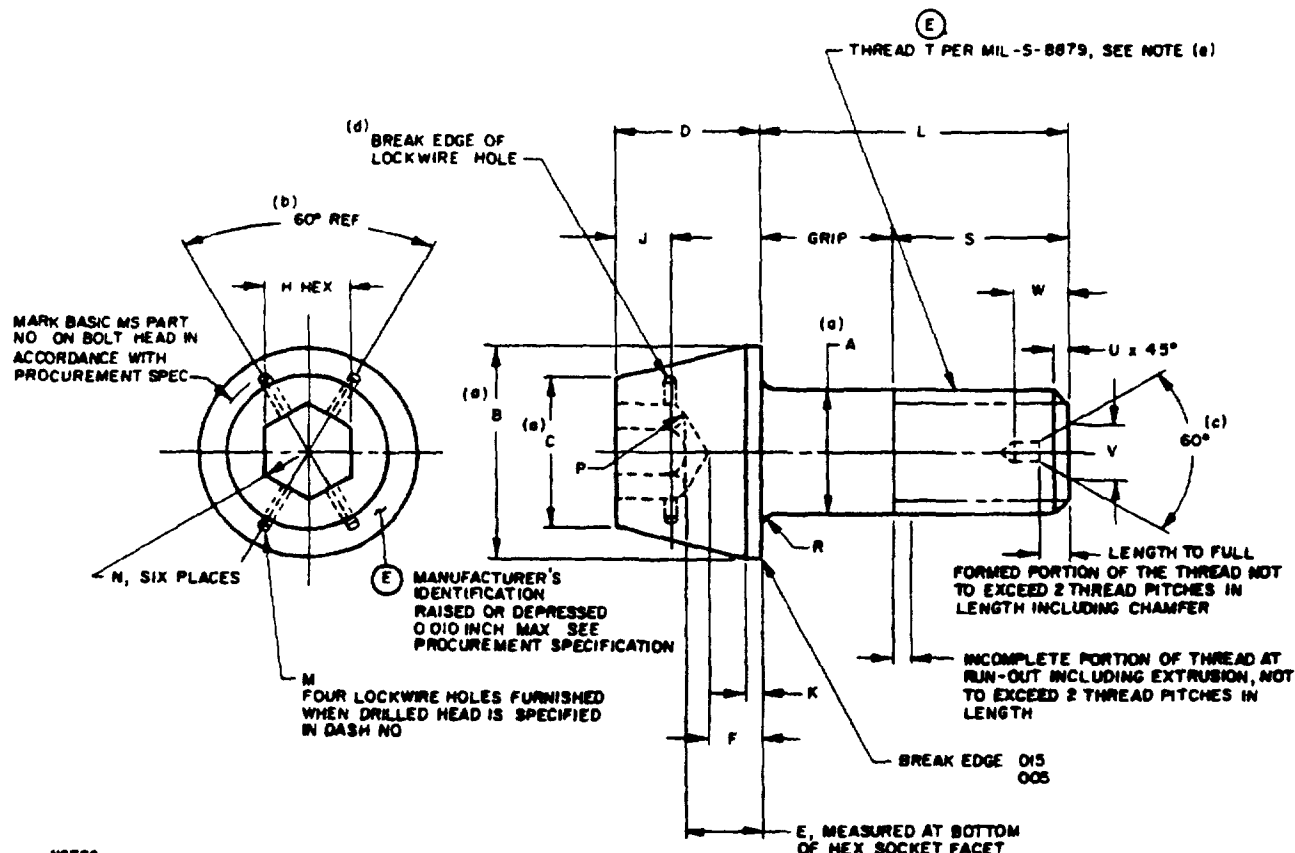


THE REQUIREMENTS FOR ACQUIRING THE PRODUCT(S) DESCRIBED HEREIN SHALL CONSIST OF THIS SPECIFICATION SHEET AND THE ISSUE OF THE FOLLOWING SPECIFICATION LISTED IN THAT ISSUE OF THE DODISS SPECIFIED IN THE SOLICITATION MIL-B-7838



