INCH-POUND

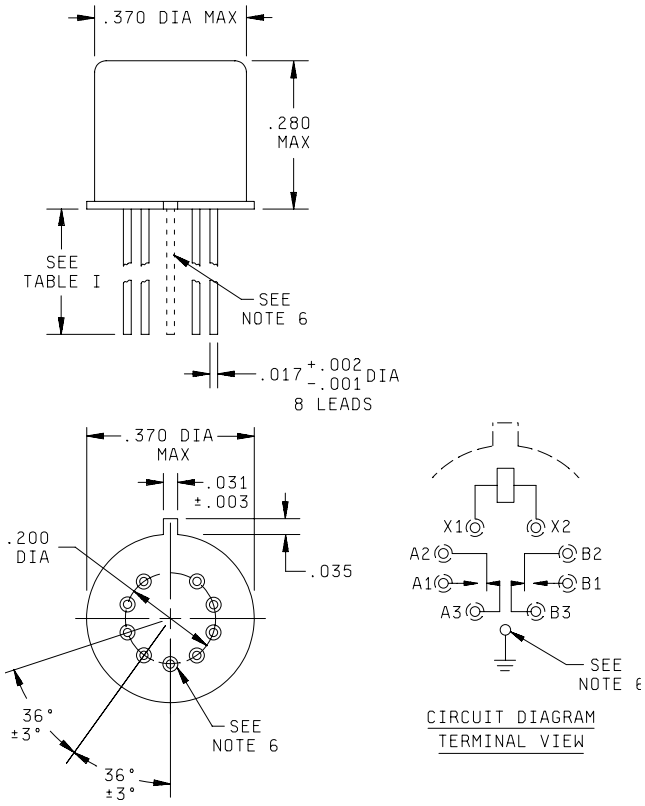
MIL-PRF-39016/9J
8 November 2004
SUPERSEDING
MIL-PRF-39016/9H
15 November 1989

PERFORMANCE SPECIFICATION SHEET

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

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

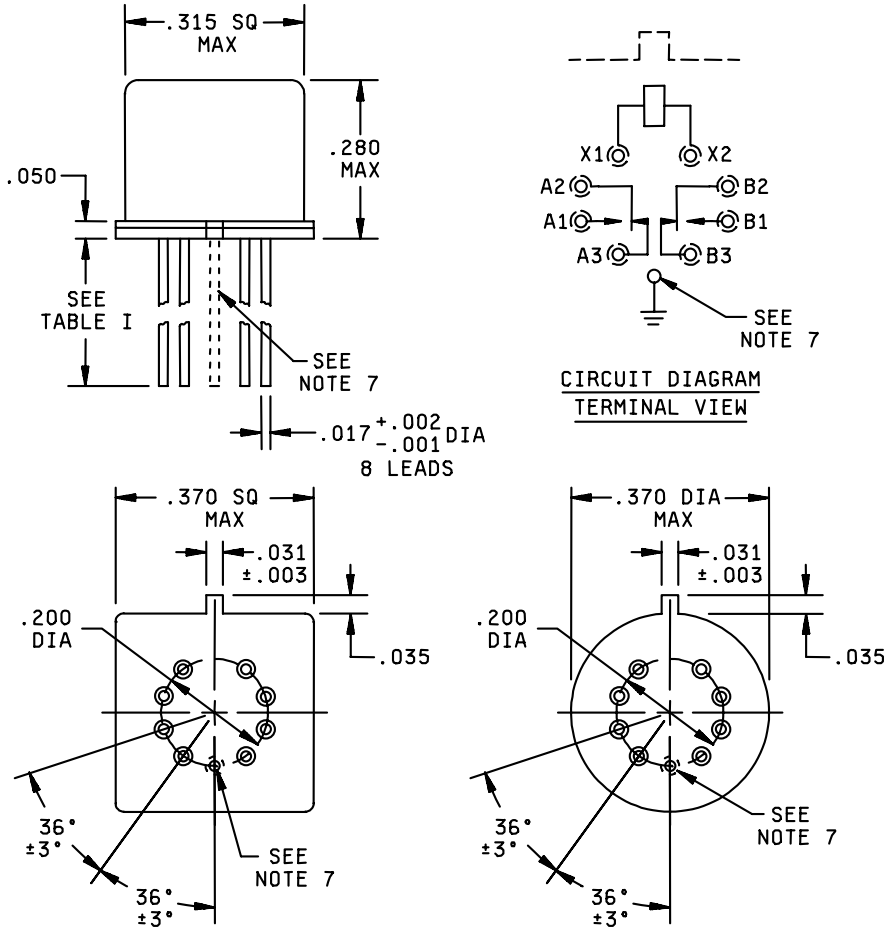
The complete requirements for acquiring the relays described herein shall consist of this specification sheet and the latest issue of MIL-PRF-39016.



