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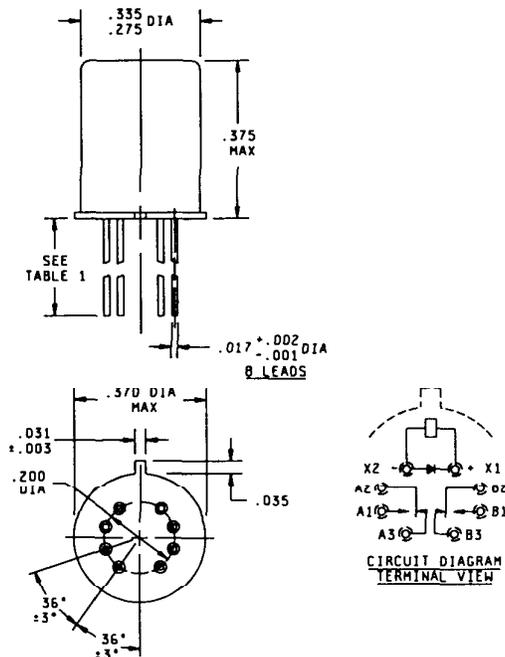
MIL-PRF-39016/16F
 20 JULY 1988
 SUPERSEDING
 MIL-R-39016/16E
 10 February 1984

PERFORMANCE SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT, LOW LEVEL TO 1.0 AMPERE (SENSITIVE, 60 MILLIWATTS) 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 product described herein shall consist of this specification and the latest issue of MIL-R-39016.



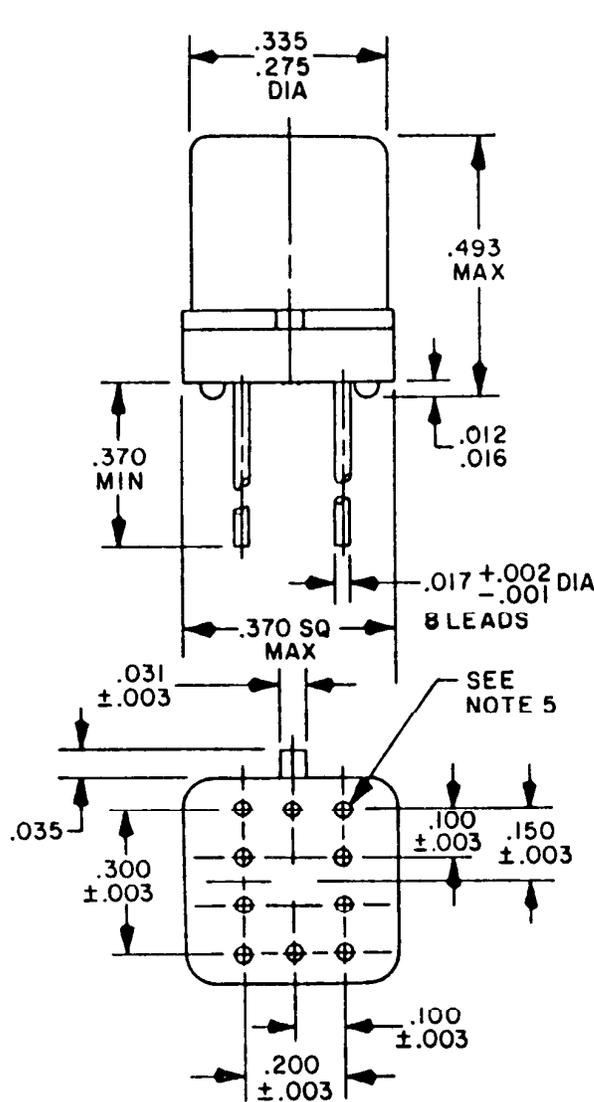
Inches	mm	Inches	mm	Inches	mm
.001	0.03	.031	0.79	.335	8.51
.002	0.05	.035	0.89	.370	9.40
.003	0.08	.200	5.08	.375	9.53
.017	0.43	.275	6.99		

NOTES:

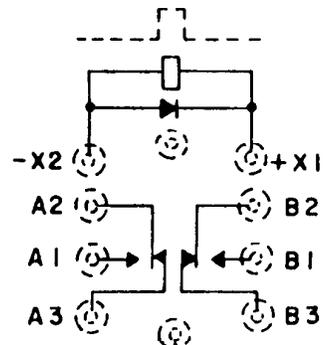
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is $\pm .010$ (0.25 mm).
4. Terminal numbers shown above are for reference only. Numbers do not appear on relay.
5. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
6. Coil symbol optional in accordance with MIL-STD-1285.
7. Circuit diagram shown on part is the terminal view.

