Westinghouse

AMPGARD STARTERS

HIGH VOLTAGE **VACUUM CONTACTOR** **FUSED**

DESCRIPTION

APPLICATION

The Westinghouse Ampgard is a high voltage starter designed for starting and controlling AC motors with horsepower and voltage ratings as indicated in Fig. 1. Check Fig. 1 and starter nameplate against motor nameplate and power system.

ENCLOSURE

Ampgard starters are supplied in a basic sheet steel floor mounted enclosure that is 36" (914 mm) wide x 30" (762 mm) deep x 90" (2286 mm) high. A 10" (254 mm) high main bus enclosure can be added at the top which increases the total enclosure height to 100" (2540 mm) . Each basic 90" (2286 mm) high enclosure can accommodate one or two Ampgard starters depending on the requirements.

INSTALLATION

Installation procedures are specified on 6432D29, a copy of which is supplied with this booklet. These recommended procedures will save you time if you follow them. In general, the cable connections can be made by access through the front of the enclosure. Alternatively, where there is access space behind the installation, the rear panel of the enclosure can be removed in order to facilitate the wiring. Sufficient space has been reserved near the left hand enclosure wall for high voltage line and load cables while low voltage cables may be conveniently arranged near the right hand enclosure wall.

GENERAL

Ampgard vacuum starters use the type LF-66V430 vacuum contactor, type LFM4 isolation switch, current limiting fuses, and either type LFC current transformers or through type current transformers. These major components are arranged as shown in Figure 2 where the starter is shown in the de-energized position.

The flow of power through the starter can be traced by referring to Figure 3 where the starter is shown in the energized position. The line stab assembly (1), mounted at the back of the enclosure also serves as the starter line terminals. The stabs themselves are engaged by the fuse jaws (2) of the isolation switch which is mounted on rails at the top of the enclosure. The line ferrules (3) of the power fuses (4), clip into the fuse jaws, and the load ferrules (5) fit into the fuse holders (6) which are part of the contactor line terminals. Power flow through the contactor is from the load ferrules of the power fuses, through the vacuum interrupter contacts (7) shunt (8) and then to the contactor load terminals (9). The contactor is mounted on rails in the lower part of the enclosure immediately adjacent to the current transformers, which are bolted to a panel in the side of the enclosure with the load terminals for the starter.

Spring loaded contact jaws mounted on the contactor load terminals plug into a lower stab assembly, providing a convenient connection to the motor load terminals.

Starter Type	Voltage	Freq. Hertz	Contactor Enclosed Continuous Rating In Amperes	Symmetrical 3 Phase Available Short Circuit Capacity in KVA	Horsepower Rating		
					Synchronous		Induction Motor
					100% P.F.	80% P.E.	
Ampgard 66L4	6600	50-60	360	570,000	5000	4000	4000

