BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 2.07

PRODUCTION PROCESS STANDARD

Installation of Jo-Bolts

Issue 19 - This standard supersedes PPS 2.07, Issue 18.
- Vertical lines in the left hand margin indicate changes over the previous issue.
- This PPS is effective as of the distribution date.

Approved By:

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the installation of Jo-Bolt fasteners.

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.

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 General

3.1.1 Unless a specific issue is indicated, the issue of the reference documents specified in this section in effect at the time of manufacture shall form a part of this specification to the extent indicated herein.

3.2 Bombardier Toronto (de Havilland) Specifications

3.2.1 PPS 1.01 - Dimpling Aluminum Alloys.

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

3.2.3 PPS 1.09 - Drilling and Reaming.

3.2.4 PPS 1.33 - Countersinking for Flush Head Fasteners.

3.2.5 PPS 13.26 - General Subcontractor Provisions.

3.2.6 PPS 27.02 - Edge Finishing Aluminum Alloy Parts.

3.2.7 PPS 27.04 - Edge Finishing Titanium Alloy Parts.

3.2.8 PPS 27.05 - Manual Edge Finishing.

3.2.9 PPS 34.02 - Application of Zinc Chromate Primer.

3.2.10 PPS 34.08 - Application of Epoxy-Polyamide Primer (F19 & F45).

4 Materials and Equipment

4.1 Materials

4.1.1 Unless otherwise specified in this section, use only the materials specified; use of superseding or alternative materials is not allowed.

4.1.2 Jo-Bolt fasteners as specified on the engineering drawing. Refer to Figure 1 for a breakdown of Jo-Bolt part numbers. Refer to Figure 2 for a general description of Jo-Bolt types. "Standard" Jo-Bolts have been superseded by Visu-Lok Jo-Bolts. Use any existing stock of "Standard" Jo-Bolts until depletion and then use Visu-Lok Jo-Bolts wherever "Standard" Jo-Bolts are specified.

4.2 Equipment

4.2.1 Pneumatic pistol installation tools (e.g., Zephyr tools and adapter assemblies as specified in Table 5 or #OAINS3 and #OA2N and adapter assemblies as specified in Table 6). Refer to Figure 6 for a general description of the installation tools and adapter assemblies.

4.2.2 Hand installation tool kit assemblies (e.g., Zephyr tools as specified in Table 7). Refer to Figure 7 for a general description of the hand installation tool assemblies.

4.2.3 Jo-Bolt grip scale (e.g., Zephyr LFVLG-1).

5 Procedure

5.1 General

5.1.1 Jo-Bolt fasteners are close tolerance blind locking fasteners consisting of a threaded nut, core screw and an expandable sleeve (see Figure 2).

5.1.2 Installation of Jo-Bolts is accomplished by means of special tools which thread the core screw into the nut so as to expand the sleeve over the shank end of the nut, making a high strength structural joint.

5.1.3 As the effectiveness of the fastener is dependent upon correct installation, it is essential that the procedure specified herein is strictly adhered to.

5.1.4 Jo-Bolt fasteners are lubricated by the manufacturer. Satisfactory installation is not possible if this lubricant has been removed or contaminated.

5.1.5 Protect fasteners at all times from dust, dirt, moisture and excessive heat. If possible, keep fasteners in their original containers. If this is not possible, used non-absorbent containers for storing the fasteners.

5.1.6 Always use the oldest stock of fasteners first.

JO-BOLT		
Visu-Lok	**"Standard"**	**Description**
PLT 110	FF	Flush head, steel
PLT 111	FFO	Flush head, steel, oversize
PLT 130	FFA	Millable head, aluminum
PLT 131	FFAO	Millable head, aluminum, oversize
PLT 210	PP	Protruding head, steel
PLT 211	PPO	Protruding head, steel, oversize
PLT 230	PPA	Protruding head, aluminum
PLT 231	PPAO	Protruding head, aluminum, oversize

DIAMETER			
Visu-Lok	**"Standard"**	**Nominal Diameter**	**Oversize Diameter**
5	164	5/32" (0.1635")	0.179"
6	200	3/16" (0.198")	0.214"
8	260	1/4" (0.259")	0.275"
10	312	5/16" (0.3105")	0.326"
12	375	3/8" (0.3735")	0.389"

GRIP LENGTH			
Grip Dash Number	**Grip Length**	**Grip Dash Number**	**Grip Length**
1	0.032 - 0.093"	17	1.032" - 1.093"
2	0.094 - 0.156"	18	1.095" - 1.156"
3	0.157 - 0.219"	19	1.157" - 1.219"
4	0.220" - 0.281"	20	1.220" - 1.281"
5	0.282" - 0.344"	21	1.282" - 1.344"
6	0.345" - 0.406"	22	1.345" - 1.406"
7	0.407" - 0.469"	23	1.407" - 1.469"
8	0.470" - 0.531"	24	1.470" - 1.531"
9	0.532" - 0.594"	25	1.532" - 1.594"
10	0.595" - 0.656"	26	1.595" - 1.656"
11	0.657" - 0.719"	27	1.657" - 1.719"
12	0.720" - 0.781"	28	1.720" - 1.781"
13	0.782" - 0.844"	29	1.782" - 1.844"
14	0.845" - 0.906"	30	1.845" - 1.906"
15	0.907" - 0.969"	31	1.907" - 1.969"
16	0.970" - 1.031"	32	1.970" - 2.031"

PLT 211 -6 -5

Figure 1 - Jo-Bolt Part Number Breakdown

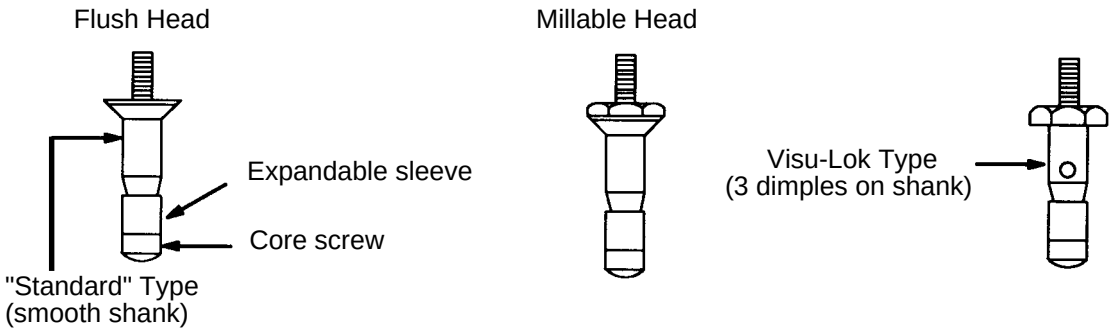


Figure 2 - General Description of Jo-Bolts

5.2 Hole Preparation

5.2.1 Wherever pre-drilling or drilling is specified herein, drill according to PPS 1.09.

5.2.2 Prepare holes for fastener installation as follows (see Figure 3):

Step 1. If the engineering drawing specifies dimpling of the hole, pre-drill for dimpling according to Table 1 before ram coin dimpling according to PPS 1.01 or PPS 1.07, as applicable.

