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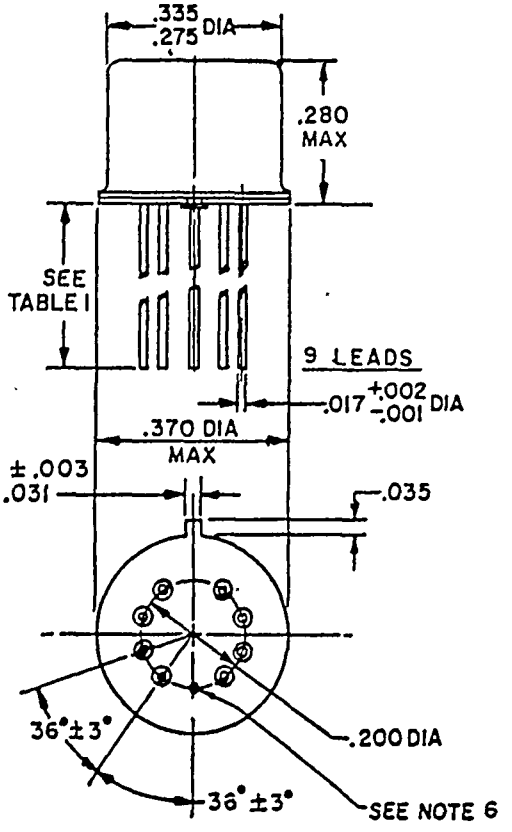
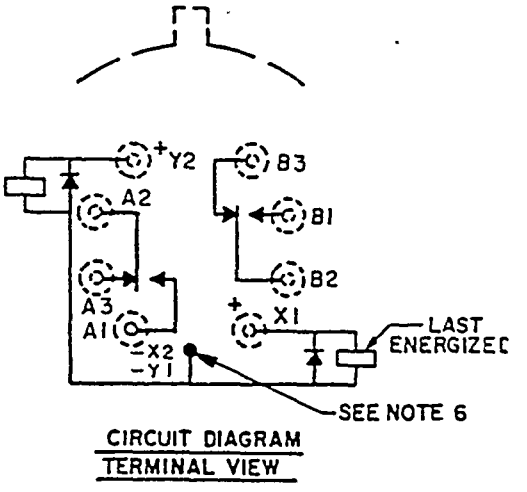
MILITARY SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, DPDT, LOW LEVEL TO 1.0 AMPERE (LATCHING) WITH INTERNAL DIODES 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 relays described herein shall consist of this specification and the latest issue of MIL-R-39016.





