harness, route individual wires and cables)
- Connection
- Testing

There are two main "hubs" in this system; the switches and circuit breakers cluster that mounts to the instrument panel and a terminal block that mounts to the sub panel.

The switch/circuit breaker cluster is configured using combination toggle type switch/circuit breakers (SCB) and plain type circuit breakers (CB). A list of these is as follows:

Master Switch	Activates master relay
Alternator SCB	Controls power to alternator field
Radio Master SCB	Controls power to radio +V tmnl. on tmnl. block
Boost Pump SCB	Controls power to fuel pump
Strobe Lights SCB	Controls power to wing tip & rudder bottom strobes
Nav. Lights SCB	Controls power to nav. lt. +V, and to the panel lt. dim +V terminal on tmnl. block
Landing Lights SCB	Controls power to landing lights
Stall Warning CB*	Controls power to stall warning system
Flaps CB	Controls power to flap system
Instruments CB	Controls power to inst. +V tmnl. on tmnl. block
Alternator CB	Controls power from the alternator to the switch cluster buss bar

The terminal block mounted on the F-1068 Sub Panel provides multiple connections for avionics and instruments and simplifies changes and upgrades. Almost any variation can be accommodated by adding or subtracting a few wires. The wires are bundled with tie wraps that are easily removed and replaced. A list of the terminals is as follows:

Radio +V: A connection point for avionics, controlled by the Radio Master SCB.
Instrument +V: A connection point for instruments and accessories controlled by the Master Switch.
Navigation Light +V: A connection point for Nav. lights and the Panel Lt. Dimmer +V controlled by the Nav. Lights SCB.
Panel Light Dimmer +V: A connection point for panel lights, controlled by an optional panel light dimmer (P/N ES DIMMER, LAMP 1.5A) and by the Nav. Lights SCB.
Flaps +V: A connection point for the flap actuator controlled by a flap switch (or a control/switching module if flaps are controlled remotely from the control stick), protected by a 5 amp CB.

* Supplied with wing kit.

The remaining two terminals on the terminal block are spares and may be used to provide power for electric trim servos, relay decks, etc. For non "safety of flight" items the wires may be protected with in-line fuse holders.

When to Install. Ideally the wiring harness would be installed at about the same time as the fuel system. The routing and attach holes would be drilled along with the fuel system installation and the actual harness would be installed after the fuel system was in place. This could be done prior to the cabin top installation.

NOTE: The wire/cable part number prefix "WH" has been omitted in the manual but should be used when reordering.

HARDWARE

Step 1: Inventory the entire kit.

Step 2: Read completely through both Section 5W of the RV-10 Construction Manual and these instructions before beginning the installation.

Step 3: Remove the F-1003A Instrument Panel. **NOTE: All snap bushing callouts will accommodate the harness as provided, including the three-conductor strobe cable which is not a part of the kit, and most but not all have room for more wires. However, the builder is ultimately responsible for the proper sizing of the snap bushings for his/her own application.**

Step 4: Size the snap bushings by laying out the harness in the fuselage using Page OP37-1 as a guide. Place the harness in the fwd. fuselage and unwind it. As the spool of wires is unwound the branching will become more obvious. Go slowly in order to avoid putting a kink in the wires as they are untangled from the rest of the spool.

Hold the harness in place temporarily by using spring clamps on the F-1003B Instrument Panel Lower Flange and on the F-1068A and F-1068B Sub panels as it is progressively unwound. For now do not thread the wires through existing openings in the airframe. If/as req'd make a service loop between the instrument panel and the sub panel with the extra wire.

Position the harness so that the circuit breaker panel group of terminals is nearly opposite the terminal block group of terminals. See Page OP37-13.

If the builder intends to add more than a few wires to the harness the snap bushings should be sized accordingly. **CAUTION: Do not exceed the "maximum" drill sizes where noted.**

When it becomes impossible to run any more wires (those not part of the harness provided) down the left side then run them down the right. When finished remove the harness from the airframe.

Step 5: Final-Drill one hole in the F-1001A Firewall Bulkhead as shown in Figure 1. Carefully position the template on Page OP37-19, Figure 1 to avoid drilling into the F-1001M Left Side Angle on the aft side of the firewall bulkhead.

Use a lubricant such as Boelube (see Accessories Catalog) and turn the cutting tool at a slow speed. Use a Unibit and support the back of the firewall with a block of wood. File two small notches in the hole opposite each other so that the P27 cable terminal may pass through. Install the SB500-6 snap bushing as per the callout **after** routing the P27 cable.

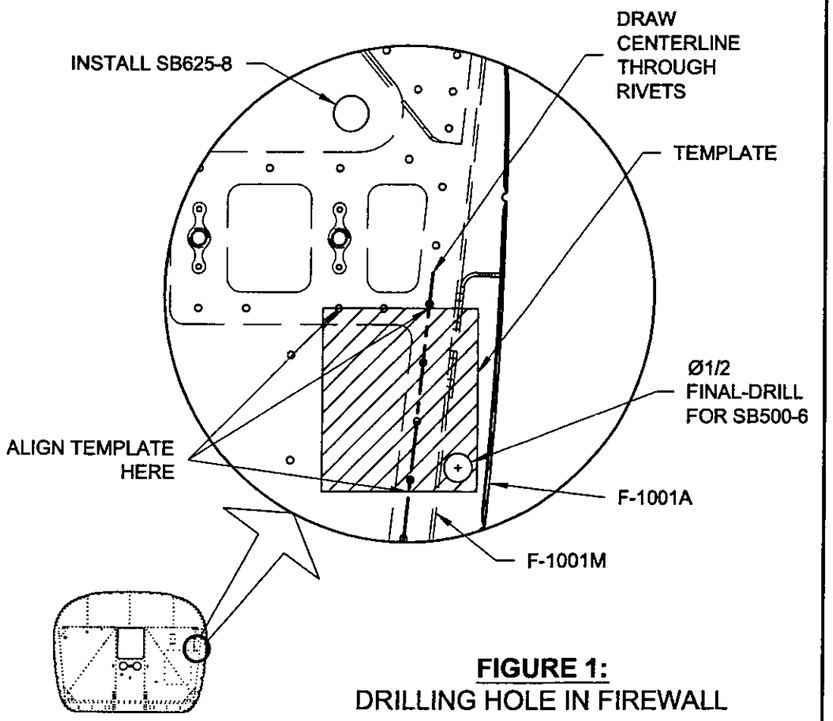


FIGURE 1:
DRILLING HOLE IN FIREWALL

NOTE: The wiring harness is designed to use the ES A-510-2K Magneto Switch With Start for an engine equipped with two magnetos. Changes may be necessary if using an alternate ignition system.

Step 1: Drill a hole in the F-1003A Instrument Panel for mounting the ES A-510-2K Magneto Switch with Start as shown in Figure 1. File the opening to final size leaving the tab. Use the template on Page OP37-19.

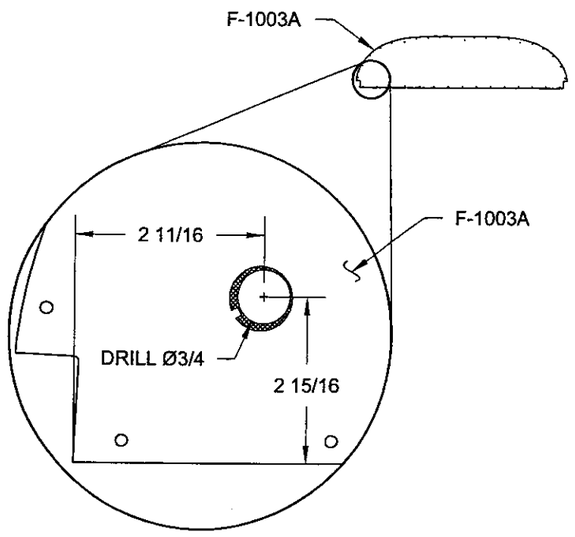


FIGURE 1:
DRILLING MAGNETO SWITCH HOLE

Step 2: Enlarge the tooling hole in the F-1068B-L Sub Panel Side as shown in Figure 2 using a Unibit. Deburr.

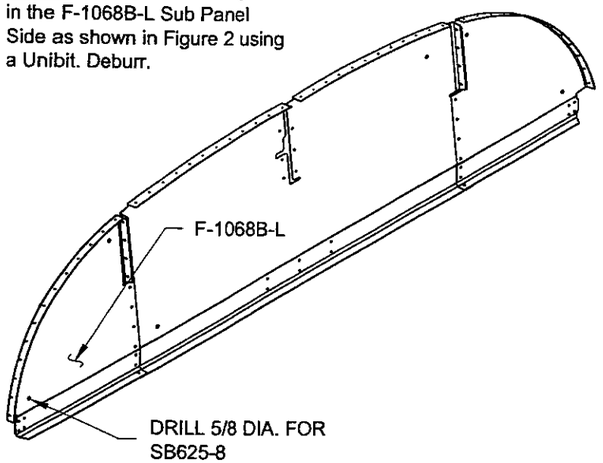


FIGURE 2:
DRILLING THE SUB PANEL

Step 3: Study the SCB/CB configuration shown in Figure 3. This is the layout for which the wiring harness has been designed. Reconfiguration may require adjustments to the harness.

The lateral position of the SCB/CB's may be varied slightly from the design locations shown in Figure 3. If planning to make changes delay drilling these holes until after fitting the harness into the fuselage to verify that the wires will reach the desired locations. The terminal block is best positioned directly forward of the SCB/CB's to prevent interference with other equipment or instruments mounted in the panel. Make certain that the terminal block is located within reach of the harness.

Open locations in the SCB/CB cluster may result from individual variations. If a portion of the buss bar is not used insulate it with tape or heat shrink tubing as shown on Page OP37-13 and fill the panel hole with a cosmetic plug available at most hardware stores. This should streamline later upgrades. Label all of the SCB/CB's on the front and back of the F-1003B Instrument Panel Lower Flange to avoid confusion.

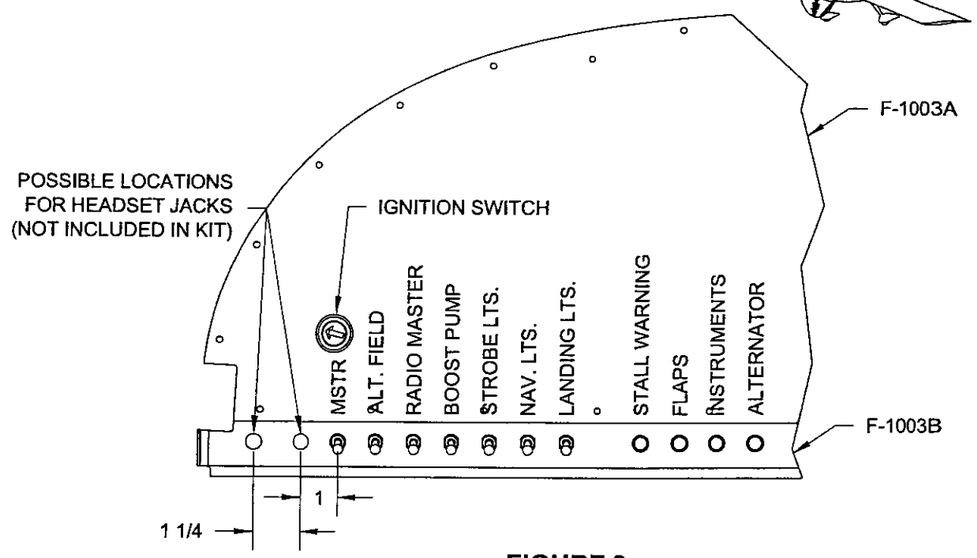


FIGURE 3:
INSTRUMENT PANEL LOWER FLANGE SCB/CB LAYOUT

Step 4: Screw the WH-801 Rt. Console Template to the F-1003B Instrument Panel Lower Flange at the two alignment holes as shown in Figure 4. Use the same hardware used to attach the instrument panel. Match-Drill pilot holes in the instrument panel lower flange using the 1/8 diameter holes in the rt. console template as a guide. Reposition the template to pilot-drill the remaining hole. Final-Drill as per the callouts for the SCB's, CB's and the toggle switch. Clamp the instrument panel lower flange in a drill press (if it has not been riveted in place) to prevent wandering off centerline.

Step 5: Install the SCB, CB's and toggle switch as shown in Figure 4. The amp values on the toggle faces should be "right side up" making the "OFF" position down. Install the flap switch in similar fashion except locate it near to the throttle control knob or lever.

If planning to install the ES SWITCH SPDT-MOM Small Flap Switch for Grip in the control stick mount the corresponding ES FLAP CONTROL BOARD Electric Flap Driver to the F-1068B-L Sub Panel Side just above the terminal block using the hardware supplied with the Electric Flap Driver kit.

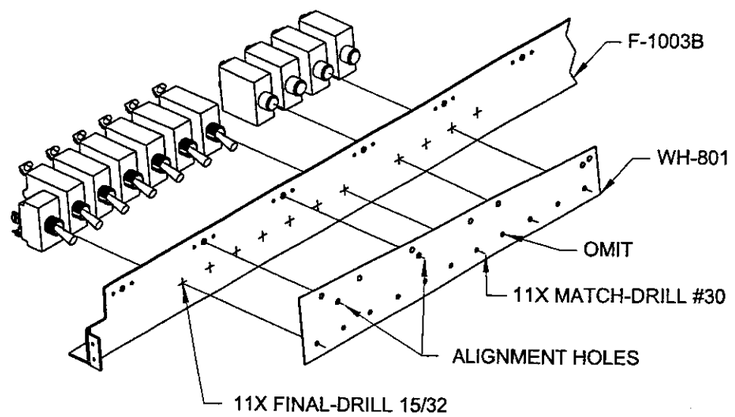


FIGURE 4: DRILLING INSTRUMENT PANEL LOWER FLANGE

Step 1: Make WH-800A from 1/4X9/16X10 3/4 UHMW plastic and WH-800B from 3/16X9/16X10 3/4 UHMW plastic provided in the kit and shown in Figure 1. From now on the assembly will be referred to as the terminal block.

