BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 2.30

PRODUCTION PROCESS STANDARD

Installation of Rivetless Nut Plates

Issue 8
- This standard supersedes PPS 2.30, Issue 7.
- 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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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the installation of rivetless nut plates.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction and the procedure specified 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 PPS 1.09 - Drilling and Reaming

3.2 PPS 1.33 - Countersinking for Flush Head Fasteners

3.3 PPS 13.26 - General Subcontractor Provisions.

4 Materials and Equipment

4.1 Materials

4.1.1 Nut plates as specified on the engineering drawing (i.e., 6010 series). Refer to Figure 1 for the nut plate part number breakdown. Refer to Figure 2 for a general description of 6010 series nut plates.

4.1.2 Lubricant (e.g., solid Boelube 70201).

6010 Nut Plate Type

FF - standard, floating type nut plate
FHN - high shear, floating type nut plate
GFP - high temperature, floating type nut plate
SFN - self-sealing, floating type nut plate
SFHN - self sealing, floating type nut plate
RFF - repair, floating type nut plate, 1/64" oversize
RFHN - repair, high shear, floating type nut plate, 1/64" oversize
RSFHN - repair, self sealing, floating type nut plate, 1/64" oversize

Nut Element Type

L - locking
NL - non-locking

Thread SIze

8 - 8-32 UNC thread
10 - 10-32 UNC thread
12 - 1/4-28 UNF thread

Grip Length

Grip	Installation Configuration		Grip	Installation Configuration	
	Plain Hole or Counterbored	Countersink		Plain Hole or Counterbored	Countersink
A	0.031" - 0.062"	0.074" - 0.106"	G	0.219" - 0.250"	0.259" - 0.289"
B	0.063" - 0.094"	0.107" - 0.133"	H	0.251" - 0.281"	0.290" - 0.320"
C	0.095" - 0.125"	0.134" - 0.165"	J	0.282" - 0.312"	0.321" - 0.351"
D	0.126" - 0.156"	0.166" - 0.196"	K	0.313" - 0.343"	0.352" - 0.382"
E	0.157" - 0.187"	0.197" - 0.227"	L	0.344" - 0.374"	0.383" - 0.413"
F	0.188" - 0.218"	0.228" - 0.258"			

For counterbore installations:
Grip Length = Panel Thickness - Counterbore Depth (0.025")

Variable Nut Height (FHN, RFHN, SFHN & RSFHN Series)

2 - nut element 1/16" longer than standard
3 - nut element 1/8" longer than standard
4 - nut element 3/16" longer than standard

FF6010 L 8 B 2

Figure 1 - Nut Plate, 6010 Series, Part Number Breakdown

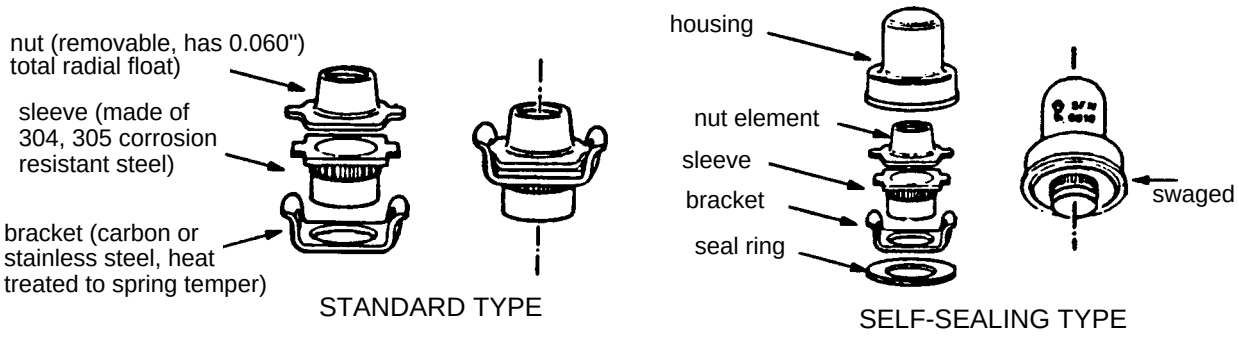


Figure 2 - General Description of Series 6010 Nut Plates

4.2 Equipment

4.2.1 Hole preparation tools as specified in Table 1, Table 2, Table 3 and Table 4, as applicable. Use of alternative hole preparation tooling is acceptable provided that the hole requirements are met.

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

4.2.3 Installation tools as specified in Table 6, Table 7, Table 8 and Table 9, as applicable.

4.2.4 DT1730 inspection gauge.

5 Procedure

5.1 General

5.1.1 Rivetless nut plates are basically identical in function to conventional anchor nuts, with the primary difference being that the nut plates are attached to the structure by means of a flared sleeve in lieu of riveting.

5.1.2 The attachment sleeve incorporates a series of “anti-rotation” lobes around the base, which permanently engage the parent metal during installation to prevent the nut plate from turning in service. As the effectiveness of the anti-rotation lobes is directly related to the interference between the lobes and the parent metal, it is imperative that the prepared hole is within the size limits specified herein.

5.1.3 Installation of the nut plate is basically a 2 stage operation, wherein the nut plate lobes are first drawn or pressed into the panel followed by flaring of the sleeve to securely hold the nut assembly to the structure.

5.2 Preparation of Parts

5.2.1 General Drilling Notes

5.2.1.1 The nut plate hole shall be either plain, counterbored or countersunk, depending on the installation configuration specified on the engineering drawing. Refer to Figure 3 for a general description of the various installation configurations. Refer to section 5.2.2, section 5.2.3, section 5.2.4, or section 5.2.5 for the recommended hole preparation sequence and data applicable to the specified installation configuration.

5.2.1.2 Perform drilling according to PPS 1.09.

5.2.1.3 Perform final drilling from the side of the work against which the sleeve will be flared.

5.2.1.4 After final drilling, remove the standing burr from the exit hole of the part using a vixen file, or similar flat deburring tool. Folded in burrs may be removed by running through the hole with the final size drill; do not break hole edges using countersink type cutters.

5.2.1.5 Check at least one hole from each pattern of drilled holes for conformance to the requirements of Table 1, Table 2, Table 3 or Table 4, as applicable, before installing nut plates. If a hole is found to be oversize, check the entire pattern of holes for conformance to the requirements of the applicable Table. Refer oversize holes to Liaison Engineering for authorization to install oversize nut plates according to section 5.4.