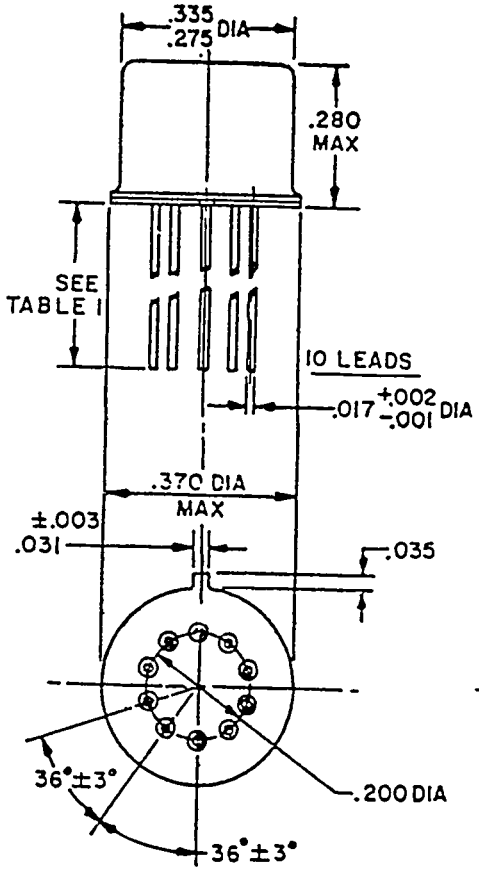
CIRCUIT DIAGRAM
TERMINAL VIEW

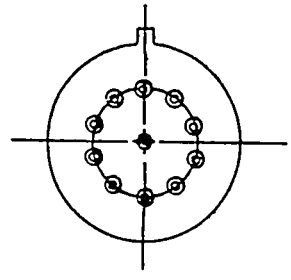
Inches	mm
.001	0.03
.002	0.05
.003	0.08
.017	0.43
.031	0.79
.035	0.89
.200	5.08
.275	6.99
.280	7.11
.335	8.51
.370	9.40

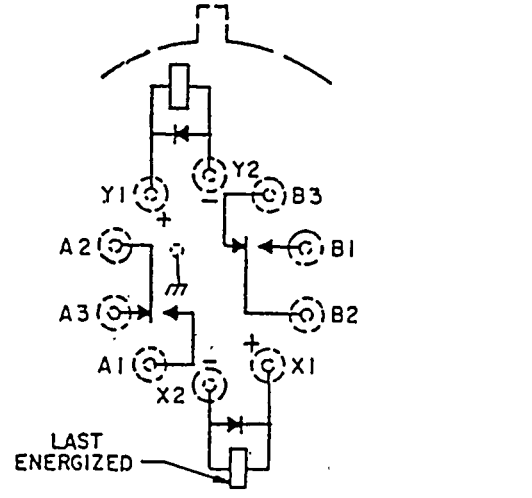
NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.010 (0.25 mm).
4. Terminal numbers shown above for reference only. Numbers do not appear on the relay.
5. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
6. All leads shall be electrically insulated from the case, except for lead terminal, -X2 -Y2, which is grounded to the case.
7. Coil symbol optional in accordance with MIL-STD-1285.
8. Circuit diagram shown on part is the terminal view.

FIGURE 1. Dimensions and configuration.

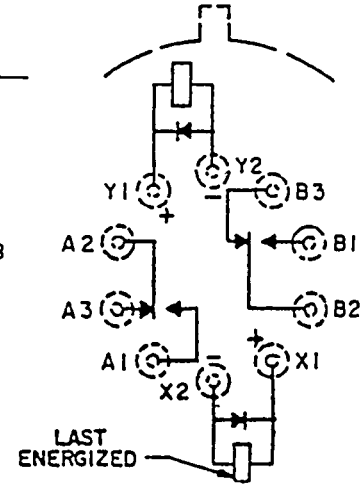
(F) denotes changes







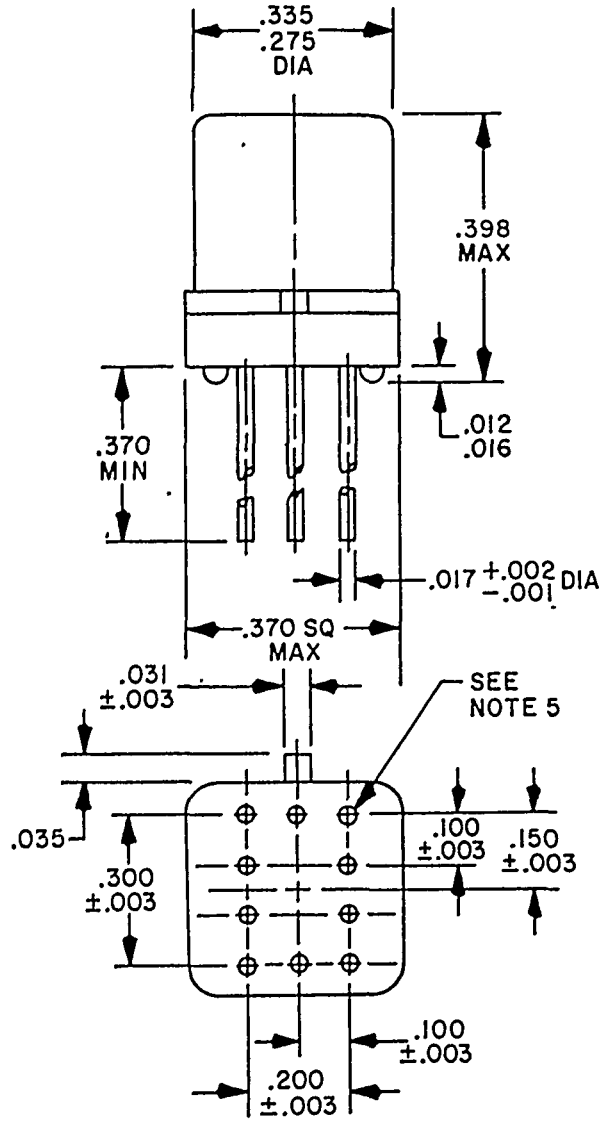
CIRCUIT DIAGRAM
TERMINAL VIEW (-073 THROUGH-078)

