HORIZONTAL DRAWOUT METAL-CLAD SWITCHGEAR

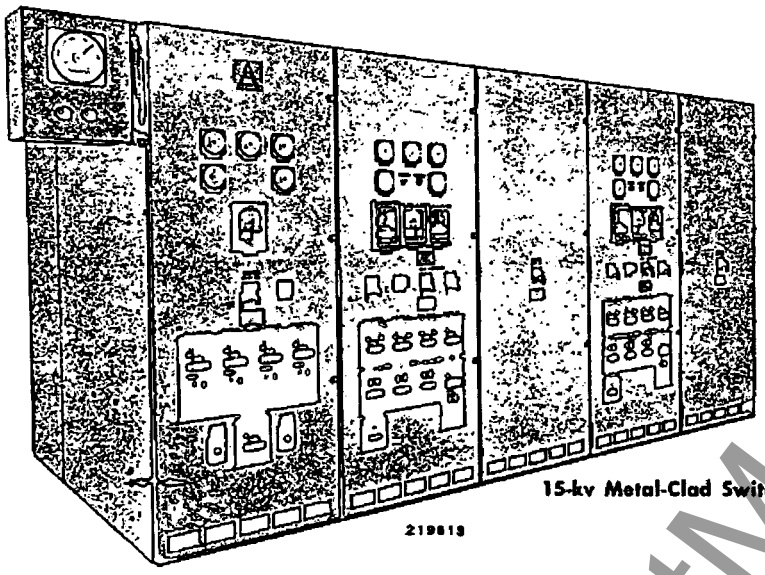
5- and 15-kv, 75 to 1000 mva interrupting capacity, 1200 to 3000 amperes continuous

ALLIS-CHALMERS

DESCRIPTION

SG 2.1

October, 1973



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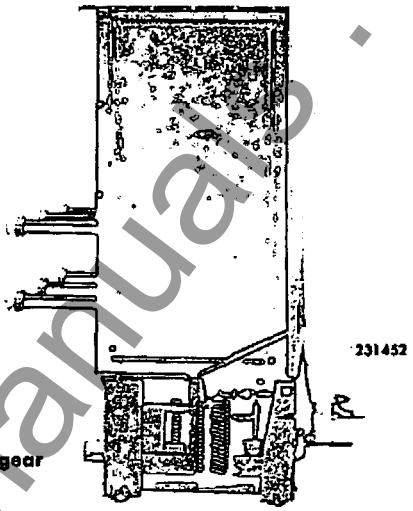

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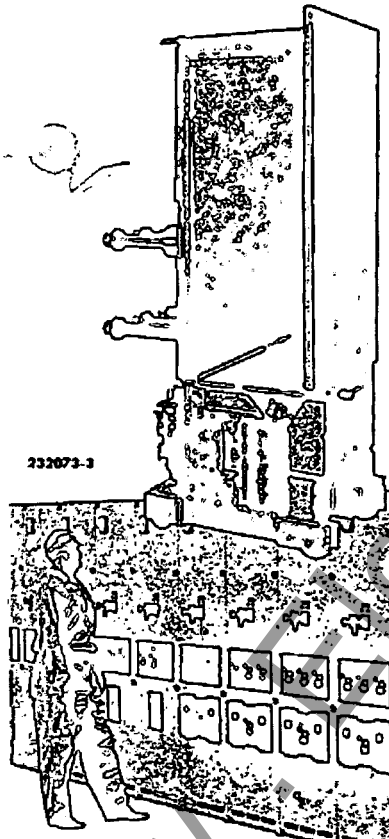
15-kv Metal-Clad Switchgear

