

INCH-POUND

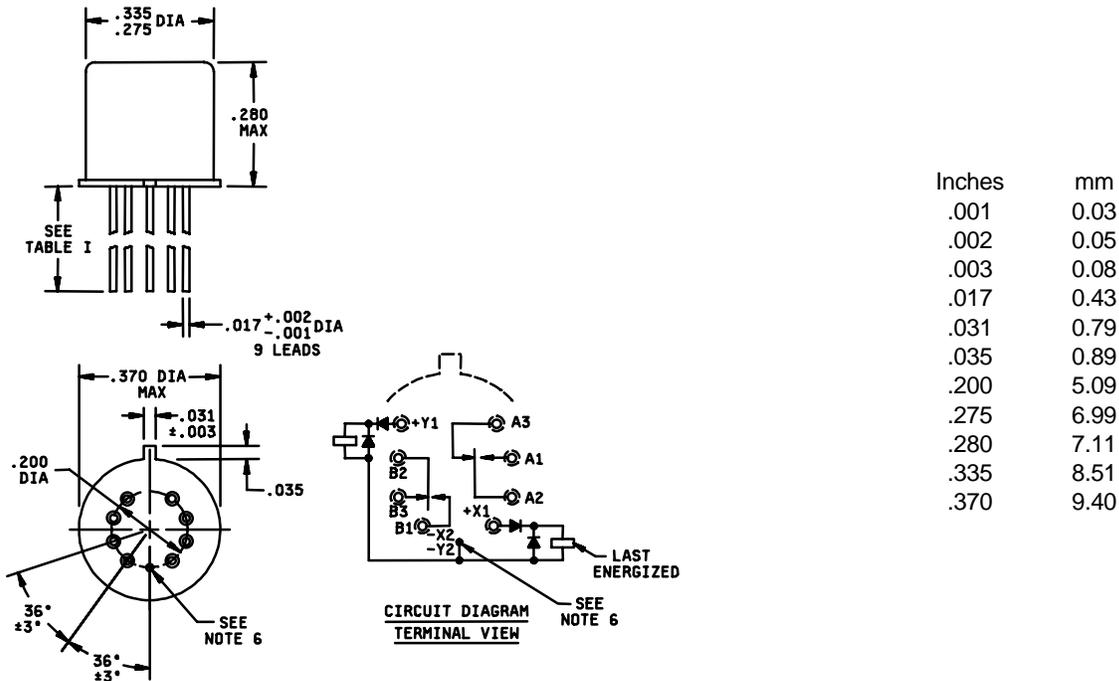
MIL-PRF-39016/30F
15 June 2005
SUPERSEDING
MIL-PRF-39016/30E
20 July 1988

PERFORMANCE SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT, LOW LEVEL TO 1.0 AMPERE (LATCHING) WITH INTERNAL DIODES FOR COIL TRANSIENT SUPPRESSION AND POLARITY REVERSAL PROTECTION

This specification sheet is approved for use by all Departments and Agencies of the Department of Defense.

