

MIL-C-23742(SHIPS)
12 July 1963

MILITARY SPECIFICATION
CONTROL CENTERS, ALTERNATING CURRENT
NAVAL SHIPBOARD

1. SCOPE

1.1 This specification covers High Impact (HI) shockproof group control and distribution sections for Naval shipboard use.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-C-504 - Copper Bus Bars (Including Bars, Rods and Shapes).

MILITARY

MIL-S-901 - Shock Tests, H. I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for.
MIL-E-917 - Electric Power Equipment, Basic Requirements for (Naval Shipboard Use).
MIL-D-963 - Drawings, Electrical, Hull and Mechanical Equipment for Naval Shipboard Use.
MIL-C-2212 - Controllers, Alternating Current, Naval Shipboard.
MIL-Q-9858 - Quality Control System Requirements.
MIL-M-15071 - Manuals, Equipment and Systems.
MIL-F-15160 - Fuses; Instrument, Power and Telephone.
MIL-W-16878 - Wire, Electrical, Insulated, High Temperature.
MIL-C-17361 - Circuit Breakers, Air, Electric, Insulated Enclosure, (Shipboard Use).
MIL-F-19207 - Fuseholder, Extractor Post Type, Blown Fuse Indicating and Nonindicating.
MIL-R-19523 - Relays, Auxiliary, Naval Shipboard.
MIL-E-22843 - Equipment, Low Noise Level, (Naval Shipboard Use).

STANDARDS

MILITARY

MIL-STD-167 - Mechanical Vibrations of Shipboard Equipment.
MIL-STD-195 - Marking of Connections for Electric Assemblies.
MIL-STD-740 - Noise Measurements of Shipboard Machinery and Equipment.

DRAWINGS

BUREAU OF SHIPS

815-1853024 - Dead Front Fuseholder, Type FHL14G.
9000-S6202-74230 - Fuseholder, Single, Dead Front-Blown Fuse Indicating for 1-1/2 x 13/32 Inch Fuses, Type 12FH1, 450 Volts.

(Copies of specifications, standards, drawings, and publications required by supplier's in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications.- The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

FSC 6110

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OFFICIAL CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules.

(Application for copies should be addressed to the Official Classification Committee, 1 Park Avenue at 33rd Street, New York 16, New York).

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
IC1 - Control, Industrial.

(Application for copies should be addressed to the National Electrical Manufacturers Association, 155 East 44th Street, New York 17, New York).

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Preproduction sample.- Prior to beginning production a sample of one control center shall be tested as specified in 4.2 (see 6.2).

3.2 Definitions.- The following definitions apply to terms used in this specification:

3.2.1 Group control section.- A self-supporting, vertical structure containing controller units for the supply and control of power to electrical auxiliaries.

3.2.2 Distribution section.- A self-supporting, vertical structure containing AQB circuit breakers, in number as required for distribution of power to miscellaneous ship service loads.

3.2.3 Group control and distribution section.- A section which contains controller units and separately mounted AQB circuit breakers for distribution of power to miscellaneous ship service loads.

3.2.4 Control center.- Distribution and group control sections, or a combination thereof, serving as a power distribution center for a selected system or distribution area.

3.2.5 Controller unit.- An assembly consisting of a magnetic controller and protective devices suitable for drawout mounting in a group control section or group control and distribution section.

3.3 General requirements.- The equipment shall conform to MIL-E-917 and MIL-C-2212. Whenever a requirement of MIL-E-917 and MIL-C-2212 conflicts with a requirement of this specification, the requirements of this specification shall govern.

3.4 Design.

3.4.1 Group control and distribution sections.- A section shall be a vertical structure of a maximum height of 82 inches over the dripshield, 20 inches wide and 12 inches deep. Controller units shall fit over a space of either 12-1/2 inches or 25 inches in height. Individually mounted circuit breakers shall fit into a space of 12-1/2 inches in height for 100 ampere units and 14 inches for 250 ampere units. Each section shall be provided with horizontal wiring space at the bottom, unless otherwise specified (see 6.1), which will line up with adjacent sections to form a convenient raceway the entire length of the load center. In addition, each section shall have a vertical wire space either in the rear or on one side for unit wiring. The vertical wiring space shall be equipped with sufficient cable tie supports to hold cables and wiring in place.

3.4.2 Controller units.- Units shall be provided in accordance with the following standards, as specified (see 6.1):

Unit type			Description
A	Twin	size 0	with fuses 5HP max.
B	Single	size 1	with fuses 10HP max.
C	Twin	size 1	with fuses 10HP max.
D	Single	size 2	with 100 amp. breaker 25HP max.
E	Single	size 3	with 100 amp. breaker 50HP max.

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Unit type			Description
F	Single	size 4	with 100 amp. breaker 75HP max.
G	Single	size 4	with 250 amp. breaker 100HP max.
H	Single	size 5	with 250 amp. breaker 200HP max.
A2	Two	size 0	with control and line fuses for two speed, 5HP max.
B2	Two	size 1	with control and line fuses for two speed, 10HP max.
C2	Two	size 2	with control fuses for two speed, 25HP max.

Controller units of the same size and design shall be readily interchangeable.

3.4.3 Terminal boards.- If required by the contract or order, all control and power circuits shall be brought to terminal boards located horizontal in the wiring space at the bottom of the section unless otherwise specified (see 6.1). Provision shall be made for approximately 10 percent spare terminals on the board. Access to the terminal boards shall be from the front. To minimize the possibility of breakage of the terminal boards, due to distortion of the mounting support under shock, the length of the terminal board shall not exceed 12 terminal points.

3.4.4 Fuses.- Fuses for control circuits shall be style F60 in accordance with MIL-F-15160. Line fuses for size 0 and size 1 controllers shall be style F60 or F62 in accordance with MIL-F-15160.

3.4.4.1 Fuseholders.- Fuseholders for control fuses shall be type 12FH1(FHL12G) 0-30 amp, 500 volt, deadfront, blown fuse indicating fuseholders in accordance with Drawing 9000-S6202-74230 and MIL-F-19207. The fuseholders shall be mounted with the megger test holes on the bottom, line side on top and load side on the bottom. Fuseholders for line fuses for size 0 and size 1 controllers shall be type FHL14G, or meet the above requirements or the requirements of MIL-E-917 and MIL-S-901.

