Westinghouse

AMPGARD STARTERS

HIGH VOLTAGE **33L2** **FUSED**

DESCRIPTION

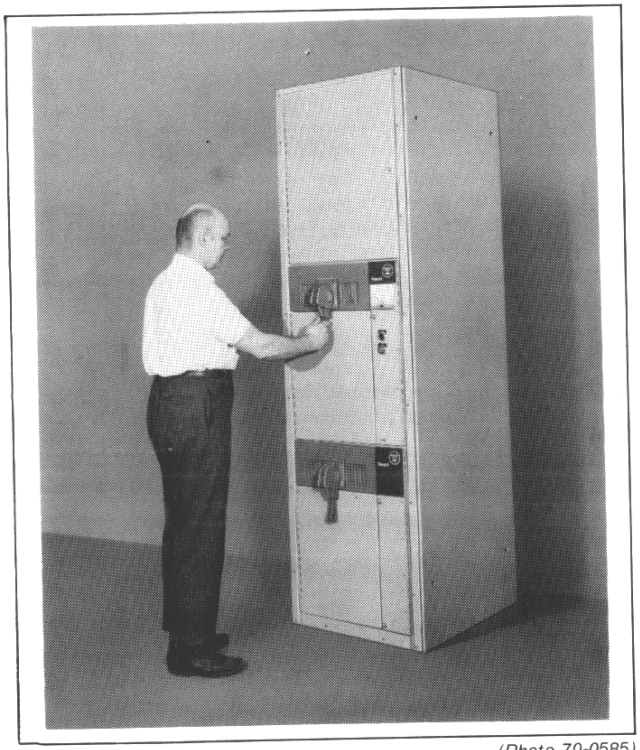
APPLICATION

The Westinghouse Ampgard is a high voltage starter designed for starting and controlling AC motors with horsepower and voltage ratings as indicated in the Rating Table on page 2. Check Table and starter nameplate data against motor nameplate and power system data.

ENCLOSURE

The Ampgard 33L2 starter can be installed in either wall mounted or floor mounted enclosures.

Floor Mounted. Floor mounted starters have a basic enclosure 26'' (660 mm) wide x 30'' (762 mm) deep x 90'' (2286 mm) high. Each 90'' (2286 mm) high enclosure can accommodate one, two, or three Ampgard 33L2 starters, depending upon the requirements. A typical floor mounted installation is shown in Figure 1. A 10'' (254 mm) high main bus enclosure can be added at the top which increases the total enclosure height to 100'' (2540 mm).



(Photo 70-0585)

Fig. 1
Ampgard 33L2 floor mounted installation

Wall Mounted (See Figure 2). The wall mounted starter has a rectangular enclosure, 22'' (559 mm) wide x 30'' (762 mm) deep x 33'' (838 mm) high. This enclosure has two compartments:

1) A cable pull box for mounting on a wall or structure. This box not only accommodates the main load and line power cables, control wiring, and all conduits, but also provides the mounting for the starter cabinet.

2) A cabinet 22'' (559 mm) wide x 24'' (610 mm) deep x 32.75'' (832 mm) high, which contains the Ampgard 33L2 starter. To complete the enclosure, the

(Photo 70-0586)

Fig. 2
Ampgard 33L2W wall mounted starter

cabinet is bolted to the wall mounted pull box during installation.

The pull box greatly simplifies the installation procedure, and is particularly useful during construction where it is convenient to arrange the wiring and wall mounting before the starter is really required. The pull box is recommended for most applications; however, its use is optional, and the user may prefer to mount the cabinet directly to a wall or a machine. In this event, cutouts for conduit entry are made directly into the cabinet, and the enclosure is completed by fitting a specially insulated steel panel to the back of the cabinet before wall mounting.

INSTALLATION

Floor Mounted Installation. The installation procedure is described on installation instruction sheet which is shipped with each floor mounted unit. These recommended procedures will save you time if you follow them.

In general all the cable connections can be made by access through the front of the enclosure. In addition, where there is access space behind the installation, the rear panel of the enclosure can be removed in order to aid wiring. The rear 6" (152 mm) of the 30" (762 mm) enclosure depth will easily accommodate the load and line cables.