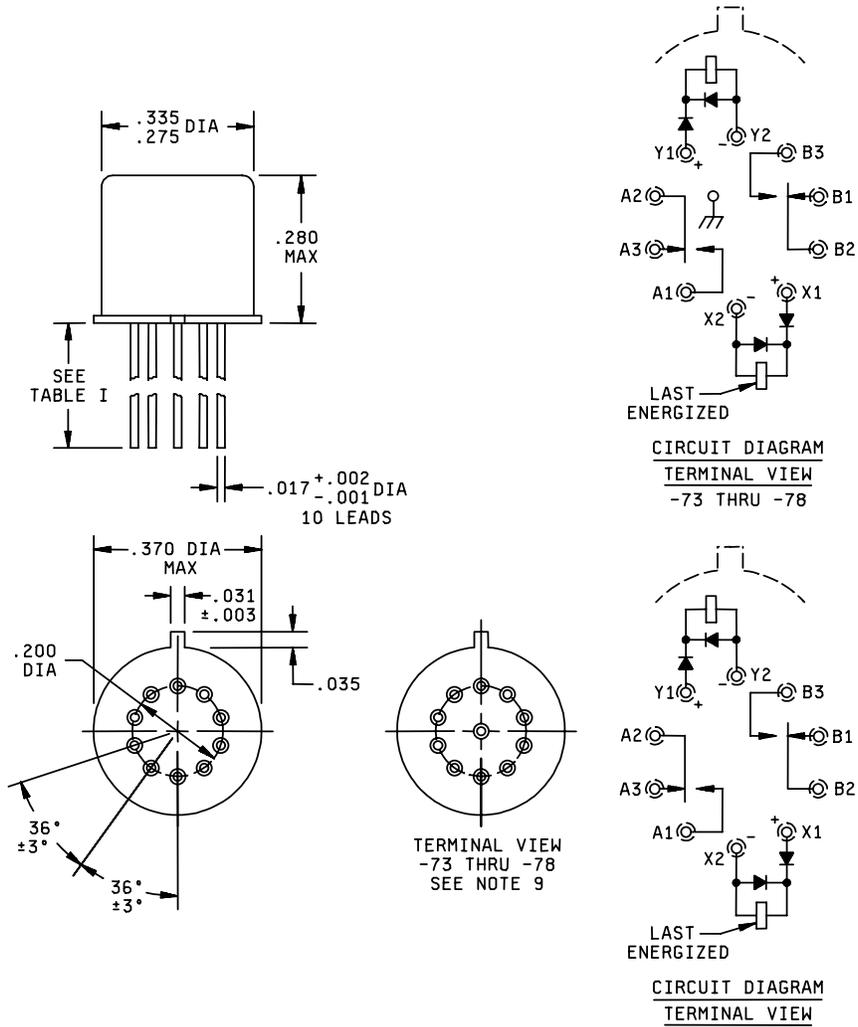
The complete requirements for acquiring the relays described herein shall consist of this specification sheet and the latest issue of MIL-PRF-39016.



NOTES:

- 1. Dimensions are in inches.
- 2. Metric equivalents are given for general information only.
- 3. Unless otherwise specified, tolerance is ± 0.010 (0.25 mm).
- 4. Terminal numbers shown above are for reference only. Numbers do not appear on the relay.
- 5. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
- 6. All leads shall be electrically insulated from the case, except for lead terminal, -X2 -Y2, which is grounded to the case.
- 7. Coil symbol optional in accordance with MIL-STD-1285.
- 8. Circuit diagram shown on part is the terminal view.

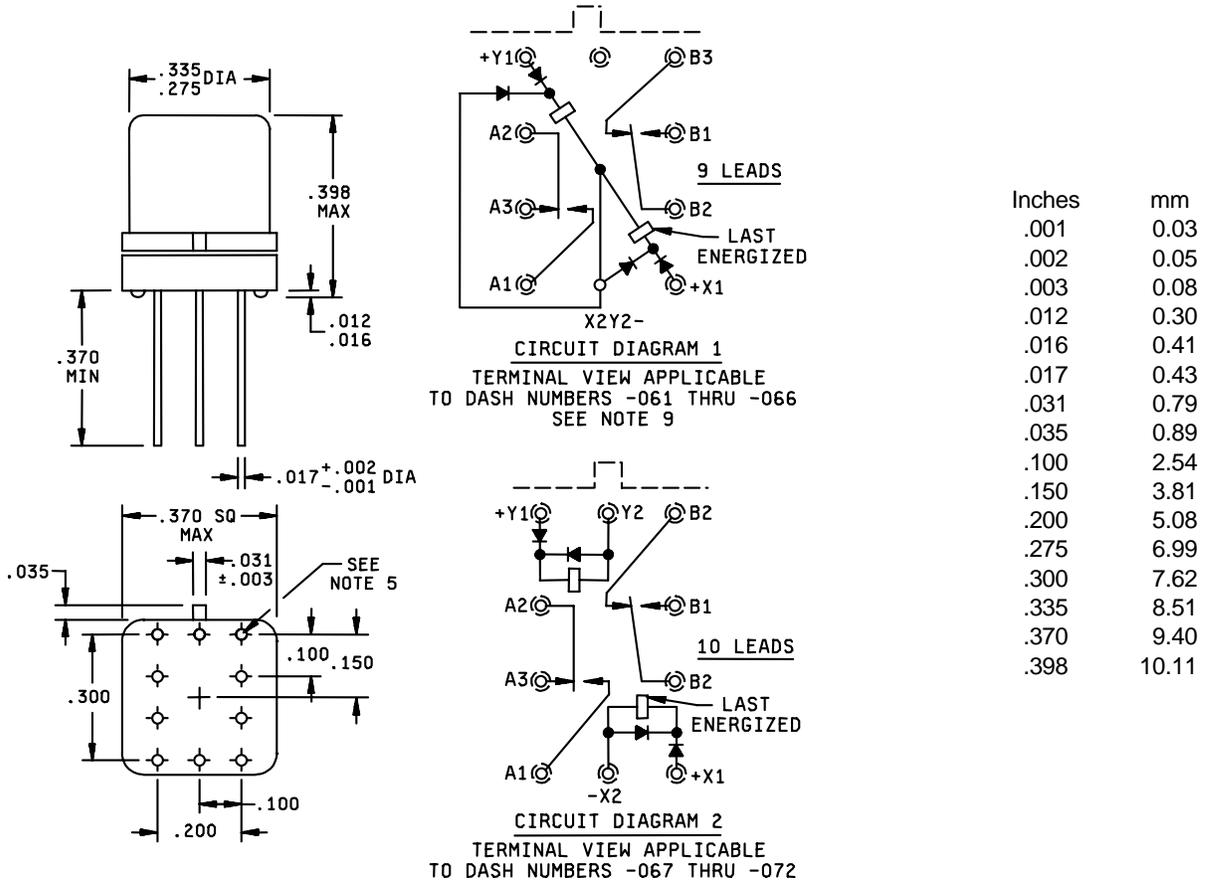
FIGURE 1. Dimensions and configuration.



NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ± 0.010 (0.25 mm).
4. Terminal numbers shown above for reference only. Numbers do not appear on relay.
5. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
6. All leads shall be electrically insulated from the case.
7. Coil symbol optional in accordance with MIL-STD-1285.
8. Circuit diagram shown on part is the terminal view.
9. M39016/30-073 through M39016/30-078 shall be supplied with a case grounding pin welded to the relay header as shown.

FIGURE 2. Dimensions and configuration.



NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ± 0.010 (0.25 mm).
4. Spreader mounting pads shall comply with the requirements of A-A-55485, A-55485/05-003.
5. Dimensions and tolerances shown for the bottom view of the spreader mounting pad are for the center-to-center locations of the holes in the spreader mounting pad.
6. Shape optional within the envelope dimension.
7. Terminal numbers shown above for reference only. Numbers do not appear on the relay.
8. Relays shall have a (+) sign placed on the circuit diagram as shown.
9. All leads shall be electrically insulated from the case.
10. Coil symbol optional in accordance with MIL-STD-1285.
11. Circuit diagram shown on part is the terminal view.

FIGURE 3. Dimensions and configuration relay with spreader mounting pad attached.

REQUIREMENTS:

CONTACT DATA:

Load ratings:

High level (relay case grounded):

Resistive:

1.0 ampere at 28 V dc.

250 milliamperes at 115 V ac 60 and 400 Hz case not grounded.

100 milliamperes at 115 V ac 60 and 400 Hz case grounded.

Inductive load: 0.2 ampere at 28 V dc with 0.32 henry inductance.

Lamp: 0.10 ampere at 28 V dc.

Low level: 10 to 50 μ A at 10 to 50 mV dc or peak ac.

Intermediate current: Applicable.

Contact resistance or voltage drop:

Initial: 0.125 ohm maximum (0.150 ohm maximum with spreader mounting pads attached).

High level:

During life: Not more than 5 percent of open circuit voltage.

After life: 0.225 ohm maximum (0.250 ohm maximum with spreader mounting pad attached).

Low level:

During life: 33 ohms maximum.

After life: 0.175 ohm maximum (0.200 ohm maximum with spreader mounting pad attached).

Intermediate current:

During: 1 ohm maximum.

After: 0.225 ohm maximum (0.250 ohm maximum with spreader mounting pad attached).

Contact bounce: 2.0 milliseconds maximum (applicable to failure rate level "L").