3.4.5 Circuit breakers.- Circuit breakers shall conform to MIL-C-17361 and shall be 500 volt, 60 cycle, 3 phase, fused type AQB1F, AQB with associated current limiting fuses, or unfused type AQB, as specified (see 6.1). Breakers shall have ratings and instantaneous trip settings as required. Circuit breakers in controller units may be of the front connecting type. Breakers for distribution sections shall be of the removable mounting type, with connections being made by use of mounting blocks in accordance with MIL-C-17361. Mounting of breakers in the distribution sections shall be arranged so that the rear terminals of the mounting blocks will be accessible from the front after the breakers are removed. Fuses for the breakers shall be replaceable from the front without opening the group control or distribution unit door. Guards shall be provided, on the outside of the unit doors, for the breaker handles to prevent accidental tripping of the breakers.

3.4.6 Relays.- Relays shall conform to MIL-C-2212 or Category A, Class I of MIL-R-19523.

3.4.7 Bus work.- The bus work in the rear of the sections may be either copper bus bar or adequately braced insulated copper cable. Cable shall conform to the standards of quality required by type D of MIL-W-16878. Bus bar shall be hard-temper in accordance with QQ-C-504, except that minimum radii of round edges shall be approximately one half the bar thickness. The bus work shall be adequately braced for 25,000 amperes short circuit current or as otherwise specified (see 6.1). All contact areas shall be silver surfaced. Bus work for controller sections shall be designed for 600 amperes, 500 volts a.c. continuous duty. Bus work for controller and distribution sections shall be designed for 1000 amperes, 500 volts a.c. continuous duty. Bus work for distribution sections shall be designed for the rating as specified (see 6.1). The interconnecting bus work shall be rated as required to carry the total load of the parallel connecting sections. See table I for bus bar rating.

3.4.7.1 Bus bar insulation.- Unless bus bars are covered by insulation or are inaccessible from the front, after units are removed, they shall have two coats of red colored insulating paint. The coating shall have an insulation resistance value of at least 500 volts per mil of thickness. Bus joints or connectors shall not be painted, either before or after assembly.

3.4.8 Arrangement.- Pushbuttons, indicating lights and fuseholders shall be mounted on small mounting plates in the unit. An opening shall be provided in the unit door to permit the pushbuttons, indicating lights and fuseholders to protrude through the door and shall be of such size that the edges of the opening will overlap the mounting plates when the door is closed. A layer of gasket material, preferably rubber, shall be

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placed on the door or mounting plates where the overlap occurs to provide dripproof protection. Auxiliary relays, if required, shall be located in the stationary structure and not be withdrawn with the controller unit (see 6.1). They shall be wired to the terminal boards. The doors shall be arranged so that they can be closed and latched after removal of a unit.

Table I - Ampere rating of rectangular bus bars placed on edge.

Number of bars in parallel	Size of bars (inches)	Cross sectional area, (square inches)	A. C. ampere rating 60 cycle
			Copper bus, silver surface
1	3/4 x 1/8	0.094	210
	1 x 1/8	.125	285
	1-1/2 x 1/8	.188	425
	2 x 1/8	.250	555
	3/4 x 3/16	.140	265
	1 x 3/16	.188	355
	1-1/2 x 3/16	.278	550
	2 x 3/16	.375	700
	3/4 x 1/4	.188	295
	1 x 1/4	.250	410
	1-1/2 x 1/4	.375	600
	2 x 1/4	.500	780
	2-1/2 x 1/4	.625	1,000
	3 x 1/4	.750	1,140
	4 x 1/4	1.000	1,425
	5 x 1/4	1.250	1,760
	6 x 1/4	1.500	2,100
2 (1/4 inch apart)	2 x 1/4	1.000	1,350
	3 x 1/4	1.500	1,825
	4 x 1/4	2.000	2,280
	5 x 1/4	2.500	2,740
	6 x 1/4	3.000	3,140
3 (1/4 inch apart)	3 x 1/4	2.250	2,200
	4 x 1/4	3.000	2,660
	5 x 1/4	3.750	3,200
	6 x 1/4	4.500	3,600

3.4.9 Terminal and wire marking.-

3.4.9.1 External connections.- All terminals for external connections shall be permanently marked in accordance with MIL-STD-195. The marking shall be such that it remains intact and does not interfere with the connection of the incoming leads. The marking shall be visible after the connection is made.

3.4.9.2 Wiring identification.- All internal wiring using wires over 18 inches long and all wires in harnesses or bundles shall be permanently marked. The wires shall be marked at each end by stamping the identification on an insulated sleeve which shall be slipped over the wire close to the terminal. The marking shall correspond to that shown on the wiring diagram.

3.4.9.3 Wiring practice.- Circuitous routing of wiring shall be avoided. Wiring may be neatly formed into bundles (multiple wires) and laced or secured by sleeving. Wire bundles shall be supported or clamped in a manner which will prevent chafing of the insulation. Fanning strips may be used to position wiring at terminal boards. Wire groups running from hinged panels shall be provided with slack and shall be formed and clamped so that sharp bends do not occur in either the open or closed position. Grommets shall be provided for protection of insulation where wires are run through holes. Care shall be exercised in the running

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of wires to insure that they are not carried over or bent around a sharp corner or edge which might in time abrade the insulation.

3.4.10 Noise.- If low noise equipment is required, it shall be designed to meet the requirements of MIL-E-22843. The grade shall be as specified (see 6.1).

3.4.11 Phase rotation.- When facing the front of a section or control center, the phase rotation shall be A, B and C respectively, from right to left, top to bottom or front to back.

3.4.12 Silver surfacing of buses.- The contact surfaces of bus bars and main connections shall be silver plated.

3.4.13 Creepage and clearance.- Creepage and clearance distances for all appurtenances shall conform to MIL-E-917. For all other live parts, such as bus work, the values shall conform to table II.

Table II - Creepage and clearance for bus bar.

Voltage	Insulation distances to ground or to opposite polarity		
	In air	Surface creepage	
		Bottom and side surfaces	Top-flat surfaces ^{1/}
	Inches	Inches	Inches
115 a.c.	1/2	15/16	1-1/8
440 a.c.	25/32	1-9/16	2

^{1/} Values for top creepage apply to flat surfaces or to curved surfaces presenting sufficient irregularities to permit accumulation of dust and moisture. Values are not intended to apply to simple cylindrical surfaces having a radius of 3 inches or less where side creepage values will apply.

