

INCH - POUND

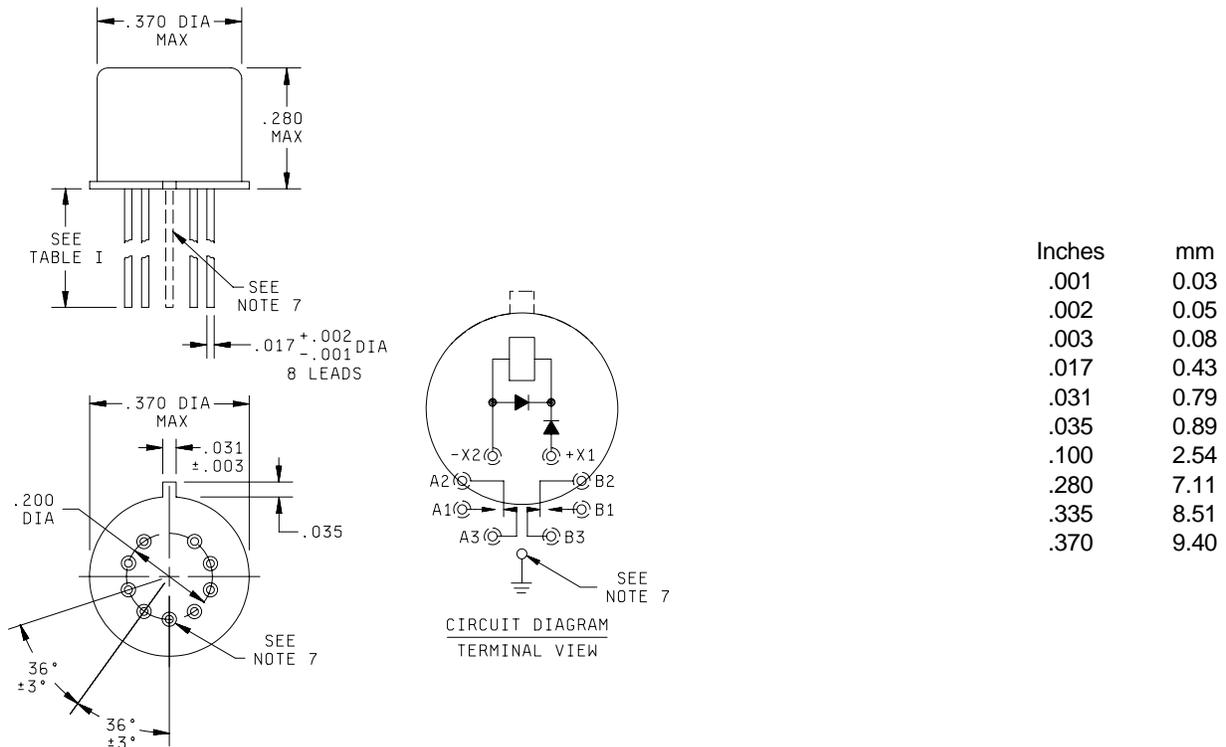
MIL-PRF-39016/20J  
 3 December 2004  
 SUPERSEDING  
 MIL-PRF-39016/20H  
 13 May 1987

PERFORMANCE SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT,  
 LOW LEVEL TO 1.0 AMPERE WITH INTERNAL DIODES FOR COIL  
 TRANSIENT SUPPRESSION AND POLARITY REVERSAL PROTECTION,

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.