Contact stabilization time: 2.5 milliseconds maximum (applicable to failure rate levels "M", "P", and "R").

Overload (high level only): Two times rated current. Not applicable to ac load ratings.

Neutral screen: Applicable.

COIL DATA: See table I.

Operate time: 2.0 ms maximum over temperature range with rated coil voltage.
 Release time: Not applicable.

ELECTRICAL DATA: 1/

Insulation resistance: 10,000 megohms minimum at 500 V dc, except the resistance between coil and case at high temperature shall be 1,000 megohms minimum.

Dielectric withstanding voltage:

	Sea level V rms (60 Hz)	Post intermediate current life test Sea level V rms (60 Hz)	Altitude V rms (60 Hz)
Between case, frame, or enclosure and all contacts in the energized and de-energized positions.	500	500	
Between case, frame, or enclosure and coils.	500	500	125
Between all contacts and coils.	500	500	All
Between open contacts in the energized and de-energized positions.	500	375	terminals to case
Between contact poles.	500	500	
Between coils of dual coil relays.	500	500	

DIODE CHARACTERISTICS:

Coil transient suppression: Applicable.

Diode block integrity (perform this test after coil transient suppression test in all inspection tables of MIL-PR-39016): With applicable voltage applied to the relay coil circuit in the reverse direction, monitor leakage current with dc microammeter, oscilloscope, or qualifying activity approved test equipment. Leakage current shall not exceed the specified value.

Block integrity maximum leakage current: 1µA at 50 V dc.

Maximum negative transient: 1.0 volt.

Breakdown voltage: 100 V dc minimum at 10 microamperes (µA). (This test may be performed in-process or as final assembly).

Semiconductor in-process screening: Applicable, visual inspection of semiconductors shall be in accordance with MIL-STD-750, method 2073, or 2074.

ENVIRONMENTAL DATA:

Temperature range: -65°C to +125°C.

1/ Dielectric withstanding voltage and insulation resistance are not applicable between coils and case or from coil to coil on figure 1 relays.

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Vibration (sinusoidal): MIL-STD-202, method 204. Contact chatter shall not exceed 10 microseconds maximum for closed contacts, and 1 microsecond maximum closure for open contacts.

Vibration (random): MIL-STD-202, method 214, test condition IG. Contact chatter shall not exceed 10 microseconds maximum for closed contacts, and 1 microsecond maximum closure for open contacts (applicable to qualification and group C testing only).

Shock (specified pulse): MIL-STD-202, method 213, test condition B (75 g's). Contact chatter shall not exceed 10 microseconds maximum for closed contacts, and 1 microsecond maximum closure for open contacts.

Magnetic interference: Applicable.

Resistance to soldering heat: Applicable.

Acceleration: Applicable.

Salt atmosphere (corrosion): In accordance with MIL-STD-750, method 1041.

PHYSICAL DATA:

Terminal strength (MIL-STD-202, method 211):

Pull test: Test condition A, 1 pound pull.

Bend test: Test condition C, ½ pound load.

Twist test: Test condition D as specified in MIL-PRF-39016.

Solderability: Applicable.

Dimensions and configuration: See figure 1, 2 and 3.

Weight: 2.84 grams (0.10 ounce) maximum, 3.09 grams (0.109 ounce) maximum with spreader mounting pad attached).

Seal: Hermetic.

Minimum marking: Military part number, "J" with the date code (example J0430), circuit diagram, manufacturer's name or source code.

LIFE TEST REQUIREMENTS:

High level: 100,000 cycles per relay.

Low level: 100,000 cycles plus 900,000 cycles mechanical life.

Part or Identifying Number (PIN): M39016/30- (dash number from table I and suffix letter designating failure rate level).