3.5 Enclosures.- Enclosures for control centers shall conform to the dripproof requirements of NEMA Standard ICI when inclined to 45 degrees from normal position and be dead-front, deck mounted with provision for sway bracing from the top.

3.5.1 General.- The sections shall be composed of stacks of vertically arranged controller units or breaker units mounted together in such an integral framework to form a free-standing structure. The framework of the enclosure of each section shall be fabricated from steel angles, channels, or other structural shapes or formed members. Each edge shall be formed by a length of a structural shape, formed member or formed members welded to effect a continuous length. Intermediate supporting members shall be provided for the support of circuit breakers or controller units. The framework shall be fabricated by welding except when disassembly is necessary for replacement of appurtenances. In these cases, bolting shall be employed. Riveting shall not be used in the assembly.

3.5.2 Drawout features.- Each group control section shall be internally subdivided into compartments into which are inserted controller units containing circuit breakers or line fuses and magnetic controllers. Barriers shall be provided between individual units and between units and bus work and cable connections. This compartmentation may be provided by enclosures or be provided integrally with the individual controller units. The units shall be completely drawout. The line, load and control circuits shall be drawout. Positive means of alignment, such as horizontal guide rails or suitable positioning devices, shall be provided for supporting and aligning the unit during its removal or replacement. Plug-in units for the line side and feeder side power connections shall have silverplated, pressure type disconnecting slip connectors of high strength copper alloy. A latching mechanism shall be provided for each controller unit so that it will be impossible to completely remove the unit without first releasing the latch. The terminal points of the disconnecting stabs shall be suitable for front access so that control and power wiring may be worked on readily after the unit is removed. An arrangement shall be provided on drawout, to short circuit all normally closed auxiliary contacts brought out to disconnecting stabs. Each unit shall be held in place by means of quick captive screw fasteners or other suitable means arranged so that the units can be removed or replaced readily without access

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to the rear of the structure. Units shall be able to be placed on a bench or the deck in its normal mounting orientation without damage to structure or the disconnecting stabs.

3.5.3 Access doors.- The enclosures for load centers shall have hinged doors except over wiring spaces and distribution units. Removable covers may be provided over wiring spaces and distribution units. Doors and covers shall be secured by captive thumb screws or other fasteners with all parts captive. The doors of group control sections shall not be attached to the drawout units.

3.5.4 Side and rear enclosures.- Solid metal sheets shall be provided for the side and rear enclosure of load centers. These sheets shall not be removable as complete front access is required. Ventilation louvers should not be provided in the side or rear enclosure.

3.5.5 Top enclosure.- The top of each control center shall be enclosed by a sheet cover, which shall be of suitable dripproof design to prevent dripping water or falling objects from affecting the operation of the control center. The top drip shields shall not interfere with adjacent sections.

3.5.6 Lifting angle and foundation channels.- Control centers shall be provided with removable lifting angles across the top. Where a control center consists of more than one section, the sections shall be bolted together and mounted on removable foundation channels for shipment.

3.5.7 Ventilation.- Adequate provision shall be made for ventilation of each section to meet the maximum temperature limitations of MIL-C-2212 and MIL-C-17361.

3.5.8 Cable entrance.- Cables shall enter the control center through the bottom unless otherwise specified (see 6.1). The design arrangement shall provide for proper cable connections without restriction of access features.

3.6 Outboard repair parts.- Repair parts shall be furnished in accordance with MIL-C-17361 for circuit breakers and MIL-C-2212 for all other equipment. For the purpose of computing a set of repair parts and consolidating spares, a controller unit shall be synonymous with controller in accordance with MIL-C-2212.

3.7 Drawings.- Drawings shall be furnished in accordance with MIL-D-963, Classes C and D. Duplication of information between types of drawings shall be kept to a minimum.

3.7.1 Class C drawings.- Figures 1a, 1b and 1c shall be used for guidance purposes in the preparation of basic design drawings. These drawings shall include the following minimum data:

- (a) Details of drawout mechanisms.
- (b) Mechanical construction details and arrangement.
- (c) Description of removal procedure for controller units and individually mounted circuit breakers.
- (d) Overload heater coil table.
- (e) Elementary and wiring diagrams of each standard controller unit. These may show possible connections to remote devices.
- (f) List of material for standard controller units and distribution units. The lists of material shall show the manufacturer's name and sufficient information to readily identify the equipment for replacement purposes.

3.7.2 Class D drawings.- Ships drawings shall be prepared at the direction of the purchasing activity and contain the following minimum data:

- (a) Dimensional front plan, and side section views of the load center showing overall dimensions, location of required equipment, location of main bases and connections thereto.
- (b) A dimensional floor or mounting view to show arrangement of anchor bolt drilling.
- (c) Identification of applicable ships for purchase contracts.
- (d) Center of gravity and weight.
- (e) Cross reference to applicable class C drawings.
- (f) Elementary of each controller unit.
- (g) Wiring diagram of each section.
- (h) A one-line wiring diagram of main power circuits. Circuit breakers, fuses, contractors or other power circuit switching and protective equipment shall be shown as required.
- (i) Quantity and size of cable connectors to be furnished by shipbuilder.

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- (j) A list of material including material not covered by 3.7.1(f). It shall show the manufacturer's name and address and sufficient information for identification and replacement purposes.

3.8 Identification plates.- Identification plates shall conform to MIL-C-2212 and shall be marked as specified (see 6.1). Connection diagrams for the controller shall be furnished in accordance with MIL-C-2212. The diagrams may be placed in a holder in the wiring space or in such location as space permits.

3.9 Manuals.- Manuals shall be in accordance with type II of MIL-M-15071.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.- Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Quality control system.- The supplier shall provide and maintain a quality control system acceptable to the Government for the supplies covered by this specification. The system of quality control shall be in accordance with MIL-Q-9858.

4.2 Preproduction inspection.- Preproduction inspection shall consist of the examination and tests specified in table III. Three copies of the test report with drawings of the equipment shall be forwarded to the Bureau of Ships. Release for manufacture of the remaining equipment shall be given by the Bureau of Ships.

Table III - Test agenda.

