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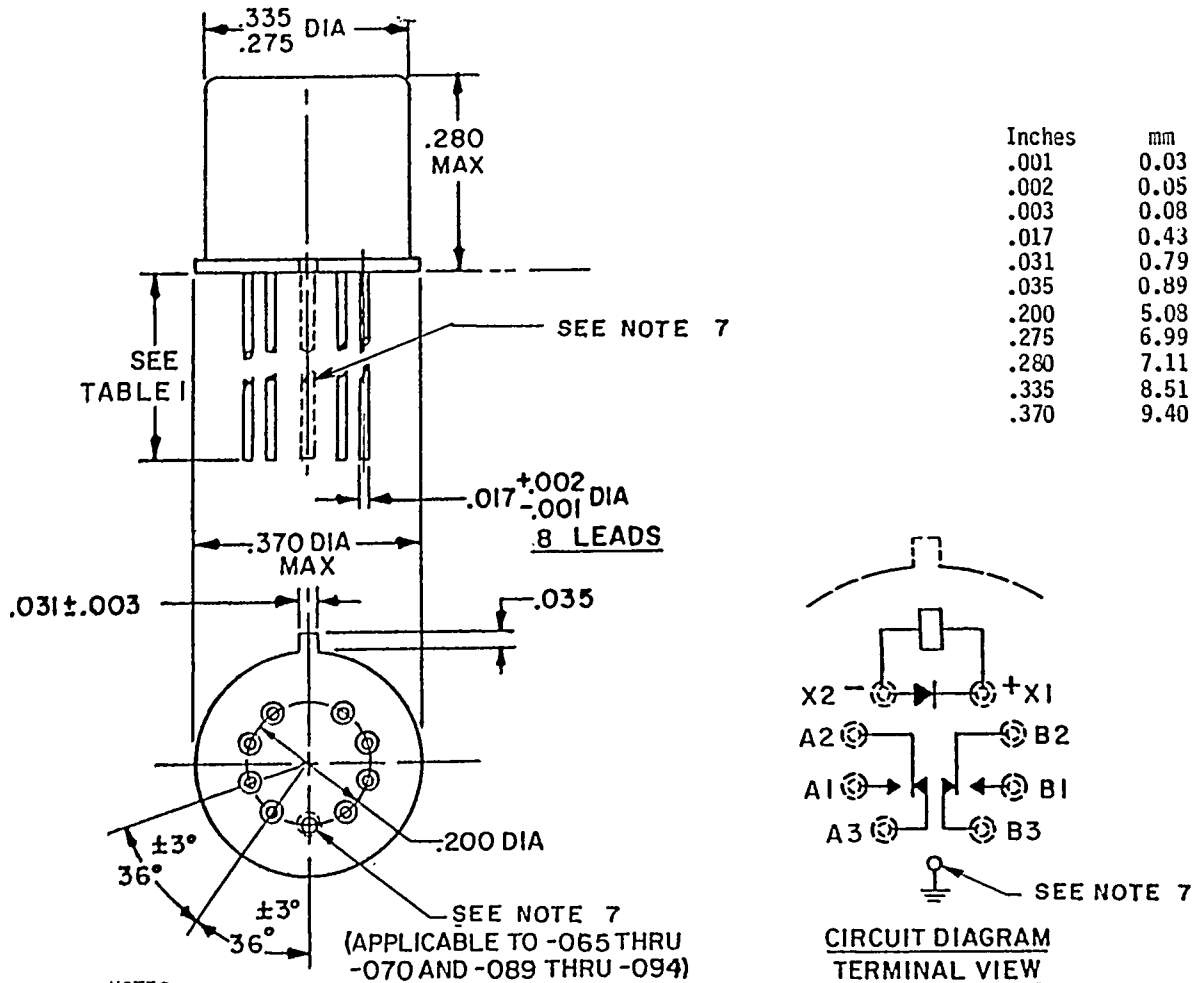
12

MILITARY SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT,  
 LOW LEVEL TO 1.0 AMPERE WITH INTERNAL DIODE FOR COIL TRANSIENT SUPPRESSION