Fig. 1 Starter Ratings

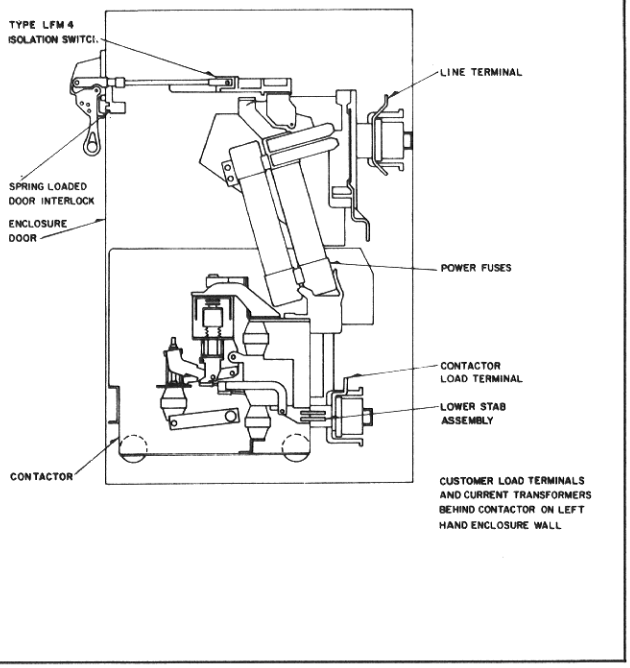


Fig. 2 Starter In De-energized Position *(Dwg. 6460D44)*

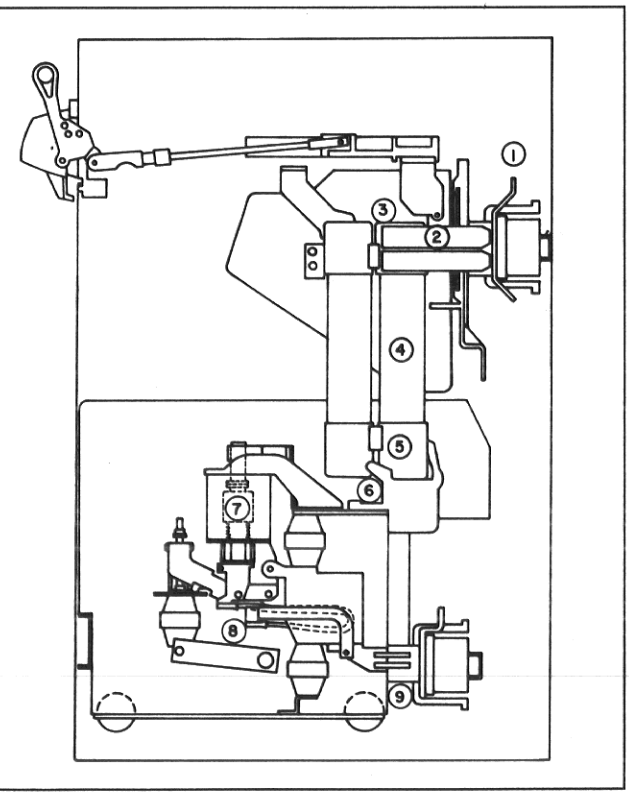


Fig. 3 Starter In Energized Position *(Dwg. 6376D62)*

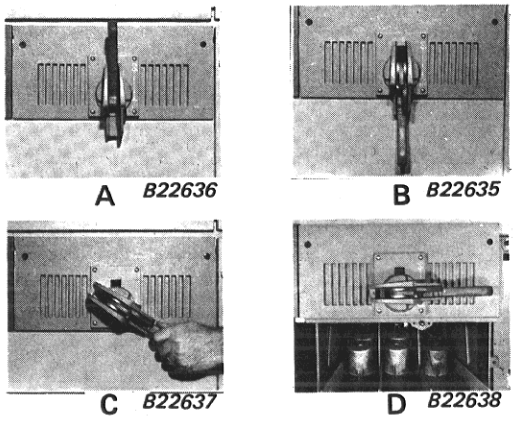
MECHANICAL INTERLOCKS

Before putting the starter into service, it is recommended that the user familiarize himself with the mechanical interlocks.

Isolation Switch Handle (See Figure 4). The isolation switch handle is operated by moving it through a vertical arc from the ON to the OFF position, and from the OFF position, it can be rotated 90° counterclockwise to the HORIZONTAL, or door open position.

In both the ON and OFF positions, a portion of the handle housing extends over the enclosure door, and thus prevents the high voltage door from being opened. To open this door, the handle must be moved to the HORIZONTAL position.

With the handle in the OFF position, either a single padlock or up to three padlocks locked in place will prevent the handle from being moved to either the ON or the HORIZONTAL position, thus preventing both unauthorized entry into the high voltage compartment and accidental closing of the isolation switch while maintenance work is being done. From the HORIZONTAL position, the handle cannot be moved to the ON position, without first moving to the OFF position.



The operating handle has three distinct positions.

In the ON position (A), the isolation switch is closed, the high voltage door is locked shut, and the starter may be energized.

In the OFF position (B), the isolation switch is open, the high voltage door is locked shut and the starter is de-energized and grounded.

With the handle rotated 90% counterclockwise (C) to the HORIZONTAL position (D), the isolation switch is open, the starter is de-energized, grounded, and the door to the high voltage compartment may be opened.

Fig. 4 Isolation Switch Operation

Door Interlocks. With the isolation switch handle in the HORIZONTAL position, the high voltage compartment door can be opened. As soon as the door opens, a mechanical interlock becomes effective. It is designed to prevent the user from accidentally operating the isolation switch handle and closing the starter on to the line with the enclosure door open.

This interlock is a spring loaded plunger located just below the handle housing (see Figure 2.) This prevents the handle from being accidentaly returned to the OFF position. This interlock may be deliberately cheated by depressing the plunger with a screwdriver so that the handle can be moved to the OFF position to observe the operation of the isolation switch during installation or maintenance. To do this, it is necessary to deliberately cheat the interlock. The operator should be aware of what he is doing and take appropriate safety precautions.

