BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 2.69

PRODUCTION PROCESS STANDARD

INSTALLATION OF HUCK-CLINCH BLIND RIVETS

Issue 5
- This standard supersedes PPS 2.69, Issue 4.
- 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 PPS (Production Process Standard) specifies the procedure and requirements for installation of Huck-Clinch blind rivets.

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

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

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

2 HAZARDOUS MATERIALS

2.1 Before receipt at Bombardier Aerospace Toronto, all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Aerospace Toronto 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 Aerospace Toronto Environment, Health and Safety Department.

3 REFERENCES

3.1 PPS 1.01 - Dimpling Aluminum Alloys.

3.2 PPS 1.07 - Dimpling of Ferrous, Nickel and Titanium Alloys.

3.3 PPS 1.09 - Drilling and Reaming.

3.4 PPS 1.33 - Countersinking for Flush Head Rivets.

3.5 PPS 1.48 - Set-up and Operation of Rivet Shavers.

3.6 PPS 13.26 - General Subcontractor Provisions.

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

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

4 MATERIALS AND EQUIPMENT

4.1 Materials

4.1.1 Huck-Clinch blind rivets as specified on the engineering drawing. Refer to Figure 1 for a part number breakdown and Figure 2 for a general description. Keep in their original packages until used and protect from contamination such as dust, dirt, moisture or excessive heat that could damage or destroy the lubricant coating applied by the manufacturer.

HUCK CLINCH RIVET TYPE
HC3212 - Flush head - aluminum alloy (nominal dia.)
HC3213 - Universal head - aluminum alloy (nominal dia.)
HC3214 - Reduced flush head - aluminum alloy (nominal dia.)
HC3242 - Flush head - aluminum alloy (1/64" oversize dia.)
HC3213 - Universal head - monel (1/64" oversize dia.)

NOMINAL SHANK DIAMETER - 32nds of an inch
-4 = 1/8"
-5 = 5/32"
-6 = 3/16"

GRIP LENGTH

GRIP NO.	MATERIAL THICKNESS RANGE		GRIP NO.	MATERIAL THICKNESS RANGE	
	MIN.	MAX.		MIN.	MAX.
-1	Note (1)	0.062	-7	0.376	0.437
-2	.063 Note (2)	0.125	-8	0.438	0.500
-3	0.126	0.187	-9	0.501	0.562
-4	0.188	0.250	-10	0.563	0.625
-5	0.251	0.312	-11	0.626	0.687
-6	0.313	0.375	-12	0.688	0.750

	RIVET DIAMETER		
GRIP LENGTH NOTES	-4	-5	-6
Note 1 - Minimum grip length for universal head rivets.	.025	.031	.037
Note 2 - Minimum grip length for flush head rivets (Not available in -1 grip length)	.045	.063	.073

HC3214 -5 -7

Figure 1 - Breakdown of Huck-Clinch Rivet Part Number

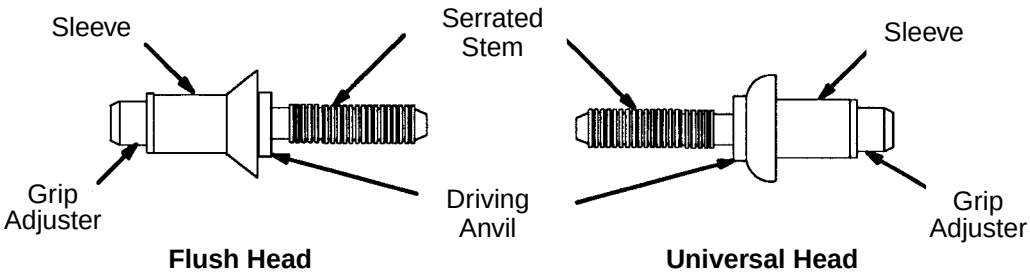


Figure 2 - General Description of Huck-Clinch Blind Rivets

4.2 Equipment

4.2.1 Rivet installation guns and pulling heads as listed in Table V. Refer to Figure 5 for a reference of tool dimensions.

4.2.2 Grip gauge, Cherry #269C3.

4.2.3 Drilling aid fixture (e.g., TS.519.10.14 MK1, MK2 and MK3).

4.2.4 Hand riveter, CherryMax G-27.

5 PROCEDURE

5.1 General

5.1.1 Huck-Clinch blind rivets are high strength blind rivets that deliver high clamp-up and positive hole fill.

5.1.2 Huck-Clinch blind rivets are set and locked by a single action pulling tool that pulls the mandrel stem to form the blind head, form the internal solid circle lock and simultaneously break off the mandrel stem.