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

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



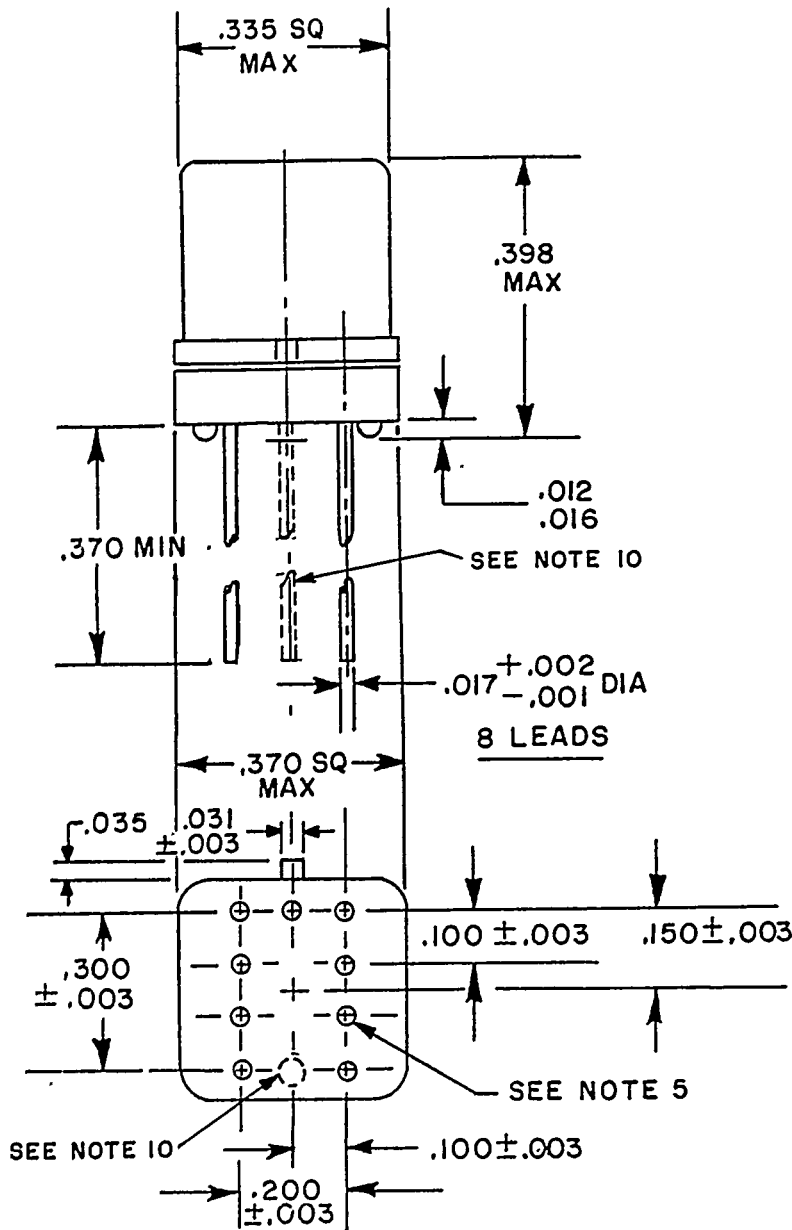
NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.010 (0.25 mm).
4. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
5. Coil symbol optional in accordance with MIL-STD-1285.
6. Circuit diagram shown on part is the terminal view.
7. The grounding pin shown is a noninsulated case ground applicable to -065 through -070 and -089 through -094 (see table I).

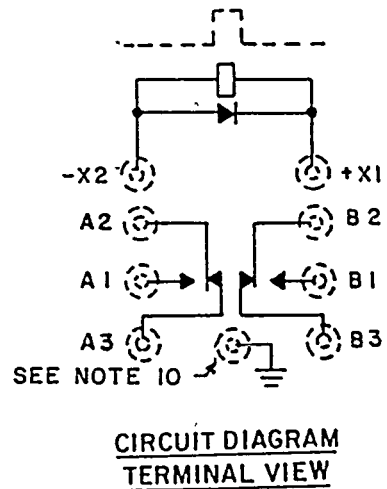
FIGURE 1. Dimensions and configuration (round).

