

# INSTRUCTIONS

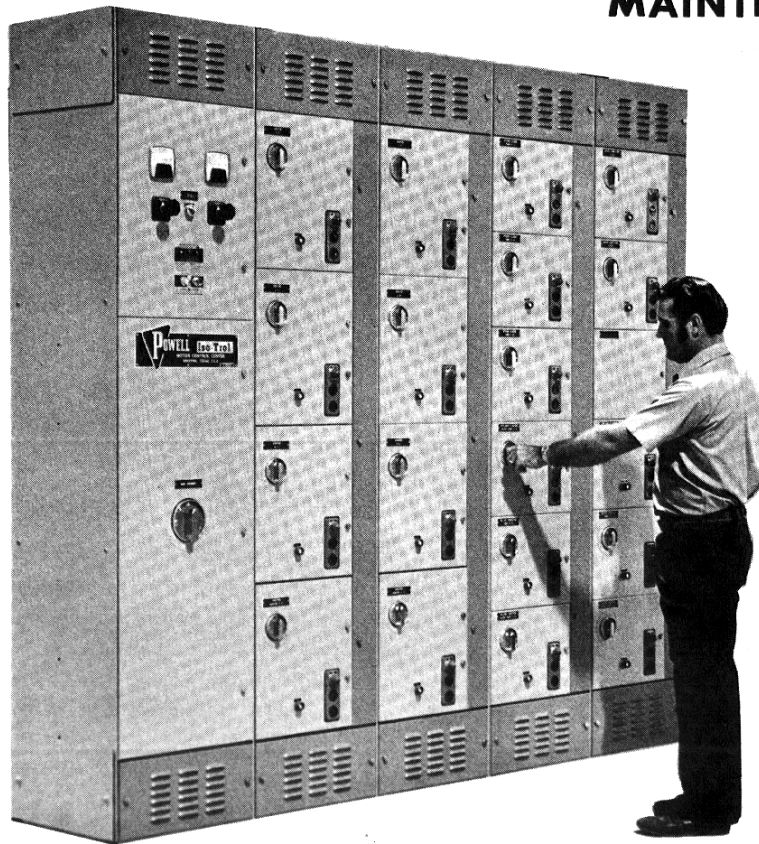


## Iso-Trol® Motor Control Center 600V Class

INSTALLATION

OPERATION

MAINTENANCE



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## INTRODUCTION

This instruction book is intended as a general guideline for the installation, operation, and maintenance of a standard Iso-Trol® Motor Control Center. As a result of special requirements, all aspects of a particular Motor Control Center may not be covered. Specific information on each particular Motor Control Center is furnished by engineering drawings—including specifications, elevations, schedules, plan views, wiring diagrams, and bill of materials.

These instructions should be read carefully and filed in a readily accessible place, together with drawings and descriptive data pertaining to the equipment. Their use will facilitate proper installation and maintenance of the Motor Control Center and prolong its life.

If required, experienced service personnel are available to assist you in the installation, check-out, and maintenance of this equipment.