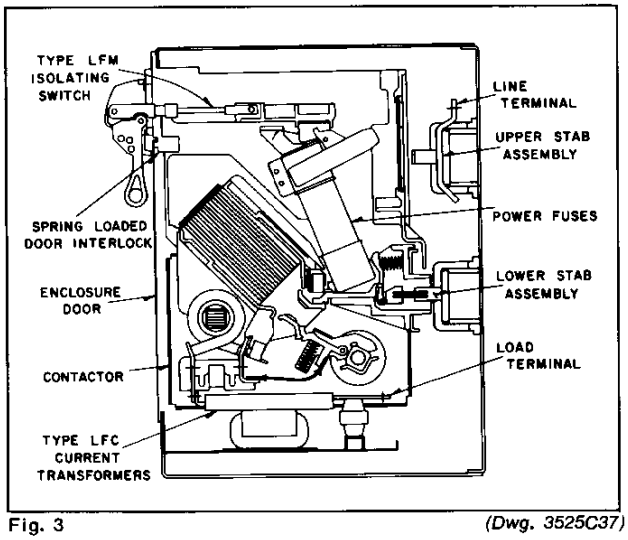


Fig. 3 *(Dwg. 3525C37)*
33L2 starter in de-energized position

Wall Mounted Installation. The installation procedure is described in step by step detail on installation instruction sheets which are shipped with the starter and the pull box.

GENERAL DESCRIPTION

The Ampgard 33L2 starter uses a type LF contactor, a type LFM isolating switch, current limiting fuses and type LFC current transformers. These four major components are arranged as shown in Figure 3, where the starter is shown in the de-energized position.

The flow of power through the starter can be traced by referring to Figure 5, where the starter is shown in the energized position. The line stab assemply mounted at the back of the enclosure also serves as the starter line terminal 1. The stabs are engaged by the fuse jaws 2 of the isolating 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. Power flow through the contactor is from the load ferrules of the power fuses, through the contacts 7, shunts 8, and electromagnetic blowout coils 9, to the contactor load terminals 10. The contactor is mounted on rails in the lower part of the enclosure, immediately above the Type LFC current transformers 11, which are bolted to the bottom of the enclosure. The front terminals of the current transformers bolt directly to the contactor load terminals, while the rear terminals are supported by standoff insulators, and provide the load terminals 12 for the starter. Thus the flow of power, from starter line to load terminals, is directly from component-to-component, completely eliminating all internal bus or cable connections.

Spring loaded contact jaws mounted on the contactor fuse support plug into a lower stab assembly, providing a convenient connection to the contactor for use in reversing, multispeed, and reduced voltage starter applications. These lower stabs are also used to energize the control transformer.

SAFETY INTERLOCKS

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

Starter Type	Contactor Continuous Rating (Amperes)		System Voltage (50/60 Hertz)	Horsepower Rating			Fuse Interrupting Capacity (Symmetrical Amperes)	Controller Interrupting Capacity – 3 Phase Symmetrical KVA
				Synchronous		Induction Motor		
	Open	Enclosed		100% P.F.	80% P.F.			
Ampgard 33L2	200	180	3300	1250	1000	1000	40,000 50,000	230,000 285,000

