

MBF2009

INSTALLATION AND INSPECTION

SPECIFICATION FOR

COMPOSI-LOK[®] IIa BLIND FASTENERS

(ALL MBF 3000 SERIES BLIND BOLTS)

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"NR"	12-07-1987	ENC#5230	
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"B"	03-23-1988	ECN#5404	_____ JAMES C. EASTWOOD VICE PRESIDENT ENGINEERING/OPERATIONS
"C"	05-20-1988	ECN#5471	
"D"	11-29-1988	ECN#5727	
"E"	07-10-2002	ECN#1379	
"F"	05-02-2006	ECN#3749	_____ H. ROSS WAMBOLT DIRECTOR, QUALITY ASSURANCE
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MONOGRAM AEROSPACE FASTENERS

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MONOGRAM AEROSPACE FASTENERS

1.0 SCOPE:

This specification outlines the installation and inspection requirements considered necessary to insure the proper performance of Composi-Lok[®] IIa Blind Fasteners. The installation tooling recommendations given here-in are not applicable to fasteners which have an "A": suffix (automatic installation) after the grip dash number (e.g. MBF 3003-06-250A). Consult factory for details on "A": coded parts.

2.0 DESCRIPTION:

The Composi-Lok[®] IIa is a five-piece (5) blind fastener consisting of a threaded nut and screw, an expandable sleeve, an acetal insert and a disposable drive-nut. It is available in a variety of head styles in sizes from 5/32" diameter through 3/8" diameter and in increments of .050" grip lengths. Refer to the "MBF" series product drawings for available sizes and types.

3.0 EQUIPMENT:

- 3.1 In order to insure the best results, only approved pneumatic and/or hand installation tools should be used. The current list of approved tools is noted in Figures 1 through 7 for the information of the user. These tools are available from:

Monogram Aerospace Fasteners
3423 South Garfield Avenue
Los Angeles, CA 90040

- 3.2 Removal tooling, developed specifically for Composi-Lok fasteners, is shown in Figures 9. Complete removal kits are also available. Contact Monogram Aerospace Fasteners at the above address.

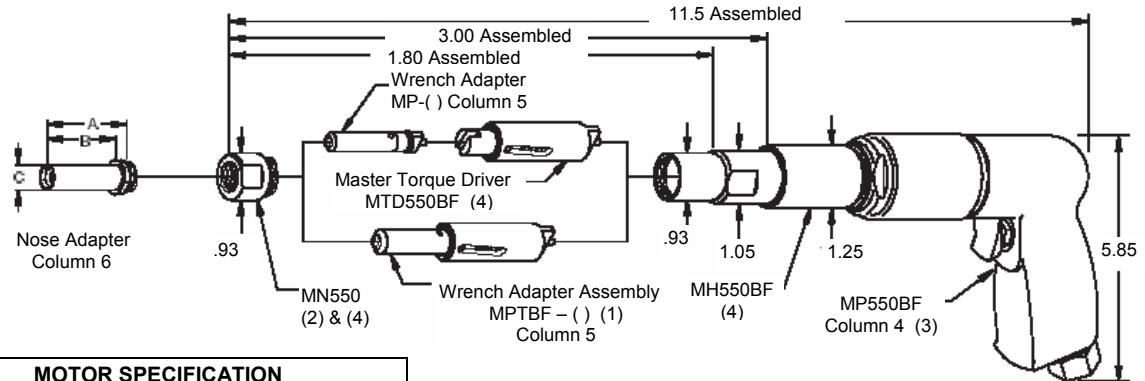
4.0 GENERAL INFORMATION:

- 4.1 These fasteners must be used within the grip range limits specified by the manufacturer in order to insure proper performance. In the event that a borderline grip condition exists, it is recommended that the maximum grip condition be favored, (i.e. a 0.250 reading uses a -250 grip part). This practice will help assure optimum performance in the event not all sheet gap has been removed. Composi-Lok[®] IIa can be installed 0.025" below the minimum grip and 0.025" above the maximum grip.
- 4.2 The blind sleeve may be driven against a 7° maximum sloping surface (see Figure 13 and Par. 6.2).
- 4.3 It is required that only the approved tools listed in Paragraph 3 of this specification be used for the installation of these fasteners.
- 4.4 Composi-Lok[®] IIa should not be used in cocked hole applications, (see Paragraph 5.1.1).



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FIGURE 1
MP 550 BF PNEUMATIC PISTOL



MOTOR SPECIFICATION	
Operating Pressure:	90 PSIA
(Min)	
Torque Output:	380 In-Lbs
Motor Speed:	300 RPM
Air Consumption at Free Speed:	22 CFM
Horse Power:	4.3
Weight:	4 Lbs
Work Space Needed:	Portable

TABLE 1

1	2	3	4	5	6	7	8	9	
BASIC DIA	TYPICAL COMPOSI-LOK® IIa PART NO.	COMPLETE PNEUMATIC TOOL ASSEMBLY	PNEUMATIC MOTOR ASSEMBLY	WRENCH ADAPTER (TURNS SCREW)	NOSE ADAPTER (HOLDS NUT)	A REF.	B REF.	C REF.	
5/32	-5- ()	MBF 3003 3004	MP550BFDN-5AA	MP550BF (3)	MPBF-05	MPPBF-08	1.81	1.70	0.56
3/16	-6- ()								
7/32	-7- ()	3005 3006	MP550BFDN-7AA	MPBF-07	MPBF-08	1.48	1.36	0.75	
1/4	-8- ()	3008 3009	MP550BFP-8AA	MPBF-08					
9/32	-9- ()	3010 3011	MP550BFDN-10AA	MPTBF-10 (1)	MPP-12 (2)	1.48	1.36	0.75	
5/16	-10	3012 3013	MP550BFDN-12AA	MPTBF-12 (1)					
11/32 (3)	-11 ()	3014 3015							
3/8	-12 ()	3016							

- (1) Combination wrench adapter and master torque driver – requires removal of master torque driver (MTD 550 BF) supplied with the tool.
- (2) Larger male thread on nose adapter. Requires removal of aluminum nut (MN 550) supplied with the tool.
- (3) See Motor Breakdown section of Tooling Catalog for spare parts and assembly.
- (4) Included with MP550BF pneumatic motor assembly (column 5).

The complete pneumatic assembly (column 3) includes the pneumatic motor assembly (column 4), the appropriate wrench adapter (column 5) and the appropriate nose adapter (column 6).