Step 2. Pre-drill for final drilling according to Table 1.

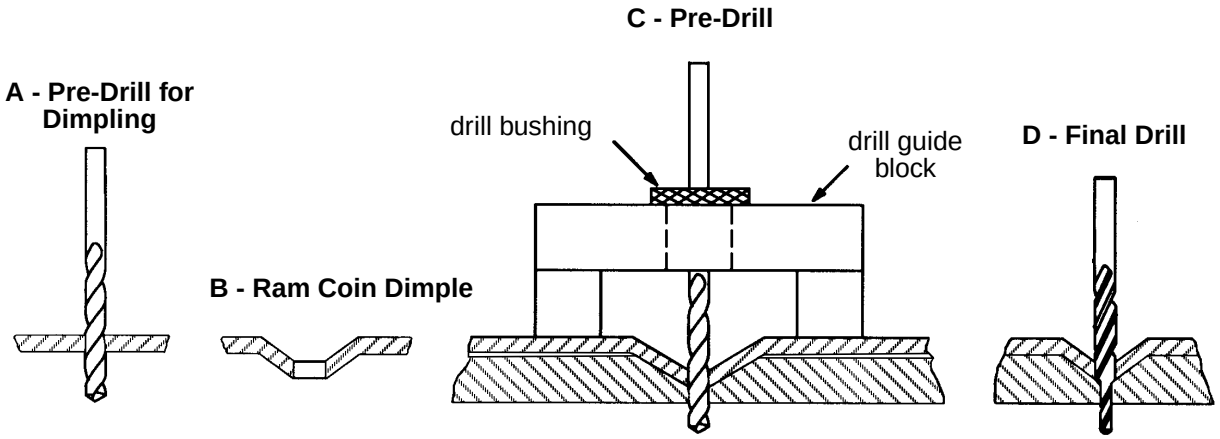
Step 3. If the engineering drawing specifies a countersunk hole, countersink using a micro-stop countersink according to PPS 1.33 to the countersink diameter specified in Table 2.

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

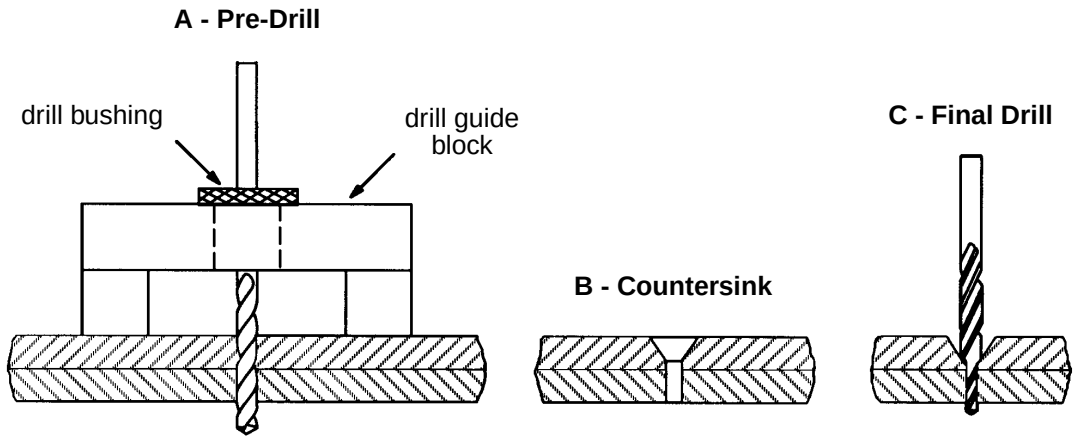
Step 5. Except for aluminum Jo-Bolt fasteners installed in aluminum structure, prime countersinks in metal surfaces with a coat of F1 zinc chromate primer according to PPS 34.02 or F19 Type 2 epoxy-polyamide primer according to PPS 34.08.

Step 6. For protruding head Jo-Bolts, manually break the edge of the hole 0.010" - 0.020" as on the side on which the Jo-Bolt head will seat according to PPS 27.05.

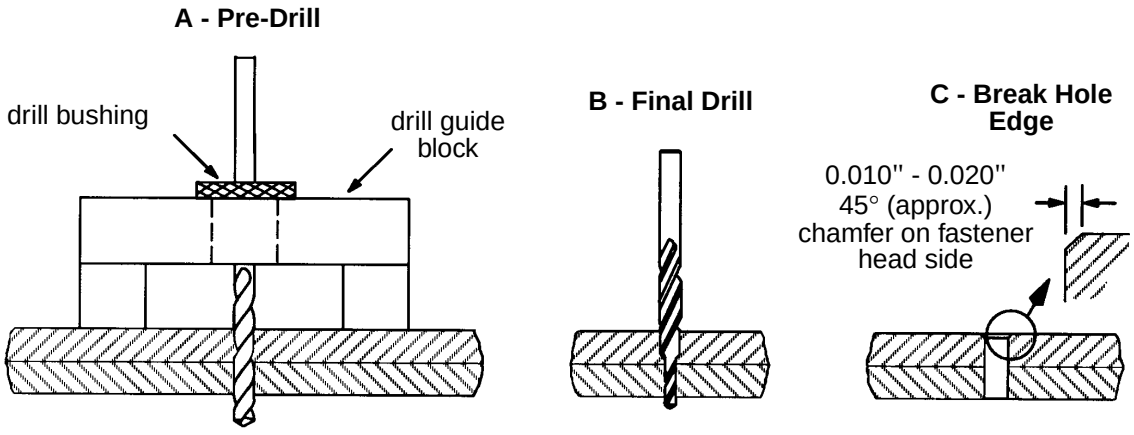
Step 7. Deburr the hole according to PPS 27.02 or PPS 27.04, as applicable. If possible, disassemble mating parts to facilitate removal of all chips and metal cuttings from faying surfaces.



