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TINCH-POUND

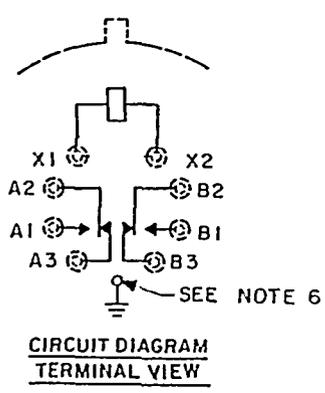
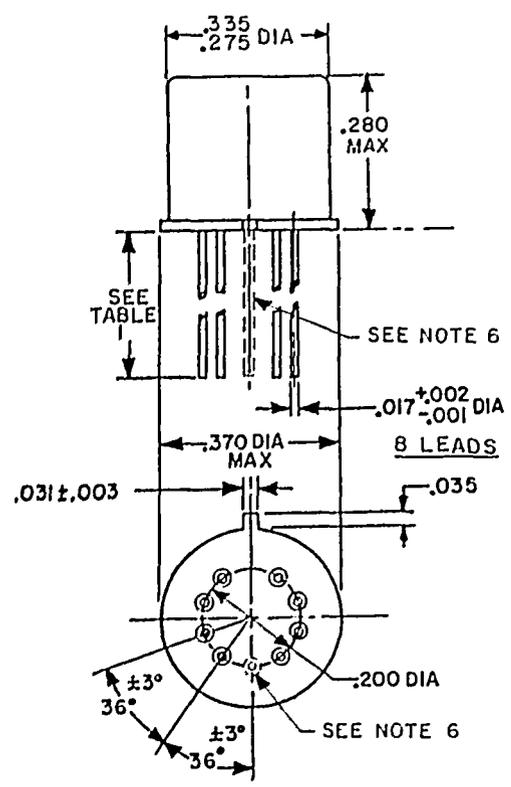
MIL-R-39016/9H
 15 November 1989
 SUPERSEDING
 MIL-R-39016/9G
 20 July 1988

MILITARY SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT,
 LOW LEVEL TO 1.0 AMPERE

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 sheet and the issue of the following specification listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation: MIL-R-39016.

