

INCH-POUND

MS27400W
 30 November 1994
 SUPERSEDING
 MS27400V
 22 October 1992

MILITARY SPECIFICATION SHEET

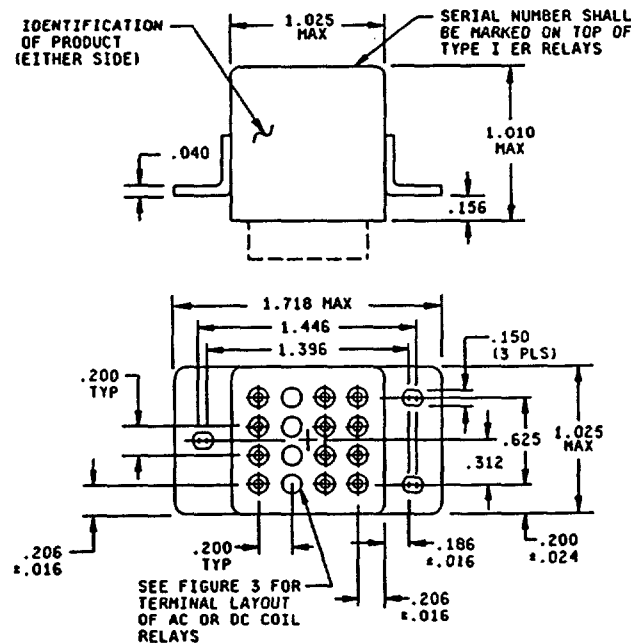
RELAYS, ELECTROMAGNETIC, TYPE I, (INCLUDING ESTABLISHED
 RELIABILITY (ER) TYPES), PERMANENT MAGNET DRIVE,
 10 AMPERES, 4PDT, HERMETICALLY SEALED

(W)

INACTIVE FOR NEW DESIGN AS OF 30 NOVEMBER 1994. THIS
 SPECIFICATION AND ITS ASSOCIATED QUALIFIED PARTS LIST ARE
 SCHEDULED FOR CANCELLATION IN OCTOBER 1995. REFER TO TABLE
 IX AND MIL-R-83536 FOR SUPERSESSION DATA.

This specification is approved for use by all Depart-
 ments 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-6106

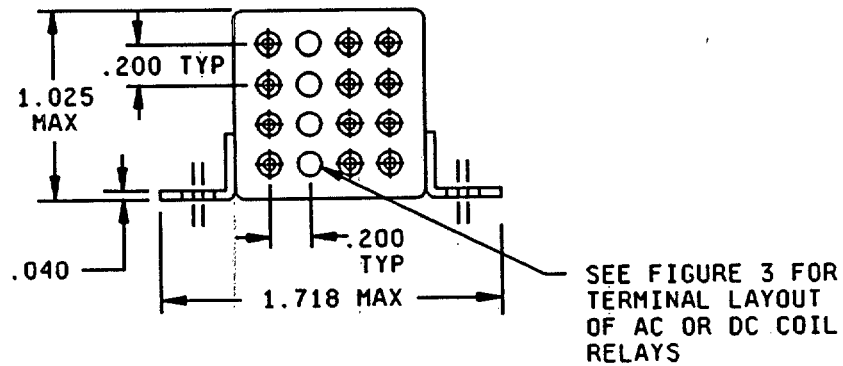
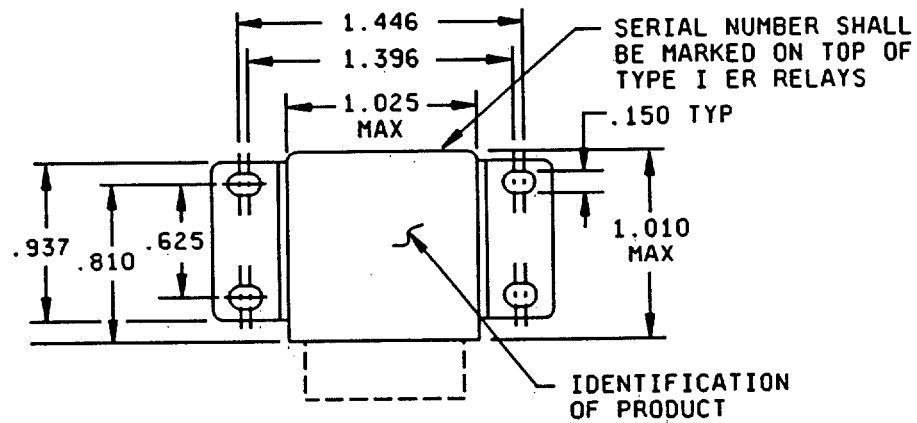


CONFIGURATION A

FIGURE 1. Dimensions and configurations.