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FIGURE 2
MRT550BF PNEUMATIC RIGHT ANGLE TORQUE RESPONSIVE TOOL

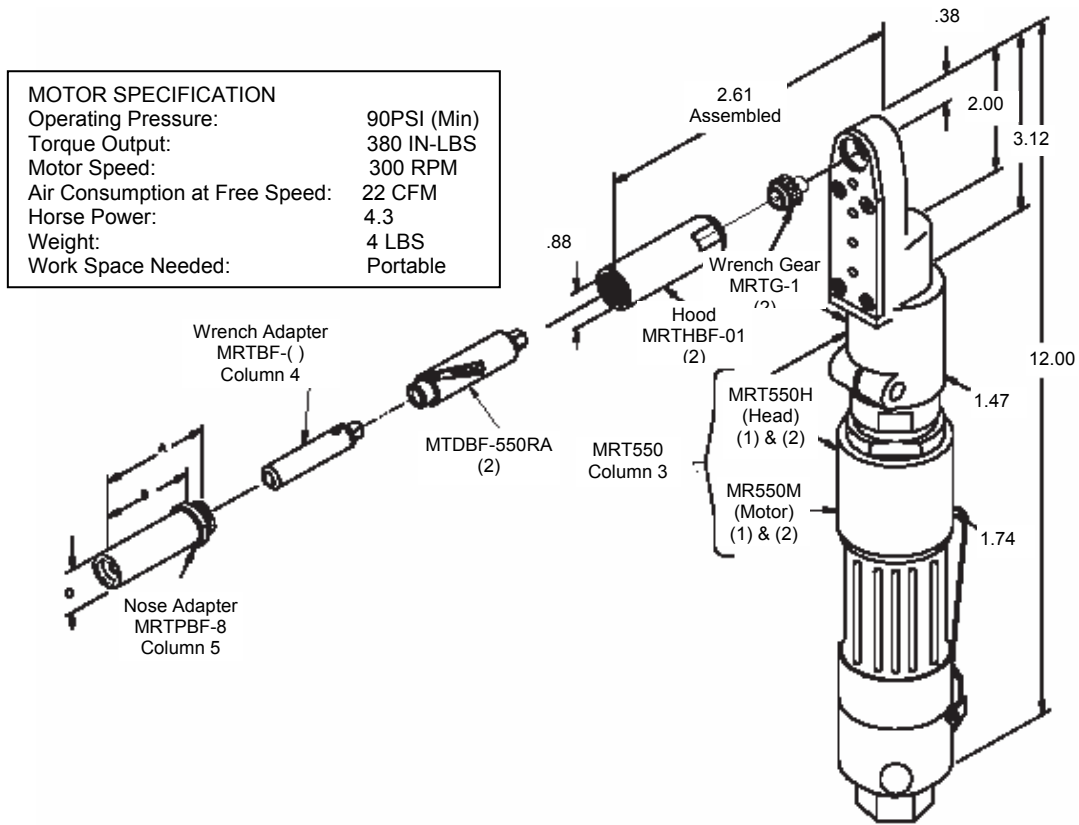


TABLE 2

1	2	3	4	5	6	7	8	9
BASIC DIA	TYPICAL COMPOSI-LOK® IIa PART NO.	PNEUMATIC MOTOR ASSEMBLY	WRENCH ADAPTER (TURNS SCREW)	NOSE ADAPTER (HOLDS NUT)	A REF.	B REF.	C REF.	COMPLETE PNEUMATIC TOOL ASSEMBLY
5/32	-5(-)	MRT550BF	MRTBF-5	MRTPBF-08	1.80	1.68	0.56	MRT550BFDN-5AA
3/16	-6(-)		MRTBF-6					MRT550BFDN-6AA
			MRTBF-7					MRT550BFDN-7AA
1/4	-8(-)		MRTBF-8					MRT550BFP-8AA

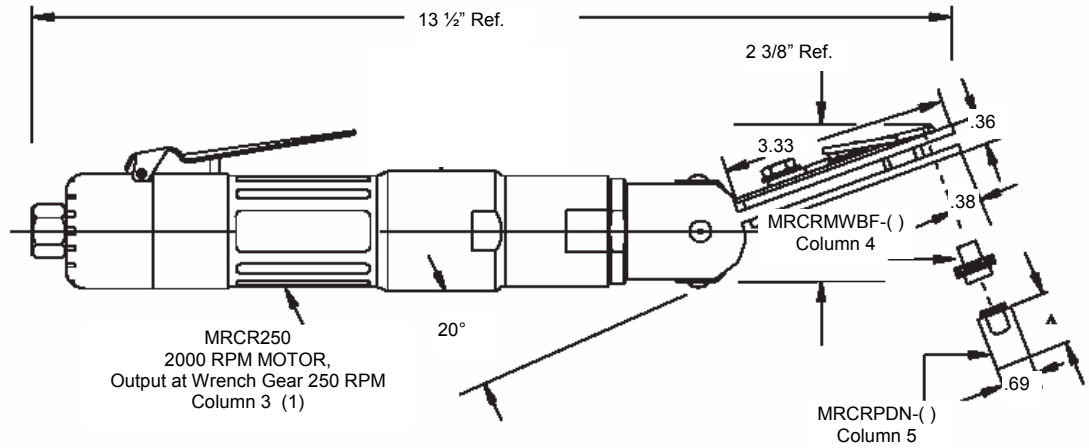
- (1) See motor breakdown section of Tooling Catalog for spare parts list and assembly.
 (2) Included with MRT550BF pneumatic motor assembly (Column 3).

The complete pneumatic assembly (column 9) includes the pneumatic motor assembly (column 3), the appropriate wrench adapter (column 4) and the appropriate nose adapter (column 5).



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FIGURE 4
MRCR 250 CLOSE QUARTER RATCHET TOOL



MOTOR SPECIFICATION	
Operating Pressure:	90PSI
(Min)	
Torque Output:	80 IN-LBS
Motor Speed:	250 RPM
Air Consumption at Free Speed:	22 CFM
Horse Power:	4.3
Weight:	4 LBS
Work Space Needed:	Portable

TABLE 4

1	2	3	4	5	6	7		
BASIC DIA	TYPICAL COMPOSI-LOK® IIa PART NO.	PNEUMATIC MOTOR	WRENCH ADAPTER (TURNS SCREW)	NOSE ADAPTER (HOLDS NUT)	A REF.	COMPLETE PNEUMATIC TOOL ASSEMBLY		
5/32	-5-()	MRCR250	MRCRMWBF-05	MRCRPN-01	.69	MRCR250BFDN-5AA		
3/16	-6-()		MRCRMWBF-06			MRCR250BFDN-6AA		
7/32	-7-()		MRCRMWBF-07	MRCRPN-02	.81	MRCR250BFDN-7AA		
			MRCRMWBF-08			MRCR250BFDN-8AA		
1/4	-8-()							

(1) See Motor Breakdown section of the Tooling Manual for spare parts list and assembly.