5.1.3 Each Huck-Clinch rivet is supplied fully assembled with a driving anvil that is discarded after installing the rivet.

5.1.4 Drill holes according to PPS 1.09.

5.2 Preparation of Fastener Holes

5.2.1 Prepare holes for installation of Huck-Clinch blind rivets as follows:

Step 1. Pre-drill the assembled parts through the pilot holes (if provided) according to Table I.

Table I - Pre-Drill Data

FASTENER DASH NUMBER	RECOMMENDED PRE-DRILL
-4	#40
-5	#30
-6	#21

Step 2. If countersinking of the fastener hole is specified on the engineering drawing and it is not necessary to use a full size pilot, countersink holes according to PPS 1.33 to the diameter specified in Table II.

Table II - Reference Countersink Data

FASTENER			COUNTERSINK	
PART NUMBER	HEAD STYLE	NOMINAL DIAMETER	PILOT DIAMETER	REFERENCE COUNTERSINK DIAMETER
HC3212	Flush Head	1/8" (-4)	3/32"	0.211"- 0.221"
		5/32" (-5)	1/8"	0.272"- 0.282"
		3/16" (-6)	5/32"	0.339"- 0.349"
HC3214	Reduced Flush Head	1/8" (-4)	3/32"	0.191"- 0.196"
		5/32" (-5)	1/8"	0.242"- 0.247"
		3/16" (-6)	5/32"	0.297"- 0.302"

Note 1. The countersink diameter limits specified herein are for reference only; install flush head Huck-Clinch blind rivets so that the head protrusion limits specified in Figure 10 are met.
Note 2. The countersink diameter requirements for the corresponding oversize Huck-Clinch blind rivet is the same as that for the standard size fastener (i.e., the countersink is not oversize).

Step 3. If dimpling of fastener holes is specified on the engineering drawing, dimple holes according to PPS 1.01 or 1.07, as applicable.

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

Table III - Final Drilling Data

FASTENER DASH NUMBER	STANDARD HOLE FINAL DRILL		OVERSIZE HOLE FINAL DRILL	
	RECOMMENDED DRILL SIZE	HOLE SIZE	RECOMMENDED DRILL SIZE	HOLE SIZE
-4	#30	0.129" - 0.132"	27	0.143" - 0.146"
-5	#20	0.160" - 0.164"	#16	0.176" - 0.180"
-6	#10	0.192" - 0.196"	#5	0.205" - 0.209"

Step 5. If countersinking of the fastener hole is specified on the engineering drawing and it is desired to countersink using a full size pilot, countersink holes according to PPS 1.33 to the diameter specified in Table II

Step 6. Except for aluminum Huck-Clinch blind rivets installed in aluminum structure, prime all countersunk surfaces in metal parts 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.

5.2.2 On a sample basis, check at random (across the entire pattern) the number of holes specified in Table IV 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 Aerospace Toronto MRB or Bombardier Aerospace Toronto delegated MRB for disposition.

5.2.2.1 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 IV - Hole Size Verification Sample Requirements

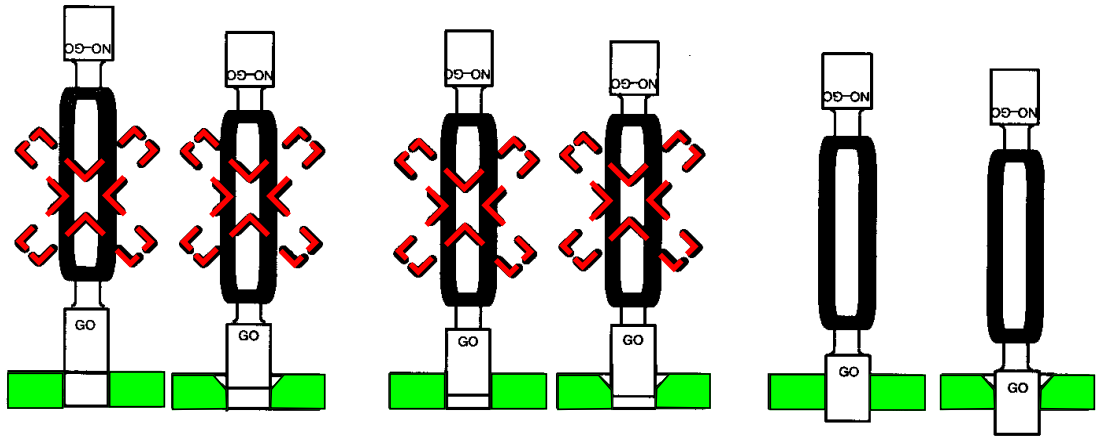
NUMBER OF HOLES IN PATTERN	REQUIRED SAMPLE SIZE
5 or less	all
6 - 50	5
51 - 90	7
91 - 150	11
151 - 280	13
281 - 500	16
more than 500	19

5.3 Use of Go/No-Go Gauges

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

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 III.

