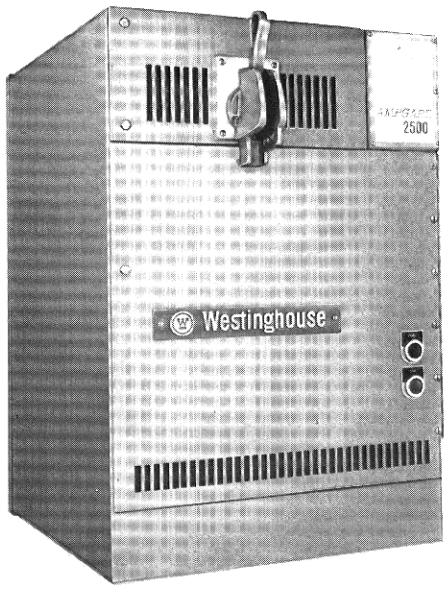
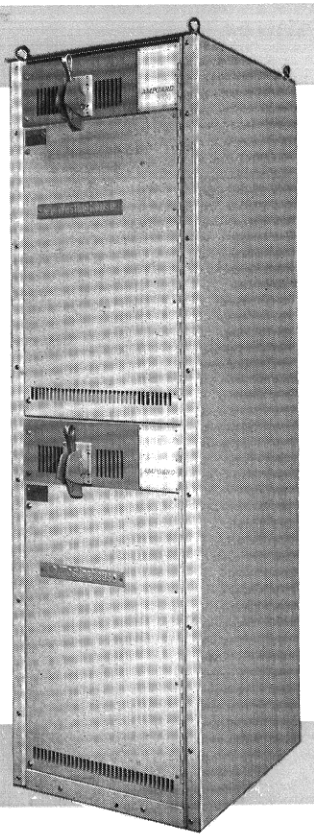
AMPGARD 2500® and *AMPGARD* 5000®
medium voltage fused starters

2200 to 5000 volts • to 700 hp at 2300 volts, 1500 hp at 4160 volts
air break contactor • interrupting capacity: 150,000 kva at 2300 volts
250,000 kva at 4160 volts



Ampgard 2500
wall mounted



Ampgard 5000
floor mounted

application

The new Westinghouse Ampgard 2500 and Ampgard 5000 medium voltage fused starters provide flexibility never before available for medium voltage applications. Rated at 2200-5000 volts, they are the first starters designed as integrated, complete units precisely matched to motor ratings, and engineered to provide component-to-component connections and front accessibility of all components and terminals.

The Ampgard 2500 for wall mounting is 22″ wide, 24″ deep and 32¾″ high. The Ampgard 2500 and 5000 units, through various arrangements in standard 90″ high, 26″ wide, 30″ deep floor mounted cabinets, are easily adapted for the following service: non-reversing and reversing, full and reduced voltage, for squirrel cage, synchronous and wound rotor motor starting.

features

ease of installation: current limiting fuses, contactor assembly and isolating switch assembly are easily removed from the enclosure; line and load terminals are completely accessible from the front

ease of maintenance: all components are front accessible, facilitating routine inspection and replacement

positive mechanical isolating switch: completely isolates starter circuit from line, leaving no exposed voltage parts

personnel safety: door is mechanically interlocked with disconnect switch; low voltage control circuits isolated from voltage power circuits

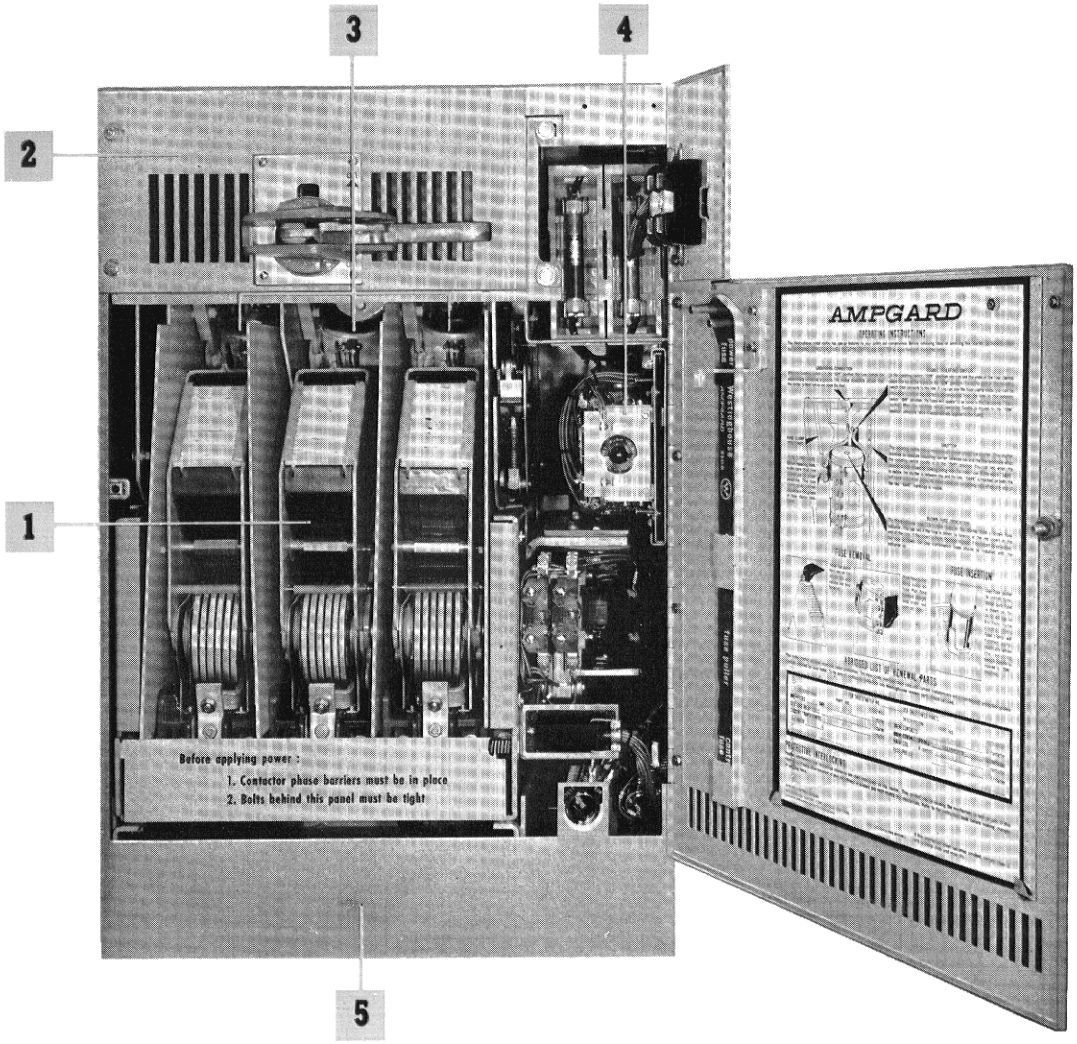
simplicity of electrical design: component-to-component circuit design eliminates cable connections and possible corrosion, failure and excess heat