Ⓜ denotes changes





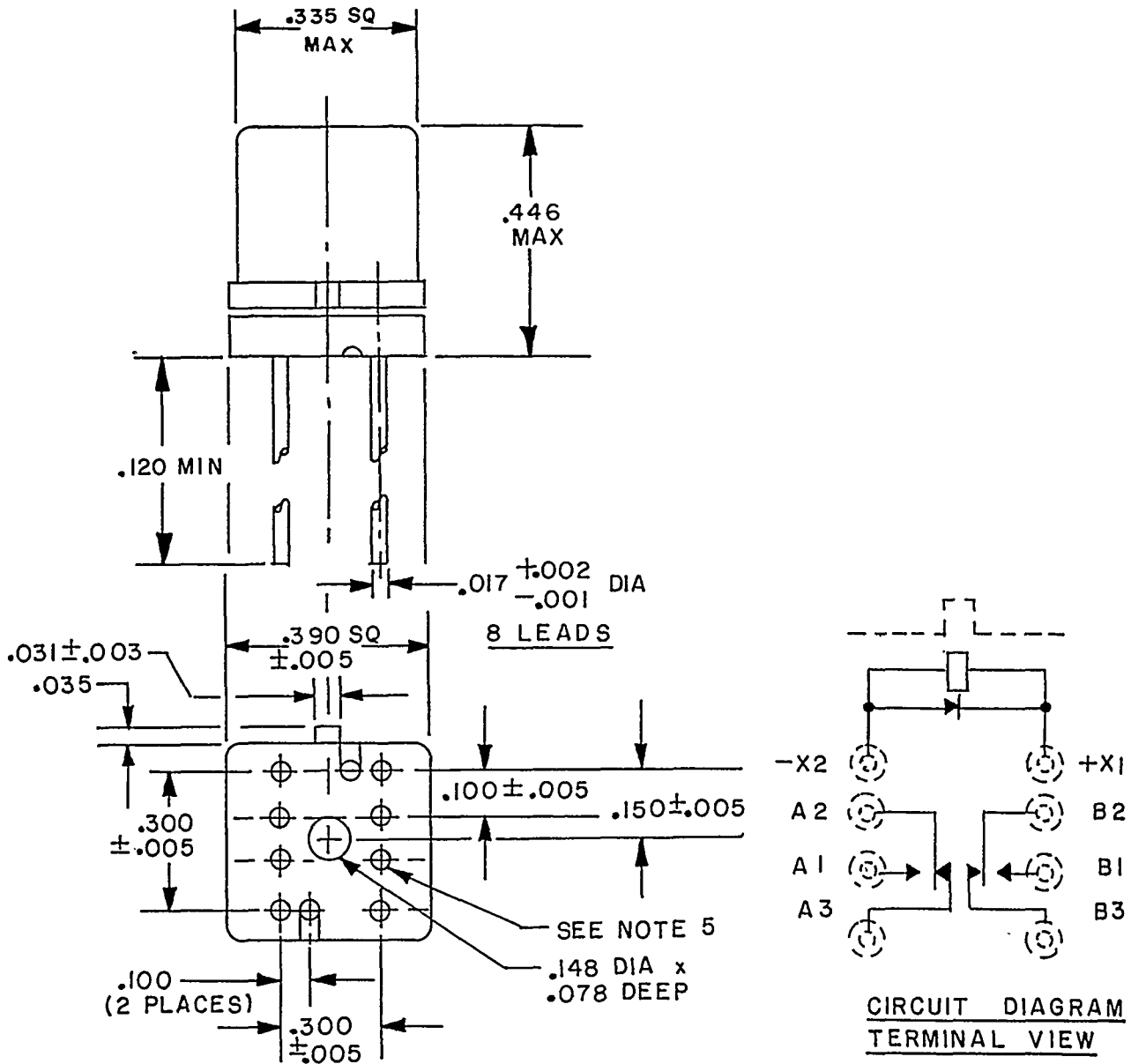
Inches	mm
.001	0.03
.002	0.05
.003	0.08
.012	0.30
.016	0.41
.017	0.43
.031	0.79
.035	0.89
.100	2.54
.150	3.81
.200	5.08
.275	6.99
.300	7.62
.335	8.51
.370	9.40
.398	10.11



**NOTES:**

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is  $\pm 0.010$  (0.25 mm).
4. Spreader pads shall be certified to MIL-M-38527, M38527/5-003 or M38527/5-013.
5. Dimensions and tolerances shown for the bottom view of the spreader pad are for the center to center locations of the holes in the spreader pad.
6. Shape optional within the envelope dimension.
7. Coil symbol optional in accordance with MIL-STD-1285.
8. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
9. Circuit diagram shown on part is the terminal view.
10. The grounding pin shown is applicable to dash numbers -113 through -118 only and is a noninsulated case ground (see table I).