The safety interlock has to be reset before the door can be closed again. The operating handle must be in the HORIZONTAL position to provide clearance for the door, thus resetting the interlock.

Contactor to Isolation Switch Mechanical Interlock (see Figure 5). The Type LFM isolating switch functions only as a disconnect; it must never close, or interrupt a power load. To prevent this, an interference lever (31), mounted on the contactor is

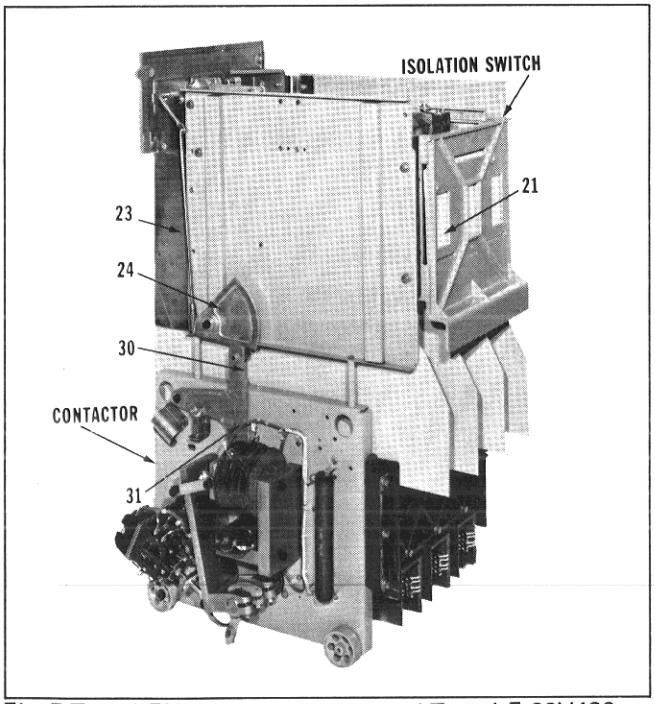


Fig. 5 Type LFM4 Isolating Switch and Type LF 66V430 Contactor *(Photo B22618)*

engaged by a cam (24) mounted on t switch. If the contactor is closed, the iso cannot be moved either from the OFF to from the ON to the OFF positions. This interlock, it cannot be cheated without dis the switch.

Isolation Switch Insulating Shutter - As switch is opened, an insulating shutter s the insulating rear barrier to prevent an access to the line bus. This shutter is n driven and thus is positive in action. As slides across the openings to the line st stripes appear to indicate that the shutt When the isolating switch is fully oper fingers are retracted from the line connected to the ground bar, groundin

The shutter and grounding fingers are vis front of the enclosure, and should be c final precaution.

CONTROL PANEL AND LOW VOLTAG COMPONENTS

The low voltage components com interposing relay, protective relays and mounted on a fixed panel. The co transformer is bolted to the L.H. contact comes out with the contactor. The pr control transformer is connected to the the main fuse assembly, and is prote current limiting fuses mounted in ins blocks located above the transformer. Th supplies power to the 110 volt control ci fuses mounted on the right hand conta

To energize the primary of the control from the line, the contactor must be pus enclosure to engage the lower stab a main power fuses must be installed, and switch must be closed on to the line.

Test-Run Plug. For convenien maintainence, when it may be desirabl the contactor or the control circuit, a con a test position is provided. To use it simpl the plug from the socket, (under t transformer on the contractor), and p 50/60 hertz, 110 volt single phase ext Special plugs may be provided when spe user.

Disconnect this temporary circuit and plug to its socket on the contactor bef unit to service.

SHORT CIRCUIT AND OVERLOAD PROTECTION

Electrical protection is provided by the power fuses and by the overload relay. The current limiting power fuses have a special time/current characteristic for motor service, and this characteristic is coordinated with the characteristic of the overload relay. Currents greater than full load motor current, up through locked rotor current, will operate the overload relay and trip the contactor before the fuses blow. This prevents unnecessary blowing of the fuses. Since the interrupting capacity of the contactor is 75,000 KVA, the power fuses must operate faster than the overload relay when current exceeds this value, in order to prevent damage to the contactor. In all faults above 75,000 KVA and within the rating of the equipment, the fuses will operate first.

The current transformers, overload relay heaters, and power fuses are coordinated with the motor characteristics, so that the starter must be used with the motor for which it was designed. Motors with special characteristic or loads requiring special protection often require other or additional protective relays. Consult the instruction leaflet for the particular relay before attempting any adjustment or service.