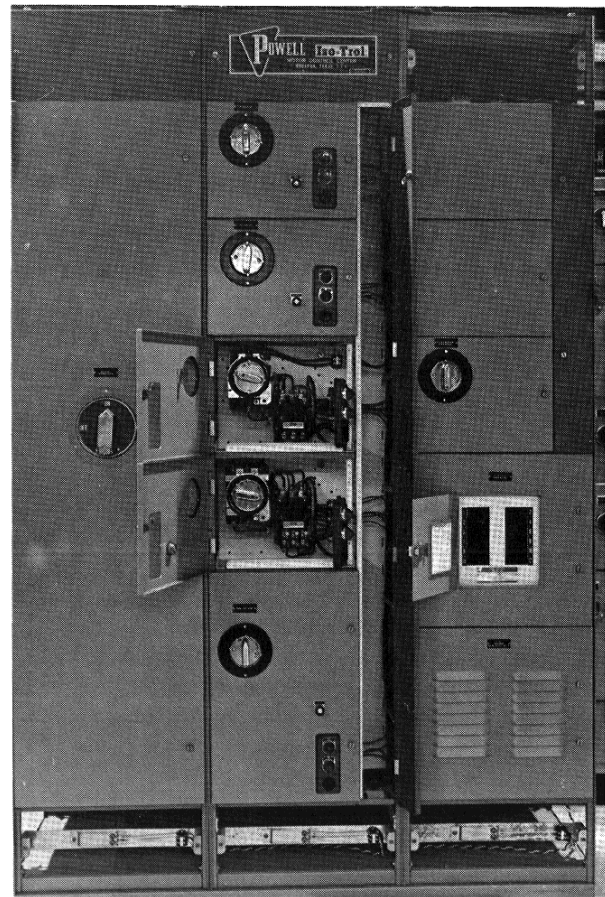
## DESCRIPTION

*(Refer to Figure 1)*

The Iso-Trol® Motor Control Center is a floor-mounted assembly of one or more vertical sections containing combination starter units, feeder units, and other control or protective devices having a common horizontal power bus which runs the entire length of the Motor Control Center. In addition, where applicable, each section has a vertical bus to which the individual units are connected. Non-metallic barriers separate horizontal wireway from horizontal main bus. Glass polyester barriers house the vertical bus to completely isolate it from each unit and from the wireways.

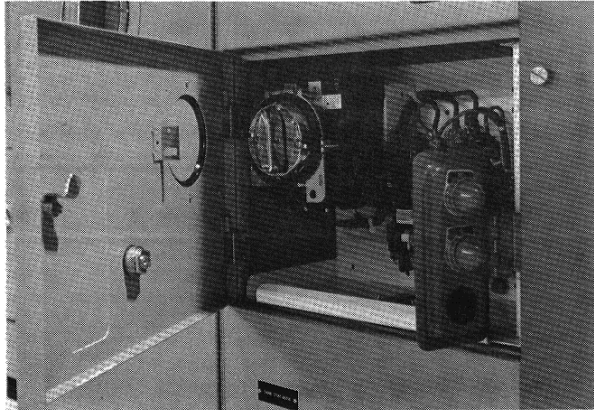
Individual units are housed in separate metal enclosed compartments, each with a separate door. Combination starter units through NEMA Size 4 and feeder breaker units through 225 amperes (feeder fusible switch units through 200 amperes) are of plug-in construction, provided the unit height is 36 inches or less. Larger units are of bolt-on construction, but are front removable with simple hand tools. Other apparatus, such as lighting panels, dry type transformers, relay panels, etc., may be stationary-mounted in the Motor Control Center.

Plug-in units are easily and safely guided by slide rails, avoiding any chance of shorting or jamming. A latch mechanism, located up front for easy access, locks the unit in place with stabs fully engaged to the vertical bus. Quarter-turn fasteners at top and bottom of the unit secure it in place. Plug-in units also have provisions for padlocking when in the disconnected (intermediate) position, for maximum safety when maintenance work is required. (See PLUG-IN UNIT REMOVAL Section)



**Figure 1.** Front view of a typical Iso-Trol® Motor Control Center.

The indoor Motor Control Center section is nominally 90" high (excluding channel base and lifting angles), 15" deep (20" deep for back-to-back mounting), and 20" wide. Each vertical section has a 9" top and bottom horizontal wireway, continuous through the assembly, and a 4½" wide separate vertical wireway. Stationary-mounted units have a full width door without a separate vertical wireway door.

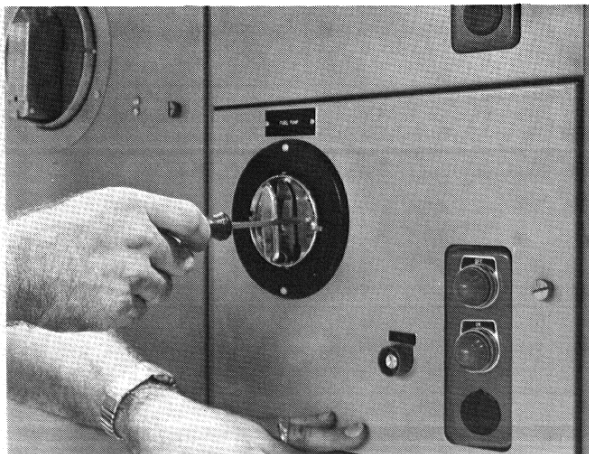


*Figure 2. Operating handle door interlock.*

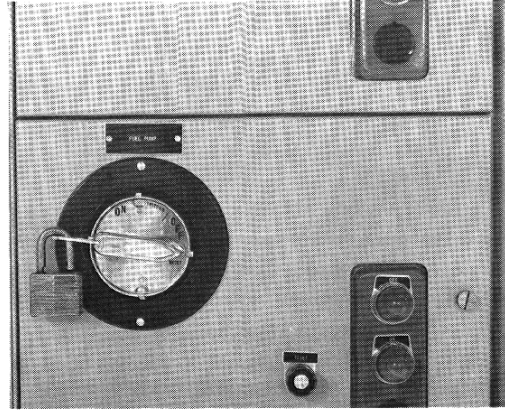
Unit doors and vertical wireway doors are independent; working in one unit does not expose personnel to live conductors in other units.