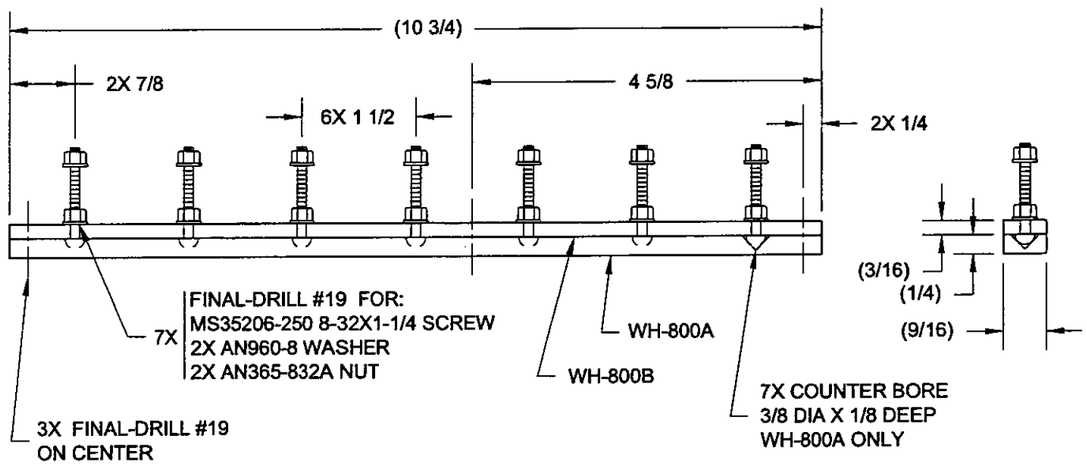


FIGURE 1: FABRICATING TERMINAL BLOCK

Step 2: Mount the WH-800 Terminal Block to the F-1068A Sub Panel Center and F-1068B-L Sub Panel Side using the hardware called out in Figure 2. Center the terminal block vertically between the gap in the AN470 rivets. Drill one #19 hole on either side of the assembly for ground connections. Remove any paint or primer at the holes and use internal tooth lock washers to help make good electrical contact.

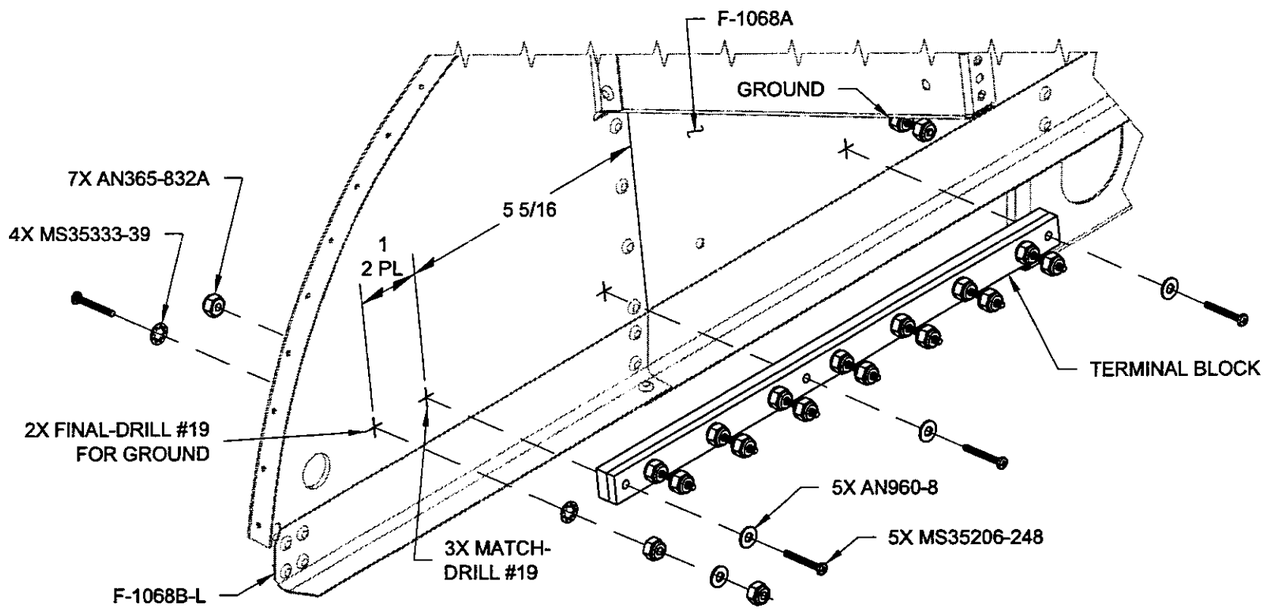


FIGURE 2: MOUNTING TERMINAL BLOCK

Step 3: Fabricate the P21 and P22 Buss Bars from ES BUSS BAR-063X.5X12 copper plate as shown in Figures 3 and 4. The WH-801 Rt. Console Template may be used to pilot-drill before drilling to final size.

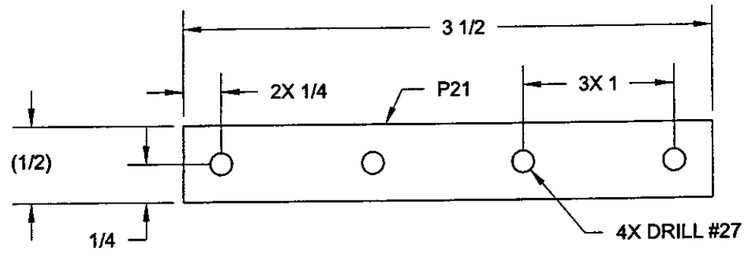


FIGURE 3: FABRICATING CIRCUIT BREAKER BUSS BAR

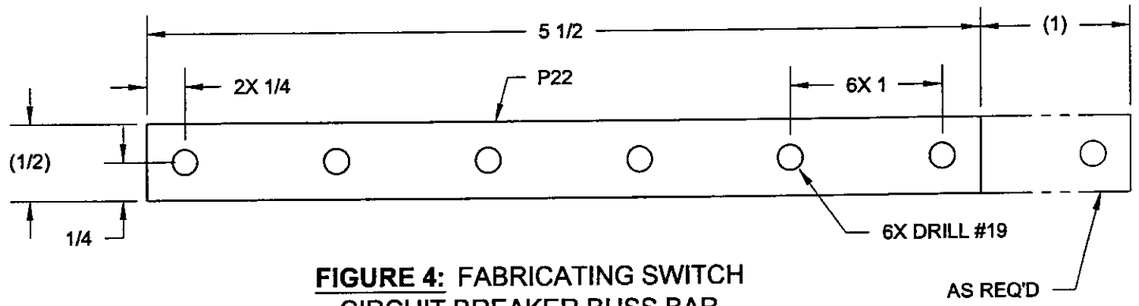


FIGURE 4: FABRICATING SWITCH CIRCUIT BREAKER BUSS BAR

Step 4: Attach the P21 Buss Bar to the cluster of plain type circuit breakers and the P22 Buss Bar to the toggle type switch circuit breakers using the hardware provided with the breakers as shown in Figure 5.

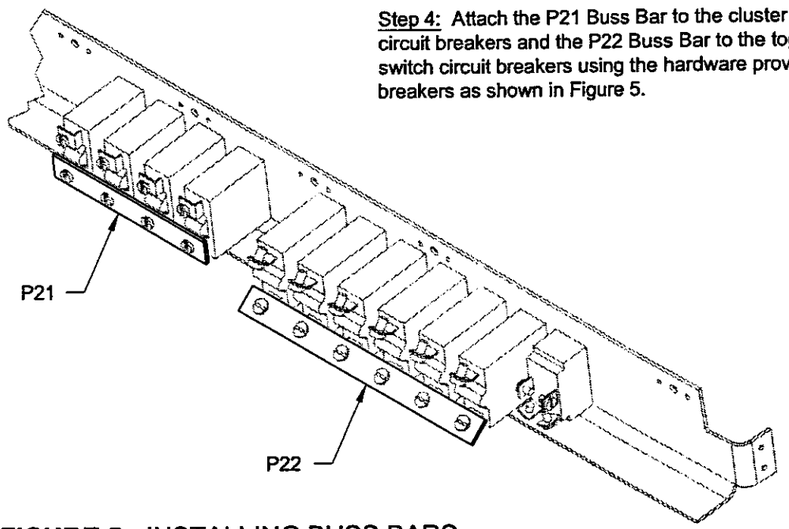


FIGURE 5: INSTALLING BUSS BARS

Step 1: Separate the F-10110A Wire Cover and the F-10110B Clip as shown in Figure 1 then deburr.

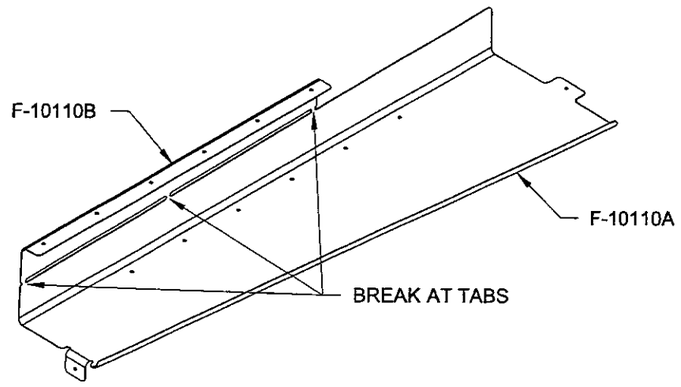


FIGURE 1: SEPARATING WIRE COVER PARTS

Step 2: Cleco together the F-10110A Wire Cover and F-10110B Clip creating the F-10110-L Wire Cover Assembly and final-drill as shown in Figure 2.

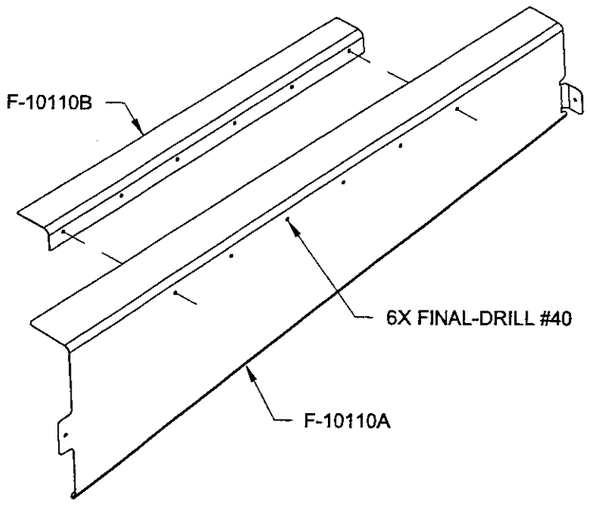


FIGURE 2: FINAL-DRILLING CLIP AND WIRE COVER

Step 3: Test fit the F-10110-L Wire Cover Assembly to the F-1013-L Fwd Fuselage Longeron (not shown). Adjust the bend angle of the F-10110B Clip if/as required until a snug friction fit is achieved.

Step 4: Install the F-10110-L Wire Cover Assembly as shown in Figure 3 with the aft tab on the inboard side of the F-1015D-L Mid Cabin Side Cover. Match-Drill the mid cabin side cover and the F-1042-L Bulkhead Side Channel using the hole in the aft tab of the wire cover assembly as a guide.

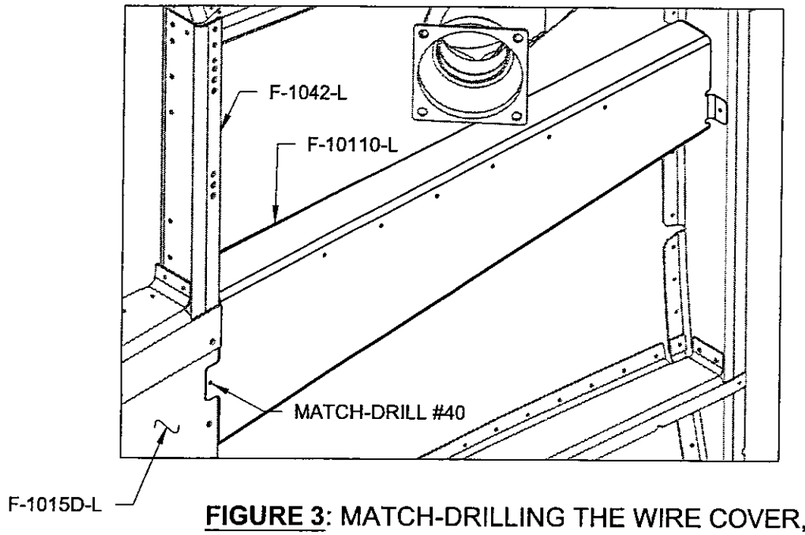


FIGURE 3: MATCH-DRILLING THE WIRE COVER, MID CABIN SIDE COVER AND BULKHEAD SIDE CHANNEL

Step 5: Remove the F-10110-L Wire Cover Assembly. Replace it positioning the aft tab on the **outboard** side of F-1042-L Bulkhead Side Channel as shown in Figure 4. Drill as per the callouts. Remove the wire cover assembly, disassemble, deburr and dimple the #40 holes.

Remove the F-1015D-L Mid Cabin Side Cover. Deburr the holes in the mating parts. Machine countersink the bulkhead side channel and dimple the mid cabin side cover for the hardware called out on Page OP37-17, Figure 1.

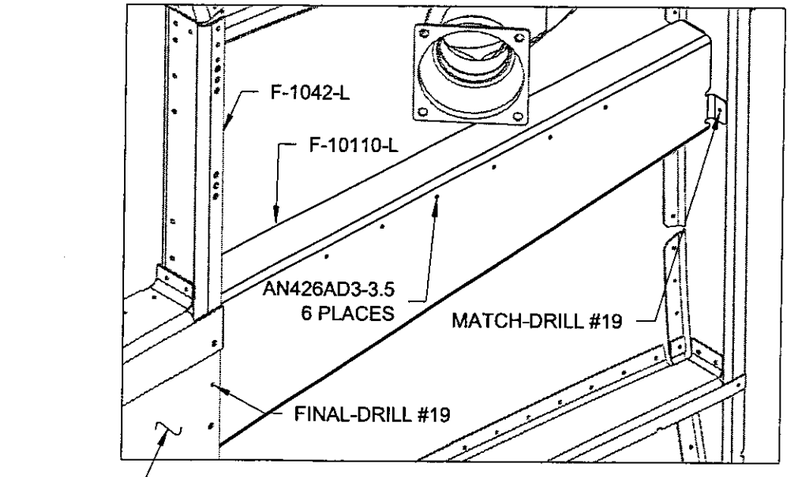


FIGURE 4: FINAL-DRILLING THE SIDE COVER, CHANNEL AND WIRE COVER

Step 1: Match-Drill, deburr and dimple the F-10110A-L Wire Cover for the nutplate rivets called out in Figure 1. Prime the wire cover and the F-10110B-L Clip as desired. Rivet the nutplate onto the wire cover using the hardware called out in Figure 1.