Fig. 4 Ratings

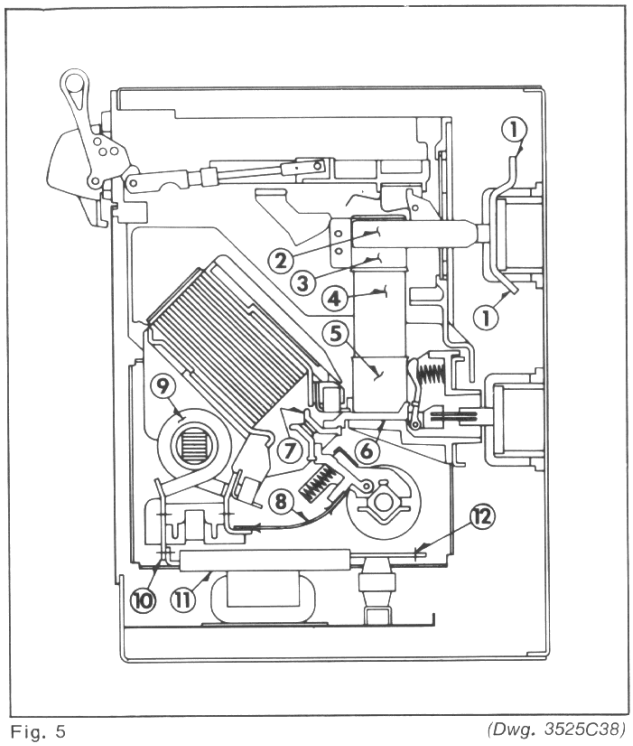


Fig. 5 *(Dwg. 3525C38)*
33L2 starter in energized position

Isolation Switch Handle - (See Figure 6).. The isolation switch is opened by moving the handle 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.

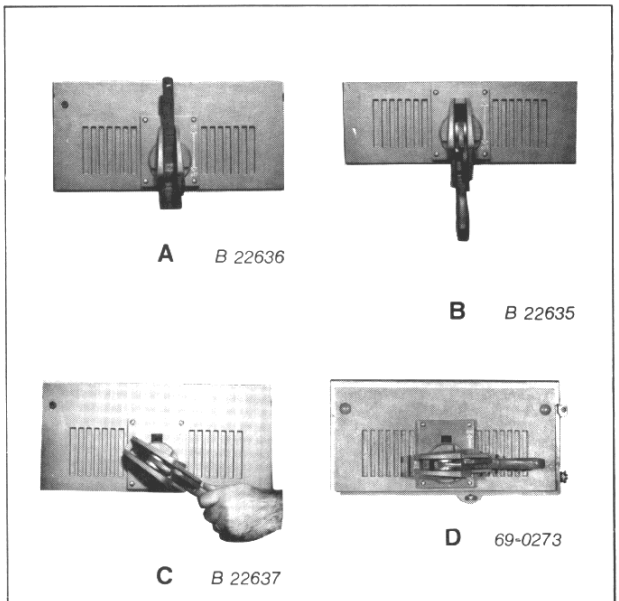
In both the ON and OFF positions, a portion of the handle housing extends over the enclosure door, and thus prevents the high voltage door from being opened. To open this door, the handle must be moved to the HORIZONTAL position.

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.

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 behind the door. When the door is open, it extends and prevents the handle from being accidently moved to the OFF position. If the user wishes to observe the operation of the isolation switch during installation or maintenance, this interlock must be deliberately cheated to move the handle to the OFF position. This is done by depressing the plunger with a screwdriver while moving the handle.

Caution - This action allows the user to close the switch on to the line stabs. He should be fully aware of the hazards, familiar with the operation of the switch, and take all appropriate safety precautions. The handle must be returned to the HORIZONTAL position to close the high voltage door. Moving the handle from the vertical OFF position to the HORIZONTAL position automatically resets the interlock.



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 can 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 can be opened.

Fig. 6
Isolation switch operation

Contactor - Isolation Switch Mechanical Interlock - (See Figure 7). The type LFM isolating switch functions only as a disconnect - it must never close on to or interrupt a power load. To prevent this, a mechanical interlock between contactor and isolating switch is provided. If the contactor is closed, the interlock lever on the contactor armature actuates a mechanical linkage that locks the handle operating mechanism of the switch. This is a positive interlock - it cannot be cheated without disassembly of the switch.

Isolation Switch Insulating Shutter - As the isolation switch is opened, an insulating shutter slides across the insulating rear barrier to prevent any accidental access to the line bus. This shutter is mechanically driven and thus is positive in action. As the shutter slides across the openings to the line stabs, warning stripes appear. When the isolation switch is fully opened, the line fingers are retracted from the line stabs and connected to the ground bar, grounding the fuses.

The shutter, the ends of the isolating switch fuse jaws and the grounding fingers are all visible from the front of the enclosure, and should be checked as a final precaution.