Hole Preparation for Flush Head Fasteners - Dimpled Installation



Hole Preparation for Flush Head Fasteners - Countersunk Installation



Hole Preparation for Protruding Head Fasteners

Figure 3 - Hole Preparation Sequence

Table 1 - Pre-Drill for Dimpling and/or Final Drilling

FASTENER NOMINAL DIAMETER	PRE-DRILL FOR DIMPLING		RECOMMENDED PRE-DRILL FOR FINAL DRILLING
	FF & PLT 110	FFA & PLT 130	
5/32" (0.1635")	#29	#30	#27
3/16" (0.198")	#24	#20	#16
1/4" (0.259")	#6	#1	#1
5/16" (0.3105")	1/4"	---	L
3/8" (0.3735")	---	---	S

Table 2 - Countersinking

FASTENER NOMINAL DIAMETER	COUNTERSINK PILOT DIAMETER	COUNTERSINK DIAMETER (100°)	
		FLUSH HEAD (FF, PLT 110)	MILLABLE HEAD (FFA, PLT 130)
5/32" (0.1635")	0.144"	0.322" - 0.335"	0.269" - 0.279"
3/16" (0.198")	0.177"	0.375" - 0.388"	0.325" - 0.335"
1/4" (0.259")	0.228"	0.497" - 0.509"	0.450" - 0.460"
5/16" (0.3105")	0.290"	0.625" - 0.636"	---
3/8" (0.3735")	0.348"	0.752" - 0.762"	---

Table 3 - Final Hole Size Requirements

FASTENER NOMINAL DIAMETER	FINAL DRILL DATA	
	RECOMMENDED DRILL SIZE	HOLE LIMITS
5/32" (0.1635")	0.166"	0.165" - 0.168"
3/16" (0.198")	0.200"	0.199" - 0.202"
1/4" (0.259")	0.261"	0.260" - 0.263"
5/16" (0.3105")	0.313"	0.312" - 0.315"
3/8" (0.3735")	0.376"	0.375" - 0.378"

5.2.3 On a sample basis, check at random (across the entire pattern) the number of holes specified in Table 4 for conformance to the hole limit requirements, using a GO/NO-GO gauge or other hole measuring gauge. If any oversize holes are found in the sample, check every hole in the pattern. Refer all oversize holes to Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB for disposition.

5.2.3.1 While checking holes using a GO/NO-GO gauge or other hole measuring gauge, also check visually for hole ovality. For holes with a visually evident oval or out of round shape, check the hole diameter at several positions using suitable hole measurement equipment (e.g., vernier calliper, hole micrometer, etc.) to determine the minor and major diameters of the hole. The minor and major diameters of the hole must be within the minimum and maximum hole diameter tolerances, respectively. If the minor or major diameters of any oval hole in the sample are not within the minimum and maximum hole diameter tolerance, check every hole in the pattern for conformance to the hole limit requirements and visually for ovality as specified herein. Refer all non-conforming holes to Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB for disposition.

Table 4 - Hole Size Verification Sample Requirement

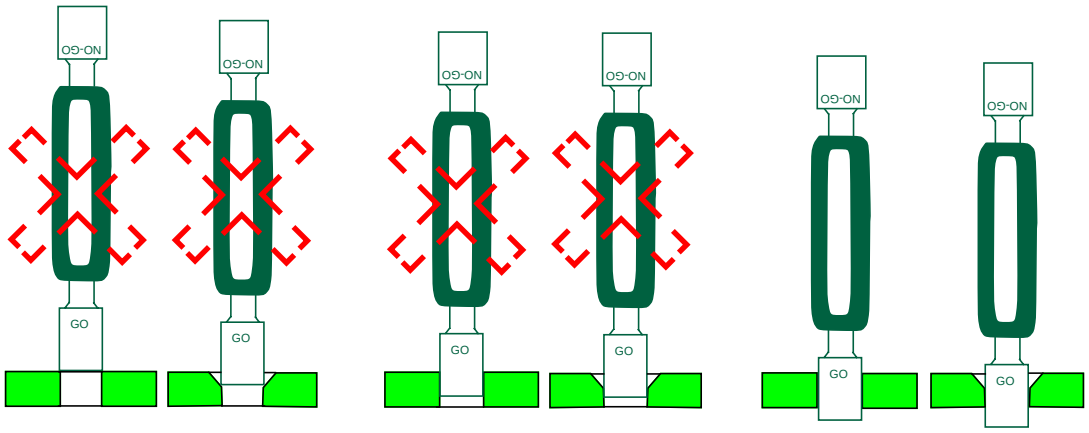
NUMBER OF HOLES IN PATTERN	REQUIRED SAMPLE SIZE
5 or less	all
6 - 50	5
51 - 90	7
91 - 150	11
151 - 280	13
281 - 500	16
more than 500	19

5.3 Use of Go/No-Go Gauges

5.3.1 Check selected fastener holes for conformance to the requirements of Table 3 using the applicable go/no-go gauge as follows (see Figure 4):

Step 1. Taking care not to force or rotate the go/no-go gauge, lightly insert the go end of the gauge into the fastener hole. If the go end of the gauge goes in only partially or does not go into the hole at all, the hole is **undersize**. Open undersize holes to the final diameter specified in Table 3.

Step 2. Lightly insert the no-go end of the plug gauge in the fastener hole. If the gauge goes completely into the hole, the hole is **oversize**; oversize holes are not acceptable and must be referred to Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB for disposition.