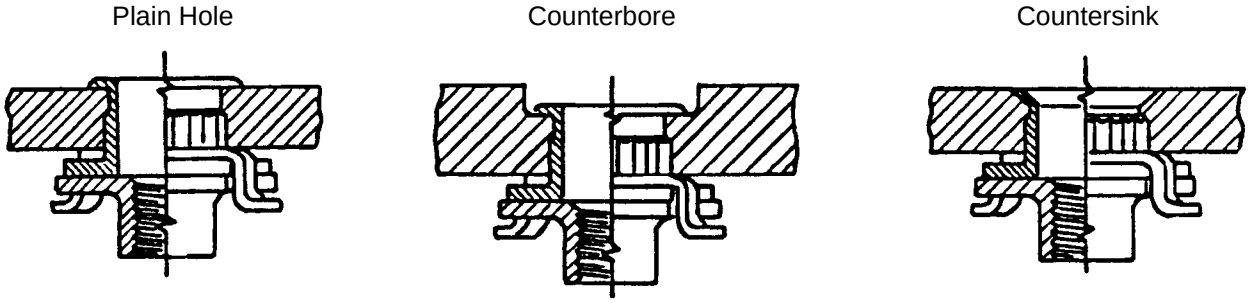


Figure 3 - Nut Plate - Installation Configurations

5.2.2 Plain Hole Installation

5.2.2.1 Pre-drill holes for plain hole installations and then open the hole to the final size specified in Table 1.

Table 1 - Hole Preparation - Plain Hole Installation

NUT PLATE SIZE		RECOMMENDED PRE-DRILL	RECOMMENDED FINAL DRILL	FINAL HOLE SIZE
DASH NUMBER	THREAD SIZE			
8	8-32	1/4"	TS.561.11.18 Mk 6	0.280" - 0.285"
10	10-32			
12	1/4-28	5/16"	TS.561.11.16 Mk 83	0.347" - 0.352"

5.2.3 Countersink Installation - Standard Nut Plate

5.2.3.1 Drill holes for countersink type installations for standard nut plates as follows:

Step 1. Pre-drill to the size specified in Table 2.

Step 2. Countersink to the diameter specified in Table 2 using a piloted countersink in a "microstop" automatic countersink according to PPS 1.33.

Step 3. Open the hole to final size specified in Table 2.

Table 2 - Hole Preparation- Countersink Installation - STD Nut Plate

NUT PLATE SIZE		PRE DRILL	COUNTERSINK (e.g., TS.423.13.00)		RECOMMENDED FINAL DRILL	FINAL HOLE SIZE
DASH NUMBER	THREAD SIZE		PILOT DIAMETER	COUNTERSINK DIAMETER		
8	8-32	1/4"	0.250"	0.370" - 0.375"	TS.561.11.18 Mk 6	0.280" - 0.285"
10	10-32	1/4"				
12	1/4-28	5/16"	0.313"	0.437" - 0.442"	TS.561.11.16 Mk 83	0.347" - 0.352"

5.2.4 Countersink Installation - High Shear (FHN) Nut Plates

5.2.4.1 Drill holes for the countersink type installation of high shear (FHN) nut plates as follows:

Step 1. Drill the fastener hole to final size specified in Table 3 (e.g., using a bushed drill template and the appropriate size drill).

Step 2. Countersink the full size hole to the diameter specified in Table 3 using a piloted countersink in a “microstop” automatic countersink according to PPS 1.33.

Table 3 - Hole Preparation - Countersink Installation - HIGH SHEAR NUT PLATE

NUT PLATE SIZE		RECOMMENDED FINAL DRILL	FINAL HOLE SIZE	COUNTERSINK (e.g., TS.423.13.00)	
DASH NUMBER	THREAD SIZE			PILOT DIAMETER	COUNTERSINK DIAMETER
8	8-32	9/32"	0.280" - 0.285"	0.281"	0.370" - 0.375"
10	10-32				
12	1/4-28	S	0.347" - 0.352"	0.348"	0.437" - 0.442"

5.2.5 Counterbore Installation

5.2.5.1 Drill holes for counterbore installations as follows:

Step 1. Pre-drill to the size shown in Table 4.

Step 2. Counterbore to the diameter specified in Table 4.

Step 3. Open the hole to final size specified in Table 4.

Table 4 - Hole Preparation Data - Counterbore Installation

NUT PLATE SIZE		PRE-DRILL	COUNTERBORE			RECOMMENDED FINAL DRILL	FINAL HOLE SIZE
DASH NUMBER	THREAD SIZE		PILOT DIAMETER	C’BORE DIAMETER	C’BORE DEPTH		
8	8-32	1/4"	0.250"	3/8"	0.020" - 0.030"	TS.561.11.18 Mk 6	0.280" - 0.285"
10	10-32	1/4"	0.250"	3/8"			
12	1/4-28	5/16"	0.313"	33/64"		TS.561.11.16 Mk 83	0.347" - 0.352"

5.3 Selection of Installation Tooling/Method

5.3.1 Refer to Table 5 for a listing of the recommended installation tooling and methods for installing nut plates. Base selection of the installation method for specific applications on the installation configuration, material gauge, edge distance, structural access and type of nut plate to be installed.

Table 5 - Selection of Installation Tooling/Method

NUT PLATE TYPE	INSTALLATION CONFIGURATION	MATERIAL GAUGE	EDGE DISTANCE	INSTALLATION METHOD
FF FHN GFP RFF RFHN	countersink	0.071" minimum	up to 1 1/4"	CP214 (TS.423.10.00) pneumatic squeezer - single stage die according to paragraph 5.3.2
			more than 1 1/4"	CP450 (TS.423.11.00) riveter - single stage die according to paragraph 5.3.4
			n/a	DTP3000 air/hydraulic power tool according to section 5.3.6 (Note 1)
		all	n/a	Hand tool according to paragraph 5.3.5 (Note 2)
	counterbore	0.063" minimum	up to 1 1/4"	CP214 (TS.423.10.00) pneumatic squeezer - single stage die according to paragraph 5.3.2
			more than 1 1/4"	CP450 (TS.423.11.00) riveter - single stage die according to paragraph 5.3.4
		all	n/a	Hand tool according to paragraph 5.3.5 (Note 2)
	plain hole	0.032" - 0.063"	up to 1 1/4"	CP214 (TS.423.10.00) pneumatic squeezer - two stage die according to paragraph 5.3.3
			more than 1 1/4"	Hand tool according to paragraph 5.3.5 (Note 2)
		0.063" minimum	up to 1 1/4"	CP214 (TS.423.10.00) pneumatic squeezer - single stage die according to paragraph 5.3.2
			more than 1 1/4"	CP450 (TS.423.11.00) riveter - single stage die according to paragraph 5.3.4
		all	n/a	Hand tool according to paragraph 5.3.5 (Note 2)
SFN SFHN RSFHN	countersink	0.071" minimum	n/a	DTP3000 air/hydraulic power tool according to paragraph 5.3.6 (Note 1)

Note 1. The DTP3000 power tool is restricted to -12 (1/4) nut plates in structures or assemblies where squeezer or riveter tools are not suitable.
Note 2. Use hand tools only if the edge distance or structural access prevent using a pneumatic squeezer or riveter.