**FIGURE 3. Dimensions and configuration relay with spreader pad (.100 x .200 terminal spacing) attached (square or round).**



NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.010 (0.25 mm).
4. Spreader pads shall be certified to MIL-M-38527, M38527/5-014.
5. Dimensions and tolerances shown for the bottom view of the spreader pad are for the center to center locations of the holes in the spreader pad.
6. Shape optional within the envelope dimension.
7. Coil symbol optional in accordance with MIL-STD-1285.
8. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
9. Circuit diagram shown on part is the terminal view.

FIGURE 4. Dimensions and configuration relay with spreader pad (.100 x .300 terminal spacing) attached (square or round).

REQUIREMENTS:

CONTACT DATA:

Load ratings:

High level (relay case grounded):

Resistive: 1.0 ampere at 28 V dc.  
500 milliamperes at 115 V ac 400 Hz case not grounded.  
250 milliamperes at 115 V ac 60 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  $\mu$ A at 10 to 50 mV dc or peak ac.

Intermediate current: Applicable.

Contact resistance or voltage drop:

Initial: 0.10 ohm maximum (0.125 ohm maximum with figure 3 spreader pad attached and 0.150 ohm maximum with figure 4 spreader pad attached).

High level:

During life: Not more than 5 percent of open circuit voltage.  
After life: 0.20 ohm maximum (0.225 ohm maximum with figure 3 spreader pad attached and 0.250 ohm maximum with figure 4 spreader pad attached).

Low level:

During life: 33 ohms maximum.  
After life: 0.15 ohm maximum (0.175 ohm maximum with figure 3 spreader pad attached and 0.200 ohm maximum with figure 4 spreader pad attached).

Intermediate current:

During: 1 ohm maximum.  
After: 0.20 ohm maximum (0.225 ohm maximum with figure 3 spreader pad attached and 0.250 ohm maximum with figure 4 spreader pad attached).

Contact bounce: 1.5 milliseconds maximum (applicable to failure rate level "L").

Contact stabilization time: 2.0 milliseconds maximum (applicable to failure rate levels "M", "P", and "R").

Overload (high level only): Two times rated current.

COIL DATA: See table I.

Operate time: 2.0 ms maximum over temperature range with rated coil voltage.  
Release time: 4.0 ms maximum over temperature range from rated coil voltage.