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 Aerospace Toronto MRB or Bombardier Aerospace Toronto delegated MRB for disposition.

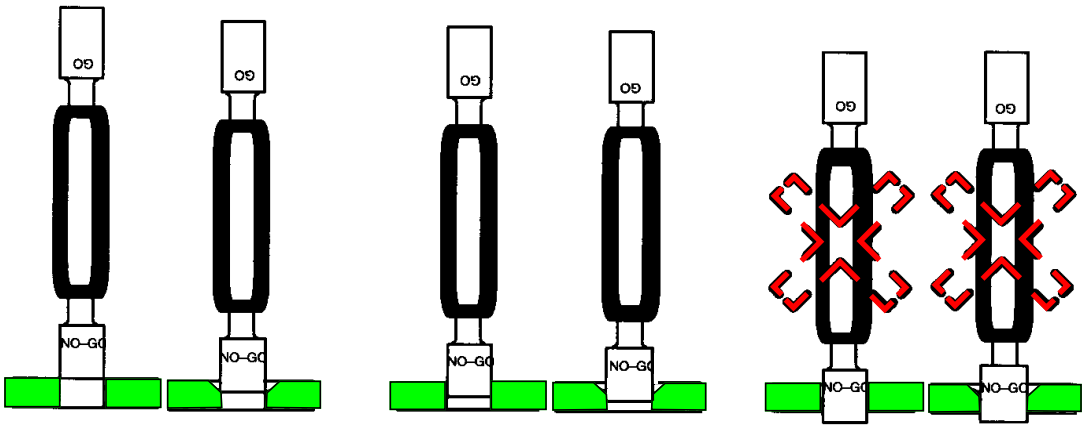


Does not go in.
UNDERSIZE HOLE

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 3 - Use of Go/No-Go Gauges

5.4 Fastener Selection

5.4.1 Use the type and diameter of fastener specified on the engineering drawing.

5.4.2 To verify that the specified grip length is correct, measure the combined material thickness after final drilling using a grip gauge as shown in Figure 4. If the hole depth is even slightly beyond the end of a particular indication on the scale, use the next larger Huck-Clinch blind rivet grip length. The fastener grip length specified on the engineering drawing is only a *reference length* and when the grip length determined by measurement does not agree with the specified grip length, use the measured grip length.

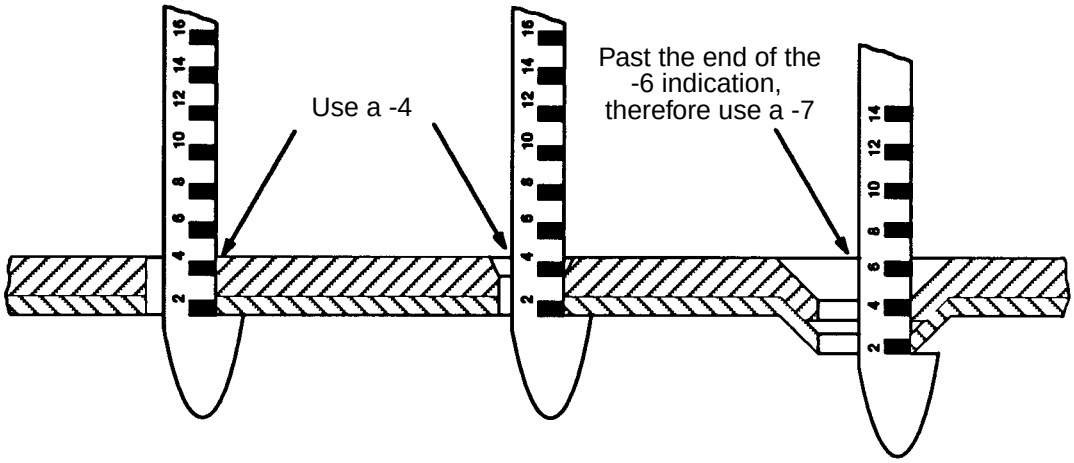


Figure 4 - Use of Grip Gauge

5.5 Selection of Installation Tools (see Figure 5)

5.5.1 Except as noted, all installation guns and pulling head combinations listed in Table V will install the -4, -5 and -6 diameter Huck-Clinch blind rivets. A G-701 series gun cannot be used to pull -6 diameter Huck-Clinch blind rivets.