CONTENTS



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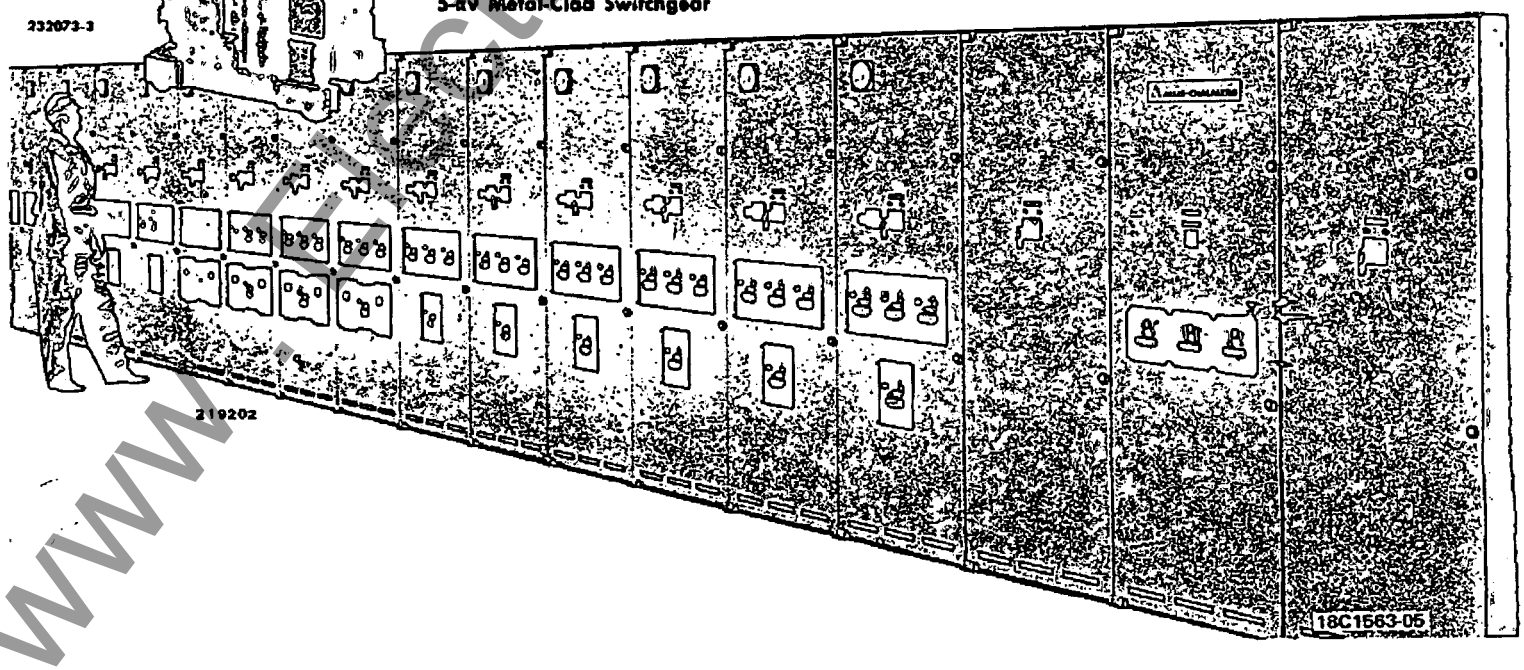
5-kv Metal-Clad Switchgear



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HORIZONTAL DRAWOUT METAL-CLAD SWITCHGEAR

5- and 15-kv, 75 to 1000 mva interrupting capacity, 1200 to 3000 amperes continuous

GENERAL

Allis-Chalmers 5- and 15-kv, horizontal drawout, metal-clad switchgear meets or exceeds the latest IEEE, ASA and NEMA standards.

This advanced switchgear line is completely factory-built, wired and assembled. Each unit contains the main air circuit breaker, bus bars, primary and secondary disconnecting devices, instrument transformers, instruments and relays, secondary wiring and other necessary components. These units are designed so that additional breaker or auxiliary units may easily be added in the future.

PROVEN ADVANTAGES NOT PREVIOUSLY AVAILABLE IN THIS SWITCHGEAR CLASS

Maximum compartmentation safely separates major [illegible] barriers effectively localize any damage.

Dead-front construction is supplemented by a hinged steel barrier on the front of the breaker. This barrier locks to the cubicle, preventing any direct path for gases to escape.

Positive-acting shutters close the opening to the stationary primary disconnects when the breaker is withdrawn. These shutters also isolate the high-voltage disconnects from the front compartment of the cubicle and the current transformers.

Front-access current transformers permit testing, replacement or servicing with complete operator safety. These transformers are fully isolated from high-voltage areas when the breaker is withdrawn from the unit.

Eye-level instrumentation speeds accurate reading of instruments.

Trunnion-mounted potential transformers withdraw easily from the switchgear. After tilting out, transformers and fuses are readily accessible.

"Pyro-Shield," a polyester glass insulation, is far superior to phenolics. It combines track resistance, low moisture absorption, high dielectric strength and flame retardance with high impact strength.

Secondary and control wiring is loop-hinged at the cubicle door to reduce bending stress, increase life of the wiring.