The complete pneumatic assembly (column 7) includes the pneumatic motor assembly (column 3), the appropriate wrench adapter (column 4) and the appropriate nose adapter (column 5).



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**FIGURE 5
MR 550 PNEUMATIC RIGHT ANGLE TOOL**

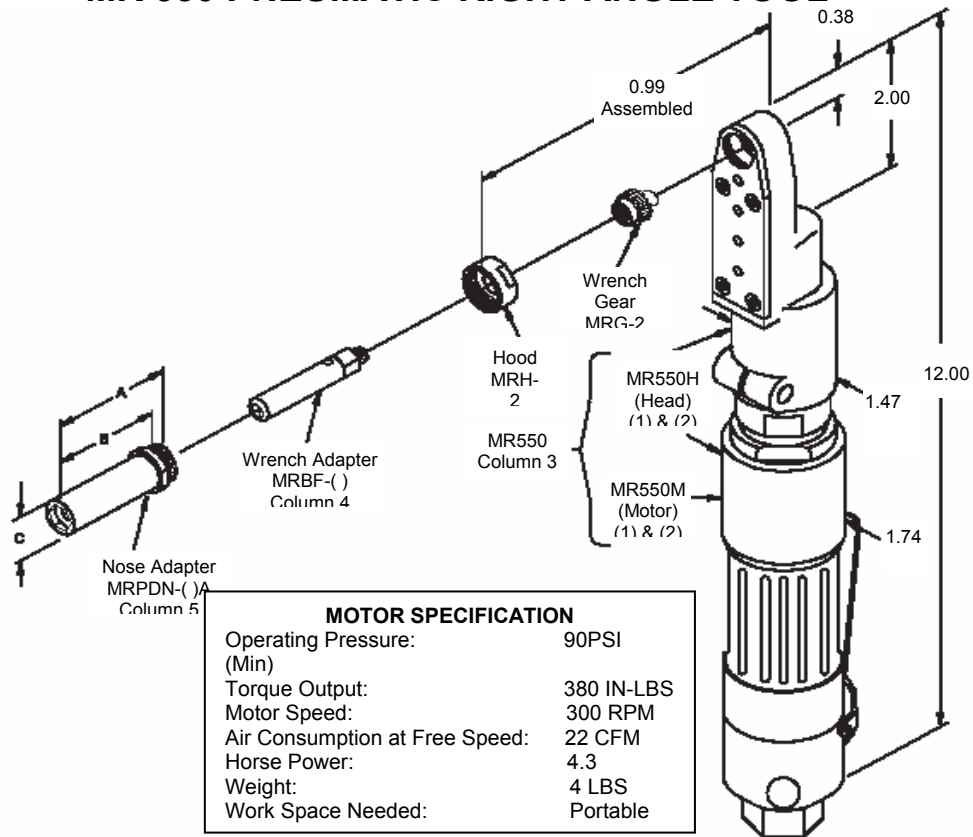


TABLE 5

1	2	3	4	5	6	7	8	9
BASIC DIA	TYPICAL COMPOSI-LOK® IIa PART NO.	PNEUMATIC MOTOR ASSEMBLY	WRENCH ADAPTER (TURNS SCREW)	NOSE ADAPTER (HOLDS NUT)	A REF.	B REF.	C REF.	COMPLETE PNEUMATIC TOOL ASSEMBLY
5/32	-5-()	MR550	MRBF-05	MRPDN-01A	1.63	1.51	0.56	MR550BFDN-5AA
3/16	-6-()		MRBF-06					MR550BFDN-6AA
7/32	-7-()		MRBF-07	MRPDN-02A	1.77	1.65	0.56	MR550BFDN-7AA
1/4	-8-()		MRBF-08					MR550BFDN-8AA

(1) See Motor Breakdown section of the Tooling Catalog for spare parts and assembly.

(2) Included with MR550 pneumatic motor assembly (column 3).

The complete pneumatic assembly (column 9) includes the pneumatic motor assembly (column 3), the appropriate wrench adapter (column 4) and the appropriate nose adapter (column 5).