Operating handles for individual units are mounted directly on the disconnect, not on unit door. Personnel always have instant control over devices. Operating handles are furnished with a door interlock, requiring the handle to be in the OFF position before the unit door can be opened. (Figure 2) This interlock can be defeated to allow for live circuit inspection by authorized personnel. (Figure 3) Provisions for padlocking the disconnect handle in the OFF position are also provided for safe maintenance purposes. (Figure 4) A small web can be knocked out of the handle ring to allow padlocking in the ON position, if desired by the user.

Units of same type and size may be interchanged without structural modifications. When interchanging units, be sure that electrical ratings of components are compatible with those required for the new position and also that the overall loading of the vertical bus in any particular section is not above its continuous rating. If necessary, compartment sizes within a vertical section can be easily changed.



*Figure 3. Defeating door interlock.*

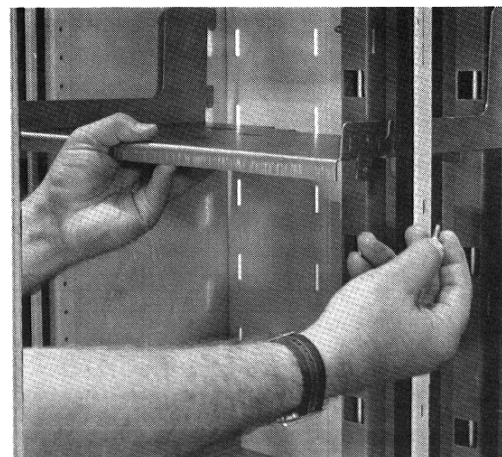


*Figure 4. Padlocking the disconnect handle.*

Each unit shelf is removable, and the center upright member to which it mounts is designed to accept it at any position, in 6-inch increments. (Figure 5) Unit doors with pin-type hinges are easily removed and relocated by correct positioning of the hinges.

The main horizontal bus is located at top or bottom, and is accessible by removing the isolating barriers which isolate the bus from the horizontal wireway. Refer to engineering drawings for the rating of the main bus. Standard ratings are 600, 800, 1200, 1600, and 2000 amperes. (Figure 6)

The vertical bus is bolted to the main horizontal bus so that phase arrangement is 1-2-3, left-to-right, as viewed from the front. Note that on back-to-back mounting, phase arrangement for back units is 1-2-3, **right-to-left**, as viewed from the back—since the vertical bus is common to front and back units. The vertical bus is enclosed in a molded polyester glass barrier. (Figure 7) Refer to engineering drawings for the rating of the vertical bus. Standard ratings are 300 amperes for front only construction and 600 amperes for back-to-back construction



*Figure 5. Removing unit shelf to change size of compartment.*

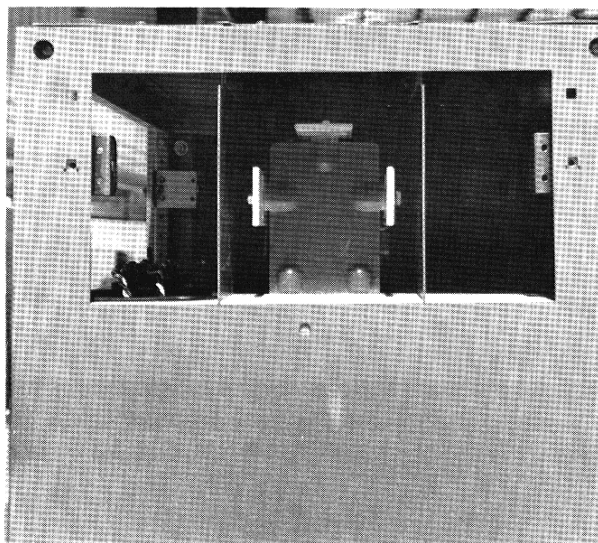


Figure 6. Main bus at top, showing isolation barriers horizontal wireway.