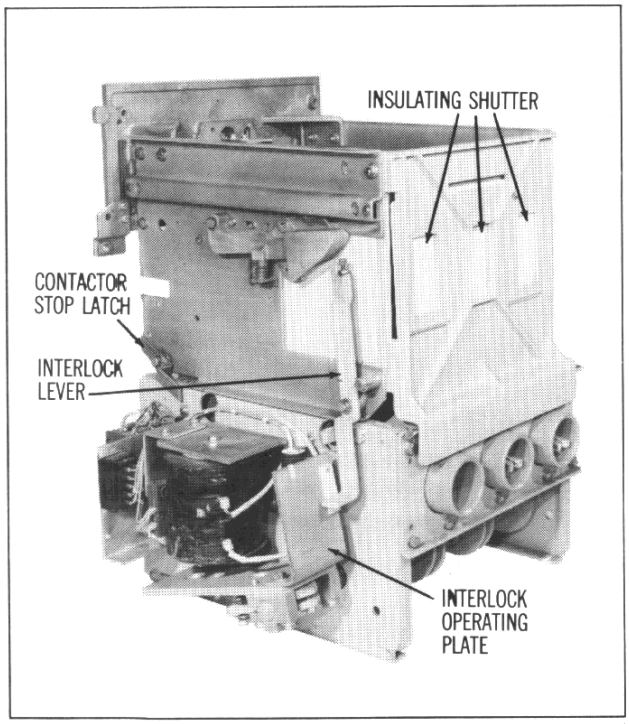


Fig. 7 *(Photo 70-0587)*
Showing Mechanical interlocking between type LFM isolating switch, and type LF-33H230 contactor

CONTROL PANEL AND LOW VOLTAGE COMPONENTS

The starter low voltage components are mounted on the drawout panel. A silicon rectifier and test plug are bolted to the bottom of the low voltage compartment. The control power transformer, nominally rated at 600 VA, single phase, is bolted to the cabinet wall and is located below the control panel. The primary of the control transformer is connected to the line through the lower stab assembly, and is protected by current limiting fuses mounted in insulating fuse blocks located in the control fuse department. The transformer secondary supplies 110 VAC to the ungrounded control circuit through 10-ampere fuses mounted next to the test plug.

To energize the primary of the control transformer, the contactor must be pushed into the enclosure, the main power fuses must be installed, and the isolation switch must be ON.

Test-Run Plug - For convenience during maintenance, when it may be desirable to energize the contactor or the control circuit only, a control plug with a test position is provided. To use it, simply disconnect the plug from its socket, (under the interlocks on the contactor), and plug it into a 50/60 Hertz, 110 volt single phase extension cord. Special plugs may be provided when specified by the user.

Caution - Disconnect this temporary circuit and restore the plug to its socket before returning the unit to service.

SHORT CIRCUIT AND OVERLOAD PROTECTION

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 characteristics of the overload relay. Since the interrupting capacity of the contactor is 25,000 KVA, the power fuses must operate faster than the contactor when the fault exceeds this value, in order to prevent damage to the contactor. Currents greater than full load motor current, up to some value above locked rotor current, will operate the overload relay and trip the contactor before the fuses blow. This prevents unnecessary blowing of the fuses.

The current transformers, overload relay, and power fuses are coordinated with the motor characteristics, so that the starter must be used with the motor for which

it was designed to obtain correct performance. Motors with special characteristics 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 starter into service, study the wiring diagram and available instruction literature.

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 starters 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 control nameplate data.

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 materials.

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 checked for conformance with applicable safety codes.

Isolation Switch - Be sure that:

1) The 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 and are properly adjusted in order to provide the intended protection. See maintenance and repair section of this instruction leaflet for adjustment procedures.

Contactor - Be sure that:

1) The arc chutes are in the operating position. Push them firmly into place to be sure that the knife switch blades engage and deflect the knife switch jaws mounted adjacent to the main contacts.

2) THE FOUR CONTACTOR PHASE BARRIERS ARE INSTALLED.

3) The three bolts connecting the contactor load terminals to the current transformers are tight.

4) The magnet armature and moving contact system move freely, without friction.

Control Circuit - Be sure that:

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

2) The contactor control plug has been pushed into the control plug socket on the contactor.

3) The test-run plug is plugged into its socket below the contactor interlocks.