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**FIGURE 6
MH75 HAND TOOL**

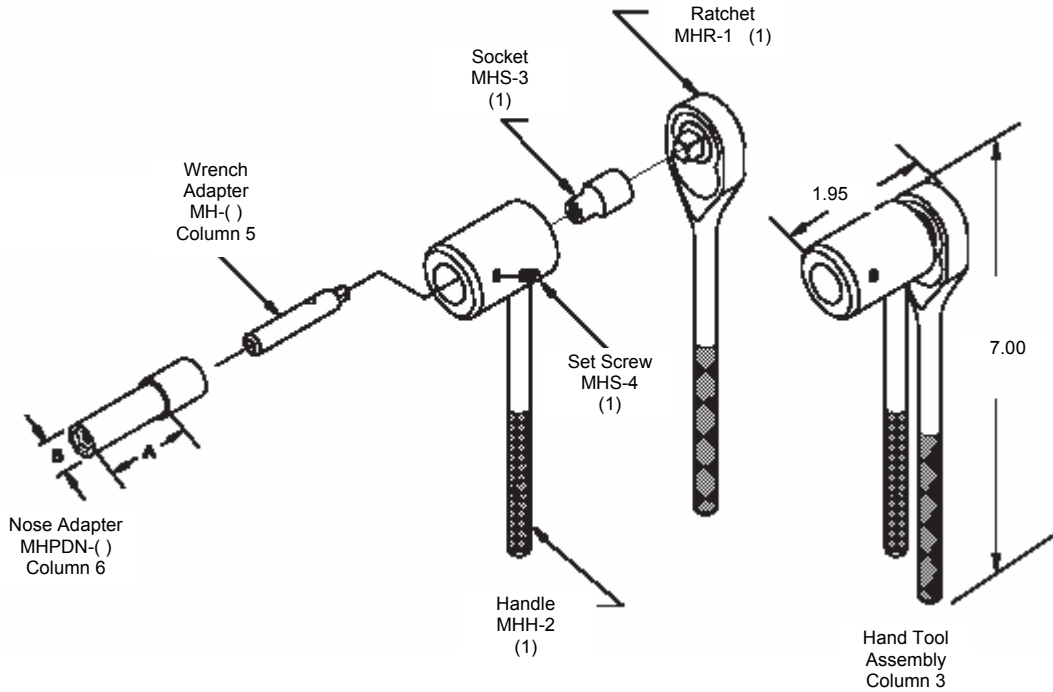


TABLE 6

1		2	3	4	5	6	8	9
BASIC DIA		TYPICAL COMPOSI-LOK® IIa PART NO.	HAND TOOL ASSEMBLY	COMPLETE HAND TOOL ASSEMBLY	WRENCH ADAPTER (TURNS SCREW)	NOSE ADAPTER (HOLDS NUT)	A Ref.	B Ref.
5/32	-5(-)	MBF 3003 3004 3005 3006 3008 3009 3010 3011 3012 3013 3014 3015 3016	MH75	MH75BFDN-5AA	MHBF-05	MHPDN-01	1.51	.56
3/16	-6(-)			MH75BFDN-6AA	MHBF-06			
7/32	-7(-)			MH75BFDN-7AA	MHBF-07	MHPDN-02	1.65	.56
1/4	-8(-)			MH75DN-8AA	MH-08			
9/32 & 5/16	-9(-) -10(-)			MH75DN-10AA	MH-10	MHPDN-03	1.82	.75
11/32 & 3/8	-11(-) -12(-)			MH75DN-12AA	MH-12			

(1) Included with MH75 hand tool assembly (column 3).



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**FIGURE 7
MHC75 CLOSE QUARTER HAND TOOL**

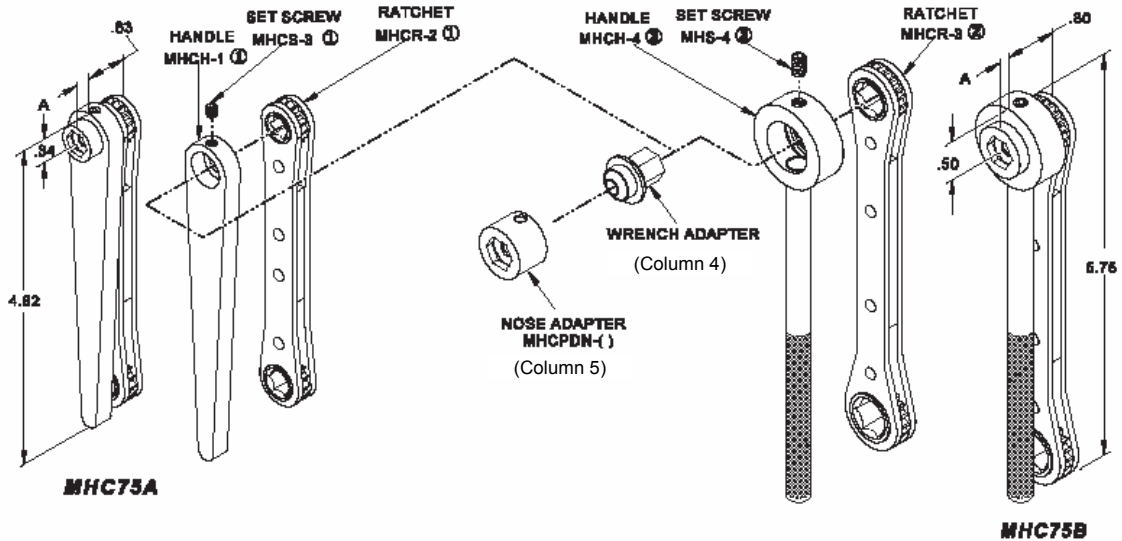


TABLE 7

1		2	3	4	5	6	7					
BASIC DIA		TYPICAL COMPOSI-LOK® IIa PART NO.	HAND TOOL ASSEMBLY	WRENCH ADAPTER (TURNS SCREW)	NOSE ADAPTER (HOLDS NUT)	COMPLETE HAND TOOL ASSEMBLY	A REF	B REF	C REF	D REF	E REF	
5/32	-5(-)	MBF 3003 3004 3005 3006	MHC75A	MHCBF-05	MHCPDN-01	MHC75BFDN-5AA	.65	.38	.32	4.50	.34	
3/16	-6(-)			MHCBF-06		MHC75BFDN-6AA						
7/32	-7(-)		3008 3009 3010 3011	MHC75B	MHCBF-07	MHCPDN-02	MHC75BFDN-7AA	.80	.38	.50	5.75	.45
1/4	-8(-)	3012 3013	MHC-08		MHC75DN-8AA							
9/32 & 5/16	-9(-) -10(-)	3014 3015	MHC-10		MHCPDN-03	MHC75DN-10AA	.80	.38	.50	5.75	.60	
11/32 & 3/8	-11(-) -12(-)	3016	MHC-12	MHC75DN-12AA								

(1) Included with MHC75A hand tool assembly (column 6).

(2) Included with MHC75B hand tool assembly (column 6).

The complete hand tool assembly (column 6) includes the hand tool assembly (column 3), the appropriate wrench adapter (column 4) and the appropriate nose adapter (column 5).