START-UP PRECAUTIONS

Before attempting to put a newly installed vacuum starter into service, study the wiring diagram and available instruction literature. In some instances the recommendations are more stringent than for conventional airbreak equipment. Westinghouse manufactures vacuum contactor starters to the same exacting standards as airbreak equipment, but we recommend additional precautions until operating personnel have developed more experience with vacuum devices.

General Precautions. Be sure that:

1) The corresponding starter and motor are connected as shown on the Westinghouse drawings. This is particularly essential in this class of motor starter as the fuse ratings, current transformers, and overload heater elements are based on the characteristics of the particular motor to be controlled.

2) The starter is connected to a suitable power supply with characteristics agreeing with motor and starter nameplate markings.

3) The motor and machine it drives are properly lined up, bolted down, lubricated, free of obstructions, and ready to go.

4) Connections are neat, tight, of proper capacity and in agreement with the diagram.

5) Equipment has been cleaned of dirt, scraps of wire, tools, and all other foreign material.

6) THE INSULATION LEVEL OF THE STARTER SHOULD BE CHECKED BEFORE THE STARTER IS ENERGIZED. Refer to maintenance and repair section for additional information regarding the checking of insulation level.

7) All possible safety precautions have been taken and the installation conforms with applicable safety codes.

Isolation Switch. Be sure that:

1) The main power fuses have been properly installed. See the permanent operating instructions on the inside of the high voltage door.

2) The mechanical interlocks operate freely, are properly adjusted, and that they will operate to provide the intended protection.

3) It is recommended that the isolating switch be opened when the motor is not to be in operation for extended periods to reduce the possibility of unintentional energization of the motor in the event of a dielectric failure within one or more of the interrupter units while the contactor is idle.

CONTACTOR

1) Vacuum contactors rely entirely on the presence and quality of a vacuum within the sealed interupter units for their current interrupting ability much as oil immersed, gas filled or air blast contactors or circuit breakers rely on the presence and quality of some special arc interrupting media for their successful operation. The presence and quality of the vacuum within the interupter units may be determined by means of a dielectric test performed across open contact gaps as described in Vacuum Contactor I.L. 16-200-20.

It is important to check the quality of the vacuum before the contactor is energized for the first time and then regularly thereafter because in the event the contactor opens under load, but due to an interrupter

failure is unable to interrupt load current, it would then become possible to operate the isolating switch under load. The isolating switch is not intended to interrupt load current.

Periodic interrupter dielectric tests should not be omitted on the basis of apparently satisfactory contactor performance since under certain operating conditions the contactor may perform satisfactorily even though one of the vacuum interrupter units is defective. Also be sure that:

2) The four contactor phase barriers are installed.

3) The drawout latch is engaged.

4) The magnet armature and moving contact system move freely.

Control Circuit. Be sure that:

2) The female low voltage control connector, (on the right hand enclosure frame) has been pushed into the male control connector on the contactor.

1) The high voltage and low voltage control fuses are properly installed.

3) The test-run plug on the left is plugged into the socket on the potential transformer panel.

Close the high voltage door, the low voltage door, and then tighten the door latches. Move the isolating switch handle of the OFF position. The Ampgard starter is now ready for operation.

MAINTENANCE AND REPAIR

GENERAL

This industrial type control is designed to be installed, operated, and maintained by adequately trained workman. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, check-out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

Ampgard starters should be operated by authorized personnel only. Personnel authorized to operate the isolating switch and those authorized to inspect, adjust, or replace equipment inside the enclosure should have a complete understanding of the operation of the starter, and must have thorough training in the safety precautions to be followed when working with all high voltage equipment.

A maintenance program should be established as soon as the starter has been installed and put into opration. After the starter has been inspected a number of times at monthly intervals and the conditions noted, the frequency of inspections can be increased or decreased to suit the conditions found, since this will depend upon the severity of the duty.

Before attempting maintenance, consult the specific diagram and the general and specific device instruction leaflets.
leaflet.

INSULATION LEVEL

After installation, and before energizing the starter for the first time, the insulation resistance between poles and from each pole to ground should be measured and recorded. It is not practical to specify an absolute value for this reading since it is dependent on other connected apparatus and conditions of service.