5.3.2 Install nut plates using a CP214 (TS.423.10.00) squeezer and a single stage forming die as follows:

Step 1. Select the correct size anvil from Table 6 for the size of nut plate to be installed and thread the anvil approximately halfway into the squeeze gun yoke.

Step 2. Select the appropriate forming die from Table 6 for the applicable nut plate size and installation configuration and insert the forming die into the squeeze gun plunger.

Step 3. For convenience of use, it is recommended that the squeezer yoke be held in a bench vise in an inverted position as shown in Figure 4.

Step 4. Connect a shop air line to the squeezer tool and actuate the tool to extend the plunger to full travel.

Step 5. Adjust the threaded anvil to provide a gap, between the forming die and anvil, approximately equal to the thickness of sheet in which the nut plate is to be installed (see Figure 4). Tighten the set screw in the yoke to secure the threaded anvil in position.

Step 6. Place the nut plate on the anvil and position the part on the nut plate so that the sleeve enters the panel hole. Ensure that the nut plate is on the right side of the part.

Step 7. Check that the nut plate bracket is correctly aligned with the part according to the engineering drawing and actuate the squeeze gun to insert and upset the sleeve.

Step 8. Visually check the first off installation to ensure that the nut plate is fully seated and the sleeve is properly formed. If necessary, re-adjust the anvil height to facilitate satisfactory installation.

Table 6 - CP214 (TS.423.10.00) Squeezer - Single Stage Forming Die

INSTALLATION CONFIGURATION	NUT PLATE SIZE		INSTALLATION TOOLS (NOTE 1)	
	DASH NUMBER	THREAD SIZE	ANVIL	FORMING DIE
Countersink	8	8-32	FAB-10 or TS.423.10.14 MK 1	FAC-10 or TS.423.10.13 MK 1
	10	10-32		
	12	1/4-28	FAB-12 or TS.423.10.14 MK 2	FAC-12 or TS.423.10.13 MK 2
Counterbore or Plain hole	8	8-32	FAB-10 or TS.423.10.14 MK 1	FAN-10 or TS.423.10.12 MK 1
	10	10-32		
	12	1/4-28	FAB-12 or TS.423.10.14 MK 2	FAN-12 or TS.423.10.12 MK 2

Note 1. For use with the CP214 (TS.423.10.00) squeezer and a PTF 7533 (TS.423.10.11) yoke assembly.

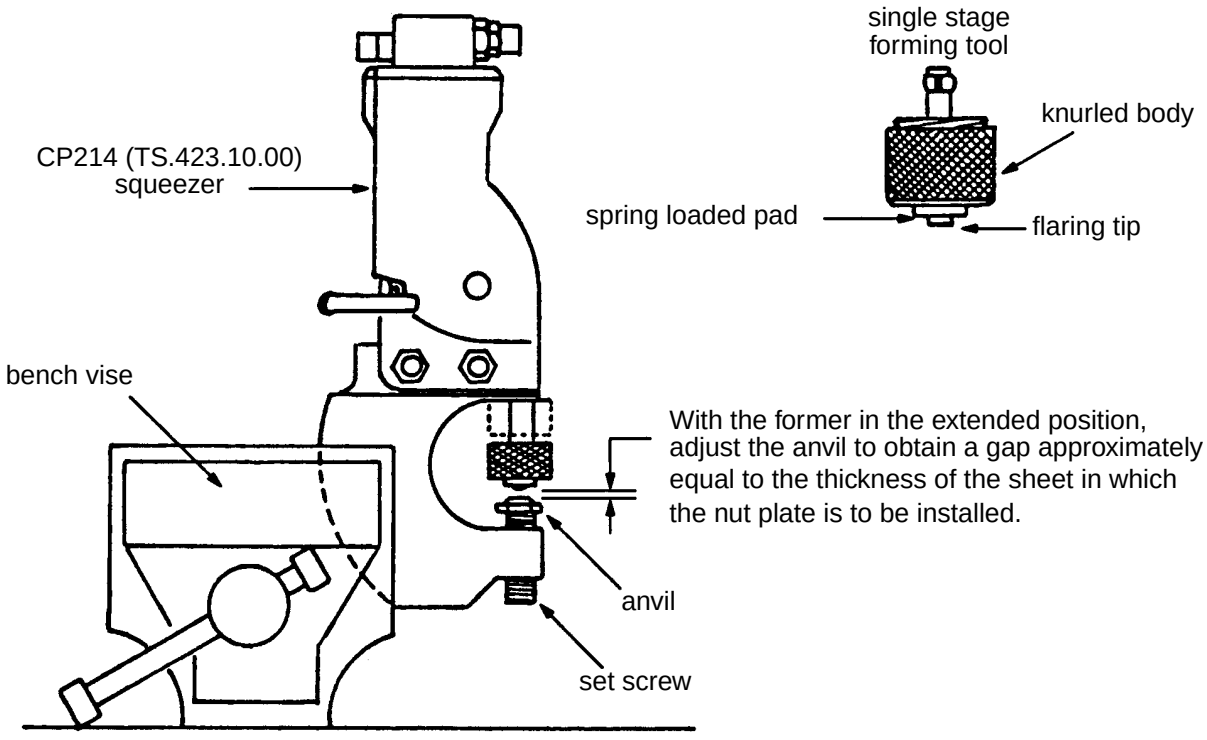


Figure 4 - CP214 (TS.423.10.00) Squeezer - Single Stage Forming Die

5.3.3 Install nut plates using a CP214 (TS.423.10.00) squeezer and a two stage forming die as follows:

Step 1. Select the correct size anvil from Table 7 for the size of nut plate to be installed and thread the anvil approximately halfway into the squeeze gun yoke.

Step 2. Select the correct size 1st stage forming die from Table 7 for the size of nut plate to be installed and insert the forming die into the squeeze gun plunger.

Step 3. For convenience of use, it is recommended that the squeezer yoke be clamped in a bench vise in an inverted position approximately as shown in Figure 5.

Step 4. Connect a shop air line to the squeezer tool and actuate the tool to extend the plunger to full travel.

Step 5. Adjust the threaded anvil to provide a gap between the die and anvil approximately equal to the thickness of sheet in which the nut plate is to be installed (see Figure 5). Tighten the setscrew in the yoke to secure the threaded anvil in position.