FIGURE 1. Dimensions and configuration.

(F) 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	0.79
.100	2.54
.150	3.81
.200	5.08
.275	6.99
.300	7.62
.275	6.99
.300	7.62
.335	8.51
.370	9.40
.493	12.52



CIRCUIT DIAGRAM
TERMINAL VIEW

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. Terminal numbers shown above for reference only. Numbers do not appear on relay.
8. Relays shall have a (+) sign placed on circuit diagram as shown.
9. Coil symbol optional in accordance with MIL-STD-1285.
10. Circuit diagram shown on part is the terminal view.

FIGURE 2. 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:

Initial: 0.10 ohm maximum (0.125 ohm maximum with 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 spreader pad attached).

Low level:

During life: 33 ohms maximum.
After life: 0.15 ohm maximum (0.175 ohm maximum with spreader pad attached).

Intermediate current:

During: 1 ohm maximum.
After: 0.20 ohm maximum (0.225 ohm maximum with 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: 4.0 ms maximum over temperature range with rated coil voltage.
Release time: 7.5 ms maximum over temperature range from rated coil voltage.

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	
Between coils of dual coil relays - - - - -	---	

DIODE CHARACTERISTICS: 2/

Maximum negative transient: 1.0 volt.

- (F) Coil transient suppression: Applicable.
- (F) Semiconductor in process screening: Applicable, visual inspection of semiconductors shall be in accordance with MIL-STD-750, methods 2073 or 2074.

ENVIRONMENTAL DATA:

Temperature range: -65°C to +125°C.

- (F) 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.
- (F) 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).
- (F) 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.

1/ Insulation resistance and dielectric withstanding voltage tests must always precede all other specified electrical measurements. Connect all coil terminals together to avoid damage to diodes.

2/ Warning: Reverse polarity on coil terminals will destroy diode.

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.
 (F) Twist test: As specified in MIL-R-39016.

Solderability: Applicable.

Dimensions and configuration: See figures 1 and 2.

Weight: 4.25 grams (0.15 ounce) maximum, 4.50 grams (0.159 ounce) maximum with spreader pad attached.

Seal: Hermetic.

- (F) 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.
 (F) Low level: 100,000 cycles plus 900,000 cycles mechanical life.

PART NUMBER: M39016/16- (dash number from table I and suffix letter designating failure rate level).

QUALIFICATION INSPECTION:

Qualification inspection and sample size: See table I.

(F) TABLE I. Dash numbers and characteristics. 1/

Dash number 2/				Coil voltage (V dc) 5/		At 25°C						Over temperature range	
Lead length 3/	Lead length length min *.010	Lead length length min	Spreader pads fig 2 4/	Rated	Max	Coil resist- ance ohms ±10%	Speci- fied pick-up value (volt- age) V dc	Speci- fied hold value (volt- age) V dc	Speci- fied drop- out value (volt- age) V dc	Speci- fied pick- up value (volt- age) V dc	Speci- fied hold value (volt- age) V dc	Speci- fied drop- out value (volt- age) V dc	
017	025	033	041	5.0	7.5	100	2.6	1.4	0.23	3.5	2.5	0.12	
018	026	034	042	6.0	10	200	3.4	2.0	0.28	4.5	3.2	0.18	
019	027	035	043	12	20	850	7.0	4.0	0.64	9.0	6.5	0.41	
020	028	036	044	26.5	40	3,300	14.0	8.0	1.4	18	13	0.89	
021	029	037	045	36	57	6,500	20	10	1.8	27	19	1.25	
022	030	038	046	48	75	11,000	25.8	13	2.4	36	26	1.60	
023	031	039	047	9	15	400	4.85	3.0	0.55	6.8	4.9	0.35	
024	032	040	048	18	30	1,600	9.8	6.0	0.92	13.5	10	0.59	

- 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/ 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, 017L - - - - 024R.
 3/ 1.500 leads are inactive for new design.
 4/ Relays supplied with spreader pads (-041 through -048) 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.

