

INSTRUCTION MANUAL

INSTALLATION - OPERATION - MAINTENANCE

**JK Series Medium Voltage Controllers
OEM Power Cells - Fixed and Withdrawable Types
360A, 7.2kV Maximum**

TOSHIBA

INSTRUCTION MANUAL

For the Installation, Operation and Maintenance of

JK Series Medium Voltage Controllers OEM Power Cells - Fixed and Withdrawable Types 360A, 7.2kV Maximum



Never attempt to install, operate, maintain or dispose of this equipment until you have first read and understood all of the relevant product warnings and user directions that are contained in this Instruction Manual.

To contact Toshiba, address all correspondence to:

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Toshiba International Corporation
13131 West Little York Road
Houston, Texas 77041 USA

or call:

(713) 466-0277
(800) 231-1412
(800) 527-1204 (Canada)

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Please complete the following information for your records and retain with this manual:

Model: _____

Serial Number: _____

Date of Installation: _____

Inspected by: _____

Reference Number: _____

IMPORTANT MESSAGES

Read this manual and follow its instructions. Signal words such as DANGER, WARNING and CAUTION will be followed by important safety information that must be carefully reviewed.

 DANGER

Indicates a situation which will result in death, serious injury, and severe property damage if you do not follow instructions.

 WARNING

Means that you might be seriously injured or killed if you do not follow instructions. Severe property damage might also occur.

 CAUTION

Means that you might be injured if you do not follow instructions. Equipment damage might also occur.

NOTE

Gives you helpful information

READ SAFETY SIGNS

To avoid injury, you must read and follow all safety signs.

Keep the safety signs visible and in good shape. Never remove or cover any safety signs.

QUALIFIED OPERATORS ONLY

Only qualified personnel are to install, operate, or service this equipment according to all applicable codes and established safety practices.

A qualified person must:

- 1) **Carefully read the entire instruction manual.**
- 2) Be skilled in the installation, construction or operation of the equipment and aware of the hazards involved.
- 3) Be trained and authorized to safely energize, deenergize, clear, ground, lockout and tag circuits in accordance with established safety practices.
- 4) Be trained and authorized to perform the service, maintenance or repair of this equipment.
- 5) Be trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses, face shield, flash clothing, etc. in accordance with established practices.
- 6) Be trained in rendering first aid.

SAFETY CODES

Toshiba medium voltage control OEM components are intended for use in general purpose, Class E, magnetic controllers designed and built in accordance with the latest applicable provisions of NEMA ICS 3 Part 2, UL 347 and the National Electrical Code. Installations must comply with all applicable state and local codes, adhere to all applicable National Electric Code (NFPA 70) standards and instructions provided in this manual.

⚠ DANGER

HAZARDOUS VOLTAGE will cause severe injury, death, fire, explosion and property damage.

- Turn off and lock out Primary and Control Circuit Power before servicing.
- Keep all panels and covers securely in place.
- Never Defeat, Modify, or Bypass any Safety Interlocks
- Qualified Operators only

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It is the intent of this manual to provide a guide for the installation of Toshiba medium voltage control components in NEMA Class E controllers manufactured by original equipment manufacturers (OEM's). This manual consists of a section of general safety instructions and is marked throughout with warning symbols. Read this manual thoroughly for instructions pertaining to installation of components furnished with the OEM kit and also read the JK Series Medium Voltage Controller manuals VF010H01 (withdrawable contactors) and VF010H02 (fixed type contactors) for additional operation and maintenance instructions.

This manual and all accompanying drawings should be considered a permanent part of the equipment. They should be readily available for review and reference at all times. This manual is not intended to cover all details, combinations, or variations of the equipment. Always refer to drawings accompanying the equipment for additional details.

All safety warnings must be followed to ensure personal safety. General safety instructions are found on pages 1 through 3. Read and save these instructions for future reference.

Follow all precautions to attain proper equipment performance and longevity.

Dimensions shown in the manual are in metric and/or their English equivalent.

This manual is divided into major sections of interest, as follows:

GENERAL DESCRIPTION – Provides a description of the equipment, information on major components and how they function.

RECEIVING, INSPECTION AND HANDLING – Describes procedures for receiving, unpacking, inspecting, handling, lifting and moving the components.

INSTALLATION – Provides information on installing the power cell in the enclosure and also installation of the withdrawable contactor carriage.

PRE-ENERGIZATION CHECK – Provides a checklist for preparing the equipment for energization.

DISPOSAL – Lists procedures for the safe disposal of the equipment when the service life has expired.

STORAGE – Provides guidelines for storing new equipment for an extended period of time.

SPECIFICATIONS – Covers ratings and other specifications of the contactor.

WARRANTY AND LIMITATION OF LIABILITY – Details Toshiba International Corporation's standard warranty terms.

JK Series OEM power cells are designed for installation into an enclosure provided by the original equipment manufacturer (OEM). The OEM is then responsible for adding power bus, control devices and other components such as current-limiting fuses, current transformers, control power transformers, etc. to complete the installation.

Each JK Series OEM power cell is a modular unit containing a vacuum contactor, isolation switch, power fuse clips and other basic components necessary for the OEM to construct an AC general-purpose NEMA Class E medium voltage controller. These controllers are intended for application at utilization voltages ranging from 2.3 through 6.6 kV at full load currents up to 360A. For complete ratings, refer to the SPECIFICATIONS section of this manual.

The power cells are available in two configurations, one having a fixed type (bolted-in) vacuum contactor and the other offering a withdrawable vacuum contactor. In the fixed type design, all components including the contactor are bolted into the power cell. The withdrawable type is similar, except that the contactor and power fuses are mounted on a separate carriage which can be withdrawn from the power cell on a built-in slide-out service drawer.

Power cells with fixed type contactors (Fig. 1) include the following components:

- Isolation Switch
- Operating Handle for Isolation Switch
- Power Fuse Cartridges (3)
- Vacuum Contactor (bolted-in)
- Mechanical and Electrical Interlocks
- Door Interlock Bracket (shipped loose)

Power cells with withdrawable type contactors (Fig. 2) include the following components:

- Isolation Switch
- Operating Handle for Isolation Switch
- Fused Vacuum Contactor (withdrawable)
- Mechanical and Electrical Interlocks
- Door Interlock Bracket (shipped loose)

Fig. 1 Power Cell With Fixed Type Contactor

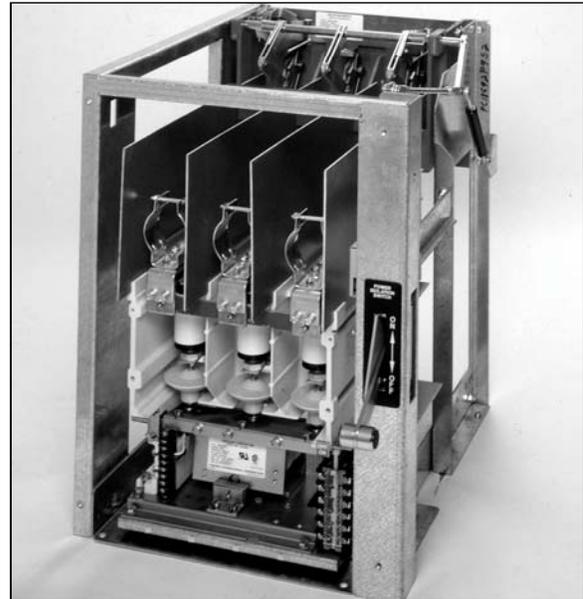
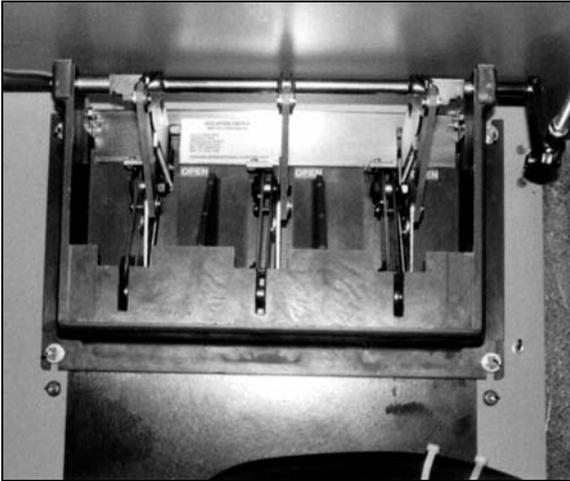