(W) denotes changes

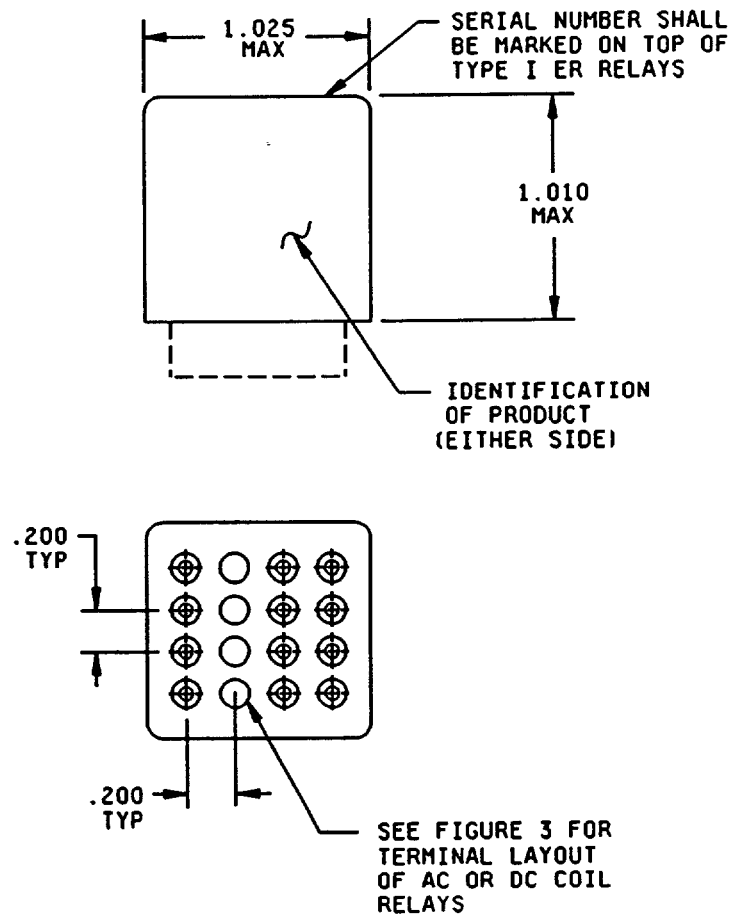
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CONFIGURATION B

FIGURE 1. Dimensions and configurations - Continued.

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CONFIGURATION C

FIGURE 1. Dimensions and configurations - Continued.

