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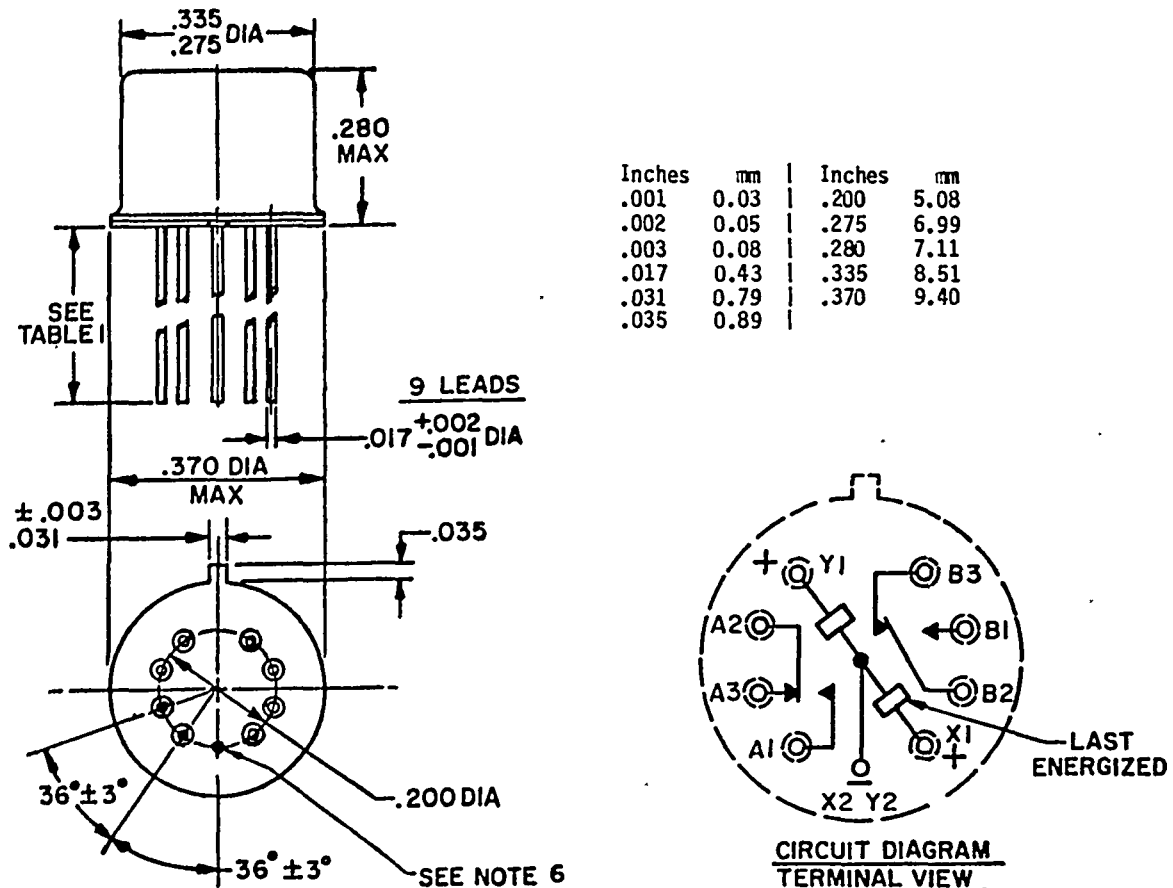
MIL-R-39016/12F
 20 JULY 1988
 SUPERSEDING
 MIL-R-39016/12E
 10 February 1984

MILITARY SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT,
 LOW LEVEL TO 1.0 AMPERE (LATCHING)

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 ± 0.010 (0.25 mm).
4. Terminal numbers shown above 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. Circuit diagram shown on part is the terminal view.
8. Coil symbol optional in accordance with MIL-STD-1285.

FIGURE 1. Dimensions and configuration.

