BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 2.22

PRODUCTION PROCESS STANDARD

Installation of Quick Release Fastener Assemblies

Issue 13
- This standard supersedes PPS 2.22, Issue 12.
- Vertical lines in the left hand margin indicate changes over the previous issue.
- Direct PPS related questions to PPS.Group@aero.bombardier.com or (416) 375-4365.
- This PPS is effective as of the distribution date.

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	Quality	

Signed original on file. Validation of paper prints is the responsibility of the user.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for installation of quick release fastener (e.g., Camloc).

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS must be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

1.1.2 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

1.1.3 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in this PPS. Similarly, the procedure and requirements specified in this PPS are not applicable when use of a BAPS, MPS, LES or P. Spec. is specified.

2 Hazardous Materials

2.1 Before receipt at Bombardier Toronto (de Havilland), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto (de Havilland) Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact the Bombardier Toronto (de Havilland) Environment, Health and Safety Department.

3 References

3.1 BM9010.05 (EO7336) - Substitution and Replacement Engineering Order (SREO).

3.2 PPS 1.01 - Dimpling Aluminum Alloys.

3.3 PPS 1.07 - Dimpling Ferrous, Nickel and Titanium Alloys.

3.4 PPS 1.09 - Drilling and Reaming.

3.5 PPS 2.01 - Installation of Solid Rivets.

3.6 PPS 2.63 - Installation of Cherry Nut Plate Rivets.

3.7 PPS 18.01 - Limitations on Shearing and Punching Aluminum Alloy Sheets.

3.8 PPS 18.04 - Limitations on Shearing and Punching Titanium Alloys.

4 Materials and Equipment

4.1 Materials

4.1.1 Quick release fastener assemblies as specified on the engineering drawing (see Figure 1), or replacement/substitution as allowed by BM9010.05 (EO7336).