TABLE I. Dash numbers and characteristics. 1/ 2/

Dash numbers 3/				.500 Min with ground pin 8/	Number of leads	Coil voltage V dc 6/		At 25°C			Over temp range	
Lead length 1.500 min 4/	Lead length .187 ±.010	Lead length .500 min	Spreader mounting pad (figure 3) 5/			Rated	Max	Coil resistance ohms (Ref. only) 7/	Coil circuit current (mA) 6/ 9/		Specified pickup (latch/reset) value (voltage) (V dc)	Specified pickup (latch/reset) value (voltage) (V dc)
									Max	Min		
025	037	049	061		9	6.0	8.0	97	63.0	46.9	4.1	5.5
026	038	050	062		9	9.0	12	280	33.7	26.0	6.3	7.8
027	039	051	063		9	12	16	500	25.5	20.0	8.0	10
028	040	052	064		9	18	24	1,130	17.2	13.7	11.6	14.5
029	041	053	065		9	26.5	32	2,000	14.4	11.6	15.4	19
030	042	054	066		9	5.0	6.0	48	104.2	75.8	3.5	4.5
031	043	055	067		10	5.0	6.0	48	104.2	75.8	3.5	4.5
032	044	056	068		10	6.0	8.0	97	63.0	46.9	4.1	5.5
033	045	057	069		10	9.0	12	280	33.7	26.0	6.3	7.8
034	046	058	070		10	12	16	500	25.5	20.0	8.0	10
035	047	059	071		10	18	24	1,130	17.2	13.7	11.6	14.5
036	048	060	072		10	26.5	32	2,000	14.4	11.6	15.4	19
				073	11	12	16	48	104.2	75.8	3.5	4.5
				074	11	5.0	6.0	97	63.0	46.9	4.1	5.5
				075	11	6.0	8.0	280	33.7	26.0	6.3	7.8
				076	11	9.0	12	500	25.5	20.0	8.0	10
				077	11	18	24	1,130	17.2	13.7	11.6	14.5
				078	11	26.5	32	2,000	14.4	11.0	15.4	19

See footnotes on following page.

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- 1/ Each relay possesses high level and low level capabilities. However, relays previously tested or used above 10 mA resistive at 6 V dc maximum or peak ac open circuits not recommended for subsequent use in low level applications.
- 2/ **WARNING:** When latching relays are installed in equipment, the latch and reset coils should not be pulsed simultaneously. Coils should not be pulsed with less than the nominal coil voltage and the pulse width should be a minimum of three times the specified operate time of the relay. If these conditions are not followed, it is possible for the relay to be in the magnetically neutral position.
- 3/ The suffix letter L, M, P, or R to designate the applicable failure rate level shall be added to the applicable listed dash number. Failure rate level (percent per 10,000 cycles): L, 3.0; M, 1.0; P, 0.1; R, 0.01. Example, 025L - - - -072R.
- 4/ 1.500 leads are inactive for new design.
- 5/ Relays supplied with spreader mounting pads (-061 through -072) shall have the spreader mounting pad rigidly attached.
- 6/ **CAUTION:** The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.
- 7/ Coil resistance not directly measurable at relay terminals. When rated voltage is applied to coil terminals, the coil circuit must be within the limits shown. Measure at 25°C at nominal voltage for 5 seconds maximum.
- 8/ Relays are supplied with a case grounding pin welded to the header (see figure 2).
- 9/ Delete "Coil resistance" and substitute "Coil current" test in all inspection tables of MIL-PRF-39016.

QUALIFICATION INSPECTION:

Qualification inspection and sample size: See table II.

TABLE II. Qualification inspection and sample size. 1/

Single submission	Group submission	
18 units plus 1 open unit for level L at C = 0 1/ 33 units plus 1 open unit for level M at C = 0 1/ Qualification inspection as applicable	M39016/30-053	18 units plus 1 open unit for level L at C = 0 1/ 33 units plus 1 open unit for level M at C = 0 1/ Qualification inspection as applicable
	M39016/30-049	2 units each PIN
	M39016/30-050	Qualification inspection, Q1.
	M39016/30-051	
	M39016/30-052	
	M39016/30-054	
	M39016/30-055	
	M39016/30-056	
	M39016/30-057	
	M39016/30-058	
	M39016/30-059	
	M39016/30-060	
	M39016/30-078	1 unit terminal strength and terminal solderability

1/ The number of units required for qualification testing shall be increased as required in Q5, MIL-PRF-39016, if the relay manufacturer elects to test the number of units permitting one or more failures. Prior to performance of qualification inspection testing; the relay manufacturer shall preselect the sampling plan.