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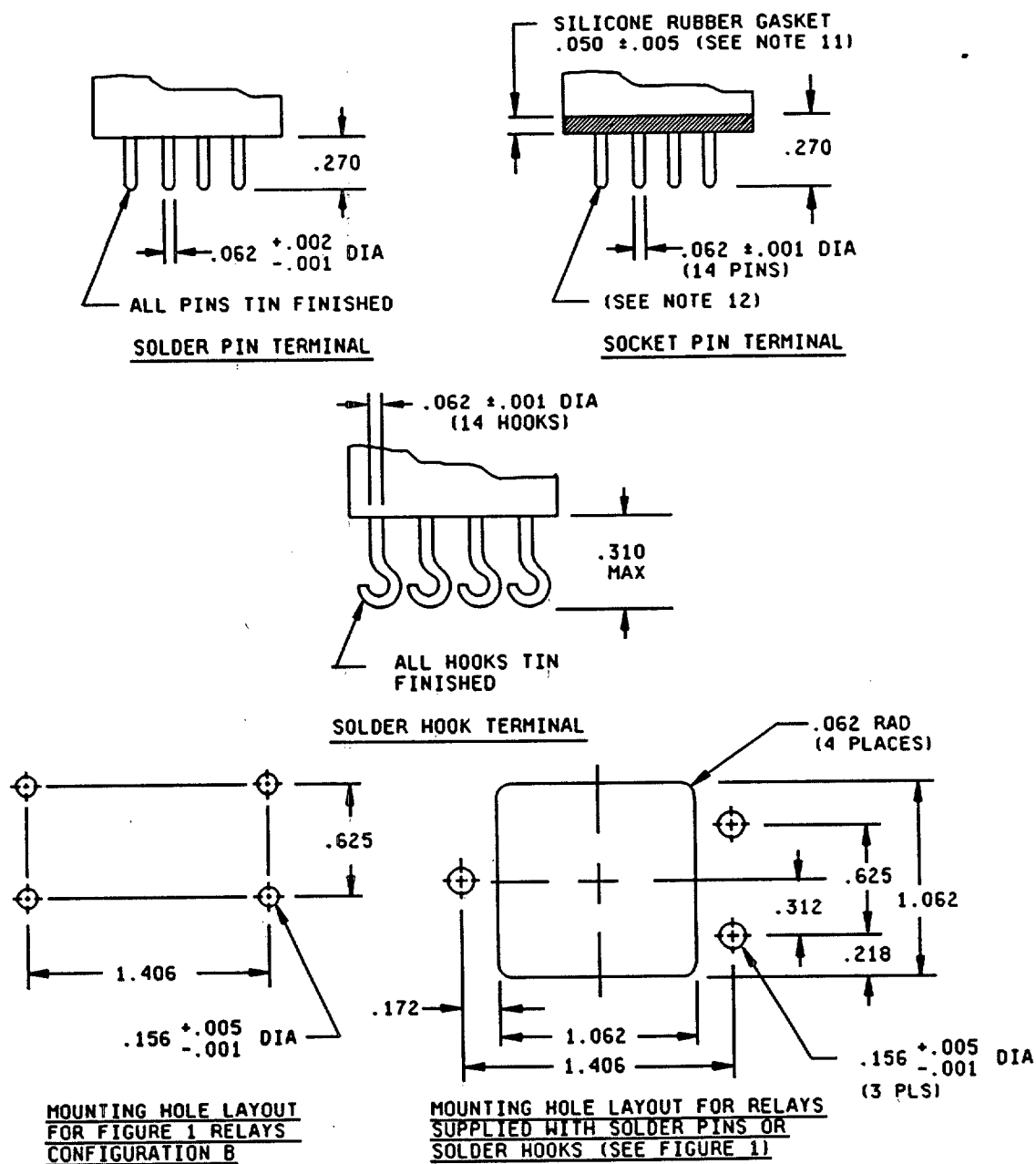
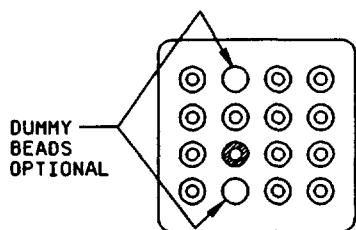
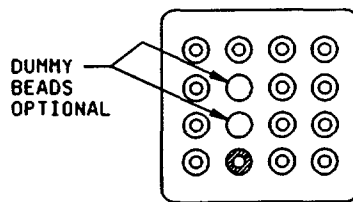


FIGURE 2. Terminal types and mounting hole layouts.

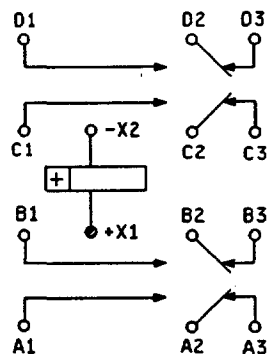
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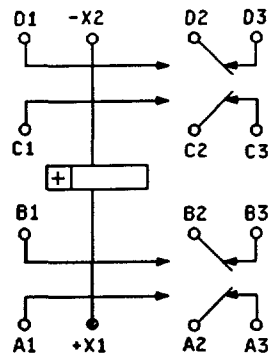
TERMINAL LAYOUT FOR
AC COIL RELAYS WITH
SOLDER PINS AND SOCKET
PINS (SEE CIRCUIT
DIAGRAM A)