(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/ 33 units plus 1 open unit for level M at C = 0 2/ Qualification inspection as applicable	M39016/16-036	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/ Qualification inspection as applicable
	M39016/16-033	2 units each part number
	M39016/16-034	Qualification inspection, group II
	M39016/16-035	
	M39016/16-037	
	M39016/16-038	
	M39016/16-039	
	M39016/16-040	

- (F) 1/ For retention of qualification or extension of qualification to lower failure rate levels, all life test data accumulated on MIL-R-39016/21 may be used in addition to MIL-R-39016/16 data. Prior to performance of qualification or extension of qualification testing the relay manufacturer shall preselect the sampling plan.
- (F) 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 inspection testing the relay manufacturer shall preselect the sample size.

Initial qualification of relays supplied with spreader pads (-041 through -048), 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, solderability, seal, visual and mechanical inspection (external).

Qualification inspection (reduced testing for previously qualified relays) for relays supplied with spreader pads (-041 through -048), two (2) units of the 26.5 volt rated coil voltage (-044) 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.

- (F) 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:

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

Group A testing for relays supplied with spread pads (-041 through -048). shall be tested as specified below:

- (F) Before installation of pad perform subgroup 2 of group A tests.
- (F) 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-39016/16 are similar in construction and design except for the steering diode to the relays produced for MIL-R-39016/21, then reduced testing for qualification of MIL-R-39016/16 relays may be performed concurrent with or subsequent to successful qualification of MIL-R-39016/21.

(F) 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. M5757/101-	New part no. M39016/16- 2/	Superseded part no. M39016/16-	New part no. M39016/16- 2/	Superseded part no. M39016/16-	New part no. M39016/16- 2/
001	017	001	017	011	027
002	018	002	018	012	028
003	019	003	019	013	029
004	020	004	020	014	030
005	021	005	021	015	031
006	022	006	022	016	032
007	025	007	023		
008	026	008	024		
009	027	009	025		
010	028	010	026		
011	029				
012	030				

1/ Dash numbers -017 through -024 are inactive for new design and are for support of existing equipment only.

- (F) 2/ Complete part number shall contain suffix letters 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.

(F) TABLE V. Cross reference for Government logistical support.

Superseded part no. M5757/101-	New part no. M39016/16-	Support with part no. M39016/ 1/	Superseded part no. M39016/16-	New part no. M39016/16-	Support with part no. M39016/ 1/	New part no. M39016/16-	Support with part no. M39016/ 1/
001	017	16-017	001	017	16-017	033	16-033
002	018	16-018	002	018	16-018	034	16-034
003	019	21-010	003	019	21-010	035	21-036
004	020	21-012	004	020	21-012	036	21-038
005	021	21-029	005	021	21-039	037	21-039
006	022	21-030	006	022	21-030	038	21-040
007	025	16-025	007	023	21-009	039	21-035
008	026	16-026	008	024	21-011	040	21-037
009	027	21-022	009	025	21-033	041	16-041
010	028	21-024	010	026	16-034	042	16-042
011	029	21-031	011	027	21-036	043	21-044
012	030	21-032	012	028	21-038	044	21-046
			013	029	21-039	045	21-047
			014	030	21-040	046	21-048
			015	031	21-035	047	21-043
			016	032	21-037	048	21-045

1/ Complete part number shall contain suffix letters 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.

CONCLUDING MATERIAL

Custodians:
 Army - ER
 Navy - EC
 (F) Air Force - 85

Review activities:
 Army - AR
 Navy - AS, OS, SH
 (F) Air Force - 99
 DLA - ES

User activities:
 Navy - MC
 (F) Air Force - 11, 19

Preparing activity:
 Navy - EC

Agent:
 DLA - ES

(Project 5945-0757-10)