5.5.2 All guns will pull either the universal or flush head rivets in all the available grip lengths.

5.5.3 In limited access areas, use guns fitted with offset or right angle pulling heads.

5.5.4 At Bombardier Aerospace Toronto, installation guns come as complete units including the pulling head. Do not change pulling heads from one gun to another.

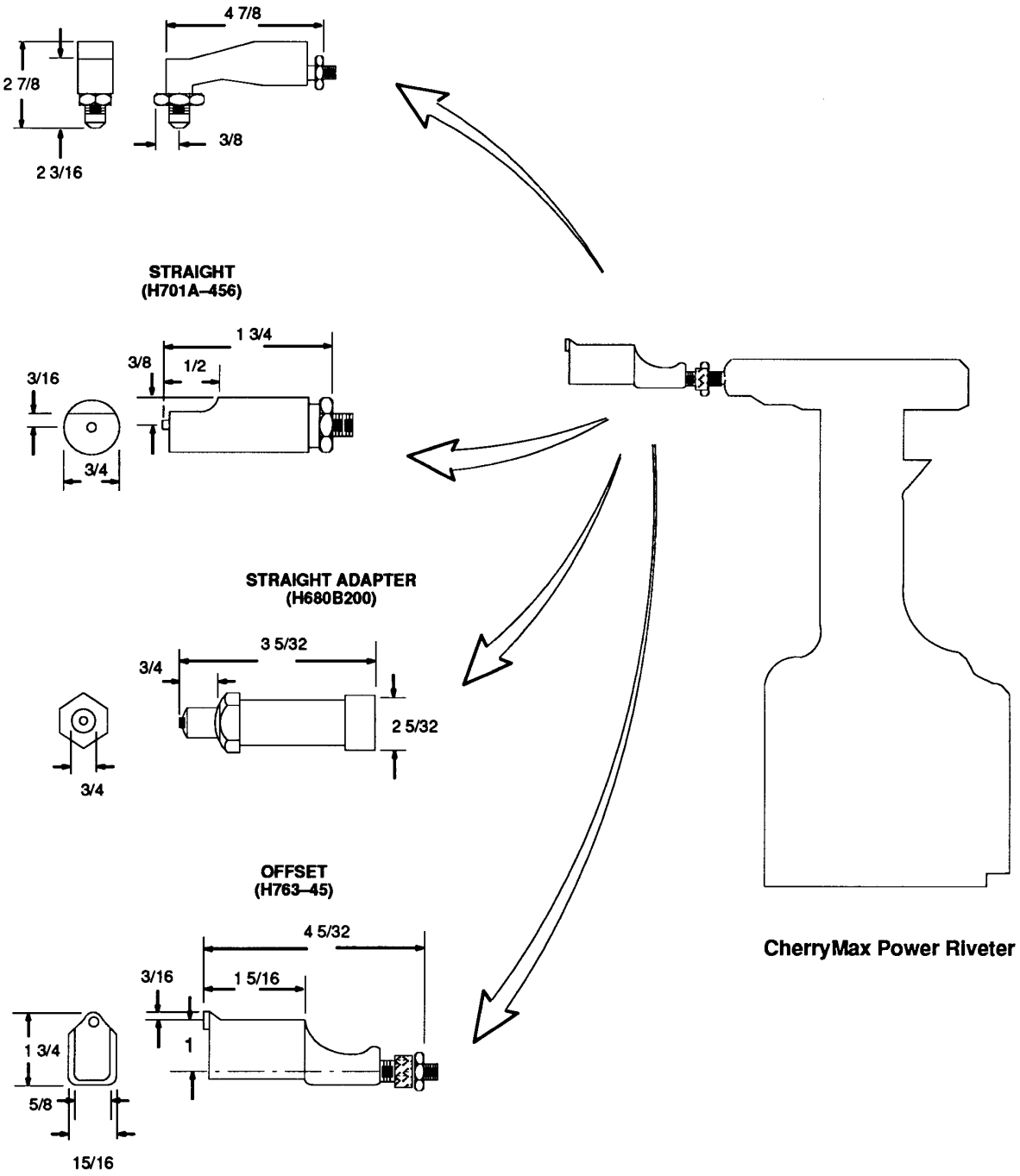


Figure 5 - Huck-Clinch Blind Rivet Pulling Heads

Table V - Huck-Clinch Rivet Installation Guns and Pulling Heads

GUN NUMBER AND TYPE (NOTE 1)	PULLING HEAD		
	STRAIGHT	OFFSET	RIGHT ANGLE
G-684 Pneumatic G-700 Pneumatic G-784 Pneumatic	H680B200 (Note 2)	Not Available	Not Available
G-704 Pneumatic G-701 Pneumatic	H701A-456 (Note 3)	H763-456 (Note 3)	H753-456 (Note 2)