designed, tested and verified in the Westinghouse High Power Laboratory: starter with fuses has an interrupting capacity of 150,000 kva at 2300 volts and 250,000 kva at 4160 volts; conforms with NEMA standards for E2 type starters

DESIGN TESTED AND VERIFIED in the Westinghouse HIGH POWER LABORATORY

August, 1964
supersedes descriptive bulletin 11-012, dated February, 1962
mailed to: E/1121,1124,1125/DB; D/792,795,797/DB; C/238,240,244,254/DB

design features



1 **type LF air-break contactor:** described on page 3

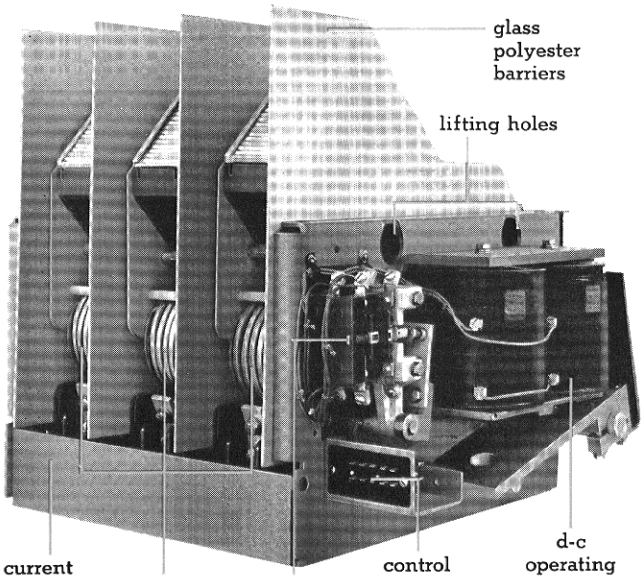
2 **type LFM mechanical isolating switch:** described on page 4

3 **current limiting fuses:** described on page 5

4 **low voltage control panel:** described on page 5

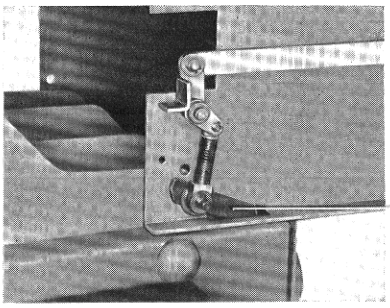
5 **enclosure:** described on page 6

1 type LF air-break contactor



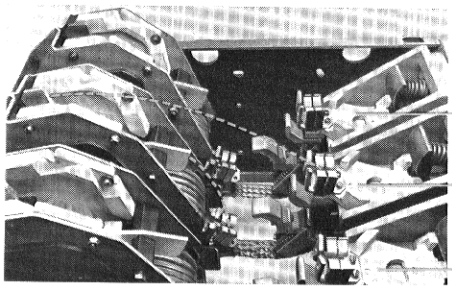
The type LF contactor was designed and engineered specifically for use in Ampgard 2500 and Ampgard 5000 starters. It is a self-supporting, compact and lightweight three-pole, d-c magnet-closed contactor rated at 200 amperes.

Of draw-out design, the contactor rests on guide rails in the bottom of the enclosure and is directly connected to the front terminals of the current transformers by three bolts. Two men can easily remove the contactor once it is unbolted from the current transformers. If it is not desirable to remove the contactor, a detent will lock it in draw-out position to allow routine inspection or replacement of coils or contacts. Flame-retarding barriers are used between phases and between the two outside poles and the contactor end plates.