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**FIGURE 8
FASTENER CLOSE QUARTER TOOLING CLEARANCE**

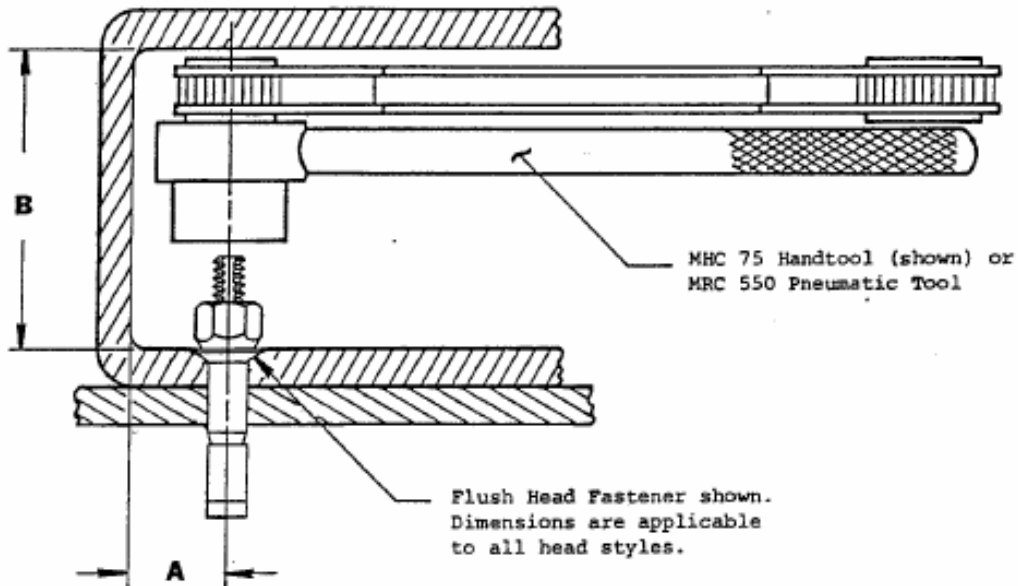


TABLE 8

NOMINAL FASTENER DIAMETER	MHC 75		MRC 550	
	A MIN	B MIN	A MIN	B MIN
5/32	.344	1.597	.344	1.696
3/16	.344	1.658	.344	1.757
7/32	.500	2.004	.344	1.976
1/4	.500	2.102	.344	2.074
9/32	.500	2.385	--	--
5/16	.500	2.357	--	--
11/32	.500	2.585	--	--
3/8	.500	2.610	--	--



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**FIGURE 9
RK5000 FASTENER REMOVAL KIT**

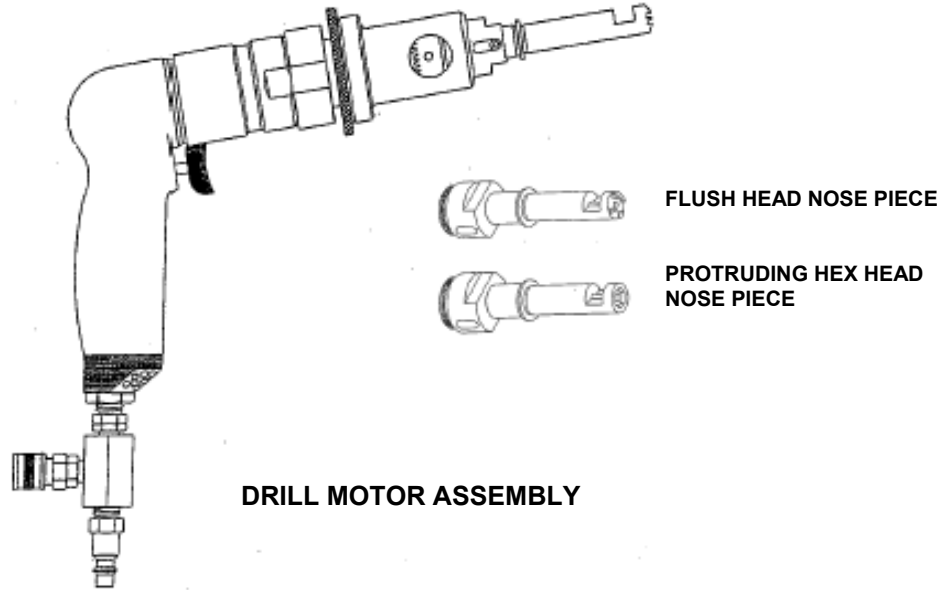


TABLE 9

NOMINAL FASTENER DIAMETER	HEAD STYLE (5)	NOSE PIECE MODULE PART NO.	CARBIDE STAR DRILL PART NO.	DRILL SIZE DIA. +.0000/.0005	DEPTH GAGE (6)	
-5 (.1635)	FLUSH	RM3118-05	RM3116-05	.1540	RM3125-01	
	PROTRUDING HEX	RM3122-05				
-6 (.1975)	FLUSH	RM3118-06	RM3116-06	.1890		
	PROTRUDING HEX	RM3122-06				
-7 (.2265) (1)	FLUSH	RM3118-07	RM3116-07	.2180		
	PROTRUDING HEX	RM3122-07				
-8 (.2585)	FLUSH	RM3118-08	RM3116-08	.2500		
	PROTRUDING HEX	RM3122-08				
-9 (.2885) (1)	FLUSH	RM3118-09	RM3116-09	.2810		RM3125-02
	PROTRUDING HEX	RM3122-09				
-10 (.3105)	FLUSH	RM3118-10	RM3116-10	.3020		
	PROTRUDING HEX	RM3122-10				
-11 (.3425) (1)	FLUSH	RM3118-11	RM3116-11	.3320		
	PROTRUDING HEX	RM3122-11				
-12 (.3735)	FLUSH	RM3118-12	RM3116-12	.3590		
	PROTRUDING HEX	RM3122-12				

(1) Used on Compositi-Lok™ fasteners only.

(2) This kit is used to remove alloy steel, titanium and A-286 Visu-Loks® or A-286 and titanium Compositi-Lok™ fasteners. To remove H-11 and similar material, contact factory for details.

(3) Corebolt protrusion should be milled flush prior to removal.

(4) A complete tool consists of the air motor module (#RM3197), a nose piece module (see Chart) and a carbide star drill (RM3116-()) and a depth gage for setting drilling depth.

(5) Use flush head style nose piece modules for non-hexagonal protruding head fasteners (e.g. MBF2010 and MBF2120).

(6) One blank receptacle #RC3076 should also be ordered for use with the depth to facilitate set up.



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TABLE 10
COMPOSI-LOK®IIa FASTENER – TYPICAL MECHANICAL PROPERTIES

ALL MATERIALS HEAD STYLES		TENSILE STRENGTH (LBS. Min.)	DOUBLE SHEAR STRENGTH (LBS. MIN.)	LOCKING TORQUE (IN. LBS. MIN.)
DIA	DASH			
5/32	-5	900	3150	1.0
3/16	-6	1400	4600	1.5
7/32	-7	1600	6050	2.0
1/4	-8	2100	7900	2.5
9/32	-9	2600	9800	3.0
5/16	-10	3600	11350	3.5
11/32	-11	4400	13850	4.0
3/8	-12	5000	16450	4.0