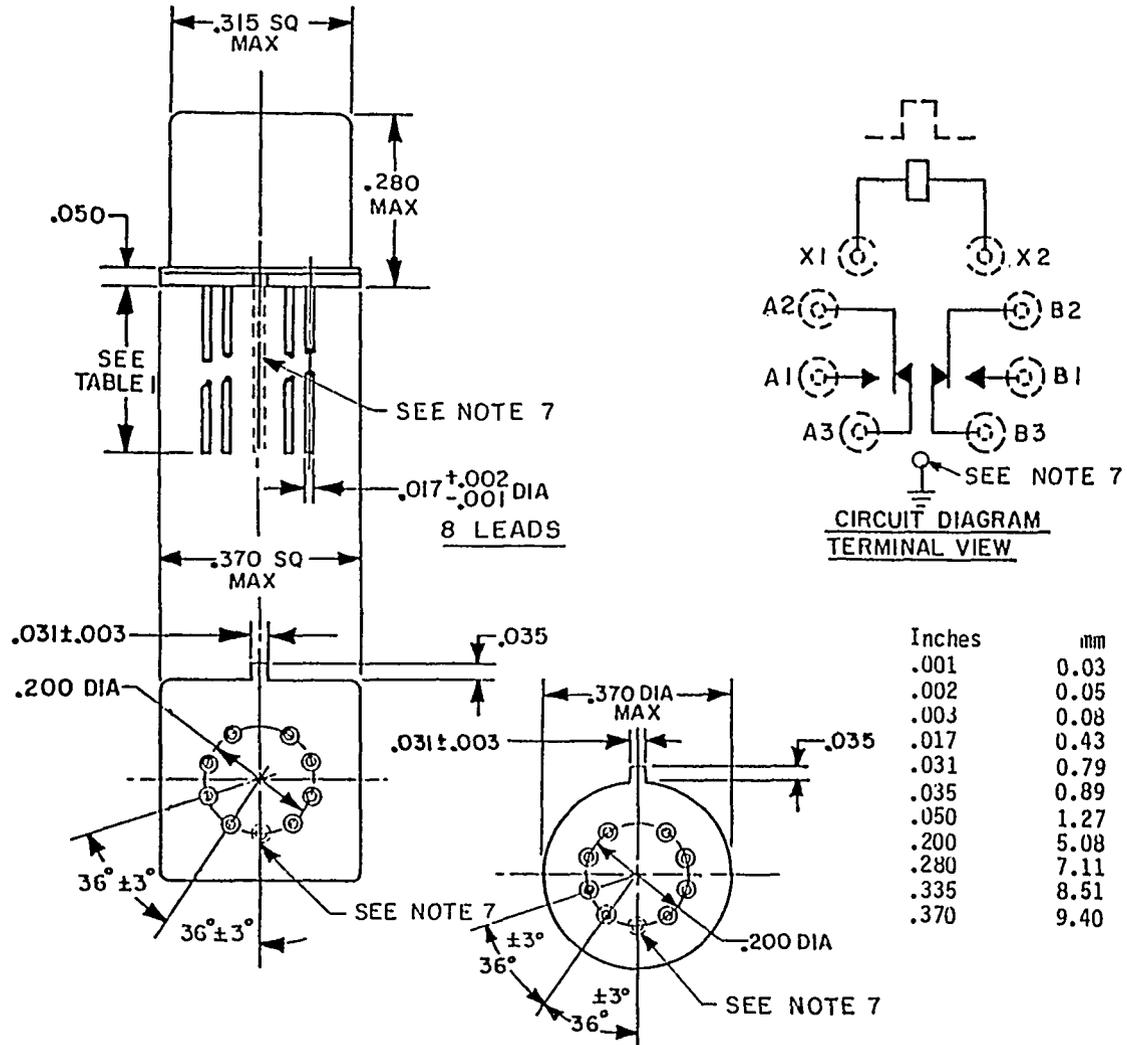


Inches	mm
.001	0.03
.002	0.05
.003	0.08
.017	0.43
.031	0.79
.035	0.89
.200	5.08
.275	6.99
.280	7.11
.335	8.51
.370	9.40

- 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. Coil symbol optional in accordance with MIL-STD-1285.
 5. Circuit diagram shown on part is the terminal view.
 6. The grounding pin shown is a noninsulated case ground applicable to -085 through -091.

FIGURE 1. Dimensions and configuration (round).

(H) denotes changes

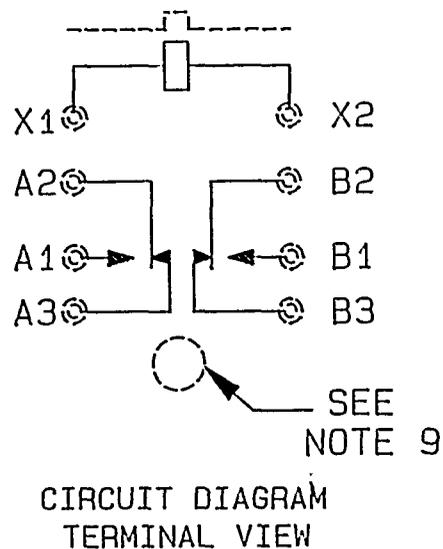
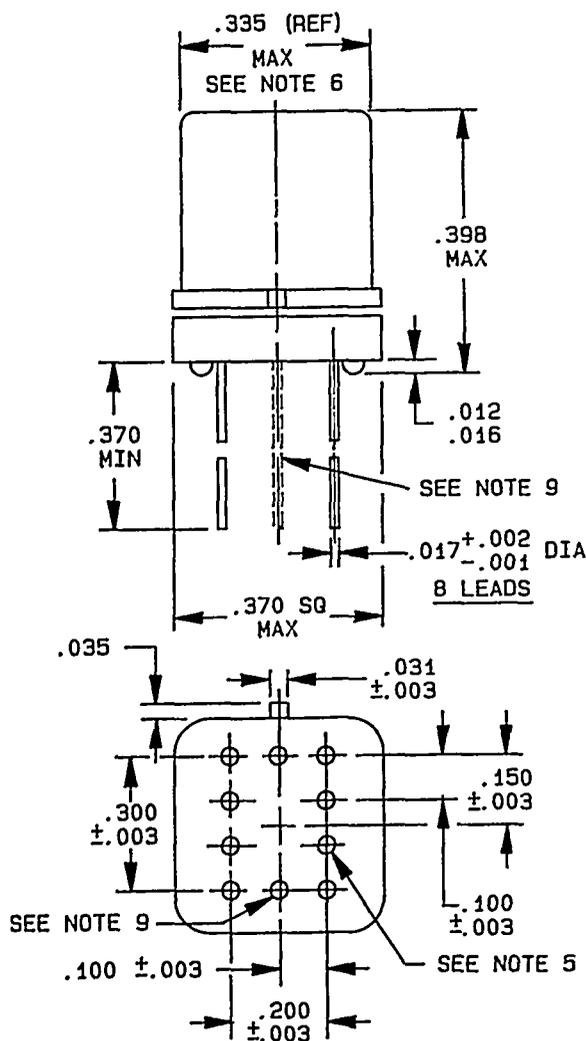


