BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 2.71

PRODUCTION PROCESS STANDARD

Installation of Pull Type Hi-Lite ST Fasteners

Issue 9
- This standard supersedes PPS 2.71, Issue 8.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS 2.71 related questions to michael.wright@aero.bombardier.com.
- This PPS is effective as of the distribution date.

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	Production Process Standards (PPS)	
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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 pull-type Hi-Lite ST 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 PPS 1.09 - Drilling and Reaming.

3.2 PPS 1.33 - Countersinking for Flush Head Fasteners.

3.3 PPS 13.26 - General Subcontractor Provisions.

3.4 PPS 31.17 - Manual Solvent Cleaning.

3.5 PPS 34.02 - Application of Alkyd Zinc Chromate Primer (F1).

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

4 Materials and Equipment

4.1 Materials

4.1.1 Pull-type Hi-Lite ST pins as specified on the engineering drawing and referenced in Table 10). Refer to Figure 1 for a pin part number breakdown.

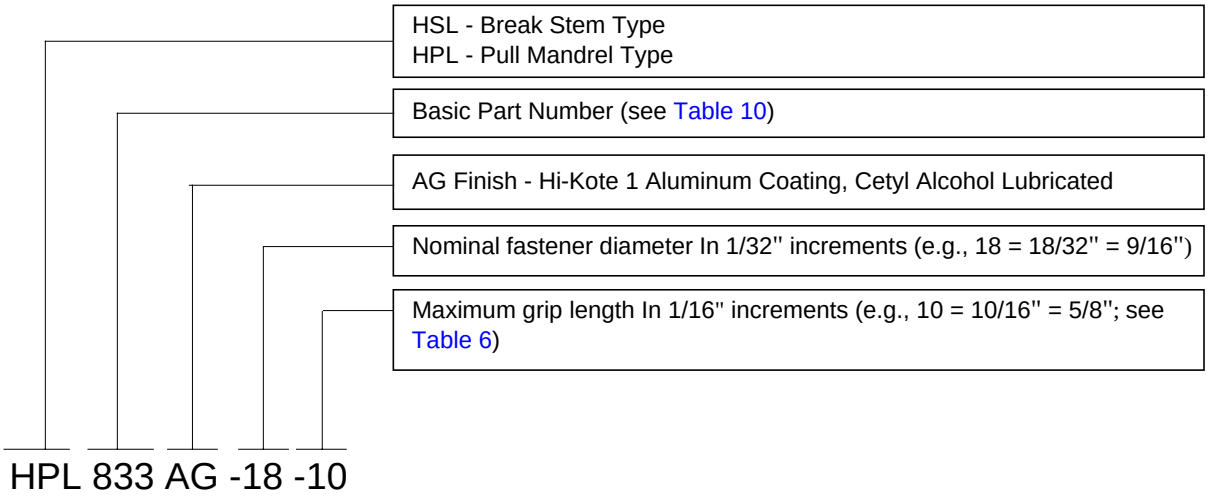


Figure 1 - Pull-type Hi-Lite ST Part Number Breakdown

Table 1 - Hi-Lok and Hi-Lite st Collars

PIN		COLLAR PART NUMBERS	
DIAMETER	**PART NUMBER**	**HI-SHEAR**	**BOMBARDIER**
standard size	HSL54AG	HST1488TP	B0206017TP
	HPL822AG	HL792TB	n/a
	HPL823AG		
1/64" oversize	HSL154AG	HST1488TP	B0206017TP
	HPL832AG	HL792TB	n/a
	HPL833AG		
1/32" oversize	HSL254AG	HST11688TP	n/a
	HPL842AG	HL972TB	n/a
	HPL843AG		

Note 1. Hi-Lite ST collars (HST1488TP or B0206017TP) are colour coded orange on the body of the collar. Hi-Lok collars are not colour coded.
Note 2. Collars for 1/32" oversize pins are not stocked at Bombardier Toronto (de Havilland).

4.1.1.1 At revision 4 of the engineering drawing for HSL54 Hi-Lite pins, the data for -14 and -16 diameter pins was changed slightly such that the pin thread length was slightly increased (see Table 2). As a result, it may occur that older and newer pins may be stocked together, as the part number is the same although the two pins are not identical (older pins being slightly shorter than the newer pins). It is acceptable to install either the older (shorter) or the newer (longer) diameter pin where use of -14 or -16 diameter HSL54 Hi-Lite pins are specified by the engineering drawing. The only difference in the assembly process is that the pin protrusion limits for the older and newer -14 and -16 pins are not the same; refer to Table 13 for the pin protrusion limits.

Table 2 - Overall Pin Length Change for HSL54 Hi-Lite Pins

NOMINAL DIAMETER	OVERALL PIN LENGTH	
	HSL54 REV 3 & PREVIOUS	HSL54 REV 4
-14	maximum grip length + **0.485**" ± 0.010"	maximum grip length + **0.500**" ± 0.010"
-16	maximum grip length + **0.525**" ± 0.010"	maximum grip length + **0.600**" ± 0.010"

4.1.2 Coolant, Blaser Swisslube Inc. Blasocut 2000.

4.1.3 MS21299 washers as specified in Table 7.

4.1.4 Oversize Hi-Lite ST pins as specified in Table 10.

4.1.5 Hi-Lok and Hi-Lite ST collars as specified on the engineering drawing. Refer to Table 1 for a cross reference of Hi-Shear and Bombardier part numbers.