The ground bus is located at top or bottom (opposite to the main horizontal bus). Lugs are provided at each end of the ground bus for connection to the system ground.

As an option, a vertical ground bus, tied to the Motor Control Center ground bus, can be furnished if specified in the order. If a vertical ground bus is furnished, units will have a ground stab which is designed to make contact before the power stabs and to break contact after the power stabs. (Figure 7)

For further design and construction details, contact the factory.

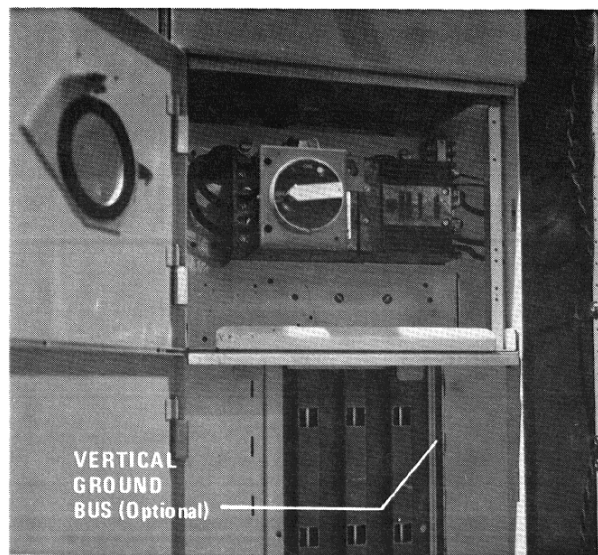


Figure 7. Vertical bus enclosed in polyester glass barrier, and optional vertical ground bus.

## RECEIVING

Before accepting shipment from the transportation company, make a thorough inspection of the Iso-Trol® Motor Control Center, to determine whether damage has occurred in transit. If so, the carrier should be immediately notified and a damage claim filed. Powell Electrical Mfg. Co. is not responsible for damage occurring after release of the equipment to the carrier. Also, check the equipment against the Packing List for possible shortage.

## STORAGE

In the event installation cannot be made immediately, the Motor Control Center should be stored in a clean, dry, ventilated location. Should the equipment be subjected to either low temperature or moisture, approximately 150W of heat per section should be introduced.

**CAUTION:** Indoor Motor Control Centers should not be stored outdoors, even if completely covered with tarpaulin or plastic sheet.

## HANDLING

The Motor Control Center sections should be maintained in an upright position during all handling, and should be treated with utmost care, as they contain devices which might be damaged if subjected to shocks. If skids are furnished, the equipment may be moved on an even surface by the use of rollers or heavy duty pipe under the skid. Any force to move the equipment should be applied only to the skid and not to the Motor Control Center itself.

**CAUTION:** When pushing or pulling, stabilize front and rear of the assembly to prevent possible tipping.

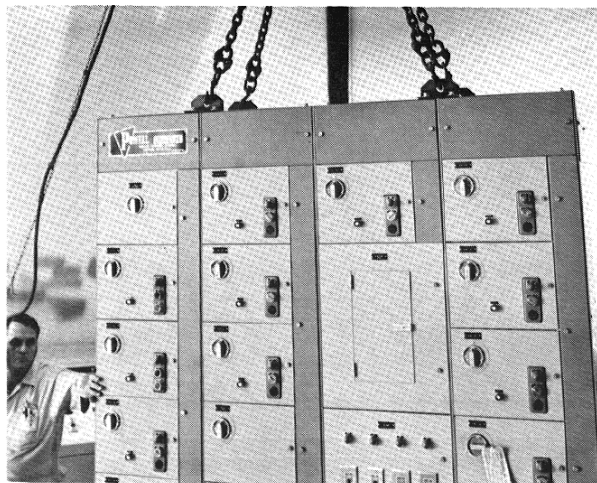


Figure 8. Handling of indoor Motor Control Center with overhead crane.