Automatic guide track locking in three positions for precise breaker positioning control when breaker is inserted or withdrawn. Mechanical stops prevent overtravel, prevent damage to disconnects, and aim[illegible]

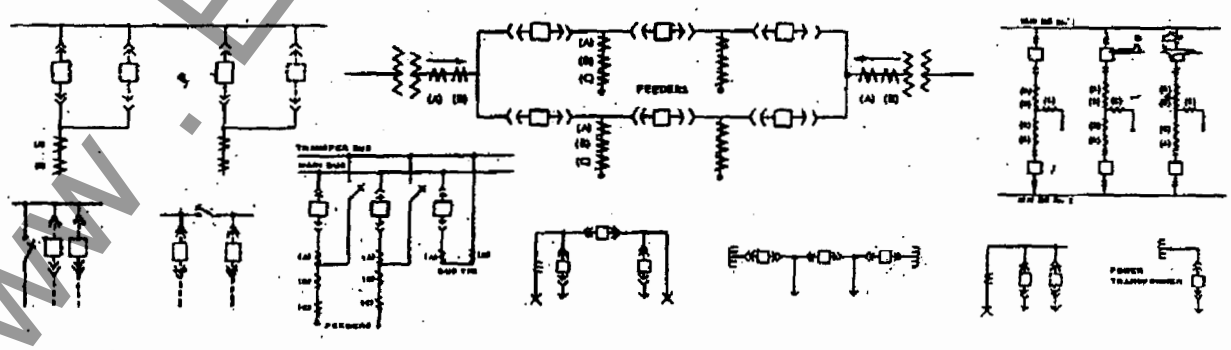
STANDARD METAL-CLAD SWITCHGEAR CONSISTS OF:

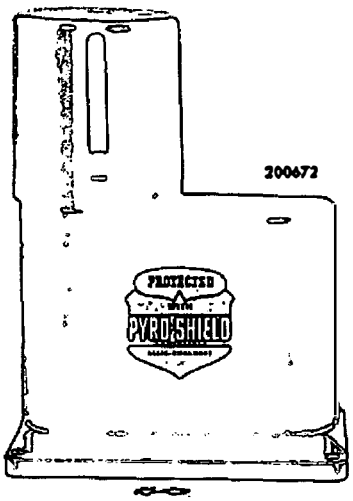
REMOVABLE ELEMENT (THE CIRCUIT BREAKER)

• *Ruptair* circuit breaker with operating mechanism • primary disconnecting device • secondary disconnecting devices with auxiliary switches • ground contacts • circuit breaker control relay (when required) • control wiring • interlocks

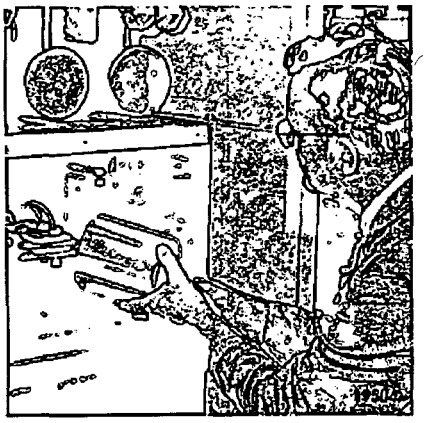
STATIONARY ELEMENT (THE CUBICLE)

• framework of welded steel • sheet steel enclosure, including a hinged front door, which may be used as an instrument panel • compartment and inter-unit barriers • three-phase insulated bus and connections • bus supports • stationary primary disconnecting devices • stationary secondary disconnecting devices • circuit breaker racking-in device • circuit breaker interlocking device • instruments and relays • control wiring • terminal blocks • instrument transformers • provision for connecting main cable • guide rail on floor of structure • wiring channels • control circuit cut-outs

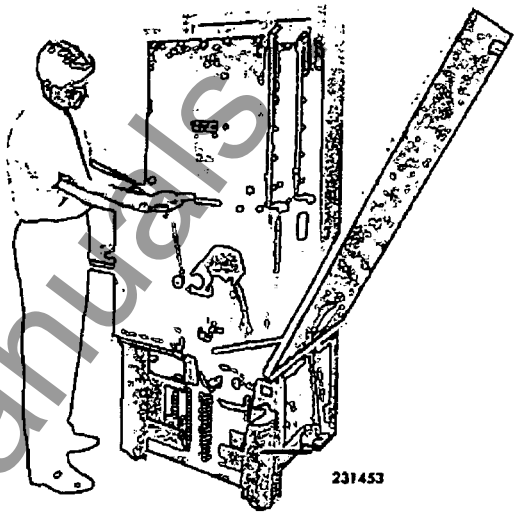




Molded glass polyester case is placed over the bus joint and fastened with a reusable nylon pin.



Polyester cap slips over and effectively insulates bolted joint.



Pyro-Shield — a flame-retardant glass polyester — insures a uniform level of insulation and simplifies construction of arc chute envelope.