4.2 Equipment

4.2.1 Positive feed drill (e.g., Intool Inc. Quackenbush 158QGDA-RAD-SU-RS).

4.2.2 Pre-drill and reamers as specified in Table 4. Use of special double margin HSCO oil hole drills (e.g., Koolcarb Inc. #ST7096BC-) and coolant fed step reamers (e.g., Koolcarb Inc.) is recommended.

4.2.3 Carr Lane drill bushing tips/collars as specified in Table 3.

4.2.4 Grip scale, Hi-Shear # 2-651.

4.2.5 Hydraulic power rig (e.g., Huck #940).

4.2.6 Hydraulic pulling heads used with hydraulic power rig, GBP Corp. GBP480 for inline nose pieces and GBP Corp. GBP4801-500 for offset nose pieces.

4.2.7 Nose pieces for hydraulic pin seating tools as specified in Table 8. Offset nose pieces are designed to operate with a 1/2" stroke while inline nose pieces are designed to operate with a 7/8" stroke. The tool will be damaged or destroyed if the wrong nose piece (i.e., the wrong stroke) is used. The stroke length is clearly marked on tools.

4.2.8 Pin stem breaker bar (e.g., Hi-Shear Corp. HPM7).

4.2.9 Pull mandrels, Hi-Shear Corp. HPM242-10-2.

4.2.10 Collar installation tools:

- angle nutrunners as specified in Table 9.
- Hi-Shear HLH102-( ) hand tool sockets, used with a 1/2" drive socket wrench.
- socket wrenches, box wrenches, etc.

4.2.11 Collar splitter, blade type (e.g., Huck #105).

4.2.12 Hollow mill collar cutter (e.g., Hi-Shear HS92000).

4.2.13 Support block (e.g., SD8853).

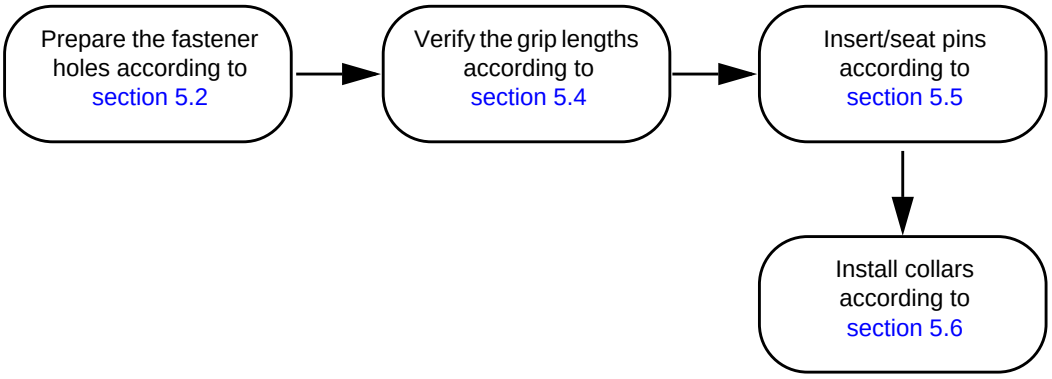
4.2.14 Pin protrusion gauge, Hi-Shear #2-1522HST (for -12 size fasteners only). For -14 through -20 size fasteners, use custom made gauges or suitable measurement tools to determine pin protrusion; ensure that custom made gauges, if used, are clearly marked with the minimum and maximum protrusion being checked using that gauge.

5 Procedure

5.1 General

5.1.1 Refer to Flow Chart 1 for the sequence for installation of Hi-Lite ST fasteners.

Flow Chart 1 - Installation of Hi-Lite ST Fasteners



5.1.2 In certain high strength structural joints (e.g., in PH15-5 alloy steels) standard type fasteners would be too soft for installation in interference fit holes. Pull-type Hi-Lite ST high strength Inconel 718 fasteners are designed for use in these applications. Refer to Table 10 for a detailed listing of the fasteners.

5.1.3 Pull-type Hi-Lite ST pins are lubricated by the manufacturer. Protect fasteners from dust, dirt, moisture and excessive heat. If possible, keep fasteners in their original containers. If this is not possible, use non-absorbent containers. Handle fasteners only from the threaded portion of the shank. Use oldest stock first.

5.1.4 Installation of pull-type Hi-Lite ST fasteners involves **pulling** the fastener pin through a close tolerance interference fit hole and installing a self-locking collar on the threaded end of the pin. Unlike other Hi-Lite fasteners, due to their material properties and the degree of interference required, under most circumstances pull-type Hi-Lite ST fasteners **should not** be seated using a rivet gun. If it is impossible to install the pin by pulling due to restrictions on tool access, it is acceptable to install pins using a rivet gun provided that the following conditions are met:

- Before installing a pin using a rivet gun, all adjacent fasteners must be installed by pulling as specified in section 5.5 and the collars of those fasteners installed according to section 5.6.
- Extreme care must be taken to ensure that neither the fastener head nor the surrounding structure are damaged by the rivet gun.

5.1.5 As the effectiveness of the fastener is dependent upon correct installation, it is essential to follow the installation procedure specified in this PPS closely.