Description and order of test	Preproduction inspection	Comparison inspection	Quality conformance inspection	Test paragraph
Workmanship, fit and materials	X	-	X	4.5.1
Weight	X	-	-	4.5.1
Creepage and clearance	X	-	-	4.5.2
General operation	X	-	X	4.5.3
Temperature rise	-	X	-	4.5.4
Vibration	-	X	-	4.5.5
Insulation resistance	X	-	-	4.5.6
Shock	-	X	-	4.5.7
Dielectric strength	X	-	X	4.5.8
Noise	X	-	X	4.5.9

4.3 Comparison inspection.- A sample, from the first production run, of one control center of each design shall be subjected to the tests specified in table III. Thereafter, a control center of each design shall be tested each three years or after each change in design that affects conformance to the requirements of this specification. Three copies of the test report should be forwarded to the Bureau of Ships.

4.4 Quality conformance inspection.- Each control center shall be subjected to the examination and tests specified in table III.

4.5 Test procedures.-

4.5.1 Workmanship, fit and materials.- Each equipment shall be given a thorough examination to determine that the design, material and workmanship conform to this specification. The fit of parts shall be observed with particular reference to interchangeability of replaceable parts. Conformance to approved drawings, with respect to material, finish, construction, dimensions and weight shall be verified. This examination should not include disassembly to the point that performance, durability or appearance would be affected.

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4.5.2 Creepage and clearance.- Creepage and clearance distances shall be demonstrated by actual measurement to be in accordance with MIL-E-917 for controller units and table II for bus bar.

4.5.3 General operation.- General operation includes all tests necessary to ascertain that the required operating features function properly. In particular, it shall be determined that the required sequence of operation has been attained and that under voltage protection devices and other control devices operate as required.

4.5.4 Temperature rise.- The test methods to be employed and the precautions to be observed in conducting temperature rise tests shall be in accordance with MIL-C-2212. The temperature rises shall not be exceeded when testing completely assembled units at rated voltage and current.

4.5.5 Vibration.- Equipment shall be subjected to the type I vibration tests of MIL-STD-167. Operation shall be checked at each frequency of vibration. Swaybracing shall not be used.

4.5.6 Insulation resistance.- Insulation resistance shall not be less than 10 megohms. The measurement shall be made with an insulation-resistance-indicating meter with a full scale reading of 100 or 200 megohms, an open circuit voltage of 500 volts and a voltage of at least 450 volts across of resistance of 1 megohm. The temperature shall be measured and recorded. If the insulation resistance is less than 25 megohms, the relative humidity shall be measured and recorded. Insulation resistance measurements shall be corrected to 25C. Corrections shall be made on the basis of insulation resistance doubling for each 15C decrease in temperature. No correction shall be made for humidity.

4.5.7 Shock.- Shock tests shall be conducted on the control center structure in accordance with MIL-S-901. Breakage or appreciable distortion of any parts, including mounting bolts, will be cause for rejection. If the structure passes the test, it may be furnished, after reconditioning, as an item under a contract.

4.5.8 Dielectric strength.- The dielectric strength test shall be conducted without breaker and controller units installed. The equipment shall withstand, for a period of 1 minute, a dielectric test of twice the rated voltage plus 1000 volts r.m.s. or 1 second at 20 percent higher voltage. The frequency of the test voltage shall not be less than the rated frequency of the equipment and in no case less than 60 cycles.

4.5.9 Noise.- If required, noise tests shall be conducted in accordance with the procedure for solidly mounted equipment of relatively light construction as specified in MIL-E-22843 (see 6.1). All devices shall be energized simulating actual operation. If the equipment does not utilize internal resilient mounts, airborne noise tests need not be conducted. Short test reports as specified in MIL-STD-740 shall be furnished (see 3.4.10).

5. PREPARATION FOR DELIVERY

5.1 Domestic shipment and early equipment installation and for storage of onboard repair parts.

5.1.1 Control centers.

5.1.1.1 Preservation and packaging.- Preservation and packaging shall be sufficient to afford adequate protection against corrosion, deterioration and physical damage during shipment from the supply source to the using activity and until early installation and may conform to the suppliers commercial practice when such meets these requirements.

5.1.1.2 Packing.- Packing shall be accomplished in a manner which will insure acceptance by common carrier at the lowest rate and will afford protection against physical or mechanical damage during direct shipment from the supply source to the using activity for early installation. The shipping containers or method of packing shall conform to the Uniform Freight Classification Rules and Regulations or other carrier regulations as applicable to the mode of transportation and may conform to the suppliers commercial practice when such meets these requirements.

5.1.1.3 Marking.- Shipment marking information shall be provided on interior packages and exterior shipping containers in accordance with the contractor's commercial practice. The information shall include nomenclature, Federal stock number or manufacturer's part number, contract or order number, contractor's name and destination.

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5.1.2 Onboard repair parts.- Onboard repair parts shall be packaged in heat sealable, laminated paper and foil bags or in heated sealable plastic film. Shipping containers and methods of packing shall comply with the carrier's regulations applicable to the mode of transportation. Interior and exterior shipping containers shall be marked with the Federal stock number.

6. NOTES

6.1 Ordering data.- Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Design characteristics of controller units (see MIL-C-2212).
- (c) Arrangement and quantity of group control and distribution sections (see 3.4.1).
- (d) Requirement for and location of terminal boards and cable entrance if not at bottom of control center (see 3.4.1, 3.4.3 and 3.5.8).
- (e) Quantity, arrangement and identification of unit types (see 3.4.2).
- (f) Identification and rating of circuit breakers for the distribution sections and motor full load ampere ratings (see 3.4.2 and 3.4.5).
- (g) Short circuit current for which bus bar is to be braced if greater than 25,000 amperes (see 3.4.7).
- (h) Rating of bus work for distribution sections (see 3.4.7).
- (i) Quantity of auxiliary control relays (see 3.4.8).
- (j) Indicating lights, if required (see 3.4.8).
- (k) Location and type of master switches (see MIL-C-2212).
- (l) Grade of low noise equipment, if required (see 3.4.10 and 4.5.9).
- (m) Number of sets of repair parts required (see 3.6).
- (n) Marking and location of identification plates (see 3.8).

6.2 Preproduction.- Invitations for bids should provide that the Government reserves the right to waive the requirement for preproduction samples as to those bidders offering a product which has been previously procured or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending procurement.