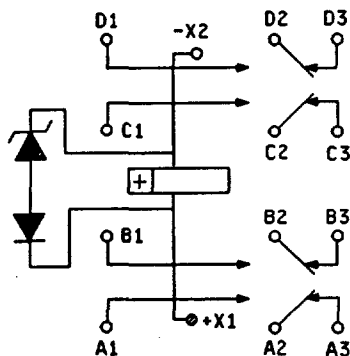
TERMINAL LAYOUT FOR ALL
DC COIL RELAYS (SEE CIRCUIT
DIAGRAMS B AND C) AND AC COIL
RELAYS WITH SOLDER HOOKS
(SEE CIRCUIT DIAGRAM B)



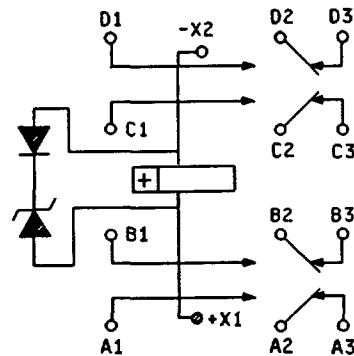
CIRCUIT DIAGRAM A
(SEE NOTES 6,7,9,AND 10)



CIRCUIT DIAGRAM B
(SEE NOTES 6,7,8,9,AND 10)



CIRCUIT DIAGRAM C
(SEE NOTES 6,8,9,AND 10)



OPTIONAL INTERNAL DIODE
CONFIGURATION
(SEE NOTES 6,8,9,AND 10)

FIGURE 3. Terminal layouts and circuit diagrams.

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Inches	mm	Inches	mm	Inches	mm
.001	0.03	.172	4.37	.937	23.80
.002	0.05	.200	5.08	1.010	25.65
.005	0.13	.218	5.54	1.025	26.04
.040	1.02	.270	6.86	1.062	26.97
.050	1.27	.310	7.87	1.396	35.46
.062	1.57	.312	7.92	1.406	35.71
.150	3.81	.625	15.88	1.446	36.73
.156	3.96	.810	20.57	1.718	43.64

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. In the event of a conflict between the text of this standard and the references cited herein, the text of this standard shall take precedence.
5. Referenced Government documents, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation, form a part of this standard to the extent specified herein.
6. Terminal numbers do not appear on the relay header. There shall be affixed to the relay a legible circuit diagram that identifies each terminal location specified. The circuit diagrams shown on figure 3 are terminal views.
7. See table I for applicable circuit diagrams of ac coils. Coil polarity is not applicable to ac coils.
8. DC versions of this relay must not operate or be damaged by reverse polarity. Semiconductors shall not be used for this purpose.
9. Permanent magnet drive consists of permanent magnet with its flux path switched and combined with the electromagnetic flux.
10. For details, see table I.
11. Silicone rubber gasket, AMS3332, shore hardness 20 ± 5 .
12. Finish shall be gold plate in accordance with MIL-G-45204, type II, class I, nickel underplating shall be 50 to 150 microinches thick.
13. CAUTION: Due to possible interaction of relay magnetic fields, the following spacing requirements, as a minimum, shall be considered in dense packaging situations:
 - a. Row to row assisting fields, .125 inch (3.18 mm).
 - b. Row to row opposing fields, .188 inch (4.78 mm).
 - c. Side to side alternating fields, .062 inch (1.57 mm).
 - d. Side to side like fields, .125 inch (3.18 mm).

FIGURE 3. Terminal layouts and circuit diagrams - Continued.

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REQUIREMENTS:

Dimensions and configurations: See figure 1.

Terminal types and mounting hole layouts: See figure 2.

Terminal layouts and circuit diagrams: See figure 3.

Dash numbers and general characteristics: See table I.

Contact data:

Load ratings: See table II.

Maximum contact drop:

Initial: 0.150 volt.

After life test: 0.175 volt.

Overload current: DC: 40 amperes; AC: 60 amperes.

Rupture current: DC: 50 amperes; AC: 80 amperes.

Time current relay characteristics: See table III.

Coil data: See table IV.

Duty rating: Continuous.

RFI specification: MIL-STD-461 (applicable to coil circuits of ac-operated relays).

Electrical data:

Minimum insulation resistance:

Initial: 100 megohms.

