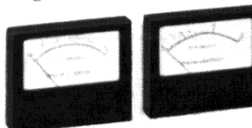
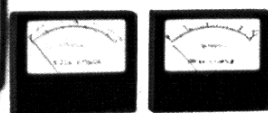


ISO-flex[®] Medium Voltage Controllers

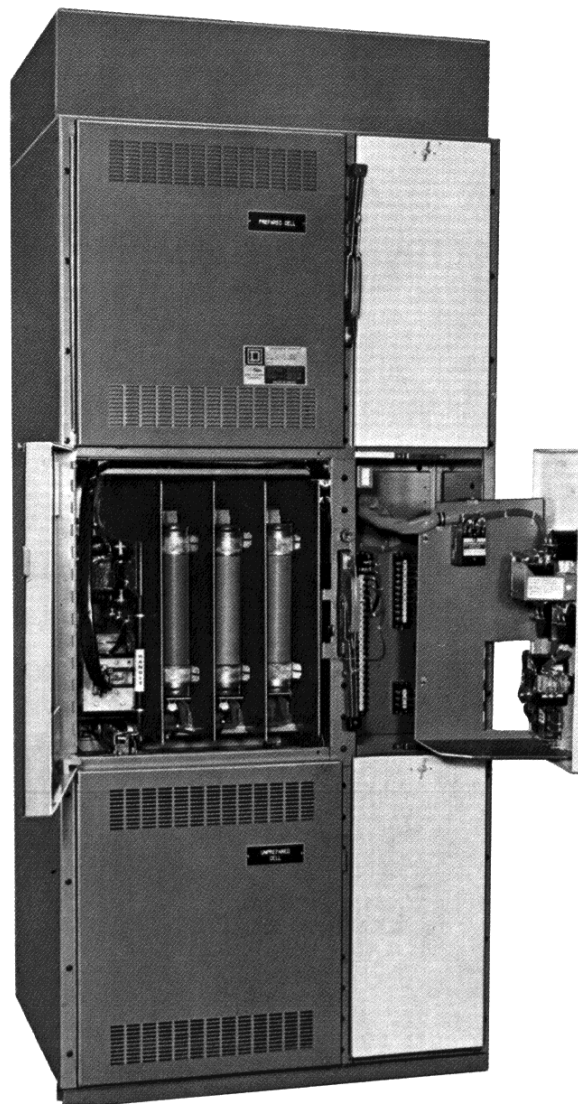
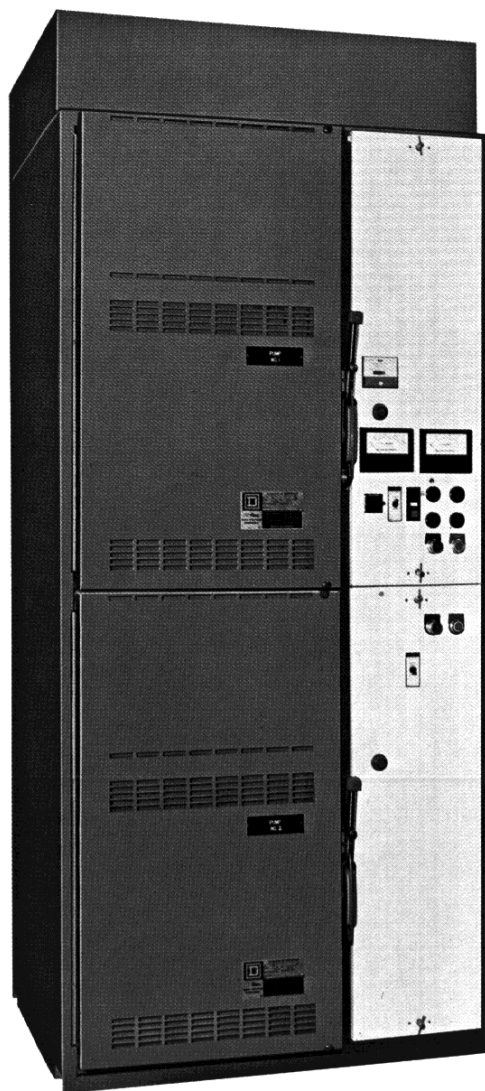
Two And Three High Construction



SQUARE D COMPANY



Square D ISO-FLEX[®] medium voltage controllers in motor control center design



Two or three high construction, ISO-FLEX 5KV controllers utilize one basic 360 ampere (enclosed) contactor and feature:

Isolated Compartments

Line cables, load cables, medium voltage contactors, and low voltage controls separated by barriers provide maximum protection.

Personnel Protection

Interlocking and grounding provisions minimize electrical hazards.

Flexible Design

Draw-out, swing-open low voltage control compartment with pre-engineered layouts

for control relays, pilot devices and meters simplify custom job requirements.

Ease of Installation

Cables and contactors easily installed without the use of special tools.

Simplified Maintenance

Front accessibility to all components and wiring facilitates quick and easy inspection or component replacement.

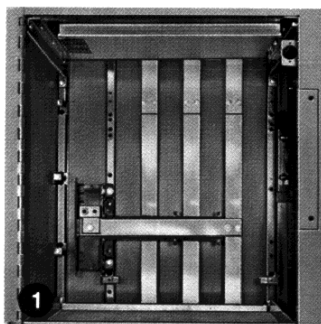


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Four distinct isolated compartments in each controller cell

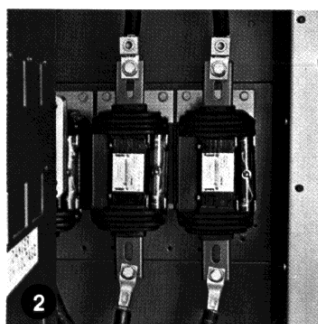


- ① Line and Vertical Bus Compartment
- ② Load Compartment
- ③ Medium Voltage Contactor Compartment
- ④ Low Voltage Control Compartment



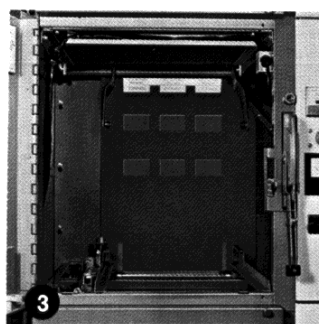
Line and Vertical Bus Compartment

- Extends from top to bottom in left rear portion of each vertical section.
- Top or bottom cable entrance is available.
- Line cable terminations are connected to vertical bus when horizontal power bus is not required.