Preparing activity:
Navy - Ships
(Project 6110-N055Sh)

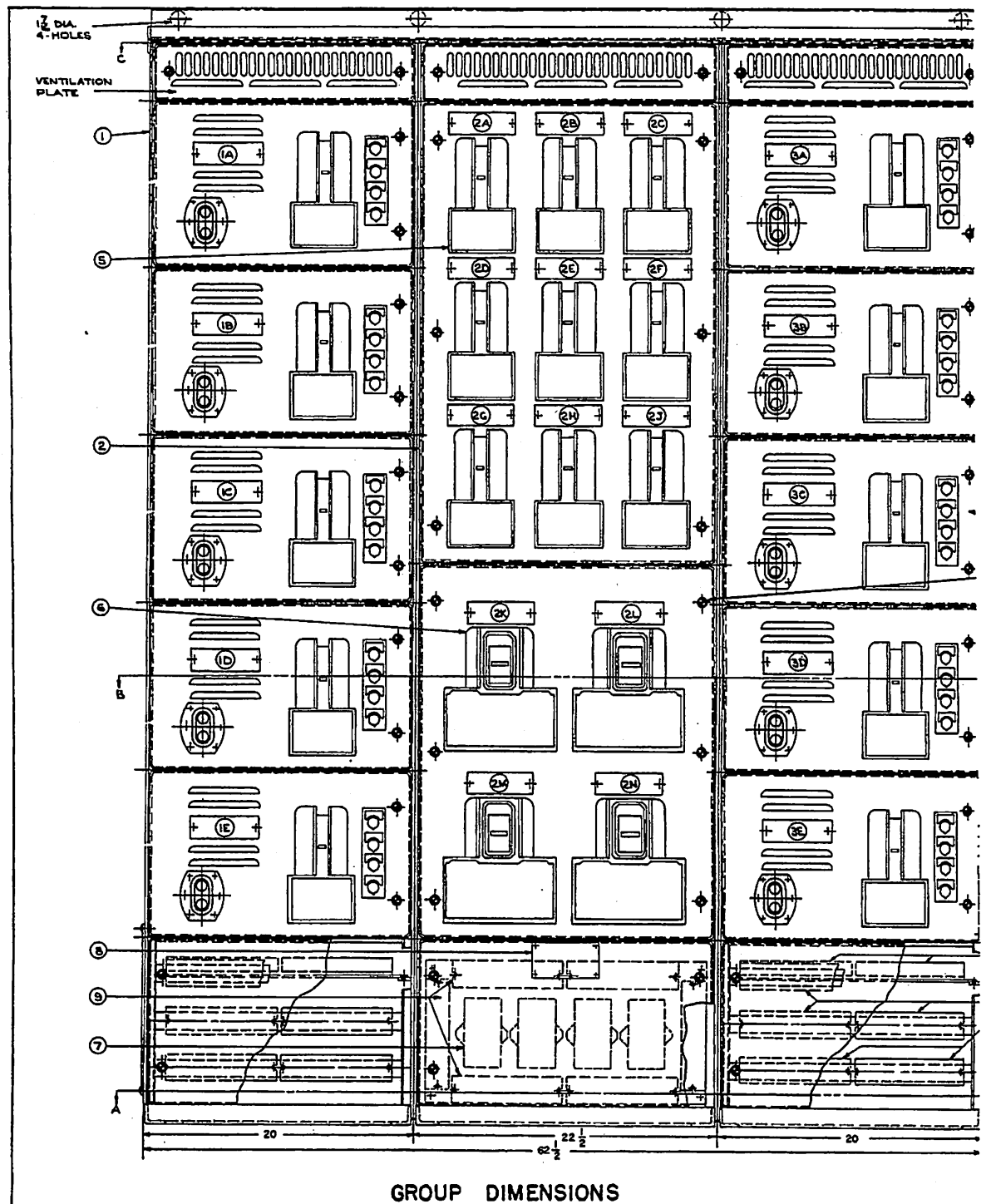
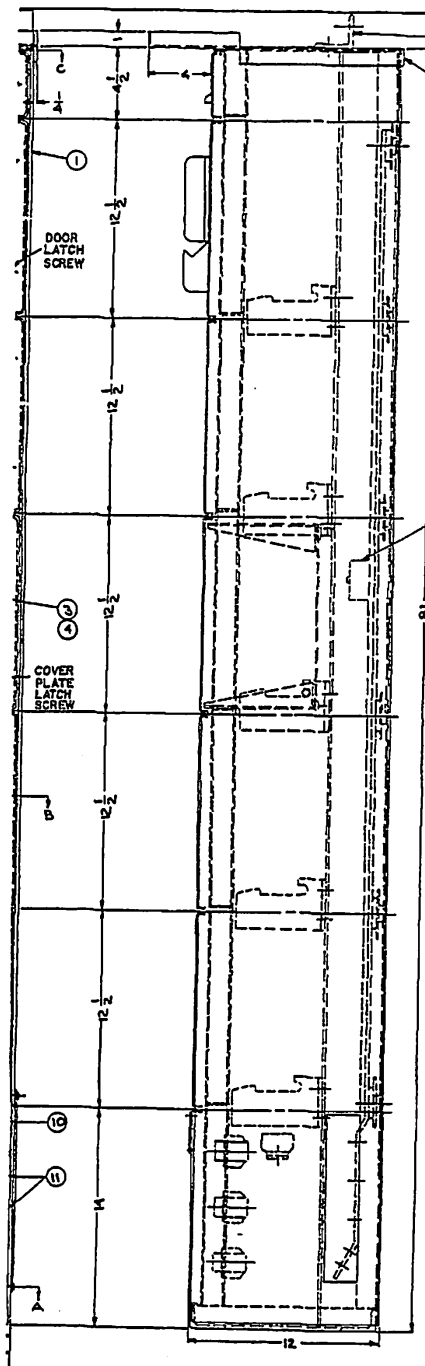


Figure 1a.