5.1.6 At revision 4 of the engineering drawing for HSL54 Hi-Lite pins, the data for -14 and -16 diameter pins was changed slightly such that the pin thread length was slightly increased (see Table 2). As a result, it may occur that older and newer pins may be stocked together, as the part number is the same although the two pins are not identical (older pins being slightly shorter than the newer pins). It is acceptable to install either the older (shorter) or the newer (longer) diameter pin where use of -14 or -16 diameter HSL54 Hi-Lite pins are specified by the engineering drawing. The only difference in the assembly process is that the pin protrusion limits for the older and newer -14 and -16 pins are not the same; refer to Table 13 for the pin protrusion limits. Before installing -14 or -16 diameter HSL54 Hi-Lite pins measure or use a suitable comparator to determine if the pin installed is the older (shorter) or newer (longer) pin so that when checking for pin protrusion the correct pin protrusion limits may be verified.

5.2 Hole Preparation

5.2.1 Prepare fastener holes as follows:

Step 1. If the hole has not already been pre-drilled, assemble the drill bushing collar assembly specified in Table 3 with the drill bushing tip that will accommodate the pre-drill specified in Table 4. If the hole has already been pre-drilled, proceed to Step 4.

Step 2. Install the pre-drill specified in Table 4 and the drill bushing collar assembly in a Quackenbush positive feed drill (see paragraph 4.2.1).

Step 3. Pre-drill the hole according to PPS 1.09.

Step 4. Assemble the drill bushing collar assembly specified in Table 3 with the drill bushing tip that will accommodate the first reamer specified in Table 4.

Step 5. Install the first reamer specified in Table 4 and the drill bushing collar assembly in a Quackenbush positive feed drill (see paragraph 4.2.1).

Step 6. First ream the fastener hole according to PPS 1.09.

Step 7. Replace the drill bushing tip in the drill bushing collar assembly with a drill bushing tip that will accommodate the final reamer specified in Table 4.

Step 8. Install the final reamer specified in Table 4 in the Quackenbush positive feed drill (see paragraph 4.2.1).

Step 9. Final ream the fastener hole according to PPS 1.09. The final hole finish must be 63 R_a or finer.

Step 10. For flush head fasteners, if the countersink has not already been prepared countersink as specified in Table 4 according to PPS 1.33.

Step 11. Radius hole edges where the rivet head will seat as shown in Figure 2. Alternatively, if radiusing equipment is not available, it is acceptable to chamfer the hole edges as shown in Figure 3.

Step 12. If possible, disassemble mating parts and remove all chips and metal cuttings from faying surfaces.

Step 13. Except when the engineering drawing specifies wet installation, prime all countersinks for flush head pins with either F1 zinc chromate primer according to PPS 34.02 or F19 Type 2 epoxy-polyamide primer according to PPS 34.08. If flush head pins are to be wet installed priming is not required.

Table 3 - Drill Bushing Collar Assemblies

DRILL PLATE HOLE DIAMETER	DRILL PLATE DEPTH (Note 1)				
	3/4"	**1-3/4"**	**2-1/4"**	**2-3/8"**	**2-1/2"**
3/4"	A-23104 (.XXXX)	A-23115 (.XXXX)	n/a	n/a	A-22522 (.XXXX)
13/16"	n/a	n/a	n/a	A-23221 (.XXXX)	n/a
7/8"	n/a	n/a	A-23320 (.XXXX)	n/a	n/a

Note 1. (.XXXX) represents the pre-drill or reamer size.

Table 4 - Hole Preparation Data for Standard Size Hi-Lite Pins

FASTENER		PRE-DRILL DIA.	FIRST REAM		FINAL REAM		FINAL HOLE SIZE	100° COUNTERSINK DIAMETER (Note 1)
DASH #	NOMINAL DIA.		DIA.	TS 561.11.12	DIA.	TS 561.11.12		
-12	3/8"	0.348" (S)	0.358" (T)	MK 41	0.3710"	MK 47	0.3710" - 0.3725"	n/a
-14	7/16"	0.4060" (13/32")	0.4219" (27/64")	MK 42	0.4335"	MK 48	0.4335" - 0.4350"	n/a
-16	1/2"	0.4687" (15/32")	0.4844" (31/64")	MK 43	0.4960"	MK 49	0.4960" - 0.4975"	n/a
-18	9/16"	0.5312" (17/32")	0.5468" (35/64")	MK 44	0.5580"	MK 50	0.5580" - 0.5595"	1.124" - 1.134"
-20	5/8"	0.5937" (19/32")	0.6093" (39/64")	MK 45	0.6205"	MK 51	0.6205" - 0.6220"	1.255" - 1.265"

Note 1. The countersink diameter dimensions specified in this table are for reference only; install flush head fasteners so that the head protrusion limits specified in paragraph 6.2 are met.