FIGURE 10

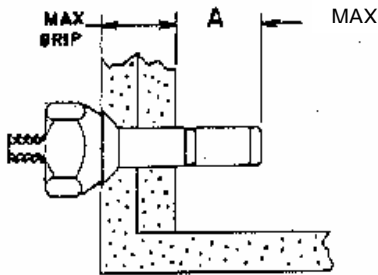


FIGURE A

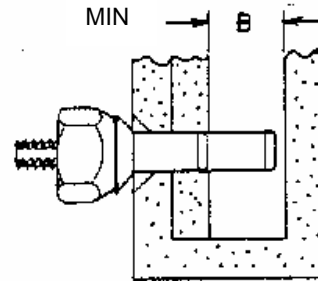


FIGURE B

TABLE 10A

NOMINAL SIZE DIA.	(A) BLIND SIDE PROTRUSION IN MAX. GRIP (FIG. A)	(B) BLIND SIDE PROTRUSION (FIG. B)
5/32	.625	.480
3/16	.675	.545
7/32	.762	.570
1/4	.900	.580
9/32	.930	.650
5/16	.912	.700
11/32	1.000	.720
3/8	1.100	.800



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- 4.5 Composi-Lok[®] IIa are supplied to the user with proper lubrication to insure satisfactory driving characteristics. This lubricant should not be removed or any additional lubricant added.
- 4.6 If a fastener had been removed, the same diameter Composi-Lok[®] IIa can be reinstalled provided the hole has not been damaged. In the event that the hole has been damaged, the next larger diameter Composi-Lok[®] IIa should be used. (Note: for flush head fasteners the countersink will have to be deepened).
- 4.7 If the fastener is to be coated with primer prior to installation, extreme care should be taken to insure that no primer will get on the thread of the screw in the sleeve area, under the head of the screw or on the sleeve and nose of the nut. Wet primer applied to these areas will act as a lubricant and tend to cause over-driving of the fastener. Dried-on primer may act as a retardant. When primer is required for additional corrosion protection, it is recommended that the primer be applied to the mating hole.
- 4.8 Use of the fastener in special applications necessitating the use of sealants, paints, etc. should be thoroughly investigated by the user prior to installation.

5.0 DETAIL REQUIREMENTS

5.1 Hole and Sheet Preparation:

- 5.1.1 Holes shall be drilled straight and perpendicular (within 1 ½°) to the surface against which the manufactured head will bear. The hole shall be reasonably round and free from burrs (metallic structure) and delamination (graphite/epoxy type structure).

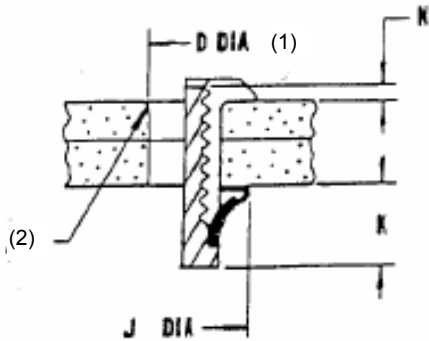
The edge of fastener installation holes for both protruding and flush head style Composi-Lok[®] IIa should be given a light chamfer on the head side as a radius relief to insure proper seating of the bearing surfaces. Chamfer should be equivalent in size to 50% of the maximum head to shank fillet radius specified on product drawings.

- 5.1.2 The sheets to be joined should be firmly clamped up or otherwise fixtured to prevent hole misalignment.
- 5.1.3 The recommended hole sizes and countersink diameter for the various type Composi-Lok[®] IIa are shown in Table IX. The countersink diameters shown may be adjusted to suit a specific manufacturer's flushness requirements, as desired.

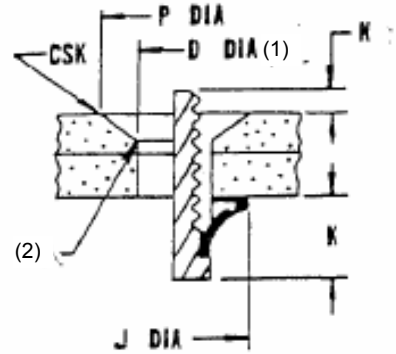


MONOGRAM AEROSPACE FASTENERS

**FIGURE 11
FASTENER HOLE PREPARATION & INSTALLED DIMENSIONS**



**MBF 3003
MBF 3004
PROTRUDING & HEX HEAD**



**MBF 3005
MBF 3006
FLUSH HEAD**

TABLE 11

DIA. DASH NO.	D DIA RECOMMENDED HOLE SIZE	FLUSH HEAD CSK P DIA.	J DIA. MIN.	K MAX.	N (3) COREBOLT BREAK-OFF LIMITS
-5	.165 - .168	.325 - .332	.250	.370	+ .103 - .000
-6	.199 - .202	.378 - .385	.300	.420	
-7	.228 - .231	.409 - .416	.350	.490	
-8	.260 - .263	.499 - .507	.400	.510	
-9	.290 - .293	.530 - .538	.450	.535	
-10	.312 - .315	.626 - .635	.475	.540	
-11	.344 - .347	.657 - .666	.525	.670	
-12	.375 - .378	.752 - .762	.565	.675	

- (1) Holes should be straight and perpendicular to surface. Holes should be reasonably round and free from delamination.
- (2) Edge of holes should be given a slight chamfer.
- (3) Corebolt break-off limits are measured from the head of the fastener. Break-off limits per applicable standards page.

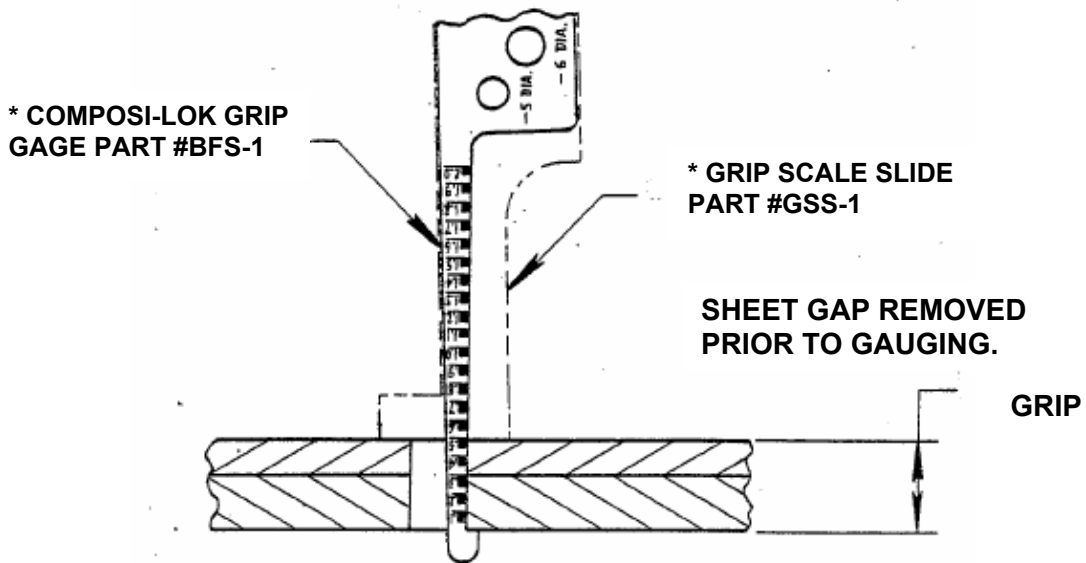
Sheets should be firmly clamped together during drilling.