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LIFTING BAR
DRIPSHIELD TURNED
DOWN ON SIDE AND BACK

REVISIONS			
REV	DESCRIPTION	MFR	APPRO DATE

LIST OF MATERIAL QUANTITIES ARE FOR ONE GROUP

PC. NO.	NAME OF PIECE	NO. REQ.	MATERIAL	MTL. SPEC.	SPARKS PART NO.	REMARKS
1	SECTION ENCLOSURE	AS REQ.	ASSEM.	MIL-G-	39722334-4	
2	SECTION ENCLOSURE	AS REQ.	ASSEM.	MIL-G-	39722346	
3	SIZE 2 UNIT ASSEM.	AS REQ.	ASSEM.	MIL-C-2212	6796ED186	
4	SIZE 3 UNIT ASSEM.	AS REQ.	ASSEM.	MIL-C-2212	6796ED192	
5	CT. BREAKER (100) AQLF 100	AS REQ.	ASSEM.	MIL-C-17361	7900J377Y	
6	CT. BREAKER (250) AQLF 100	AS REQ.	ASSEM.	MIL-C-17361	7900J3782	
7	NBA? RELAY	AS REQ.	ASSEM.	MIL-C-2212	8957ED24-1A9	
8	NAMEPLATE (GROUP)	AS REQ.	PLASTIC	MIL-P-150378	8073729	
9	TERM. BDS. 30 AMPS. (12 TERM.)	AS REQ.	ASSEM.	MIL-C-2212	80-95816	
10	TERM. BDS. 100 AMPS. (9 TERM.)	AS REQ.	ASSEM.	MIL-C-2212	80-21160	
11	CIRCUIT BREAKER NAMEPLATE	AS REQ.	PLASTIC	MIL-P-150378	3073728	
12	INTERLOCK SW.	AS REQ.	ASSEM.	MIL-C-2212	86-47744	
13	COMPOSITE DIAGRAM	1			SEE SHIPS PLAN	

TO WITHDRAW AND REPLACE UNITS

WARNING: BE SURE CIRCUIT BREAKER IS IN THE OFF POSITION BEFORE OPENING DOOR.

TURN BOTH DOOR LATCH SCREWS COUNTER CLOCKWISE AS FAR AS POSSIBLE. OPEN DOOR AND TURN EACH OF THE 4 UNIT LATCH SCREWS COUNTER CLOCKWISE UNTIL THE LATCH IS FREE OF THE SLOT. GRASP BOTH HAND GRIPS AND WITH A SLIGHTLY UPWARD MOTION PULL UNIT FORWARD.

TO REPLACE UNIT BE SURE CIRCUIT BREAKER IS IN THE OFF POSITION. GRASP BOTH HAND GRIPS AND WITH THE TOP OF THE UNIT TILTED SLIGHTLY FORWARD PUSH INTO CELL AS FAR AS POSSIBLE. KEEP GRASP ON TOP HAND GRIP AND TURN UPPER LATCH SCREWS CLOCKWISE UNTIL LATCHES ARE ENGAGED IN SLOTS. RELEASE HAND GRIP AND TURN LOWER RIGHT HAND LATCH SCREW UNTIL A SLIGHT PRESSURE IS EXERTED ON THE SLOT BRACKET. PUSH ON LOWER RIGHT HAND OF UNIT UNTIL LATCH SNAPS INTO SLOT. DO SAME ON THE LOWER LEFT HAND SIDE AND THEN TIGHTEN ALL LATCH SCREWS.

BE SURE BOTH DOOR LATCH SCREWS ARE FULL OPEN THEN CLOSE DOOR AND TURN LATCH SCREWS CLOCKWISE UNTIL TIGHT.

TO REMOVE CIRCUIT BREAKERS

IN DISTRIBUTION SECTION

WARNING: BE SURE CIRCUIT BREAKERS ARE IN THE OFF POSITION BEFORE REMOVING COVER PLATE. TURN THE COVER PLATE LATCH SCREWS COUNTER-CLOCKWISE AS FAR AS POSSIBLE. LIFT OFF COVER PLATE. THE CIRCUIT BREAKERS CAN THEN BE REMOVED BY PULLING THEM FROM THEIR MOUNTING BLOCKS.

AFTER REPLACING THE CIRCUIT BREAKERS ON THEIR MOUNTING BLOCKS REPLACE THE COVER PLATE AND TIGHTEN ALL OF THE LATCH SCREWS.

DESCRIPTIVE DATA

- A. EXCEPTIONS TO MILITARY SPEC. MIL-G- ARE: NONE
 B. RATING: SEE SHIP EQUIP. DWGS.
 C. DUTY: CONTINUOUS
 D. TYPE: ACROSS THE LINE
 E. ENCLOSURE: DRIPPROOF
 F. AMBIENT: 50 DEG. C.

DESIGNED
3.11.1977
BY
H.E. K. 11/77
APPROVED
DATE
11/77

BASIC DESIGN DRAWING

GROUP CONTROL

3 SECTION

SPARKS MFG. CO.
OURLTOWN, USA

ORDER NO. ET90155

FED. SUPPLY CODE 99999

DWG NO.
6796K24

NO. OF SHEETS 3 SHEET NO. 1

TITLES ARE FOR ONE GROUP

MTL SPEC.	SPARKS PART NO.	REMARKS
QQ-C-504	25-186333	
QQ-C-504	25-187072	
MIL-C-2212	80-22316	
MIL-C-2212	80-22327	

MIL-C-23742 (SHIPS)

REVISIONS

REV.	DESCRIPTION	MFR APP'D	DATE

LIST OF ON BOARD REPAIR PARTS

WEIGHT OF ONE SET OF ON BOARD REPAIR PARTS (UNBOXED) 300 LBS. (EST.)