Notes 1. Minimum air pressure required - 90 psi.
2. Front ejection of rivet stems.
3. Rear ejection of rivet stems.

5.6 Riveting Operation (see Figure 7)

5.6.1 Before installing Huck-Clinch blind rivets, clamp parts tightly using Cleco type temporary fasteners in every 4th to 6th rivet hole. Ensure that all holes are in alignment, with dimples (if any) nesting properly and without excessive gaps between sheets (see Figure 6).

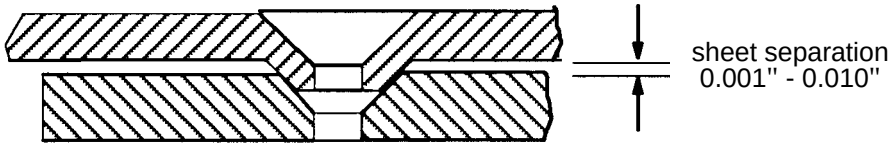


Figure 6 - Dimple Installation Sheet Separation

5.6.2 Install Huck-Clinch blind rivets using a power riveter as follows:

Step 1. Insert the Huck-Clinch blind rivet into the prepared hole.

Step 2. Place the pulling head of the power riveter fully onto the rivet stem so that the pulling head rests against the driving anvil of the rivet.

Step 3. Holding the power riveter square to the surface of the work, push the pulling head firmly against the work and squeeze the trigger to set the rivet and break off the rivet stem.

Step 4. Release the installation tool trigger to eject the rivet stem.

5.6.3 Install 1/8" diameter Huck-Clinch blind rivets using a use a G-27 hand riveter (see Figure 8).

5.6.4 Do not place a rivet into an installation gun before connecting to an air line as the gun will cycle and break off the rivet.

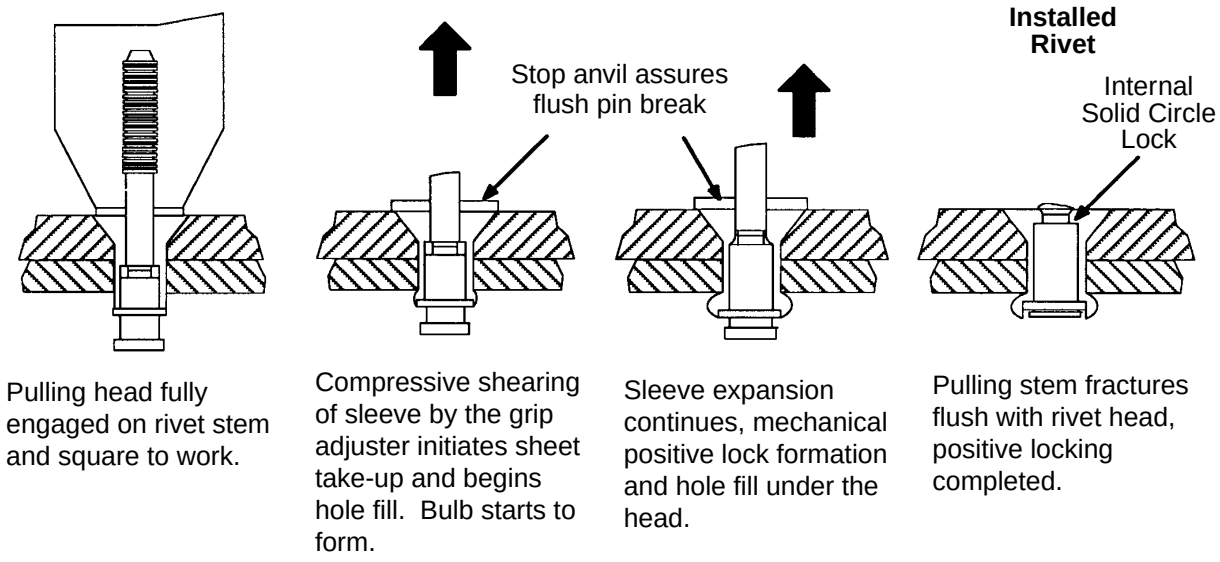


Figure 7 - Huck-Clinch Riveting Operation (Typ.)