ⓐ TABLE I. Dash numbers and characteristics. 1/

Dash numbers 2/							Figure	Coil voltage (V dc) 5/		At 25°C			Over temperature range			
1.500 min leads 3/	1.500 min leads with ground 3/	.187 leads +.040	.500 min leads	.500 min leads with ground	Spreader pads 4/	Spreader pads with ground 4/		Rated	Max	Coil resistance ohms ±10%	Specified pickup value (voltage) (V dc)	Specified hold value (voltage) (V dc)	Specified dropout value (voltage) (V dc)	Specified pickup value (voltage) (V dc)	Specified hold value (voltage) (V dc)	Specified dropout value (voltage) (V dc)
		-.010														
029	065	035	077	089	---	---	1	6.0	8.0	98	3.5	2.0	0.28	4.5	3.2	0.18
030	066	036	078	090	---	---		9.0	12	220	5.3	3.0	0.54	6.8	4.9	0.35
031	067	037	079	091	---	---		12	16	390	7.0	4.0	0.63	9.0	6.5	0.41
032	068	038	080	092	---	---		18	24	880	10.5	6.0	0.91	13.5	10.0	0.59
033	069	039	081	093	---	---		26.5	32	1,560	14.2	8.0	1.37	18	13.0	0.89
034	070	040	082	094	---	---	2	5.0	5.8	50	2.7	1.4	0.22	3.5	2.3	0.14
041	071	047	083	095	---	---		6.0	8.0	98	3.5	2.0	0.28	4.5	3.2	0.18
042	072	048	084	096	---	---		9.0	12	220	5.3	3.0	0.54	6.8	4.9	0.35
043	073	049	085	097	---	---		12	16	390	7.0	4.0	0.63	9.0	6.5	0.41
044	074	050	086	098	---	---		18	24	880	10.5	6.0	0.91	13.5	10.0	0.59
045	075	051	087	099	---	---	3	26.5	32	1,560	14.2	8.0	1.37	18.0	13.0	0.89
046	076	052	088	100	---	---		5.0	5.8	50	2.7	1.4	0.22	3.5	2.3	0.14
---	---	---	---	---	101	113		6.0	8.0	98	3.5	2.0	0.28	4.5	3.2	0.18
---	---	---	---	---	102	114		9.0	12	220	5.3	3.0	0.54	6.8	4.9	0.35
---	---	---	---	---	103	115		12	16	390	7.0	4.0	0.63	9.0	6.5	0.41
---	---	---	---	---	104	116	4	18	24	880	10.5	6.0	0.91	13.5	10.0	0.59
---	---	---	---	---	105	117		26.5	32	1,560	14.2	8.0	1.37	18	13.0	0.89
---	---	---	---	---	106	118		5.0	5.8	50	2.7	1.4	0.22	3.5	2.3	0.14
---	---	---	---	---	125	---		6.0	8.0	98	3.5	2.0	0.28	4.5	3.2	0.18
---	---	---	---	---	126	---		9.0	12	220	5.3	3.0	0.54	6.8	4.9	0.35
---	---	---	---	---	127	---	4	12	16	390	7.0	4.0	0.63	9.0	6.5	0.41
---	---	---	---	---	128	---		18	24	880	10.5	6.0	0.91	13.5	10.0	0.59
---	---	---	---	---	129	---		26.5	32	1,560	14.2	8.0	1.37	18	13.0	0.89
---	---	---	---	---	130	---		5.0	5.8	50	2.7	1.4	0.22	3.5	2.3	0.14

MIL-R-39016/15J

- 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 application.
- 2/ 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, 029L - - - - - 118R.
- 3/ 1.500 leads are inactive for new design.
- 4/ Relays supplied with spreader pads (-101 through -106, -113 through -118, and -125 through -130) shall have the pad rigidly attached.
- 5/ CAUTION: The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.

ELECTRICAL DATA:

Insulation resistance: 1/ 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: 1/

	Sea level V rms (60 Hz)	Altitude V rms (60 Hz)
Between case, frame, or enclosure and all contacts both in the energized and deenergized positions - - -	500	125 All terminals to case
Between case, frame, or enclosure and coil- - - - -	500	
Between all contacts and coil - - - - -	500	
Between open contacts in the energized and deenergized positions - - - - -	500	
Between contact poles - - - - -	500	

DIODE CHARACTERISTICS: 2/

Maximum negative transient: 1.0 volt.

- ① Coil transient suppression: Applicable.
- ① 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 Vibration (sinusoidal): MIL-STD-202, method 204. Contact chatter shall not exceed 10 microseconds maximum for closed contacts and 1 microsecond maximum for open contacts.
  - ① 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 inspection and group C inspection 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 for open contacts.

Magnetic interference: Applicable.

Resistance to soldering heat: Applicable.

Acceleration: Applicable.

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

PHYSICAL DATA:

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

- Pull test: Test condition A, 1 pound pull.
- Bend test: Test condition C, 1/2 pound load.
- Twist test: As specified in MIL-R-39016.

1/ Connect coil leads together to avoid damage to the diode.  
2/ Warning: Reverse polarity on coil terminals will destroy diode.

Solderability: Applicable.

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

Weight: 2.55 grams (0.09 ounce) maximum, 2.80 grams (0.099 ounce) maximum with spreader pad attached.

Seal: Hermetic.

Minimum marking: Military part number, J date code, circuit diagram, manufacturer's name or source code.

LIFE TEST REQUIREMENTS:

High level: 100,000 cycles per relay.

① Low level: 100,000 cycles plus 900,000 cycles mechanical life.

PART NUMBER: M39016/15- (dash number from table I and suffix letter designating failure rate level).

QUALIFICATION INSPECTION:

Qualification inspection and sample size: See table II.