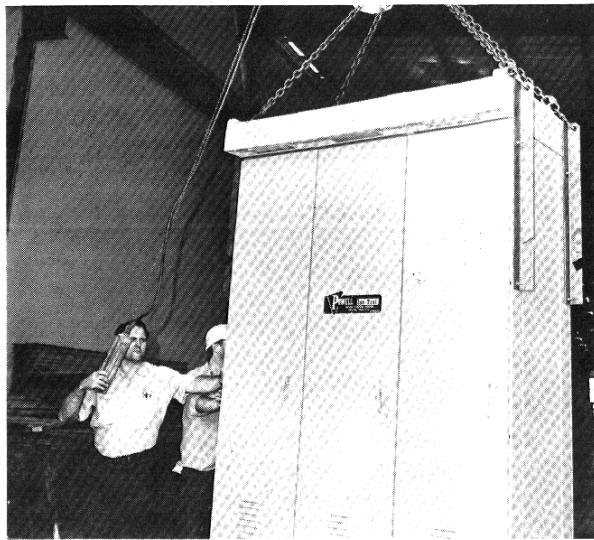


Figure 9. Handling of outdoor non-walk-in Motor Control Center with overhead crane.

For handling with overhead cranes, lifting eyes (angles) are provided at the top of the Motor Control Center assembly for all indoor equipment. (Figure 8) For outdoor non-walk-in equipment, lifting angles are provided on the side of the structure, near the top. (Figure 9)

**NOTE:** For outdoor walk-in enclosures, lifting channels are provided attached to the base of the equipment, and spreaders should be used in the slings above the Motor Control Center to prevent damage to the top edges. Do not attempt to lift the equipment by using the angles installed on the sides, as these angles are provided only to insure that the equipment will not tip if top-heavy by tying it down during shipment, and are not intended to be used for lifting purposes. Slings should be tied to referenced angles to prevent tipping.

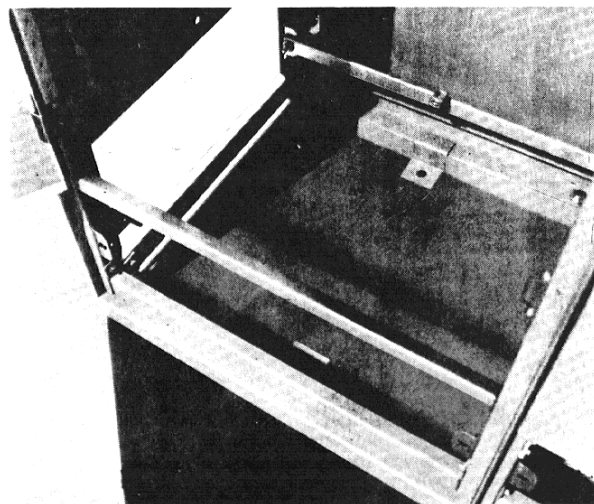


Figure 10. Anchor clip.

## INSTALLATION: GENERAL

Before attempting installation, all information furnished by the Powell Electrical Mfg. Co. for the particular equipment should be reviewed. Engineering drawings will show elevations, plan views, incoming service entrance area, and available conduit space area. As much clearance as possible should be allowed from walls, columns, obstructions, other equipment, etc. Minimum working clearances as permitted by codes and standards should be observed.

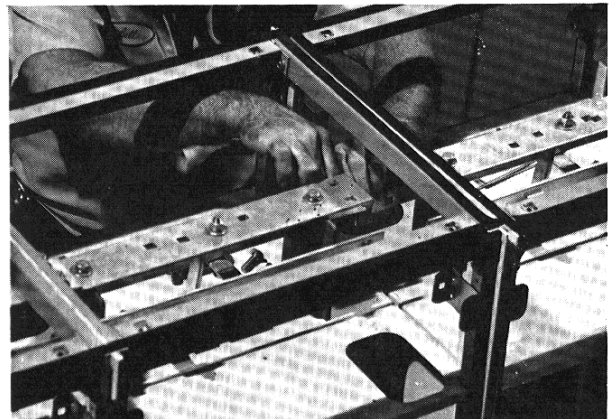


Figure 11. Installing bus splices at shipping splits.



Figure 12. Typical incoming lugs compartment.

## FLOOR PREPARATION

The Iso-Trol® Motor Control Center is a free-standing, self-supporting assembly; however, it should be bolted down with anchor bolts. Refer to engineering drawings for recommended anchor method details and anchor bolt sizes and locations. (Figure 10) It is important that the Motor Control Center be straight and level throughout its length. To insure this condition, shims should be placed as required before anchoring.

**NOTE** that if both 20-inch-deep and 15-inch-deep sections are in a single lineup, front lineup is required to properly align the main bus.



## LAYOUT OF CONDUIT

Conduit stubs, from either top or bottom, should be held to a minimum in order to obtain maximum wiring space inside the Motor Control Center.

Care should be taken to plan for any future conduit requirements, such as for future units and/or sections. Refer to engineering drawings for available conduit space; do not run conduit into the main horizontal bus area.