NOTES

- (a) DIMENSIONS A, B AND C SHALL BE CONCENTRIC TO EACH OTHER WITHIN VALUES SPECIFIED FOR X TOTAL INDICATOR READING. DIMENSIONS A AND C SHALL BE CONCENTRIC TO EACH OTHER WITHIN VALUES SPECIFIED FOR Y TOTAL INDICATOR READING. DIMENSION A AND THREAD PITCH DIAMETER SHALL BE CONCENTRIC TO EACH OTHER WITHIN VALUES SPECIFIED FOR Z TOTAL INDICATOR READING.
- (b) REFERENCE DIMENSIONS ARE FOR DESIGN PURPOSES AND TO PROVIDE INFORMATION ONLY. THESE DIMENSIONS ARE NOT INSPECTION OR MANUFACTURING REQUIREMENTS. S MIN REF = (L MIN) - (GRIP MAX).
- (c) ON MS20012 THRU MS20024 CENTER DRILLING OF SHANK IS OPTIONAL FOR BOLT MANUFACTURER.
- (d) COUNTERSINKING OF DRILLED HOLES IS OPTIONAL.
- (e) MS20016 (SEE TABLE 1), 1-14MS-3A IS INACTIVE FOR NEW DESIGN MS20016 THREADS ARE NOTED AS AN EXCEPTION IN MIL-B-7838
- (f) MS20012A IS CANCELLED AFTER 13 JANUARY 1990

REQUIREMENTS

- (E) 1 MATERIAL ALLOY STEEL - UNS G43400, UNS G43406, UNS G41400, UNS G87400, UNS G87350
- (E) 2 FINISH CADMIUM PLATING PER QQ-P-416, TYPE II, CLASS 2 PARTS WITH CLASS 3 PLATING MAY BE FURNISHED FROM SUPPLIER'S STOCK UNTIL 1 JANUARY 1975.
- (E) 3 HARDNESS 34-40 HRC
4. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED, TOLERANCES DECIMALS - 0.10, ANGLES $\pm 1^\circ$
- 5 DIMENSIONS TO BE MET AFTER PLATING
- BOLTS WITH TYPE II PLATING CAN BE USED TO REPLACE BOLTS WITH TYPE I PLATING IN ALL APPLICATIONS
- BOLTS WITH TYPE I PLATING CAN BE USED IN PLACE OF BOLTS WITH TYPE II PLATING UNTIL PRESENT STOCKS ARE DEPLETED, BUT BOLTS WITH TYPE I PLATING SHALL NOT BE USED AFTER 1 JANUARY 1964

FOR DESIGN FEATURE PURPOSES, THIS STANDARD TAKES PRECEDENCE OVER PROCUREMENT DOCUMENTS REFERENCED HEREIN REFERENCED DOCUMENTS SHALL BE OF THE ISSUE IN EFFECT ON DATE OF INVITATIONS FOR BID

(E) DENOTES CHANGES

PREPARING ACTIVITY NAVY - AS CUSTODIANS ARMY-AR NAVY- AIR FORCE-99 DLA- REVIEW ARMY - ER, ME, MI DLA - 15 AF-82 USER ARMY - AV PROJECT NUMBER 5306-1238	MILITARY SPECIFICATION SHEET TITLE BOLTS, INTERNAL WRENCHING, 160 KSI FTU AND 56 KSI FSL	SPECIFICATION SHEET NUMBER 30 MAY 1969 MS20004E THRU 20024E SUPERSEDING MS20004D THRU 20024D 10 AUGUST 1981 AMSC- N/A FSC 5306
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Page 1 of 4

DD FORM 672 MAY 1968

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE

14-00000

THIS SPECIFICATION IS APPROVED FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

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(E)