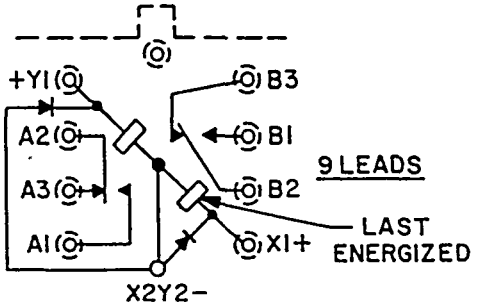


CIRCUIT DIAGRAM
TERMINAL VIEW

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.010 (0.25 mm).
4. Terminal numbers shown above for reference only. Numbers do not appear on the relay.
5. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
6. All leads shall be electrically insulated from the case.
7. Coil symbol optional in accordance with MIL-STD-1285.
8. Circuit diagram shown on part is the terminal view.
9. M39016/29-073 through M39016/29-078 shall be supplied with a case grounding pin welded to the relay header as shown.

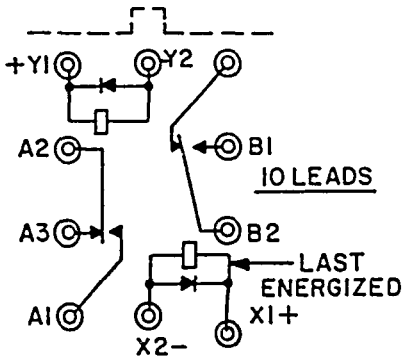
FIGURE 2. Dimensions and configuration 10 leads.





CIRCUIT DIAGRAM 1
TERMINAL VIEW APPLICABLE
TO DASH NUMBERS -061 THRU -066
(SEE NOTE 9)

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
.300	7.62
.335	8.51
.370	9.40
.398	10.11



CIRCUIT DIAGRAM 2
TERMINAL VIEW APPLICABLE
TO DASH NUMBERS -067 THRU -072

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. (F) Spreader pads shall be certified to MIL-M-38527, M38527/05-003, or M38527/05-013.
5. Dimensions and tolerances 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 the relay.
8. Relays shall have a (+) sign placed on the circuit diagram as shown.
9. All leads shall be electrically insulated from the case.
10. Coil symbol optional in accordance with MIL-STD-1285.
11. Circuit diagram shown on part is the terminal view.

FIGURE 3. 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 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: 0.125 ohm maximum (0.150 ohm maximum with spacer pad attached).

High level:

During life: Not more than 5 percent of open circuit voltage.

Ⓕ After life: 0.225 ohm maximum (0.250 ohm maximum with spacer pad attached).

Low level:

During life: 33 ohms maximum.

Ⓕ After life: 0.175 ohm maximum (0.200 ohm maximum with spacer pad attached).

Intermediate current:

During: 1 ohm maximum.