After life or environmental test: 50 megohms.

Dielectric strength (sea level): See table V.

Dielectric strength (altitude): See table VI.

Environmental characteristics:

Operating temperature range: -70°C to +125°C.

Maximum altitude rating: 300,000 feet.

Shock G-level:

Configurations A and C: 200 g's.

Configuration B: 100 g's.

Maximum duration contact opening: 10 μ s.

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TABLE I. Dash numbers and general characteristics.

PIN MS27400- 1/	Mounting configuration (see figure 1)	Terminal type (see figure 2)	Circuit diagram (see figure 3)	Rated coil voltage (and frequency when applicable) 2/ (see table III)	Coil suppression (back EMF, transient voltage) 3/ 4/	Mating socket M12883/40-
Type I unsuppressed dc coils						
9 6/	A	Solder hook	B	28 V dc	N/A	N/A
10 6/	A	Socket pin	"	"	"	01, 07
35 6/	A	Solder pin	"	"	"	N/A
21 6/	B	Solder hook	"	"	"	"
40 5/ 6/	C	Solder hook	"	"	"	"
41 6/	C	Solder pin	"	"	"	"
Type I suppressed dc coils						
17 6/	A	Socket pin	C	28 V dc	42 V dc max	01, 07
18	A	Socket pin	"	48 V dc	77 V dc max	01, 07
23 6/	A	Solder hook	"	28 V dc	42 V dc max	N/A
37 6/	A	Solder pin	"	"	"	"
24 6/	B	Solder hook	"	"	"	"
42 5/ 6/	C	Solder hook	"	"	"	"
43 6/	C	Solder pin	"	"	"	"
Type I ER unsuppressed dc coils						
5	A	Solder hook	B	28 V dc	N/A	N/A
6	A	Socket pin	"	"	"	01, 07
36	A	Solder pin	"	"	"	N/A
19	B	Solder hook	"	"	"	"
44 5/	C	Solder hook	"	"	"	"
45	C	Solder pin	"	"	"	"
Type I ER suppressed dc coils						
29	A	Solder hook	C	28 V dc	42 V dc max	N/A
31	A	Socket pin	"	"	"	01, 07
38	A	Solder pin	"	"	"	N/A
30	B	Solder hook	"	"	"	"
46 5/	C	Solder hook	"	"	"	"
47	C	Solder pin	"	"	"	"
Type I ac coils						
11 6/	A	Solder hook	B	115 V ac, 400 Hz	N/A	N/A
12 6/	A	Socket pin	A	115 v AC, 400 Hz	"	02, 08
26 6/	A	Solder hook	B	115 V ac, 50/400 Hz	"	N/A
28 6/	A	Socket pin	A	"	"	02, 08
39	A	Solder pin	A	"	"	N/A
22 6/	B	Solder hook	B	115 V AC, 400 Hz	"	"
27 6/	B	Solder hook	B	115 V ac, 50/400 Hz	"	"
48 5/ 6/	C	Solder hook	B	"	"	"
49 6/	C	Solder pin	A	"	"	"

See footnotes at end of table.

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TABLE I. Dash numbers and general characteristics - Continued.

PIN MS27400- 1/	Mounting configuration (see figure 1)	Terminal type (see figure 2)	Circuit diagram (see figure 3)	Rated coil voltage (and frequency when applicable) 2/ (see table III)	Coil suppression (back EMF, transient voltage) 3/ 4/	Mating socket M12883/40-
Type I ER ac coils						
7	A	Solder hook	B	115 V ac, 400 Hz	N/A	N/A
8	A	Socket pin	A	115 V ac, 400 Hz	"	02, 08
32	A	Solder hook	B	115 V ac, 50/400 Hz	"	N/A
34	A	Socket pin	A	115 V ac, 50/400 Hz	"	02, 08
20	B	Solder hook	B	115 V ac, 400 Hz	"	N/A
33	B	Solder hook	B	115 V ac, 50/400 Hz	"	"
50 5/	C	Solder hook	B	"	"	"
51	C	Solder pin	A	"	"	"