**CAUTION:** Always remove the top when drilling or pulling holes for conduit entering from top. This will prevent metal from falling into the Motor Control Center and causing possible damage.

## JOINING OF SECTIONS

When the Motor Control Center is shipped in more than one assembly of sections, it is necessary to join the individual "shipping splits" by bolting together. Engineering drawings indicate "shipping splits", and each partial assembly is clearly marked showing its relative position. The required hardware is furnished, loose, in an identified compartment. All bolts—and particularly bus bolts—should be carefully tightened. (Figure 11)

## INCOMING POWER CABLES

Before installation of the incoming power cables, consult the engineering drawings for details. Special consideration must be given to incoming power cables which pass through current transformers, for metering purposes and/or ground fault protection, to insure that diagrams and notes as shown on engineering drawings are adhered to. Also, make sure that phase rotation is correct.

Normally incoming power cables will terminate at the incoming lugs compartment or at the line side of the main disconnect. The incoming power cables may enter from top or bottom, as specified in the engineering drawings. Cables should be securely clamped. (Figure 12)

## UNIT WIRING

Opening the unit door and the vertical wireway door will give full access to the unit terminal blocks. (Figure 13) When Type C wiring is specified, the master terminal block will be located at top or bottom (opposite to main horizontal bus) and will be accessible by removing the top or bottom horizontal wireway cover. (Figure 14)

Wires should be securely tied to the brackets mounted along the right-hand side of the vertical wireway.

Interwiring between the sections can be accomplished at both top and bottom, through the continuous horizontal wireway.

**CAUTION:** When installing cables, avoid any possibility of damage to cable insulation by any sharp edges.

## PLUG-IN UNIT REMOVAL

Plug-in units may be removed without disturbing other circuits in the Motor Control Center.

**CAUTION:** When removing or servicing a unit, verify that power from any external source is not applied to the unit.

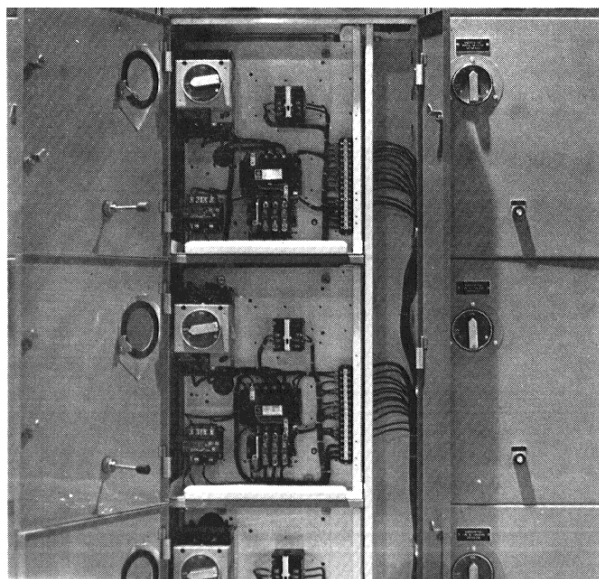


Figure 13. Unit terminal blocks — Type B wiring.

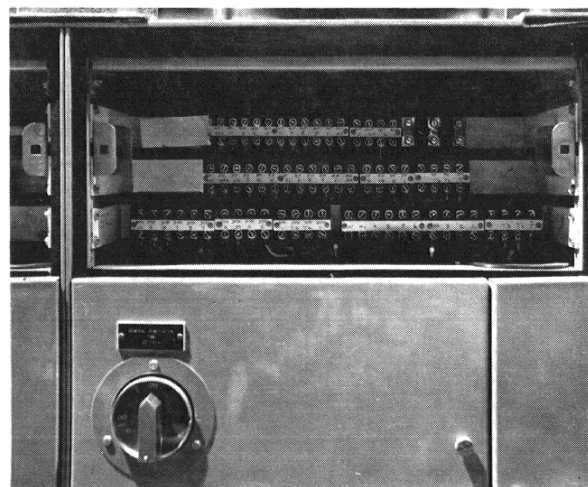


Figure 14. Master terminal block — Type C wiring.