Step 6. Place the nut plate on the anvil and position the part on the nut plate so that the sleeve enters the hole in the panel. Ensure that the nut plate is on the right side of the part.

Step 7. Check that the nut plate bracket is correctly aligned with the part as shown on the engineering drawing and actuate the squeeze gun to insert the sleeve fully into the panel.

Step 8. Visually check the first off installation to ensure that the sleeve is fully inserted into the panel and then insert all the remaining nut plates in the batch of parts.

Step 9. On completion of inserting all the nut plates in the batch of parts using the 1st stage die, replace the 1st stage die with the 2nd stage forming die and flare the nut plate sleeves in place. Visually check the first off installation to ensure that the nut plate is fully seated and the sleeve is properly formed; if necessary, re-adjust the anvil height to facilitate satisfactory installation.

Table 7 - CP214 (TS.423.10.00) Squeezer - Two Stage Forming Die

INSTALLATION CONFIGURATION	NUT PLATE SIZE		INSTALLATION TOOLS (Note 1)	
	DASH NUMBER	THREAD SIZE	ANVIL	FORMING DIE
Plain Hole	8	8-32	FAB-10 or TS.423.10.14 MK 1	**1st STAGE** CPR 7650A-10 or TS.423.10.15 MK 1 **2ND STAGE** CPR 7650B-10 or TS.423.10.16 MK 1
	10	10-32		
Note 1. for use with a CP 214 (TS.423.10.00) squeezer fitted with a PTF 7533 (TS.423.10.11) yoke assembly.				

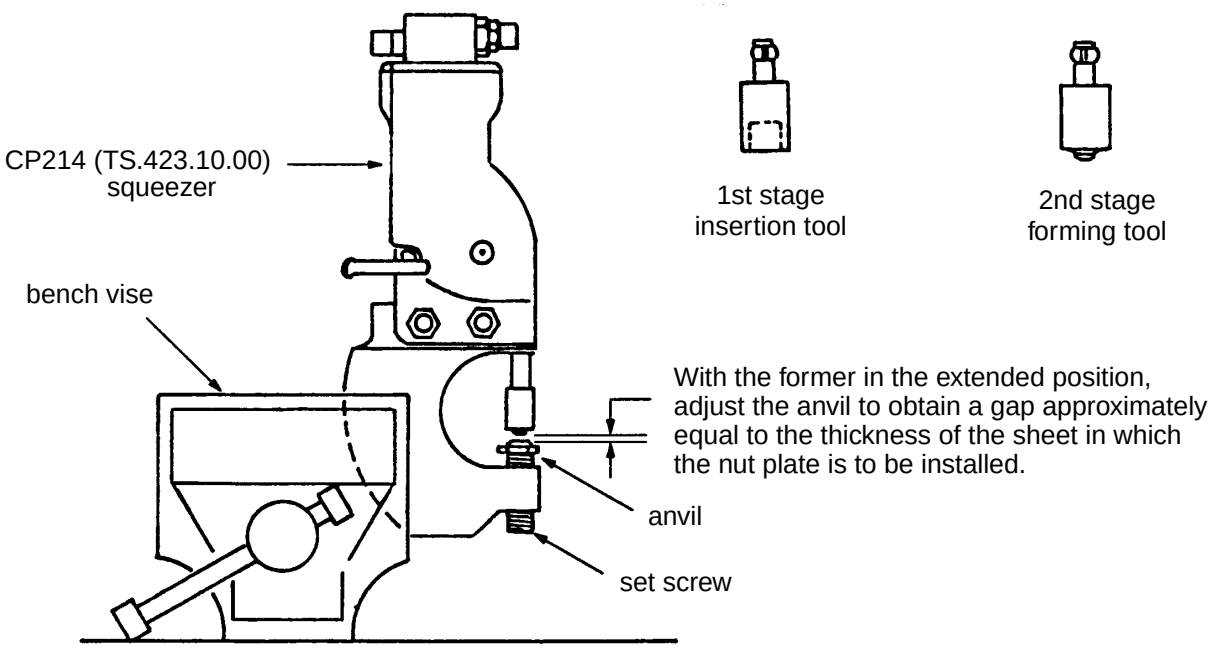


Figure 5 - CP214 (TS.423.10.00) Squeezer - Two-Stage Forming Die

5.3.4 Install nut plates using a CP450 (TS.423.11.00) Riveter and a single stage forming die (see Figure 6) as follows:

Step 1. Install a rivet set adapter, as listed in Table 8, in the upper and lower tool posts on the CP450 (TS.423.11.00) riveter.

Step 2. Select the correct size anvil from Table 8 for the size of nut plate to be installed and insert the anvil into the adapter in the lower tool post.

Step 3. Select the appropriate forming die from Table 8 for the applicable nut plate size and installation configuration and insert the forming die into the adapter in the upper tool post.

Step 4. Extend the upper tool post to full travel using the return stroke lever on the right hand side of the pneumatic cylinder mounted on top of the yoke.

Step 5. Adjust the height of the lower post to provide a gap, between the forming die and anvil, approximately equal to the thickness of the sheet in which the nut plate is to be installed. Set the return stroke lever to allow the part to be easily slipped between the forming die and anvil.

Step 6. Open the air supply valve and switch on the riveter.

Step 7. Place the nut plate on the anvil and position the part on the nut plate so that the sleeve enters the hole in the panel. Ensure that the nut plate is on the right side of the part.

Step 8. Actuate the riveter by means of the foot pedal control to insert and upset the sleeve.

Step 9. Visually inspect the first off nut plate installation to ensure that the sleeve is properly formed. Adjust the lower tool post height, as necessary, to ensure that the sleeve is fully formed without excessive pressure causing distortion of the part.

Table 8 - CP450 (TS.423.11.00) Riveter - Single Stage Forming Die

INSTALLATION CONFIGURATION	NUT PLATE SIZE		INSTALLATION TOOLS		
	DASH NUMBER	THREAD SIZE	ANVIL	FORMING DIE	RIVET SET ADAPTER
Countersink	8	8-32	HWN 7658-2 or TS.423.11.13 MK 1	HWS 7657-2 or TS.423.11.12 MK 1	Chicago Pneumatic P.82190Y, TS.423.11.10 or TS.323.04.11 MK 24
	10	10-32			
	12	1/4-28	HWN 7658-3 or TS.423.11.13 MK 2	HWS 7657-3 or TS.423.11.12 MK 2	
Counterbore or Plain hole	8	8-32	HWN 7658-2 or TS.423.11.13 MK 1	HWN 7657-2 or TS.423.11.11 MK 1	
	10	10-32			
	12	1/4-28	HWN 7658-3 or TS.423.11.13 MK 2	HWN 7657-3 or TS.423.11.11 MK 2	