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 ±.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.

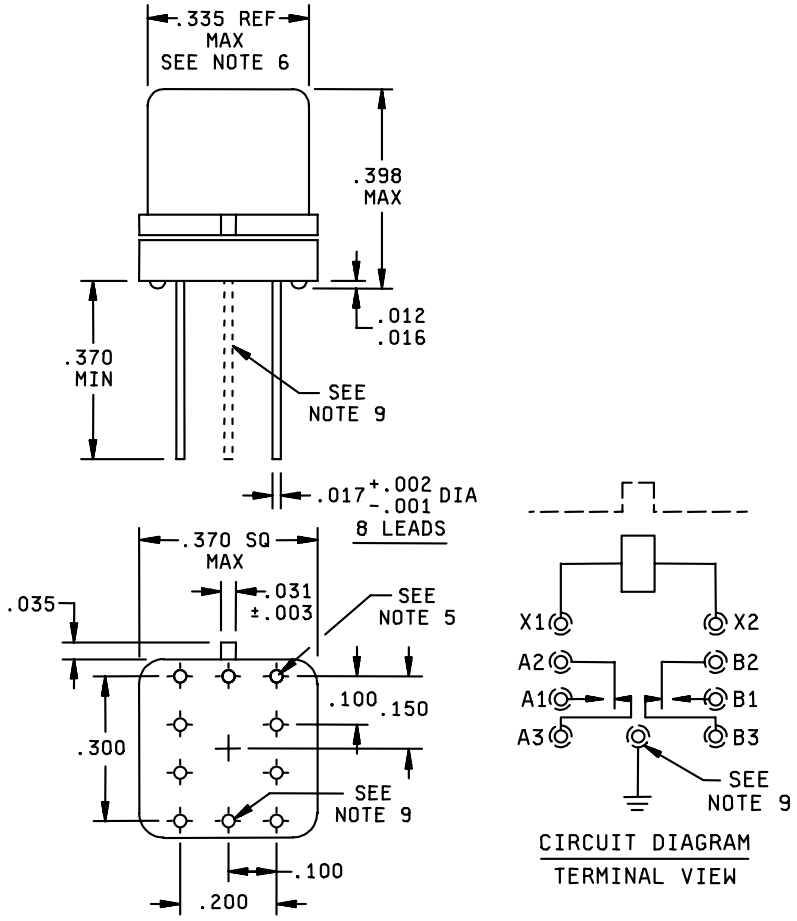
FIGURE 1. Dimensions and configuration.



Inches	mm
.001	0.03
.002	0.05
.003	0.08
.017	0.43
.031	0.79
.035	0.89
.050	1.27
.200	5.08
.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 ±.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.