- 1/ Part or Identifying Number (PIN). The term Part or Identifying Number (PIN) is equivalent to the term part number which was previously used in this document: Type I relays shall be identified as MS27400 and a dash number from table I. Type I ER relays shall be identified as MS27400, a dash number from table I, and a suffix letter (M, U, X, or P) designating failure rate level. Failure rate level (percent per 10,000 cycles): M, 1 percent; U, 0.5 percent; X, 0.3 percent; and P, 0.1 percent.
- 2/ CAUTION: The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.
- 3/ JANTX or equivalent screened semiconductors shall be used in type I ER relays with internal coil suppression or ac coil ratings after 30 December 1980.
- 4/ Diodes shall have a peak inverse voltage of 600 V dc minimum when used.
- 5/ Caution should be exercised to ensure configuration C relays with solder hooks meet the environmental characteristics of the system. Environmental characteristics can be adversely affected by mounting means.
- 6/ Type I relays are inactive for new design after 21 Dec 1990. See table VIII for cross-reference data.

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TABLE II. Rated contact load (amperes per pole) case grounded.

Type of load	Life operating cycles x 10 ³	28 V dc				115 V ac, 1 phase					115/200 V ac, 3 phase					See appropriate notes
		Main		Aux												
		NO	NC	NO	NC	400 Hz	50/60 Hz	400 Hz	60 Hz	400 Hz	50/60 Hz	400 Hz	60 Hz			
Resistive	100	10	10	---	---	10	2.5	2/	---	10	2.5	2/	---	---		
Inductive	10	---	---	---	---	---	2.5	2/	---	---	2.5	2/	---	3/		
Inductive	20	8	8	---	---	8	---	---	---	8	---	---	---	---		
Motor	100	4	4	---	---	4	2.0	2/	---	4	2.0	2/	---	---		
Lamp	100	2	2	---	---	2	1.0	2/	---	---	---	---	---	4/		
Transfer load																
Mechanical life reduced current	400	2.5	2.5	---	---	2.5	---	---	---	2.5	---	---	---			
Intermediate current																

1/ Absence of value indicates relay is not rated for 3 phase applications.

2/ For 50/60 Hz rating, rupture and overload are not applicable and life shall be 10,000 cycles.

3/ MS274001-7, -8, -11, -12, -20, -22, -26, -27, -28, -32, -33, -34, -39, -48, -50, and -51 for 28 V dc inductive rating life is 10 x 10³ cycles.

4/ Transfer load indicates relay is suitable for transfer between unsynchronized ac power supplied at rating indicated.

TABLE III. Time current characteristics at 25°C. 1/ 2/

1	15A - 1 hour
2	50A - 5.0 seconds
3	100A - 1.2 seconds
4	250A - 0.2 second
5	350A - 0.1 second

1/ CAUTION: Compare with time current characteristics of the associated circuit protective device.

2/ Time-current relay characteristic at 25°C. Relays shall sustain five applications (make and carry only) of power concurrently on adjacent poles at each of five different current levels for the time durations in table IV. Separate relays shall be tested at 28 V dc and 115/200 V dc, 400 Hz, 3 phase. Cooling time between successive applications shall be 30 minutes. The test shall be performed on both normally open and normally closed contacts of each relay. There shall be no failures or evidence of welding or sticking and the relay shall pass contact voltage drop at conclusion.

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TABLE IV. Operating characteristics.

PIN MS27400-	Coil data										Time (milliseconds maximum)						
	Rated			Maximum		Max pickup voltage			Hold voltage 3/	Drop- out voltage 3/	Operate 4/	Release 5/	Contact bounce			Break bounce NO only	
	Volts 1/	Freq. Hz	Res.Ω ±10% 25°C	Volts 2/	Ampere	Normal 3/	High temp test	Cont. current test					Main				Aux.
													NO	NC	NO		
Unsuppressed dc coils																	
5 6 9 10 19 21 35 36 40 41 44 45	28 V dc	N/A	290	29 2/	0.12	18	19.8	22.5	7.0	1.5	15	15	1	1	N/A	N/A	N/A
Suppressed dc coils																	
17 23 24 29 30 31 37 38 42 43 46 47	28 V dc	N/A	290	29 2/	0.12	18	19.8	22.5	7.0	1.5	15	15	1	1	N/A	N/A	0.1
18	48 V dc	N/A	800 min	50	0.08	31	34.1	39.0	14	2.0	15	15	1	1	N/A	N/A	0.1
AC coils																	
7 8 11 12	115 V ac	400	N/A	122	0.04	90	95.4	103.5	30	5.0	20	50	1	1	N/A	N/A	N/A
20 22	115 V ac	400	N/A	122	0.04	90	95.4	103.5	30	5.0	20	50	1	1	N/A	N/A	0.1
26 27 28 32 33 34 39 48 49 50 51	115 V ac	50/400	N/A	122	0.03	95	100	105	40	5.0	20	50	1	1	N/A	N/A	N/A