Rivet the F-10110-L Wire Cover Assembly together using the hardware called out on Page OP37-5, Figure 4 and set it aside.

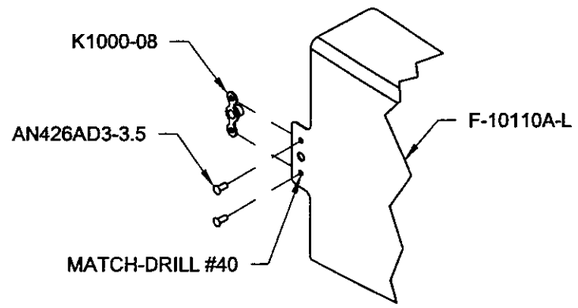


FIGURE 1: ATTACHING THE NUTPLATE

Step 2: Measure and drill the two 3/4 diameter holes in the F-1002-L Fwd Fuselage Bulkhead as shown in Figure 2.

CAUTION: Do not exceed the hole diameters shown.

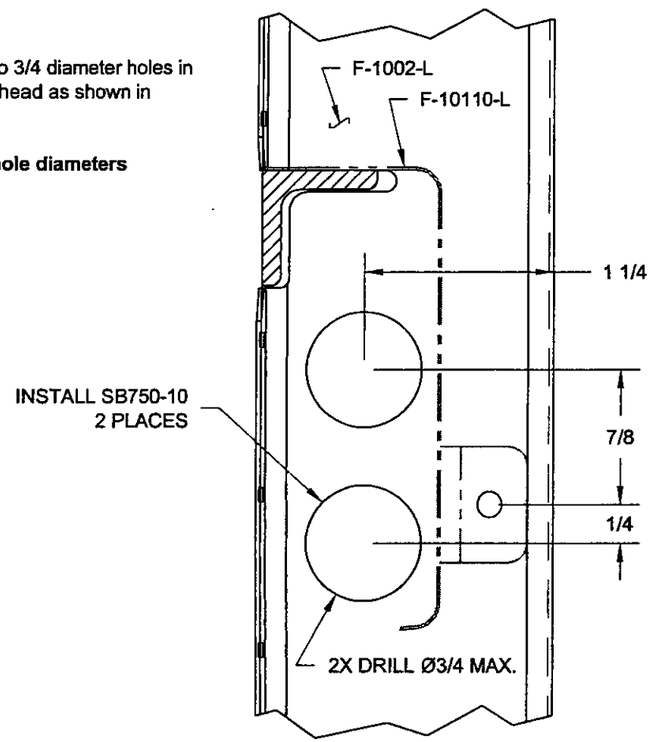


FIGURE 2: DRILLING THE SNAP BUSHING HOLES (REAR VIEW)

Step 3: Working from the outside of the aircraft measure and drill one hole in the outboard side of the F-1069 Fwd Side Skin as shown in Figure 3. Cleco the F-1016H Guide Brackets to this hole. Match-Drill the fwd side skin using the holes in the guide brackets as a guide as shown in Figure 3. Insert additional clecos along the way.

Remove and break apart the guide brackets. Deburr and dimple all mating parts.

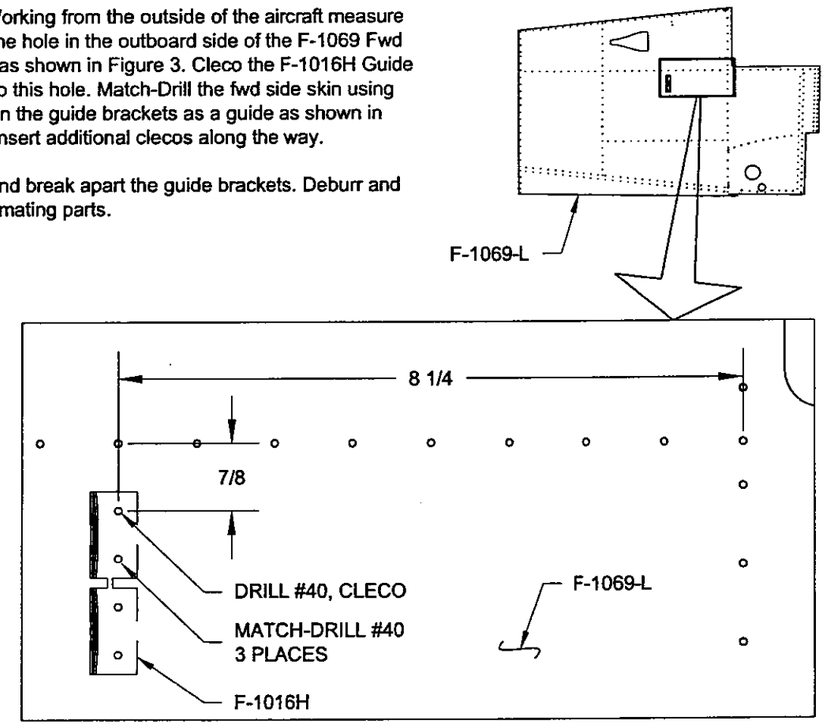


FIGURE 3: DRILLING THE SKIN FOR THE GUIDE BRACKETS

Step 4: Final-drill the F-1016H Guide Brackets as shown in Figure 4. Drill using a drill press and drill press vise or clamp the part securely in a bench vise. Prime if desired. Rivet them in place as shown in Figure 3 using the hardware called out in Figure 4.

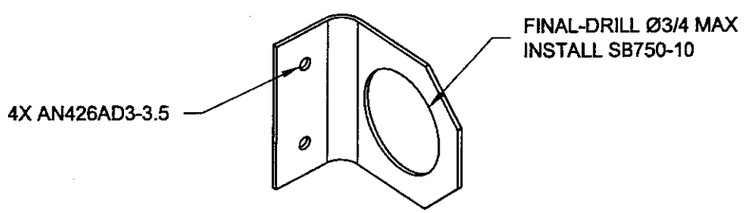


FIGURE 4: MODIFYING THE GUIDE BRACKETS

Step 1: Drill the attach holes in the approximate locations for the hardware shown in Figure 1. Delay installation of the clamps until installing the harness.

NOTE: Become familiar with the harness routing and refer back to this detail during the actual wiring harness installation.

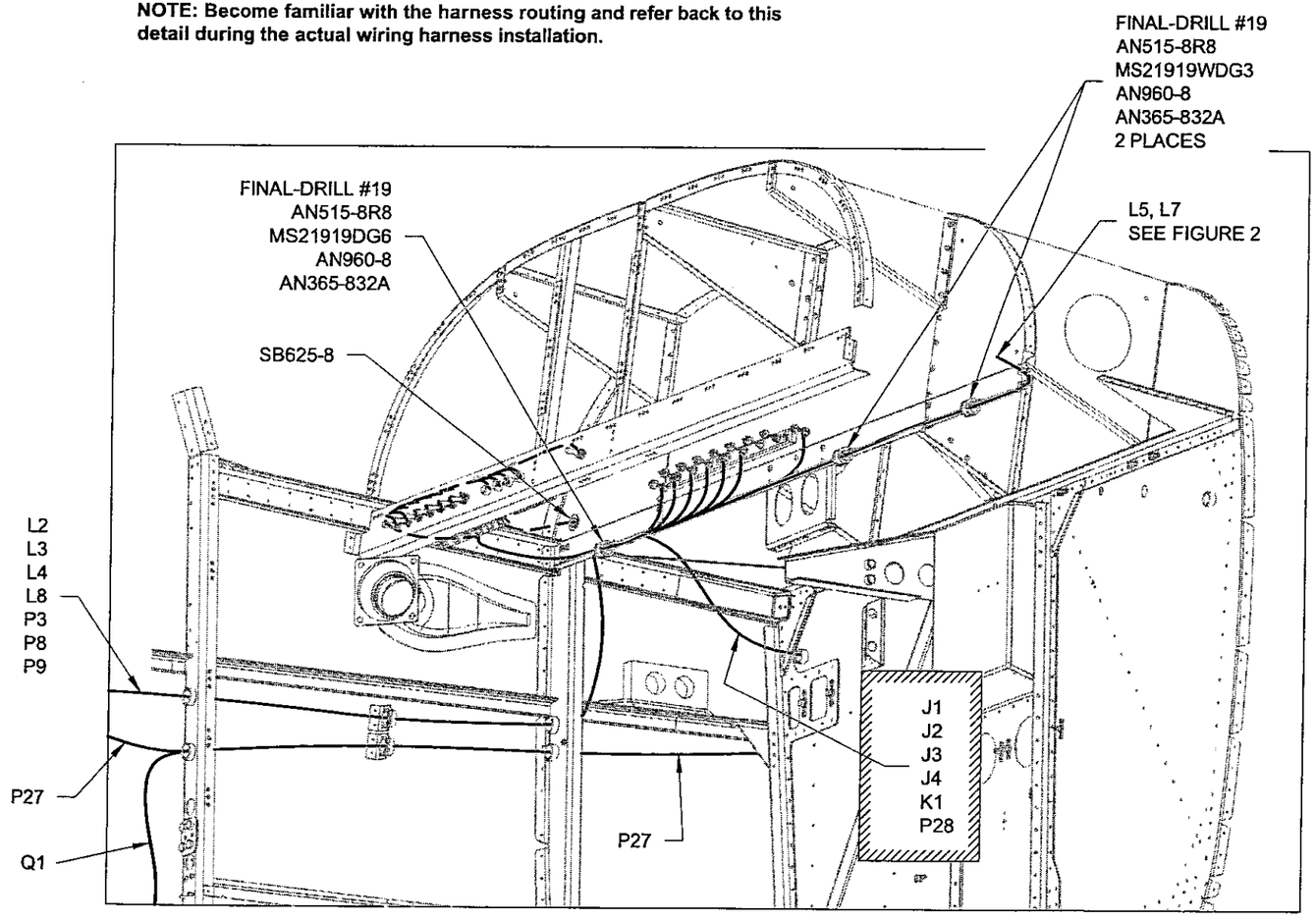


FIGURE 1: DRILLING FOR ATTACH HARDWARE

Step 2: Replace the existing AN509 screw with the longer screw called out in Figure 2 so that the cushioned clamp may be installed. Since it is likely that additional wires will be routed along this path the sizing of the cushioned clamp is left to the builder. One MS21919DG6 Cushioned Clamp is provided in the kit. The largest size the F-1042-R Bulkhead Side Channel will accommodate is a DG8.

Wrap safety wire around the flanges of the cushioned clamp in order to hold it closed during installation.

When directed, route wires L5 and L7 as shown in Figure 2. For the remainder of the route to the wing root mirror the path taken down the left side of the aircraft by wires L2 and L4 as shown on Pages OP37-1 and OP37-9, Figure 5.