PC. NO.	NO. SETS	NO. PER SET	NAME OF PART	PART NO.
3	AS REQ		SIZE 2 UNIT ASSEMBLY	
23A		1	AQB-LF100 BREAKER	14520390002
23B		1	250 AMP. TRIP UNIT (1B, 1C, 1D, 3C)	14520384015
23C		1	500 AMP. TRIP UNIT (1A)	14520384017
23D		3	FUSE CURR. LIMIT (15-25A)	1313C743402
23E		3	FUSE CURR. LIMIT (50-100A)	1313C743403
23F		1	FUSE HOUSING	1313C742401
23G		1	150 AMP. TRIP 3A, 3B	14520384013
21	AS REQ	8	CONTACTOR-NR541	9657E029-2AQ
21A		8	CONTACT, STAT.	623-3054
21B		4	CONTACT, MOVABLE	623-3081
21C		8	CONTACT, STAT. INTER.	623-2912
21D		4	CONTACT, MOV. INTER.	623-3004
21E		4	SPRING, CONTACT	469-2291
21F		2	SPRING, MAG. FRAME	569-2240
21G		1	COIL, SHUNT (440V.)	19-1620-32
33	AS REQ	1	OVERLOAD RELAY-NR501	8957E014-9AQ
33A		1	HEATER COIL PKGS.	SEE TABLE
27	AS REQ	4	FUSE HOLDERS	
27A		4	HOLDER, FUSE	TYPE FHL12G
4	AS REQ		SIZE 3 UNIT ASSEMBLY	
23B		1	AQB-LF100 BREAKER	14520390002
23C		1	500 AMP. TRIP UNIT 3D	14520384017
23H		1	250 AMP. TRIP UNIT 3E, 1E	14520384020
23J		3	FUSE CURR. LIMIT (50-100A)	1313C742403
23K		1	FUSE HOUSING	1313C742401
22	AS REQ	1	CONTACTOR-NR461	8957E031-2AQ
22A		8	CONTACT, STAT. MAIN	623-3001
22B		4	CONTACT, MOV. MAIN	623-3008
22C		4	SPRING, MOV. MAIN CONT.	469-1970
22D		2	SPRING, MAG. FRAME	569-2206
22E		16	CONTACT, STAT. INTER.	623-2912
22F		4	CONTACT, MOV. INTER.	623-3004
22G		1	COIL, SHUNT	19-1587-30
33	AS REQ	1	OVERLOAD RELAY-NR501	8957E014-9A11
33A		1	HEATER COIL PKGE.	SEE TABLE
27	AS REQ	4	FUSE HOLDERS	
27A		4	HOLDER, FUSE	SEE PC. 27A ABOVE
16	AS REQ	1	INTERLOCK SWITCH	
16A		1	ELEMENT, INTERLOCK	86-47774
28	AS REQ	12	TERMINAL BLOCK (30A)	80-22327
28A		12	CLIP, STAT. CONTACT	23-29657
28B		12	BLADE, MOV. CONTACT	23-29688
29	AS REQ	6	TERMINAL BLOCK (100A)	80-22316
29A		6	CLIP, STAT. CONTACT	23-29660
29B		6	BLADE, MOV. CONTACT	23-29674
5	AS REQ	6	CIRCUIT BREAKER	
5A		1	AQB-LF100 BREAKER	14520390002
5B		1	150 AMP. TRIP UNIT (UNITS 2E, 2F)	14520384013
5C		1	250 AMP. TRIP UNIT (UNIT 2A)	14520384015
5D		1	500 AMP. TRIP UNIT (UNIT 2D-2B)	14520384017
5E		1	1000 AMP. TRIP UNIT (UNITS 2C, 2G, 2H, 2J)	14520384023
5G		3	FUSE CURR. LIMIT (15-25A)	1313C743402
5H		3	FUSE CURR. LIMIT (50-100A)	1313C743403
5J		1	FUSE HOUSING	1313C742001
6	AS REQ		CIRCUIT BREAKERS	
6A		1	AQB-LF250 BREAKER	14520820002
6B		1	150L. AMP. TRIP UNIT (UNITS 2H, 2K)	14520821020
6C		1	225 LH AMP. TRIP UNIT (UNITS 2K, 2L)	14520821025
6D		3	FUSE CURR. LIMIT	1313C743401
6E		1	FUSE HOUSING	14520832001
7	AS REQ	1	RELAY NR517	8957E024-1AQ
7A		4	CONTACT, STAT. MAIN R.H.	623-2871-5
7B		4	CONTACT, STAT. MAIN L.H.	623-2871-6
7C		4	CONTACT, MOV. MAIN	623-2129-3
7D		8	CONTACT, STAT. INTERL.	623-2912
7E		2	CONTACT, BAR MOV. INT. N.C.	623-2870
7F		2	SPRING MOV. MAIN CONT.	569-1406
7G		2	SPRING, MAG. FRAME	469-2023
7H		1	COIL, SHUNT	19-1545-37