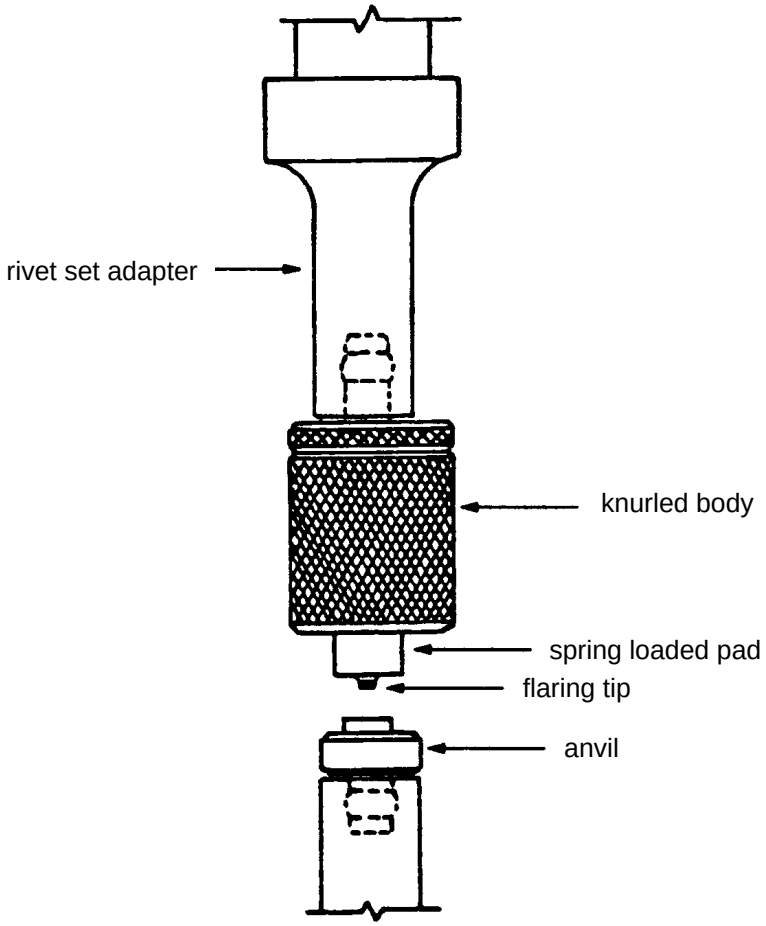


Figure 6 - CP450 (TS.423.11.00) Riveter - Single Stage Forming Die

5.3.5 Install nut plates using a TA7533 or TS.423.12.00 hand tool as follows:

Step 1. Select the correct nose piece and puller from Table 9 for the nut plate size and installation configuration and assemble the puller unit and nose piece to the tool handle. Refer to Figure 7 for a general description of the hand tool.

Step 2. Back-off the adjustment stop screw nut 1 to 2 turns and loosen the grip length adjustment set screw.

Step 3. Adjust the grip length barrel in or out of the handle until the correct grip length graduation is aligned with the end of the handle. Tighten the set screw to lock the setting and tighten the adjustment stop screw nut until the stop screw is felt to firmly bottom against the grip length barrel.

Step 4. Before commencing installation, ensure that the nose piece collet assembly is pushed forward and that the collet assembly is fully seated on the tool (see Figure 8-A).

Step 5. Insert the threaded puller through the panel hole and engage the nut threads until full thread engagement is reached (see Figure 8-A).

Step 6. Close the handles, thus pulling the nut plate into the prepared hole, until it is fully seated against the panel and the lobes are fully engaged (see Figure 8-B).

Step 7. Release the handles and, without disengaging the tool from the nut, retract the nose piece collet assembly by pulling back on the outer sleeve to expose the flaring tip (see Figure 8-C).

Step 8. Close the tool handles to upset the nut sleeve. Apply enough pressure to form a flat upset against the panel surface for plain holes, against the counterbore surface or against the countersink (see Figure 8-D).

Step 9. Disengage the tool from the nut plate when installation is complete.

Step 10. If a gap larger than 0.002" exists between the nut plate bracket and the panel (see Figure 13), repeat Step 4 through Step 9.

Table 9 - Hand Tool

INSTALLATION CONFIGURATION	NUT PLATE SIZE		INSTALLATION TOOLS (Note 1)		
	DASH NUMBER	THREAD SIZE	HANDLE	NOSEPIECE	PULLER
Countersink	8	8-32	TA7533	DCSN86130-8	DTP86230-8
			TS.423.12.10	TS.423.12.12 MK 1	TS.423.12.13 MK 1
	10	10-32	TA7533	DCSN86130-10	DTP86230-10
			TS.423.12.10	TS.423.12.12 MK 2	TS.423.12.13 MK 2
Counterbore or Plain Hole	8	8-32	TA7533	DCBN86130-8	DTP86230-8
			TS.423.12.10	TS.423.12.11 MK 1	TS.423.12.13 MK 1
	10	10-32	TA7533	DCBN86130-10	DTP86230-10
			TS.423.12.10	TS.423.12.11 MK 2	TS.423.12.13 MK 2

Note 1. Do not interchange the TS and non TS tools specified in this table. Use either all TS tools or all non-TS tools.

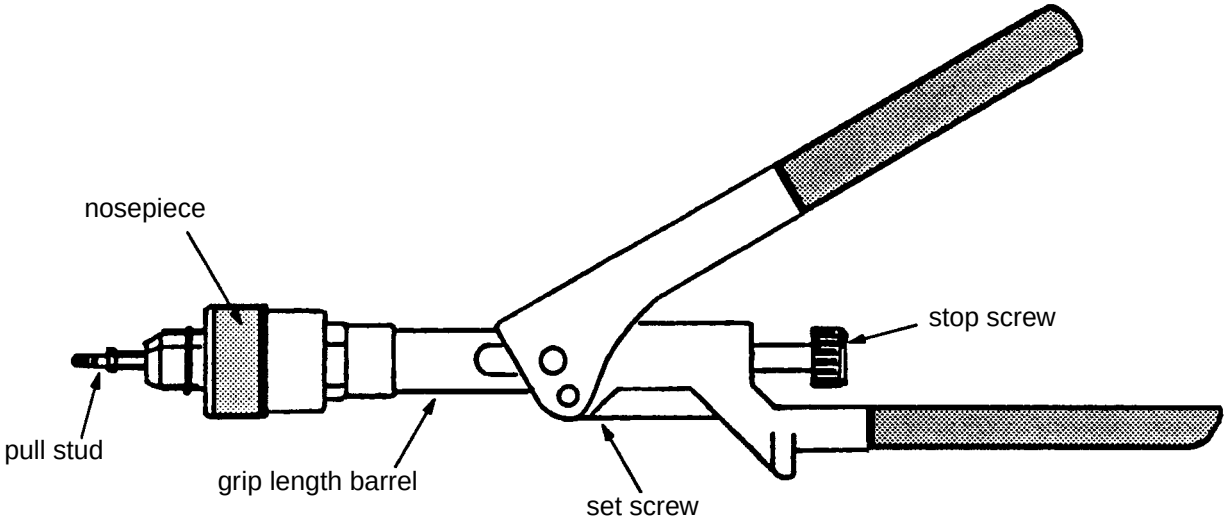
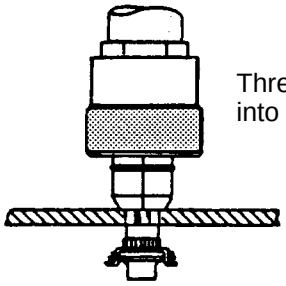
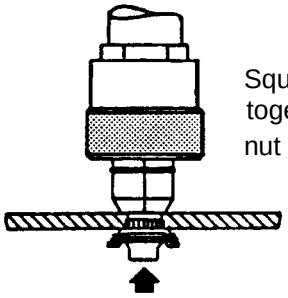