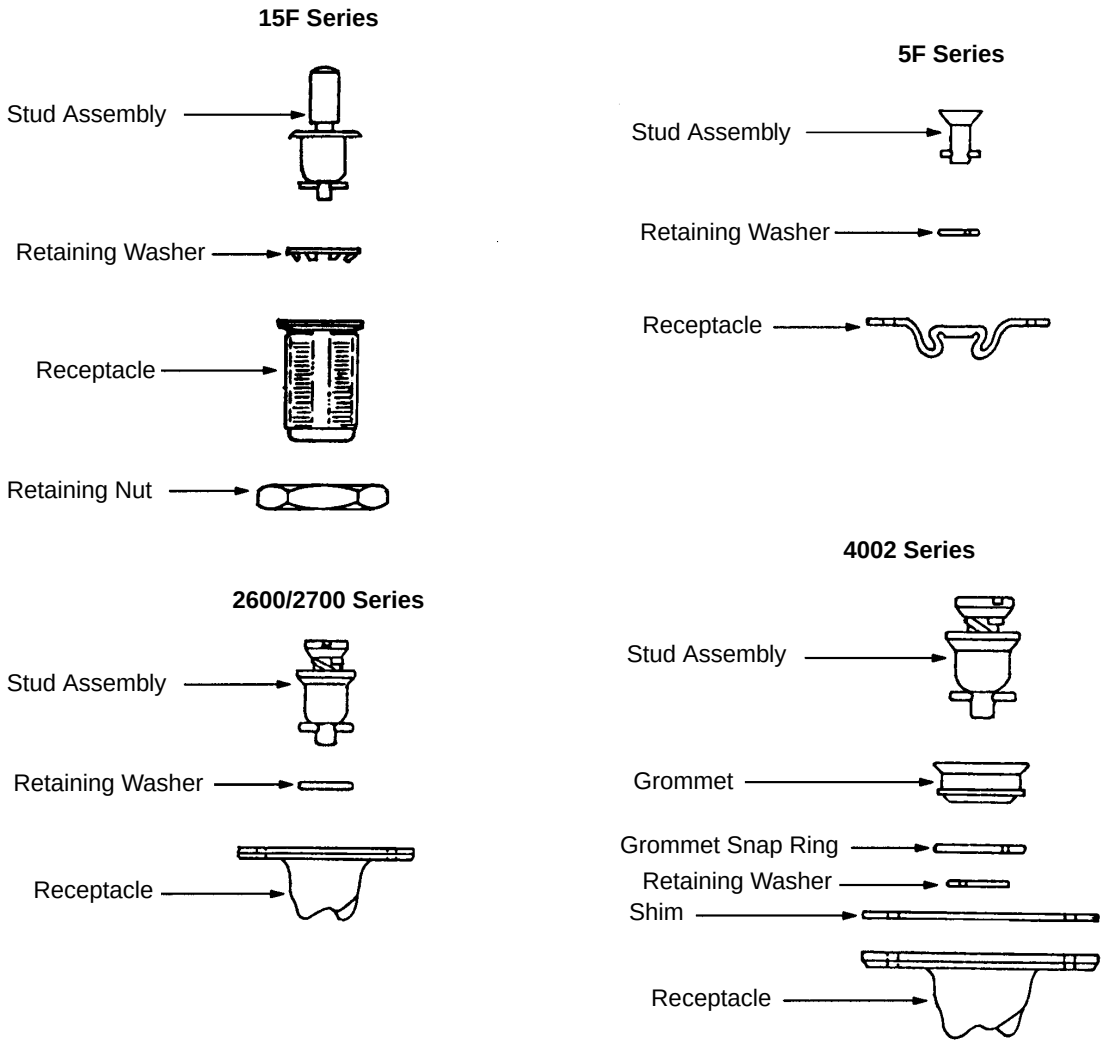


Figure 1 - General Description of Quick Release Fastener Assemblies

4.2 Equipment

4.2.1 Camloc pliers (e.g., 4P3).

4.2.2 Drill jigs (e.g., as listed in Table 2).

4.2.3 Vixen File, (e.g., SD8066).

4.2.4 Hole saws, as listed in Table 1, Table 2 and Table 3.

4.2.5 Hole saw arbors (e.g., TS.561.22.21 Mk 2, with 3/16" diameter mandrel, and Mk 4, with 1/4" diameter mandrel).

4.2.6 Countersinking tools, included angles 100° and 140°.

4.2.7 Counterboring tools with 3/16” diameter mandrels, as listed in Table 1.

5 Procedure

5.1 General

5.1.1 Quick release fastener assemblies (e.g., Camloc) are used to secure access panels and doors which require frequent opening for maintenance or inspection. The push button, or 15F series, fasteners require a slight downward pressure to either engage or disengage the lock. The 5F, 2600/2700 and 4002 series fasteners are locked or unlocked by applying a 1/4 turn to the fastener stud.

5.2 Preparation of Parts

5.2.1 If possible, clamp parts to be joined firmly together and drill or punch pilot holes for studs and receptacles simultaneously to ensure proper alignment of the holes. Drill holes according to PPS 1.09. Punch holes according to PPS 18.01 or PPS 18.04, as applicable.

5.2.2 For preparation of parts for installation of studs, if countersinking is specified pre-drill to the pilot diameter as specified in Table 1 before countersinking to the diameter and angle specified in Table 1. If dimpling is specified, pre-drill to the pilot diameter specified in Table 1 before ram coin dimpling according to PPS 1.01 or PPS 1.07, as applicable. If counterbore is specified, counterbore to the dimensions specified in Table 1.

5.2.3 For preparation of parts for installation of receptacles for 15F series fasteners, if dimpling is specified drill or punch to the required hole diameter as specified in Table 2 and ram coin dimple using a ZT1709 die and ZT1710 punch according to PPS 1.01 or PPS 1.07, as applicable. If countersinking is specified, pre-drill to the pilot diameter specified in Table 2 before countersinking to the diameter and angle specified in Figure 2.

5.2.4 Prepare parts for installation of receptacles for 5F, 2600/2700 and 4002 series fasteners as follows (see Figure 3 and Figure 4):

Step 1. Pre-drill the stud hole for the drill jig (ref., para. 4.2.2) to the pilot diameter specified in Table 2.

Step 2. Using the appropriate drill jig, locate and drill the rivet holes for the receptacle.

Step 3. Dimple or countersink the rivet holes, as specified, according to PPS 2.01 or PPS 2.63, as applicable.

Step 4. Open the stud hole to final size using the drill or hole saw specified in Table 2.

5.2.5 Prepare rivet holes for ejector springs as follows:

Step 1. Locate the rivet holes using the dimensions shown in Table 3 and on the engineering drawing or use the ejector spring as a drill template by drilling out the stud pilot hole using a letter “F” drill and bolting the spring, in an upside down position, to the sheet using a 1/4" diameter bolt.

Step 2. Drill rivet holes using the drill specified in Table 3.

Step 3. If necessary, countersink the rivet holes to the dimensions specified in Table 3.

Step 4. Open the stud hole to the final size specified in Table 3 using a drill or hole saw.