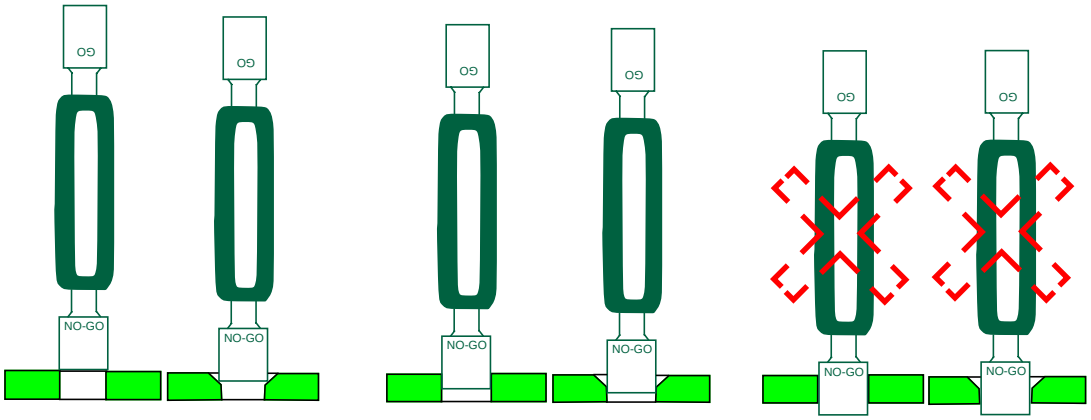


Does not go in.
UNDERSIZE HOLE

Goes only partially in.
UNDERSIZE HOLE

Goes in completely.
ACCEPTABLE

USE OF GO END



Does not go in.
ACCEPTABLE

Goes only partially in.
ACCEPTABLE

Goes in completely.
OVERSIZE HOLE

USE OF NO-GO END

Figure 4 - Use of Go/No-Go Gauges

5.4 Fastener Selection

5.4.1 Except as noted, install the type and diameter of fastener as specified on the Engineering drawing.

5.4.2 The fastener grip length specified on the engineering drawing, work order or assembly manual is only a reference length. To verify that the specified grip length is correct, ensure that the sheets are pulled up tight and measure the hole depth using a Jo-Bolt grip scale. The hole depth number shown on the grip scale corresponds to the Jo-Bolt pin grip length dash number. Always read to the next higher number as shown in Figure 5 (i.e., if the reading is past the **end** of the -4 marking, then use a -5 fastener). If a tapered sheet condition exists, use the grip length indicated for the thickest section.

5.4.3 If Jo-Bolts of the required length are not available, refer to Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB for written authority (e.g., fastpath RNC) to use the next longer fastener, together with one or two AN960-( ) L washers under the fastener head, to shim to the correct length.

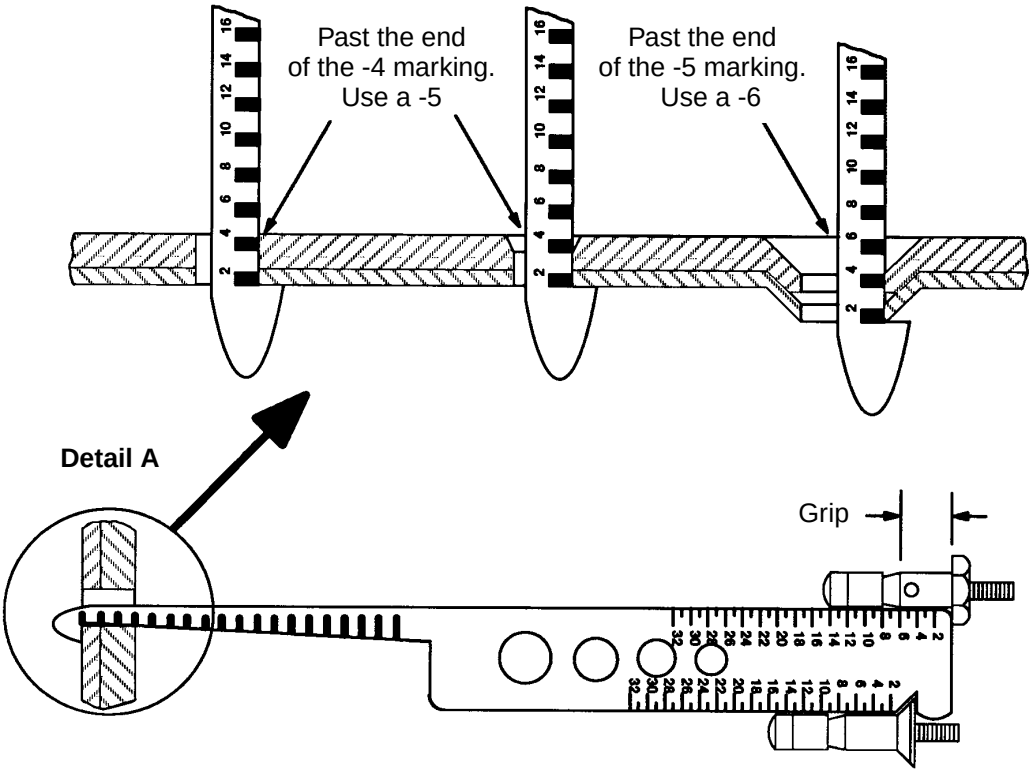


Figure 5 - Use of A Jo-Bolt Grip Scale

5.5 Set-Up of Installation Tools

5.5.1 If using a pneumatic pistol type installation tool (as shown in Figure 6), install the correct adapter assembly for the particular Jo-Bolt type and size (refer to Table 5 and Table 6 for adapter assemblies for use with S540MTD, OAINS3 and OA2N tools. Before connecting the pistol to an air line, allow the line to blow through and clear itself of any dirt or moisture that may have accumulated inside.

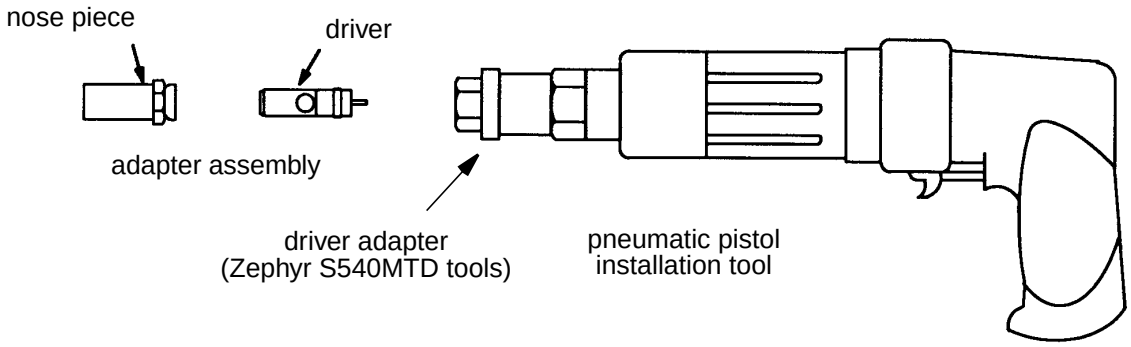


Figure 6 - Pneumatic Installation Tool and Adapter Assembly

Table 5 - Adapter Assemblies for Zephyr S540MTD Pneumatic Installation Tools

JO-BOLT			PISTOL/ADAPTER ASSEMBLY	ADAPTER ASSEMBLIES		
NOMINAL DIAMETER	VISU-LOK	"STANDARD"		DRIVER ADAPTER	NOSE	DRIVER
5/32" (0.1635")	PLT 110-5	FF 164	S540MTD-5	TD165	PW3652	TD1651
	PLT 130-5	FFA 164	S540MTD-5A	TD165A	PW3652A	
	PLT 210-5	PP 164	S540MTD-5P	TD165P	PW3652P	
	PLT 230-5	PPA 164				
3/16" (0.198")	PLT 110-6	FF 200	S540MTD-6	TD200	PW3002	TD2001
	PLT 130-6	FFA 200	S540MTD-6A	TD200A	PW3002A	
	PLT 210-6	PP 200	S540MTD-6P	TD200P	PW3002P	
	PLT 230-6	PPA 200				
1/4" (0.259")	PLT 110-8	FF 260	S540MTD-8	TD260	PW3602	TD2601
	PLT130-8	FFA 260	S540MTD-8A	TD260A	PW3602A	
	PLT 210-8	PP 260	S540MTD-8P	TD260P	PW3602P	
	PLT 230-8	PPA 260				
5/16" (0.3105")	PLT 110-10	FF 312	S540MTD-10	TD312	PW3122	TD3121
	PLT 210-10	PP 312	S540MTD-10P	TD312P	PW3122P	
3/8" (0.3735")	PLT 110-12	FF 375	S540MTD-12	PT375	PT3752	PT3751
	PLT 210-12	PP 375	S540MTD-12P	PT375P	PT3752P	