Figure 7 - General Description of Hand Tool



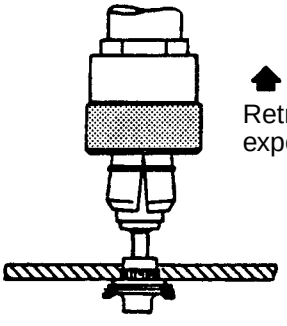
Thread the pull stud into the nut plate

Fig 8-A



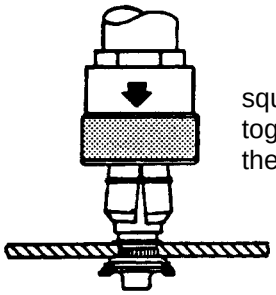
Squeeze the tool handles together to seat the nut plate in the panel

Fig 8-B



Retract the collet to expose the flaring tip

Fig 8-C



squeeze the tool handles together to flare the nut plate sleeve

Fig 8-D

Figure 8 - Hand Tool Installation Sequence

5.3.6 The DTP3000 rivetless nut plate installation tool is a portable air/hydraulic power tool used to install -12 (1/4") size rivetless nut plates in countersink type installation. Although the DTP3000 tool is the only type of tool which can be used to install self-sealing type nut plates, it can also be used to install standard type nut plates on assemblies or components which do not permit the use of standard squeezers or riveter tools. The basic equipment consists of a handle-gun and a booster unit with connecting hoses and a TS.423.14.12 plier type holding tool to hold sealed nut plates, or a wrench type holding tool to hold standard nut plates, during installation. Refer to Figure 9 for a general description of the DTP3000 power tool. Refer to Figure 10 for a general description of using the DTP3000 tool. Install nut plates using a DTP3000 air/hydraulic power tool as follows:

Step 1. Check the flaring nose assembly before use to ensure that the flaring tip extends past the pressure pad no more than 1/32" (see Figure 9-A). If the flaring tip extends more than 1/32", loosen the pressure pad set screws and turn the pressure pad counterclockwise to reduce the flaring tip extension to less than 1/32". Re-tighten the set screws after adjustment.

Step 2. Connect a shop air line to the air inlet on the power booster. Check that the air pressure regulator on the power booster is turned up so that full line pressure (90 psi minimum) is supplied to the tool.

Step 3. In order to verify the pressure setting on the booster unit and to ensure the mandrel is sufficiently threaded into the flaring tip of the gun when installing self-sealing type nut plates, install a nut plate in a prepared hole in a stack of scrap material representative of the production work at hand. If the flare on the sleeve is unacceptable, change the pressure setting on the booster unit accordingly and, if the mandrel pierces the nut housing of a self-sealing type nut plate, thread it further into the flaring tip.

Step 4. Place the nut to be installed into the appropriate holding tool. For sealed type nut plates, place the nut plate housing fully into the rubber grommet of the holding tool and squeeze the plier handles fully together to firmly grip the nut plate. For standard type nut plates, place the nut plate into the 12 mm (magnet end) opening of the holding wrench with the nut element on the magnet side.

Step 5. Insert the nut sleeve into the prepared hole and press down firmly. Ensure that the puller mandrel is lubricated (e.g., with solid Boelube) before installing the first and each fourth subsequent nut plate.

Step 6. Holding the installation gun square to the panel surface, insert the puller mandrel through the panel hole and press firmly against the nut plate to engage the nut element threads. Squeeze the air motor trigger to thread the puller mandrel into the nut plate. Hold the trigger down until the nut plate is pulled firmly against the panel and the air motor stalls out. Release the trigger and remove the holding tool.

Step 7. Press the cycle button on the gun handle and hold until the nut plate is fully drawn into the panel. Release the cycle button when it is felt that the tool is pulled solidly against the panel.

Step 8. Switch the air motor to reverse and press the air motor trigger to reverse the rotation of the puller and hold until the puller mandrel is completely threaded out of the nut plate.