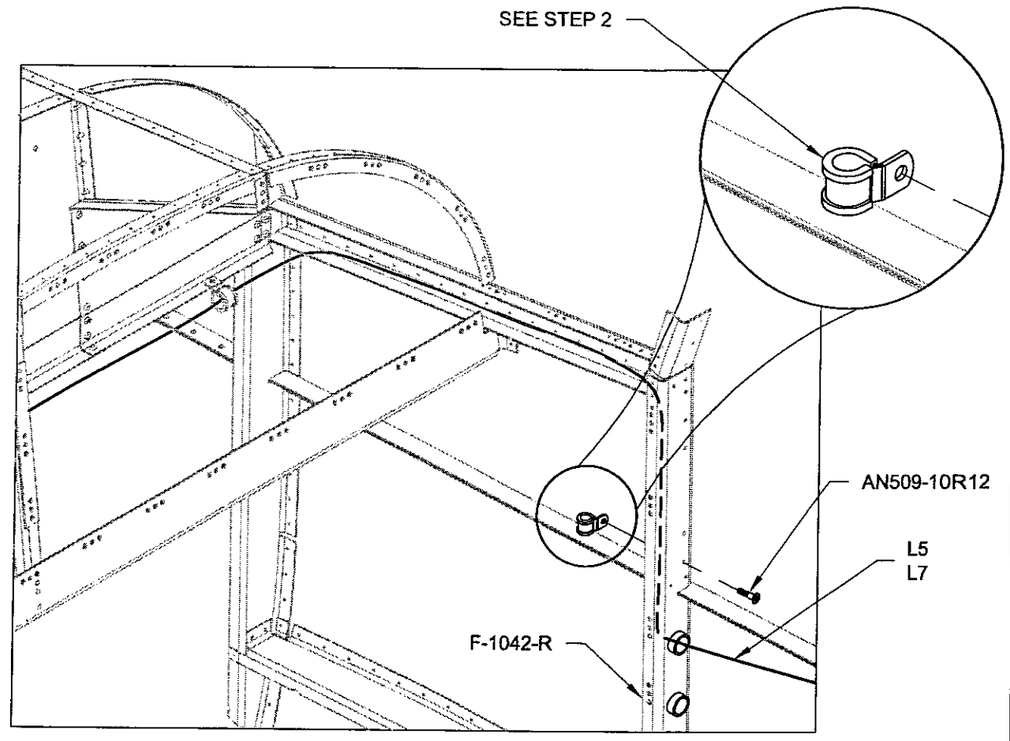


FIGURE 2: MOUNTING CUSHIONED CLAMP TO BULKHEAD SIDE CHANNEL

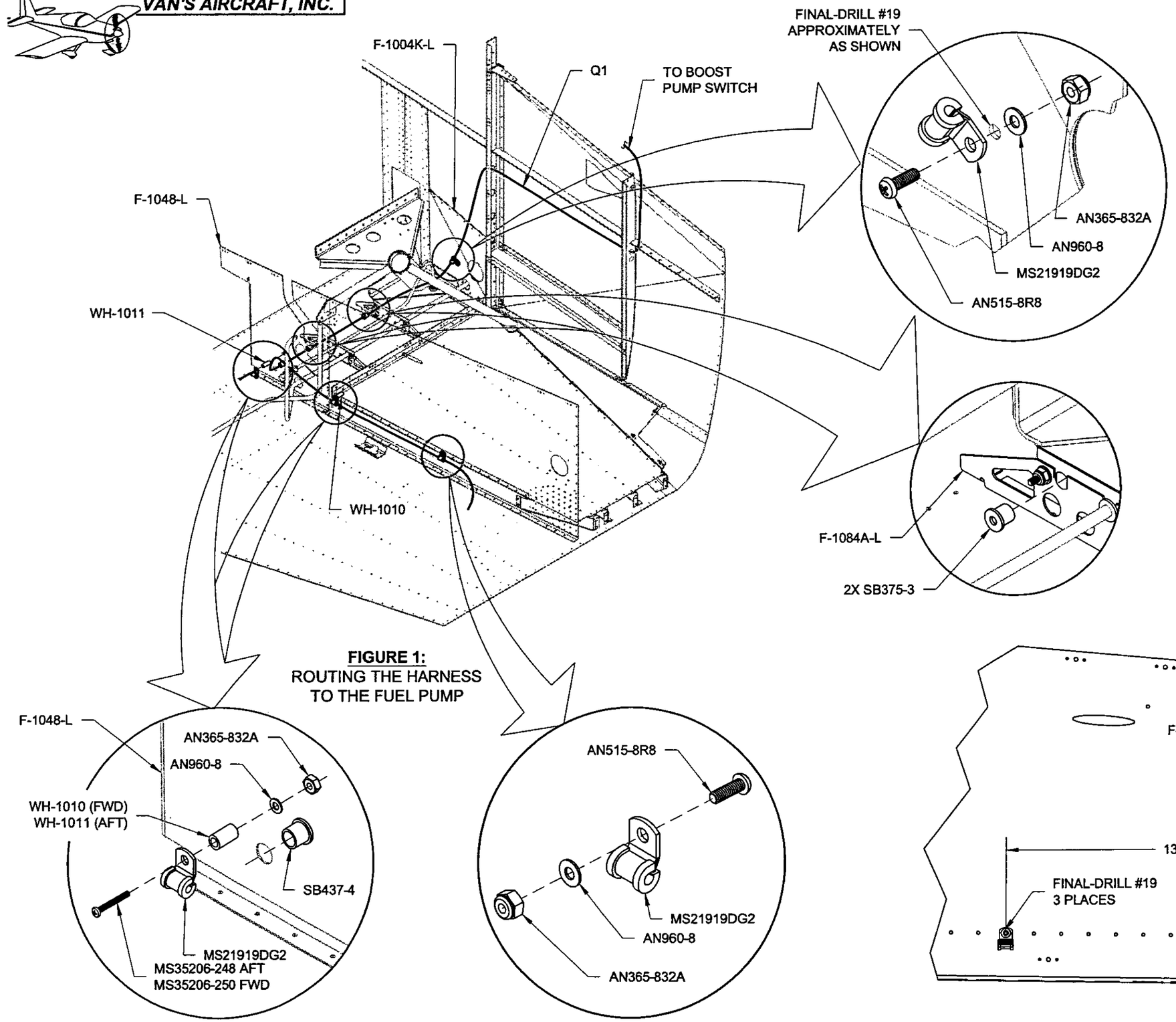


FIGURE 1:
ROUTING THE HARNESS
TO THE FUEL PUMP

Step 1: Route wire Q1 down the left side of the fuselage through the F-1084A-L Systems Brackets and into the tunnel as shown in Figure 1. When mounting the cushioned clamp to the F-1004K-L Center Section Side Plate and side skin keep the wire above and away from the fuel line as much as possible.

Step 2: Fabricate one WH-1010 Fwd Bushing and one WH-1011 Aft Bushing from BUSH AL-058X5/16X1.438 as shown in Figure 2.

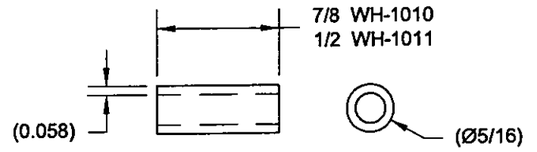


FIGURE 2: FABRICATE BUSHINGS

Step 3: Mount the cushioned clamps to the F-1048-L Fwd Fuselage Rib as per Figure 3. The WH-1010 Fwd Bushing and WH-1011 Aft Bushing shown in Figure 2 keep the wire away from the fuel supply lines.

NOTE: If using a fuel flow transducer substitute MS21919WDG3 in place of the MS21919DG2 clamps called out in Figures 1 & 3. The additional four MS21919WDG3's are not included in the kit.

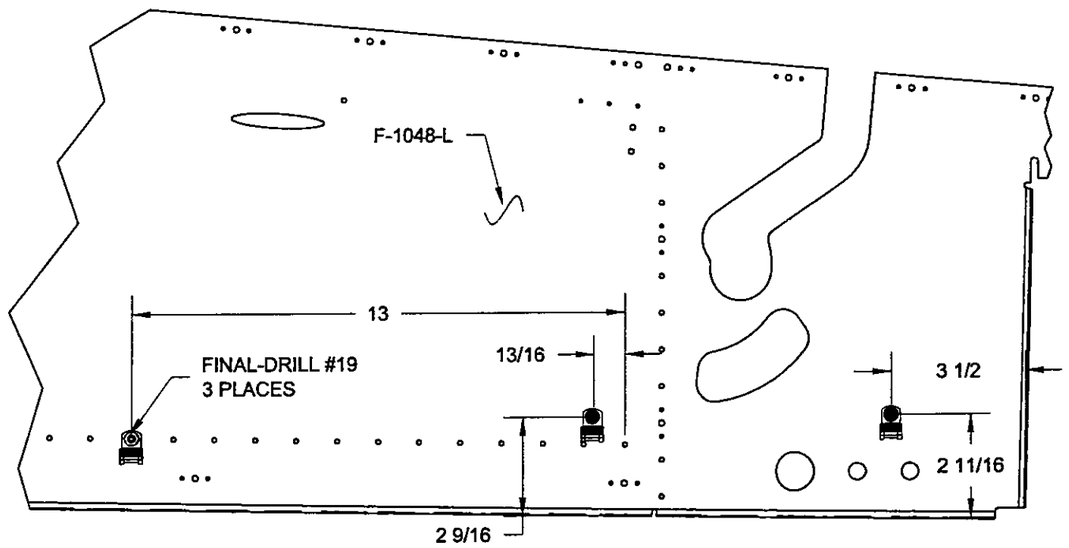


FIGURE 3: ATTACHING THE HARDWARE

Step 1: Follow the references from Figure 1 to install the mounting hardware for cable P27 and others in the mid-fuselage.

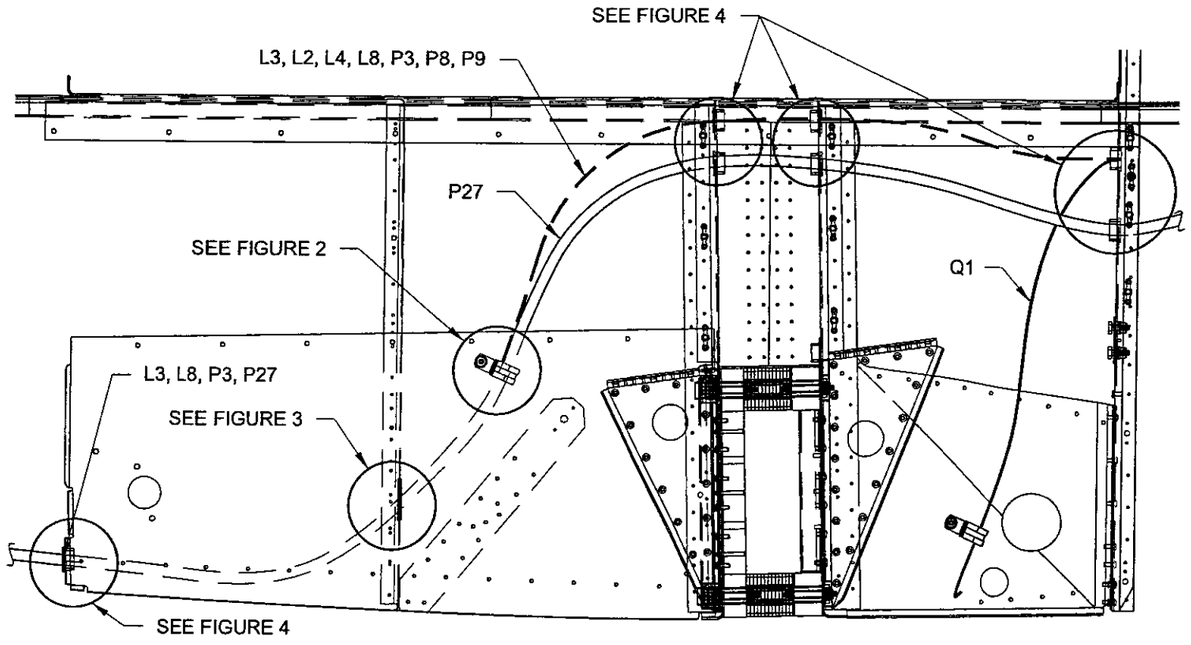


FIGURE 1: ATTACHING HARDWARE AT MID FUSELAGE

Step 2: Drill the F-1016-L Outboard Foot Well Rib and install the hardware called out in Figure 2.

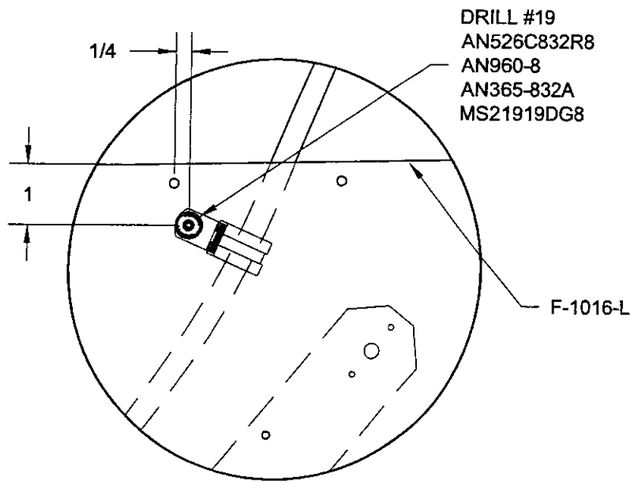


FIGURE 2: ATTACHING CUSHIONED CLAMP

Step 3: Route the P27 cable through the MS21266-1N Plastic Edging Grommet in the second hole from the bottom of the F-1015B-L Foot Well Rib Intercostal as shown in Figure 3.

NOTE: The MS21266-1N Plastic Edging Grommet was included in the wing kit for use with the stall warning system.

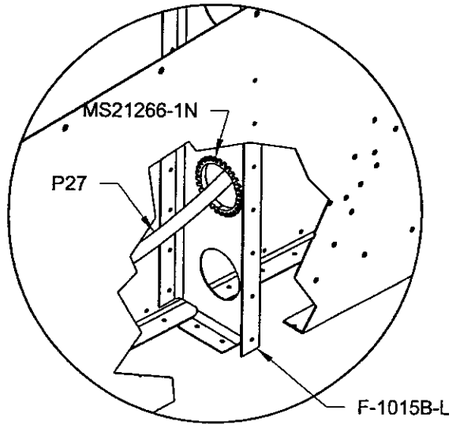


FIGURE 3:
INSTALLING EDGING GROMMET

Step 4: The snap bushings depicted in Figure 4 were provided in the Fuselage kit. To insert the cable in an installed bushing squeeze the bushing before inserting the cable terminal. Otherwise, remove the snap bushing from the bulkhead before inserting the terminal, or slit the bushing, slip it over the cable and snap it into the hole.

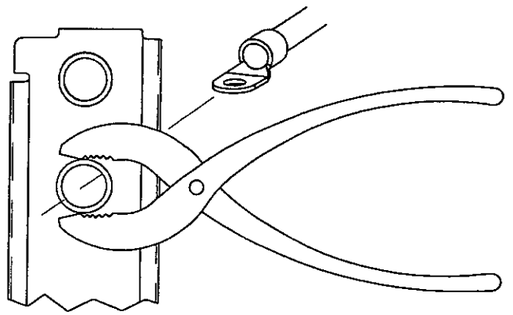


FIGURE 4:
SQUEEZING SNAP BUSHINGS

Step 5: Enlarge the pilot hole in the F-1070-L Mid Side Skin as shown in Figure 5 for wires L2 and L4 to exit the left side of aircraft. **NOTE: It is assumed that the three-conductor strobe wire will also exit here, hence the bushing is sized accordingly.**

Step 6: Repeat Step 5 for the F-1070-R Mid Side Skin and wires L5 and L7.

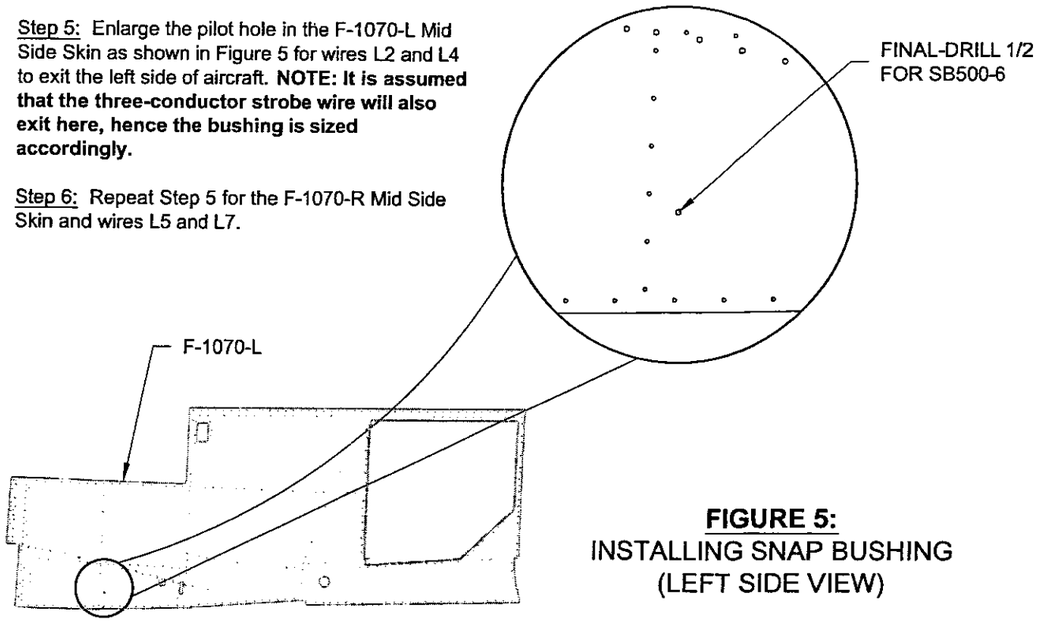


FIGURE 5:
INSTALLING SNAP BUSHING
(LEFT SIDE VIEW)