① TABLE II. Qualification inspection and sample size. 1/

Single submission		Group submission
18 units plus 1 open unit for level L at C = 0 2/	M39016/15-081	18 units plus 1 open unit for level L at C = 0 2/
33 units plus 1 open unit for level M at C = 0 2/	or	33 units plus 1 open unit for level M at C = 0 2/
Qualification inspection as applicable	M39016/15-087	Qualification inspection as applicable
	M39016/15-077	2 units each part number
	M39016/15-078	Qualification inspection, group II
	M39016/15-079	
	M39016/15-080	
	M39016/15-082	
	or	
	M39016/15-083	
	M39016/15-084	
	M39016/15-085	
	M39016/15-086	
	M39016/15-088	

1/ Figure 1 only: For retention of qualification or extension of qualification to lower failure rate levels, all life test data accumulated on MIL-R-39016/20 and MIL-R-39016/21 may be used in addition to MIL-R-39016/15 data. Qualification to figure 1 automatically qualifies round relays to figure 2. Prior to performance of retention of qualification or extension of qualification testing the relay manufacturer shall preselect the sampling plan.

Figure 2 only: For retention of qualification or extension of qualification to lower failure rate levels, all life test data accumulated on MIL-R-39016/20 may be used in addition to MIL-R-39016/15 data. Prior to performance of retention of qualification or extension of qualification testing the relay manufacturer shall preselect the sampling plan.

2/ The number of units required for qualification testing shall be increased as required in group V, table II, MIL-R-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 sample size.



- ① Initial qualification of relays supplied with spreader pads (-101 through -106 and -113 through -118, and -125 through -130) shall be tested as specified below:

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

- ① Before installation of pad: Screening, visual and mechanical examination (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 pad, perform the following tests as specified in the qualification inspection table of MIL-R-39016, in the order shown below:

- ① Insulation resistance, dielectric withstanding voltage, static contact resistance, specified pickup, hold, and dropout values (voltages), coil resistance, operate and release time, contact dynamic characteristics, coil transient suppression, solderability, seal, visual and mechanical inspection (external).

- ① Qualification inspection (reduced testing for previously qualified relays) for relays supplied with spreader pads (-101 through -106 and -113 through -118, and -125 through -130), two units from figure 3 and two units from figure 4 of the 26.5-volt rated coil voltage (-117 and -129) shall be tested as specified below:

Before installation of pad, perform the following tests as specified in the qualification inspection table of MIL-R-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), particle impact noise detection (PIND, when specified), screening.

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

- ① Insulation resistance, dielectric withstanding voltage, static contact resistance; specified pickup, hold, and dropout values, coil resistance, operate and release time, contact dynamic characteristics, coil transient suppression (when specified), solderability, seal, visual and mechanical inspection (external).

Figures 3 and 4 only: If the relays produced for MIL-R-39016/15 are similar in construction and design except for the diodes and coils, as applicable, to the relays produced for MIL-R-39016/20 or MIL-R-39016/21, then reduced testing for qualification of MIL-R-39016/15 relays may be performed concurrent with or subsequent to successful qualification of MIL-R-39016/20 or MIL-R-39016/21.

- ① Group A testing for relays supplied with spreader pads (-101 through -106 and -113 through -118, and -125 through -130) shall be tested as specified below:

- ① Before installation of pad, perform subgroup 2 of group A tests.

- ① After installation of pad, perform subgroups 3 and 4 of group A tests.

Qualification inspection (reduced testing) and sample size: See table III.

Figure 1 only: If the relays produced for MIL-R-39016/15 are similar in construction and design except for the diodes and coils, as applicable, to the relays produced for MIL-R-39016/20 or MIL-R-39016/21, then reduced testing for qualification of MIL-R-39016/15 relays may be performed concurrent with or subsequent to successful qualification of MIL-R-39016/20 or MIL-R-39016/21.

Figure 2 only: If the relays produced for MIL-R-39016/15 are similar in construction and design except for the diodes and coils, as applicable, to the relays produced for MIL-R-39016/20, then reduced testing for qualification of MIL-R-39016/15 relays may be performed concurrent with or subsequent to successful qualification of MIL-R-39016/20.

① TABLE III. Qualification inspection (reduced testing).

Examination or test
2 units each coil voltage Group II of qualification inspection table 1 unsealed sample unit for internal examination

**SUPERSESSION DATA:**

Supersession data: See table IV.