6.0 SELECTION OF GRIP LENGTH:

6.1 Prior to installation, the grip length should be checked with a grip gauge (see Figure 12). Refer to product drawings for available grip ranges. All sheet gap should be removed prior to gauging for proper grip.

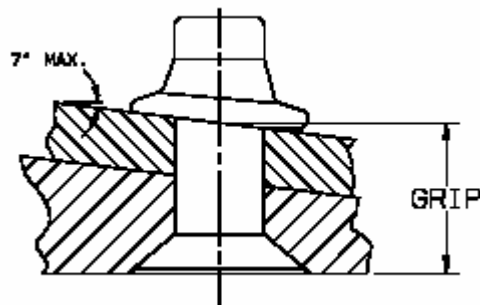
FIGURE 12 GRIP GAUGE



* COMPOSITI-LOK GRIP GAGE AND GRIP SCALE SLIDE AVAILABLE AS AN ASSEMBLY – PART #BFS-1A

6.2 In those applications where a tapered sheet condition exists on the blind side, the grip length must be determined by the depth at the centerline of the hole. In no case should this taper exceed 7°, in order to insure proper performance of the fastener. (Refer to Figure 13).

FIGURE 13

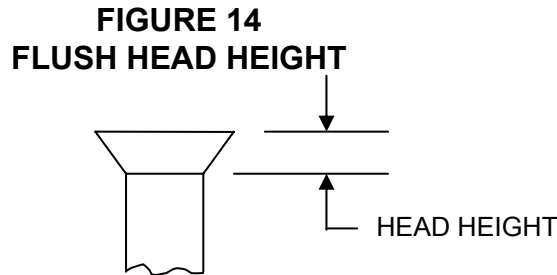




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- 6.3 In those applications where the grip is a borderline condition, it is recommended that a maximum grip condition be favored, (i.e. a 0.250 reading uses a -250 grip part). This practice will help to assure optimum performance.

Note: The minimum grip for a flush-type shall in no case ever be less than the head height (see Figure 14).



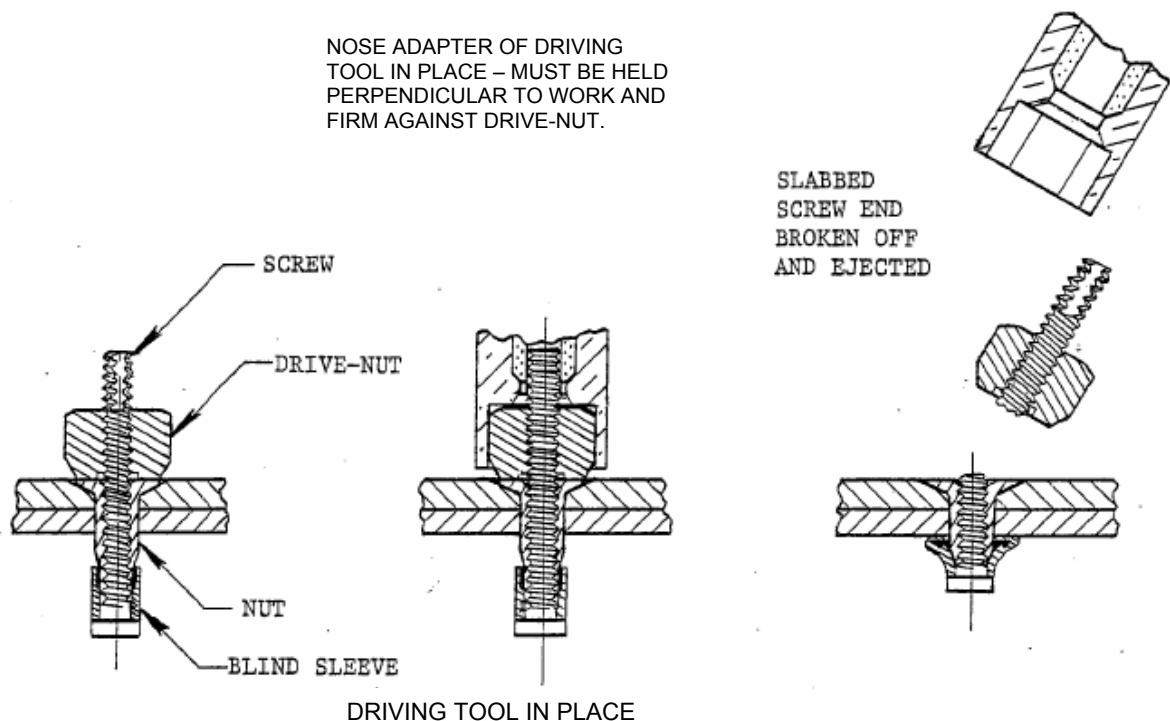
7.0 DRIVING PROCEDURE:

- 7.1 Compositi-Lok[®] IIa are driven with special tools and equipment designed specifically for this job. The correct tools and equipment are listed in Paragraph 3 of this specification.
- 7.2 Insert the fastener in the hole. The Compositi-Lok[®] IIa can be inserted in a properly prepared hole without interference.
- 7.3 The wrenching part of the adapter assembly is inserted over the slabbed portion of the screw and the nose piece engages the drive nut. The driving tool must be held firmly against the head of the fastener and perpendicular to it. Cocking of the driver may cause premature stem break-off before the fastener is completely driven.
- 7.4 The driving force is then applied by the pneumatic power tool or by a hand driving tool. As power is applied, the screw is turned as the nut is held stationary by the drive-nut which in turn is held stationary by the nose piece. The sleeve is compressed between the screw head and the conical end of the nut and is drawn over the tapered nose portion of the nut. The sleeve is thereby expanded subsequently forming a head against the mating surface being joined. As driving is completed, the slabbed portion of the screw is snapped off and ejected along with the drive-nut (see Figure 15). The resultant break-off should be within the limits specified on the product drawings.
- 7.5 In those instances where special driving tools are adopted by the user, wrenching speed of this tooling shall not exceed 600 RPM.