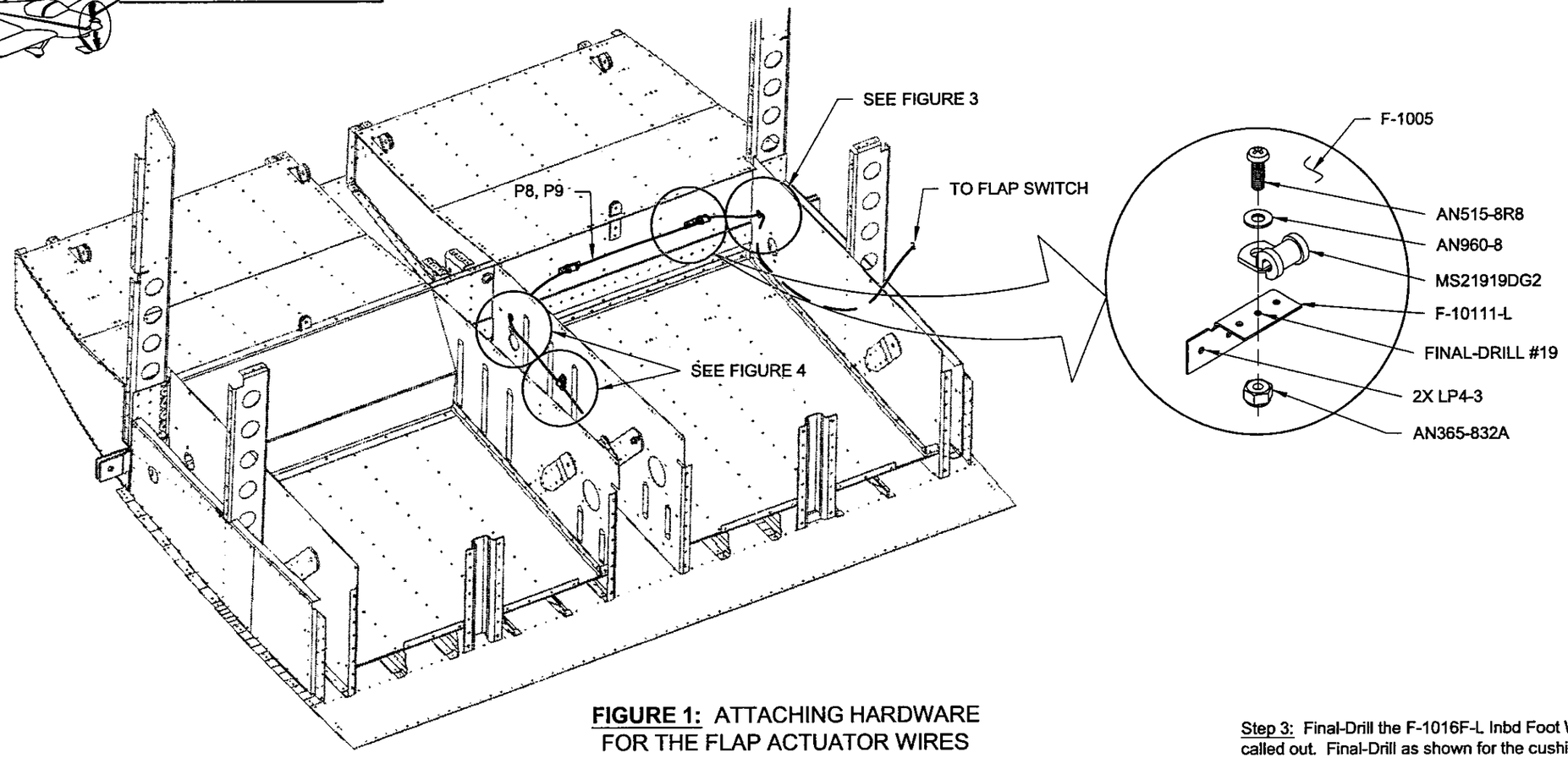


FIGURE 1: ATTACHING HARDWARE FOR THE FLAP ACTUATOR WIRES

Step 1: Final-Drill two places as per the dimensions in Figure 2. Break apart and deburr the F-10111 Angle Brackets into two lefts and two rights. Cleco the angle brackets to the F-1005 Rear Spar Bulkhead and match-drill the rear spar bulkhead using the second hole in each angle bracket as a guide. Remove the angle brackets and final-drill as per the callout in Figure 1. Deburr. Prime the angle brackets as desired. Rivet the angle brackets in place as per the callouts in Figure 1.

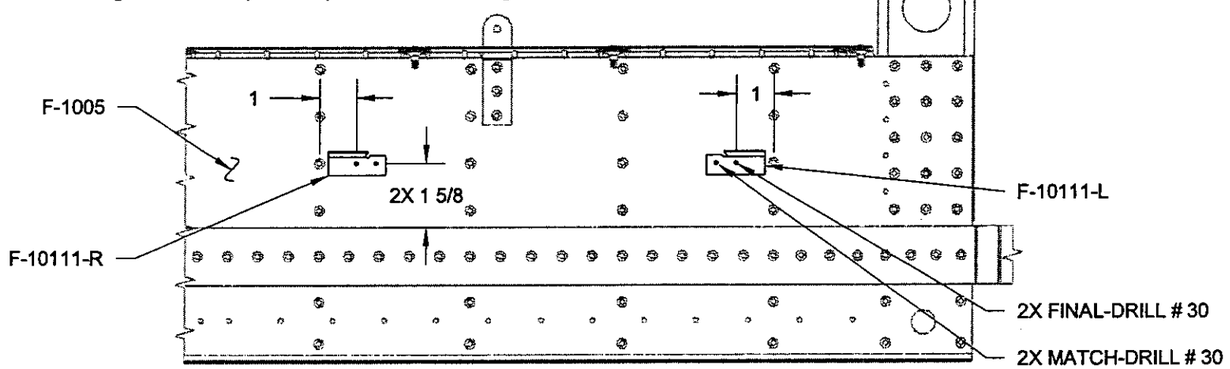


FIGURE 2: ATTACHING ANGLE BRACKETS TO THE REAR SPAR BULKHEAD ASSY (FRONT VIEW)

Step 2: Enlarge the tooling hole in the F-1016-L Outboard Foot Well Rib as shown in Figure 3 for the snap bushing called out.

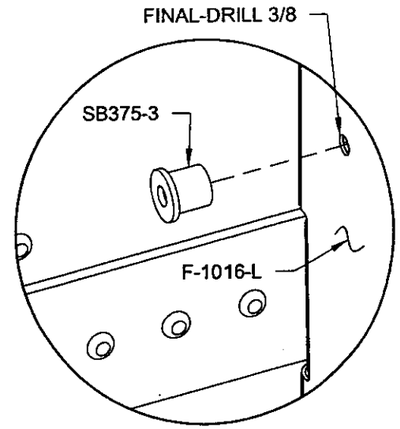


FIGURE 3: INSTALLING SNAP BUSHING IN THE FOOT WELL RIB

Step 3: Final-Drill the F-1016F-L Inbd Foot Well Rib as shown in Figure 4 for the snap bushing called out. Final-Drill as shown for the cushioned clamp and attach it using the hardware called out.

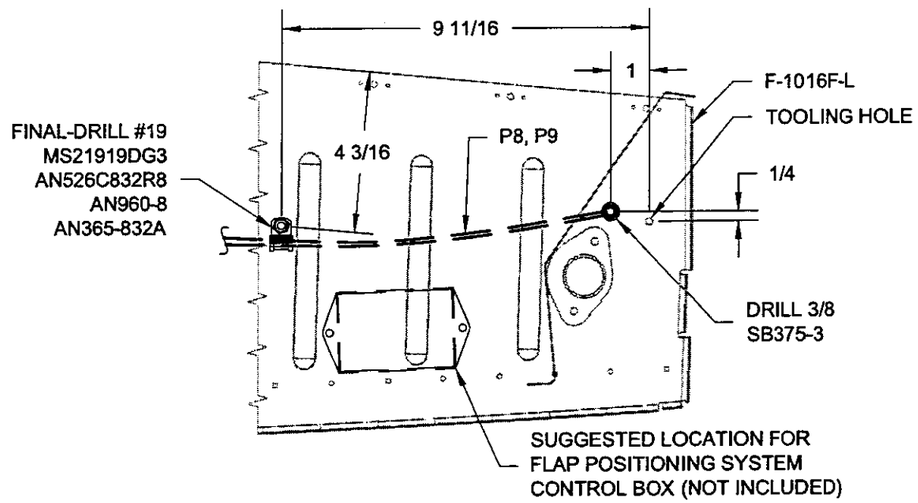


FIGURE 4: ATTACHING HARDWARE TO THE LEFT INBD FOOT WELL RIB (LEFT SIDE VIEW)

Step 1: Route cable P27 through the F-1005 Rear Spar Bulkhead and the F-1034A Fuselage Bulkhead squeezing the snap bushings as before. Follow the references in Figure 1 for the remaining tasks.

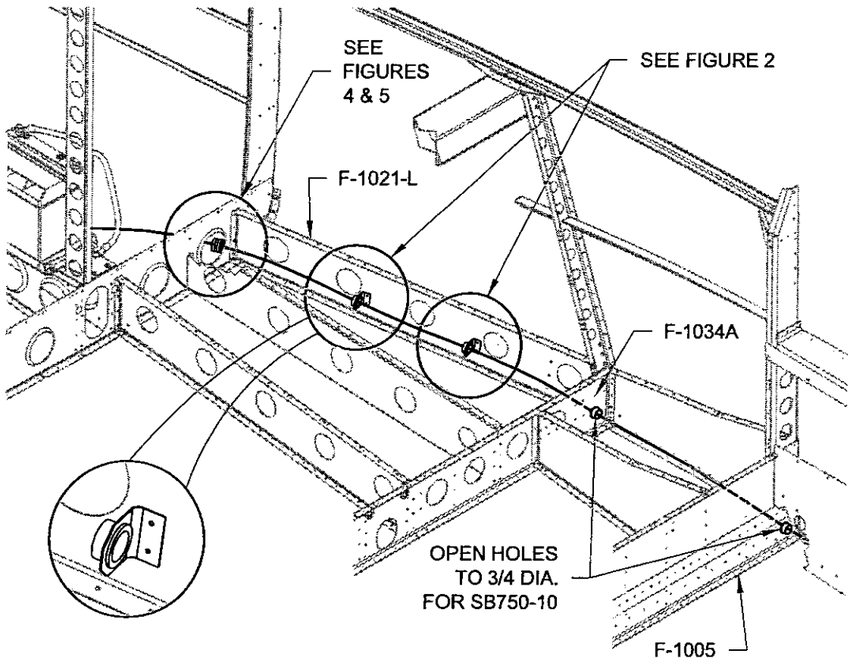


FIGURE 1: HARNESS ROUTING BENEATH BAGGAGE COMPARTMENT

Step 2: Enlarge the Ø5/8 holes in the F-1016H Guide Brackets to Ø3/4. Install them onto the F-1021-L Outboard Baggage Rib as shown in Figure 2 using the hardware called out and in the same manner as the F-10111 Angle Brackets on Page OP37-10 Step 1.

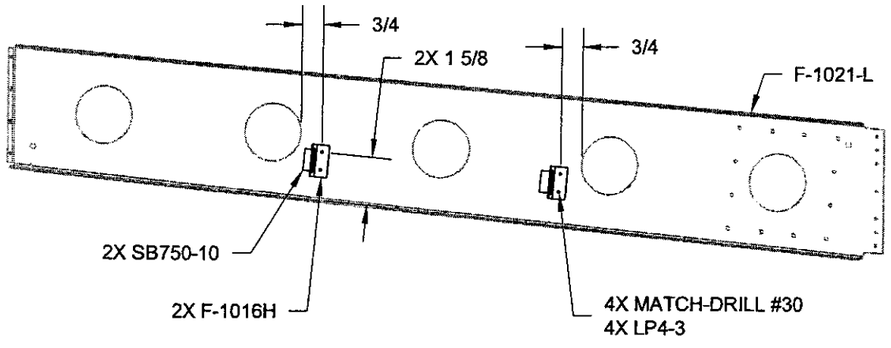


FIGURE 2: ATTACHING BRACKETS (LEFT SIDE VIEW)

Step 3: Drill the F-10111-L Angle Bracket as shown in Figure 3. Deburr and dimple the mating parts for flush rivets. Prime as desired. Rivet the nutplate in place using the hardware shown.

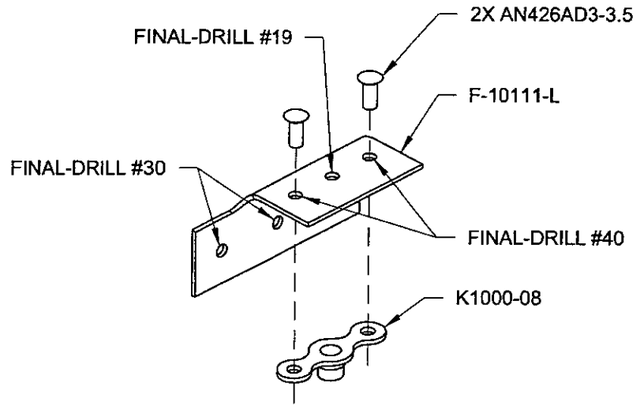


FIGURE 3: ATTACHING THE NUTPLATE

Step 4: Match-Drill the F-1006B Fuselage Bulkhead using the F-10111-L Angle Bracket as a guide as shown in Figure 4. Deburr the parts and prime the angle bracket if desired.

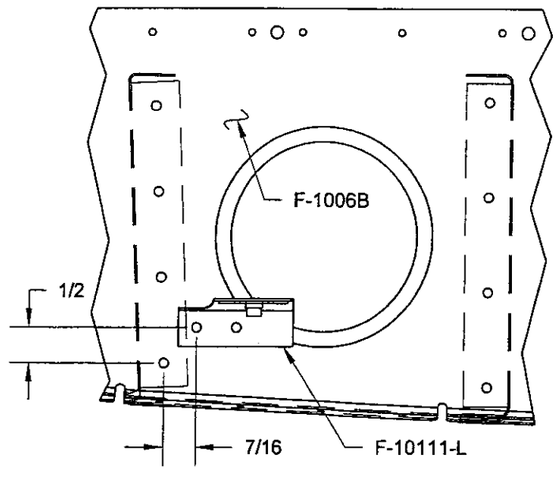


FIGURE 4:
MATCH-DRILLING THE ANGLE BRACKET
(REAR VIEW)

Step 5: Rivet the F-10111-L Angle Bracket to the aft side of the F-1006B Fuselage Bulkhead and attach the remaining hardware as called out in Figure 5.