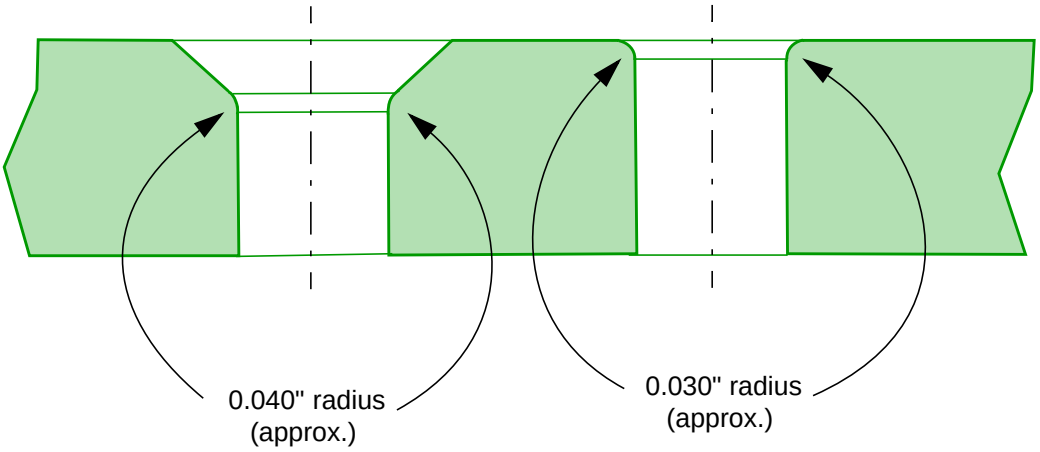


Figure 2 - Radiusing of Hole Edges for Fastener Seating

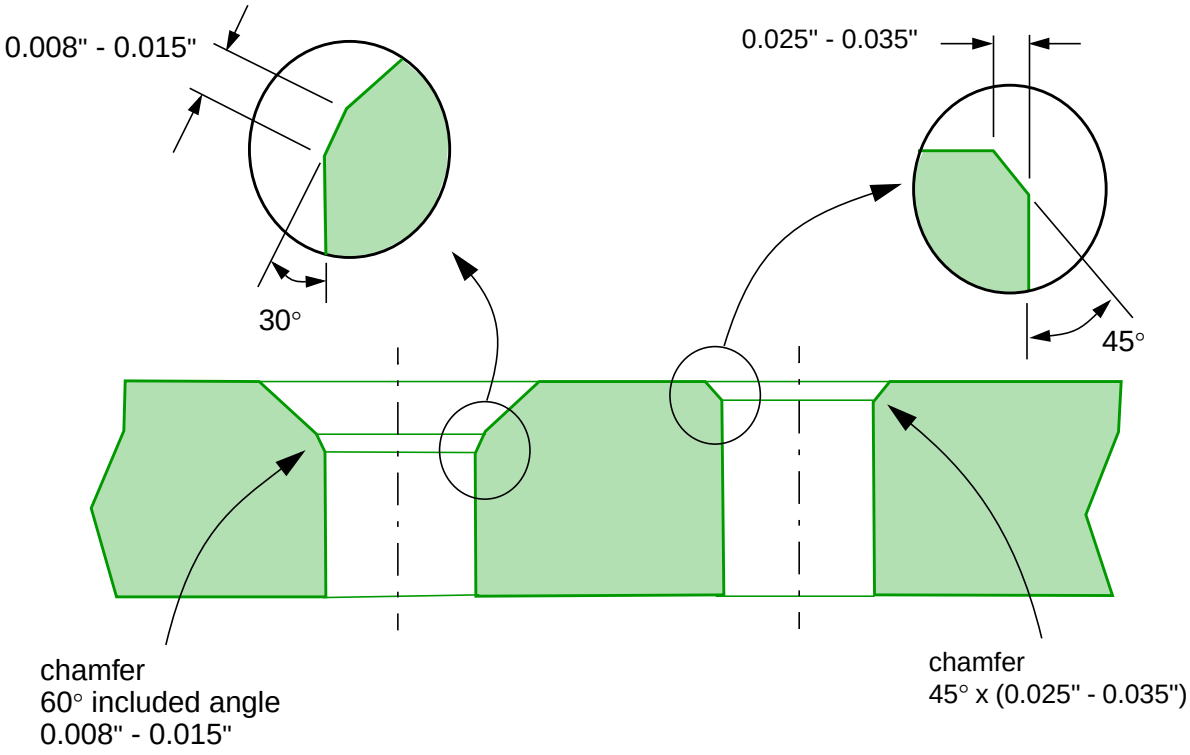


Figure 3 - Breaking of Hole Edges for Fastener Seating

5.2.2 To assist in minimizing the hole size it is acceptable to “flood” the hole with coolant (see materials section, paragraph 4.1.2) when drilling and reaming. Before installing the fastener, remove all trace of coolant from the hole.

5.2.3 On a sample basis, check at random (across the entire pattern) the number of holes specified in Table 5 for conformance to the hole limit requirements of Table 4 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 5 - Hole Size Verification Sample Requirements