Fig. 2 Power Cell With Withdrawable Type Contactor



POWER CELLS WITH FIXED TYPE



CONTACTORS - MAJOR COMPONENTS

A. Isolation Switch (Fig. 3)

Power is switched on and off by a fixed-mounted, externally operated, three-pole isolation switch. When the switch is in the OFF position, incoming power is isolated from the power cell interior by an automatic shutter. For additional safety, the load terminals of the switch are automatically grounded when the switch is OFF. When the external handle is operated, the switch is closed and incoming power is applied to the line side of the power fuses. In this position, the motor or other load may be switched on and off by operating the vacuum contactor.

The isolation switch has a maximum interrupting capacity of 0.4 amperes.

⚠ WARNING Do not connect additional load to the isolation switch.

B. Power Fuse Clips (Fig. 4)

Clips for three bolted-in power fuse cartridges provide a mounting means for the current-limiting fuses that provide primary short-circuit protection for the controller and load circuit. These fuse cartridge clips are connected between the isolation switch and the vacuum contactor.

C. Vacuum Contactor (Fig. 5)

The Type HCV-5HA vacuum contactor used in these power cells is a compact, fixed mounted

device. It is mounted to the floor of the cell compartment, beneath the isolation switch.

Switching occurs entirely within vacuum bottles, which results in long life with virtually no maintenance. The contactor is mechanically interlocked with the isolation switch so that the switch may not be opened or closed unless the contacts of the vacuum contactor are opened.

Fig. 3 Isolation Switch

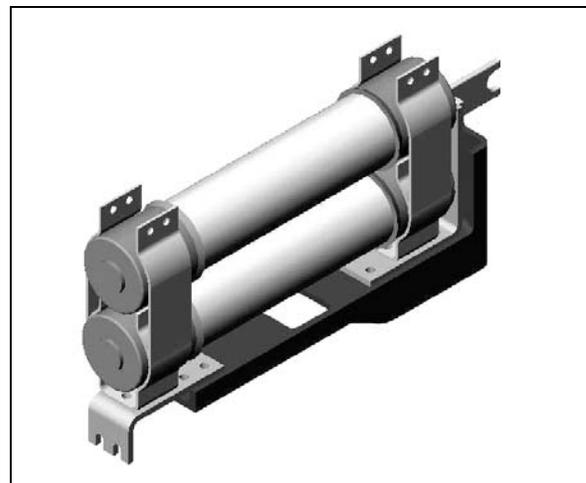
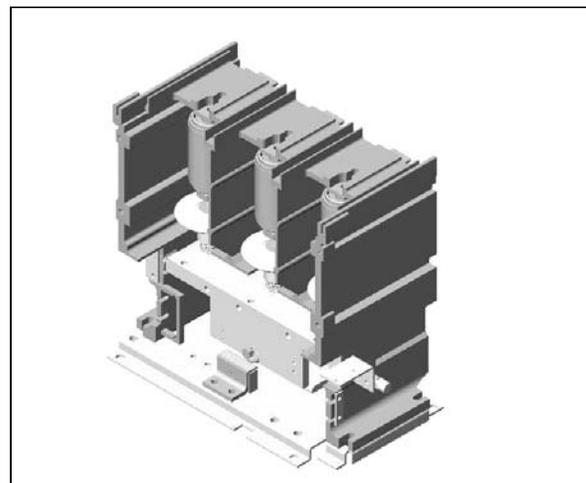
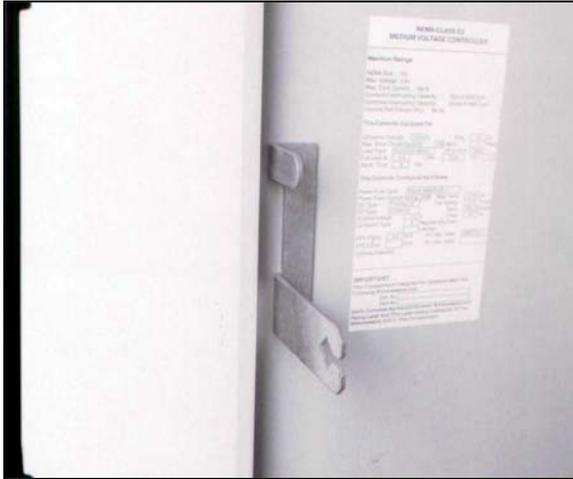


Fig. 4 Power Fuse Clip (Fuses not included)

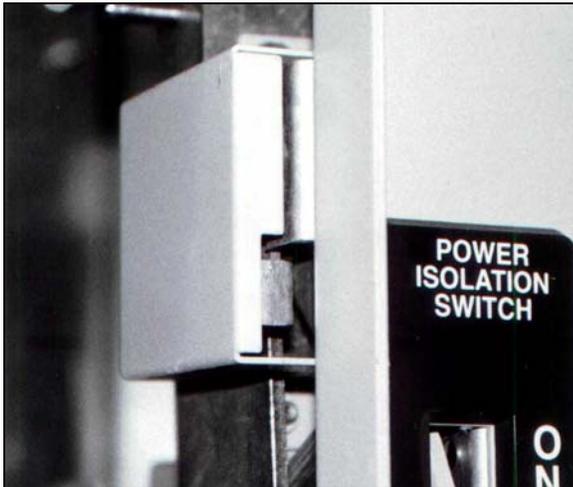
Fig. 5 Vacuum Contactor



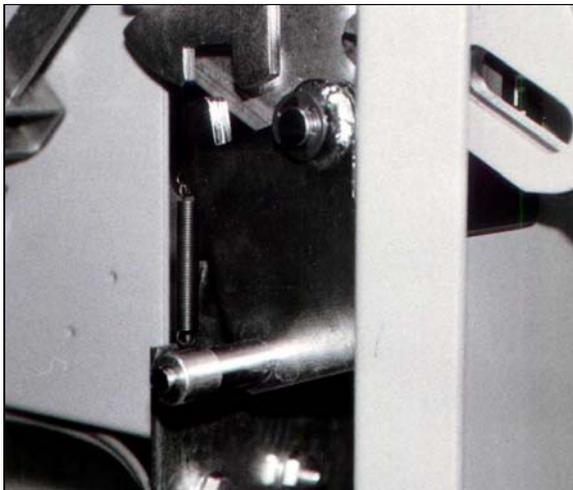
D. Interlocks – Mechanical



The isolation switch is mechanically interlocked with the vacuum contactor and the compartment



door. Three separate interlocks are provided, as described below.



a. Door Interlock Bracket

A door interlock bracket is provided to prevent opening or closing the medium voltage compartment door unless the switch operating handle is OFF. The bracket (Fig. 6) is furnished loose with the power cell and it is the responsibility of the OEM to mount it to the enclosure door in the proper location. Refer to the INSTALLATION section for mounting details.

b. Handle Interlock to Door

A mechanical interlock is provided which prevents moving the handle from OFF to ON unless the compartment door is closed (Fig. 7).