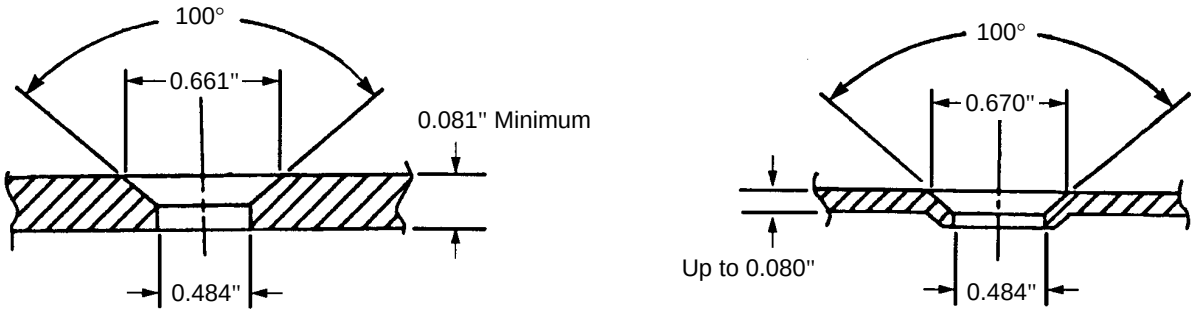


Figure 2 - 15F Series - Receptacle Sheet Preparation

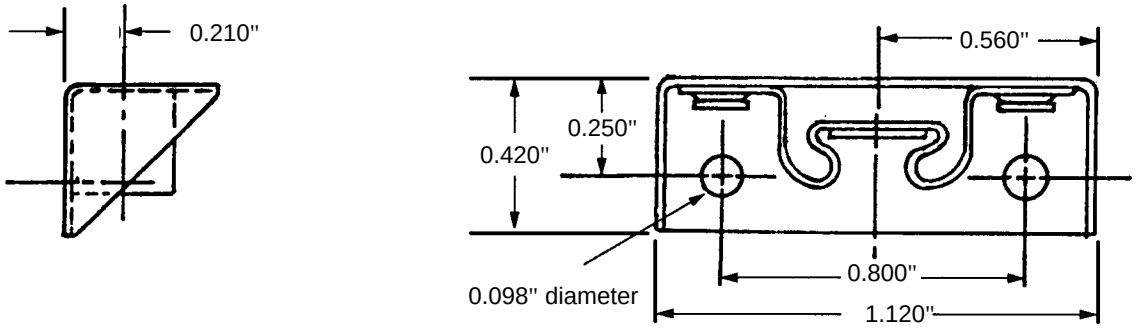


Figure 3 - 5F Series Side Mount Receptacle (5R3-1)

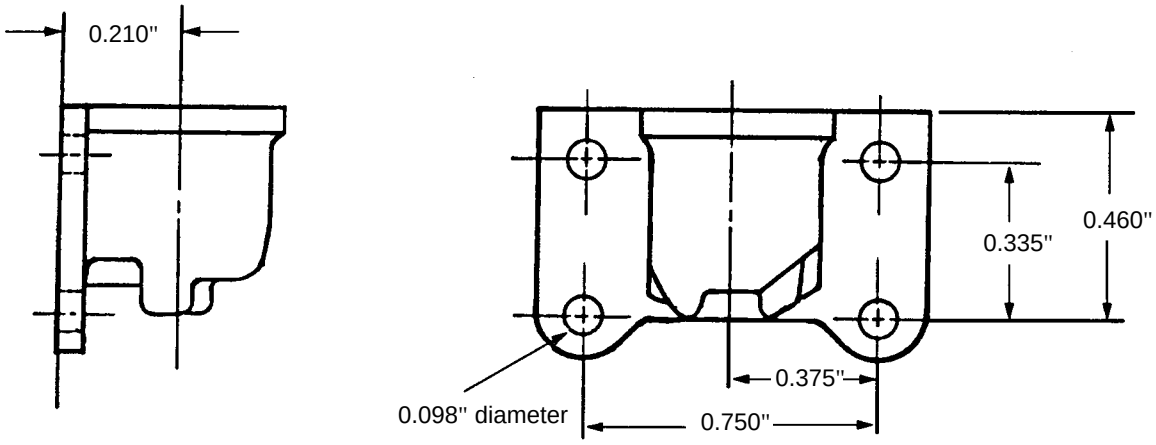


Figure 4 - 2600/2700 and 4002 Series Side Mount Receptacles (26R1-1, 212-12B-R and 244-16B-R)