Table 6 - Adapter Assemblies for OAINS3 and OA2N Pneumatic Installation Tools

JO-BOLT			ADAPTER ASSEMBLIES	
NOMINAL DIAMETER	VISU-LOK	"STANDARD"	OAINS3	OA2N
5/32" (0.1635")	PLT 110-5	FF 164	NSEM 164 F	NS-T-EM-164 F
	PLT 130-5	FFA 164	NSEM 164 PAFA	NS-T-EM-164 FAPA
	PLT 210-5	PP 164	NSEM 164 P	NS-T-EM-164 P
	PLT 230-5	PPA 164	NSEM 164 PAFA	NS-T-EM-164 FAPA
3/16" (0.198")	PLT 110-6	FF 200	NSEM 200 F	NS-T-EM-200 F
	PLT 130-6	FFA 200	NSEM 200 PAFA	NS-T-EM 200-FAPA
	PLT 210-6	PP 200	NSEM 200 P	NS-T-EM-200 P
	PLT 230-6	PPA 200	NSEM 200 PAFA	NS-T-EM 200-FAPA
1/4" (0.259")	PLT 110-8	FF 260	NSEM 260 F	NS-T-EM-260 F
	PLT130-8	FFA 260	NSEM 260 PAFA	NS-T-EM-260 FAPA
	PLT 210-8	PP 260	NSEM 260 P	NS-T-EM-260 P
	PLT 230-8	PPA 260	NSEM 260 PAFA	NS-T-EM-260 FAPA
5/16" (0.3105")	PLT 110-10	FF 312	NSEM 312 F	NS-T-EM-312 F
	PLT 210-10	PP 312	NSEM 312 P	NS-T-EM-312 P
3/8" (0.3735")	PLT 110-12	FF 375	NSEM 375 F	NS-T-EM-375 F
	PLT 210-12	PP 375	NSEM 375 P	NS-T-EM-375 P

5.5.2 If the surrounding structure does not permit the use of a pneumatic installation tool, install the Jo-Bolts using a hand tool assembly (refer to Table 7 for the Zephyr hand tool assembly which may be used to install each particular Jo-Bolt size and head style). Assemble hand tools as shown in Figure 7.

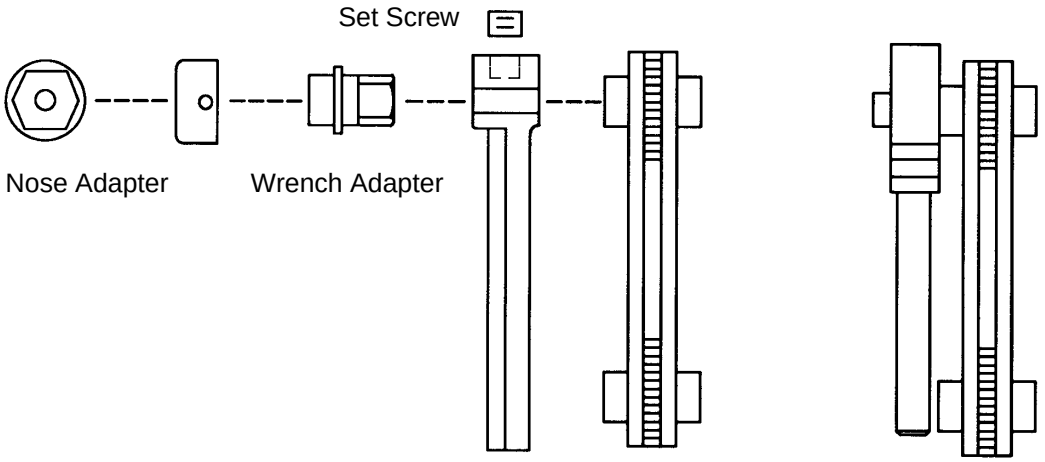


Figure 7 - Hand Installation Tool Assembly

Table 7 - Zephyr Hand Installation Tool Kits

JO-BOLT NOMINAL DIAMETER	JO-BOLT SERIES		ZEPHYR HAND TOOL ASSEMBLY				
	VISU-LOK	"STANDARD"	ASSEMBLY NUMBER	NOSE ADAPTER	WRENCH ADAPTER	HANDLE	RATCHET
5/32" (0.1635")	PLT 110-5	FF 164	HWF5	HN5	HW5	HW102	HW101
	PLT 130-5	FFA 164	HWP5A	HN5A			
	PLT 210-5	PP 164	HWP5	HN5P			
	PLT 230-5	PPA 164					
3/16" (0.198")	PLT 110-6	FF 200	HWF6	HN6	HW6		
	PLT 130-6	FFA 200	HWA6	HN6A			
	PLT 210-6	PP 200	HWP6	HN6P			
	PLT 230-6	PPA 200					
1/4" (0.259")	PLT 110-8	FF 260	HWF8	HN8	HW8	HW402	HW401
	PLT130-8	FFA 260	HWA8	HN8A			
	PLT 210-8	PP 260	HWP8	HN8P			
	PLT 230-8	PPA 260					
5/16" (0.3105")	PLT 110-10	FF 312	HWF10	HN10	HW10		
	PLT 210-10	PP 312	HWP10	HN10P			
3/8" (0.3735")	PLT 110-12	FF 375	HWF12	HN12	HW12		
	PLT 210-12	PP 375	HWP12	HN12P			

5.6 Installation of Jo-Bolts

5.6.1 Install Jo-Bolts using a pneumatic installation tool as follows:

Step 1. Insert the Jo-Bolt into the prepared hole.

Step 2. Place the driving gun over the bolt and ensure the nose piece is firmly seated on the fastener head.