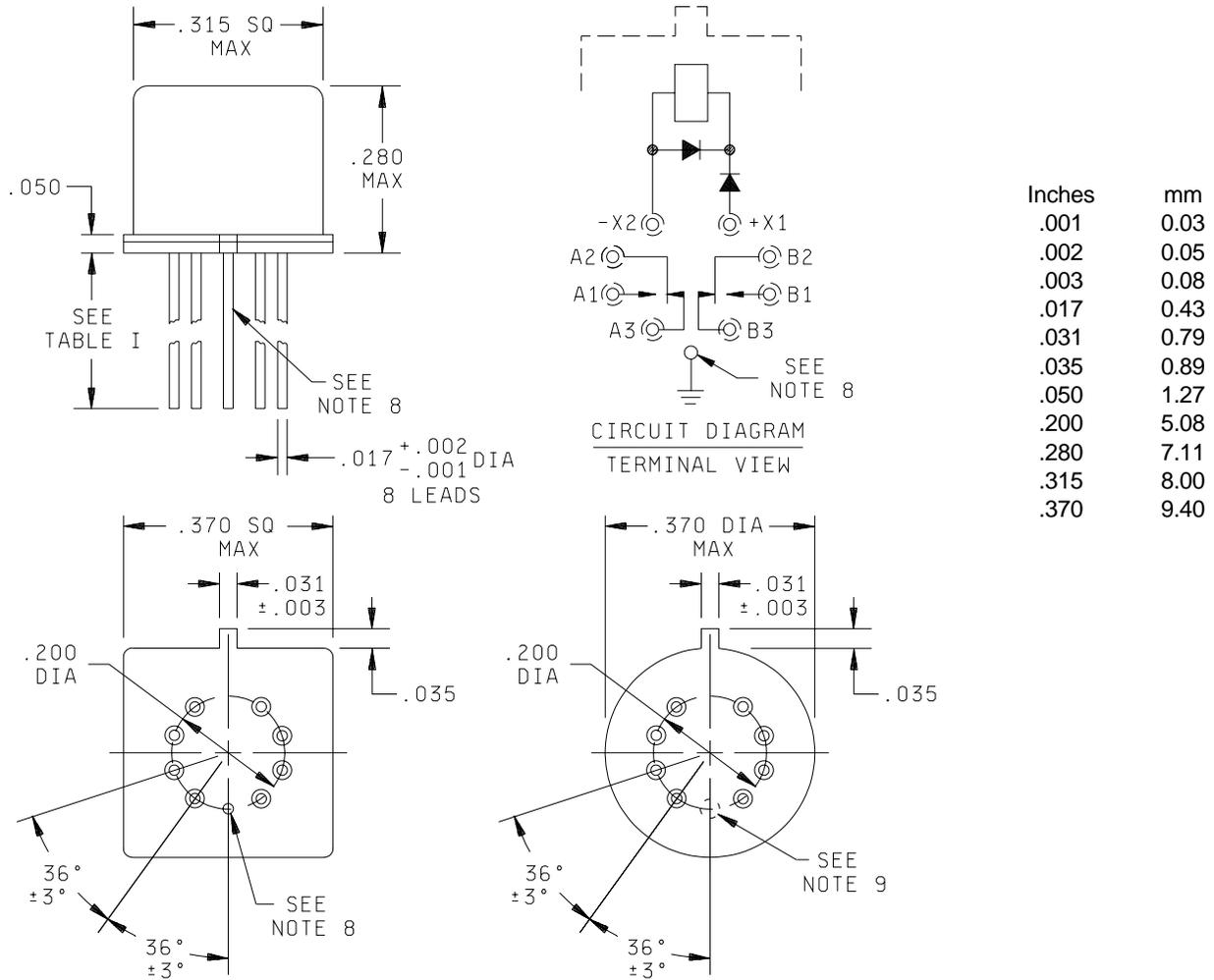


NOTES:

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 -079 through -084 only.

FIGURE 1. Dimensions and configuration (round).