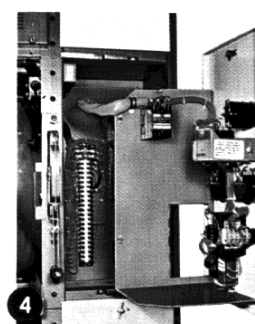
Load Compartment

- Extends from top to bottom in right rear portion of each vertical section.
- Top or bottom cable exit is available.
- Includes current transformers.



Medium Voltage Contactor Compartment

- Located in left front section of controller cell.
- Includes mechanical and electrical interlocks to minimize electrical hazards.
- Compartment door permits easy access to:
 - contactor and related components
 - line connections
 - load connections

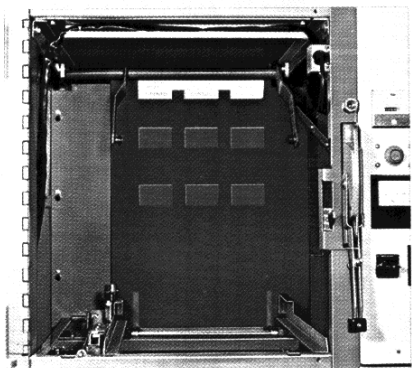


Low Voltage Control Compartment

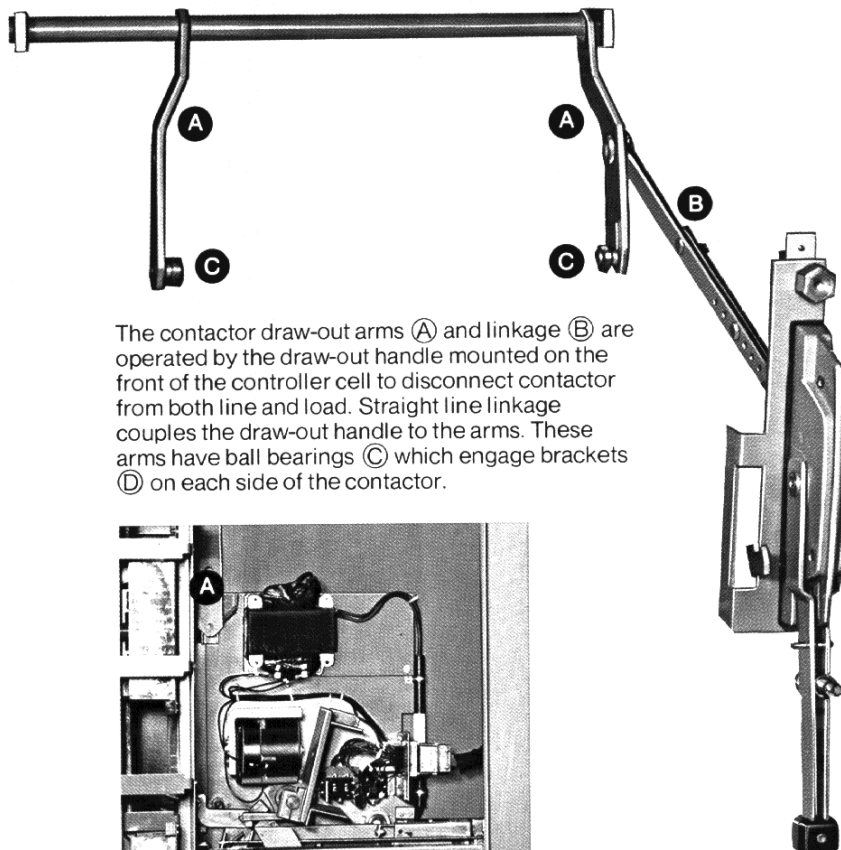
- Located in right front portion of controller cell.
- Draw-out, swing-open construction permits easy access for inspection and maintenance.
- Includes 600 volt rated relays, pilot devices and terminal boards.

Designed for personnel protection

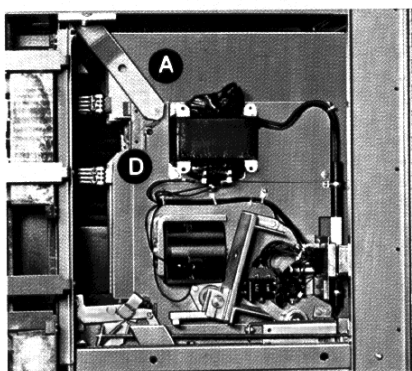
Simple Draw-Out System



Draw-out system installed in controller compartment.

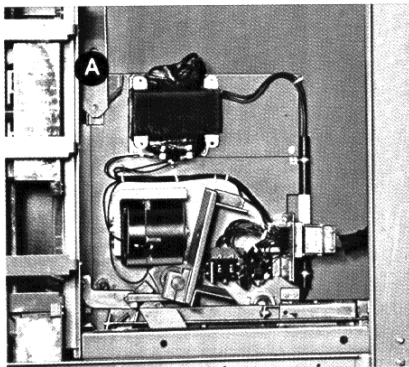


The contactor draw-out arms (A) and linkage (B) are operated by the draw-out handle mounted on the front of the controller cell to disconnect contactor from both line and load. Straight line linkage couples the draw-out handle to the arms. These arms have ball bearings (C) which engage brackets (D) on each side of the contactor.