- 1/ CAUTION: The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.
- 2/ Maximum coil voltage of +32 V dc when maximum ambient temperature does not exceed +85°C.
- 3/ Over the temperature range.
- 4/ With rated coil voltage.
- 5/ From rated coil voltage.

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TABLE V. Dielectric strength (sea level).

	Initial	After life
Coil to case	1,000 V rms	1,000 V rms
Aux contacts	N/A	N/A
All other points	1,250 V rms	1,000 V rms

TABLE VI. Dielectric strength (altitude). 1/

	80,000 ft	300,000 ft
Coil to case	350 V rms	500 V rms
Aux contacts	N/A	N/A
All other points	350 V rms	500 V rms

1/ Dielectric may be improved by suitable insulation of terminals and wiring after installation.

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Vibration (sinusoidal):

Configurations A and C: 30 g's.

Configuration B: 20 g's.

Frequency range: 10 to 3,000 Hz.

Maximum duration contact opening: 10 μ s.

Vibration (random):

Configurations A and C: MIL-STD-202, method 214, test condition IG, 15 minutes each plane.

Configuration B: MIL-STD-202, method 214, test condition IE, 15 minutes each plane.

Maximum duration contact opening: 10 μ s.

Acceleration: 15 g's.

PHYSICAL DATA:

Weight: 0.17 pound (78 grams) maximum.

Seal: Hermetic; relays are sealed by welding (laser, tungsten inert gas, or other suitable means, as approved by the qualifying activity).

Construction (internal and external): All welded, except that coil magnet wire to coil lead wire shall be soldered.

Identification of product: Applicable. The circuit diagram shall be oriented so that when the relay is held with the circuit diagram right side up as shown on figure 3, and rotated away from the viewer about a horizontal axis through the diagram until the header terminals face the viewer, then each terminal shall be in the location shown on the circuit diagram.

Part or Identifying Number (PIN):

Type I relays: MS27400- (plus dash number from table I).

Type I ER relays: MS27400- (plus dash number and suffix letter designating failure rate level from table I).

Qualification by similarity: See table VII.

Cross-reference for Government logistical support: See table VIII.

Supersession data: See table IX.

Quality conformance inspection: Performance of Group C inspection for Type I and Type I-ER relays is not required. Performance of Retention of Qualification for Type I-ER relays is not required, provided the manufacturer possesses and maintains a current qualification to MIL-R-83536.

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TABLE VII. Qualification by similarity. 1/

PIN	Loads						Dynamics										Environmental					
	Basic qualification						ER			Sockets/pins												
	A	B	C	D	E	F	G	B	C	D	H	F	A	B	C							
MS27400-	3/ 4/	3/ 4/	5/	3/ 4/	3/ 4/	3/ 4/ 5/	3/ 4/	DC	50/400	3/ 4/	DC Config A	400 Config A	3/ 4/	50/400 Config A	3/ 4/	50/400 Config B	DC	400	50/400	6/		
	DC	400	50/400		400	50/400																
5	4			3			2										4					
6	4			3			2										4					
7		2,3			1,2					1								2,3				
8		2,3			1,2					1								2,3				
9	4			3			2										4					
10	4			3			2										4					
11		1,2,3			1,2					1								1,2,3				
12		1,2,3			1,2					1								1,2,3				
17	1,2,3			1,2			1						1				1,2,3					
18	1,2,3			1,2						1				1			1,2,3					
19	4			3						2							4					
20		2,3			1,2								1					2,3				
21	4			3			2										4					
22		1,2,3			1,2								1					1,2,3				
23	1,2,3			1,2			1							1			1,2,3					
24	1,2,3			1,2						1							1,2,3					

See footnotes at end of table.