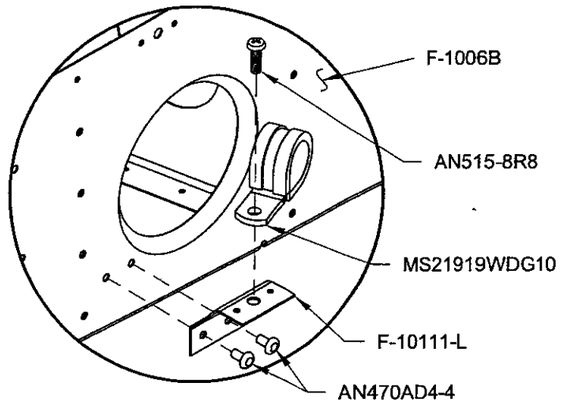


FIGURE 5:
ATTACHING THE BRACKET
AND CUSHIONED CLAMP

Step 1: Final-Drill a hole into the F-1035 Battery/Bellcrank Mount for an AN4 bolt as shown in Figure 1. Deburr and remove primer from the surface of the mount where the terminal will make contact.

Step 2: Consider mounting the strobe power supply to the F-1047C-L and F-1047D-L J Stiffeners as shown in Figure 1. Hardware is not included in the kit for this step. This location is based on the assumption that a single strobe power supply will be used.

Step 3: Refer to Page 10-24 of the RV-10 Manual for mounting the ES 24115 Master Relay. This hardware was included in the Empennage/Tailcone kit.

CAUTION: Do not connect the battery cables at this time.

NOTE: Refer back to Figure 1 during the actual wiring harness installation to install the L3, L8, P3, P4F, P5, and P27 wires and cables.

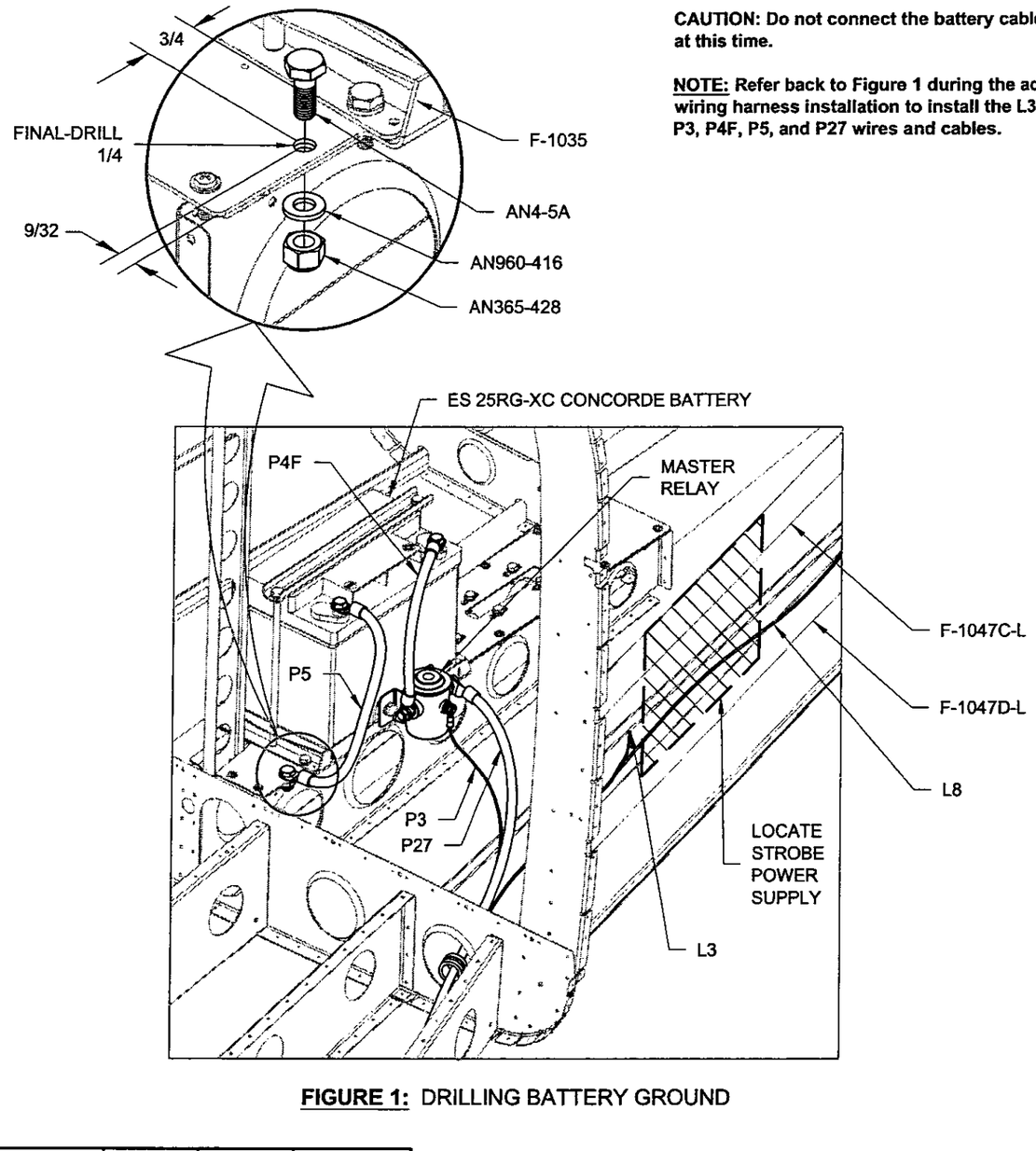


FIGURE 1: DRILLING BATTERY GROUND

Step 4: Mount the ES24021 Starter Relay to the left side of the F-1001A Firewall Bulkhead as shown in Figure 2. The connection orientation of the starter relay is not critical but its physical orientation should be followed to prevent accidental activation under high G's.

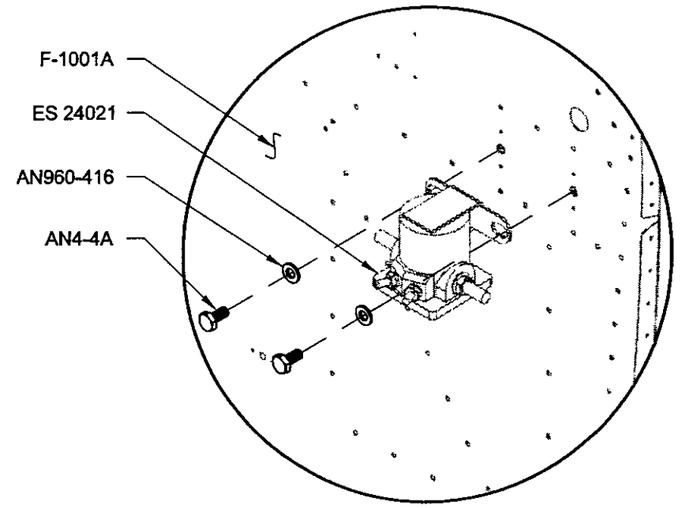


FIGURE 2:
MOUNTING THE STARTER RELAY

Step 5: Place the battery in the F-1035 Battery/Bellcrank Mount and cover the positive terminal.

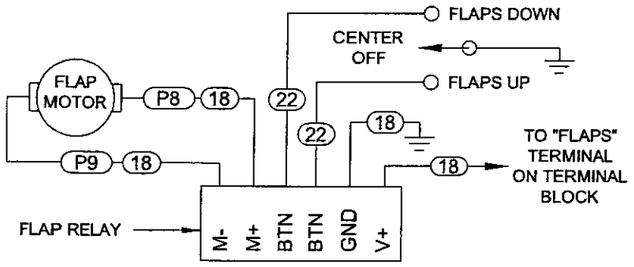
INSTALLATION AND CONNECTION

Step 6: The builder should position himself in the forward fuselage area with the end of the harness that will connect to the switches (the part with the most terminals bundled together) laying in his lap. About 30 inches from this end are the terminals that will connect to the terminal block. Temporarily install the terminals on the appropriate studs of the terminal block without tightening any nuts. Route the remaining wires by passing the tie-wrapped wire bundle sets through the appropriate holes following the routes on Page OP37-1, the schematic on Page OP37-13 and general details at large throughout this manual.

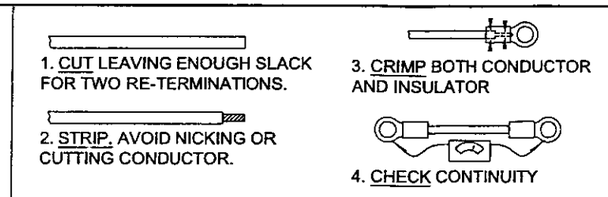
CAUTION: Avoid bending the wire bundles tighter than 10x the diameter of the largest wire in the bundle.

Some of the wires are longer than necessary. Later these will be cut to final length, relabeled with the spare wire labels provided, and terminated. For now do not permanently tie or anchor the harness. Use trash bag twist ties or pieces of soft wire to temporarily hold the harness to the anchor holes. The 2 AWG battery cables will be installed individually as the connections are made. If operating a 60-amp alternator circuit J1, the 8 AWG wire running from the alternator to the buss, should not be placed inside conduit. Leaving it exposed to free air will maximize its ability to cool in case of high load such as a nearly dead battery.

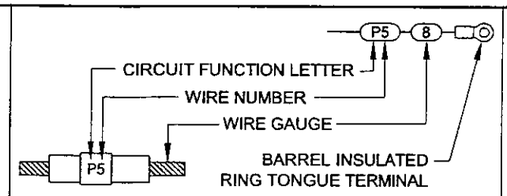
FOR STICK GRIP SWITCH ORDER P/N: ES SWITCH SPDT-MOM



OPTIONAL FLAP RELAY ORDER: ES FLAP CONTROL BOARD

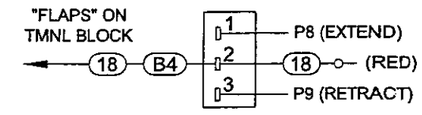


FABRICATING WIRES

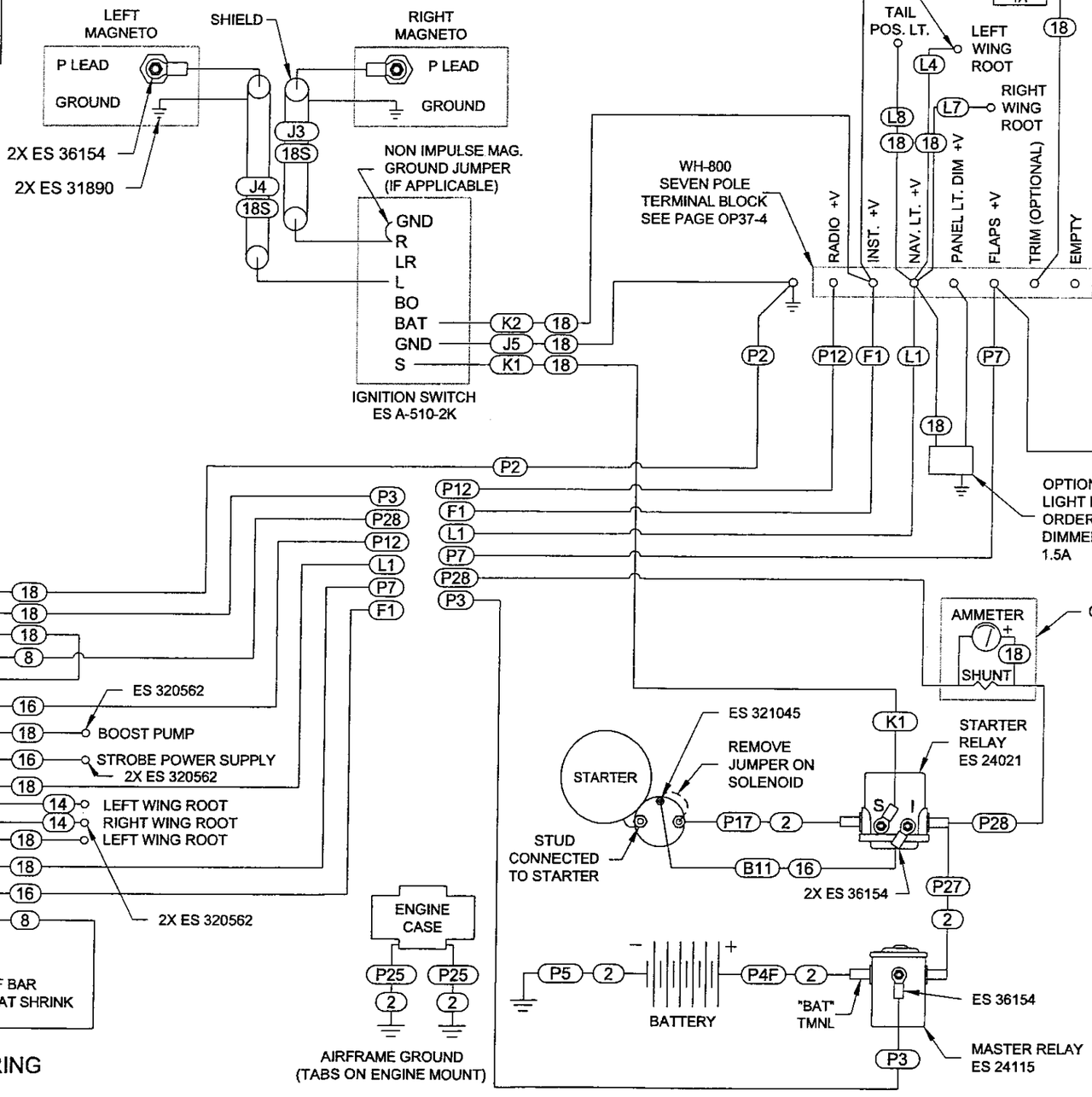


KEY

ORDER: ES FLAP POS SWV 10



OPTIONAL FLAP POSITIONING SYSTEM



CIRCUIT BREAKER PANEL WIRING

WIRE NOMENCLATURE

18S = #18 AWG SHIELDED**
18 = #18 AWG NON-SHIELDED*
16 = #16 AWG NON-SHIELDED*
14 = #14 AWG NON-SHIELDED*
8 = #8 AWG NON-SHIELDED*
2 = #2 AWG NON-SHIELDED*
** = WIRE SPEC. M27500/18TG-14
* = WIRE SPEC. M22759/16-XX 27478

EXAMPLE: WIRE SPEC FOR WIRE NUMBER P4F = M22759/16-2 27478

SCB = SWITCH CIRCUIT BREAKER
CB = CIRCUIT BREAKER
O = SPLICE OR CONNECTION

CIRCUIT FUNCTION LETTER	CIRCUITS
B	= BUILDER FABRICATED
F	= FLIGHT INSTRUMENTS
J	= IGNITION
K	= STARTER
L	= LIGHTING
P	= POWER
Q	= FUEL

NOTES:
1. FOR MORE INFORMATION, SEE "ELECTRICAL WIRING NOTES" & "RV AIRCRAFT SAMPLE WIRING SCHEMATIC" IN SECTION 5 OF THE BUILDER'S MANUAL.