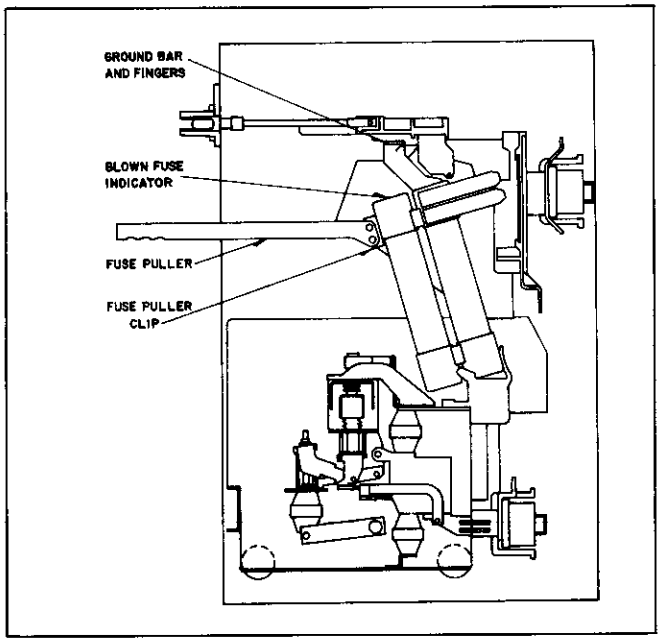


Fig. 6 Fuse Removal *(Dwg. 6376D75)*

However, any unusually low reading or abrupt reduction in a reading would indicate a possible source of trouble, and the cause should be established and corrected. Before startup and periodically thereafter, a 14 KV 60 hertz dielectric test should be performed across interrupter contacts blocked at a gap of .125" (3.2 mm).

FUSES (See Figure 6). The Power fuses should be inspected after each fault-clearing operation, since this is the most severe service to which they will be subjected. Visual indication of a blown fuse is provided by a colored indicator in the top of the fuse. This indicator pops up and is visible over the top of the contactor arc chutes when the fuse is blown.

Blown fuses may be removed and replaced by using the fuse puller provided.

The correct procedure for replacing fuses is described on the instruction sheet (NP 6432D30H01) which is permanently fastened inside the door. This instruction sheet also lists the correct fuse rating and fuse part number for that particular starter. The same type, rating and part number of power fuses must be used for replacement in all cases.

If preferred, fuses may be removed and replaced by hand.

If for any reason, there is doubt about the condition of a fuse, a simple test is to check its electrical continuity.

CONTACTOR

The Type LF66V430 contactor can usually be inspected in its normal operating position. To make a more detailed examination, or to carry out maintenance work, the contactor can be withdrawn from the enclosure to a drawout position as follows:

1) Remove the power fuses.

2) Remove all four phase barriers by lifting slightly pulling forward, and then rotating the top outwards.

3) Lift the contactor latch on the left hand side of contactor, grip the contactor and pull sharply to free the contactor from the stab connectors at the back.

4) **Carefully** slide the contactor toward you to the detent position.

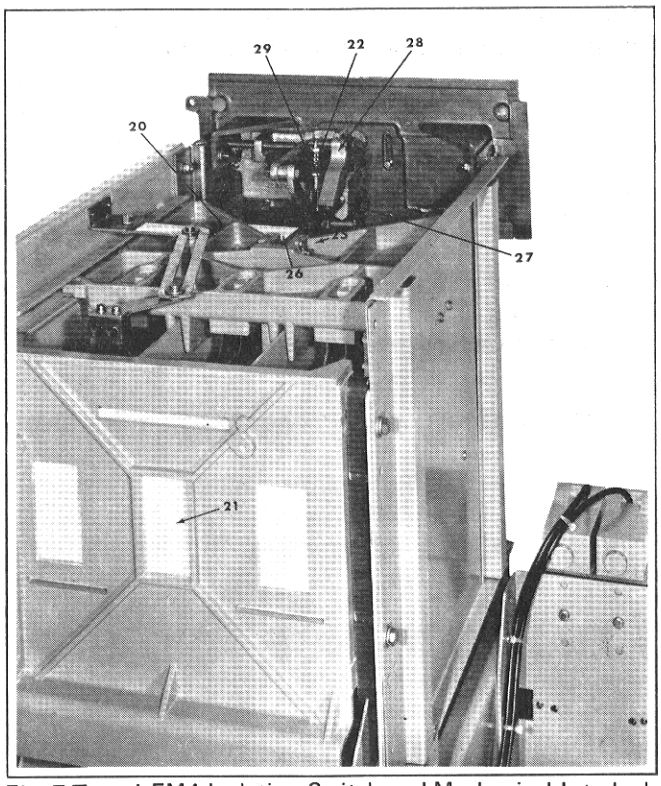


Fig. 7 Type LFM4 Isolation Switch and Mechanical Interlock Adjustment

It will again be stopped by the contactor latch (located at the front lower left corner of the contactor) about ¾ of the way out.