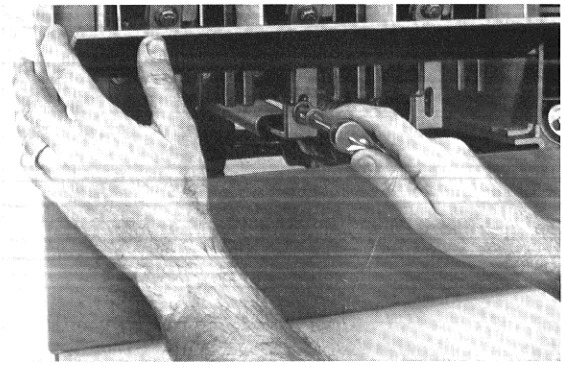
detent holds contactor in inspection position

The contactor design incorporates fuse clamps for the load side of the current limiting fuses and provides for plug-in connection to the high voltage side of the control transformer. Contacts are "single-break", high pressure type having weld-resistant contact faces. Two L-61 electrical interlocks provide four auxiliary circuits in any combination of "make" or "break". Blowout assemblies are series connected and mounted at the front of the contactor for easy access. The d-c clapper-type operating magnet provides quiet, positive contactor operation. A rectifier in the bottom of the enclosure supplies the coils with d-c power.

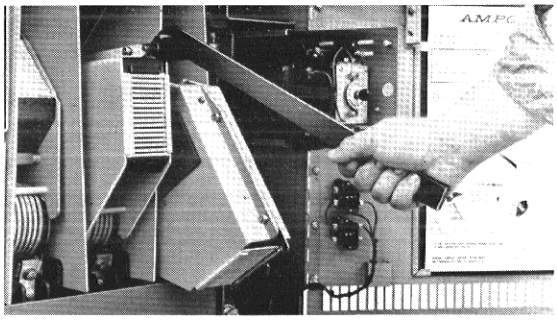


clamps for current limiting fuses

Arc chutes are De-ion type tilted forward at a 45° angle which directs hot gasses from the grid stack exhaust toward the enclosure door. With arc chutes in their normal operating position, electrical connections to the arc horns mounted in the chutes are made through knife-jaw assemblies mounted adjacent to the moving and stationary contacts. Arc chutes may be rotated out of their normal position, either by hand or by using the fuse puller provided, to allow convenient access for contact inspection.

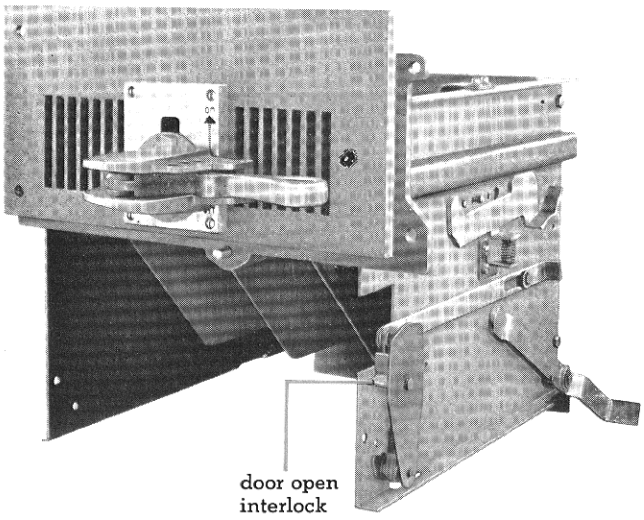


removing current transformer connection bolts



arc box being tilted out

2 type LFM mechanical isolating switch

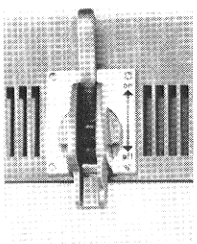


This is a draw-out type, light-weight, three pole manually operated isolating switch mounted on slide rails in the top of the enclosure. It may be easily removed, once the contactor and current limiting fuses have been removed, by loosening four bolts in the front casting.

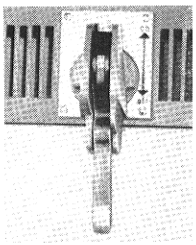
The component-to-component circuitry concept of Ampgard 2500 and Ampgard 5000 starters utilizes the current limiting fuses as part of the isolating switch. The switch is equipped with a fuse jaw so constructed that firm pressure is applied to the fuse ferrule when the switch is in the "on" position yet allows the fuse to be easily removed or inserted when the switch is open.

To operate the isolating switch, the operating handle is moved through a 180° vertical arc from the "OFF" to the "ON" position. In the "ON" and "OFF" position, a portion of the handle housing extends over the starter door preventing the door from being opened. From the "OFF" position, the handle must be rotated 90° counterclockwise to an access position which allows the enclosure door to be opened. When the door is open, an interlock prevents the handle from being returned to the "OFF" position. From the access position, the handle cannot be moved to the "ON" position without first moving to the "OFF" position.

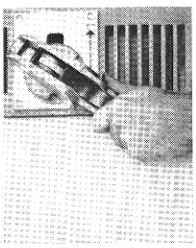
When the operating handle is moved from "ON" to "OFF", pairs of copper fingers are withdrawn from an incoming stab. As the fingers are withdrawn, they are automatically tilted up so that they are visible above the top of the fuses when viewed from the front, and are simultaneously grounded. At the same time as the fingers are withdrawn, a mechanically-operated insulating shutter is driven across the back barrier to completely prevent access to the line connections. As the insulating shutter slides into position, the word "safe" appears on the back barrier, giving visible proof that the stabs are disconnected.