2. USE ONLY 60AMP BREAKER WITH 60AMP ALTERNATOR. USE 35A OR 60A BREAKER WITH 35AMP ALTERNATOR.

3. 60 AMP ALTERNATOR (AS SUPPLIED BY VAN'S) IS INTERNALLY REGULATED AND REQUIRES NO VOLTAGE REGULATOR.

4. FOR 35 AMP ALTERNATOR INSTALLATION SEE PAGE OP37-18.

Step 1: Fabricate wire B11 as per the schematic on Page OP37-13. Do not cut the wires to final length until you have firmly established their route. Following the WD-1001-D1 Dyna-1 Engine Mount tube pass wires J1, J2 and B11 between the engine cylinders and the induction intake tubes on the left side of the engine as per Figure 1. Route cable P17 from the starter relay to the starter solenoid on the engine. Clamp the wires in place as per the details. Share the oil sump attach bolts where noted. Follow the schematic on Page OP37-13 for the connections at the alternator and starter.

NOTE: Use the existing oil sump attach bolts. Do not over tighten them.

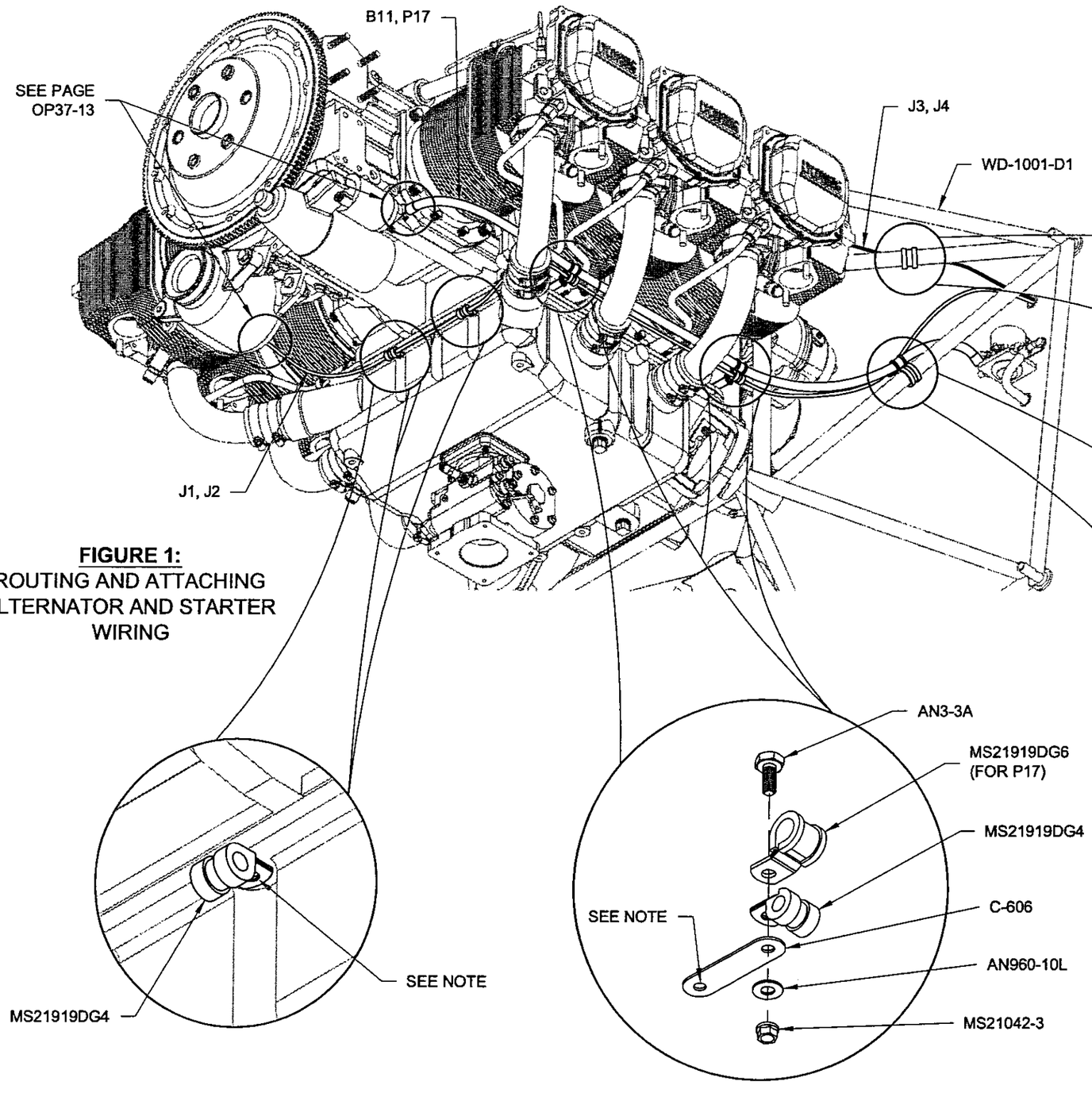


FIGURE 1:
ROUTING AND ATTACHING ALTERNATOR AND STARTER WIRING

Step 1: Enlarge the hole in both ground strap attach tabs on the WD-1001-D1 Dyna-1 Engine Mount as shown in Figure 1. Remove the powder coating from the side of the tab that will contact the terminal to insure a good electrical connection.

Step 2: Attach both P25 Ground Straps to the WD-1001-D1 Dyna 1 Engine Mount and the upper bolt on the accessory case as shown in Figure 1.

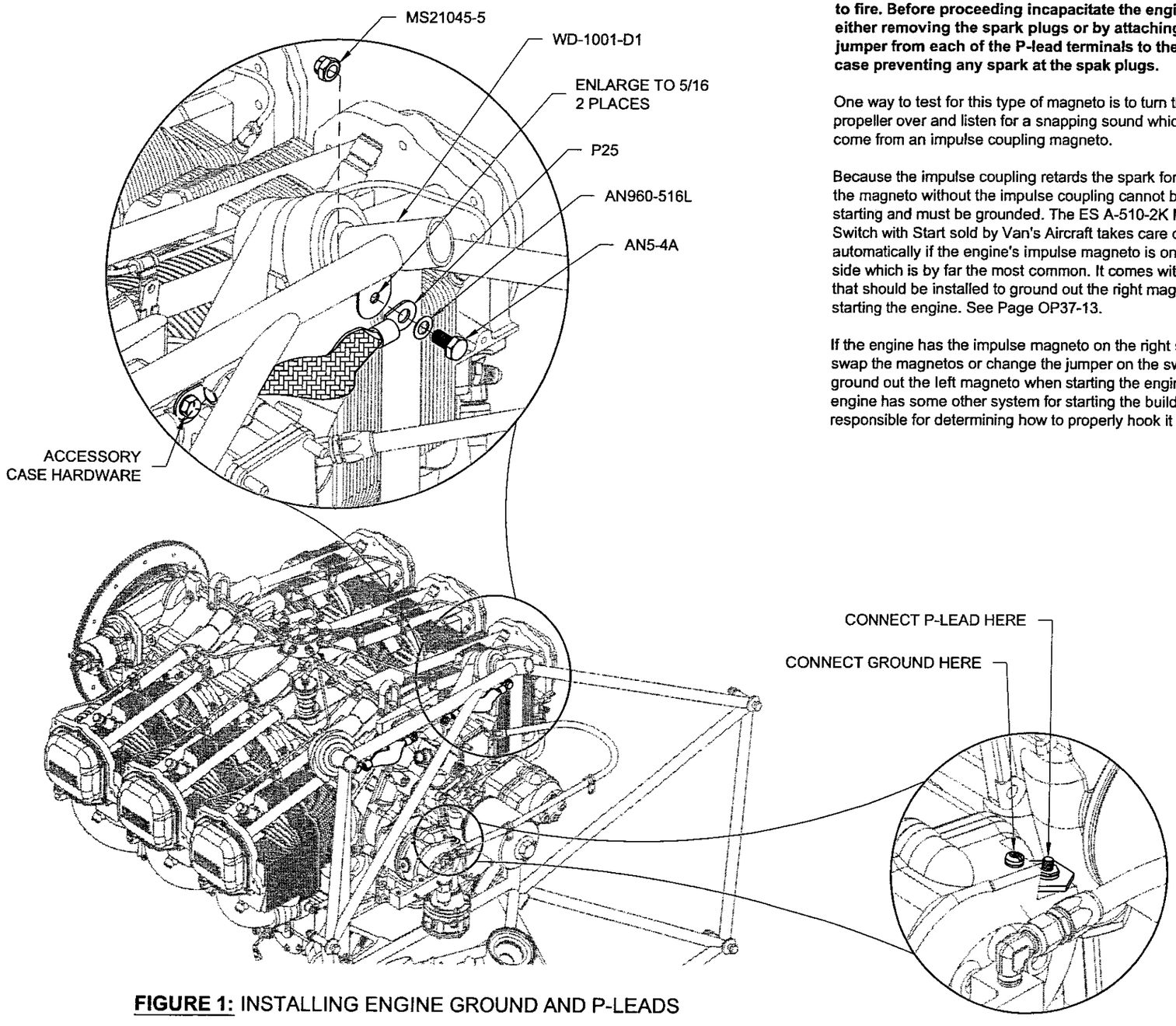


FIGURE 1: INSTALLING ENGINE GROUND AND P-LEADS

Step 3: Several different systems are used to help a magneto provide a strong retarded spark for starting. By far the most common is the impulse coupler. To spot an impulse coupler (while installed) look for the 3/4 inch spacer between the magneto and the accessory housing.

WARNING: Turning the propeller may cause the engine to fire. Before proceeding incapacitate the engine by either removing the spark plugs or by attaching a ground jumper from each of the P-lead terminals to the engine case preventing any spark at the spak plugs.

One way to test for this type of magneto is to turn the propeller over and listen for a snapping sound which will only come from an impulse coupling magneto.

Because the impulse coupling retards the spark for starting the magneto without the impulse coupling cannot be used for starting and must be grounded. The ES A-510-2K Magneto Switch with Start sold by Van's Aircraft takes care of this automatically if the engine's impulse magneto is on the left side which is by far the most common. It comes with a jumper that should be installed to ground out the right magneto when starting the engine. See Page OP37-13.

If the engine has the impulse magneto on the right side either swap the magnetos or change the jumper on the switch to ground out the left magneto when starting the engine. If the engine has some other system for starting the builder is responsible for determining how to properly hook it up.

Step 4: Prepare each P-lead wire for connection to the appropriate magneto.

Strip off 2 1/2 inches of the outer jacket of insulation using a wire stripper, exposing the braided shielding as shown in Figure 2. Slide the shielding back up the wire to make it bunch up like a loose sock. Use a needle to open a hole in the shielding next to the end of the insulation and pull the center conductor wire out through this hole in the shield. Add the heat shrink and terminals called out in Figure 2.

Leave the P-leads disconnected until the test phase is completed. If the P-leads are connected while testing the results will be incorrect.

WARNING: Safe the engine as per Step 3 if not already done.

When the time comes (after testing) make the connections as per Figures 1 and 2. For Slick magnetos, the ground screw is labeled "GND" and is located near the P-lead terminal. If no screw is designated as such then use one of the screws that attach the ignition lead cap to the magneto. Use one of the MS25171-1S Small Nipple Boots at each of the P-lead connections to insulate them from accidental grounding.

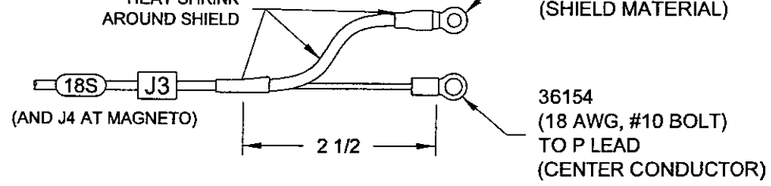


FIGURE 2: SEPARATING THE SHIELDING

Step 1: Route the L8 wire down the length of the F-1047 J Stiffener. Final-Drill #30 holes every 12 inches along the J Stiffener as shown in Figure 1 and deburr. Use the hardware called out to attach the wire to the J stiffener at each hole. Leave enough extra wire inside the R-1011 Rudder Bottom Fairing so that the tail position light can be removed and the connectors accessed without having to remove the rudder bottom fairing. (Route the strobe wire here as well if applicable.)

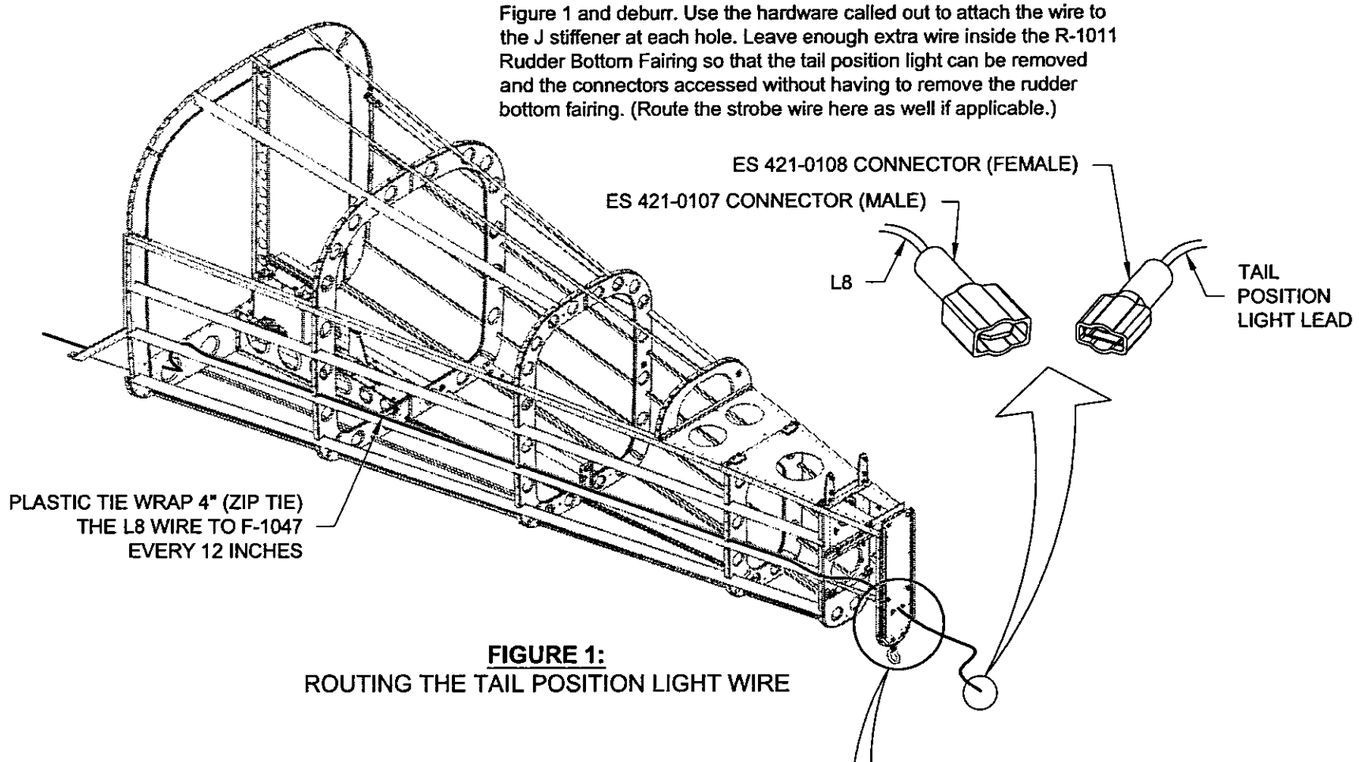


FIGURE 1:
ROUTING THE TAIL POSITION LIGHT WIRE

Step 2: Drill through the F-1012 Fuselage Bulkhead stack-up as shown in Figure 2 and deburr. Protect the wires with a piece of heat shrink at the hole. A snap bushing is not required.