NOTES:

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. Coil symbol optional in accordance with MIL-STD-1285.
5. Circuit diagram shown on part is the terminal view.
6. Shape optional within the envelope dimension.
7. The grounding pin shown is a noninsulated case ground applicable to -092 through -098.

FIGURE 2. Dimensions and configuration (square or round).

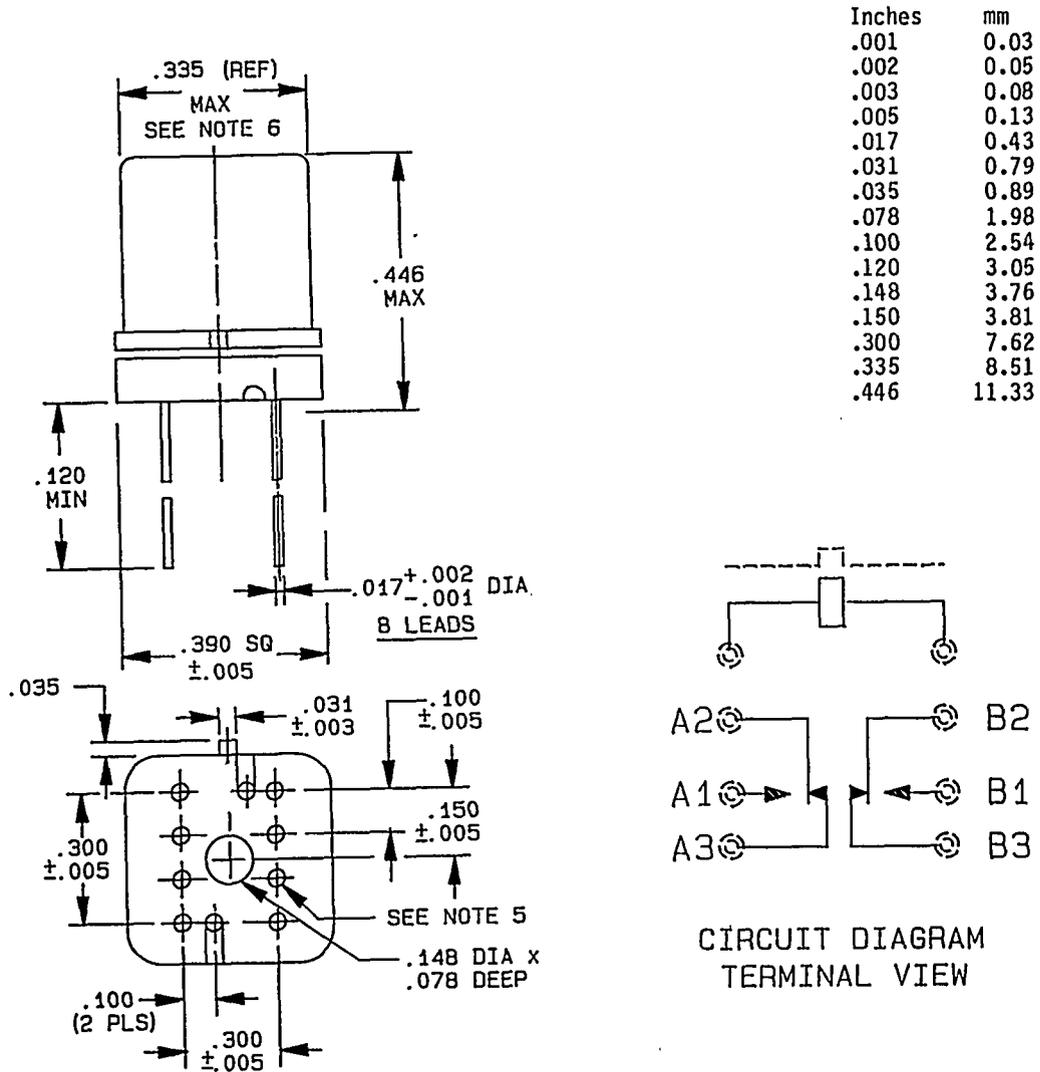
Inches	mm
.001	0.03
.002	0.05
.003	0.08
.012	0.30
.016	0.41
.017	0.43
.031	0.79
.035	0.89
.100	2.54
.150	3.81
.200	5.08
.275	6.99
.335	8.51
.370	9.40
.398	10.11



NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ± 0.010 (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. Circuit diagram shown on part is the terminal view.
9. The grounding pin shown is a noninsulated case ground applicable to -099 through -105.

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



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, M38527/05-014.
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 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 (square or round) with spreader pad (.100 x .300 terminal spacing) attached.

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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 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: 1.5 ms maximum over temperature range from rated coil voltage.

ELECTRICAL DATA:

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.

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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 - - - - -	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:

Terminals:

- Terminal strength: Test condition A, 1 pound pull minimum.
- Bend test: Test condition C, 1/2 pound load.
- Terminal twist test: As specified in MIL-R-39016.

Solderability: Applicable.

Ⓜ Dimensions and configuration: See figures 1, 2, 3, and 4.

Ⓜ Weight: 2.55 grams (0.09 ounce) maximum. Figure 3: 2.80 grams (0.099 ounce) maximum with spreader pad attached. Figure 4: 3.26 grams (0.115 ounce) maximum with spreader pad attached.

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

Dash numbers 2/						Coil voltages (V dc) 3/			At +25°C			Over temperature range				
Lead length 1.500 min 4/	Lead length .187 +.040 -.010	Lead length .500 min	Spreader pads 5/	Lead length .500 min with ground	Spreader pads with ground 5/	Fig.	Rated	Max	Coil resistance ohms ±10%	Specified pickup value (volt-age) (V dc)	Specified hold value (volt-age) (V dc)	Specified dropout value (volt-age) (V dc)	Specified pickup value (volt-age) (V dc)	Specified hold value (volt-age) (V dc)	Specified dropout value (volt-age) (V dc)	
013	019	057	---	085	---	1	5.0	5.8	50	2.7	1.4	0.22	3.5	2.3	0.14	
014	020	058	---	086	---		6.0	8.0	98	3.5	2.0	0.28	4.5	3.2	0.18	
015	021	059	---	087	---		9.0	12	220	5.3	3.0	0.54	6.8	4.9	0.35	
016	022	060	---	088	---		12	16	390	7.0	4.0	0.63	9.0	6.5	0.41	
017	023	061	---	089	---		18	24	880	10.5	6.0	0.91	13.5	10.0	0.59	
018	024	062	---	090	---		26.5	32	1,560	14.2	8.0	1.37	18.0	13.0	0.89	
051	052	063	---	091	---		30.0	36	2,500	17.7	10.0	1.50	22.0	16.0	1.0	
037	043	064	---	092	---		5.0	5.8	50	2.7	1.4	0.22	3.5	2.3	0.14	
038	044	065	---	093	---		6.0	8.0	98	3.5	2.0	0.28	4.5	3.2	0.18	
039	045	066	---	094	---		9.0	12	220	5.3	3.0	0.54	6.8	4.9	0.35	
040	046	067	---	095	---	2	12	16	390	7.0	4.0	0.63	9.0	6.5	0.41	
041	047	068	---	096	---		18	24	880	10.5	6.0	0.91	13.5	10.0	0.59	
042	048	069	---	097	---		26.5	32	1,560	14.2	8.0	1.37	18.0	13.0	0.89	
055	056	070	---	098	---		30.0	36	2,500	17.7	10.0	1.50	22.0	16.0	1.0	
---	---	---	071	---	099		3	5.0	5.8	50	2.7	1.4	0.22	3.5	2.3	0.14
---	---	---	072	---	100			6.0	8.0	98	3.5	2.0	0.28	4.5	3.2	0.18
---	---	---	073	---	101			9.0	12	220	5.3	3.0	0.54	6.8	4.9	0.35
---	---	---	074	---	102			12	16	390	7.0	4.0	0.63	9.0	6.5	0.41
---	---	---	075	---	103			18	24	880	10.5	6.0	0.91	13.5	10.0	0.59
---	---	---	076	---	104			26.5	32	1,560	14.2	8.0	1.37	18.0	13.0	0.89
---	---	---	077	---	105	30.0		36	2,500	17.7	10.0	1.50	22.0	16.0	1.0	
---	---	---	106	---	---	5.0		5.8	50	2.7	1.4	0.22	3.5	2.3	0.14	
---	---	---	107	---	---	6.0		8.0	98	3.5	2.0	0.28	4.5	3.2	0.18	
---	---	---	108	---	---	9.0		12	220	5.3	3.0	0.54	6.8	4.9	0.35	
---	---	---	109	---	---	4	12	16	390	7.0	4.0	0.63	9.0	6.5	0.41	
---	---	---	110	---	---		18	24	880	10.5	6.0	0.91	13.5	10.0	0.59	
---	---	---	111	---	---		26.5	32	1,560	14.2	8.0	1.37	18.0	13.0	0.89	
---	---	---	112	---	---		30.0	36	2,500	17.7	10.0	1.50	22.0	16.0	1.0	