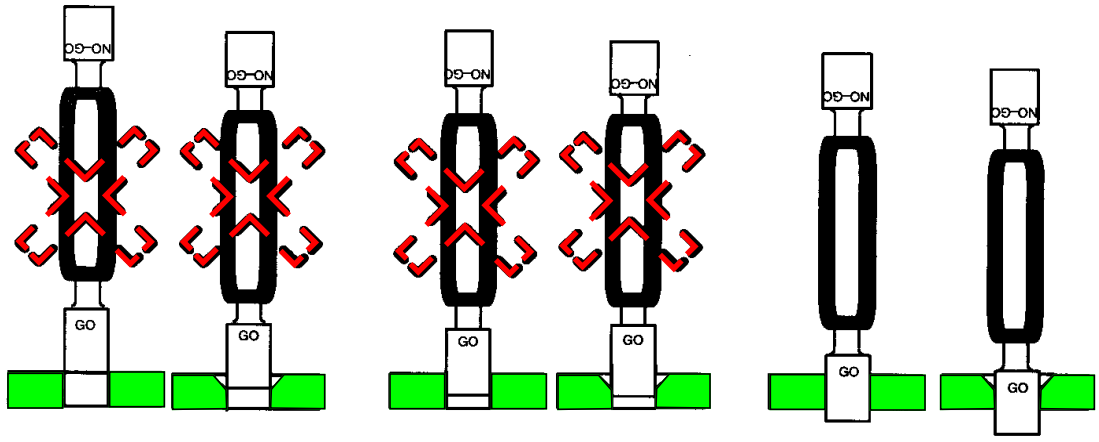
NUMBER OF HOLES IN PATTERN	REQUIRED SAMPLE SIZE
5 or less	all
6 - 50	5
51 - 90	7
91 - 150	11
151 - 280	13
281 - 500	16
more than 500	19

5.3 Use of Go/No-Go Gauges

5.3.1 Check selected fastener holes for conformance to the requirements of Table 4 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 4.

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.

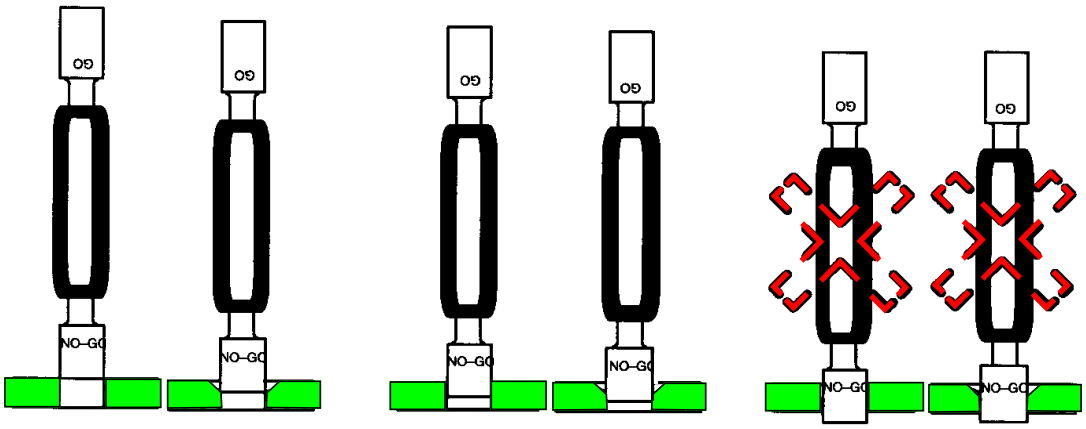


Does not go in.
UNDERSIZE HOLE

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 Grip Length Verification/Selection

5.4.1 Measure the hole depth to verify that the grip length specified on the engineering drawing is correct using a grip scale (see paragraph 4.2.4) as follows:

Step 1. Assemble all the components to be joined. If the engineering drawing specifies the use of a washer, include the washer in the measurement. Ensure the sheets are pulled up tight so that no gap exists.

Step 2. Insert the grip scale into the prepared hole and read the number on the scale. The hole depth number shown on the grip scale corresponds to the pin grip length. If the hole depth is even slightly beyond a particular indication on the scale, use the next larger size shown on the scale.

5.4.2 If the measured grip length does not agree with the specified grip length, use the measured length. Refer to Table 6 for the grip length ranges for each grip number. If the correct grip length pin is not available it is acceptable to use the next longer pin with the washer specified in Table 7.

Table 6 - Grip Ranges

GRIP NUMBER	GRIP LENGTH
10	0.563" - 0.625"
11	0.626" - 0.688"
12	0.689" - 0.750"
13	0.751" - 0.812"
14	0.813" - 0.875"
15	0.876" - 0.938"
16	0.939" - 1.000"
17	1.001" - 1.062"
18	1.063" - 1.125"
19	1.126" - 1.188"
20	1.189" - 1.250"
21	1.251" - 1.312"

GRIP NUMBER	GRIP LENGTH
22	1.313" - 1.375"
23	1.376" - 1.438"
24	1.439" - 1.500"
25	1.501" - 1.562"
26	1.563" - 1.625"
27	1.626" - 1.688"
28	1.689" - 1.750"
29	1.751" - 1.812"
30	1.813" - 1.875"
31	1.876" - 1.938"
32	1.939" - 2.000"

Table 7 - Washer Selection

FASTENER		WASHER	
DASH NUMBER	NOMINAL DIAMETER	COLLAR SIDE	HEAD SIDE
-12	3/8"	MS21299-6	MS21299C6
-14	7/16"	MS21299-7	MS21299C7
-16	1/2"	MS21299-8	MS21299C8
-18	9/16"	MS21299-9	MS21299C9
-20	5/8"	MS21299-10	MS21299C10

5.5 Seating of Pins

5.5.1 Seat pins in the fastener hole as follows:

Step 1. For HPL pins, screw the pull mandrel (see paragraph 4.2.9) into the pin.

Step 2. Assemble the nose piece specified in Table 8 to the hydraulic pin seating tool (see paragraph 4.2.6). When using offset nose pieces, use the hydraulic pin seating tool intended for use with offset nose pieces. Assemble the offset nose piece to the hydraulic pin seating tool according to paragraph 5.5.2.