Ⓕ After: 0.225 ohm maximum (0.250 ohm maximum with spacer pad attached).

Contact bounce: 2.0 milliseconds maximum (applicable to failure rate level "L").

Contact stabilization time: 2.5 milliseconds maximum (applicable to failure rate levels "M", "P", and "R").

Overload (high level only): Two times rated current.

Ⓕ Neutral screen: Applicable.

COIL DATA: See table I.

Operate time: 2.0 ms maximum over temperature range with rated coil voltage.
Release time: Not applicable.

ELECTRICAL DATA: 1/ 2/

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.

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/ Dielectric withstanding voltage and insulation resistance are not applicable between coil and case or from coil to coil on figure 1 relays.

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	
(F) Between coils (applicable to 10 and 11 lead relays)	500	

(F) DIODE CHARACTERISTICS: (WARNING: Reverse polarity on coil terminals will destroy the diodes).

Maximum transient voltage: 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, method 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 MIL-STD-750, method 1041.

PHYSICAL DATA:

Terminal strength, (method 211 of MIL-STD-202):

Pull test: Test condition A, 1 pound pull.
Bend test: Test condition C, .5 pound load.
(F) Twist test: As specified in MIL-R-39016.

Solderability: Applicable.

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

Weight: 2.84 grams (0.10 ounce) maximum, 3.09 grams (0.109 ounce) maximum with spreader pad attached.

Seal: Hermetic.

(F) Minimum marking: Military part number "J" with the date code (example J8530), circuit diagram, manufacturers' 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: M39016/29- (dash number from table I and suffix letter designating failure rate level).

(F) TABLE I. Dash number and characteristics. 1/ 2/

Dash numbers 3/				.500 Min leads with ground 6/	Number of leads	Coil voltage V dc 7/		At 25°C		Over temperature range
Lead length 1.500 min 4/	Lead length .187 ±.010	Lead length .500 min	Spreader pad (figure 3) 5/			Rated	Max	Coil resistance ohms ±10%	Specified pickup (latch/reset) value (voltage) (V dc)	Specified pickup (latch/reset) value (voltage) (V dc)
025	037	049	061	---	9	6.0	8.0	120	3.5	4.5
026	038	050	062	---	9	9.0	12	280	5.3	6.8
027	039	051	063	---	9	12	16	500	7.0	9.0
028	040	052	064	---	9	18	24	1,130	10.5	13.5
029	041	053	065	---	9	26.5	32	2,000	14.2	18
030	042	054	066	---	9	5.0	6.0	61	2.8	3.7
031	043	055	067	---	10	5.0	6.0	61	2.8	3.7
032	044	056	068	---	10	6.0	8.0	120	3.5	4.5
033	045	057	069	---	10	9.0	12	280	5.3	6.8
034	046	058	070	---	10	12	16	500	7.0	9.0
035	047	059	071	---	10	18	24	1,130	10.5	13.5
036	048	060	072	---	10	26.5	32	2,000	14.2	18
---	---	---	---	073	11	12	16	500	7.0	9.0
---	---	---	---	074	11	5.0	6.0	61	2.8	3.7
---	---	---	---	075	11	6.0	8.0	120	3.5	4.5
---	---	---	---	076	11	9.0	12	280	5.3	6.8
---	---	---	---	077	11	18	24	1,130	10.5	13.5
---	---	---	---	078	11	26.5	32	2,000	14.2	18

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/ WARNING: When latching relays are installed in equipment, the latch and reset coils should not be pulsed simultaneously. Coils should not be pulsed with less then the nominal coil voltage and the pulse width should be a minimum of three times the specified operate time of the relay. If these conditions are not followed, it is possible for the relay to be in the magnetically neutral position.
3/ 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, 0.1; P, 0.1; R, 0.01. Example, 025L - - - - - 072R.
4/ 1.500 leads are inactive for new design.
5/ Relays supplied with spreader pads (-061 through -072) shall have the pad rigidly attached.
6/ Relays are supplied with a case grounding pin welded to the header (see figure 2).
7/ CAUTION: The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.