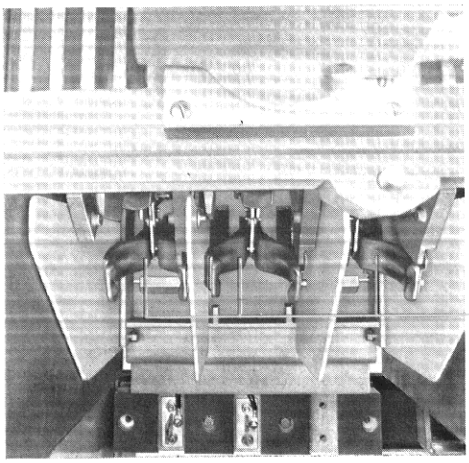
handle in ON position

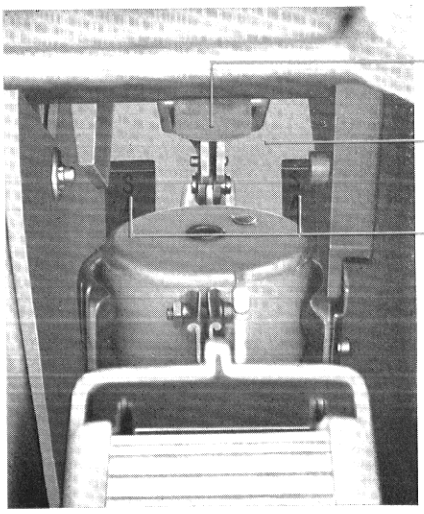


handle in OFF position



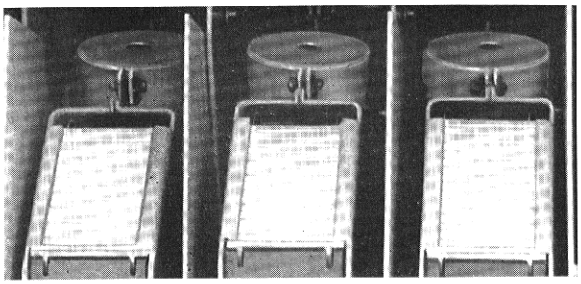
handle being moved from OFF to door open position



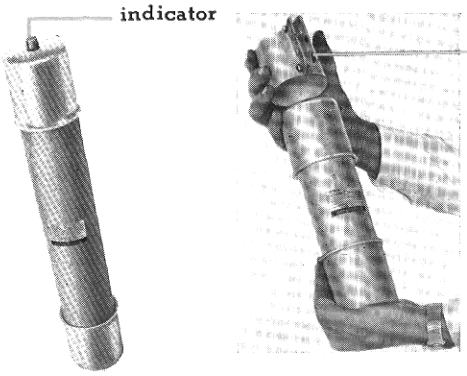


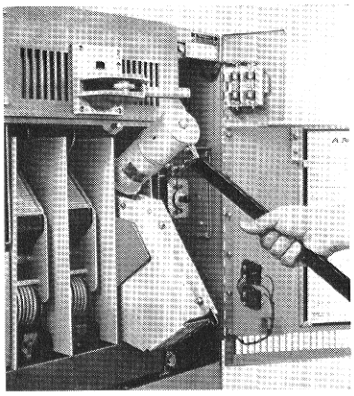
3 current limiting fuses

Ampgard 2500 and Ampgard 5000 starters use type CLS-1 fuses designed to limit peak currents to values less than the value of available short circuit current. Interruption is accomplished without expulsion of gases, noise or moving parts. Type CLS-1 fuses are completely self-protecting. They are mounted in a vertical position to insure maximum rating reliability, proper operation and to eliminate the possibility of dust and dirt collecting and causing a short. A plastic indicator in the top of the fuse provides visible proof that the fuse is blown: normally depressed, the indicator pops up and is visible over the top of the arc chutes when the fuse is blown. Blown fuses may be removed and replaced, without removing or drawing out the contactor, either by hand or by using the fuse puller provided on the starter door. Original equipment fuses are equipped with a fuse puller clamp.