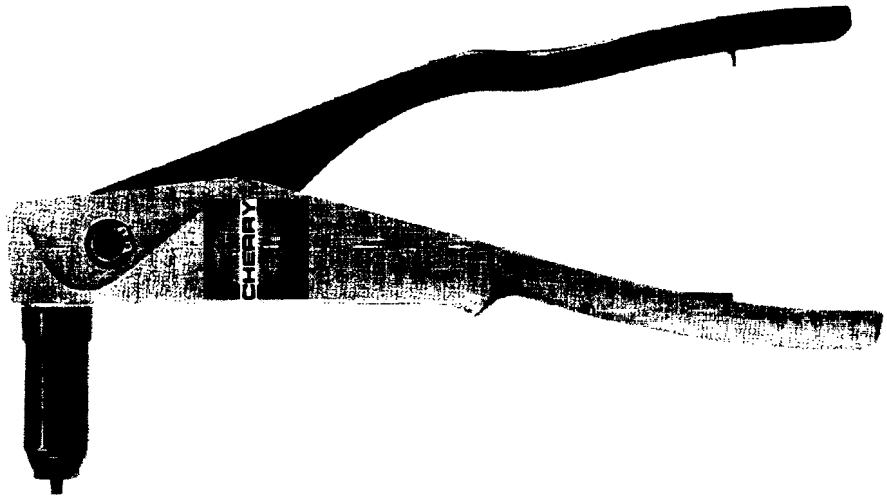


Figure 8 - Hand Riveter - G-27

5.7 Removal of Installed Huck-Clinch Blind Rivets

5.7.1 If necessary, remove installed Huck-Clinch blind rivets in heavier, rigid structures as follows (see Figure 9):

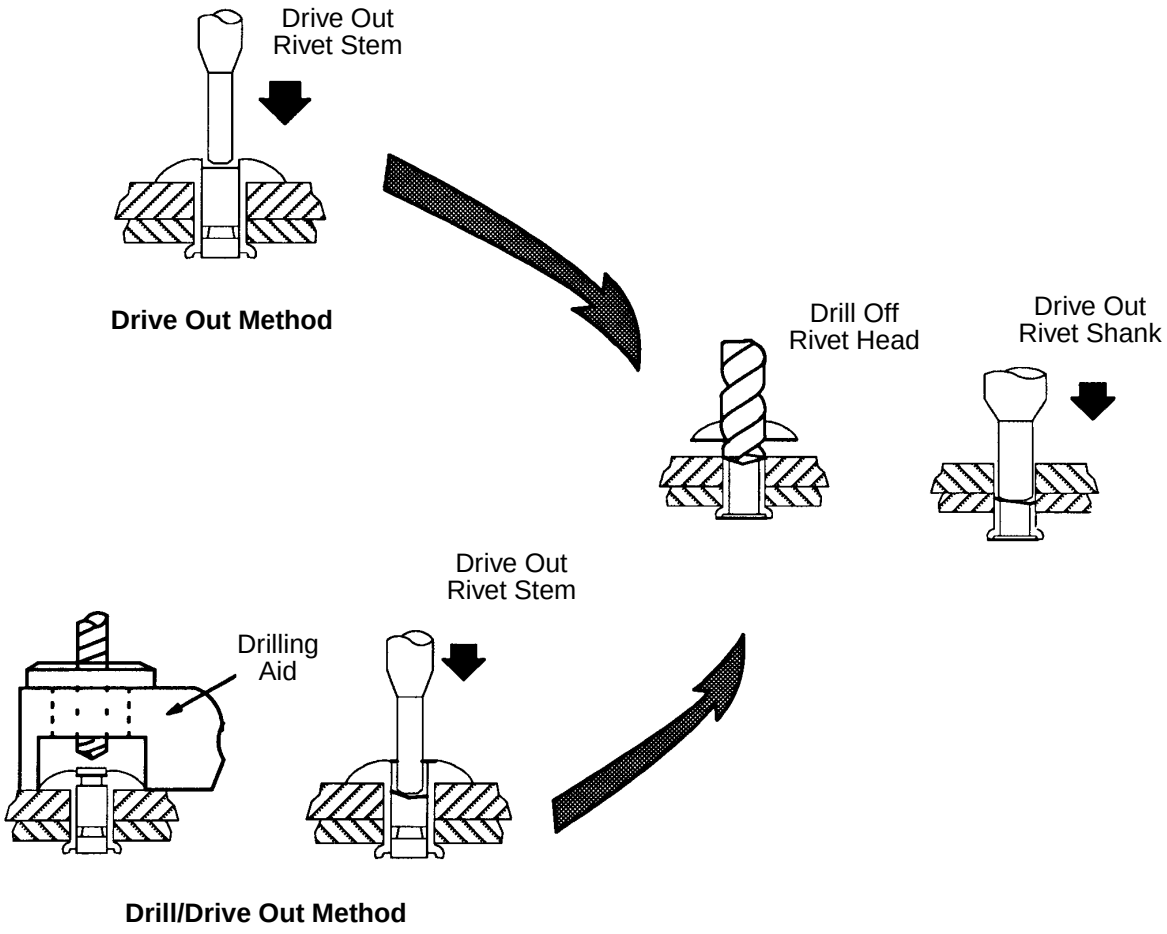
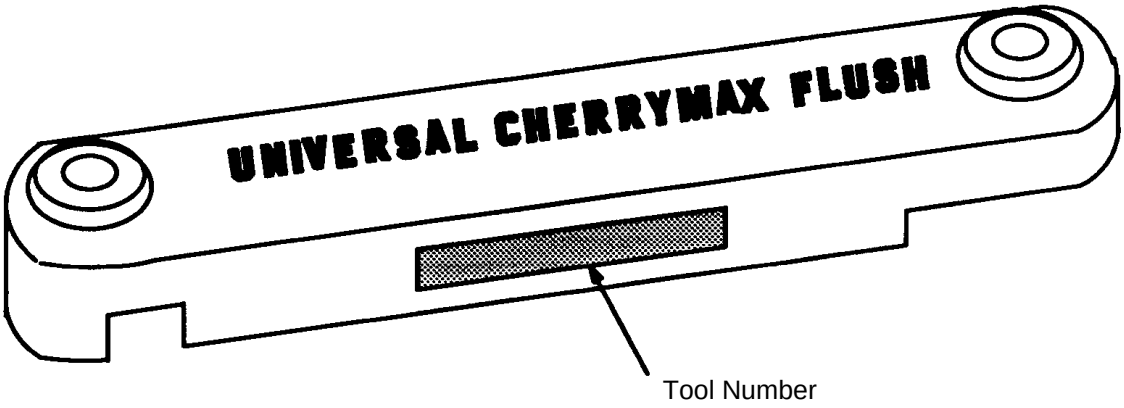