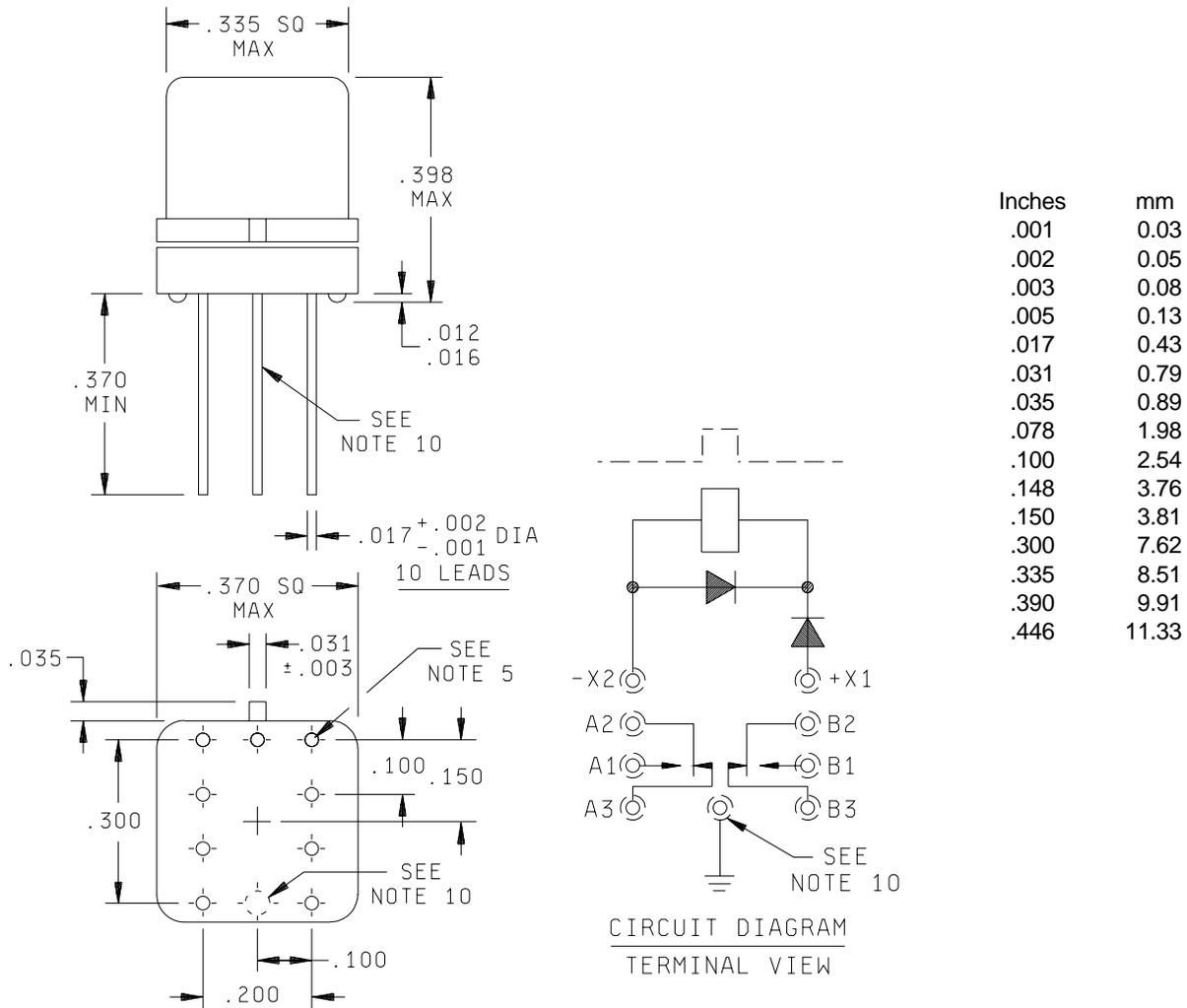
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NOTES:

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. 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. Shape optional within envelope dimension.
8. The grounding pin shown is a non-insulated case ground applicable to -085 through -090 only.