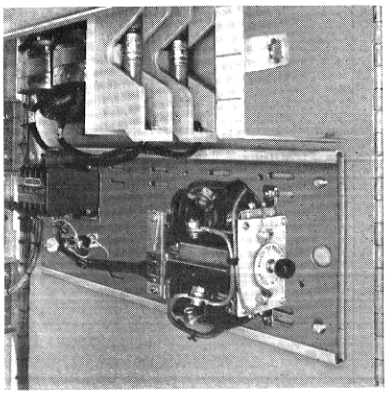
fuses mounted in vertical position



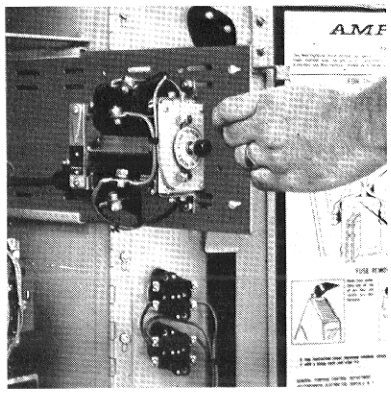


fuse being removed with fuse puller

4 low voltage control panel



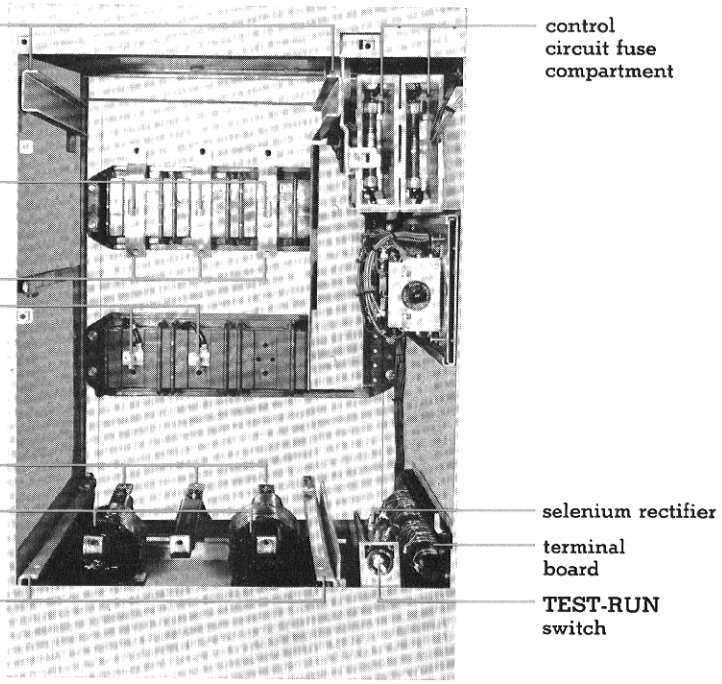
in normal position



being pulled out to inspection position

Mounted on the side of the enclosure, this is a draw-out panel which contains the following low voltage control components: interposing relay, overload relay and an aging resistor. The two-pole overload relays are temperature compensated, thereby affording maximum protection to the motor. The aging resistor adjusts the voltage supplied to the d-c magnet by the rectifier. Additional space is provided on the panel for mounting a third overload relay pole and one auxiliary relay, or for three dashpot-type overload relays in place of the standard overload relay. The panel draws out and is held in position for inspection or maintenance, but stops prevent its removal from the enclosure.

5 enclosure



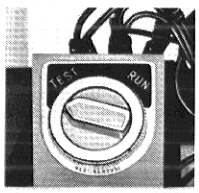
Units will be assembled in sheet steel cabinets meeting NEMA standards and specifications. Additional strength is given to the cabinet through the use of a minimum flange on one side and a continuous piano hinge on the other side. In addition to the main door, the compartment housing the medium and low voltage control circuit fuses has a small door designed so that it cannot be opened unless the main enclosure door is opened. Included as part of the enclosure assembly are the following:

slide rails for isolating switch
slide rails for contactor
line stabs for isolating switch
line stabs for contactor
current transformers
potential transformer
TEST-RUN switch
terminal board
selenium rectifier
line and load terminals

current transformers

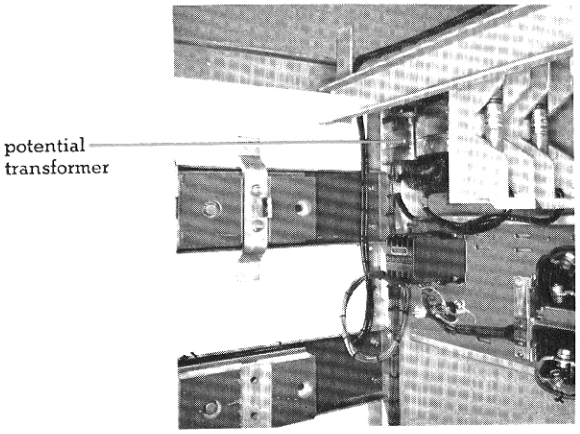
Type LFC current transformers are mounted in the bottom of the enclosure. The secondary windings are connected to the overload relays; the primary windings are bolted to the contactor on the front end while the back end provides a terminal for the load cable.

test-run selector switch



This is a double-pole, double-throw selector switch which permits the checking of the starter control circuit with the high voltage main supply disconnected. In the "TEST" position, the switch connects the control circuit to a separate 115 volt, 60 cycle supply. In the "RUN" position, the control circuit is energized from the secondary of the potential transformer.

potential transformer

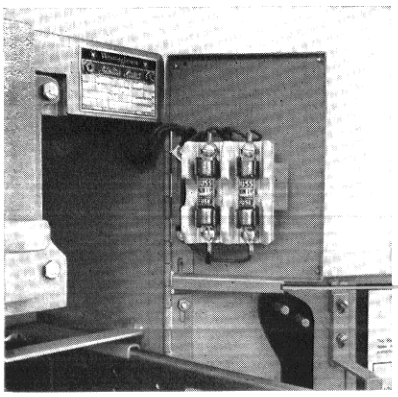


The type LFV single-phase potential transformer is mounted on the side of the enclosure above the low voltage control panel and behind the medium voltage control fuses. It is connected directly to the medium and low voltage control fuses.

selenium rectifier

This is a full wave, single-phase bridge rated 115 volts a-c and 1.02 amperes continuous. It supplies d-c power to the contactor coils.

control circuit fuse compartment



This is a separate compartment located in the upper right corner of the cabinet. It houses all medium and low voltage control circuit fuses. Like the main current limiting fuses, these fuses are mounted vertically to assure rating reliability and to eliminate shorting due to dust and dirt collecting on them. The door of this compartment is so constructed that it cannot be opened until the main starter door is opened.