Table 1 - Stud Sheet Preparation Data

PART NUMBER	PANEL THICKNESS	PILOT DIA.	FINAL DRILL OR HOLE SAW DIA.	C'BORE DIA.	CSK OR DIMPLE DIA.	PANEL THICKNESS AFTER C'BORE	ANGLE
15F Series							
15S1-( )-1AC 15S1-( )-1AD	up to 0.188"	3/16"	0.323" or letter P drill	N/A			
	over 0.188"	3/16"	0.323" or letter P drill	0.625"	N/A	0.188"	N/A
5F Series							
5S5-( ) 5S10-( ) 5S15-( ) B0209032-( )SL	up to 0.054"	3/16"	0.196" or number 9 drill	N/A			
	0.055" - 0.090"	3/16"	0.228" or number 1 drill	N/A			
	over 0.090"	3/16"	0.228" or number 1 drill	0.375"	N/A	0.090"	N/A
5S7-( )	0.030" - 0.054"	3/16"	0.196" or number 9 drill	N/A	0.325" - 0.335"	N/A	140°
	0.055" - 0.090"	3/16"	0.228" or number 1 drill	N/A	0.325" - 0.335"	0.090"	140°
	over 0.090"	3/16"	0.228" or number 1 drill	0.375"	0.325" - 0.335"	0.090"	140°
2600 Series							
26S8-( ) 26S13-( )A 26S13-( )B 26S22-( )B 26S34-( ) 26S36-( ) 2600-( ) 2600-( )K 2600-( )KA 2600-( )S 2600-( )W 2600-( )SW B0209002-( ) B0209002S( ) B0209003-( ) B0209071-( ) B0209071S( )	0.030" - 0.065"	3/16"	letter F drill	N/A			
	0.066" - 0.125"	3/16"	0.281" or letter K drill	N/A			
	over 0.125"	3/16"	0.281" or letter K drill	0.375"	N/A	0.125" minimum	N/A

Note 1: Consider the "Panel thickness after C'bore" as specified above as representing the stud grip length required after counterbore and make the counterbore depth accordingly.

Table 1 - Stud Sheet Preparation Data

PART NUMBER	PANEL THICKNESS	PILOT DIA.	FINAL DRILL OR HOLE SAW DIA.	C'BORE DIA.	CSK OR DIMPLE DIA.	PANEL THICKNESS AFTER C'BORE	ANGLE
2700 Series							
2700-( ) 2700-( )S 27S3-( ) B0209001-( ) B0209001S( ) B0209035-( )	up to 0.072"	no. 3 drill	letter F drill	N/A	0.432" - 0.442"	N/A	100°
	0.073" - 0.140"	3/16"	letter F drill	N/A	0.432" - 0.442"	N/A	100°
	over 0.140"	3/16"	letter F drill	0.375	0.432" - 0.442"	0.140" maximum	100°
4002 Series							
40G1-10	0.113" maximum	3/16"	0.500"	N/A	0.625" - 0.629"	N/A	140°
4002-G	up to 0.064"	no. 30 drill	15/32"	N/A	0.651" - 0.661"	N/A	140°
	0.065" and over	3/16"	15/32"	0.688"	0.620" - 0.630"	0.074" maximum	140°
4002-H	up to 0.086"	no. 30 drill	15/32"	N/A	0.651" - 0.661"	N/A	140°
	0.087" and over	3/16"	15/32"	0.688"	0.620" - 0.630"	0.117" maximum	140°
4002-N	up to 0.065"	3/16"	15/32"	N/A			
	0.066" and over	3/16"	15/32"	0.688"	N/A	0.065" maximum	N/A
4002-O	up to 0.094"	3/16"	15/32"	N/A			
	0.095" and over	3/16"	15/32"	0.688"	N/A	0.094" maximum	N/A
4002-P4	0.040" - 1.532"	3/16"	0.500"	N/A			
4002-T-6	0.060" - 0.069"	3/16"	0.500"	0.625" - 0.629"	N/A	0.027" - 0.032"	N/A
4002-T-8	0.080" - 0.089"	3/16"	0.500"	0.625" - 0.629"	N/A	0.037" - 0.042"	N/A

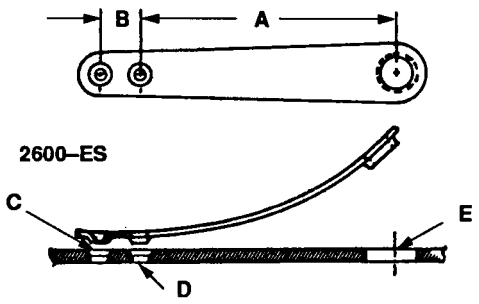
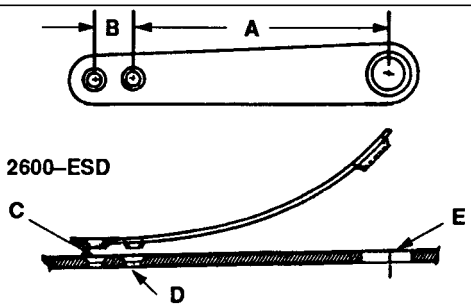
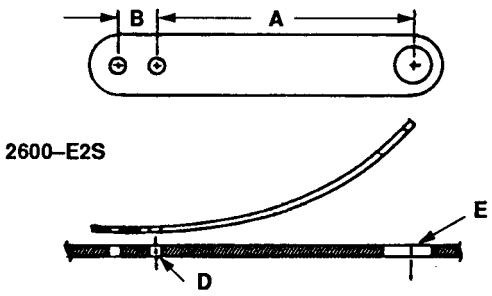
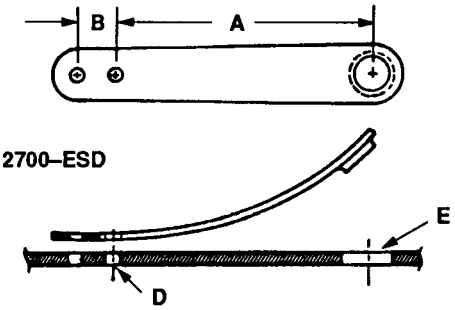
Note 1: Consider the "Panel thickness after C'bore" as specified above as representing the stud grip length required after counterbore and make the counterbore depth accordingly.