This interlock is actuated by the upper part of the door interlock bracket described in item a. above.

c. Handle Interlock to Vacuum Contactor

The vacuum contactor is mechanically interlocked to prevent it from closing unless the switch handle is in the fully ON or fully OFF position. The interlock shown in Fig. 8 provides this function.

If the switch handle is in an intermediate position, and a closing signal is given to the contactor, it is mechanically prevented from operating by the interlock.

This interlock also prevents the switch handle from being moved in either direction unless the contacts of the vacuum contactor are opened.

Fig. 6 Door Interlock Bracket

Fig. 7 Handle Interlock to Door

Fig. 8 Handle Interlock to Vacuum Contactor

E. Interlocks - Electrical

Control Power Interlock (CPI)

The control power interlock (CPI) is a microswitch (Fig. 9) which is directly driven by the operation of the switch handle. This normally open switch is closed only when the handle is fully ON. As the switch handle is moved from ON to OFF, the CPI opens before the main contacts of the power isolation switch. Conversely, during closing of the switch, the CPI contacts do not close until after the switch contacts have fully closed.

The CPI microswitch contacts must be wired in series with the secondary connected load of the control power transformer (installed and wired by the OEM). This ensures that all load is disconnected from the control power transformer secondary winding before the isolation switch can be operated. The isolation switch is therefore only required to make or break currents equal to the no-load magnetizing current of the transformer.

Refer to the INSTALLATION section for the correct wiring of the control power transformer.

Fig. 9 Control Power Interlock



⚠WARNING

Failure to correctly wire the CPI contacts in series with the control transformer secondary load can result in arcing and failure of the isolation switch, which can cause severe injury or death.

Do not connect additional load to the isolation switch.

POWER CELLS WITH WITHDRAWABLE TYPE CONTACTORS - MAJOR COMPONENTS**A. Isolation Switch (Fig. 10)**

The isolation switch is the same design as that used for the fixed type contactor, except in this configuration the switch accepts a direct connection from the line stabs of the removable contactor carriage. The connection is automatically made when the contactor carriage is installed in the medium voltage compartment.

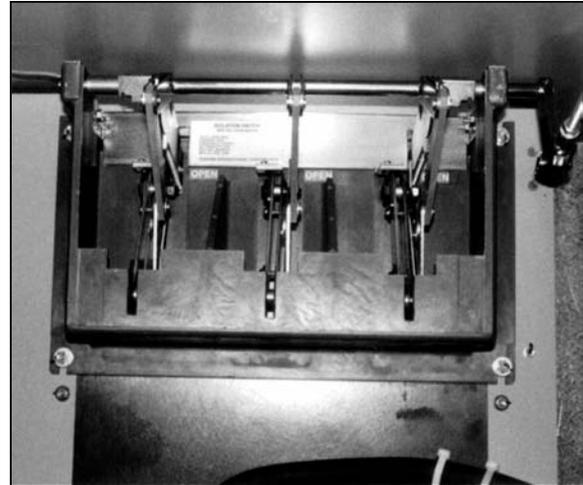
B. Withdrawable Contactor Carriage (Fig. 11)

The withdrawable contactor carriage is a removable assembly that contains the following components:

- Vacuum contactor
- Power fuse housing assembly
- Set of line and load power stab terminals
- Auxiliary contacts for vacuum contactor
- Control wiring disconnect plug
- Set of wheels to facilitate moving the carriage when it is outside the controller

The withdrawable contactor carriage is shipped installed in the power cell. It should be removed for access to the power cell during initial installation, connection of motor cables, etc.

After installation, periodic removal of the carriage will also be necessary for routine maintenance of the contactor or replacement of the power fuses.

Fig. 10 Isolation Switch**Fig. 11 Withdrawable Contactor Carriage**

C. Service Drawer (Fig. 12)

The withdrawable contactor carriage is moved in and out of the power cell on a built-in slide-out service drawer. The drawer has four locating pins on top of it. When the contactor carriage is placed on the drawer, these pins engage four holes in the bottom of the carriage, which serve to align it properly. The drawer moves in and out of the power cell on sliding ball-bearing type rails. There is a handle on the front of the drawer to provide a gripping point.

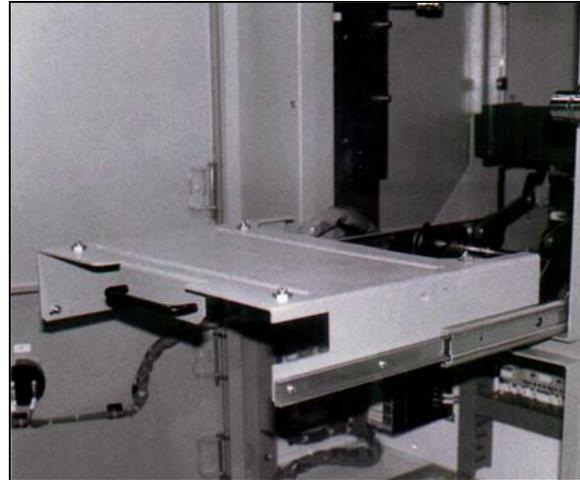
When the carriage is installed in the power cell, the following connections are automatically made:

- 1) The line side stabs engage the fixed-mounted isolation switch connecting the load side of the switch to the line side of the power fuses.
- 2) The load side stabs engage the fixed-mounted load receptacle connecting the load side of the vacuum contactor to the outgoing cell terminals.
- 3) Medium voltage control power take-off stabs engage stationary clips on the left side of the cell, providing a connection point for the OEM to derive primary power for the control power transformer. These take-off stabs are electrically connected to the load side of the main power fuses.

D. Load Receptacle (Fig. 13)

The load receptacle is a fixed three-phase disconnecting block, which uses bolted pressure type stab contacts similar to those used in the isolation switch. The vacuum contactor load stabs on the withdrawable carriage engage the load receptacle when the carriage is installed.

The operation of the bolted pressure contact mechanism is controlled by a release lever located at the front of the power cell below the service drawer. Outgoing load cables are to be connected by the OEM to the terminal pads that are furnished on the rear of the load receptacle.

Fig. 12 Service Drawer**Fig. 13 Load Receptacle**

E. Interlocks - Mechanical

When the withdrawable contactor carriage is inserted into the power cell, mechanical interlocking is established between the isolation switch, the vacuum contactor and the compartment door.

a. Door Interlock Bracket

A door interlock bracket is provided to prevent opening or closing the medium voltage compartment door unless the switch operating handle is OFF. This interlock is the same as that furnished on cells with fixed type contactors. Refer to Fig. 6 .

b. Handle Interlock to Door

A mechanical interlock is provided which prevents moving the handle from OFF to ON unless the compartment door is closed. This interlock is the same as that furnished on cells with fixed type contactors. Refer to Fig. 7 .

c. Handle Interlock to Vacuum Contactor

The vacuum contactor is mechanically interlocked to prevent it from closing unless the switch handle is in the fully ON or fully OFF position. The interlock shown in Fig. 14 provides this function.