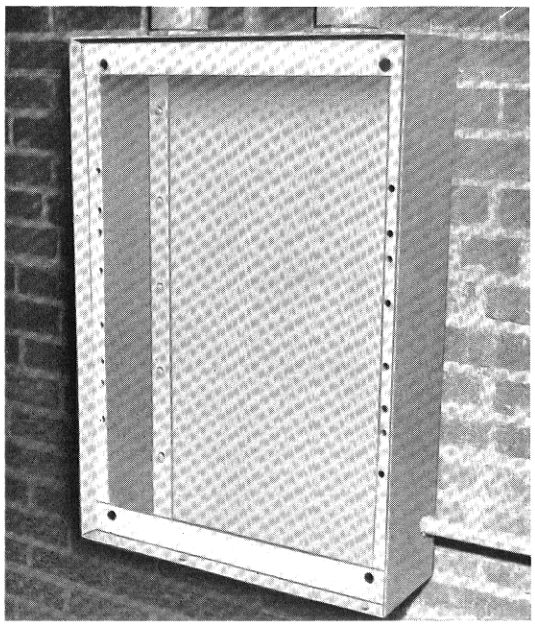
meter box and cable pull box (Ampgard 2500 only)

In addition to the basic wall mounted unit, other Ampgard 2500 wall mounted starter assemblies are available with the following enclosure additions:

meter box on top for mounting desired meters or auxiliary control items

cable pull box on back for pulling in line and load cable before installation of starter

The meter box is 12¼ inches high increasing total height to 45 inches. The cable pull box shown below mounted on wall is 6 inches deep increasing the total depth to 30 inches.



cable pull box (junction box)

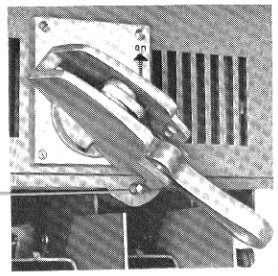
personnel safety features

One of the most important considerations in designing the Ampgard 2500 and Ampgard 5000 starter was personnel safety. The result is a complete system of interlocks and other safety features.

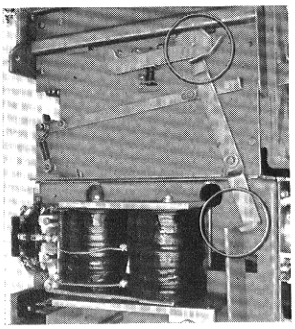
interlocks

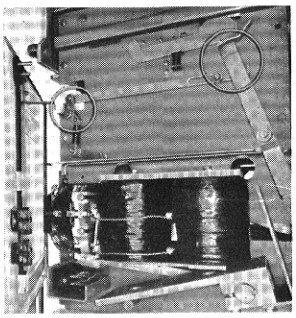
Ampgard 2500 and Ampgard 5000 interlocking includes:

- isolating switch handle housing extends over door when handle is in "ON" or "OFF" position preventing door from being opened (see LFM isolating switch)
- provision for key interlocks
- control circuit fuse compartment door cannot be opened until main starter door is opened
- when door is open, detent prevents operating handle from being moved to "OFF" or "ON" position



- with contactor energized, isolating switch cannot be opened (left, below)



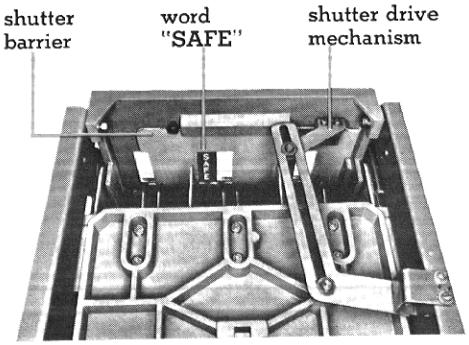


- with door open and contactor de-energized, isolating switch cannot be closed (right, above)

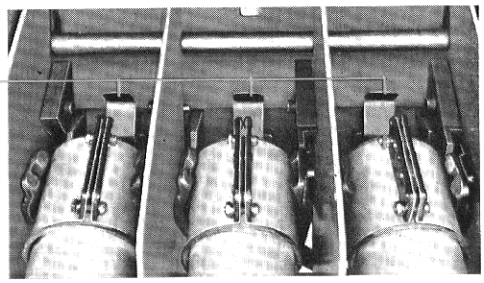
other safety features

In addition to the interlock system, Ampgard 2500 and Ampgard 5000 starters include many other features designed to protect operating personnel. These features include:

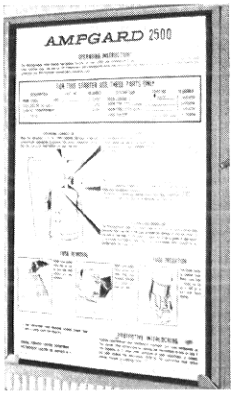
- provision for three padlocks on isolating switch handle in "OFF" position
- operating handle must be rotated 90° from locked "OFF" position in order to open main door, assuring complete isolation
- shutter barrier between line terminals and fuse stabs is mechanically driven in both directions



- clearly visible "safe" marking on back of switch assembly appears when shutter barrier is in position and starter is completely isolated from the line
- louvers are baffled to prevent entrance of foreign objects
- visible grounding clips provide a positive ground of the fuses to the enclosure as soon as the isolating switch is opened

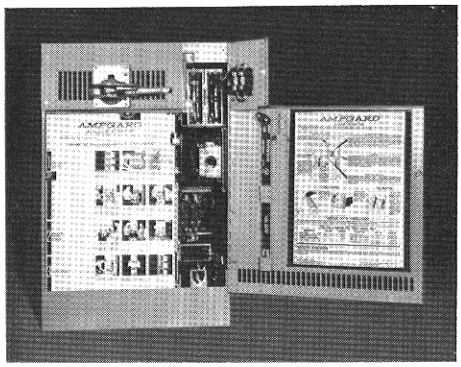


- illustrated operating instructions and renewal parts information mounted inside main enclosure door (shown at right)
- medium and low voltage circuits are compartmentized and isolated from each other
- 115 volt control circuit provided as standard