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

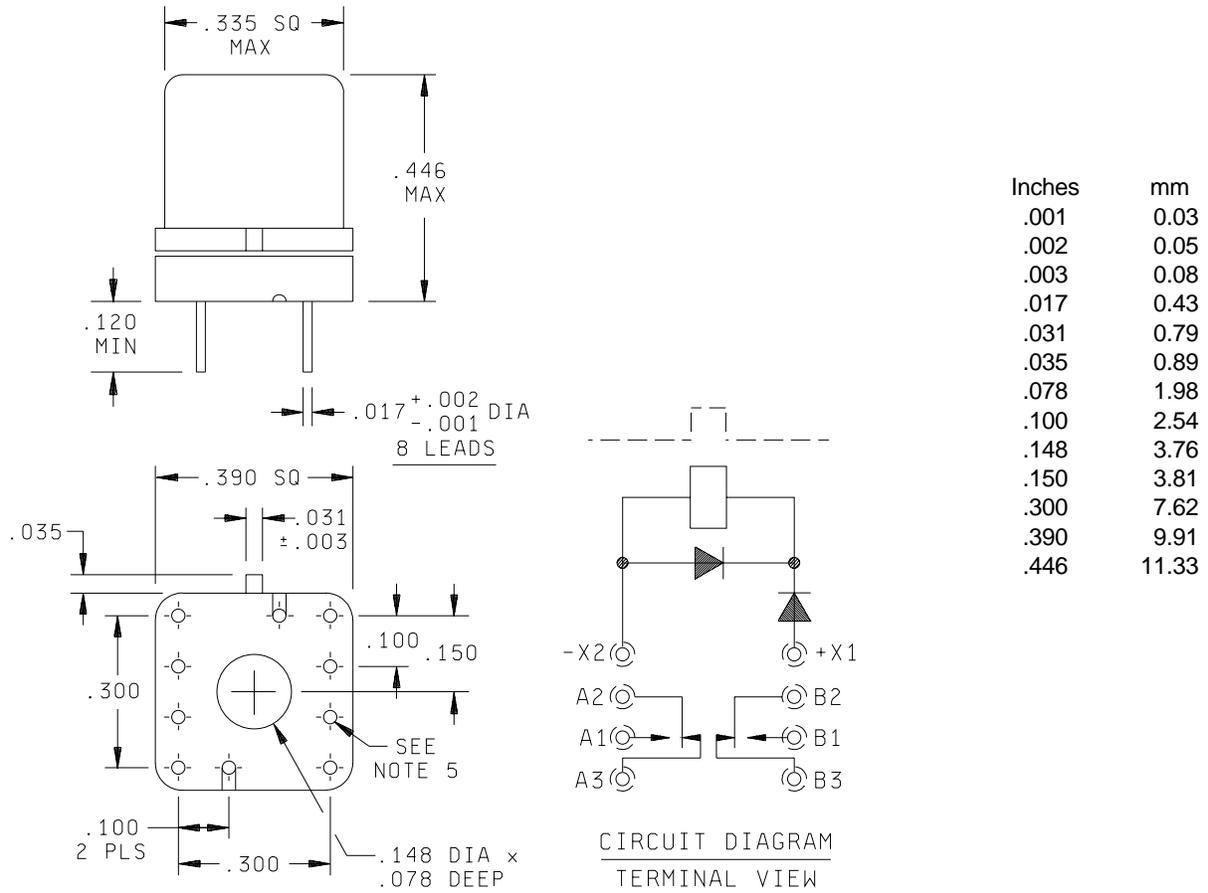


NOTES:

1. FIGURE 0. 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 mounting pads shall comply with the requirements of A-A-55485, A-55485/05-003, or A-55485/05-013.
5. Dimensions and tolerances 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. Relays shall have a plus (+) sign place on the circuit diagram as shown.
8. Coil symbol optional in accordance with MIL-STD-1285.
9. Circuit diagram shown on part is the terminal view.
10. The grounding pin shown is a non-insulated case ground applicable to -091 through -096 only.

FIGURE 3. Dimensions and configuration relay with spreader mounting pad (.100 x .300 terminal spacing) attached.

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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 mounting pads shall comply with the requirements of A-A-55485, A55485/05-014.
5. Dimensions and tolerances 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 place on the circuit diagram as shown.
9. Circuit diagram shown on part is the terminal view.

FIGURE 4. Dimensions and configuration relay with spreader mounting 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.

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  $\mu$ 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 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: 4.0 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	125 All terminals to case
Between case, frame, or enclosure and coils.	500	500	
Between all contacts and coils.	500	500	
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	

DIODE CHARACTERISTICS

Coil transient suppression: Applicable.

Diode block integrity (perform this test after coil transient suppression test in all inspection tables of MIL-PRF-39016): With applicable voltage applied to the relay coil circuit in the reverse direction, monitor leakage current with dc microammeter, oscilloscope, or qualifying activity approved test equipment. Leakage current shall not exceed the specified value.

Block integrity maximum leakage current: 1µA at 50 V dc.

Maximum negative transient: 1.0 volt.

Breakdown voltage: 100 V dc minimum at 10 microamperes (µA). (This test may be performed in-process or as final assembly).

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.

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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:

Terminals:

Terminal strength: MIL-STD-202, method 211

Pull test: Test condition A, 1 pound pull.

Bend test: Test condition C, ½ pound load.

Twist test: As specified in MIL-PRF-39016.

Solderability: Applicable.

Dimensions and configuration: See figure 1, 2, 3, and 4.

Weight: 2.27 grams (0.08 ounce) maximum, 2.52 grams (0.089 ounce) maximum with spreader mounting pad.

Seal: Hermetic.