Table 2 - Receptacle Sheet Preparation Data

FASTENER SERIES	RECEPTACLE PART NUMBER	PILOT DIAMETER	DRILL JIG	DRILL FOR RIVET HOLE	FINAL DRILL OR HOLE SAW DIAMETER
15F	15R1-1AC	17/64"	N/A (Note 1)		31/64"
5F	5R2-1 5R2-2	#40	TS.519.11.20 Mk 27	#40	5/16"
		#30	TS.519.11.20 Mk 28		
	5R3-1	N/A (Note 2)			N/A
2600/2700	26R16-1 B0209039-001	#30	TS.519.11.20 Mk 28	#40	1/2"
	212-12 212-12A 212-12D 212-12AD 212-12ADH 212-12S 212-12SD B0209009-001 B0209009S001	#40	TS.519.11.20 Mk 27		
		1/4"	TS.519.11.20 Mk 10		
		3/16"	TS.519.11.20 Mk 33		
	212-12N 212-12ND B0209031-001 B0209031-001C	#40	TS.519.11.20 Mk 27	#40	7/16"
		1/4"	TS.519.11.20 Mk 10		
		3/16"	TS.519.11.20 Mk 33		
	26R1-1 212-12B-R B0209037-001	N/A (Note 3)			N/A
4002	214-16N 214-16ND 214-16S 244-16 244-16D 40R12-1 40R12-2 B0209028-001 B0209038-001S B0209040-001 B0209055-001 B0209058-001 B0209058-001C	#40	TS.519.11.20 Mk 31	#30	11/16"
		1/8"	TS.519.11.20 Mk 12		
		P	TS.519.11.20 Mk 14		
	244-22 B0209029-001	#30	TS.519.11.20 Mk 12		13/16"
	244-16B-R B0209057-001	N/A (Note 3)			N/A

Notes
1. The 15R1-1AC receptacle is a threaded mount and does not require riveting for installation (see Figure 2).
2. The 5R3-1 is a side mounted receptacle. Refer to Figure 3 and the engineering drawing for installation instructions.
3. The 26R1-1, 212-12B-R, 244-16B-R, B0209037-001 and B0209057-001 receptacles are side mounted receptacles. Refer to Figure 4 and the engineering drawing for installation instructions.

Table 3 - Hole Preparation Data for Ejector Springs

EJECTOR SPRING	RIVET HOLES				STUD HOLE
	DIMENSION "A" (when flat)	**DIMENSION "B"**	**CSK DIA. "C"** (Note 1)	**HOLE DIA. "D"**	**HOLE DIA. "E"** (Note 2)
	2.50"	0.375"	N/A	0.128"	0.438"
	2.50"	0.375"	0.245" - 0.255"	0.128"	0.438"
	2.84"	0.500"	N/A	0.128"	0.438"
	2.50"	0.375"	0.245" - 0.255"	0.128"	0.500"

Notes: 1. Countersink angle - 100°.
2. Use a 1/4" diameter mandrel as the hole saw pilot.

5.3 Installation of Studs

5.3.1 It is acceptable to use a quick release fastener assembly stud **one** grip length longer or shorter than the grip length specified by the engineering drawing if necessary (i.e., in order to meet the flushness requirements specified in section 6).

5.3.2 Install 15F series studs as shown in Figure 5. Ensure that the retaining washer fits squarely against the stud panel and holds the fastener secure.