Step 3. Holding the installation gun tightly against the bolt and square to the surface, depress the trigger to draw up the Jo-Bolt and break off the slabbed portion of the screw.

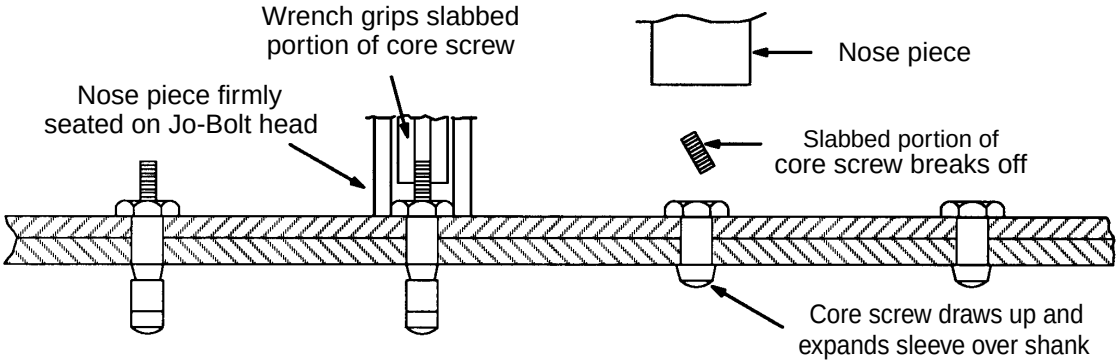


Figure 8 - Jo-Bolt Installation using Pneumatic Pistol Installation Tool

5.6.2 Install Jo-Bolts using a hand tool as follows (see Figure 9):

Step 1. Insert the Jo-Bolt in the prepared hole.

Step 2. Place the nose piece adapter of the hand installation tool squarely over the Jo-Bolt head and ensure that, for flush head fasteners, the tangs on the nose adapter are firmly seated in the head recesses or, for hex head fasteners, the recess in the nose adapter fully engages the hex flats on the Jo-Bolt head.

Step 3. Place the ratchet over the wrench adapter and turn until the slabbed portion of the core screw breaks off.

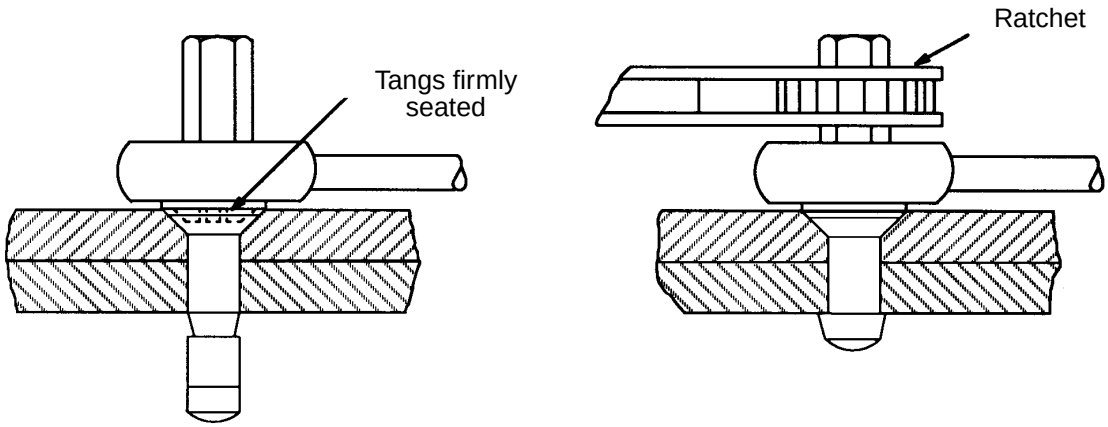


Figure 9 - Installation of Jo-Bolts using Hand Tool Assembly

5.7 Salvage of Holes Using Oversize Jo-Bolts

5.7.1 Only if authorized in writing by Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB, install oversize Jo-Bolts to salvage slightly oversize holes as follows:

Step 1. Open the existing fastener hole to the size specified in Table 8. Countersink diameters for oversize Jo-Bolts are the same as for standard size Jo-Bolts and shall be as specified in Table 2.

Step 2. Install oversize Jo-Bolts in the same manner and with the same tools as standard size Jo-Bolts.

Table 8 - Final Hole Preparation for Oversize Jo-Bolts

OVERSIZE JO-BOLT NOMINAL DIAMETER	FINAL DRILL	
	RECOMMENDED DRILL SIZE	HOLE LIMITS
-5 (0.179")	0.181"	0.180" - 0.183"
-6 (0.214")	0.216"	0.215" - 0.218"
-8 (0.275")	0.277"	0.276" - 0.279"
-10 (0.326")	0.328"	0.327" - 0.330"
-12 (0.389")	0.391"	0.390" - 0.393"

5.8 Post Installation Procedure

5.8.1 After installation of Jo-Bolts, proceed as follows:

Step 1. Ensure that flush type Jo-Bolt heads are within + 0.005" of the material surface. When measuring flushness in dimpled installations, take the measurement from the normal skin surface at a point at least 1/4" from the edge of the head. If the head of the Jo-Bolt protrudes by more than 0.005", remove the Jo-Bolt and check the countersink or dimple before replacing the Jo-Bolt.

Step 2. If torquing is specified on the engineering drawing, check installed Jo-Bolts by torquing the head of the bolt to the torque value specified in Table 9 in a counter clockwise direction using a slipping clutch torque wrench fitted with the nose piece from the installation tool adapter assembly specified in Table 5 or Table 7 (take care not to exceed the specified torque value). If torquing is not specified on the engineering drawing, check installed Jo-Bolts for tightness by holding the nose piece between the thumb and forefinger and applying light torque to the head of the bolt. Remove and replace any loose Jo-Bolts.

Table 9 - Torque Check Values

JO-BOLT SIZE	CHECK TORQUE VALUES
5/32" (0.1635")	4 in. lbs.
3/16" (0.198")	6 in. lbs.
1/4" (0.259")	10 in. lbs.
5/16" (0.3105")	20 in. lbs.
3/8" (0.3735")	30 in. lbs.

Step 3. Shave millable head Jo-Bolts (FAA and PLT 130 series) flush (0.000" - 0.005" above the sheet surface) using a standard rivet shaver equipped with a 1" diameter carbide cutter. When shaving millable Jo-Bolts, place the shaver off-centre on the Jo-Bolt head so that the steel core screw is located approximately 3/16" from the centre of the cutter. Take care during shaving to avoid damaging the surface adjacent to the fastener.