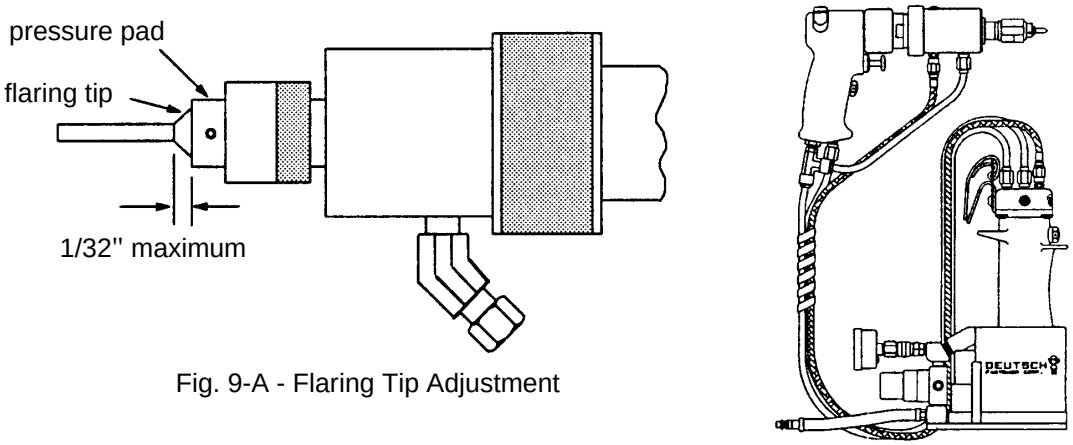


Fig. 9-A - Flaring Tip Adjustment

Figure 9 - General Description of DTP3000 Tool

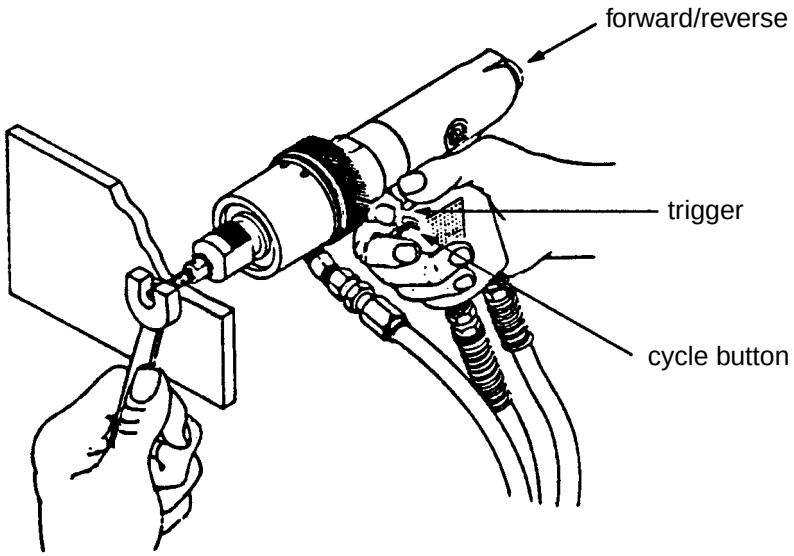


Figure 10 - Use of DTP3000 Air/Hydraulic Tool

5.4 Installation of Oversize Nut Plates (RFF, RFHN and RSFHN Series)

5.4.1 Only if authorized by Liaison Engineering, install oversize nut plates for the salvage of oversize installation holes.

5.4.2 Use RFF, RFHN and RSFHN nut plates in oversize holes in place of FF, FHN and SFHN nut plates, respectively.

5.4.3 The oversize nut plates specified herein are of the same dimensions and configurations as the corresponding standard size nut plates, except that the diameter of the lobes on the sleeve are 1/64" oversize. Refer to Table 10 for hole diameters for oversize nut plates. Countersink and counterbore diameters for oversize nut plates are the same as those for standard size nut plates.

5.4.4 Install oversize nut plates in the same manner, using the same tools, as standard size nut plates.

Table 10 - Hole Preparation Data for Oversize Nut Plates

OVERSIZE REPAIR NUT PLATE			FINAL HOLE DATA	
SERIES	DASH NUMBER	THREAD SIZE	RECOMMENDED DRILL SIZE	HOLE LIMITS
RFF RFHN RSFHN	8	8-32	19/64"	0.295" - 0.300"
	10	10-32	19/64"	0.295" - 0.300"
	12	1/4-28	0.363"	0.362" - 0.367"

5.5 Replacement of Nut Element

5.5.1 The threaded part of the nut plate assembly (nut element), may be replaced if damage to the threads occurs.

5.5.2 To remove the nut element, use an RB 6527 removal tool as follows (see Figure 11-A):

Step 1. Insert the prongs of the removal tool between the nut element base and the bracket.

Step 2. Push down on the removal tool to pry the nut element out of the bracket.

5.5.3 Insert a new element into the installed bracket as follows:

Step 1. Insert one ear of the nut element into one slot of the bracket and tap the nut element with a mallet to snap the other ear into the bracket (see Figure 11-B).

Step 2. In order to prevent damage to thin gauge material, support the structure from the reverse side with a suitable support block while tapping the nut element into the bracket.

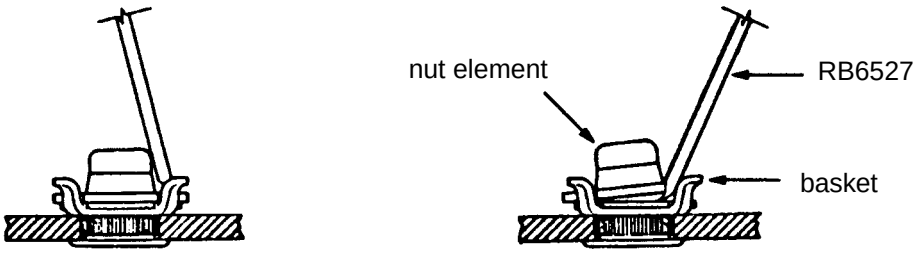


Fig 11-A - Removal of Nut Element

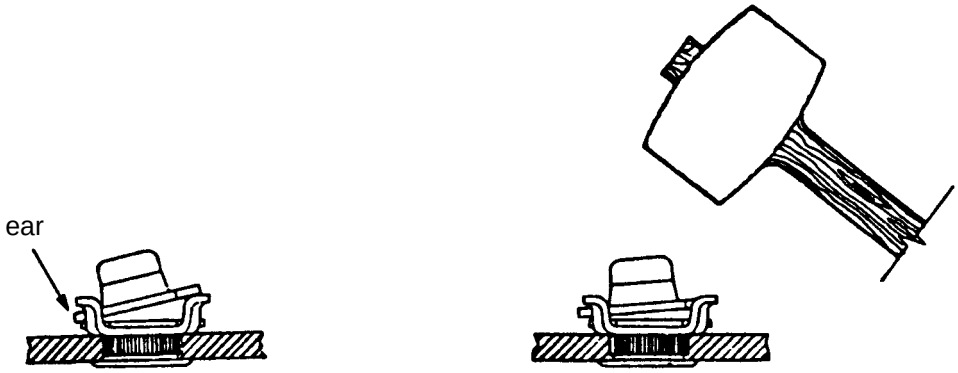


Fig 11-B - Replacement of Nut Element

Figure 11 - Nut Element Removal and Replacement

5.6 Removal of Installed Nut Plate

5.6.1 If necessary, remove rivetless nut plates in a similar manner to that used for solid rivets as follows:

Step 1. Using an 82° or 90° countersink tool, carefully machine off the corner of the flare as shown in Figure 12. Take care to machine just through or almost through the corner of the flare.

Step 2. Drive out the nut plate sleeve using a suitable drift punch. In order to prevent damage to thin gauge material, it may be necessary to support the part from the reverse side with a suitable support block while driving out the nut plate sleeve.