Step 3. Check that the nose piece release mechanism is working properly by inserting and removing a pull mandrel.

Step 4. Insert the pull mandrel or break stem into the fastener hole.

Step 5. Fit the nose piece over the pull mandrel or break stem.

Step 6. With the fastener/nose piece orientated square to the sheet surface, use the hydraulic pin seating tool to pull the pin into the fastener hole. Unlike lockbolts, neither the break stem on HSL pins nor the pull mandrel on HPL pins should break off automatically after pin seating. If the break stem or pull mandrel breaks off during or immediately after seating of the pin, refer to Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB for disposition.

Step 7. Verify proper pin protrusion using a pin protrusion gauge (see paragraph 4.2.14).

Step 8. For HPL pins, unscrew the pull mandrel from the pin. For HSL pins, break off the pin break stem using a suitable bar.

5.5.2 Assemble offset nose pieces to the hydraulic pulling tool as follows (see Figure 5):

Step 1. Thread the collet adaptor (with the drawbar nut in position) on the hydraulic pulling head.

Step 2. Thread the nose piece housing and anvil adapter together and place them over the collet adaptor.

Step 3. Insert a 1/4" hex key into the drawbar nut and a 3/16" hex key through the hydraulic pulling head and tighten.

Step 4. Tighten the anvil adapter nut to secure the adapter anvil to the hydraulic pin seating tool.

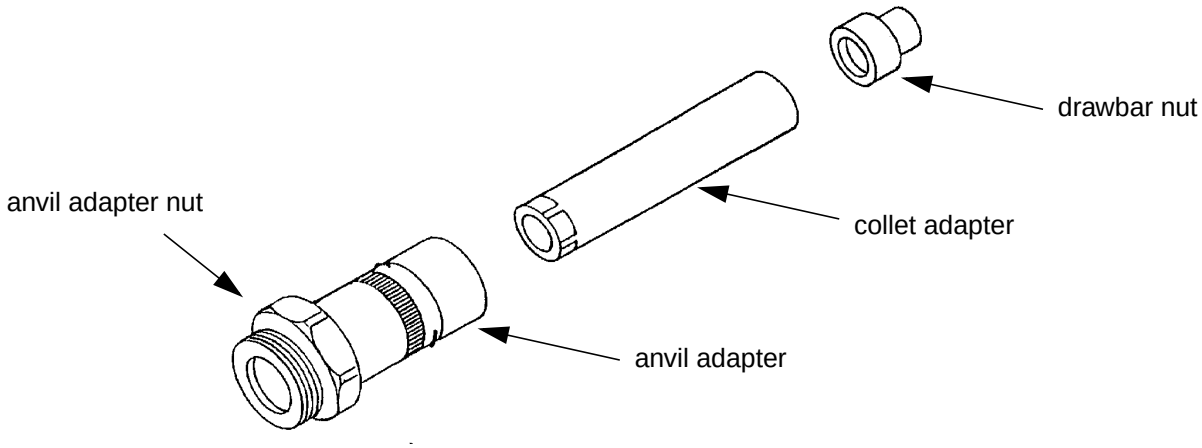


Figure 5 - Assembly of Offset Nose Piece to Hydraulic Pulling Head

Table 8 - Nose Pieces for Hydraulic Pulling Head

FASTENER		HI-SHEAR NOSE PIECE	
DASH #	NOMINAL DIAMETER	IN LINE	OFFSET
-12	3/8"	HPM5-12-53SR	n/a
-14	7/16"	HPM5-14-54SR	
-16	1/2"	HPM5-16-54SR	HPM2OF16-35SR
-18	9/16"	HPM5-18-55SR	HPM2OF20-35SR
-20	5/8"	n/a	

5.6 Collar Installation

5.6.1 Install collars as follows:

Step 1. Fit the collar specified on the engineering drawing over the threaded portion of the pin with the collar wrenching device outermost (see Figure 6).

Step 2. Using a nutrunner as specified in Table 9 or other collar installation tool (see paragraph 4.2.10) tighten the collar until the collar wrenching device shears off. When installing double hex type collars (e.g., B0206017TP) ensure that the installation tool engages only the collar wrenching device and not the hex of the collar itself.

5.6.2 For wet installations, the collar must be fully installed (i.e., the collar wrenching device sheared off) before the sealant has cured.

5.6.3 Any rotation of the pin during collar installation indicates that insufficient interference has been achieved and is not acceptable.

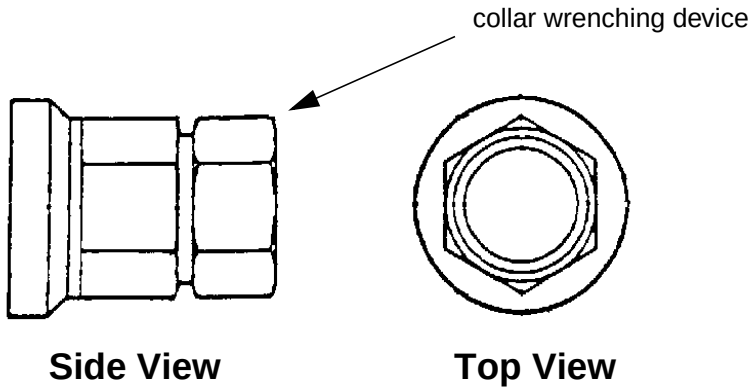


Figure 6 - Double Hex Hi-Lite ST Collar (e.g., B0206017TP)