Step 4. Check the screw break-off to ensure that the limits specified in Table 10 are met. If the break-off is outside of the specified limits, remove and replace the Jo-Bolt.

Table 10 - Screw Break-Off Limits

JO-BOLT SIZE	BREAK-OFF DISTANCE FROM SKIN (see Figure 10)			
	FF or FFO PLT 110 or PLT 111	PP or PPO PLT 210 or PLT 211	FFA or FFAO PLT 130 or PLT 131	PPA or PPAO PLT 230 or PLT 231
5/32" (0.1635")	+0.020" -0.068"	+0.088" -0.000"	+0.088" -0.000"	+0.088" -0.000"
3/16" (0.198")	+0.015" -0.073"	+0.098" -0.010"	+0.098" -0.010"	+0.103" -0.015"
1/4" (0.259")	+0.010" -0.078"	+0.135" -0.047"	+0.098" -0.010"	+0.135" -0.047"
5/16" (0.3105")	+0.010" -0.083"	+0.146" -0.043"	---	---
3/8" (0.3735")	+0.010" -0.093"	+0.152" -0.049"	---	---

Step 5. Coat the break-off end of the Jo-Bolt core screw and the shaved head of millable type fasteners with zinc chromate F1 primer according to PPS 34.02or F19 Type 2 epoxy-polyamide primer according to PPS 34.08.

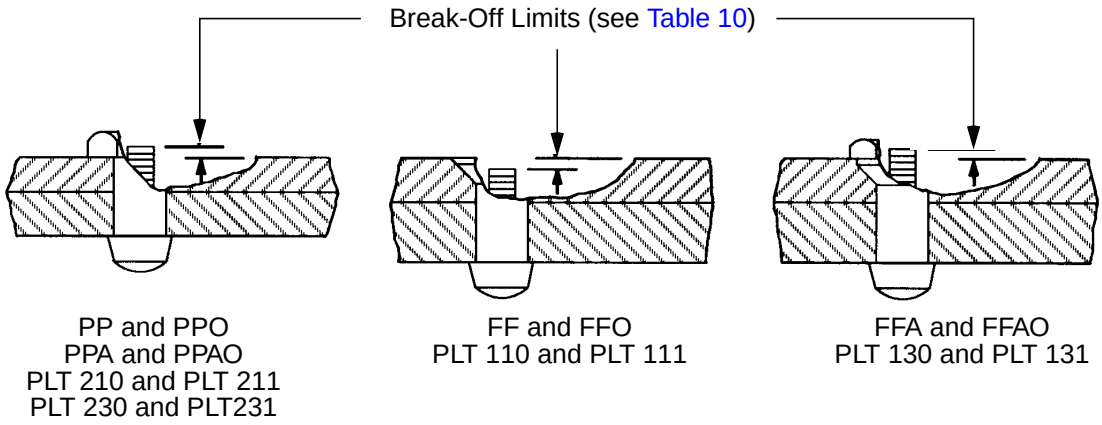


Figure 10 - Core Screw Break-Off Limits

5.9 Removal of Installed Fasteners

5.9.1 If the head of the Jo-Bolt screw is easily accessible, the fastener may be removed as follows, if necessary:

Step 1. Using a Phillips screwdriver, pliers or vise grips, thread the screw out of the nut and remove the swaged sleeve (Jo-Bolt screws have left hand threads).

Step 2. Drive out the Jo-Bolt nut using a suitable punch.

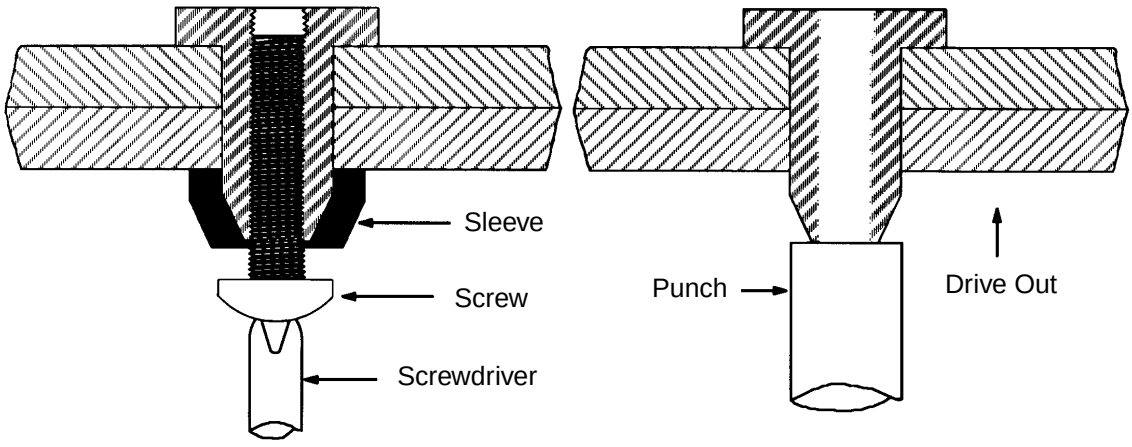


Figure 11 - Screw Removal Method

5.9.2 In blind applications where the screw break-off is too long or the fastener has not clamped up securely, the fastener may be removed as follows, if necessary:

Step 1. Select the correct size drill from Table 11 for the applicable fastener diameter.

Step 2. Engage the pneumatic gun nose adapter with the fastener head and hold in position using vise grip pliers.

Step 3. Drill out the screw and pick the nut out of the hole using a suitable punch (see Figure 12).