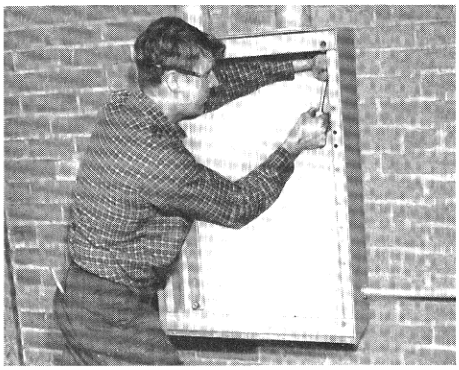


installation — Ampgard 2500 wall mounted starter

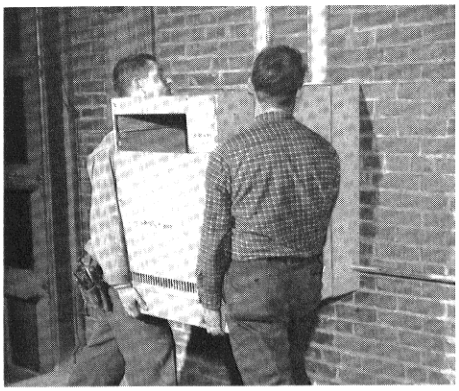
Ease of installation is one of the Ampgard 2500 starters outstanding features. Starters arrive completely assembled with only two shipping bolts to remove. Wall mounted units can be quickly and easily installed and wired by two men without any special tools using the illustrated installation instructions included. The following series of photos show the starter being installed.



1 starter with packing case removed showing installation instructions

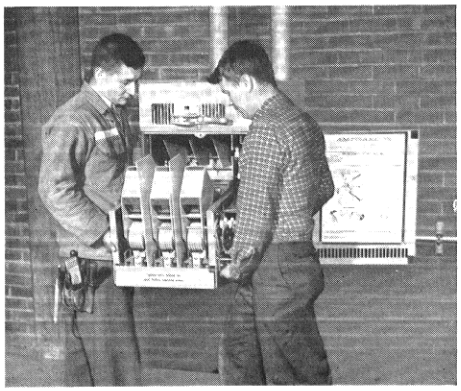


2 cable pull box being mounted on wall, with conduit connections

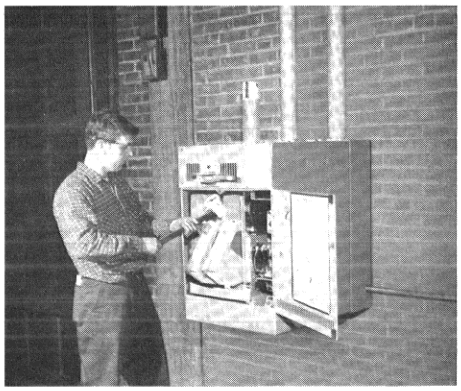


3 mounting empty cabinet on cable pull box (two men can easily do)

4 line and load cables connected to disconnect stabs and current transformers



5 contactor being installed in cabinet

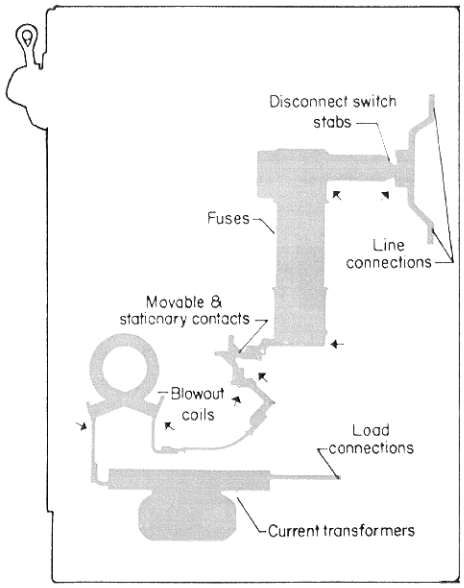


6 current limiting fuses being inserted in assembled starter.

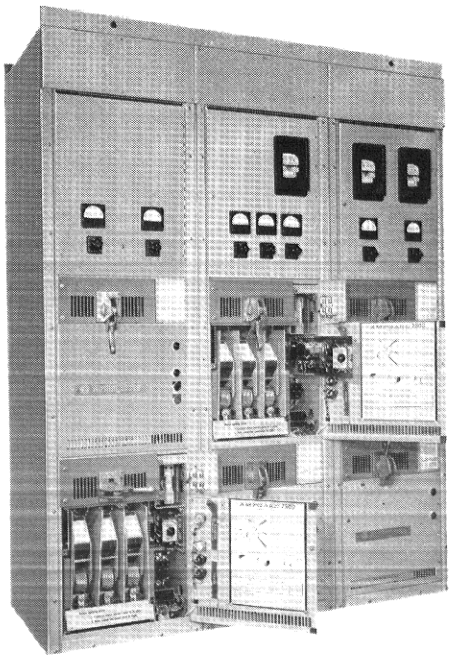
component-to-component circuitry

All major components of Ampgard 2500 and Ampgard 5000 starters—mechanical isolating switch, air-break contactor, current transformers and potential transformer—were designed specifically to function together as an integrated starter unit.