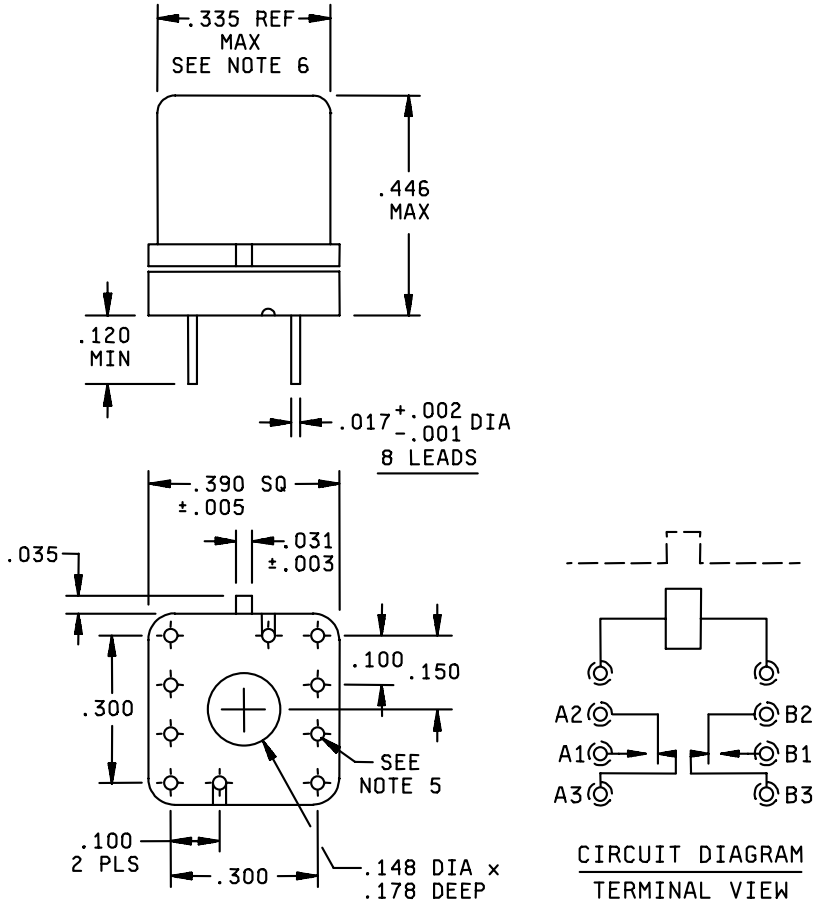
FIGURE 2. Dimensions and configuration (square or round).



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 ±.010 (0.25 mm).
4. Spreader mounting pads shall comply with the requirements of A-A-55485, A-55485/05-003, or A-55485/05-013.
5. Dimensions and tolerance 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. 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 non-insulated case ground applicable to -099 through -105.

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



Inches	mm
.001	0.03
.002	0.05
.003	0.08
.005	0.13
.017	0.43
.031	0.79
.035	0.89
.078	1.98
.100	2.54
.120	3.05
.148	3.76
.150	3.81
.300	7.62
.335	8.51
.446	11.33

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 mounting pads shall comply with the requirements of A-A-55485, A-55485/05-014.
5. Dimensions and tolerance 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. 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 mounting pad (.100 x .300 terminal spacing) 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 μA 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 mounting pad attached and 0.150 ohm maximum with figure 4 spreader mounting 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 mounting pad attached and 0.250 ohm maximum with figure 4 spreader mounting pad attached).

Low level:

During life: 33 ohms maximum.

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

Intermediate current:

During: 1 ohm maximum.

After: 0.20 ohm maximum (0.225) ohm maximum with figure 3 spreader mounting pad attached and 0.250 ohm maximum with figure 4 spreader mounting 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. Not applicable to ac load ratings.

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.

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 terminals to case
Between open contacts in the energized and de-energized positions.	500	375	
Between contact poles.	500	500	
Between coils of dual coil relays.	N/A	N/A	

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 MIL-STD-750, method 1041.

PHYSICAL DATA:

Terminal strength: MIL-STD-202, method 211.

Terminal strength: Test condition A, 1 pound pull.

Bend test: Test condition C, ½ pound load.

Terminal twist test: As specified in MIL-PRF-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 mounting attached. Figure 4: 3.26 grams (0.115 ounce) maximum with spreader mounting pad attached.

Seal: Hermetic.

Internal moisture: Applicable.