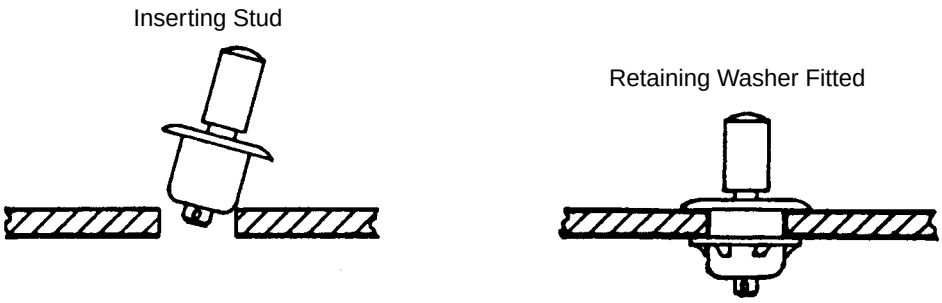


Figure 5 - Installation of 15F Series Studs

5.3.3 Install 2600/2700 series studs using Camloc 4P3 pliers and fit the retaining washer as shown in Figure 6. If the engineering drawing does not specify a washer type, use a split washer. For 2600 series installation only, if the fastener hole is opened up for lateral movement, use a solid washer. Install 2600-LW and 27S5-1 solid retaining washers using a T-98-1 retaining washer installation tool.

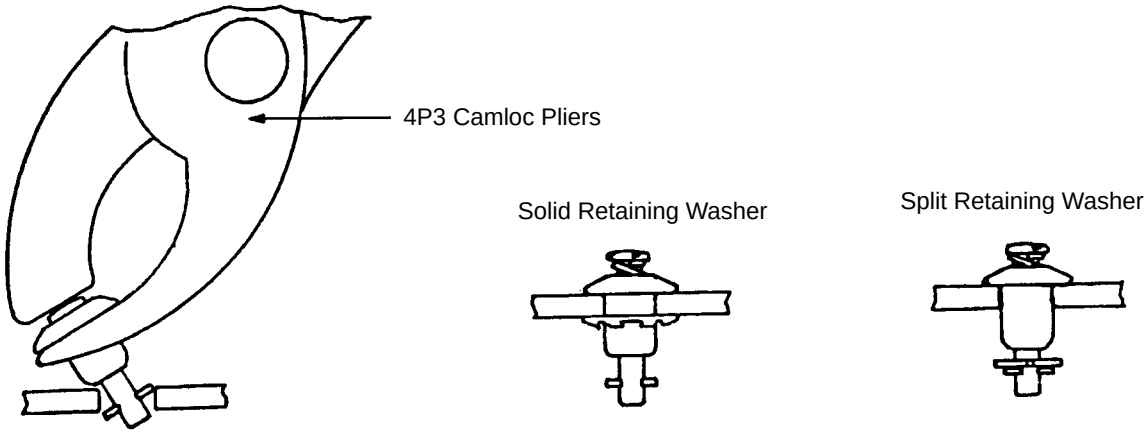


Figure 6 - Installation of 2600/2700 Series Studs

5.3.4 Install 5F series studs as shown in Figure 7.

Figure 7 - Installation of 5F Series Studs

5.3.5 Install 4002 series studs (except 4002-P4) as follows:

Step 1. If a sealed stud assemblies is specified, place the 40G11 seal on the grommet before fitting the grommet to the stud panel and fit the 40S39 seal around the stud spring cup (see Figure 8).

Step 2. Insert the grommet in the prepared hole.

Step 3. Place the grommet snap ring on the mandrel of the retaining ring installation tool specified in Table 4.

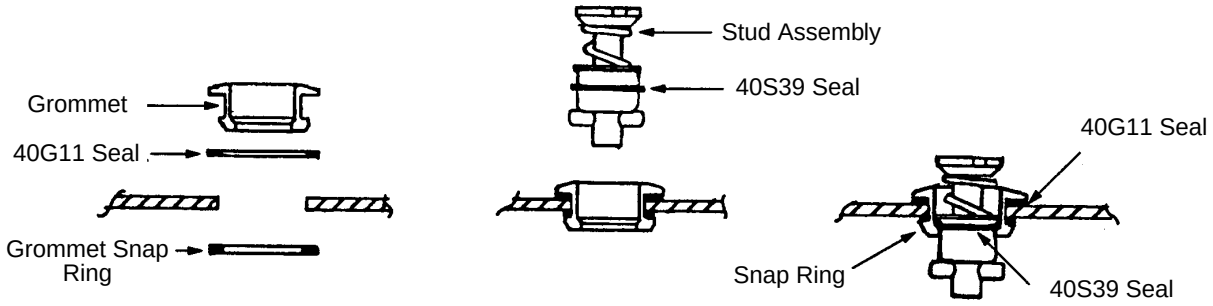


Figure 8 - Installation of Sealed 4002 Series Stud Assembly

Table 4 - R4G and R4T Retaining Ring Installation Tools

RETAINING RING	INSTALLATION TOOL	TOOL HANDLE	MANDREL	TIP
R4G	T26	T26-1	T26-2	T40
R4T	T39	T39-1	T39-2	

Step 4. Insert the mandrel into the grommet and push the tool handle over the mandrel until the snap ring is fully seated behind the shoulder of the grommet. See Figure 9 for the position of the snap ring when fitted.