In this drawout position, all routine maintenance can be carried out. For major overhaul, the contactor can be completely removed from the enclosure by taking two more steps:

7) Remove the low voltage control plug from the contactor.

8) Press down the contactor stop latch, and roll the contactor out of the enclosure onto the floor, or in the case of an upper unit onto a fork truck or other suitable platform of the right height.

TYPE LFM ISOLATION SWITCH

Removal. Any maintenance beyond visual examination should be carried out with the switch removed from the enclosure. This will avoid the possible hazard of closing the switch on to an energized line when the mechanical interlock has been cheated manually.

To remove the isolation switch from the cabinet:

1) De-energize main power feeder, or take

precaution noted below.

2) Remove the power fuses and the four contactor phase barriers.

3) Remove the Type LF contactor.

4) Remove the two bolts located one in each top corner of the isolation switch front casting.

5) Slide the isolation switch out of the cabinet.

Generally, it is most convenient to place the isolation switch at the edge of a bench or table, to facilitate maintenance. Note that while it is safe to remove the contactor and isolation switch from the enclosure with the main line bus energized, once the isolation switch has been removed, the line stab assembly at the back of the enclosure is uncovered, is energized, and is thus a hazard. Be sure to close and latch the doors, and display a DANGER sign on the enclosure.

Examination. With the isolation switch on a table or bench, check the following points:

1) Move the operating handle through its full range of operation from the HORIZONTAL position, through OFF to ON (door interlock has to be cheated manually). The handle should move freely, without binding, and the top insulating tray and safety shutter at the back of the switch should glide smoothly in their guides.

2) With the handle on the ON position, the ends of the fuse jaws will project through the openings in the safety shutter and rear insulating barrier. Move these jaws by hand, they should appear to be loose and should pivot freely up and down.

3) When the cam (24) is blocked, the mechanical interlock must lock the handle mechanism and prevent the fuse jaws from being moved from either the ON to OFF position or from the OFF to ON position. In the OFF position it is normal for the shutter to open slightly when an attempt is made to force the handle with the interlock engaged. In the ON position, the shutter should never intefere with the ends of the fuse jaws.

Adjustment (See Figure 5 and 7). Normally, the isolation swicch will not require any adjustment; however, if for any reason parts are removed or replaced, it will be necessary to adjust the top insulating tray (20), safety shutter (21), rocker linkage (22), cam adjustment rod (23) and cam (24).

The adjustment procedure is as follows:

1) Adjust the shutter travel by removing the tray pin (25) and turning the rod end (26) into or out of the clevis (27) until the shutter just moves to the end of its travel when the handle is moved to the OFF position. If the shutter tends to be bent towards the handle then the rod end (26) must be loosened until this condition is eliminated.

2) Adjust the rocker (28) so that when the handle is moved from the "OFF" to the "ON" position, the rocker just clears the end of the clevis (27). Make this adjustment by tightening or loosening the adjustment clevis (29).

3) Adjust the interlock cam (24) so that it will just touch the roller (30) on the contactor. Make this adjustment by tightening or loosening the cam adjustment rod (23). As a final check, install isolation switch, contactor, and fuses, and with the feeder bus de-energized see if disconnect can be opened or closed with contactor either held closed mechanically or energized from a separate control supply.

Opening the Main Door Under Abnormal Conditions. In the unlikely event that either the isolation switch fuse jaws or the contactor contacts should weld closed, or if an event should occur so that the isolation switch handle cannot be moved from the ON to the OFF postion, provision has been made so that the high voltage door can be opened in an emergency. The door can be opened by using the following procedure:

1) Make sure that the main incoming power line is de-energized, to avoid a hazardous situation when the door is opened.

2) Remove the four screws holding the rectangular handle housing of the isolation switch to the front casting.

3) The complete handle housing can now be pushed up far enough to provide clearance for the door. The door can be opened and any maintenance carried out.

Westinghouse Electric Corporation
General Control Division
Buffalo, New York, U.S.A. 14240

Printed In U.S.A.
3/74