Attach the tail position light ground wire to an existing AN3 bolt on the forward side of the F-1012 Fuselage Bulkhead using the hardware called out.

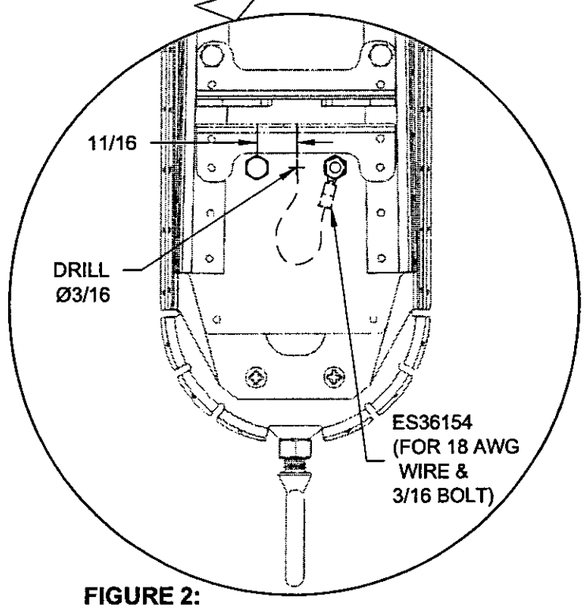


FIGURE 2:
DRILLING EXIT HOLE

Step 3: Hook up the 2 AWG cable and wire connections at the master and start relays; see Pages OP37-12 and OP37-13.

CAUTION: When making cable connections to the relays a wrench on the stud nut adjacent to the case must be used to prevent the stud from turning and mis-aligning the contacts inside the relay.

Step 4: Route the cables to the battery and starter but do not hook them up yet.

Step 5: Cover the relay activation wires P3 and K1 with the remaining MS25171-1S Small Nipple Boots. Cover the 2 AWG battery cable connections except for cables P5 and P25 which are ground cables using the MS25171-3S Large Nipple Boots.

Step 6: Fabricate and install wires B4, B5, B6, and B7 onto the ES S338T DPDT-CO Momentary Flap Switch using the specified wire gauge. See Page OP37-13. Cut wires P8 and P9 to final length, leaving some slack and install the terminals.

If installing the ES SWITCH SPDT-MOM flap switch in the control stick, refer to the corresponding wiring diagram on Page OP37-13. Route two 22 AWG wires from the stick grip switch to the flap relay board (ES FLAP CONTROL BOARD) BTN screw terminals. A light gauge wire is not however as durable when run by itself outside of a wire bundle. Therefore, if no other switches will be used in the stick grip so that no other wires are present with which to create a small bundle, 18 AWG wire should be substituted for the 22 AWG wire shown. Connect wires P8 and P9 as per the detail. If the actuator direction is incorrect reverse the wires at the flap actuator later. Finally, connect the ground and +V terminal wires.

Step 7: Double check the schematic diagram on Page OP37-13 to insure all connections have been marked off as completed except the following:

- P4F at the positive battery terminal
- P17 at the starter
- J3 and J4 at the magnetos
- P8 and P9 at the flap actuator
- L2, L4, L5, L7, L8 lights at the wing roots and at the tail

TESTING

Post Installation	Preflight	
☐	☐	Step 1: Check that unconnected wires are **not shorted** to the airframe.
☐	☐	Step 2: Check that the starter is **disconnected**.
☐	☐	Step 3: Check that the master switch is **off**.
☐	☐	Step 4: Connect the positive battery cable P4F to the **positive** battery terminal.
☐	☐	Step 5: Turn Master Switch **On**: Result: Master relay makes a clicking sound as it activates, +12 volts present at copper buss bar on switch console (check all voltages with a voltmeter), and +12 volts present at instrument terminal on terminal block.
☐	☐	Step 6: Turn Alt. Field Switch **On**: Result: +7 to +10 Volts measured at green wire in alternator plug.
☐	☐	Step 7: Turn Boost Pump Switch **On**: Result: Hear boost pump operate (operate for only a few seconds with no fuel).
☐	☐	Step 8: Turn Strobe Lights Switch **On**: Result: +12 volts present at the end of wires L3.
☐	☐	Step 9: Turn Navigation Lights Switch **On**: Result: +12 volts present at the end of wires L4, L7, and L8 and +12 volts present at the panel light terminal on the terminal block.
☐	☐	Step 10: Turn Landing Light Switch **On**: Result: +12 volts present at the end of wires L2 and L5.
☐	☐	Step 11: Turn Magneto Switch to **"Off"**: Result: J3 and J4 P-lead wires both grounded (0-5 Ohms between wire terminal and airframe when checked with an ohm meter).
☐	☐	Step 12: Turn Magneto Switch to **"Right"**: Result: J4 grounded, J3 has infinite resistance with respect to ground.
☐	☐	Step 13: Turn MagnetoSwitch to **"Left"**: Result: J4 has infinite resistance with respect to ground, J3 is grounded.
☐	☐	Step 14: Turn Magneto Switch to **"Both"**: Result: J3 and J4 both have infinite resistance with respect to ground.
☐	☐	Step 15: Turn Magneto Switch to **"Start"**: Result: Hear start relay activate, and +12 volts at starter end of cable P17.
☐	☐	Step 16: Temporarily connect wires P8 and P9 to the flap actuator leads. Move the flap switch down while observing the actuator. The actuator length should decrease lowering the flaps. If not simply reverse the wires and recheck. Complete the wire connections using ES 320559 18 AWG Splices.

When everything has checked OK installation is complete. If something does not work recheck all of the connections associated with the problem circuit.

Step 17: Install the F-10110-L Wire Cover Assembly using the hardware called out in Figure 1 upon completion of the electrical system. The F-1015D-L Fuselage Side Panel is not shown.

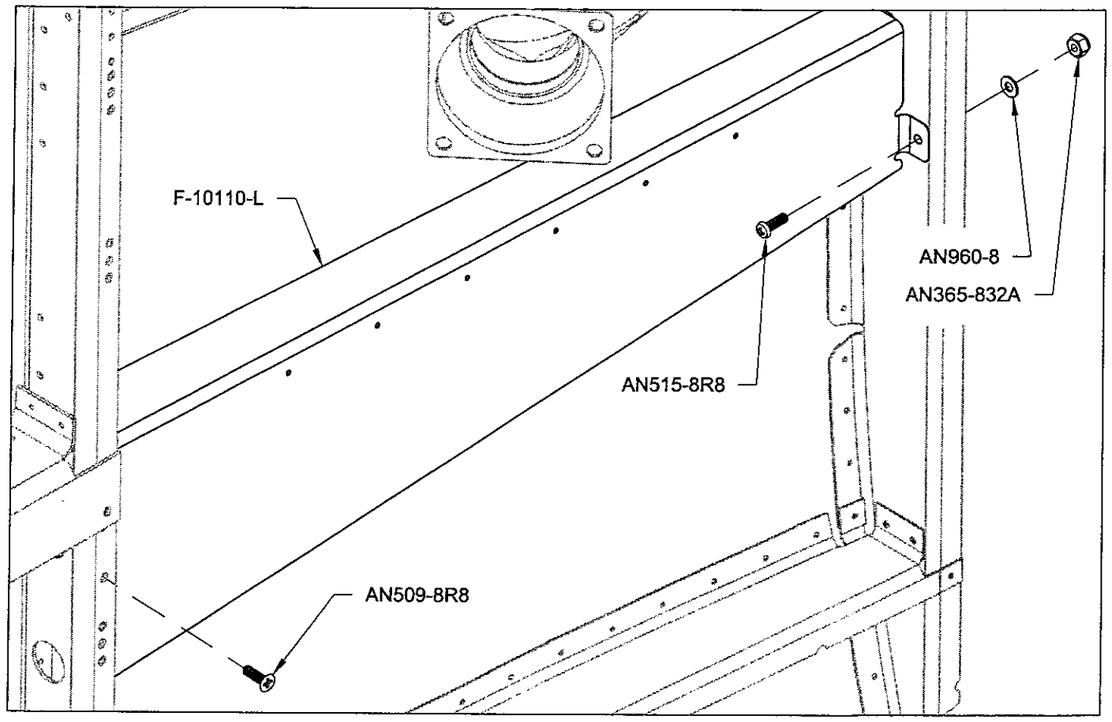


FIGURE 1:
INSTALLING THE WIRE COVER ASSEMBLY

CONCLUSION

Additional instrument, avionics and panel light connections to the system are made possible by use of the three terminals provided for this purpose on the terminal block. Two ground terminals also simplify connections from the instrument panel and additional ground terminals may be added if/as required.

Prior to flight, make one last check of each circuit to ensure all connections and fasteners are secure.

For more information, see the Department of Transportation FAA publication AC 43.13-1B, Aircraft Inspection and Repair; Acceptable Methods, Techniques and Practices, chapter 11.

ALTERNATIVE 35AMP ALTERNATOR INSTALLATION

Install the 35AMP Alternator.

Make the electrical connections as depicted in Figure 1.

Mount the voltage regulator to the firewall (not shown).

Drill a #19 hole in the firewall to allow turning the adjusting potentiometer without removing the regulator if using an adjustable regulator (such as Van's Aircraft P/N: ES M5-150A).

Connect the adjustable regulator's black ground wire to ground using a 22-18 AWG ring terminal and one of the regulator's mounting screws.

Connect wire J2 to the voltage regulator input (the red wire on ES M5-150A and VR-1751) using an ES 320559 22-18 AWG splice.

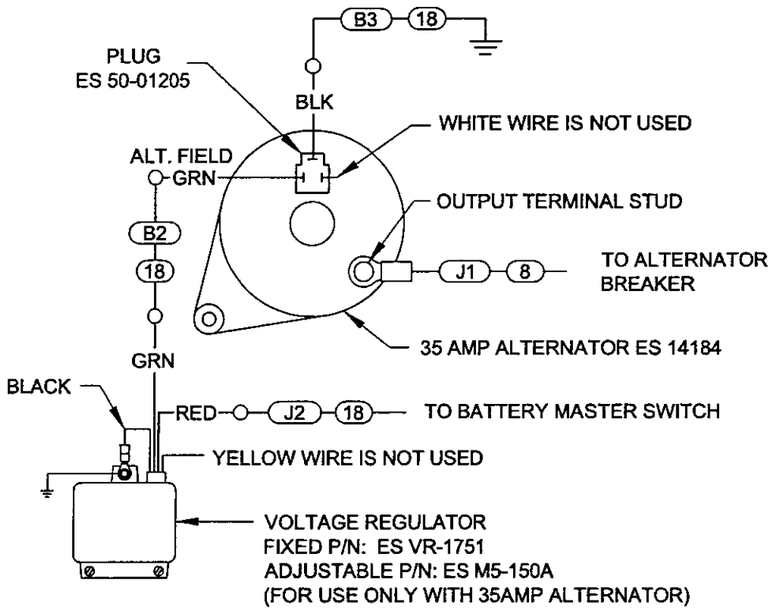


FIGURE 1:
INSTALLATION OF EXTERNALLY REGULATED
35AMP ALTERNATOR

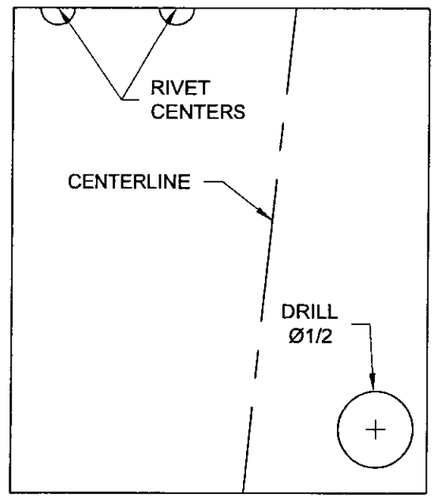


FIGURE 1:
FIREWALL PENETRATION TEMPLATE
(SCALE 1:1)

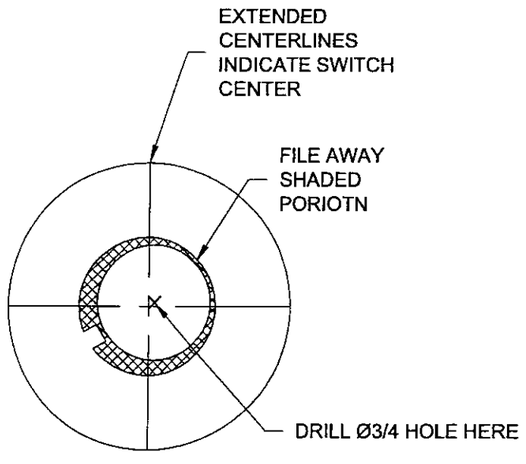


FIGURE: 2
MAGNETO SWITCH TEMPLATE
(SCALE 1:1)