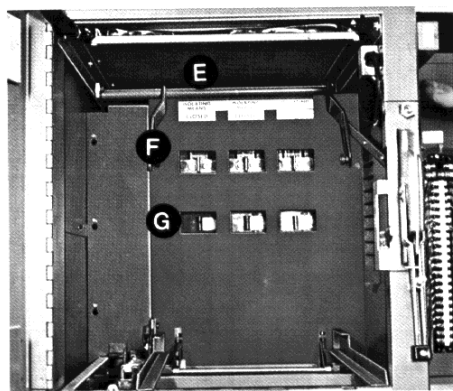
Disengaged/Test Position

The draw-out arms (A) move the contactor into the disengaged/test position as the draw-out handle is moved to the "DOWN" position.



Engaged Position

The draw-out arms (A) move the contactor into engagement with the line and load stabs as the draw-out handle is moved to the "UP" position.

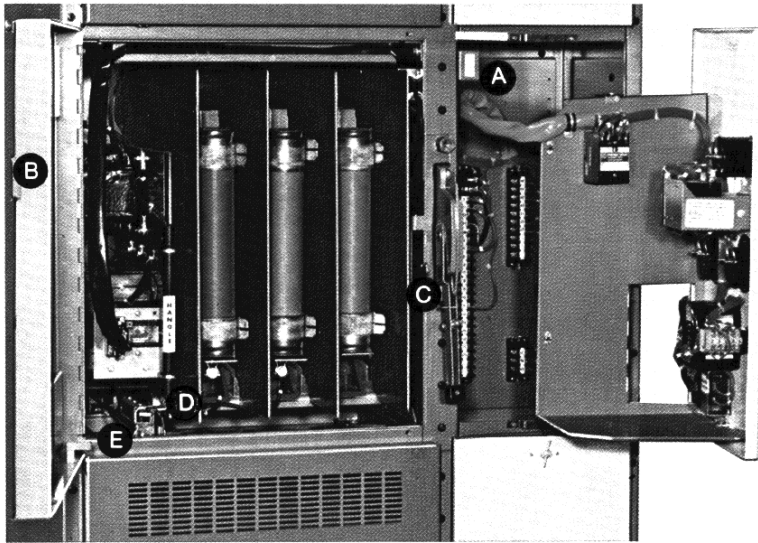


Shutter plate assembly shown with shutter open.

The line stabs (F) and load stabs (G) are located within the controller connection box mounted in the rear of the controller cell. The connection box is isolated from the contactor compartment by the shutter plate assembly.

A label (E) on the shutter plate assembly clearly indicates whether the isolating means is "OPENED" (Disengaged) or "CLOSED" (Engaged). The shutter plate operation is directly controlled by the position of the contactor. As the draw-out handle is moved toward the "UP" position, a cam on the contactor frame operates the shutter mechanism causing the shutter to open just prior to insertion of the contactor line and load fingers.

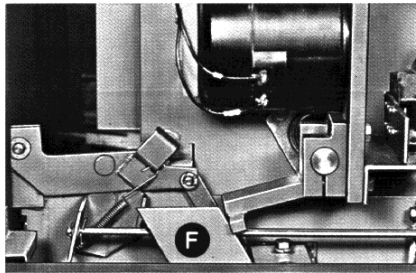
Interlocking and Grounding



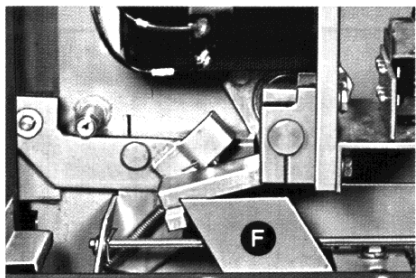
Controller cell with contactor in the disengaged/test position.

Contactor

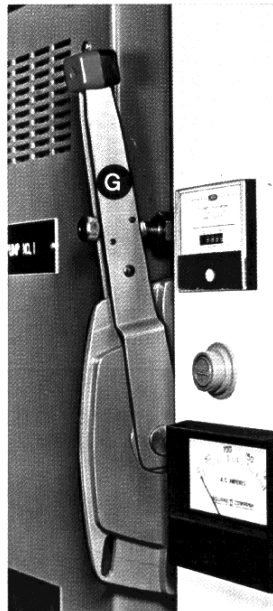
When the contactor is closed, contactor engagement or disengagement with line and load stabs is prevented by the contactor interlock bar (F) located on the contactor rail assembly. This interlock also prevents closing the contactor unless it is in the completely engaged or the completely disengaged position.



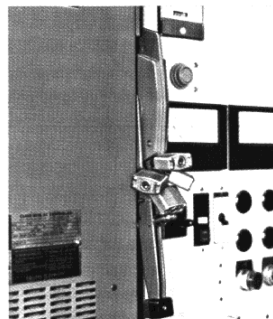
Closed contactor in the disengaged or test position.



Closed contactor in the engaged position.



Draw-out handle in "UP" position.



Draw-out handle padlocked in "DOWN" position.

Interlocking system designed to

- prevent inadvertent personnel contact with energized equipment during normal operation and while performing maintenance or testing
- prevent engaging or disengaging contactor under load

Medium Voltage Compartment Door

Medium voltage compartment door (B) is mechanically interlocked with the draw-out handle (C) to ensure that the door cannot be inadvertently opened when the contactor is engaged with the line and load stabs.

An interlock system located on the contactor rail assembly (E) prevents inadvertent contactor engagement with line and load stabs when the medium voltage compartment door is open. Prior to energizing the equipment, it is possible for qualified personnel to bypass this interlock system when necessary to check contactor alignment or draw-out system operation.