TABLE IV. Supersession data. 1/

Superseded part no. M5757/99-	New part no. M39016/15- 2/	Superseded part no. M39016/15-	New part no. M39016/15- 2/	Superseded part no. M39016/15-	New part no. M39016/15- 2/
001	034	001	029	053	065
002	029	002	030	054	066
003	030	003	031	055	067
004	031	004	032	056	068
005	032	005	033	057	069
006	033	006	034	058	070
007	040	011	041	059	071
008	035	012	042	060	072
009	036	013	043	061	073
010	037	014	044	062	074
011	038	015	045	063	075
012	039	016	046	064	076
013	046	017	035	107	101
014	041	018	036	108	102
015	042	019	037	109	103
016	043	020	038	110	104
017	044	021	039	111	105
018	045	022	040	112	106
019	052	023	047	119	113
020	047	024	048	120	114
021	048	025	049	121	115
022	049	026	050	122	116
023	050	027	051	123	117
024	051	028	052	124	118

1/ Dash numbers -029 through -034, -041 through -046, and -065 through -076 are inactive for new design and are for support of existing equipment designs only.

2/ Complete part number shall contain suffix letter L, M, P or R to designate failure rate level (see 2/ of table I). A part with any failure rate supersedes the applicable MIL-R-5757 part.

Cross reference for Government logistical support: See table V.

TABLE V. Cross reference for Government logistical support.

Superseded part no. M5757/99-	New part no. M39016/15-	Support with part no. M39016/	Superseded part no. M39016/15-	New part no. M39016/15-	Support with part no. M39016/	New part no. M39016/15-	Support with part no. M39016/
001	034	15-034	001	029	15-029	077	15-077
002	029	15-029	002	030	20-009	078	20-051
003	030	20-009	003	031	20-010	079	20-052
004	031	20-010	004	032	20-011	080	20-053
005	032	20-011	005	033	20-012	081	20-054
006	033	20-012	006	034	15-034	082	15-082
007	040	15-082	011	041	15-029	083	15-077
008	035	15-077	012	042	20-009	084	20-051
009	036	20-051	013	043	20-010	085	20-052
010	037	20-052	014	044	20-011	086	20-053
011	038	20-053	015	045	20-012	087	20-054
012	039	20-054	016	046	15-034	088	15-082
013	046	15-034	017	035	15-077	089	15-089
014	041	15-029	018	036	20-051	090	15-090
015	042	20-009	019	037	20-052	091	15-091
016	043	20-010	020	038	20-053	092	15-092
017	044	20-011	021	039	20-054	093	15-093
018	045	20-012	022	040	15-082	094	15-094
019	052	15-082	023	047	15-077	095	15-089
020	047	15-077	024	048	20-051	096	15-090
021	048	20-051	025	049	20-052	097	15-091
022	049	20-052	026	050	20-053	098	15-092
023	050	20-053	027	051	20-054	099	15-093
024	051	20-054	028	052	15-082	100	15-094
			053	065	15-065	101	15-101
			054	066	15-066	102	20-063
			055	067	15-067	103	20-064
			056	068	15-068	104	20-065
			057	069	15-069	105	20-066
			058	070	15-070	106	15-106
			059	071	15-065	113	15-113
			060	072	15-066	114	15-114
			061	073	15-067	115	15-115
			062	074	15-068	116	15-116
			063	075	15-069	117	15-117
			064	076	15-070	118	15-118
			107	101	15-101	125	15-125
			108	102	20-063	126	20-075
			109	103	20-064	127	20-076
			110	104	20-065	128	20-077
			111	105	20-066	129	20-078
			112	106	15-106	130	15-130
			119	113	15-113		
			120	114	15-114		
			121	115	15-115		
			122	116	15-116		
			123	117	15-117		
			124	118	15-118		

**Custodians:**

Army - ER  
Navy - EC  
Air Force - 85

**Review activities:**

Army - AR  
Navy - AS  
Air Force - 17, 99  
DLA - ES  
NSA - NS

**User activities:**

Navy - MC, OS, SH  
Air Force - 11, 19

**Preparing activity:**

Navy - EC

**Agent:**

DLA - ES

(Project 5945-0757-09)