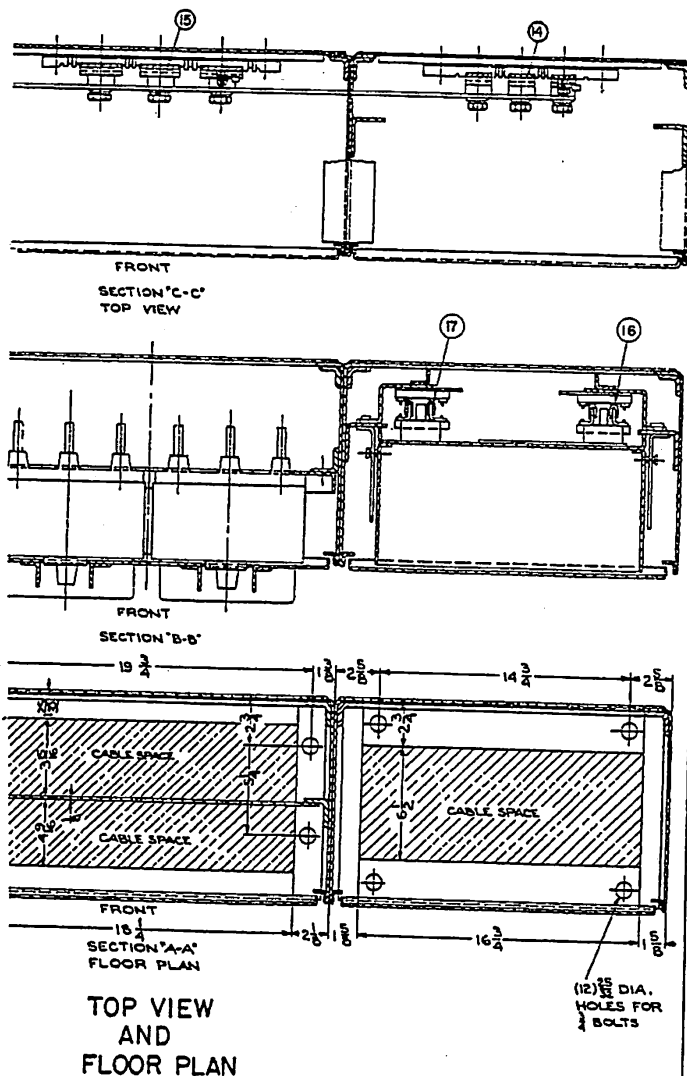
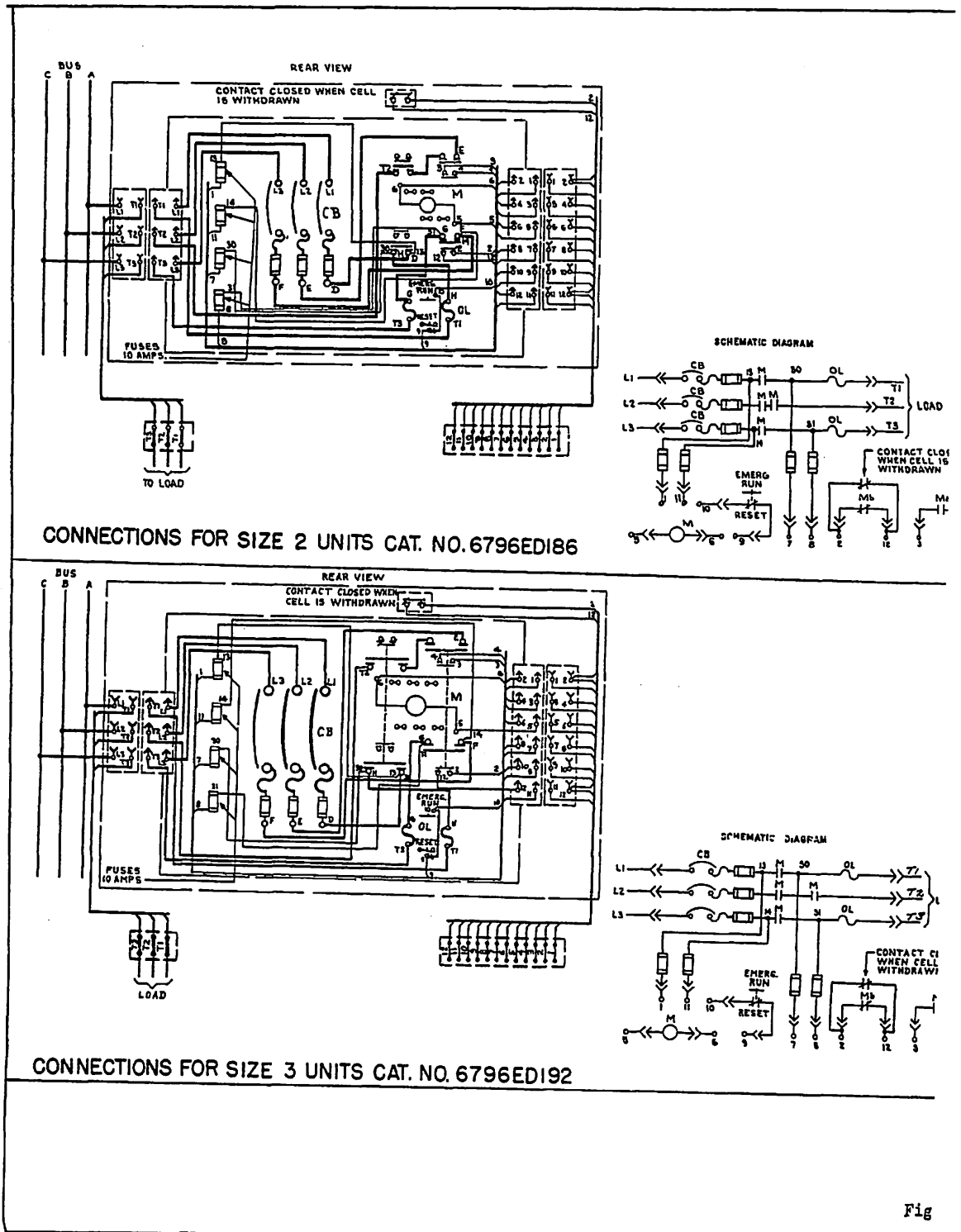


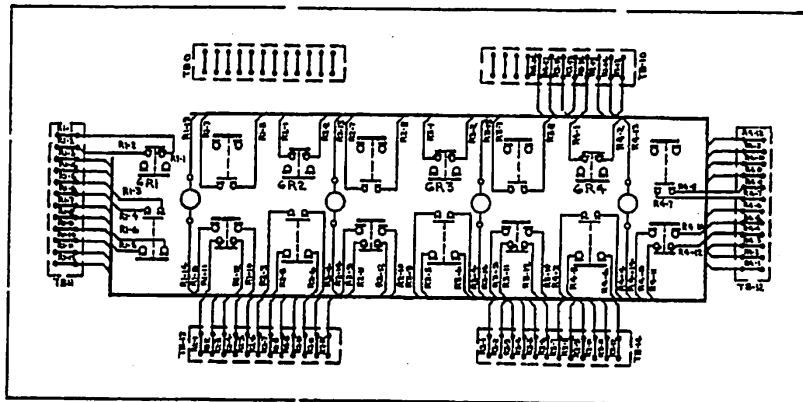
Figure 1b.

CHECKED S.M. 11/15	DATE 11/15	BASIC DESIGN DRAWING	SPARKS MFG. CO. OURTOWN, USA
APPROVED R.D. 11/15	DATE 11/15	GROUP CONTROL	ORDER NO. ETS0155
		3 SECTION	FED. SUPPLY CODE 99999
			DWG NO. 6796K24
			REV
			SHEET NO. 2



MIL-C-23742 (SHIPS)

REVISIONS		
REV.	DESCRIPTION	MFR APPD DATE



CONNECTIONS FOR RELAY PANEL

SIZE 3 HEATER COILS		
MOTOR AMPS.	COIL	
MIN.	MAX.	NO.
33.2	35.9	H3963
36.0	38.7	H3964
38.8	41.2	H3965
42.3	45.8	H3966
45.9	49.2	H3967
49.3	53.0	H3968
53.1	57.6	H3969
57.7	61.8	H3970
61.9	67.3	H3971
67.4	72.4	H3972
72.5	78.7	H3973
78.8	84.9	H3974
85	91.6	H4078
91.7	99.6	H4079

SIZE 2 HEATER COILS		
MOTOR AMPS.	COIL	
MIN.	MAX.	NO.
17.9	19.2	H3955
19.3	20.8	H3956
20.9	22.4	H3957
22.5	24.1	H3958
24.2	26.1	H3959
26.2	28.4	H3960
28.5	30.7	H3961
30.8	33.1	H3962
33.2	35.9	H3963
36.0	38.7	H3964
38.8	41.2	H3965
42.3	45.8	H3966

ure 1c.

DESIGNED DATE 10/1/63 APPROVED 10/1/63 APPD.	BASIC DESIGN DRAWING GROUP CONTROL 3 SECTION	SPARKS MFG. CO. OURLTOWN, USA ORDER NO EY90155 FED. SUPPLY CODE 99999 D 6796K24 SHEET NO. 3
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