Draw-Out Handle

A draw-out handle interlock thumb-screw (G) is provided in conjunction with the draw-out handle to function as both a mechanical and electrical interlock. This interlock disconnects the secondary side of the control transformer prior to withdrawing the contactor from line and load stabs. This action assures that the contactor operating coil is de-energized before the handle can be operated to disengage the contactor from the line and load stabs.

When in the disengaged/test position, the contactor is electrically isolated from both line and load stabs and the flange mounted draw-out handle is in the "DOWN" position. In this position, the handle can be locked with up to four padlocks.

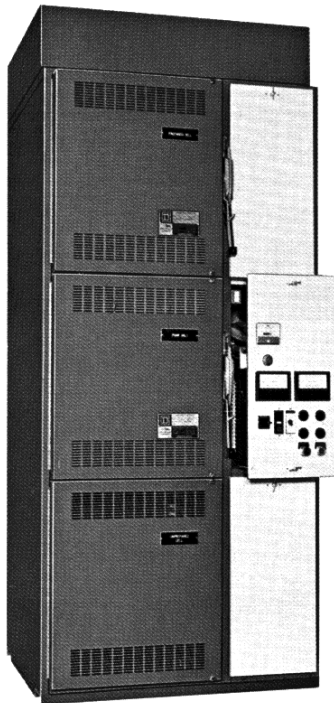
Low Voltage Compartment Door

Electrical interlock (A) located in the low voltage compartment deenergizes the controller whenever the low voltage compartment door is opened. If access to the low voltage compartment is necessary while the controller is energized, qualified personnel may bypass the interlock.

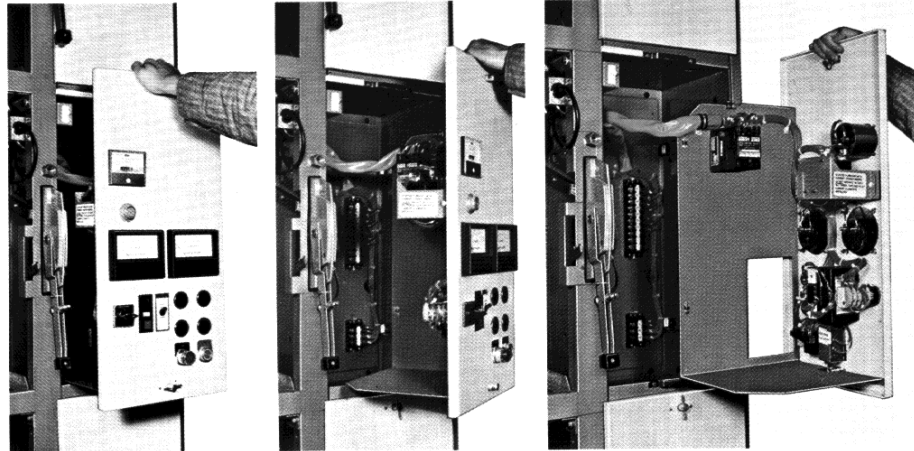
Grounding

The contactor frame is grounded to the enclosure in all positions through a spring loaded ground system (D) located on the left side of the contactor rail assembly.

Isolated low voltage control compartment



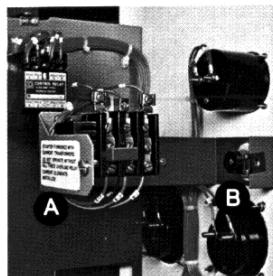
Draw-out, swing-open construction . . . permits easy access to all low voltage components.



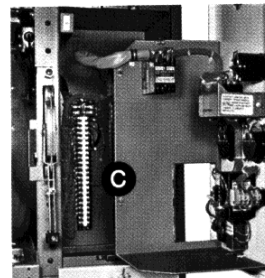
Low voltage control is isolated and barred from medium voltage circuits. It is readily accessible by unlatching the door, drawing it out and swinging the door to the right. The spacious swing-open panel has additional space available to mount auxiliary control and protective devices.



Shown above are typical mountings of protective devices, meters, meter selector switches and pilot devices.



Standard melting alloy or temperature-compensated bimetallic type overload relays are mounted on a hinged bracket (A) attached to the inside of the low voltage compartment door. The reset push button (B) is mounted on the door to permit external reset of the overload relay. Magnetic, solid state, or switchgear type overload protection with external reset is also available.



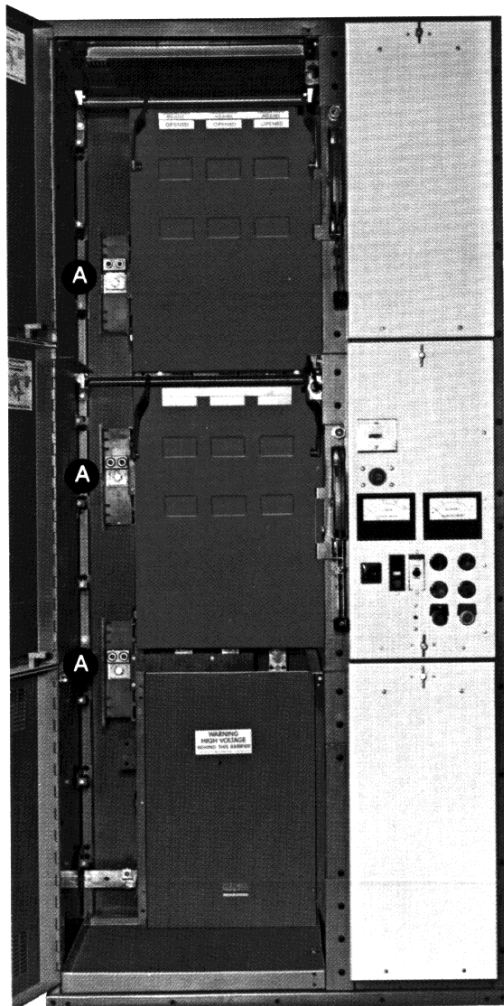
All control wiring is connected to readily accessible terminals (C) mounted in the rear of the low voltage compartment. Provisions are made to bring external control wiring into the compartment from above or below and for interconnection between controller cells.