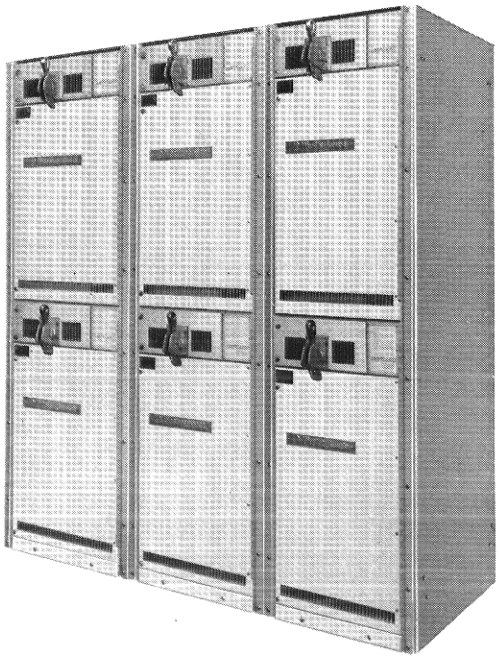
One of the most important design features, however, is the component-to-component circuit concept employed to eliminate 50 percent of the current carrying junctions. In this concept, the isolating switch, contactor, current limiting fuses and current transformer are electrically connected without use of cables. The drawing shown here illustrates the component-to-component circuitry used in Ampgard 2500 and Ampgard 5000 starters.



assemblies of starter units



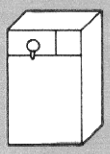
Ampgard 2500 assembly

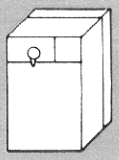


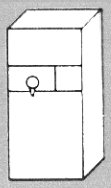
Ampgard 5000 assembly

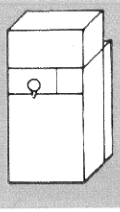
Ampgard 2500 and Ampgard 5000 starter arrangements

Ampgard 2500 wall mounted squirrel cage motor starters full voltage


basic wall mounted unit

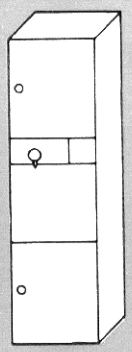

wall mounted with pull box

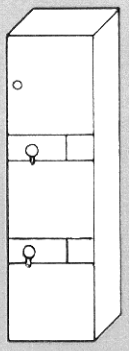

wall mounted with meter box

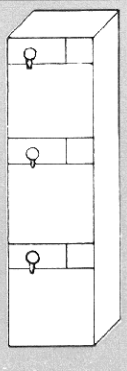

wall mounted with meter box and pull box

Ampgard 2500 and Ampgard 5000 squirrel cage motor starters

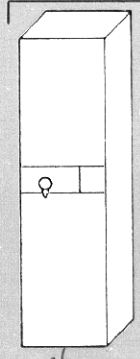
full voltage — Ampgard 2500

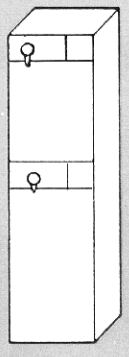

standard floor mounted assembly


two high assembly

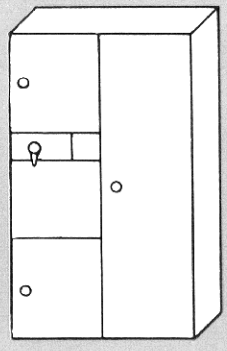

three high assembly

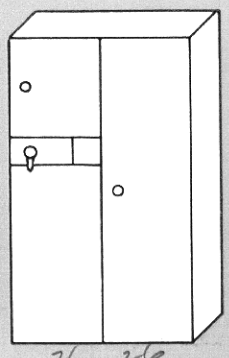
full voltage — Ampgard 5000


standard floor mounted assembly


two high assembly

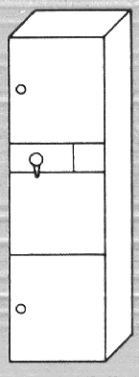
reduced voltage


reactor type

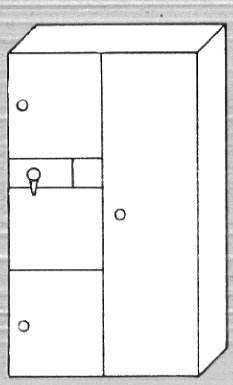

auto-transformer type

Ampgard 2500 and Ampgard 5000 synchronous motor starters

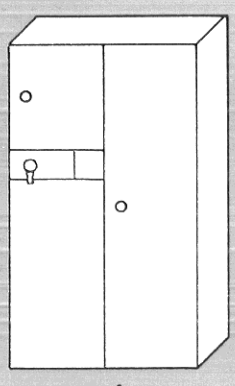
full voltage


standard floor mounted assembly

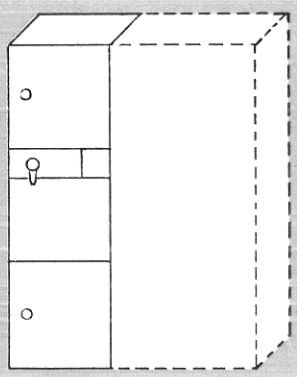
reduced voltage


reactor type

reduced voltage


auto-transformer type

Ampgard 2500 and Ampgard 5000 wound rotor motor starters


standard floor mounted assembly secondary resistors mounted and wired

further information

price lists

squirrel cage full voltage starters: price lists 11-021 and 11-022
squirrel cage reduced voltage starters: price lists 11-521 and 11-522
wound rotor motor starters: price lists 13-021 and 13-022
synchronous motor starters: price lists 14-021 and 14-022
incoming line units: price list 11-025

price modifications: price list 14-025

instruction leaflets

Ampgard 2500 and 5000 starters: IL 11-202-2
Ampgard starter: IL 7488
Static Slipsyn: IL 14-000-2A

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