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, Q13L - - - - - Q77R.

3/ CAUTION: The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.

4/ 1.500 leads are inactive for new design.

5/ Relays supplied with spreader pads (-071 through -077, -099 through -105, and -106 through -112) shall have the pad rigidly attached.

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Seal: Hermetic.

Internal moisture: Applicable.

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 or Identifying Number (PIN): M39016/9- (dash number from table I and suffix letter designating failure rate level).

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 2/	M39016/9-062	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 M39016/9-069	33 units plus 1 open unit for level M at C = 0 2/
Qualification inspection as applicable	M39016/9-057	Qualification inspection as applicable
	M39016/9-058	2 units each PIN
	M39016/9-059	Qualification inspection, group II
	M39016/9-060	
	M39016/9-061	
	M39016/9-063	1 unit terminal strength and solderability
	M39016/9-090	
	or	
	M39016/9-064	
	M39016/9-065	
	M39016/9-066	
	M39016/9-067	
	M39016/9-068	
	M39016/9-070	
	M39016/9-097	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-39016/15, MIL-R-39016/20, and MIL-R-39016/21 may be used in addition to MIL-R-39016/9 data. Qualification to figure 1 automatically qualifies round relays to figure 2. Figure 2 only - For retention of qualification or extension of qualification to lower failure rate levels, all life test data accumulated on MIL-R-39016/15 and MIL-R-39016/20 may be used in addition to MIL-R-39016/9 data. Prior to performance of 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 V, table II, MIL-R-39016, if the contractor 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.

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- ④ Initial qualification of relays supplied with spreader pads (-071 through -077 and -099 through -105 and -106 through -112) 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:

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:

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

- ④ Qualification inspection (reduced testing for previously qualified relays) for relays supplied with spreader pads (-071 through -077, -099 through -105, and -106 through -112): Two units of the 26.5-volt rated coil voltage (-076 or -104 and -111) 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).

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Figure 3 only - If the relays produced for MIL-R-39016/9 are similar in construction and design except for the diodes and coils, as applicable, to the relays produced for MIL-R-39016/15, MIL-R-39016/20, or MIL-R-39016/21, then reduced testing for qualification of MIL-R-39016/9 relays may be performed concurrent with or subsequent to successful qualification of MIL-R-39016/15, MIL-R-39016/20, or MIL-R-39016/21.

- ⑨ Group A testing for relays supplied with spreader pads (-071 through -077, -099 through -105, and -106 through -112) 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.

Figure 1 only - If the relays produced for MIL-R-39016/9 are similar in construction and design except for the diodes and coils, as applicable, to the relays produced for MIL-R-39016/15, MIL-R-39016/20, or MIL-R-39016/21, then reduced testing for qualification of MIL-R-39016/9 relays may be performed concurrent with or subsequent to successful qualification of MIL-R-39016/15, MIL-R-39016/20, or MIL-R-39016/21.

Figure 2 only - If the relays produced for MIL-R-39016/9 are similar in construction and design except for the diodes and coils, as applicable, to the relays produced for MIL-R-39016/15 or MIL-R-39016/20, then reduced testing for qualification of MIL-R-39016/9 relays may be performed concurrent with or subsequent to successful qualification of MIL-R-39016/15 or MIL-R-39016/20.

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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

SUPERSESSON DATA:

Supersession data: See table IV.