If the switch handle is in an intermediate position, and a closing signal is given to the contactor, it is mechanically prevented from operating by the interlock.

This interlock also prevents the switch handle from being moved in either direction unless the contacts of the vacuum contactor are opened.

F. Interlocks - Electrical**Control Power Interlock (CPI)**

The control power interlock microswitch is the same as that furnished on cells with fixed type contactors. Refer to Fig. 9 .

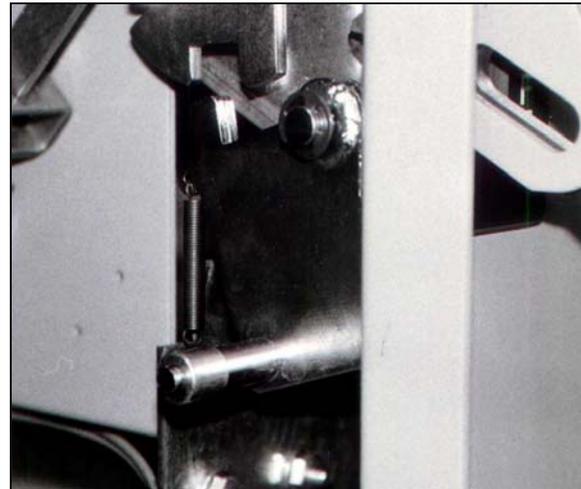


Fig. 14 Handle Interlock to Vacuum Contactor

RECEIVING AND UNPACKING

The OEM components are subjected to factory production alignment and testing prior to being packed and shipped.

ACCEPTANCE INSPECTION

Confirm that the power cell and withdrawable contactor carriage (if furnished) are complete, correct as specified and undamaged from shipment and handling.

Upon receipt of the equipment, do the following:

- 1) Make an immediate inspection for damage which might have occurred during shipment. If damage is discovered, it should be noted with the carrier prior to accepting the shipment, if possible.
- 2) Carefully unpack the equipment sufficiently to check for missing parts or concealed damage.
- 3) Keep the components upright.

Never lay the power cell or the contactor carriage on their sides or upside down. This may cause damage.

- 4) File a claim with the carrier for any damaged or missing items and immediately notify the nearest Toshiba representative.

Do not install or energize equipment that has been damaged. Damaged equipment can fail during operation, resulting in fire and explosion.

HANDLING AND MOVING THE POWER CELL

When handling and moving the power cell, the suspension technique shown in Fig. 15 should be used.

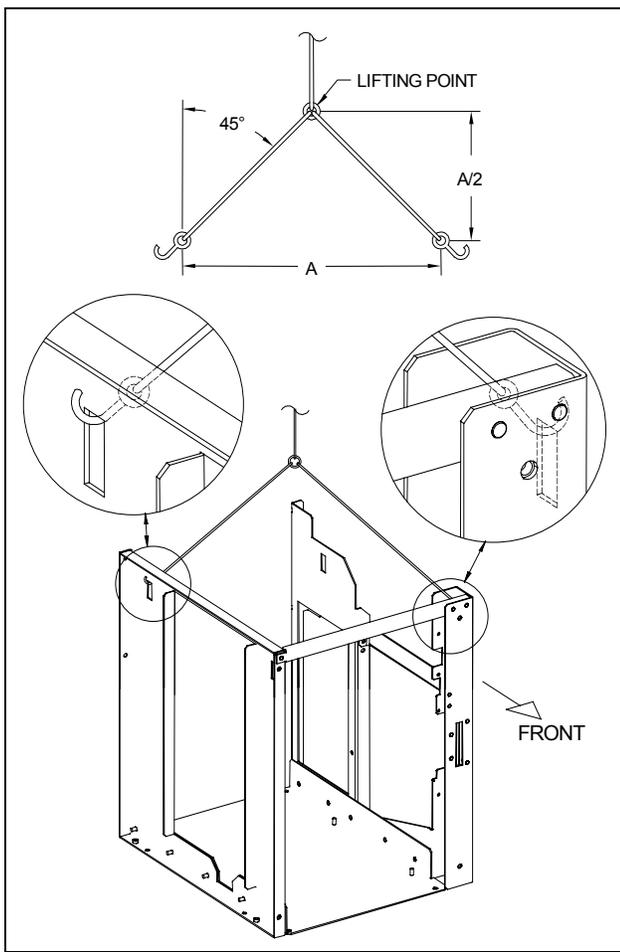


Fig. 15 Lifting Method for Power Cell (Fixed-Type and Withdrawable Contactor)

Care and caution should be used when handling the power cell to avoid damage to the equipment and personal injury. Always keep the cell in a generally upright position.

WITHDRAWABLE CONTACTOR CARRIAGE HANDLING

Withdrawable contactor carriages are shipped inside their respective power cells. During initial installation by the OEM, the contactor carriage must be removed from the cell to allow access for anchoring the cell to the enclosure, for connecting cables, etc.

Removal of the contactor carriage may be accomplished by the use of an optional Toshiba JK carriage lifting attachment and a suitable overhead lifting device. The use of the lifting device is illustrated in Fig. 16 .

Two shipping brackets securing the carriage to the service drawer must be removed before attempting to lift the carriage from the drawer. These brackets are used only for transportation and may be discarded.

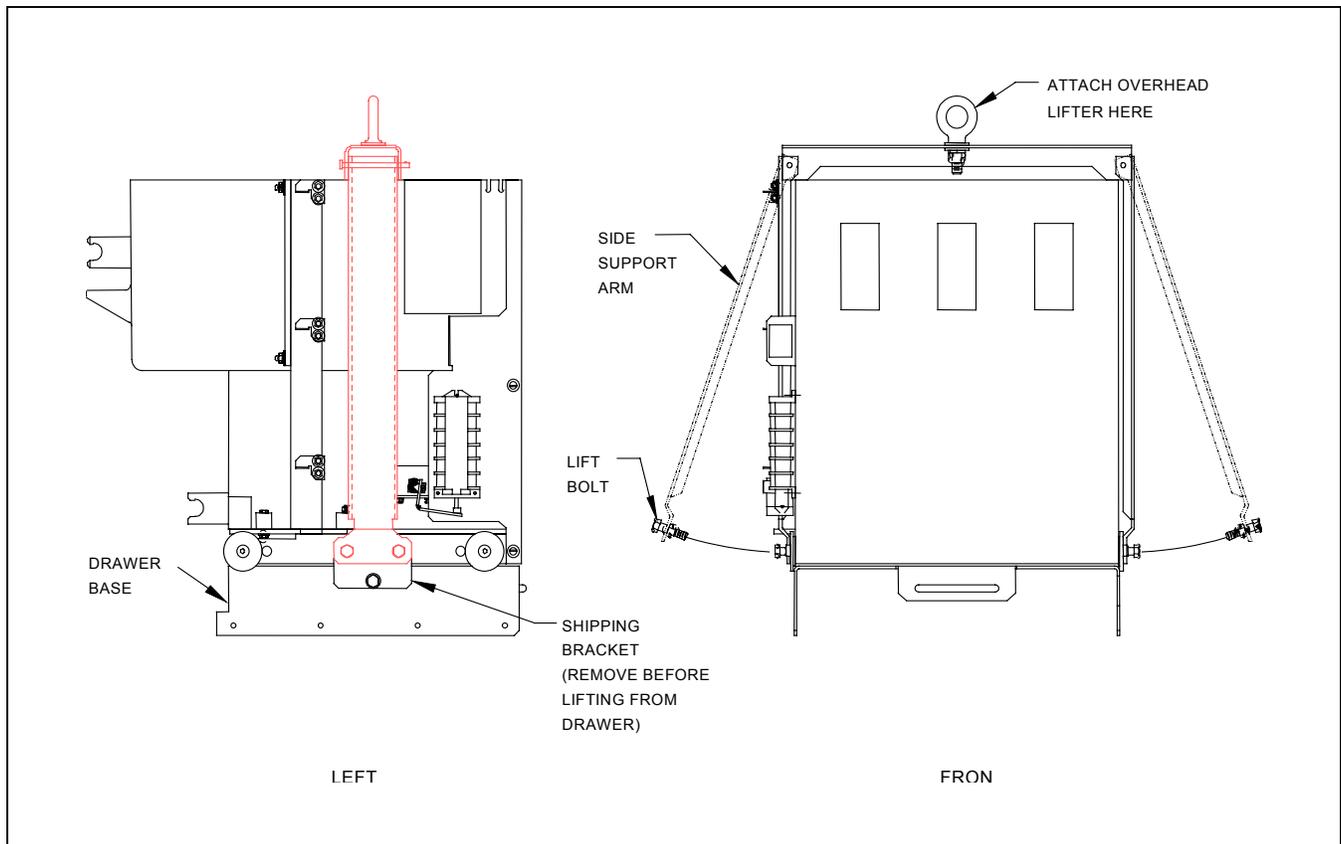
To attach the lifting attachment to the carriage:

1. Position lifting attachment on top of carriage.
2. Swing side support arms down to meet carriage base.
3. Securely screw lift bolts into base.
4. Attach overhead lifter to eye bolt on top of lifting attachment and lift from drawer.



Maximum weight of carriage is 135 lbs equipped with double barrel fuses. Verify that lifter used has adequate load capacity.

Fig. 16 Contactor Carriage Lifting Attachment



OEM ENCLOSURE DESIGN

These power cells should be totally enclosed in sheet metal structures that comply with the applicable requirements of NEMA Standards Publications ICS 6 and 250 for enclosures for industrial systems. The minimum controller compartment size is 30 inches wide by 30 inches high by 36 inches deep.

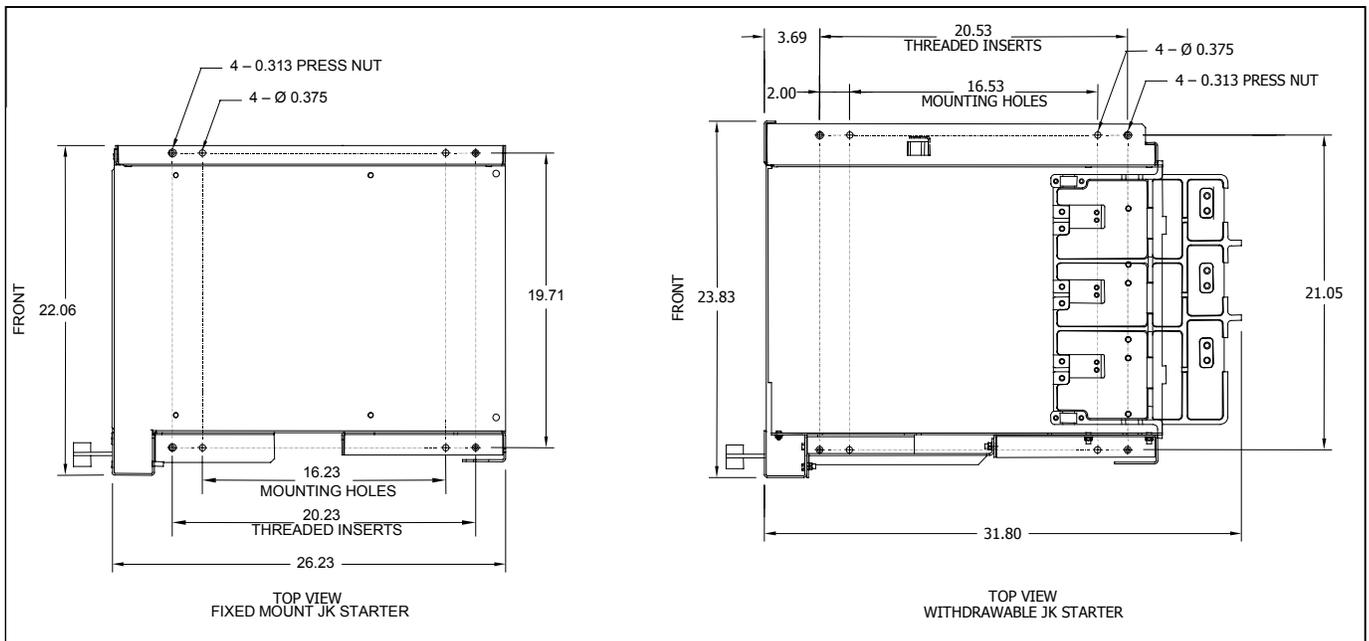
The power cell must be securely attached to the floor of the controller compartment. Four holes are provided in the cell base for anchoring using 5/16-18 bolts or studs. In addition, four threaded inserts are provided which will accept 5/16-18 bolts installed from the underside of the cell, for use if the compartment floor is located above floor level. Refer to Fig. 17 for location of mounting points.

The right front corner of the OEM structure should include a flange of approximately 4 inches in width with a cutout for the operating handle to extend through. The dimensions and location of the handle cutout are given in Fig. 20.

The cell should be positioned in the enclosure as far to the right and as far to the front as possible. The compartment door should have flanged edges, which result in a dimension of 1.25 inches from the inside of the door to the front of the cell as shown in Fig. 20.

The door interlock that is provided with the kit should be attached to the inside of enclosure door at the specified location (Fig. 20).