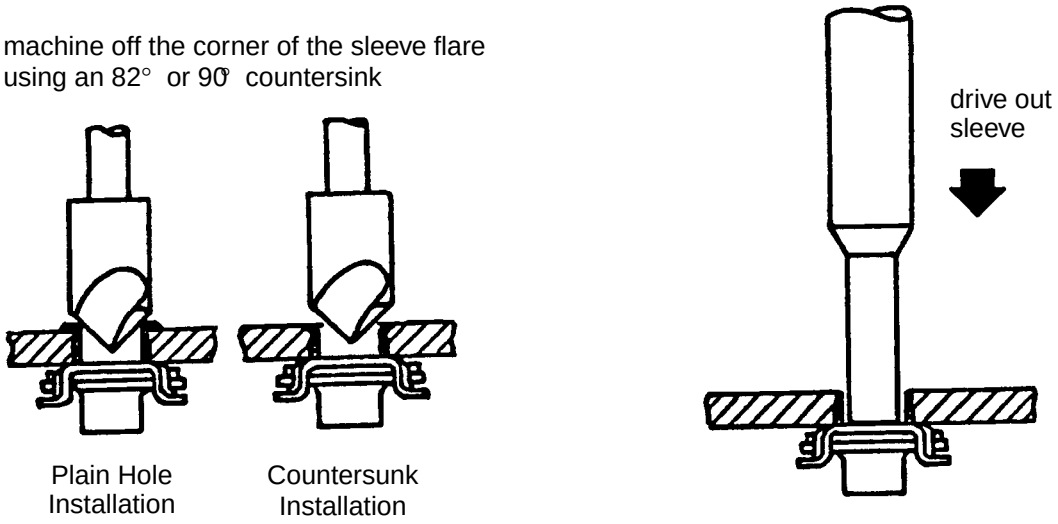


Figure 12 - Removal of Installed Nut Plate

6 Requirements

6.1 Visually check all installed nut plates according to Figure 13.

VISUAL APPEARANCE	DESCRIPTION	CORRECTIVE ACTION
Cracks in Sleeve Flare Light 	**LIGHT** - Cracks are closed and on the periphery of the flare	n/a
Medium 	**MEDIUM** - Cracks are open and extend inwards on the flare but do not extend into the sleeve ACCEPTABLE: 1 crack per 180° UNACCEPTABLE: 2 or more cracks per 180°	Replace unacceptable nut plate
Severe 	**SEVERE** - Cracks are open and extend into the sleeve - UNACCEPTABLE	Replace nut plate
Note 1. If re-swaging fails to correct the discrepant condition, replace the nut plate.		

Figure 13 - Visual Inspection of Installed Nut Plates

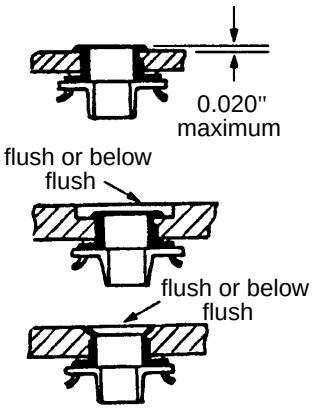
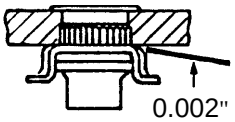
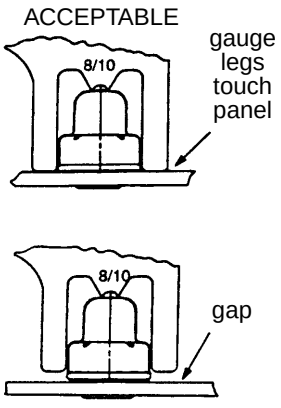
VISUAL APPEARANCE	DESCRIPTION	CORRECTIVE ACTION
Sleeve Flushness  	**PLAIN HOLE** ACCEPTABLE: Sleeve a maximum of 0.020 above flush with surface UNACCEPTABLE: Sleeve more than 0.020 above flush with surface **COUNTERBORE** ACCEPTABLE: Sleeve flush or below flush with surface UNACCEPTABLE: Sleeve above flush with surface **COUNTERSINK** ACCEPTABLE: Sleeve flush or below flush with surface UNACCEPTABLE: Sleeve above flush with surface	Repeat installation procedure for unacceptable nut plates (Note 1)
Nut Plate Seating (Standard Type Only)  	ACCEPTABLE: Gap between the nut plate bracket and panel is less than 0.002 (i.e., a 0.002 feeler gauge cannot be inserted between the bracket and the panel) UNACCEPTABLE: Gap between the nut plate bracket and panel exceeds 0.002 (i.e., a 0.002 feeler gauge can be inserted between the bracket and the panel)	Repeat installation procedure for unacceptable nut plates (Note 1)
Installed Height (Sealed Type Only)  	ACCEPTABLE: Legs on DT1730 inspection gauge touch panel. UNACCEPTABLE: Legs on DT1730 inspection gauge do not touch panel.	Repeat installation procedure for unacceptable nut plates (Note 1)
Note 1. If re-swaging fails to correct the discrepant condition, replace the nut plate.		

Figure 13 - Visual Inspection of Installed Nut Plates

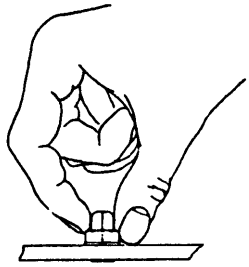
VISUAL APPEARANCE	DESCRIPTION	CORRECTIVE ACTION
Nut Tightness (Sealed Type Only)  grasp nut housing and try to move sideways	ACCEPTABLE: Installation feels tight and steady with no evidence of looseness. UNACCEPTABLE: Housing rocks back and forth.	Repeat installation procedure for unacceptable nut plates (Note 1)
Note 1. If re-swaging fails to correct the discrepant condition, replace the nut plate.		

Figure 13 - Visual Inspection of Installed Nut Plates

7 Safety Precautions

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

7.2 Wear Bombardier approved safety glasses while drilling holes.

7.3 Disconnect the shop air supply line from the drillmotor or pneumatic squeezer when changing bits or tools.

7.4 Switch off the CP450 (TS.423.11.00) riveter when changing tools.

8 Personnel Requirements

8.1 Personnel responsible for installation of rivetless nut plates must have a good working knowledge of the procedure and requirements as specified herein and must have exhibited their competency to their supervisor.

9 Maintenance of Equipment

9.1 Keep nut plate installation tools clean and free from shop swarf, etc. Periodically lubricate the flaring tips on forming dies (e.g., with solid Boelube).

9.2 Single stage forming tools are spring loaded with a specific number and arrangement of spring washers for the particular tool and installation configuration. Under no circumstances are these tools to be disassembled by shop personnel. Perform repair or adjustment of spring loaded tools according to the manufacturer's instructions.

9.3 Periodically check the DTP3000 flaring nose assembly to ensure that the flaring tip extension does not exceed 1/32".