TABLE I BOLT DIMENSIONS AND TENSILE STRENGTH

BASIC MS PART NO	(a) THREAD T	(a) A DIA		(a) B DIA		(a) C DIA	D	E	F MIN	(a) H HEX		J	K	M +.005 - .000 DIA	N MAX RAD
		MAX	MIN	MAX	MIN					MAX	MIN				
MS20004	1/4-28 UNJF-3A	.2492	.2477	.438	.428	.342	.250	.112	.068	.1900	.1880	.078	063	.037	.010
MS20005	5/16-24 UNJF-3A	.3117	.3102	.531	.521	.394	.312	.144	.094	.2270	.2190	.094			
MS20006	3/8-24 UNJF-3A	.3742	.3727	.649	.639	.520	.375	.183	.116	.3150	.3130	.125			
MS20007	7/16-20 UNJF-3A	.4367	.4347	.750	.740	.534	.438	.208	.141	.3785	.3755	.156			
MS20008	1/2-20 UNJF-3A	.4991	.4971	.828	.818	.625	.500	.247	.169	.4410	.4380	.203	094	.055	.019
MS20009	9/16-18 UNJF-3A	.5616	.5596	.938	.928	.723	.562	.279	.190	.5035	.5005	.234			
MS20010	5/8-18 UNJF-3A	.6240	.6220	1.050	1.040	.826	.625	.317	.216	.5660	.5630	.281			
MS20012	3/4-16 UNJF-3A	.7488	.7468	1.230	1.220	.921	.750	.385	.273	.6295	.6257	.344			
MS20014	7/8-14 UNJF-3A	.8737	.8707	1.438	1.428	1.083	.875	.450	.327	.7547	.7507	.391	094	.055	.022
MS20016 *	1-14 NS-3A														
MS20017	1-12 UNJF-3A	.9985	.9955	1.625	1.615	1.249	1.000	.527	.381			.453			
MS20018	1-1/8-12 UNJF-3A	1.124	1.121	1.875	1.865	1.275	1.125	.589	.443			.500			
MS20020	1-1/4-12 UNJF-3A	1.249	1.246	2.125	2.115	1.598	1.250	.667	.475	1.005	1.001	.547	.125	.156	.084
MS20022	1-3/8-12 UNJF-3A	1.374	1.370	2.313	2.303	1.768	1.375	.746	.531	1.131	1.126	.594			
MS20024	1-1/2-12 UNJF-3A	1.499	1.495	2.500	2.490	1.931	1.500	.823	.586	1.256	1.251	.694			
MS20012A	3/4-16 UNJF-3A	.7488	.7468	1.230	1.220	.921	.750	.385	.273	.6295	.6257	.344			

(E) SEE NOTE (f)

TABLE I (CONTINUED)

BASIC MS PART NO	P RAD		P RAD		(b) S MIN REF	U ±.016	(c) V MAX	(c) W MAX	(b) (c) CENTER DRILL SIZE REF	TENSILE STRENGTH LB MIN	(a) CONCENTRICITY		
	MAX	MIN	MAX	MIN							X	Y	Z
MS20004	020	010	.041	.031	.475	.031				6,190	.005	.007	.0045
MS20005					.537					9,820	.006	.008	
MS20006					.662					15,200	.008	.010	
MS20007					.787	.047				20,600	.009	.011	
MS20008			.057	.047	.850				27,400	.010	.012	.006	
MS20009					.912				34,800	.011	.014		
MS20010					1.037	.062			43,600	.012	.016		
MS20012					1.037		187	200	2	63,200	.015		.018
MS20014					1.162				86,100	.018	.022		
MS20016 *					1.287	.078			112,000				
MS20017	.073	.063	1.475		250	260	3	114,000	.020	.025	.009		
MS20018			1.600				144,000	.022	.026				
MS20020			1.725	.094	.312	320	4	180,000	.025	.032			
MS20022			1.850				219,000	.028	.035				
MS20024	.089	.077	1.975		.312	320	4	263,000	.030	.039	.012		
MS20012A			.073	.063	1.725	.062	.187	.200	2	63,200		.015	.018

(E) SEE NOTE (f)

* SEE NOTE (a)

PREPARING ACTIVITY NAVY - AS
CUSTODIANS ARMY - AD NAVY -
AIR FORCE - 99 DLA -
ARMY - EP, ME, MI DLA - IS AF - RC
REVIEW USER ARMY - AV
PROJECT NUMBER 5306-1233

MILITARY SPECIFICATION SHEET
TITLE BOLTS, INTERNAL WRENCHING, 160 KSI FTU
AND 96 KSI FSL

SPECIFICATION SHEET NUMBER 30 MAY 1989
MS20004E THRU 20024E
SUPERSEDING
MS20004D THRU 20024D 10 AUGUST 1981
AMSC - N/A FSC 5306