QUALIFICATION INSPECTION:

Qualification inspection and sample size: See table II.

(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	M39016/29-053	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
	M39016/29-049 M39016/29-050 M39016/29-051 M39016/29-052 M39016/29-054 M39016/29-055 M39016/29-056 M39016/29-057 M39016/29-058 M39016/29-059 M39016/29-060	2 units each part number Qualification inspection, table, group II
	M39016/29-073	1 unit terminal strength and terminal solderability

1/ For retention of qualification or extension of qualification to lower failure rate levels, all life test data accumulated on MIL-R-39016/30 may be used in addition to MIL-R-39016/29 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 will be increased as required in table II, group V, MIL-R-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.

Initial qualification of relays supplied with spreader pads (-061 through -072) 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 inspection (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 (latch/reset) value (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 pads (-061 through -072) two units of the 26.5 volt rated coil voltage (-065) 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.
(Failure rate level "L" is inactive for new design).

(F) 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:

(F) Insulation resistance, dielectric withstanding voltage, static contact resistance, specified pickup (latch/reset) value (voltage), coil resistance, operate and release time, contact dynamic characteristics, coil transient suppression (when specified), solderability, seal, visual, and mechanical inspection (external).

(F) Group A testing for relays supplied with spreader pads (-061 through -072), 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 group A tests.

Qualification inspection (reduced testing) and sample size: See table III. If the relays produced for MIL-R-39016/29 are similar in construction and design except for diodes and coils to the relays produced for MIL-R-39016/30, then reduced testing for qualification of MIL-R-39016/29 relays may be performed concurrent with or subsequent to successful qualification of MIL-R-39016/30 relays. For reduced testing see table III.

(F) TABLE III. Qualification inspection (reduced testing).

Examination of 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. M39016/29-	New part no. M39016/29-	Superseded part no. M39016/29-	New part no. M39016/29-	Superseded part no. M39016/29-	New part no. M39016/29-
001	025	009	040	017	035
002	026	010	041	018	036
003	027	011	030	019	043
004	028	012	042	020	044
005	029	013	031	021	045
006	037	014	032	022	046
007	038	015	033	023	047
008	039	016	034	024	048

1/ Dash numbers M39016/29-025 through M39016/29-036 are inactive for new design and are for support of existing equipment design only.

Cross reference for Government logistical support: See table V.

TABLE V. Cross reference for Government logistical support.

Superseded part number M39016/29-	New part number M39016/29-	Support with part number M39016/	New part number M39016/29-	Support with part number M39016/29-	New part number M39016/29-	Support with part number M39016/
001	025	29-025 1/	049	29-049	073	30-073
002	026	30-026	050	30-050	074	29-074
003	027	30-027	051	30-051	075	29-075
004	028	30-028	052	30-052	076	29-076
005	029	30-029	053	30-053	077	29-077
006	037	29-049	054	29-054	078	29-078
007	038	30-050	055	29-055		
008	039	30-051	056	29-056		
009	040	30-052	057	30-057		
010	041	30-053	058	30-058		
011	030	29-030 1/	059	30-059		
012	042	29-054	060	30-060		
013	031	29-031 1/	061	29-061		
014	032	29-032 1/	062	30-062		
015	033	30-033	063	30-063		
016	034	30-034	064	30-064		
017	035	30-035	065	30-065		
018	036	30-036	066	30-066		
019	043	29-055	067	29-067		
020	044	29-056	068	29-068		
021	045	30-057	069	30-069		
022	046	30-058	070	30-070		
023	047	30-059	071	30-071		
024	048	30-060	072	30-072		

(F) 1/ Dash numbers -025, -030, 031, and -032 are inactive for new design and for support existing equipment designs only.

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 5945-0757-23)