TABLE IV. Supersession data. 1/

Superseded PIN M5757/40-	New PIN M39016/9- 2/	Superseded PIN M5757/40-	PIN M39016/9- 2/	Superseded PIN M39016/9-	PIN M39016/9-	Superseded PIN M39016/9-	PIN M39016/9-
001	014	025	018	001	013	078	071
002	015	026	020	002	014	079	072
003	016	027	021	003	015	080	073
004	017	028	022	004	016	081	074
005	018	029	023	005	017	082	075
006	020	030	024	006	018	083	076
007	021	031	038	007	019	084	077
008	022	032	039	008	020		
009	023	033	040	009	021		
010	024	034	041	010	022		
011	038	035	042	011	023		
012	039	036	044	012	024		
013	040	037	045	025	037		
014	041	038	046	026	038		
015	042	039	047	027	039		
016	044	040	048	028	040		
017	045	041	013	029	041		
018	046	042	037	030	042		
019	047	043	019	031	043		
020	048	044	043	032	044		
021	014	045	013	033	045		
022	015	046	037	034	046		
023	016	047	019	035	047		
024	017	048	043	036	048		
				049	051		
				050	052		
				053	055		
				054	056		

1/ Dash numbers -013 through -018, -037 through -042, -051, and -055 are inactive for new design and are for support of existing equipment designs only.

2/ Complete PIN 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.

(H) TABLE V. Cross-reference for Government logistical support.

Superseded PIN M5757/40-	PIN M39016/9-	Support with PIN M39016/9-	Superseded PIN M39016/9-	PIN M39016/9-	Support with PIN M39016/9-	Superseded PIN M39016/9-	PIN M39016/9-	Support with PIN M39016/9-
041	013	013	001	013	013 1/		070	063
001	014	014	002	014	014 1/		071	071
002	015	015	003	015	015 1/		072	072
003	016	016	004	016	016 1/		073	073
004	017	017	005	017	017 1/		074	074
005	018	018	006	018	018 1/		075	075
043	019	057	007	019	057		076	076
006	020	058	008	020	058		077	077
007	021	059	009	021	059		085	085
008	022	060	010	022	060		086	086
009	023	061	011	023	061		087	087
010	024	062	012	024	062		088	088
045	013	013	025	037	013		089	089
021	014	014	026	038	014		090	090
022	015	015	027	039	015		091	091
023	016	016	028	040	016		092	085
024	017	017	029	041	017		093	086
025	018	018	030	042	018		094	087
047	019	057	031	043	057		095	088
026	020	058	032	044	058		096	089
027	021	059	033	045	059		097	090
028	022	060	034	046	060		098	091
029	023	061	035	047	061		099	099
030	024	062	036	048	062		100	100
042	037	063	049	051	051		101	101
011	038	014	050	052	063		102	102
012	039	015	053	055	051		103	103
013	040	016	054	056	063		104	104
014	041	017	078	071	071		105	105
015	042	018	079	072	072		106	106
044	043	057	080	073	073		107	107
016	044	058	081	074	074		108	108
017	045	059	082	075	075		109	109
018	046	060	083	076	076		110	110
019	047	061	084	077	077		111	111
020	048	062		057	057		112	112
046	037	013		058	058			
031	038	014		059	059			
032	039	015		060	060			
033	040	016		061	061			

See footnote at end of table.

(H) TABLE V. Cross-reference for Government logistical support - Continued.

Superseded PIN M5757/40-	PIN M39016/9-	Support with PIN M39016/9-	Superseded PIN M39016/9-	PIN M39016/9-	Support with PIN M39016/9-	Superseded PIN M39016/9-	PIN M39016/9-	Support with PIN M39016/9-
	034	017		062	062			
	035	018		063	063			
	048	057		064	057			
	036	058		065	058			
	037	059		066	059			
	038	060		067	060			
	039	061		068	061			
	040	062		069	062			

1/ Dash numbers -013 through -018 are inactive for new design and are for support of existing designs only.

CONCLUDING MATERIAL

Custodians:
Army - ER
Navy - EC
Air Force - 85

Review activities:
Navy - AS
Air Force - 99
DLA - ES
NASA - NS

User activities:
Army - AR
Navy - MC, OS, SH
Air Force - 11, 19

Preparing activity:
Navy - EC

Agent:
DLA - ES

(Project 5945-0804)