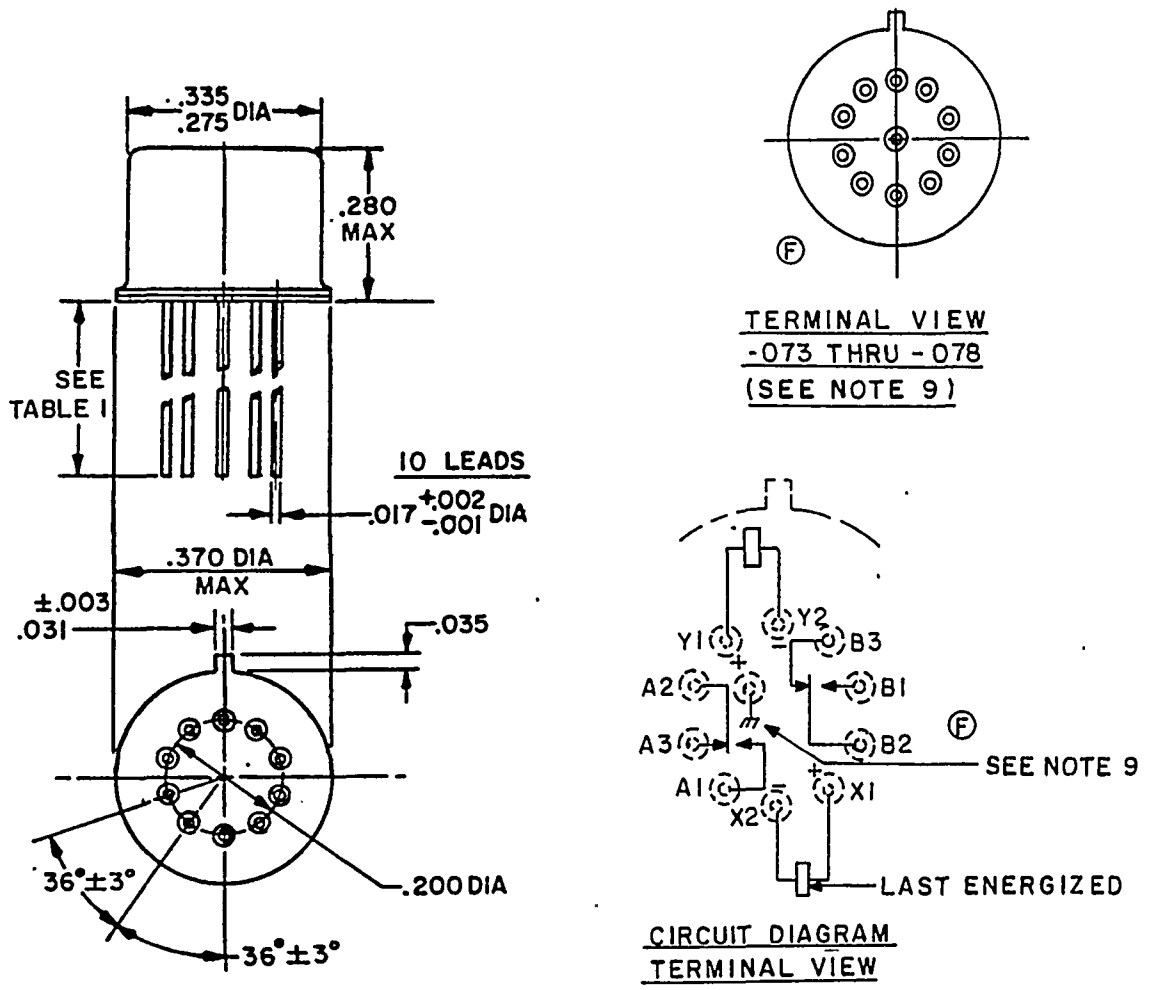
(F) denotes changes

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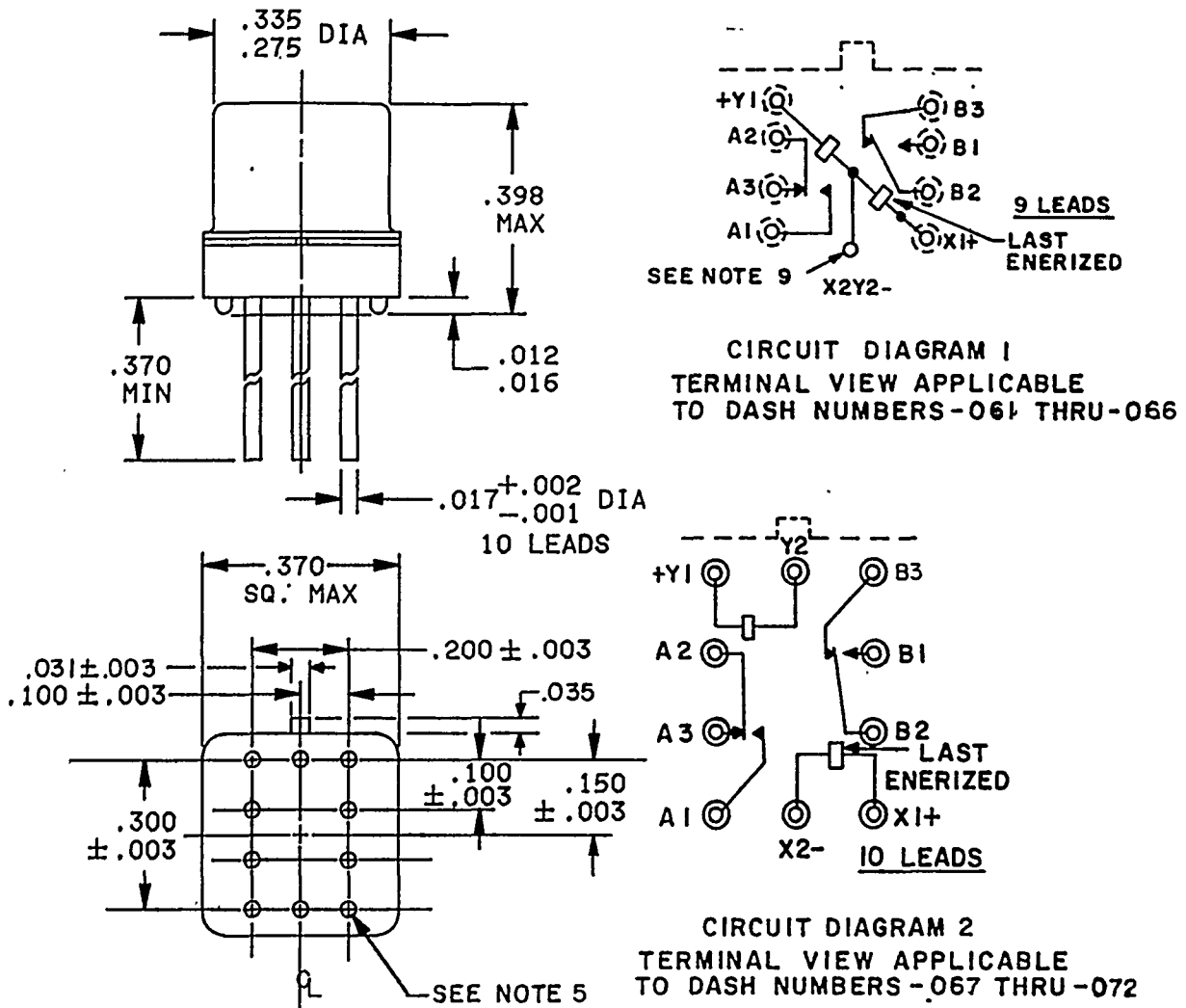
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Inches	mm	Inches	mm
.001	0.03	.200	5.08
.002	0.05	.275	6.99
.003	0.08	.280	7.11
.017	0.43	.335	8.51
.031	0.79	.370	9.40
.035	0.89		

- 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. Terminal numbers shown above 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.
 7. Coil symbol optional in accordance with MIL-STD-1285.
 8. Circuit diagram shown on part is the terminal view.
 9. M39016/12-073 through -078 shall be supplied with a case grounding pin welded to the relay header as shown.

FIGURE 2. Dimensions and configuration.