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TABLE VII. Qualification by similarity - Continued. 1/

PIN	Loads						Dynamics										Environmental		
	Basic qualification			ER			Sockets/pins												
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
MS27400-	3/ 4/	3/ 4/	5/	3/ 4/	3/ 4/	5/	3/ 4/	5/	3/ 4/	5/	3/ 4/	5/	3/ 4/	5/	3/ 4/	5/	3/ 4/	5/	6/
DC	400	400	50/400	DC	400	50/400	DC	400	DC	400	DC	400	DC	400	DC	400	DC	400	50/400
40	4			3			2								4				
41	4			3			2								4				
42	1,2,3			1,2			1								1,2,3				
43	1,2,3			1,2			1								1,2,3				
44	4			3			2								4				
45	4			3			2								4				
46	2,3			1,2			1								2,3				
47	2,3			1,2			1								2,3				
48			1,2,3			1,2								1					1,2,3
49			1,2,3			1,2								1					1,2,3
50			2,3			1,2								1					2,3
51			2,3			1,2								1					2,3

Reference MIL-R-6106 for information on grouping and ranking relays within each subgroup.

EMI test must be performed on each type of ac network.

Coils (dc suppressed and ac networks). Discretes qualify only hybrids. Hybrids qualify only hybrids. DC standard coils can be

qualified by suppress coils.

Terminals-socket pin type terminals are considered worst case. Solder pins and hooks may be qualified by similarity.

Universal ac coils (50/400 Hz). Test at 50 Hz and 400 Hz during initial qualification. Alternate between 50 Hz and 400 Hz for

qualification retention. 60 Hz testing may be used in lieu of 50 Hz.

Socket pins (with gasket seals), are considered nonsimilar to solder pins and hooks and each must be tested.

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W TABLE VIII. Cross-reference for Government logistics support.

PIN MS27400-	Support with PIN M83536	PIN MS27400-	Support with PIN M83536
5	/15-021	29	/16-021
6	/15-022	30	/16-024
7	/17-001	31	/16-022
8	/17-002	32	/17-004
9	/15-021	33	/17-004
10	/15-022	34	/17-005
11	/17-001	35	/15-020
12	/17-002	36	/15-020
13	1/	37	/16-020
14	1/	38	/16-020
15	1/	39	/17-003
16	1/	40	/15-018
17	/16-022	41	/15-017
18	/16-031	42	/16-018
19	/15-024	43	/16-017
20	/17-006	44	/15-018
21	/15-024	45	/15-017
22	/17-006	46	/16-018
23	/16-021	47	/16-017
24	/16-024	48	/17-009
25	/16-022	49	/17-008
26	/17-004	50	/17-009
27	/17-007	51	/17-008
28	/17-005		

1/ MS27400-13 through -16 are canceled without replacement.

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(W) TABLE IX. Supersession data.

Superseded PIN MS27400-	Replacement PIN M83536	Superseded PIN MS27400-	Replacement PIN M83536
1	/15-021	27	/17-007
2	/15-022	28	/17-005
3	/17-001	29	/16-021
4	/17-002	30	/16-024
5	/15-021	31	/16-022
6	/15-022	32	/17-004
7	/17-001	33	/17-007
8	/17-002	34	/17-005
9	/15-021	35	/15-020
10	/15-022	36	/15-020
11	/17-001	37	/16-020
12	/17-002	38	/16-020
13	1/	39	/17-003
14	1/	40	/15-018
15	1/	41	/15-017
16	1/	42	/16-018
17	/16-022	43	/16-017
18	/16-031	44	/15-018
19	/15-024	45	/15-017
20	/17-006	46	/16-018
21	/15-024	47	/16-017
22	/17-006	48	/17-009
23	/16-021	49	/17-008
24	/16-024	50	/17-009
25	/16-022	51	/17-008
26	/17-004		

1/ MS27400-13 through -16 are canceled without replacement.

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CONCLUDING MATERIAL

Custodians:

Army - ER

Navy - EC

Air Force - 85

Review activities:

Army - AR, MI

Navy - AS, OS

Air Force - 99

Preparing activity:

Air Force - 85

Agent:

DLA - ES

(Project 5945-0942)