Figure 9 - Removal of Installed Rivets

Step 1. In heavier, rigid structures, attempt to drive out the rivet stem using a suitable punch. Use only light blows on the rivet stem.

In thin gauge structures or if it is difficult to drive the stem out, drill off the fastener stem to the depth of the head using the appropriate drilling aid and drill size for the particular size of Huck-Clinch blind rivet from Table VI before driving out the remaining stem using a suitable punch. Use the universal side of the drilling aid on universal head fasteners and the flush side of the drilling aid on flush head fasteners. Ensure the drill is centred on the stem.

Table VI - Drilling Aid Fixture Selection



FASTENER DASH NUMBER	TS.519.10.14 MARK NUMBER	PRE-DRILL NUMBER
-4	MK 1	#40
-5	MK 2	#30
-6	MK 3	#20

Step 2. Drill completely through the fastener head, using a drill corresponding to the nominal shank diameter, until the head breaks off.

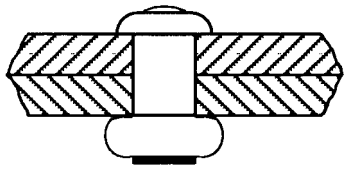
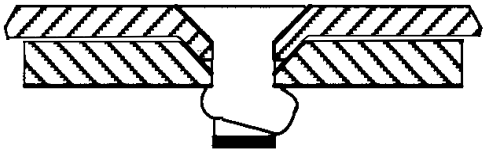
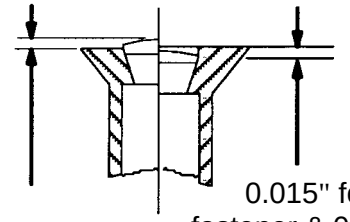
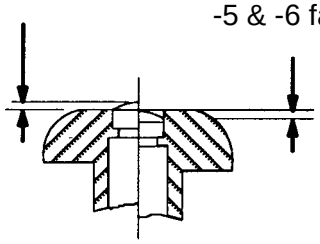
Step 3. Drive out the fastener shank using a suitable punch. To prevent damage to thin gauge structures, support the structure from the reverse side using a suitable support block while driving out the fastener.