Fig. 17 Power Cell Mounting Points



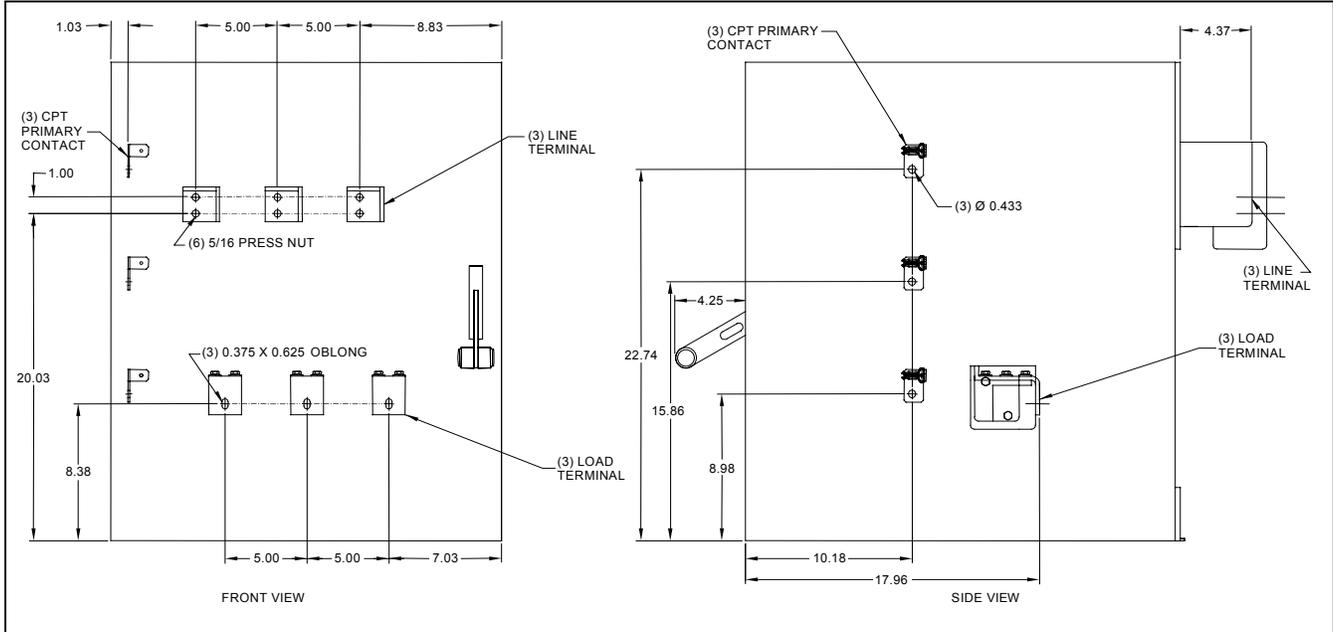


Fig. 18 Line and Load Terminal Locations with Withdrawable Type Contactor

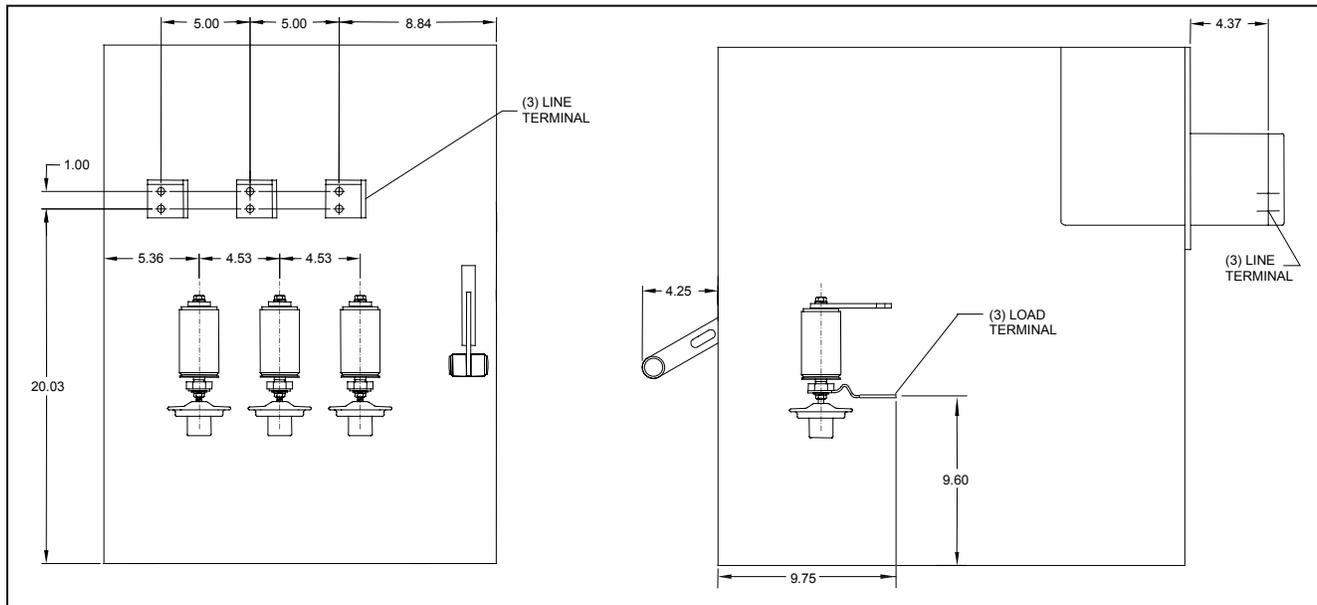


Fig. 19 Line and Load Terminal Locations with Fixed Type Contactor

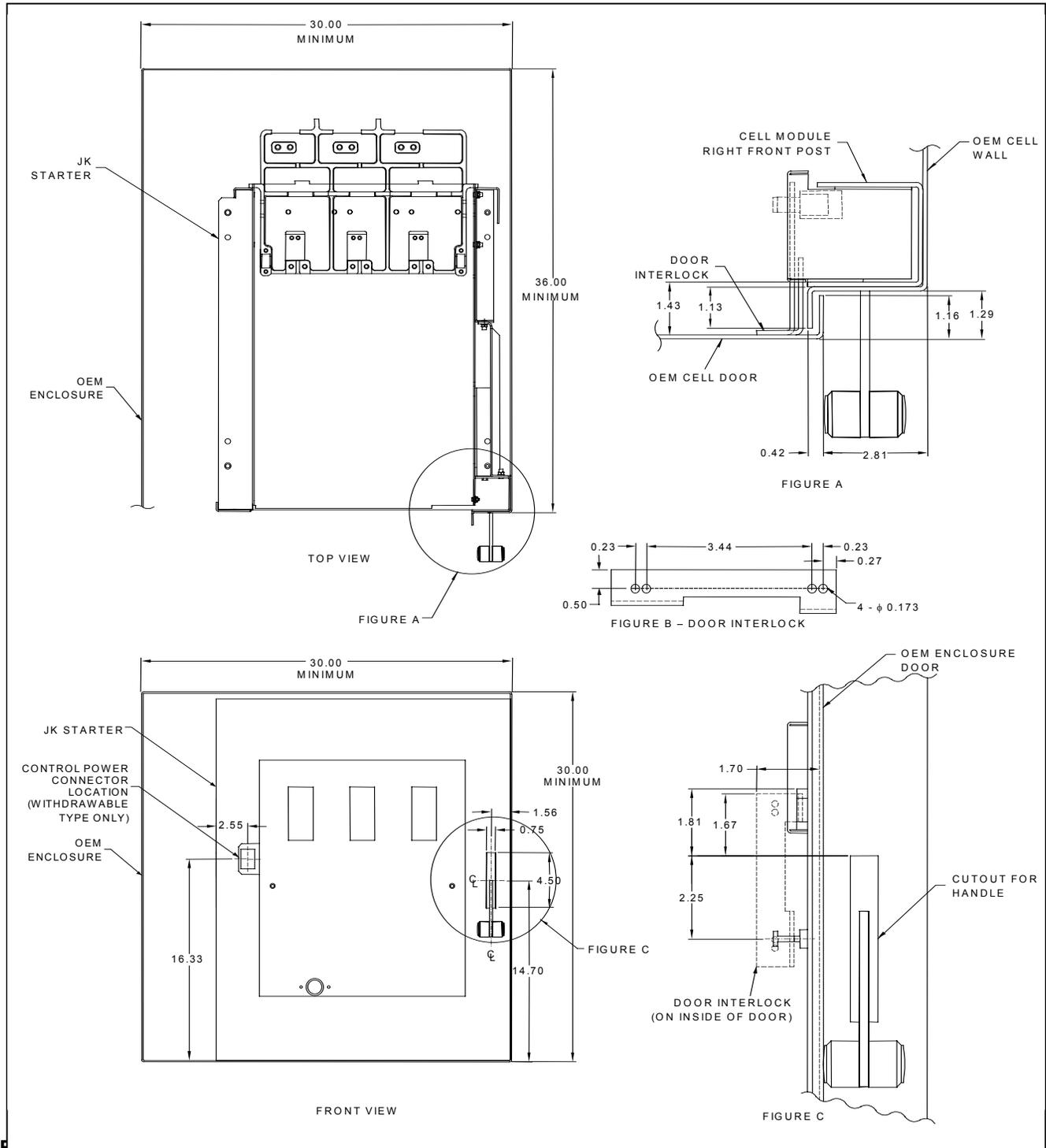


Fig. 20 Enclosure Specifications, Handle Location, and Door Interlock Location with Fixed and Withdrawable Type Contactors

MAIN CIRCUIT CABLING

Cables which connect to the power cell should be routed to avoid interference with sharp edges and moving parts. Minimum bending radius for the type of cable used should be observed.