Close the high voltage door, the low voltage door, and then tighten the door latches. Move the isolating switch handle to the OFF position. The Ampgard is now ready to be energized.

MAINTENANCE AND REPAIR

GENERAL

This industrial type control is designed to be installed, operated, and maintained by adequately trained workmen. 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 isolation 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 operation. After the starter has been inspected a number of times at monthly intervals and the conditions noted, the frequency of inspection 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.

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. However, any unusually low reading or abrupt reduction in a reading would indicate a possible source of trouble, and the cause should be investigated and corrected.

Fuses – The current limiting fuses should be inspected after each fault-clearing operation, since this is the most severe service to which they will be subjected. Check the fuse resistance, and compare this value with a new fuse. 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 when the fuse is blown.

Blown fuses may be removed and replaced by using the fuse puller stored alongside the contactor rail in the low voltage compartment.

The correct procedure for replacing fuses is described on the operating instruction panel which is permanently fastened inside the high voltage door. This instruction panel 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 for any reason, there is doubt about the condition of a fuse, a simple test is to check its electrical continuity and resistance.

When replacing fuses, the fuse puller clamp should be removed from the line ferrule of the blown fuse and installed on the replacement fuse. If preferred, fuses may be removed and replaced by hand.

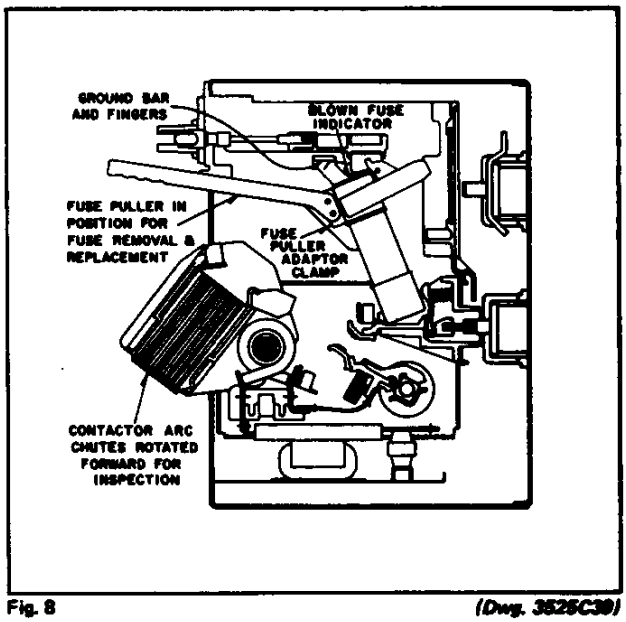


Fig. 8 (Dwg. 3525C39)
Fuse removal

Contactor – The Type LF contactor contacts can be examined by simply pulling the arc chutes forward to rotate them out of the operating position (See Figure 8). To make a more detailed examination, to replace contacts, or to carry out any maintenance work, the contactor can be withdrawn from the enclosure to a draw-out position.

To do this:

1) Remove the three 5/16 bolts connecting the contactor load terminals to the current transformers.

2) Using the fuse puller, rotate the arc chutes forward and then remove the power fuses.

3) Rotate the arc chutes back into the operating position and then remove all four phase barriers by lifting slightly, pulling forward, and then rotating the top outwards.

4) Grip the inside of the contactor end plates and pull sharply to free the contactor from the stab connectors at the back.

5) Carefully slide the contactor out as far as it will go.

   It will be stopped by a stop latch (located at the front lower right corner of the isolating switch) about 3/4 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:

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

7) Release the contactor stop latch, and lift the contactor out of the enclosure.

For additional information, see the Type LF contactor instruction leaflet, IL. 16-200-18.

TYPE LFM ISOLATION SWITCH

Removal – Any maintenance beyond the 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 the 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 in each top corner of the isolation switch front casting.

5) Slide the isolation switch out of the cabinet.

Note that the interlock lever projects below the bottom edge of the switch at the right hand side. Generally, it is most convenient to place the isolating switch at the edge of a bench or table, or on top of the contactor, so that this lever is free to pivot.