Table 11 - Screw Drill-Out Drill Sizes

JO-BOLT SIZE	DRILL SIZE
5/32" (0.1635")	#42
3/16" (0.198")	#35
1/4" (0.259")	#24
5/16" (0.3105")	#17
3/8" (0.3735")	#5

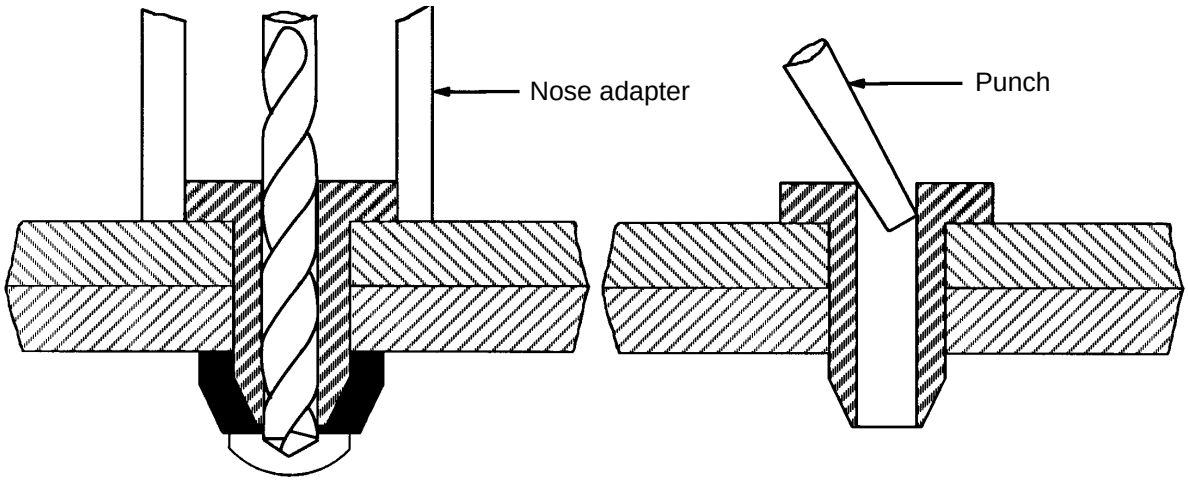


Figure 12 - Screw Drill-Out Removal of Jo-Bolt

5.9.3 In blind applications where the screw break-off is too short, but the fastener has clamped up securely, the fastener may be removed as follows, if necessary:

Step 1. Select a pilot drill from Table 12 and centre drill the Jo-Bolt to below the head/shank juncture (see Figure 13-A).

Step 2. Select the applicable shank drill from Table 12 and drill to the depth of the pilot hole (see Figure 13-B).

Step 3. Break off the Jo-Bolt head using a suitable drift punch of the same size as the shank drill (see Figure 13-C).

Step 4. Drive out the remaining shank using a suitable punch (see Figure 13-D).

Table 12 - Drill Sizes for Nut Drill-Out of Jo-Bolts

JO-BOLT SIZE	PILOT DRILL	SHANK DRILL
5/32" (0.1635")	#42	#23
3/16" (0.198")	#35	#12
1/4" (0.259")	#24	D
5/16" (0.3105")	#17	M
3/8" (0.3735")	#5	23/64

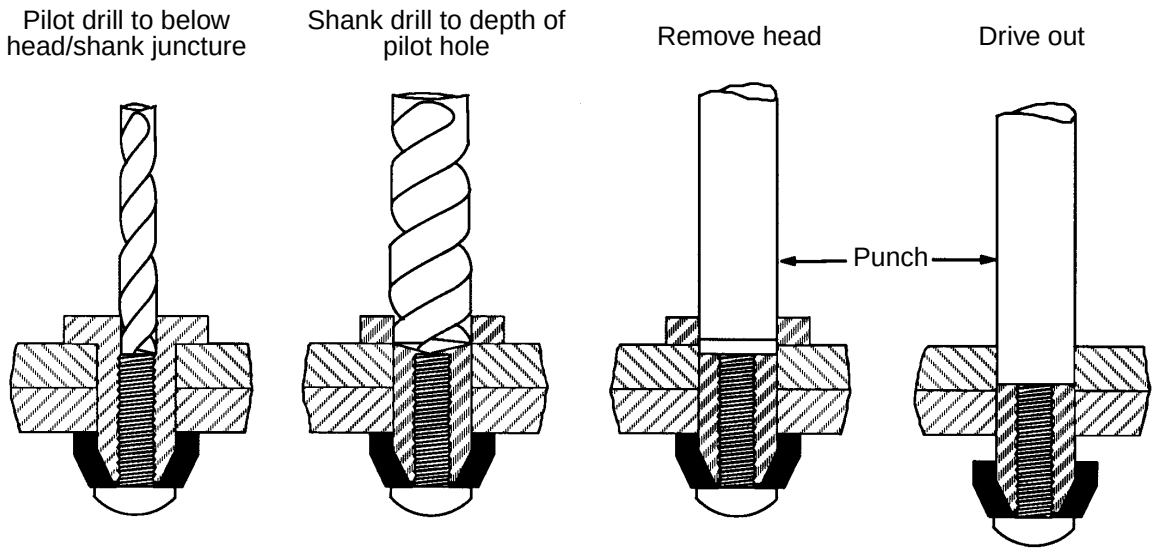


Fig. 13-A **Fig. 13-B** **Fig. 13-C** **Fig. 13-D**

Figure 13 - Nut Drill-Out Removal of Jo-Bolts

6 Requirements

6.1 The core screw break-off must be within the limits specified in Table 10.

6.2 There must be no gap between the head of the nut and the material.

6.3 Flush type Jo-Bolt heads must be within + 0.005" of the material surface. When measuring dimpled installations, take the measurement from the normal skin surface at a point at least 1/4" from the edge of the head.

6.4 Millable type Jo-Bolt heads must be flush to 0.005" above flush with the material surface after shaving.

7 Safety Precautions

7.1 The safety precautions specified herein are specific to Bombardier Toronto to meet Canadian Federal and Provincial government environmental, health and safety regulations. It is recommended that other facilities consider these safety precautions; however, suppliers, subcontractors and partners are responsible for ensuring that their own environmental, health and safety precautions satisfy the appropriate local government regulations.

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

7.3 Disconnect the shop air supply line from drillmotors or pneumatic installation tools when changing bits or tools.

8 Personnel Requirements

8.1 Personnel responsible for installation of Jo-Bolts 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 - Bombardier Toronto (de Havilland)

9.1 Keep installation tools clean and dry. Oil or grease moving parts. It is recommended that pneumatic tools have a few drops of light machine oil injected daily into the air inlet.

9.2 It is recommended that installation tools be checked periodically. Replace damaged or badly worn parts immediately, independent from the periodic check-up.

9.3 Alteration or rework of installation tools or accessories is prohibited unless authorized.

10 Additional Information

10.1 A small gap or sheet separation of 0.001 to 0.010" shall exist between sheets where a dimpled sheet nests into another dimple or into a countersink (see Figure 14).

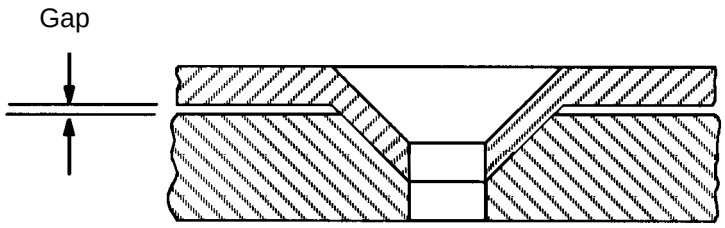


Figure 14 - Sheet Separation