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): M39016/20- (dash number from table I and suffix letter designating failure rate level).

TABLE I. Dash numbers and characteristics. 1/

Dash numbers 2/						Fig.	Coil voltage (V dc) 5/		At 25°C						Over temperature range		
Lead length 1.500 min 3/	Lead length .187 +.040 -.010	Lead length .500 min	Spreader mounting pads 4/	Lead length .500 min with ground	Spreader mounting pads with ground 4/		Rated	Max	Coil resist- ance (ref. only Ohms	Coil circuit current (mA) 6/ 7/		Speci- fied pickup value (volt.) (V dc)	Speci- fied hold value (volt.) (V dc)	Speci- fied drop- out value (volt.) (V dc)	Speci- fied pickup value (volt.) (V dc)	Speci- fied hold value (volt.) (V dc)	Speci- fied drop- out value (volt.) (V dc)
										Max	Min						
007	037	049	---	079	---	1	5.0	5.8	39	128.2	93.2	3.2	2.3	0.6	4.0	2.8	0.6
008	038	050	---	080	---		6.0	8.0	78	78.3	58.3	4.0	2.8	0.7	5.0	3.4	0.7
009	039	051	---	081	---		9.0	12.0	220	42.9	33.0	6.3	4.2	0.9	7.8	5.3	0.8
010	040	052	---	082	---		12.0	16.0	390	32.8	25.6	8.0	5.2	1.1	10.0	6.5	0.9
011	041	053	---	083	---		18.0	24.0	880	22.1	17.5	11.5	7.3	1.4	14.5	10.0	1.1
012	042	054	---	084	---		26.5	32.0	1,560	18.5	14.8	15.2	9.5	1.8	19.0	13.0	1.4
019	043	055	---	085	---	2	5.0	5.8	39	128.2	93.2	3.2	2.3	0.6	4.0	2.8	0.6
020	044	056	---	086	---		6.0	8.0	78	78.3	58.3	4.0	2.8	0.7	5.0	3.4	0.7
021	045	057	---	087	---		9.0	12.0	220	42.9	33.0	6.3	4.2	0.9	7.8	5.3	0.8
022	046	058	---	088	---		12.0	16.0	390	32.8	25.6	8.0	5.2	1.1	10.0	6.5	0.9
023	047	059	---	089	---		18.0	24.0	880	22.1	17.5	11.5	7.3	1.4	14.5	10.0	1.1
024	048	060	---	090	---		26.5	32.0	1,560	18.5	14.8	15.2	9.5	1.8	19.0	13.0	1.4
---	---	---	061	---	091	3	5.0	5.8	39	128.2	93.2	3.2	2.3	0.6	4.0	2.8	0.6
---	---	---	062	---	092		6.0	8.0	78	78.3	58.3	4.0	2.8	0.7	5.0	3.4	0.7
---	---	---	063	---	093		9.0	12.0	220	42.9	33.0	6.3	4.2	0.9	7.8	5.3	0.8
---	---	---	064	---	094		12.0	16.0	390	32.8	25.6	8.0	5.2	1.1	10.0	6.5	0.9
---	---	---	065	---	095		18.0	24.0	880	22.1	17.5	11.5	7.3	1.4	14.5	10.0	1.1
---	---	---	066	---	096		26.5	32.0	1,560	18.5	14.8	15.2	9.5	1.8	19.0	13.0	1.4
---	---	---	073	---	---	4	5.0	5.8	39	128.2	93.2	3.2	2.3	0.6	4.0	2.8	0.6
---	---	---	074	---	---		6.0	8.0	78	78.3	58.3	4.0	2.8	0.7	5.0	3.4	0.7
---	---	---	075	---	---		9.0	12.0	220	42.9	33.0	6.3	4.2	0.9	7.8	5.3	0.8
---	---	---	076	---	---		12.0	16.0	390	32.8	25.6	8.0	5.2	1.1	10.0	6.5	0.9
---	---	---	077	---	---		18.0	24.0	880	22.1	17.5	11.5	7.3	1.4	14.5	10.0	1.1
---	---	---	078	---	---		26.5	32.0	1,560	18.5	14.8	15.2	9.5	1.8	19.0	13.0	1.4

See footnotes following page.