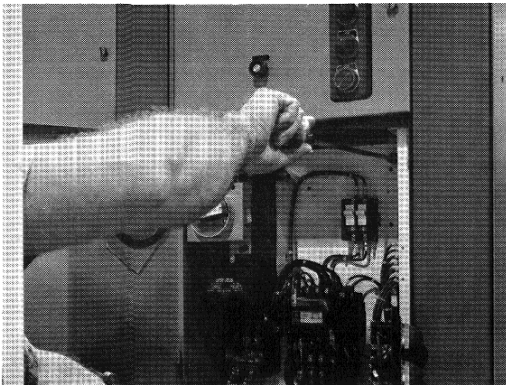


Figure 15.

The unit can be withdrawn in the following manner

1. Turn the unit disconnect to the OFF position and open the unit door.
2. Disconnect all field wires at unit terminals if pull-apart terminal blocks are not furnished. Wires should be tagged for reconnection.
3. Turn the one-quarter-turn-fasteners to release top and bottom of unit. (Figure 15)
4. Press down on latch mechanism on bottom of unit and pull the unit partially out until it locks in the intermediate withdrawn position (with latch mechanism released). (Figures 16 and 17)
5. The unit may be padlocked in the intermediate withdrawn position, with stabs disengaged from the vertical bus, for inspection of the unit in place. (Figure 17)
6. To completely withdraw the unit from the structure, again press down on latch mechanism and pull to remove unit. (Figure 18)
7. When removing more than one unit at the same time, care should be taken to reinstall each unit in its proper location. Units may be mechanically interchange-

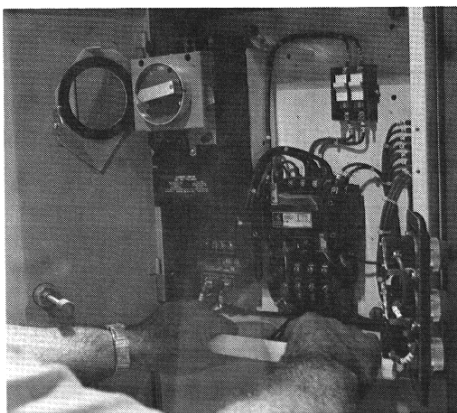


Figure 16.

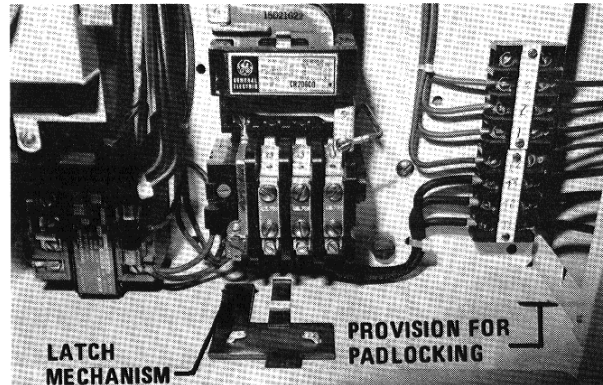


Figure 17.

able but not electrically interchangeable due to different ratings.

## EQUIPMENT CHECK-OUT

Before energizing the Motor Control Center, the following steps should be taken:

1. Operate all components (i.e., circuit breakers, starters, relays, etc.) by hand to make sure that there is no binding of moving parts. *NOTE: Remove any blocking wedges that may have been inserted in components (i.e., meters, relays, etc.) to prevent movement during shipment.*
2. Make a thorough inspection to determine that no foreign matters (i.e., tools, etc.) have been left in the Motor Control Center after field installation. Particular attention should be paid to the bus compartment.
3. The Motor Control Center should be cleaned thoroughly by use of an industrial vacuum cleaner or a clean brush or soft cloth. During this cleaning process, bus insulators and unit plug-in stabs should be carefully inspected for possible damage.
4. All bus and circuit connections are carefully tightened at the factory; however, it is possible that these

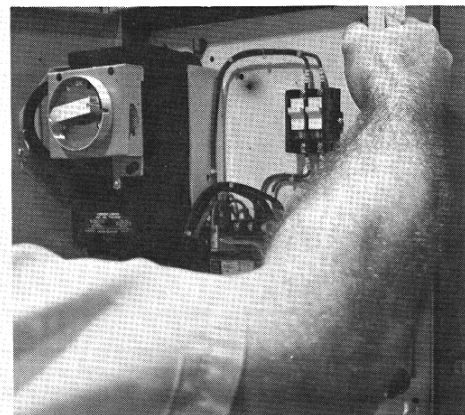


Figure 18.





may be loosened during shipment, so they should be checked for tightness before energizing.