MONOGRAM AEROSPACE FASTENERS

FIGURE 15
DESCRIPTION OF INSTALLATION



8.0 REMOVAL OF COMPOSI-LOK® IIa:

Compositi-Lok® IIa may be removed with the tooling shown in Figure 9 of this specification. Complete kits are available from Monogram Aerospace Fasteners. Contact factory for details.

9.0 SHAVING OF COMPOSI-LOK® IIa SCREWS (COREBOLTS):

The corebolt protrusion may be shaved flush with the sheet surface using a standard rivet shaver equipped with a carbide cutter. The shaver must turn at a speed of approximately 10,000 RPM. The cutter and skirt diameter must be large enough to permit the corebolt to be approximately 3/16" from the center of the cutter. The shaver will not mill properly if the corebolt is centered on the cutter. A one-inch diameter cutter will be required for most fasteners. Monogram's Pintail Shaving unit has been developed to "slice" the corebolt, producing an uninterrupted cut. A supplement to MAF's Pintail Shaving unit is the Miller, a very effective corebolt flushing tool.



10.0 INSPECTION AFTER INSTALLATION:

10.1 The stem break-off position of the screw in the head of the nut is a positive indication that the fastener has been properly installed (provided that the correct grip length has been used).

Product drawings list the acceptable stem break-off limits for a properly installed fastener. Stem break-off beyond acceptable tolerances as prescribed may indicate the use of the wrong length fastener or other problem. In either case, the fastener should be removed, the grip length carefully checked, and then replaced by the correct grip fastener, as necessary. Stem break-off gages are available for inspection of the installed fasteners. Refer to Figure 16.

10.2 If desired, clamp-up may be determined indirectly by seating torque. Adapt the applicable torque adaptor (Table 12) to a suitable torque wrench, engage the recess in the fastener head and apply the minimum seating torque. The ability of the fastener to resist rotation when subjected to the torque values in Table 12 below is a good indication that the required preload has been imparted to the joint. To prevent damage to the joint, care should be taken not to exceed the seating torque.

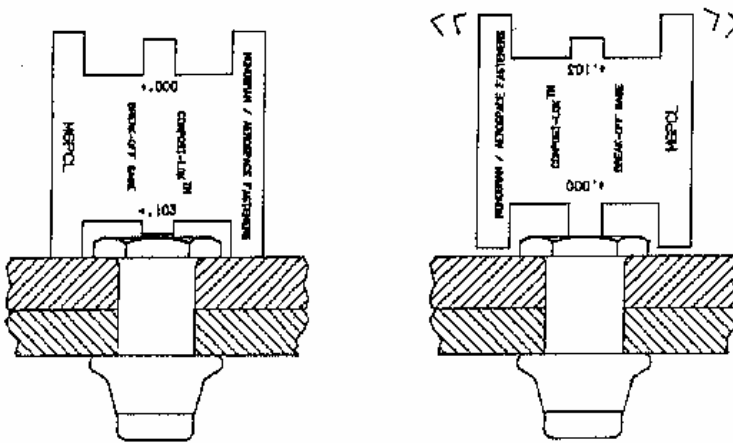
TABLE 12 SEATING TORQUE

FASTENER SIZE	TORQUE ADAPTOR PART NO.	SEATING TORQUE IN. LB. MINIMUM
-5	MHTFDN -05	4
-6	MHTFDN -06	6
-7	MHTFDN -07	8
-8	MHTFDN -08	10
-9	MHTFDN -09	15
-10	MHTFDN -10	20
-11	MHTFDN -11	25
-12	MHTFDN -12	30



MONOGRAM AEROSPACE FASTENERS

FIGURE 16

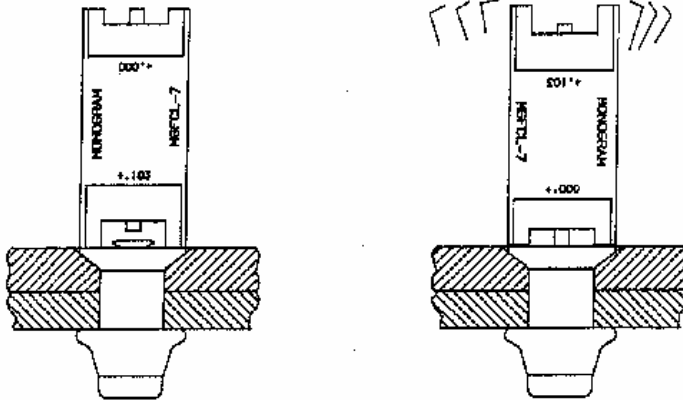


**HIGH BREAK-OFF CHECK
GAGE MUST NOT ROCK**

**LOW BREAK-OFF CHECK
GAGE MUST ROCK**

MONOGRAM LEAF GAGES:
To check break-off on protruding head Compositi-Loks, place leaf gage on the installed fastener as shown. When checking high break-off, the gage prongs must straddle both sides of the screw. If the gage rocks the break-off is too high.

When checking low break-off, repeat the procedure using low break-off end of the gage as shown. If gage does not rock, the break-off is too low.



MONOGRAM BARREL GAGES:
To check break-off on flush head Compositi-Loks, place gage on the installed fastener as shown. When checking high break-off, the gage prongs must straddle both sides of the screw. If the gage rocks, the break-off is too high.

When checking low break-off, repeat the procedure using low break-off end of gage as shown. If gage does not rock, the break-off is too low.

TABLE 13

FASTENER SIZE	MONOGRAM PART NUMBER		
	FLUSH HEAD BARREL GAGE	PROTRUDING HEAD LEAF GAGE	SCREW BREAK-OFF LIMITS
-5 (5/32)	MGFCL-5	MGPCL	+0.103 +0.000
-6 (3/16)	MGFCL-6		
-7 (7/32)	MGFCL-7		
-8 (1/4)	MGFCL-8		
-9 (9/32)	MGFCL-9		
-10 (5/16)	MGFCL-10		
-11 (11/32)	MGFCL-11		
-12 (3/8)	MGFCL-12		

Notes: Use MGPCL for checking break-off on MBF3003, MBF3004, MBF3008, MBF3009, and MBF3012 and MBF3015. Use MGFCL for checking break-off on MBF3005, MBF3006, MBF3010, MBF3011, MBF3013, MBF3014 and MBF3016.