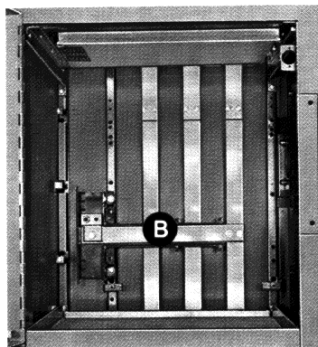
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Power bus system

The power bus system is braced for 80,000 ampere asymmetrical short circuit current and is designed to distribute incoming power to each controller in a manner that eliminates the need for line cabling to individual controller cells. The bus is available in either aluminum or copper.

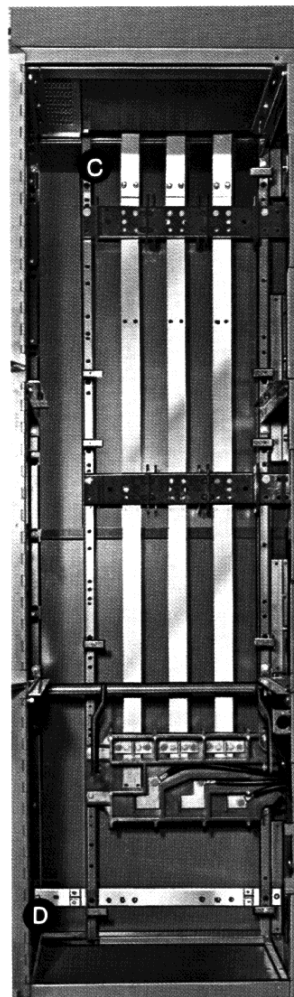


When a single section is furnished, the incoming cables are terminated at connection boxes (A) mounted in the line cable compartment. The connection boxes contain bus bar links (B) which connect to the vertical bus. The vertical bus (C) is mounted in the rear of the section and is completely isolated from other compartments by barriers.

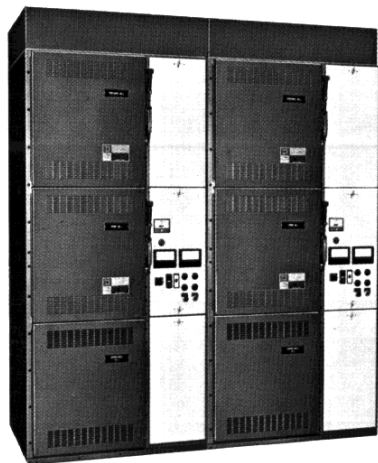


When a lineup of vertical sections is furnished, the incoming line cables are terminated on the horizontal bus (E). The horizontal bus is mounted in a 10" high isolated compartment and is connected to the vertical bus in each section. The horizontal bus is rated for either 1000 or 2000 amperes. Couplings are provided to connect the bus between vertical sections.

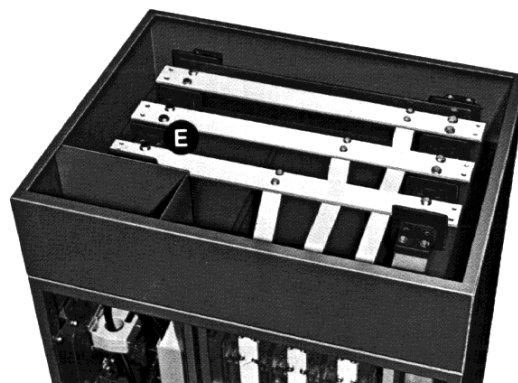
When ground bus (D) is furnished, it is located in the bottom rear of the vertical section. For a lineup of vertical sections, links provide a continuous ground throughout the equipment.



Vertical power bus (C) and ground bus (D) shown with isolation barriers removed.



Vertical sections connected with horizontal power bus.



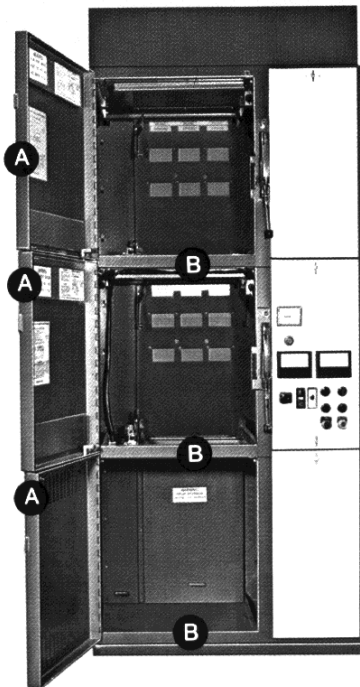
Rear top view of horizontal bus (E) connected to vertical bus.

Easy to install

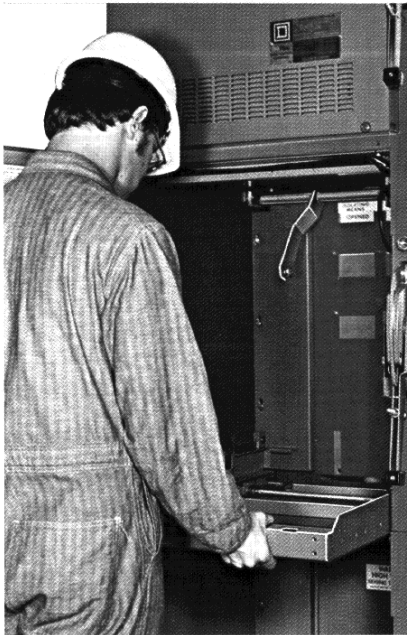
Front walk-in accessibility, to line and load cable connections, makes installation of ISO-FLEX® controllers quick and easy. For walk-in access simply open the medium voltage compartment doors (A) and remove the contactor rail assemblies (B). The spacious interior, after removal of line and load isolation barriers, makes it easy to pull in external cables from top or bottom with sufficient space for stress cones.