Table 9 - Nutrunner Selection

OMEGA NUTRUNNER	TO FIT NUT SIZE
OMW251-21	7/32" (0.218")
OMW251-25	1/4" (0.250")
OMW251-28	9/32" (0.281")
OMW251-31	5/16" (0.312")
OMW251-34	11/32" (0.343")
OMW251-37	3/8" (0.375")
OMW251-43	7/16" (0.437")

5.7 Installation of Oversize Pull-Type Hi-Lite ST Pins

5.7.1 Only if authorized in writing by Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB, install oversize pull-type Hi-Lite ST pins for salvage of oversize holes. Select the oversize pin part number from Table 10 for the corresponding original standard size pin. Use the 1/32" oversize pin only when the hole size exceeds the final hole diameter specified in Table 11 for 1/64" oversize. Use the same grip number of the standard size pin for the oversize pin. At Bombardier Toronto (de Havilland), 1/64" oversize pins are stocked in even dash grip lengths only. If an odd dash grip length 1/64" oversize pin is required, install the next larger even dash grip length pin with a washer as specified in Table 7. 1/32" oversize pins are not stocked at Bombardier Toronto (de Havilland).

5.7.2 For 1/64" oversize pins use the same collar as specified for the standard pin. For 1/32" oversize pins use the collar specified in Table 1.

5.7.3 Install oversize pins using the same procedure and tools as for standard size pins except refer to Table 11 or Table 12 for reamer sizes and hole diameters for oversize pins. The countersink diameters for oversize pins are the same as those for standard size pins.

Table 10 - Standard and Oversize Hi-Lite ST Pins

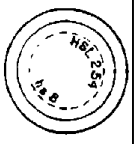
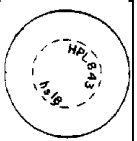
TYPE AND HEAD STYLE	PIN MATERIAL	STANDARD SIZE		1/64" OVERSIZE		1/32" OVERSIZE	
		PART NUMBER	HEAD MARKING	PART NUMBER	HEAD MARKING	PART NUMBER	HEAD MARKING
Protruding Tension Head with Break Stem 	Inconel 718	HSL54		HSL154		HSL 254	
Protruding Tension Head with Pull Mandrel 	Inconel 718	HPL822		HPL832		HPL842	
100° Flush Tension Head with Pull Mandrel 	Inconel 718	HPL823		HPL833		HPL843	

Table 11 - Hole Preparation Data for 1/64" Oversize Hi-Lite Pins

1/64" OVERSIZE FASTENER		REAMER		FINAL HOLE SIZE	100° COUNTERSINK DIAMETER (Note 1)
DASH #	NOMINAL DIA.	DIA.	TS 561.11.12		
-12	25/64"	0.3866	MK 52	0.3866" - 0.3881"	n/a
-14	29/64"	0.4491	MK 53	0.4491" - 0.4506"	n/a
-16	33/64"	0.5116	MK 54	0.5116" - 0.5131"	n/a
-18	37/64"	0.5736	MK 55	0.5736" - 0.5751"	1.124" - 1.134"
-20	41/64"	0.6361	MK 56	0.6361" - 0.6376"	1.255" - 1.265"

Note 1. The countersink diameter dimensions specified in this table are for reference only; install flush head fasteners so that the head protrusion limits specified in paragraph 6.2 are met.

Table 12 - Hole Preparation Data for 1/32" Oversize Hi-Lite Pins

1/32" OVERSIZE FASTENER		REAMER		FINAL HOLE SIZE	100° COUNTERSINK DIAMETER (Note 1)
DASH #	NOMINAL DIA.	DIA.	TS 561.11.12		
-12	13/32"	0.4022"	MK 57	0.4022" - 0.4037"	n/a
-14	15/32"	0.4647"	MK 58	0.4647" - 0.4662"	n/a
-16	17/32"	0.5272"	MK 59	0.5272" - 0.5287"	n/a
-18	19/32"	0.5892"	MK 60	0.5892" - 0.5907"	1.124" - 1.134"
-20	21/32"	0.6517"	MK 61	0.6517" - 0.6532"	1.255" - 1.265"

Note 1. The countersink diameter dimensions specified in this table are for reference only; install flush head fasteners so that the head protrusion limits specified in paragraph 6.2 are met.

5.8 Post Installation Clean-Up

5.8.1 After the installation of the fastener is complete, remove excess F1 zinc chromate primer by solvent cleaning according to PPS 31.17.

5.9 Removal of Installed Fasteners

5.9.1 If necessary, remove installed fasteners as follows:

Step 1. For hex type collars (e.g., B0206017TP), use a hex socket or wrench to unscrew the collar. For non-hex type collars (e.g., HL792), use a collar splitter (see paragraph 4.2.11) to remove the installed collar. Alternatively, it is acceptable to mill away the collar using a hollow mill collar cutter (see paragraph 4.2.12) provided that the surface is protected by a fibre washer during milling.

Step 2. Support the head side of the structure using a support block (see paragraph 4.2.13).

Step 3. Punch the fastener shank out of the hole using a flat punch with slightly rounded corners to prevent damage to the walls of the fastener hole.