Step 5. Install the stud using 4P3 Camloc pliers. The retaining washer shown in position in Figure 9 is required for stud lengths -16 and greater (except sealed studs 40S37). 4P3 Camloc pliers are not required to install stud assemblies -16 and larger.

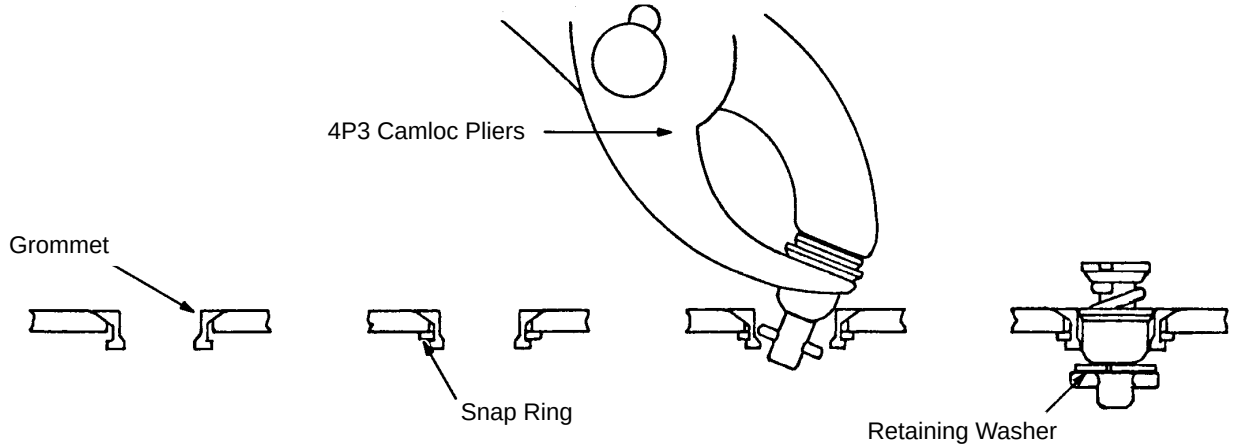


Figure 9 - Installation of Non-Sealed 4002 Series Grommet and Stud

5.3.6 Install 4002-P4 studs as follows:

Step 1. Insert the grommet and flare the grommet sleeve, using a 4-GM-4 punch and 4-PF-4 die mounted in a CP450 rivet squeezer or other suitable press, as shown in Figure 10. For small production runs, it is acceptable to flare the sleeve by squeezing the punch and die in a vise (remove the shanks from the bodies of the punch and die if necessary).

Step 2. Ensure the sleeve is completely flared over.

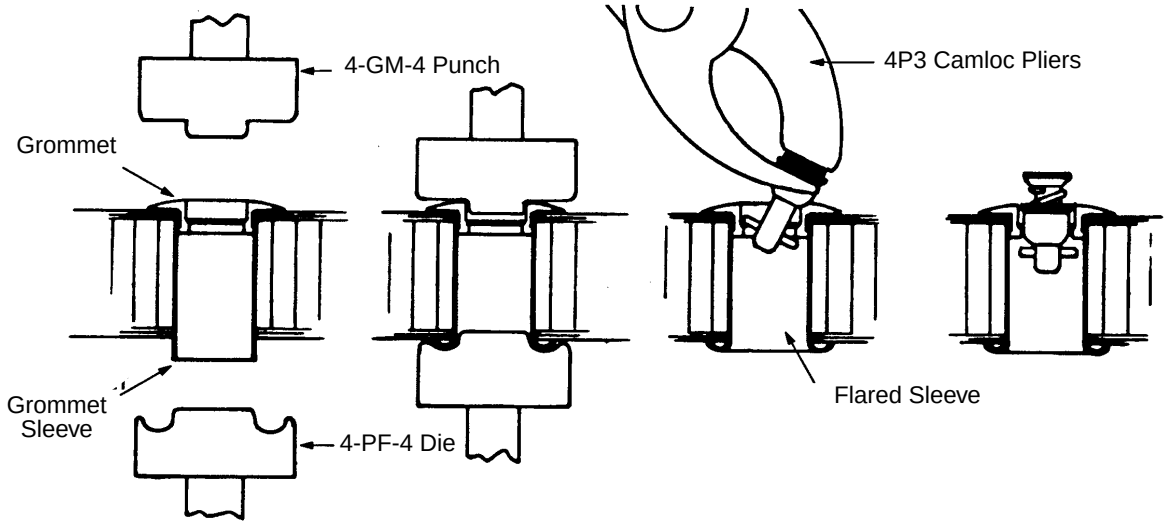


Figure 10 - Installation of 4002-P4 Fastener Grommet and Sleeve

5.4 Installation of Receptacles

5.4.1 Install receptacles as follows:

Step 1. If specified on the engineering drawing, install shims between the sheet and receptacle.