Line and load cables are each located in their own isolated compartment and space is available in the incoming line cable compartment for termination of two 500 MCM or one 750 MCM cable per phase. Each controller cell has space available in the load cable compartment for termination of one 500 MCM cable per phase.

After all external cable connections are made, isolating barriers repositioned, and contactor rail assemblies reinstalled, the medium voltage contactors can be installed and the control cables connected.



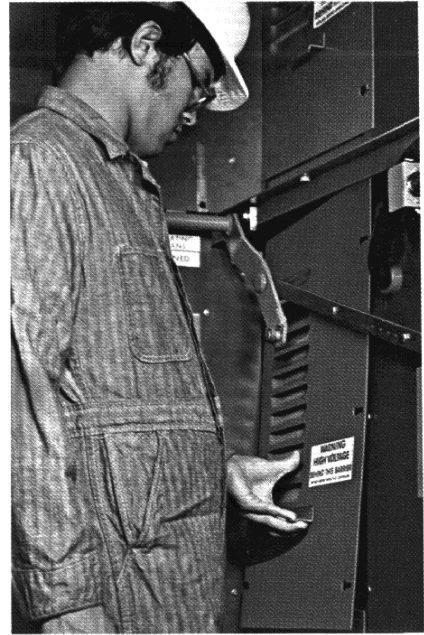
Line cable connections are made at terminal boxes.



Contactor rail assemblies are easily removed.



Isolation barriers for line and load cables are simple to remove.



Load cable connections are made at current transformers.

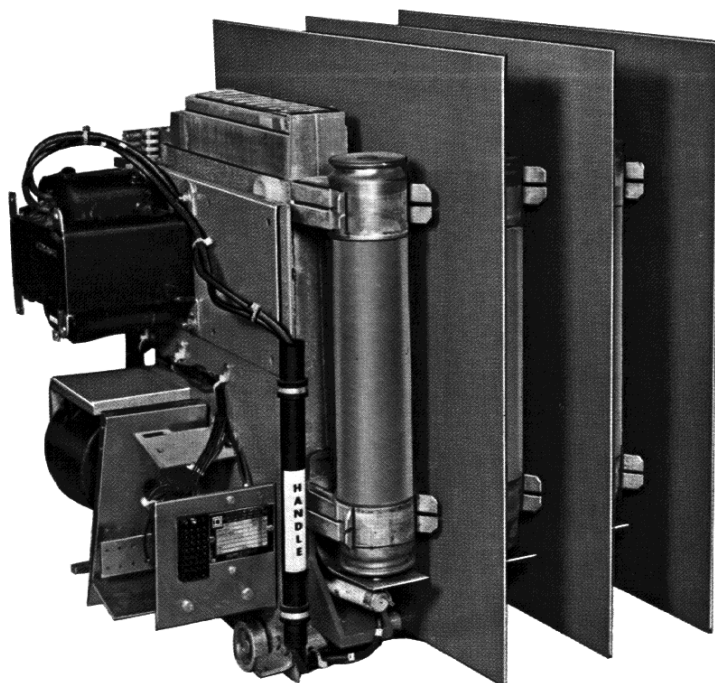


Contactor lift jack is used to install contactors.



Control cable connects the contactor to the control panel.

One basic Contactor



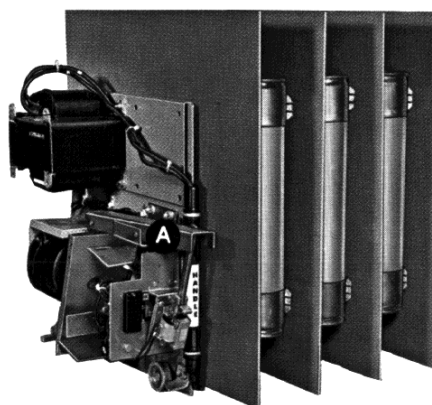
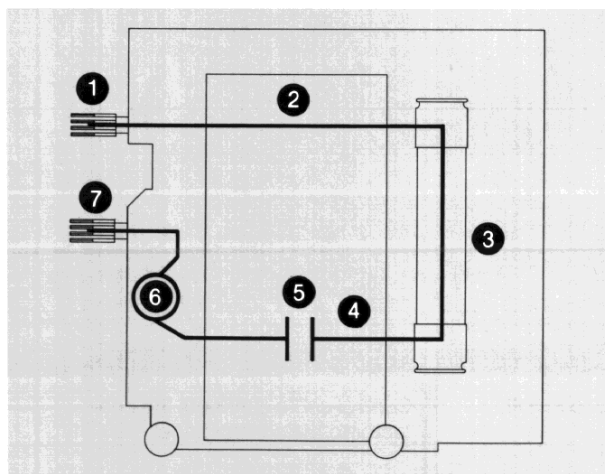
- **Contactor Rated 360 Amperes (Enclosed)**
- **5000 Volt, 50-60 Hertz**
- **50 MVA Interrupting Capacity**
- **NEMA H3 Heavy Duty Clapper Type**
- **Designed for Long Operating Life**

Contactor Assembly Features –

- Silver-tungsten carbide faced copper contacts to prolong operating life.
- DC operated coil to ensure quiet operation.
- 750 VA control transformer to provide 500 VA extra capacity. A 1.5 KVA or 2.5 KVA control transformer is also available.
- Positive grounding in all positions.
- Power fuses vertically front mounted for ease of replacement.
- Line and load connection fingers located on the contactor for convenience of inspection.
- Auxiliary contacts available for customer use.
- Conveniently located handle to facilitate contactor removal from controller cell.