Caution – 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 – HIGH VOLTAGE** 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 (the door interlock has to be cheated manually). The handle should move freely, without binding, and the top insulating tray and the safety shutter at the back of the switch should glide smoothly in their guides.

2) With the handle in 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) The mechanical interlock should be positive in action with the handle in both the ON and the OFF positions. In the OFF position, the safety shutter should not open more than .12" (3mm) when an attempt is made to force the handle with the interlock engaged. In the ON position, the shutter should not interfere with the ends of the fuse jaws when the handle is forced against the interlock.

Adjustment (See Figure 9). Normally, the isolating switch 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 A, safety shutter B, and interlock lever C. The procedure is as follows:

1) Place the operating handle in the ON position.

2) Remove the pivot pin H and turn the adjustment rod D until the guides on the edge of the tray are about .12" (3mm) from the rear insulating barrier.

3) Place the operating handle alternately in the ON and OFF positions. In each position, move the interlock lever C under the tray interlock casting E.

4) Turn the adjustment rod D until the clearance between the end of the interlock lever C and the casting E is the same for each position of the operating handle. This clearance is usually of the order .06" to .12" (1.5 to 3mm) , and since it cannot be seen, is estimated by moving the interlock casting up or down. It is important to get this adjust-

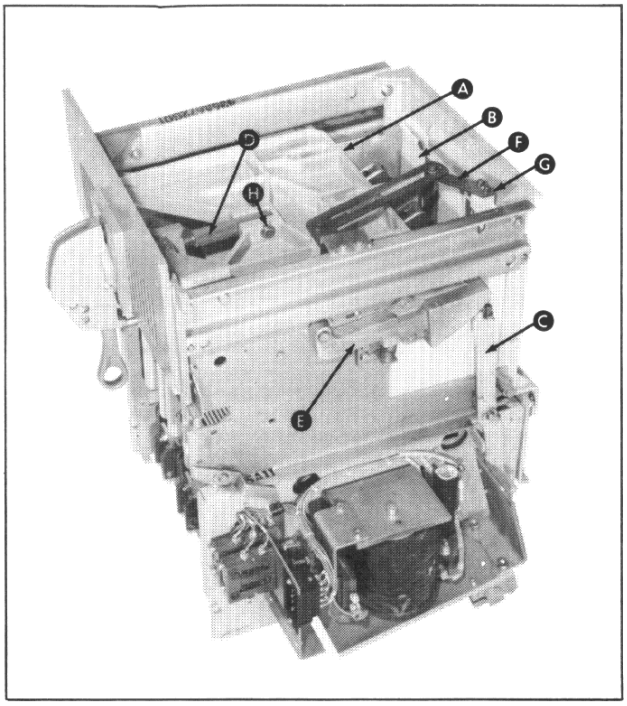


Fig. 9 *(Photo 70-0588)*
Type LFM isolating switch and mechanical interlock adjustment

ment equal for both the ON and OFF positions, since too small a clearance may result in the interlock lever jamming under the casting, and too large a clearance might allow the fuse jaws to leave the stab assembly and thus interrupt a power circuit.

5) Adjust the set screw on top of the interlock lever C until the clearance between the casting and the stop screw is .031 to .094'' (.8 to .24mm) .

To adjust the safety shutter travel:

6) Center the small shutter lever F on the shutter B by eye, and tighten the two screws.

7) Place the operating handle alternately in the ON and OFF positions. With the handle in the ON position, the shutter openings should line up with the openings in the rear barrier. Adjust the shutter lever F to obtain this position. In the OFF position, the shutter should completely close the openings in the rear barrier, and when the door interlock is engaged and an attempt is made to move the handle from OFF to ON, the shutter should not open (up to .12'' (3mm) is permissible).

   Further adjustment of the shutter lever to obtain this optimum setting may be required.

Opening the High Voltage Door Under Abnormal Conditions – In the unlikely event that either the isolation switch line fingers or the contactor contacts should weld closed, or if any other event should occur such that the isolation switch handle cannot be moved from the ON to the OFF position, 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 emergency procedure.

1) Make sure that the incoming power line to the starter 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 emergency maintenance carried out. The handle housing cannot be removed – it is held by a retaining screw installed from the rear of the front casting.