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 $\pm .010$ (0.25 mm).
 4. Spreader pads shall be certified to MIL-M-38527, M38527/05-003, or M38527/05-013.
 5. Dimensions and tolerance 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 (+) sign placed on circuit diagram as shown.
 9. All leads shall be electrically insulated from the case, except for lead terminal -X2Y2, circuit diagram I, which is grounded to the case.
 10. Circuit diagram shown on part is the terminal view.
 11. Terminal numbers show above for reference only. Numbers do not appear on relay.

(F) FIGURE 3. Dimensions and configuration relay with spreader pad attached.

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 μ A at 10 to 50 mV dc or peak ac.

Intermediate current: Applicable.

Contact resistance or voltage drop:

(F) Initial: 0.125 ohm maximum (0.150 ohm maximum with spreader pad attached).

High level:

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

Low level:

(F) During life: 33 ohms maximum.
After life: 0.175 ohm maximum (0.200 ohm maximum with spreader pad attached).

Intermediate current:

(F) During: 1 ohm maximum.
After: 0.225 ohm maximum (0.250 ohm maximum with spreader 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.

(F) 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.

1/ Dielectric withstanding voltage and insulation resistance are not applicable between coil and case or from coil to coil on figure 1 relays and circuit diagram 1 relays on figure 3.

Dielectric withstanding voltage:

	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(s) - - - -	500	
Between all contacts and coil(s) - - - - - - - - - -	500	
Between open contacts in the energized and deenergized positions - - - - - - - - - - - - - - - -	500	
Between contact poles - - - - - - - - - - - - - - - -	500	
Between coils of dual coil relays (figure 2 and circuit diagram 2 of figure 3) - - - - - - - - - - - - - - - -	500	

ENVIRONMENTAL DATA:

Temperature range: -65°C to +125°C.

- ⓕ 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 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.

ⓕ Solderability: Applicable.

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

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

Seal: Hermetic.

ⓕ Minimum marking: Military part number, "J" with the date code (example J8530), 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 NUMBER: M39016/12- (dash number from table I and suffix letter designating failure rate level).

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

Dash number 3/					Coil voltage (V dc) 4/		At 25°C		At 125°C	
Lead length 1.500 min 5/	Lead length .187 ±.010	Lead length .500 min	Figure	Spreader pad 6/ (fig 3)	Rated	Max	Coil resistance ohms ±10%	Specified pickup (latch/reset) value (voltage) (V dc)	Specified pickup (latch/reset) value (voltage) (V dc)	
025	037	049	1	061	5.0	6.0	61	2.8	3.5	
026	038	050		062	6.0	8.0	120	3.5	4.5	
027	039	051		063	9.0	12	280	5.3	6.8	
028	040	052		064	12	16	500	7.0	9.0	
029	041	053		065	18	24	1,130	10.5	13.5	
030	042	054		066	26.5	32	2,000	14.2	18.0	
031	043	055		067	5.0	6.0	61	2.8	3.5	
032	044	056		068	6.0	8.0	120	3.5	4.5	
033	045	057		069	9.0	12	280	5.3	6.8	
034	046	058		070	12	16	500	7.0	9.0	
035	047	059		071	18	24	1,130	10.5	13.5	
036	048	060		072	26.5	32	2,000	14.2	18.0	
---	---	073		2	---	5.0	6.0	61	2.8	3.5
---	---	074			---	6.0	8.0	120	3.5	4.5
---	---	075	---		9.0	12	280	5.3	6.8	
---	---	076	---		12	16	500	7.0	9.0	
---	---	077	---		18	24	1,130	10.5	13.5	
---	---	078	---		26.5	32	2,000	14.2	18.0	

- 1/ **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.
- 2/ 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.
- 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 - - - - - 060R.
- 4/ **CAUTION:** The use of any coil voltage less than the rated voltage will compromise the operation of the relay.
- 5/ 1.500 leads are inactive for new design.
- 6/ Relays supplied with spreader pads (-061 through -072) shall have the pad rigidly attached.
- 7/ Relays are supplied with a case grounding pin welded to the header (see figure 2).

QUALIFICATION INSPECTION:

Qualification inspection and sample size: See table II.