6 Requirements

6.1 The gap, if any, under the head or collar of an installed fastener must be less than 0.002" (i.e., a 0.002" feeler gauge must not be able to touch the fastener shank).

6.2 The head of flush head fasteners shall protrude 0.000" - 0.010" above the surface.

6.3 Check the pin protrusion for conformance to the requirements of Table 13.

6.4 There shall be no evidence of pin rotation in installed fasteners.

Table 13 - Pin Protrusion Limits

Hi-Lite Pin		Pin Protrusion	
Nominal Pin Diameter	**Pin Drawing Revision**	**Minimum**	**Maximum**
-12	all	0.410"	0.492"
-14 (Note 1)	HSL54 Rev 3 & Previous	0.475"	0.557"
	HSL54 Rev 4 & Subsequent	0.490"	0.572"
-16 (Note 1)	HSL54 Rev 3 & Previous	0.515"	0.597"
	HSL54 Rev 4 & Subsequent	0.590"	0.672"
-18	all	0.760"	0.842"
-20	all	0.815"	0.897"

Note 1. At revision 4 of the engineering drawing for HSL54 Hi-Lite pins, the data for -14 and -16 diameter pins was changed slightly such that the pin thread length was slightly increased (see Table 2). As a result, it may occur that older and newer pins may be stocked together, as the part number is the same although the two pins are not identical (older pins being slightly shorter than the newer pins). It is acceptable to install either the older (shorter) or the newer (longer) diameter pin where use of -14 or -16 diameter HSL54 Hi-Lite pins are specified by the engineering drawing. The only difference in the assembly process is that the pin protrusion limits for the older and newer -14 and -16 pins are not the same.

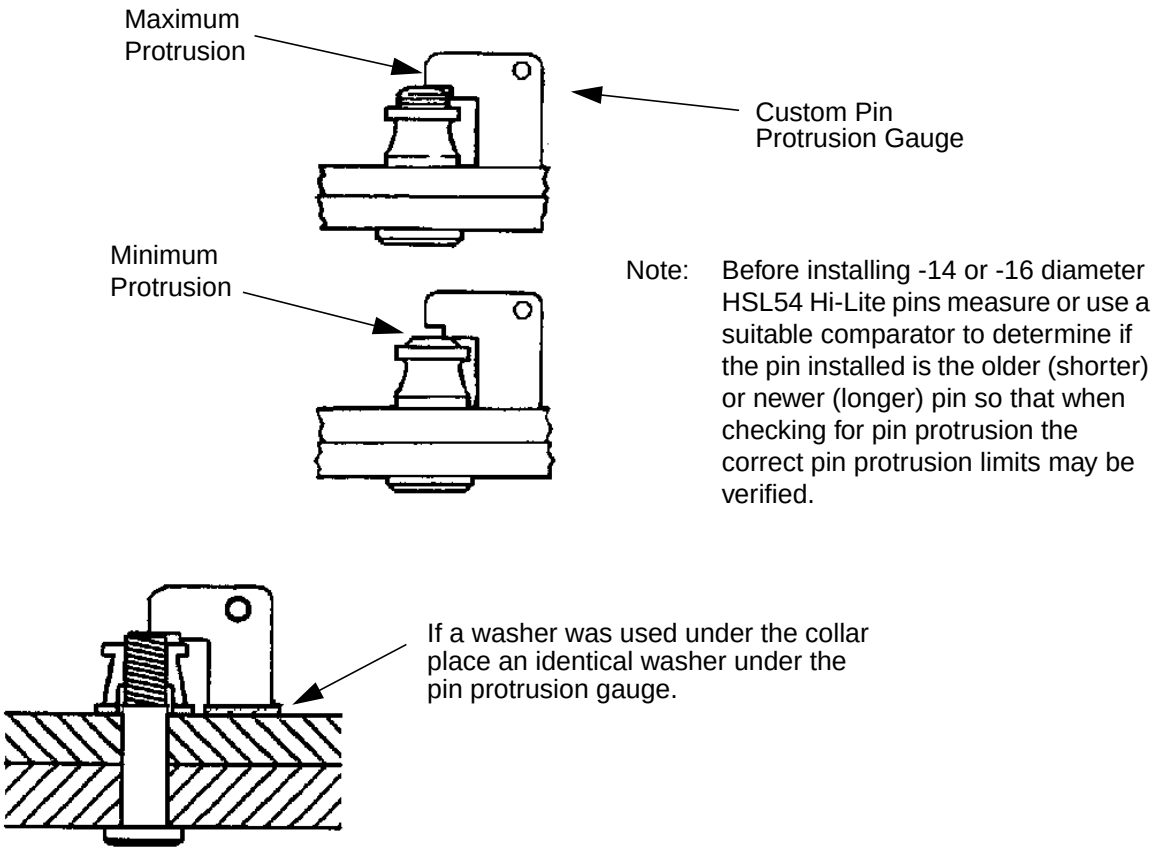


Figure 7 - Pin Protrusion Check

7 Safety Precautions

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

7.2 Refer to PPS 34.02 for the safety precautions for handling/application of zinc chromate primer.

7.3 Refer to PPS 31.17 for the safety precautions for handling/use of solvents.

8 Personnel Requirements

8.1 Personnel must have a good working knowledge of the applicable procedure and requirements as specified herein and must have exhibited their competency to their supervisor.