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TABLE 11 DASH NOS., GRIP LENGTHS AND BOLT LENGTH

		LENGTH = D15														
DASH NO	GRIP NO	MS20004	MS20005	MS20006	MS20007	MS20008	MS20009	MS20010	MS20012	MS20014	MS20016	MS20017	MS20018	MS20020	MS20022	MS20024
	= 010	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1	1-1/8	1-1/4	1-3/8	1-1/2
4	250	.750														
6	375	.875	938	1 062												
8	500	1.000	1 062	1 188	1 312	1 312										
10	625	1.125	1 188	1 312	1 438	1 438	1.500	1.562	1 688	1 812						
12	750	1.250	1.312	1 438	1.562	1.562	1 625	1.688	1 812							
14	875	1.375	1 438	1.562	1 688	1 688	1 750	1 812	1 938	2 062						
16	1 000	1.500	1.562	1 688	1 812	1 812	1.875	1 938	2 062	2 188	2 312	2 312				
18	1.125	1.625	1.688	1 812	1 938	1 938	2 000	2 062	2 188	2 312	2 438	2 438	2 625			
20	1.250	1.750	1 812	1 938	2 062	2 062	2 125	2 188	2 312	2 438	2.562	2 562	2 750	2 875		
22	1.375	1.875	1 938	2 062	2 188	2 188	2 250	2 312	2 438	2 562	2.688	2 688	2 875	3.000	3 125	
24	1.500	2.000	2.062	2 188	2.312	2 312	2 375	2 438	2.562	2.688	2.812	2.812	3.000	3 125	3 250	3.375
26	1.625	2.125	2.188	2.312	2 438	2 438	2.500	2.562	2.688	2.812	2.938	2.938	3 125	3 250	3 375	3.500
28	1.750	2.250	2.312	2 438	2.562	2 562	2 625	2.688	2.812	2.938	3 062	3 062	3 250	3.375	3 500	3 625
30	1.875	2.375	2.438	2.562	2.688	2 688	2 750	2.812	2.938	3 062	3 188	3 188	3.375	3 500	3 625	3 750
32	2.000	2.500	2.562	2.688	2.812	2 812	2 875	2.938	3.062	3 188	3 312	3 312	3 500	3 675	3 750	3.875
34	2.125	2.625	2.688	2.812	2.938	2 938	3 000	3 062	3 188	3 312	3 438	3 438	3.625	3 750	3.875	4 000
36	2.250	2.750	2.812	2.938	3 062	3 062	3 125	3 188	3 312	3 438	3.562	3.562	3 750	3 875	4 000	4.125
38	2.375	2.875	2.938	3.062	3 188	3 188	3.250	3 312	3 438	3.562	3.688	3.688	3 875	4 000	4 125	4.250
40	2.500	3.000	3 062	3 188	3 312	3.312	3.375	3 438	3.562	3.688	3.812	3 812	4 000	4 125	4.250	4.375
42	2.625	3.125	3 188	3.312	3 438	3 438	3 500	3.562	3.688	3.812	3.938	3 938	4 125	4 250	4 375	4.500
44	2.750	3.250	3.312	3 438	3.562	3.562	3.625	3.688	3.812	3.938	4.062	4.062	4 250	4 375	4 500	4.625
46	2.875	3.375	3.438	3.562	3.688	3.688	3.750	3.812	3.938	4.062	4.188	4.188	4.375	4 500	4 625	4.750
48	3.000	3.500	3.562	3.688	3.812	3.812	3.875	3.938	4.062	4.188	4.312	4.312	4.500	4 625	4 750	4.875
50	3.125	3.625	3.688	3.812	3.938	3.938	4.000	4.062	4.188	4.312	4.438	4.438	4 625	4 750	4 875	5.000
52	3.250	3.750	3.812	3.938	4.062	4.062	4 125	4.188	4.312	4.438	4.562	4.562	4 750	4 875	5 000	5.125
54	3.375	3.875	3.938	4.062	4 188	4 188	4 250	4 312	4.438	4.562	4.688	4.688	4 875	5 000	5 125	5.250
56	3.500	4.000	4.062	4 188	4 312	4 312	4 375	4.438	4.562	4.688	4.812	4.812	5 000	5 125	5 250	5.375
58	3.625	4.125	4 188	4 312	4 438	4 438	4 500	4.562	4.688	4.812	4.938	4.938	5 125	5 250	5 375	5.500