Power cables should be braced and/or laced to withstand short-circuit forces wherever such cables are unsupported. Power cables should be adequately sized to carry the maximum continuous current and should have an adequate voltage rating.

The OEM should perform a temperature rise test on the completed controller to verify compliance with the temperature rise requirements of NEMA ICS3 Part 2.

It is recommended that a cable size of at least 4/0 AWG be used throughout the power circuit for continuous ratings up to 360A. It should be noted, however, that the maximum obtainable continuous current rating of the controller might be less than 360A in some cases. This is due to a number of factors that have an influence on temperature rise, including:

- Ventilation provided
- Number of controllers stacked vertically
- Controller position within a stacking arrangement

CONTACTOR INSTALLATION

To install the contactor carriage in the controller:

- 1) Lift and pull the release lever out all the way, then pull the service drawer (Figure).

▲WARNING

To avoid tipping over, the controller enclosure must be securely bolted to the floor.

- 2) Lift and place the contactor carriage on the service drawer (Fig. 12). The front of the carriage should line up with the front of the drawer, and the four locator pins on top of the drawer should engage the holes in the bottom of the carriage. Installation of the contactor carriages in the upper compartments of the one- and two-high stacking arrangements requires the use of a Toshiba JK lifting device.

▲WARNING

Manually lifting heavy equipment can cause serious injury. Use a Toshiba JK lifting device.

- 3) With the carriage properly in place on the service drawer, push the drawer firmly all the way into the compartment. Then push the release lever in until it drops slightly and latches. This operation causes the load receptacle to apply bolted pressure to the load stabs of the carriage.

The release lever **must be pushed in** (Fig. 2) before the isolation switch is closed or the controller is operated under load. The medium voltage compartment door cannot be closed unless the release lever is pushed in. A mechanical interlock prevents the isolation

switch from being closed unless the medium voltage door is closed.

▲WARNING

Release lever must be pushed in and latched before operating the controller.

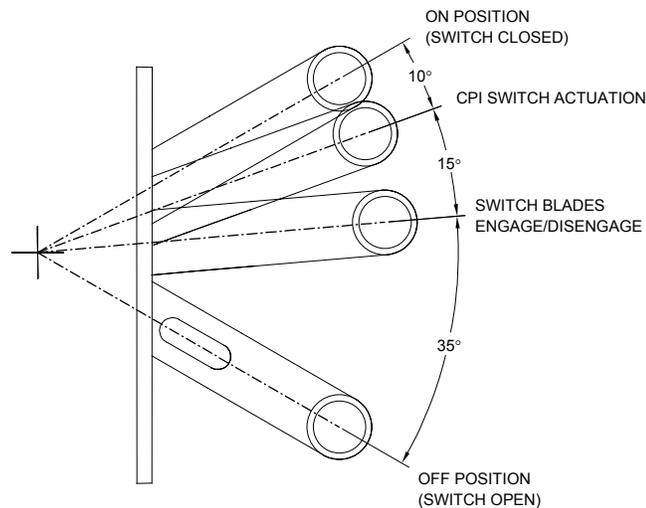
SWITCH HANDLE MECHANISM

The handle mechanism, which operates the isolation switch, is adjusted at the factory and under normal operation requires no further adjustment. Adjustment can be checked, however, as follows (Fig. 21):

- 1) Move handle to full OFF position.
- 2) Observe that isolation switchblades are in contact with the ground pads.
- 3) If adjustment is required, loosen lock nut securing yoke on handle end of connecting rod. Remove pin that attaches yoke to handle drive lever. Turn yoke in required direction to achieve adjustment defined in step 2. Re-attach yoke and pin to drive lever and tighten yoke lock nut.

The moving joints should be occasionally lubricated with a light coat of Toshiba B8 grease.

- Circumvent the handle interlock by pushing a screwdriver through the slot and operate the handle several times.
- Check that the CPI electrical interlock (microswitch) operates each time the handle is moved. The CPI (control power interlock) should close approximately 10° before the handle reaches the full ON position. As the handle is moved from ON to OFF, the CPI switch should open by the time the handle has moved approximately 10° or one inch.
- Check that the handle interlock to the vacuum contactor operates freely. Lubricate with Toshiba B8 grease if necessary. Refer to the GENERAL DESCRIPTION section for the location of the handle mechanical interlocks and the CPI electrical interlock.