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Initial qualification of relays supplied with spreader mounting pads (-061 through -072) shall be tested as specified below:

Perform the following tests as specified in the qualification inspection table of MIL-PRF-39016, in the order shown below:

Before installation of spreader mounting pad; screening, visual and mechanical inspection (internal), thermal shock, resistance to solvents, vibration (sinusoidal), vibration (random), shock (specified pulse), acceleration, terminal strength, magnetic interference (when specified), capacitance (when specified), coil life (applicable to continuous duty relays only), resistance to soldering heat, salt spray (corrosion), overload (applicable to high level relays only), life, terminal strength, and intermediate current.

After installation of spreader mounting pad perform the following tests as specified in the qualification inspection table of MIL-PRF-39016 in the order shown below:

Insulation resistance, dielectric withstanding voltage, static contact resistance; specified pickup (latch/reset) value (voltage), coil resistance, operate and release time, contact dynamic characteristics, coil transient suppression (when specified), solderability, seal, visual and mechanical inspection (external).

Qualification inspection (reduced testing for previously qualified relays) for relays supplied with spreader mounting pads (-061 through -072), two (2) units of the 26.5 volt rated coil voltage (-065) shall be tested as specified below:

Before installation of spreader mounting pad, perform the following tests as specified in the qualification inspection table of MIL-PRF-39016 in the order shown below:

For failure rate level L only. Screening.

For failure rate levels M, P, and R: Vibration (sinusoidal) test duration shall be 10 minutes, vibration (random), and screening.

After installation of spreader mounting pad perform the following tests as specified in the qualification inspection table of MIL-PRF-39016 in the order shown below:

Insulation resistance, dielectric withstanding voltage, static contact resistance, specified pickup (latch/reset) value (voltage), coil resistance, operate and release time, contact dynamic characteristics, coil transient suppression (when specified), solderability, seal, visual and mechanical inspection (external).

Group A testing for relays supplied with spreader mounting pads (-061 through -072), shall be tested as specified below:

Perform seal test immediately, preceding the subgroup A2 electrical tests. Relay leads shall be formed and the spreader mounting pad removed before the seal test. After the seal test, the spreader mounting pad shall be rigidly attached to the relay and the remaining group A tests performed.

SUPERSESSION DATA:

Supersession data: See table III.

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TABLE III. Supersession data. ^{1/}

Superseded part no. M39016/30-	New part no. M39016/30-		Superseded part no. M39016/30-	New part no. M39016/30-
001	025		013	031
002	026		014	032
003	027		015	033
004	028		016	034
005	029		017	035
006	037		018	036
007	038		019	043
008	039		020	044
009	040		021	045
010	041		022	046
011	030		023	047
012	042		024	048

^{1/} Dash numbers -025 through -036 are inactive for new design and are for support of existing equipment design only.

Cross reference for Government logistical support. See table IV.

TABLE V. Cross reference for Government logistical support.

Superseded part no. M39016/30-	New part number M39016/30-	Support with part number M39016/30-	New part number M39016/30-	Support with part number M39016/30-	New part number M39016/30-	Support with part number M39016/30-
001	025	025	049	049	073	073
002	026	026	050	050	074	074
003	027	027	051	051	075	075
004	028	028	052	052	076	076
005	029	029	053	053	077	077
006	037	049	054	054	078	078
007	038	050	055	055		
008	039	051	056	056		
009	040	052	057	057		
010	041	053	058	058		
011	030	030	059	059		
012	042	054	060	060		
013	031	031	061	061		
014	032	032	062	062		
015	033	033	063	063		
016	034	034	064	064		
017	035	035	065	065		
018	036	036	066	066		
019	043	055	067	067		
020	044	056	068	068		
021	045	057	069	069		
022	046	058	070	070		
023	047	059	071	071		
024	048	060	072	072		

Referenced documents. In addition to MIL-PRF-39016, this document references the following:

A-A-55485, /5
MIL-STD-202
MIL-STD-750
MIL-STD-1285

Changes from previous issue: Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:
Army - CR
Navy - EC
Air Force - 11
DLA - CC

Preparing activity:
DLA - CC

Review activities:
Army - AR, AT, AV, CR4, MI
Navy - AS, MC, OS, SH
Air Force - 19, 99

(Project 5945-1264)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil>.