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

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 mounting pads 5/	Lead length .500 min with ground	Spreader mounting pads with ground 5/	Fig.	Rated	Max	Coil resist-ance ohms ±10%	Speci-fied pickup value (voltage) (V dc)	Speci-fied hold value (voltage) (V dc)	Speci-fied dropout value (voltage) (V dc)	Speci-fied pickup value (voltage) (V dc)	Speci-fied hold value (voltage) (V dc)	Speci-fied dropout value (voltage) (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	---	2	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	---		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	---	---	4	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	---	---		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

See footnotes next page.

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, 013L - - - - - - - -077R.
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 mounting pads (-071 through -077, -099 through -105, and -106 through -112) shall have the spreader mounting pad rigidly attached.

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/ 33 units plus 1 open unit for level M at C = 0 2/	M39016/9-062 or M39016/9-069	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		Qualification inspection as applicable
	M39016/9-057 M39016/9-058 M39016/9-059 M39016/9-060 M39016/9-061	2 units each PIN Qualification inspection, Q1.
	M39016/9-063 M39016/9-090 or M39016/9-064 M39016/9-065 M39016/9-066 M39016/9-067 M39016/9-068	1 unit terminal strength and solderability
	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-PRF-39016/11, /15, /16, /20, and /21 may be used in addition to MIL-PRF-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-PRF-39016/11, /15, /16, /20, and 21 may be used in addition to MIL-PRF-39016/9 data. Prior to performance of retention of qualification testing, the relay manufacturer shall pre-select the sampling plan.
2/ The number of units required for qualification testing shall be increased as required in Q5, MIL-PRF-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 pre-select the sampling plan.

Initial qualification of relays supplied with spreader mounting 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-PRF-39016, in the order shown below:

Before installation of spreader mounting 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 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, 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).

Qualification inspection (reduced testing for previously qualified relays) for relays supplied with spreader mounting 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 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, 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).

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

Group A testing for relays supplied with spreader mounting pads (-071 through -077, -099 through -105, and -106 through -112) shall be tested as specified below:

Perform seal test immediately, preceding the 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.

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

Figure 1 only - If the relays produced for MIL-PRF-39016/9 are similar in construction and design except for the diodes and coil assembly, as applicable, to the relays produced for MIL-PRF-39016/11, /15, /16, /20, or /21, then reduced testing for qualification of MIL-PRF-39016/9 relays may be performed concurrent with or subsequent to successful qualification of MIL-PRF-39016/11, /15, /16, /20, or /21. For reduced testing, see table III.

Figure 2 only - If the relays produced for MIL-PRF-39016/9 are similar in construction and design except for the diodes and coil assembly, as applicable, to the relays produced for MIL-PRF-39016/11, /15, /16, /20, or /21, then reduced testing for qualification of MIL-PRF-39016/9 relays may be performed concurrent with or subsequent to successful qualification of MIL-PRF-39016/11, /15, /16, /20, or /21.

TABLE III. Qualification inspection (reduced testing).

Inspection
2 units each coil voltage - Q1 of qualification inspection table. 1 unsealed sample unit for internal examination.

SUPERSESSION 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	0141		---	---
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.

TABLE V. Cross-reference for Government logistical support. 1/

Superseded PIN M5757/40-	New 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.

TABLE V. Cross-reference for Government logistical support.

Superseded PIN M5757/40-	New 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	041	017		---	062	062		---	---	---
035	042	018		---	063	063		---	---	---
048	043	057		---	064	057		---	---	---
036	044	058		---	065	058		---	---	---
037	045	059		---	066	059		---	---	---
038	046	060		---	067	060		---	---	---
039	047	061		---	068	061		---	---	---
040	048	062		---	069	062		---	---	---

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

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

A-A-55485, /5
MIL-PRF-39016/11, /15, /16, /20, or /21
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

Review activities:
Army - AR
Navy - AS, MC, OS, SH
Air Force - 19, 99
NSA - NS

Preparing activity:
DLA - CC

(Project 5945-1248)

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.