(F) 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/	M39016/12-054	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/		33 units plus 1 open unit for level M at C = 0 2/
Qualification inspection as applicable		Qualification inspection as applicable
	M39016/12-049	2 units each part number
	M39016/12-050	Qualification inspection, group II
	M39016/12-051	
	M39016/12-052	
	M39016/12-053	
	M39016/12-055	
	M39016/12-056	
	M39016/12-057	
	M39016/12-058	
	M39016/12-059	
	M39016/12-060	
	M39016/12-078	1 unit terminal strength and solderability

- 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-39016/29 and MIL-R-39016/30 may be used in addition to MIL-R-39016/12 data. Prior to retention 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 IV, 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 testing, the relay manufacturer shall preselect the sampling plan.

Initial qualification of relays supplied with spreader pads (-061 through -072), 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:

- (F) 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:

- (F) 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 (when specified), solderability, seal, visual and mechanical inspection (external).

Qualification inspection (reduced testing for previously qualified relays) for relays supplied with spreader pads (-061 through -072): Two units of the 26.5 volt rated coil voltage (-066) 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 (P.I.N.D., 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:

- Ⓕ 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 (when specified), solderability, seal, visual and mechanical inspection (external).

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

Before installation of pad perform subgroup 2 of group A tests.

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

Qualification inspection (reduced testing) and sample size: See table III. If the relays produced for MIL-R-39016/12 are similar in construction and design except for the diodes, to the relays produced for MIL-R-39016/29 and MIL-R-39016/30, then reduced testing for qualification of MIL-R-39016/12 relays may be performed concurrent with or subsequent to successful qualification of MIL-R-39016/20 or MIL-R-39016/30 relays.

Ⓕ 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. M5757/71-	New part no. M39016/12- 2/	Superseded part no. M39016/12-	New part no. M39016/12- 2/
001	026	001	025
002	027	002	026
003	028	003	027
004	029	004	028
005	030	005	029
006	038	006	030
007	039	007	037
008	040	008	038
009	041	009	039
010	042	010	040
011	025	011	041
012	037	012	042
013	031	013	031
014	032	014	032
015	033	015	033
016	034	016	034
017	035	017	035
018	036	018	036
019	043	019	043
020	044	020	044
021	045	021	045
022	046	022	046
023	047	023	047
024	048	024	048

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

(F)

2/ Complete part number shall contain suffix letter L, M, P, or R to designate failure rate level (see 3/ 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. M5757/71-	Superseded part no. M39016/12-	Support with part no. M39016/12-	Superseded part no. M39016/12-	New part no. M39016/12-	Support with part no. M39016/12-	New part no. M39016/12-	Support with part no. M39016/12-	New part no. M39016/12-	Support with part no. M39016/12-
001	026	026	001	025	025	049	049	073	073
002	027	027	002	026	026	050	050	074	074
003	028	028	003	027	027	051	051	075	075
004	029	029	004	028	028	052	052	076	076
005	030	030	005	029	029	053	053	077	077
006	038	050	006	030	030	054	054	078	078
007	039	051	013	031	031	055	055		
008	040	052	014	032	032	056	056		
009	041	053	015	033	033	057	057		
010	042	054	016	034	034	058	058		
011	025	025	017	035	035	059	059		
012	037	049	018	036	036	060	060		
013	031	031	007	037	037	061	061		
014	032	032	008	038	038	062	062		
015	033	033	009	039	039	063	063		
016	034	034	010	040	040	064	064		
017	035	035	011	041	041	065	065		
018	036	036	012	042	042	066	066		
019	043	055	019	043	055	067	067		
020	044	056	020	044	056	068	068		
021	045	057	021	045	057	069	069		
022	046	058	022	046	058	070	070		
023	047	059	023	047	059	071	071		
024	048	060	024	048	060	072	072		

CONCLUDING MATERIAL

Custodians:

Army - ER

Navy - EC

ⓕ Air Force - 85

Review activities:

Army - AR

Navy - AS, OS, SH

ⓕ Air Force - 99

DLA - ES

NSA - NS

User activities:

Navy - MC

ⓕ Air Force - 11, 19

Preparing activity:

Navy - EC

Agent:

DLA - ES

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