5. Check all doors with circuit-breaker or fusible-switch operating handles, to make sure they operate freely and correctly; adjust if required. Also, check door interlock for proper operation, and adjust if required.
6. Overload heaters are normally supplied with the Motor Control Center, sized per NEC tables unless actual motor full-load-current is supplied before shipment. Verify that actual motor full-load-current as shown on motor nameplate agrees with the value shown in engineering drawings. If current is not within manufacturer's tolerance range, replace overload heaters with heaters of the correct rating.
7. When fusible switches are used, power fuses are not included unless specifically ordered. Refer to the fuse manufacturer's tables for correct sizing of fuses, and install same.
8. Make sure the setting of protective devices is in accordance with engineering drawings.
9. Check for correct interrupting capacity of the circuit breakers and/or fusible switches.
10. Current transformers are shipped with a shunt across the secondary if the circuit is not complete. Remove the shunt after completing the circuit.

## PLACING INTO SERVICE

The following procedure is recommended when energizing the Motor Control Center for the first time:

1. Make sure EQUIPMENT CHECK-OUT procedure has been followed.
2. Megger all terminals and buses for grounds. Devices which may be damaged by megger voltage should be isolated from the circuit.
3. Be sure all protective barriers and covers are in place and secured.
4. Be certain that all applicable codes and sound wiring practices have been followed.
5. Make sure that the Motor Control Center enclosure is solidly grounded.
6. Close all doors and turn all unit's disconnects to the OFF position.
7. Energize the main bus, and check for proper operation of meters that may be included.
8. Test all units by operating the pilot devices incorporated on their circuits.

## MAINTENANCE AND INSPECTION

### PERIODIC INSPECTION

All Motor Control Center installations should be given a general inspection at frequent intervals, depending very much upon the environmental conditions where the equipment is installed.

Perform a visual inspection to detect unusual vibrations, loose parts, etc.; and take immediate steps to remedy any deficiencies of this nature.

*The equipment should be kept clean at all times; any accumulation of dust or dirt should be removed by the use of vacuum cleaner, clean brush, or soft cloth.*

*The Motor Control Center should be kept dry at all times; prevent moisture by adding approximately 150W of heat per section, if required.*

### SCHEDULED INSPECTION

As scheduled by the purchaser (recommended at least twice a year), a thorough inspection of the Motor Control Center should be performed. The following checks, in particular, are emphasized—*after de-energizing the equipment*:

1. Remove accumulated dust and dirt.
2. All devices should be hand-operated to determine their operating condition.
3. Badly worn contacts should be replaced; do not file contacts.
4. Inspect all bolted connections for tightness.
5. Inspect all cable connections for tightness.
6. Inspect all wiring for signs of damage; examine the insulation for evidence of overheating.
7. Check proper setting of all protective devices.
8. If fuse replacement is required, always install fuses of the same type and ratings as furnished with the Motor Control Center.
9. Remove draw-out units and check stabs; remove accumulated dust from stab area.
10. Check unit door interlock for proper operation.

**NOTE:** *When inspecting Motor Control Centers, make sure personnel are familiar with all safety features of the equipment.*



## INFORMATION NEEDED FOR ORDERING ADDITIONAL CONTROL UNITS AND PARTS

When ordering units for installation in an existing Iso-Trol® Motor Control Center, supply the following information:

1. Original Powell Electrical Mfg. Co. Order No. from the equipment nameplate.
2. Desired location of the new unit.
3. Nameplate engraving information.
4. Combination starter unit, to include the following:
  - a. Motor horsepower (RPM and full-load current, if available).
  - b. Type of starter and modifications, if required.
  - c. Source of control voltage.
  - d. Control wiring information.
5. Feeder unit, to include the following:
  - a. Frame and trip size of circuit breaker (accessories, if required).

- b. Fusible switch size and class of fuse clips (indicate fuse sizes if to be included).

*When ordering parts, furnish the Powell Electrical Mfg. Co. Order No. from the equipment nameplate and a full description of the required part.*

## RENEWAL PARTS

Depending upon equipment usage, stock of spare parts will vary; however, maintaining an adequate stock of the following is recommended:

1. Overload heaters.
2. Power and control circuit fuses.
3. Starter coils.
4. Starter replacement contact kits.
5. Pilot lights.
6. Pushbuttons and contact blocks.
7. Circuit breakers and/or fusible switches.
8. Spare units as warranted by installation needs.

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