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- 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, 007L - - - - -66R.
- 3/ 1.500 leads are inactive for new design.
- 4/ Relays supplied with spreader mounting pads (-061 through -066 and -091 through -096) shall have the spreader mounting pad rigidly attached.
- 5/ CAUTION: The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.
- 6/ Coil resistance not directly measurable at relay terminals. When rated voltage is applied to the coil terminals, the coil circuit current must be within the limits shown. Measure at 25°C at nominal voltage for 5 seconds, maximum.
- 7/ Delete "Coil resistance" and substitute "Coil current" test in all inspection tables of MIL-PRF-39016.

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/ Qualification inspection as applicable	M39016/20-054 or M39016/20-060	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
	M39016/20-049 M39016/20-050 M39016/20-051 M39016/20-052 M39016/20-053 M39016/20-084 or M39016/20-055 M39016/20-056 M39016/20-057 M39016/20-058 M39016/20-059 M39016/20-090	2 units each PIN Qualification inspection, Q1.  1 unit terminal strength and solderability.
		1 unit terminal strength and solderability.

- 1/ For 1 only: For retention of qualification or extension of qualification to lower failure rate levels, all life test data accumulated on MIL-PRF-39016/21 may be used in addition to MIL-PRF-39016/20 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 Q5, MIL-PRF-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.

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Initial qualification of relays supplied with spreader mounting pads (-061 through -066 and -073 through -078 and -091 through -096), 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 and dropout values (voltage), 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 (-061 through -066, -073 through -078, and -091 through -096), two units from figure 3 and two units from figure 4 of the 26.5 volt rated coil voltage (-066 and -078) 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-39106 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).

Group A testing for relays supplied with spread mounting pads (-061 through -066, -073 through -078, and -091 through -096) shall be tested as specified below:

Perform seal test immediately, preceding the A2 electrical tests. Relay leads shall be formed and the mounting pad removed before the seal test. After the seal test, the 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-39016/20 are similar in construction and design except for the coils to the relays produced for MIL-PRF-39016/21, then reduced testing for qualification of MIL-PRF-39016/20 relays may be performed concurrent with or subsequent to successful qualification of MIL-PRF-39016/21 relays.

TABLE III. Qualification inspection (reduced testing).

Examination or test
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 part no. M39016/20-	New part no. M39016/20-	Superseded part no. M39016/20-	New part no. M39016/20-	Superseded part no. M39016/20-	New part no. M39016/20-
001	007	025	037	067	061
002	008	026	038	068	062
003	009	027	039	069	063
004	010	028	040	070	064
005	011	029	041	071	065
006	012	030	042	072	066
013	019	031	043		
014	020	032	044		
015	021	033	045		
016	022	034	046		
017	023	035	047		
018	024	036	048		

1/ Dash numbers -001 through -006, -013 through -018, and -025 through -036 are inactive for new design and are for support of existing equipment designs only.

Cross reference for Government logistical support: See table V.

TABLE V. Cross reference for Government logistical support.

Superseded part no. M39016/20-	New part no. M39016/20-	Support with part no. M39016/20-		New part no. M39016/20-	Support with part no. M39016/20-		New part no. M39016/20-	Support with part no. M39016/20-
001	007	007		049	049		085	085
002	008	008		050	050		086	086
003	009	009		051	051		087	087
004	010	010		052	052		088	088
005	011	011		053	053		089	089
006	012	012		054	054		090	090
013	019	007		055	049		091	091
014	020	008		056	050		092	092
015	021	009		057	051		093	093
016	022	010		058	052		094	094
017	023	011		059	053		095	095
018	024	012		060	054		096	096
025	037	049		061	061			
026	038	050		062	062			
027	039	051		063	063			
028	040	052		064	064			
029	041	053		065	065			
030	042	054		066	066			
031	043	049		073	073			
032	044	050		074	074			
033	045	051		075	075			
034	046	052		076	076			
035	047	053		077	077			
036	048	054		077	078			
067	061	061		078	078			
068	062	062		079	079			
069	063	063		080	080			
070	064	064		081	081			
071	065	065		082	082			
072	066	066		083	083			
				084	084			

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

A-A-55485, /5  
MIL-PRF-39016/21  
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

Preparing activity:

DLA - CC

Review activities:

Army - AR  
Navy - AS, MC, OS, SH  
Air Force - 99

(Project 5945-1255)

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>.