5.8 Post Installation Procedure

5.8.1 Provided installed flush head Huck-Clinch blind rivets meet the protrusion requirements specified in Figure 10 **before** shaving, if necessary shave the flush head as required to meet aerodynamic surface requirements according to PPS 1.48.

6 REQUIREMENTS

6.1 Ensure installed Huck-Clinch blind rivets meet the requirements specified in Figure 10.

VISUAL APPEARANCE	DESCRIPTION	CORRECTIVE ACTION
	**Acceptable** - Good installation - Sheets drawn up tight - Stem trimmed flush - No cracks in shop head	None Required
	Unacceptable - Gap between sheets - Cracks in shop head	Replace Fastener
	**Acceptable** - Irregular bulb formation	None Required
 	**Acceptable** - Stem fracture not more than 0.010" above flush. - Stem fracture not more than 0.015" below flush for -4 fastener and 0.020" below flush for -5 and -6 fasteners.	None Required (Note 1)
	Unacceptable - Stem fracture more than 0.010" above flush. - Rivet stem fracture more than 0.015" below flush for -4 fastener and 0.020" below flush for -5 and -6 fasteners.	Replace Fastener

Note 1. Provided the installed Huck-Clinch blind rivet meets the head protrusion limits, to meet aerodynamic surface requirements flush head rivets may be shaved according to PPS 1.48. or filed flush with the work surface if specified on the engineering drawing

Figure 10 - Installation Requirements for Huck-Clinch Blind Rivets

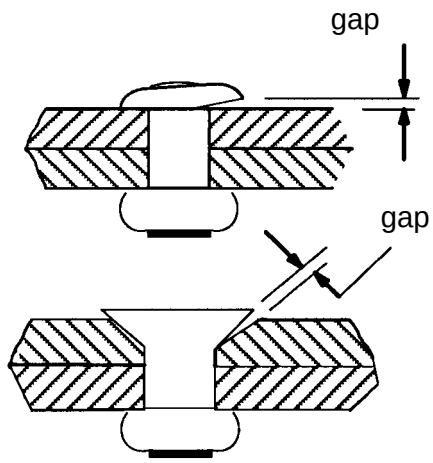
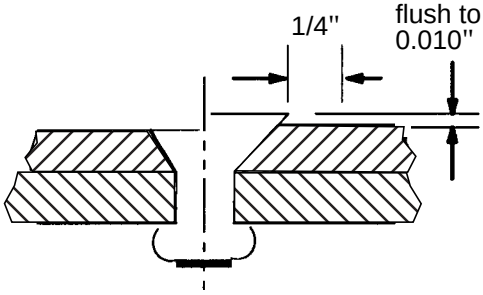
VISUAL APPEARANCE	DESCRIPTION	CORRECTIVE ACTION
	**Acceptable** - Gap under one side of head must be less than 0.002" (i.e. it must not be possible to insert the edge of a 0.002" feeler gauge) and must not extend to the shank.	None Required
	Unacceptable - Gap extends to shank or it is possible to insert a 0.002" feeler gauge into the gap.	Protruding head: replace rivet Flush head: replace rivet and check countersink diameter
	**Acceptable** - Head of flush head fastener is flush to 0.010" above flush (see Note 1). In dimpled installations measure flushness 1/4" away from head.	None Required
	Unacceptable - Head of flush type rivet is below flush or more than 0.010" above flush.	Remove fastener and check countersink diameter
Note 1. Provided the installed Huck-Clinch blind rivet meets the head protrusion limits, to meet aerodynamic surface requirements flush head rivets may be shaved according to PPS 1.48. or filed flush with the work surface if specified on the engineering drawing		

Figure 10 - Installation Requirements for Huck-Clinch Blind Rivets

7 SAFETY PRECAUTIONS

7.1 The procedures specified herein present no specific safety hazards when performed according to accepted plant safety regulations.

8 PERSONNEL REQUIREMENTS

8.1 Personnel responsible for installation of Huck-Clinch blind rivets must have a good working knowledge of the procedure and requirements as specified herein and must have exhibited their familiarity to their supervisor.

9 MAINTENANCE OF EQUIPMENT

9.1 It is recommended that light machine oil be injected daily into the air inlet in the air tools.

9.2 Repair or overhaul damaged or worn tools, as required.

9.3 Unauthorized rework or alteration of Huck-Clinch tooling is prohibited.