60	3.750	4.250	4 312	4 438	4.562	4.562	4 625	4.688	4.812	4.938	5.062	5.062	5 250	5.375	5.500	5.625
62	3.875	4.375	4.438	4.562	4.688	4.688	4 750	4.812	4.938	5.062	5.188	5.188	5 375	5 500	5.625	5.750
64	4.000	4.500	4.562	4.688	4.812	4.812	4.875	4.938	5.062	5.188	5.312	5.312	5 500	5 625	5 750	5.875
66	4.125	4.625	4.688	4.812	4.938	4.938	5.000	5.062	5.188	5.312	5.438	5.438	5 625	5 750	5 875	6.000
68	4.250	4.750	4.812	4.938	5.062	5.062	5.125	5.188	5.312	5.438	5.562	5.562	5 750	5 875	6 000	6.125
70	4.375	4.875	4.938	5.062	5.188	5.188	5.250	5.312	5.438	5.562	5.688	5.688	5.875	6 000	6 125	6.250
72	4.500	5.000	5.062	5.188	5.312	5.312	5.375	5.438	5.562	5.688	5.812	5.812	6.000	6 125	6 250	6.375
74	4.625	5.125	5.188	5.312	5.438	5.438	5.500	5.562	5.688	5.812	5.938	5.938	6 125	6 250	6 375	6.500
76	4.750	5.250	5.312	5.438	5.562	5.562	5 625	5.688	5.812	5.938	6.062	6.062	6 250	6 375	6 500	6.625
78	4.875	5.375	5.438	5.562	5.688	5.688	5.750	5.812	5.938	6.062	6.188	6.188	6 375	6 500	6 625	6.750
80	5.000	5.500	5.562	5.688	5.812	5.812	5.875	5.938	6.062	6.188	6.312	6.312	6 500	6 625	6 750	6.875
82	5.125	5.625	5.688	5.812	5.938	5.938	6.000	6.062	6.188	6.312	6.438	6.438	6.625	6 750	6 875	7.000
84	5.250	5.750	5.812	5.938	6.062	6.062	6.125	6.188	6.312	6.438	6.562	6.562	6 750	6.875	7.000	7.125
86	5.375	5.875	5.938	6.062	6.188	6.188	6.250	6.312	6.438	6.562	6.688	6.688	6 875	7 000	7.125	7.250
88	5.500	6.000	6.062	6.188	6.312	6.312	6 375	6.438	6.562	6.688	6.812	6.812	7.000	7 125	7 250	7.375
90	5.625	6.125	6.188	6.312	6.438	6.438	6 500	6.562	6.688	6.812	6.938	6.938	7.125	7.250	7.375	7.500
92	5.750	6.250	6.312	6.438	6.562	6.562	6 625	6.688	6.812	6.938	7.062	7.062	7.250	7.375	7.500	7.625
94	5.875	6.375	6.438	6.562	6.688	6.688	6 750	6.812	6.938	7.062	7.188	7.188	7 375	7.500	7.625	7.750
96	6.000	6.500	6.562	6.688	6.812	6.812	6.875	6.938	7.062	7.188	7.312	7.312	7 500	7 625	7 750	7.875
98	6.125						7 000	7.062	7.188	7.312	7.438	7.438	7 625	7 750	7 875	8.000
100	6.250						7 125	7.188	7.312	7.438	7.562	7.562	7 750	7 875	8 000	8.125
102	6.375						7 250	7.312	7.438	7.562	7.688	7.688	7 875	8 000	8 125	8.250
104	6.500						7 375	7.438	7.562	7.688	7.812	7.812	8 000	8 125	8 250	8.375
106	6.625						7 500	7.562	7.688	7.812	7.938	7.938	8 125	8.250	8 375	8.500
108	6.750						7.625	7.688	7.812	7.938	8.062	8.062	8 250	8 375	8 500	8.625
110	6.875						7.750	7.812	7.938	8.062	8.188	8.188	8 375	8.500	8 625	8.750
112	7.000						7.875	7.938	8.062	8.188	8.312	8.312	8.500	8 625	8 750	8.875
114	7.125												8 625	8 750	8 875	9.000
116	7.250												8 750	8 875	9 000	9.125
118	7.375												8 875	9 000	9 125	9.250
120	7.500												9 000	9 125	9 250	9.375
122	7.625												9 125	9 250	9 375	9.500
124	7.750												9 250	9 375	9 500	9.625
126	7.875												9 375	9 500	9.625	9.750
128	8.000												9 500	9 625	9 750	9.875

(E) *APPLIES TO MS20012A ONLY.