Step 2. If required, rivet the receptacle to the sheet according to PPS 2.01 or PPS 2.63, as applicable. If authorized by Liaison Engineering, Cherry nut plate rivets may be used in place of 3/32" diameter solid rivets for installing receptacles in limited access areas to avoid damaging the receptacles with bucking bars. Liaison Engineering authorization is not required to substitute MS20426AD3 rivets for Cherry nut plate rivets when installed in aluminum.

Step 3. If necessary, shave countersunk heads of solid rivets, other than reduced flush head rivets (e.g., NAS1097), flush with the surface to obtain proper seating of the panel. Shaving of reduced flush head rivets is not permitted.

5.5 Installation of Ejector Springs

5.5.1 Install ejector springs as follows:

Step 1. Install the stud in the spring according to section 5.3.

Step 2. Cleco the spring to the panel through the end rivet hole.

Step 3. Rivet the spring to the panel according to PPS 2.01, ensuring that the stud retaining washer nests in the stud hole in the panel.

6 Requirements

6.1 Fastener locations must be as specified on the engineering drawing.

6.2 The type and size of quick release fastener assemblies must be as specified on the engineering drawing, or replacement/substitution as allowed by BM9010.05 (EO7336).

6.3 Drilled holes, dimples and countersinks must meet the requirements of PPS 1.01, PPS 1.07, PPS 1.09, PPS 2.01 or PPS 2.63, as applicable.

6.4 There must be no evidence of looseness in the stud of installed 15F and 5F series fasteners when fully down and locked.

6.5 When measured from the external surface of the panel, the maximum head height of 2600 series studs, when down and locked, shall be 3/16" (see Figure 11).

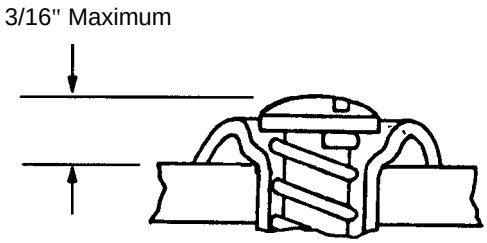


Figure 11 - 2600 Series Stud Head Height

6.6 When measured from the top of the grommet, the head height of 2700 series studs, when down and locked, shall be +0.020 to -0.010" (see Figure 12).

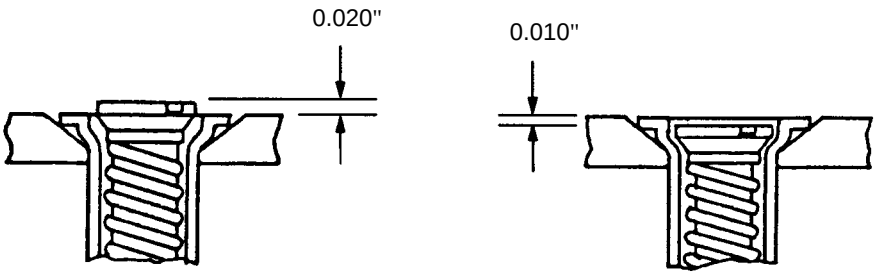


Figure 12 - 2700 Series Stud Head Height

6.7 When measured from the top of the grommet, the head height of 4002 series studs, when down and locked, shall be +0.010 to -0.020" (see Figure 13).

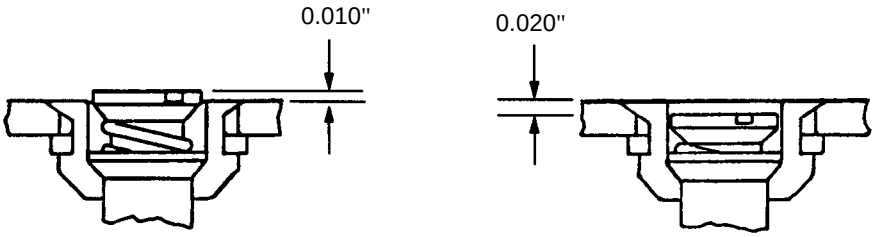


Figure 13 - 4002 Series Stud Head Height

7 Safety Precautions

7.1 Observe general shop safety precautions when performing the procedure specified herein.

8 Personnel Requirements

8.1 Personnel responsible for installation of quick release fastener assemblies must have a good working knowledge of the procedure and requirements as specified herein and must have exhibited their competency to their supervisor.