When the contactor line and load fingers are connected to their mating stabs, the current flow through the contactor is as follows:

- | | |
|---------------------------|------------------------------------|
| ① in the line fingers, | ⑤ movable and stationary contacts, |
| ② bus bar links, | ⑥ blowout coils |
| ③ current limiting fuses, | ⑦ and out the load fingers. |
| ④ flexible connectors, | |



Latched contactor

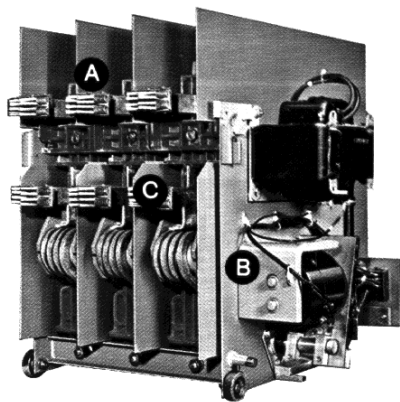
A latched contactor can be provided whenever a contactor will be energized for prolonged periods of time or whenever power continuity must be maintained, regardless of the voltage conditions. It is closed electrically and held in this position by a mechanical latch (A) with the contactor coil being deenergized. The contactor remains closed for all undervoltage or loss of power conditions and is opened by use of an external manual trip handle or an electrical solenoid release. The latched contactor is frequently used for:

- transformer feeder disconnect
- manual or automatic bus transfer device
- capacitor bank switching



SQUARE D COMPANY

Simplified Maintenance

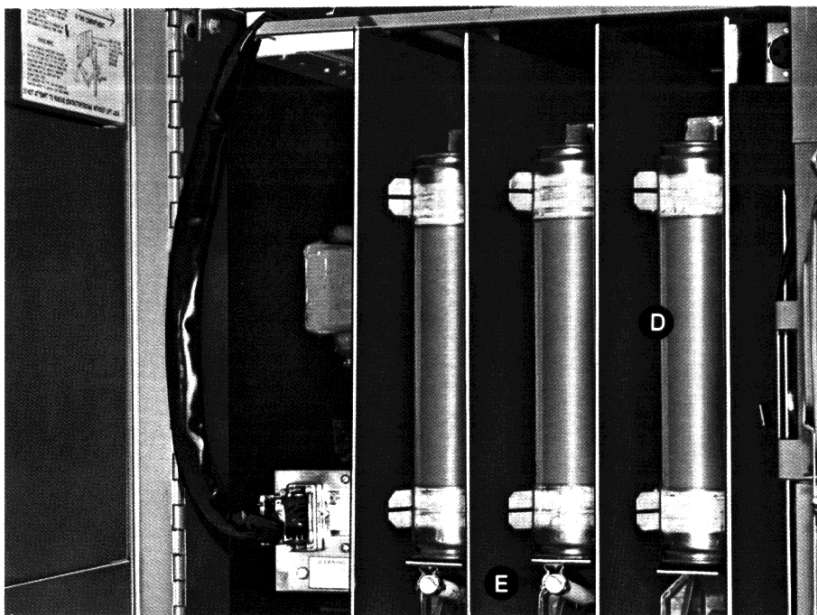


Rear view of contactor.

One basic contactor reduces spare part inventory and eliminates the possibility of mixing parts of different ampere capacity. The control transformer, coil circuit rectifier, dc coil, economizing reactor and auxiliary contacts are mounted on the side of the contactor (B) to facilitate quick inspection or easy component replacement. Spring loaded disconnect line fingers (A) and load fingers (C) are mounted on the contactor to allow inspection without need to de-energize the section power bus.



A test circuit permits checking the control circuit and contactor operation of individual controller cells without need to de-energize the entire vertical section. With the contactor in the disengaged/test position, the plug located in the upper right front corner of the medium voltage contactor compartment may be removed and inserted into a standard three-wire extension cord (F). This procedure disconnects and isolates the contactor control transformer from the circuit and prevents the 120 volt test source from backfeeding the control transformer. The control circuit and contactor operation can then be tested or inspected without exposing personnel to the danger of medium voltage.



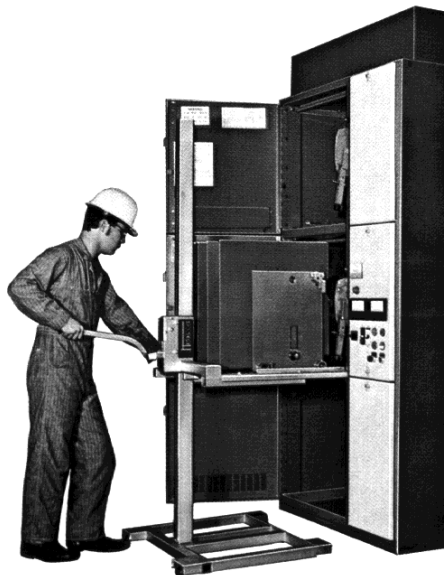
Contactor in the disengaged/test position.

Maintenance is simplified by having front accessibility to all components and wiring. The power fuses (D) and the control transformer primary fuses (E) are located on the front of the contactor for easy inspection and/or replacement. They can be replaced without removing the contactor from the compartment.

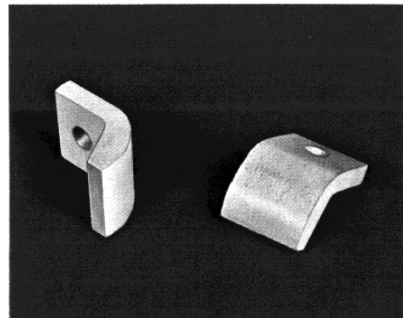


Contact tip replacement.

When the contactor is removed from the compartment, the contact tips can be easily inspected or replaced after removing the fuses and arc chutes. Contact replacement is accomplished with the use of standard tools.



A contactor lift jack can be utilized to easily remove a contactor from its cell.



Silver-tungsten carbide faced copper contacts are used to insure long operating life. Stationary and movable contacts are identical and interchangeable.