PREPARING ACTIVITY NAVY - AS
CUSTODIANS ARMY-AP NAVY-
AIR FORCE-99 DLA-
REVIEW ARMY - EP, ME, MJ DLA - IS AF-R
USER APPY - AV
PROJECT NUMBER 5306-123E

MILITARY SPECIFICATION SHEET
TITLE BOLTS, INTERNAL WRENCHING, 160 KSI FTU
AND 96 KSI FSL

SPECIFICATION SHEET NUMBER 30 MAY 1969
MS20004E THRU 20024E
SUPERSEDING
MS20004D THRU 20024D 1C AUGUST 1981
AMSC- N/A FSC 5306

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Page 1 of 4

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THAT ISSUE OF THE DDORS SPECIFIED IN THE SOLICITATION MIL-8-7838

THIS SPECIFICATION IS APPROVED FOR USE
BY ALL DEPARTMENTS AND AGENCIES OF THE
DEPARTMENT OF DEFENSE

THE REQUIREMENTS FOR ACQUIRING THE PRODUCT(S) DESCRIBED HEREIN SHALL CONSIST OF THIS SPECIFICATION SHEET AND THE ISSUE OF THE FOLLOWING SPECIFICATION LISTED IN THAT ISSUE OF THE DODSS SPECIFIED IN THE SOLICITATION MIL-B-7838

THIS SPECIFICATION IS APPROVED FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

Form approved
OMB No 0704-0188

UNASSIGNED DASH NUMBERS SHALL NOT BE USED, EXCEPT THOSE DASH NUMBERS COVERED BY THE FOLLOWING CODING NOTE

DASH NUMBERS INDICATE PREFERRED GRIP LENGTHS IN 125 INCREMENTS. INTERMEDIATE GRIP LENGTHS BETWEEN THOSE LENGTHS LISTED, MAY BE SPECIFIED IN .062 INCREMENTS BY INTERMEDIATE DASH NUMBERS. LENGTH AND GRIP OF A BOLT WITH AN ODD NUMBER FOR THE DASH NUMBER WILL BE .062 GREATER THAN SHOWN FOR THE BOLTS WITH THE PRECEDING EVEN DASH NUMBER. ONLY BOLT DIAMETER FOR WHICH THERE ARE QUALIFIED PRODUCTS LISTED ON QPL-7838 SHALL BE USED FOR DESIGN.

FOR EACH BOLT DIAMETER GRIP LENGTHS GREATER OR LESS THAN THOSE DESIGNATED BY ASSIGNED DASH NUMBERS ON TABLE II ARE INACTIVE FOR DESIGN.

ADD "H" BEFORE DASH NUMBER FOR BOLT WITH DRILLED HEAD

EXAMPLES OF PART NUMBERS MS20017-18 = 1-12 BOLT, 2.438 INCH LONG, 1.125 INCH GRIP, UNDRILLED HEAD
MS20017H18 = 1-12 BOLT, 2.438 INCH LONG, 1.125 INCH GRIP, DRILLED HEAD.

PREPARING ACTIVITY NAVY - AS	MILITARY SPECIFICATION SHEET	SPECIFICATION SHEET NUMBER 30 MAY 1989
CUSTODIANS ARMY - AR NAVY -	TITLE BOLT - INTERNAL WRENCHING, 160 KS; FTU	MS20004E THRU 20024E
AIR FORCE - 99 DLA -	AND 96 KS; FSL	SUPERSEDING MS20004D THRU 20024D 10 AUGUST 1981
REVIEW ARMY - ER, ME, MI DLA - JS AF - B2		AMSC - N/A FSC 5306
USER ARMY - AV		
PROJECT NUMBER 5306-1234		
DISTRIBUTION STATEMENT <u>A</u> Approved for public release distribution is unlimited		Page <u>1</u> of <u>1</u>