INTERLOCKS

CONTACTOR RATINGS**TABLE 1 CONTACTOR TYPE HCV-5HAM (Magnetically Held)**

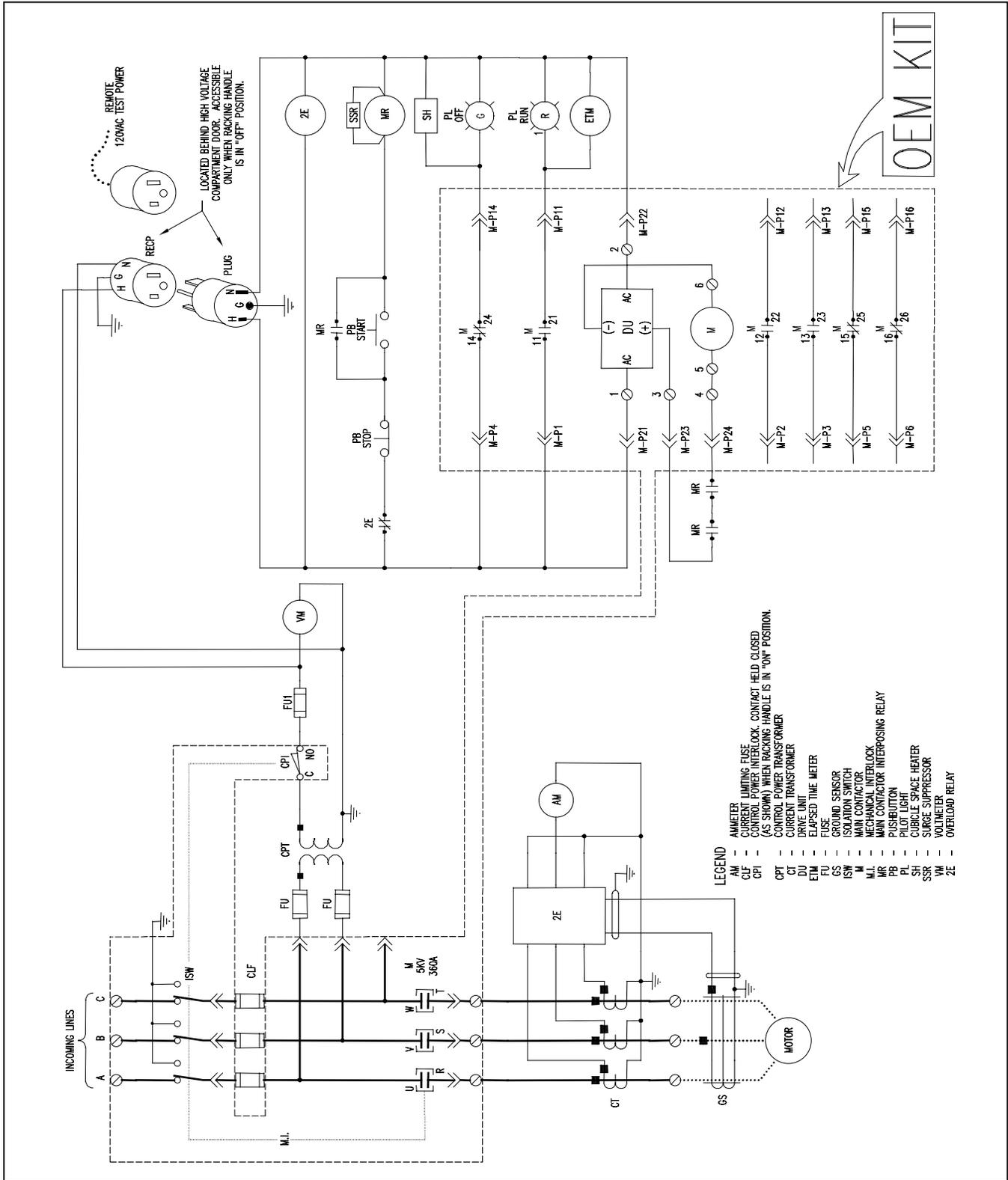
Maximum Voltage	7200 Volts
Maximum Current	400 Amps
Interrupting Capacity	7000 Amps RMS Sym. @ 5 kV Max 4500 Amps RMS Sym. @ 7.2 kV Max
Permissible Switching Frequency	1200/Hour
Mechanical Life	2,500,000 Operations
Electrical Life	250,000 Operations
Closing Time	80 ms or less
Opening Time	25 ms or less
Arcing Time	10 ms or less
Pick-up Voltage AC or DC	85% Rated (Hot) – 75% Rated (Cold)
Drop-out Voltage AC or DC	50% Rated (Hot) – 40% Rated (Cold)
Rated Control Voltage AC *	115/120 or 230/240 V 50/60 Hz
Rated Control Voltage DC *	120/125 or 240/250 V
Coil Circuit Inrush	670 VA AC (700W DC)
Coil Circuit Holding	85 VA AC (85W DC)
Auxiliary Contact Arrangement	3 N.O. – 3 N.C. (Max-STD)
Auxiliary Contact Rating	10 A, 600 V (NEMA Class A600)

* Coil drive board setting required (120 VAC standard)

CONTACTOR TYPE HCV-5HAML (Latched Type)

Permissible Switching Frequency	300/Hour
Mechanical Life	250,000 Operations
Tripping Voltage	65-75% Rated DC
Tripping Current	4.8 A DC Max

Other characteristics of latched contactor same as magnetically held type except number of auxiliary contacts is reduced to 2 N.O. – 3 N.C. Standard operating voltage is 120VAC Close / 125VDC Trip.



OEM KIT

Toshiba International Corporation ("Company") warrants that all equipment and parts described herein will be free from defects in materials and workmanship. THIS WARRANTY WILL EXPIRE EIGHTEEN (18) MONTHS AFTER THE DATE ON WHICH SUCH EQUIPMENT AND PARTS (EXCLUDING REPAIRED OR REPLACEMENT EQUIPMENT AND PARTS FURNISHED PURSUANT TO THIS WARRANTY) ARE SHIPPED BY THE COMPANY TO THE INITIAL PURCHASER OR TWELVE (12) MONTHS AFTER SUCH EQUIPMENT AND PARTS (EXCLUDING REPAIRED OR REPLACEMENT EQUIPMENT AND PARTS FURNISHED PURSUANT TO THIS WARRANTY) ARE FIRST PLACED IN OPERATION, WHICHEVER PERIOD FIRST EXPIRES.

The Company will, at its option, repair or replace such equipment or part which is defective under the terms of the foregoing warranty, free of charge; provided the purchaser (1) promptly notifies the Company in writing of such defect, and (2) furnishes the Company satisfactory proof thereof, and (3) establishes that the equipment or part has been properly installed, maintained and operated within the limits of rated capacity and normal usage and in accordance with this manual, and (4) if requested by the Company, returns the defective equipment or part to the Company and pays all expenses incurred in connection with such return. The repaired or replacement equipment or part will be delivered, free of charge, to the purchaser F.O.B. the Company's warehouse or, at the Company's option, F.O.B. a Company authorized service shop, not loaded on truck or other carrier. The purchaser will pay the costs applicable to the equipment or part following such delivery, including, without limitation, all handling, transportation, assembly, insurance, testing and inspection charges.

THE FOREGOING OBLIGATION TO REPAIR OR REPLACE EQUIPMENT PARTS SHALL BE THE SOLE AND EXCLUSIVE REMEDY OF THE PURCHASER, ITS CUSTOMERS AND USERS OF THE EQUIPMENT AND PARTS FOR BREACH OF THE FOREGOING WARRANTY. THE COMPANY WILL HAVE NO OBLIGATIONS TO DISASSEMBLE ANY EQUIPMENT OR PART WHICH IS DEFECTIVE WITHIN THE TERMS OF THE ABOVE WARRANTY OR TO INSTALL ANY REPAIRED OR REPLACEMENT PART OR EQUIPMENT OR TO PAY ANY COSTS INCURRED IN CONNECTION WITH ANY SUCH DISASSEMBLY OR INSTALLATION. THE COMPANY, TOSHIBA CORPORATION AND THEIR SUPPLIERS AND SUBCONTRACTORS HEREBY DISCLAIM ALL OTHER EXPRESS, STATUTORY AND IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, ALL EQUIPMENT AND PARTS FURNISHED PURSUANT TO THE FOREGOING WARRANTY AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY.

The total liability of the Company, Toshiba Corporation and their suppliers and subcontractors for any loss, damage or claim, whether in contract, tort (including negligence and liability without fault), or otherwise, arising out of, connected with or resulting from the equipment and parts described in this manual or the performance or breach of any contract for the sale or supply of such equipment and parts, or from the design, manufacture, sale, delivery, resale, installation, technical direction or supervision of installation, inspection, testing, repair, replacement, operation, maintenance or use of any such equipment or part or any service relating thereto furnished by the Company shall not in any event exceed the price allocable to the equipment, part or service which gives claim, loss or damage. In no event, whether as a breach of contract or warranty, alleged negligence, liability without fault, or otherwise, shall the Company, Toshiba Corporation or their suppliers or subcontractors be liable for special or consequential damages, including, without limitation, loss or profits or revenue, loss of equipment described herein or any associated equipment, cost of capital, cost of substitute equipment or parts, facilities or services, down-time costs, labor costs or claims of customers of the purchaser for such damages.

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