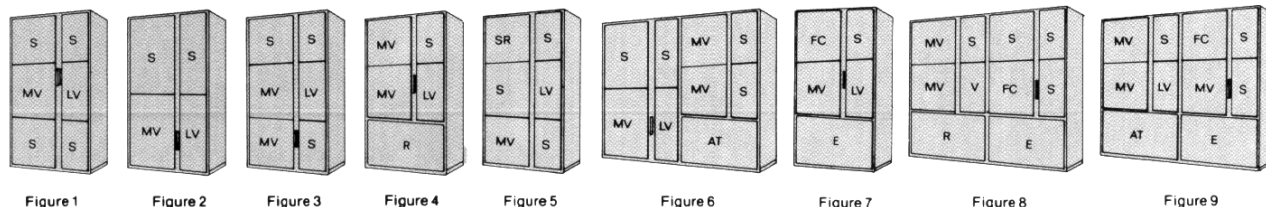
Weights and dimensions

Type Controller	Approximate Shipping Weights Vertical Section(s) Without Contactor and Without Horizontal Power Bus				Approximate Installation Dimensions Inches Millimeters						Number of Contactors	Arrangement Figure
	NEMA 1 or 12 Enclosure		NEMA 3 Enclosure		NEMA 1 or 12 Enclosure			NEMA 3 Enclosure				
	LBS.	KGS.	LBS.	KGS.	Height	Width	Depth	Height	Width	Depth		
Squirrel Cage Full Voltage Non-Reversing	1350*	612 *	2150 *	975 *	$\frac{90}{2286}$	$\frac{42}{1067}$	$\frac{35}{889}$	$\frac{106.5}{2705}$	$\frac{49.5}{1257}$	$\frac{37.4}{953}$	1	1 or 2
Squirrel Cage Full Voltage Reversing	1550	703	2350	1065	$\frac{90}{2286}$	$\frac{42}{1067}$	$\frac{35}{889}$	$\frac{106.5}{2705}$	$\frac{49.5}{1257}$	$\frac{37.4}{953}$	2	3
Squirrel Cage Reduced Voltage Non-Reversing Reactor	2100 ▲	952 ▲	2900 ▲	1315 ▲	$\frac{90}{2286}$	$\frac{42}{1067}$	$\frac{35}{889}$	$\frac{106.5}{2705}$	$\frac{49.5}{1257}$	$\frac{37.4}{953}$	2	4
Squirrel Cage Reduced Voltage Non-Reversing Autotransformer	3300 ▲	1497 ▲	4100 ▲	1859 ▲	$\frac{90}{2286}$	$\frac{84}{2134}$	$\frac{35}{889}$	$\frac{106.5}{2705}$	$\frac{99}{2515}$	$\frac{37.4}{953}$	3	6
Wound Rotor Non-Reversing (Maximum 300 H. P.) ★	2000	907	2800	1270	$\frac{90}{2286}$	$\frac{42}{1067}$	$\frac{35}{889}$	$\frac{106.5}{2705}$	$\frac{49.5}{1257}$	$\frac{37.4}{953}$	1	5
Synchronous Full Voltage Non-Reversing	1450	658	2250	1020	$\frac{90}{2286}$	$\frac{42}{1067}$	$\frac{35}{889}$	$\frac{106.5}{2705}$	$\frac{49.5}{1257}$	$\frac{37.4}{953}$	1	7
Synchronous Reduced Voltage Reactor	3300 ▲	1497 ▲	4100 ▲	1859 ▲	$\frac{90}{2286}$	$\frac{84}{2134}$	$\frac{35}{889}$	$\frac{106.5}{2705}$	$\frac{99}{2515}$	$\frac{37.4}{953}$	2	8
Synchronous Reduced Voltage Autotransformer	3400 ▲	1542 ▲	4200 ▲	1905 ▲	$\frac{90}{2286}$	$\frac{84}{2134}$	$\frac{35}{889}$	$\frac{106.5}{2705}$	$\frac{99}{2515}$	$\frac{37.4}{953}$	3	9

* For every additional controller in same 90" high vertical section add 250 lbs. (114 kg) for components, plus weight of the medium voltage contactor.
 ▲ Weight may vary \pm 300 lbs. (136 kgs) depending on horsepower rating.
 ★ Consult factory for controllers above 300 horsepower.

Notes:

- Each medium voltage contactor is shipped separately and weighs: 350 lbs. (158 kg)
- Horizontal power bus per vertical section weighs: 300 lbs. (136 kg)
- Total weight of controller = (weight of vertical section(s)) + (number of contactors x weight of each contactor) + (weight of horizontal bus, if used)



Key: AT= Auto-Transformer
 E= Space for Static Exciter
 FP= Field Control Panel
 MV= Medium Voltage Contactor
 LV= Low Voltage Control
 R= Reactor
 S= Space
 SC= Secondary Contactors
 SR= Secondary Resistor

MAXIMUM RATINGS

	Contactor Rating		2400 Volt 60 Hertz	4160/4800 Volt 60 Hertz
	NEMA	Amperes (Enclosed)		
Squirrel Cage Motors	H3	360	1500 HP	2500 HP
Wound Rotor Motors	H3	360	1500 HP	2500 HP
Synchronous Motors (0.8 Pf)	H3	360	1500 HP	2500 HP
(1.0 Pf)	H3	360	1750 HP	3000 HP
Interrupting Capacity				
Class E1 (Unfused)	H3	360	50 MVA	50 MVA
Class E2 (Fused)	H3	360	200 MVA*	350 MVA*
Basic Impulse Level	H3	360	60 KV	60 KV

*With 50 KA (symmetrical) rated fuse



SQUARE D COMPANY

For further information contact your local Square D field office or write SQUARE D COMPANY, Dept. SA, P.O. Box 9247, Columbia, S.C. 29290 Phone 1-803-776-7500.