HIGH-RELIABILITY – RESULT OF A COORDINATED INSULATION SYSTEM USING SUPER PYRO-SHIELD GLASS POLYESTER AND PORCELAIN

For service under extreme conditions of contamination and humidity, or where high voltages can create destructive carbon tracking, flame-retardant glass polyester and porcelain materials form the basis for a modern, coordinated switchgear insulation system.

The important characteristics of *Pyro-Shield* insulation are:

- ability to resist tracking
- low water absorption rate
- low time-temperature deterioration rate
- excellent flame retardance
- high resistance to chemical fumes
- high impact strength

Years of experience have shown that when the absorption of moisture is held below one percent, as measured by the ASTM 24-hour test, the reliability of the insulation is not noticeably impaired. *Pyro-Shield* insulation measures less than one-half percent absorption.

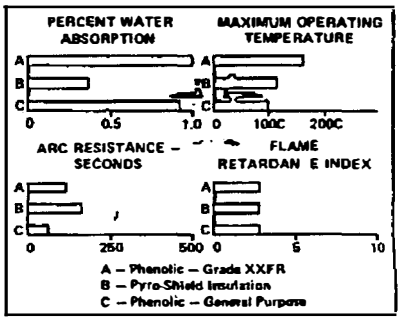
Dust-filled or high-moisture atmospheres create abnormal operating conditions, unfavorable to the high dielectric strength required at bus joints. There have been instances in the past where older insulation has experienced partial failure and possible electrical discharge leakage. However, glass polyester materials have a high resistance to arc tracking and are self-healing.

Preformed insulating materials eliminate the need for molding and taping joints when connecting shipping groups in the field. This method reduces installation time and resultant costs.

After bolting the main bus to the primary connectors, a molded polyester glass cap is placed over the joint and fastened by means of a reuseable nylon pin. The same preformed, high dielectric strength joints used in factory assembly are also used in field assembly. Insulation of conductor joints in the field with consistent dielectric strength is now independent of experience of installation personnel.

All primary bus bar connections are constructed of round-edge tin-plated aluminum bars. Bus bars are insulated by means of tight-fitting, extruded phenolic tubing. The tubing has a conducting layer deposited on the inside to protect against the formation of corona in the small air spaces which may exist between the bars and the insulating tubes. The insulation is at bus potential.

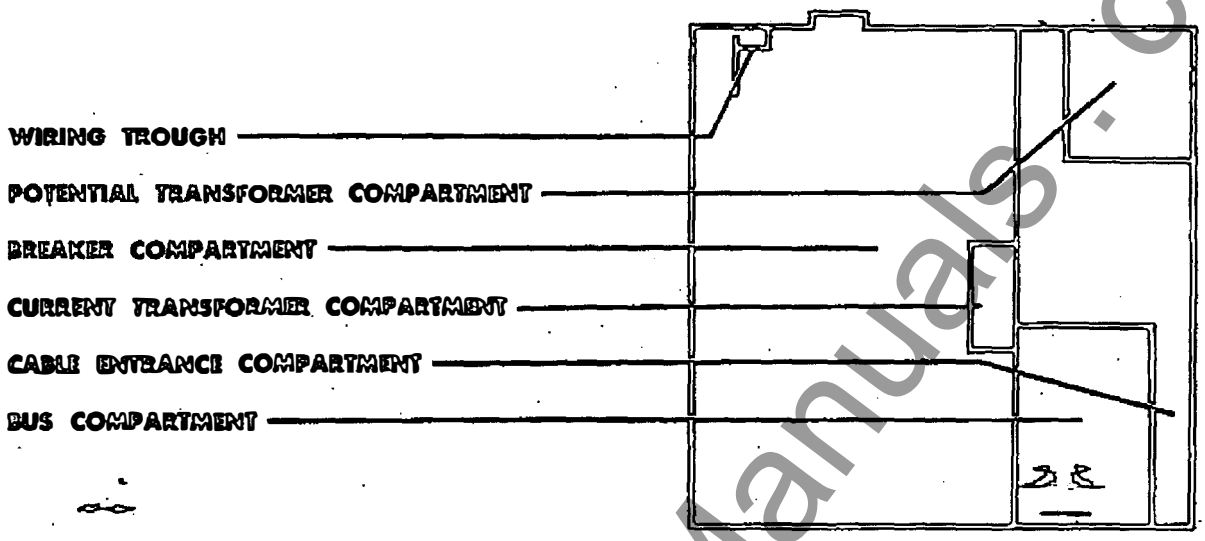
All buses are mechanically braced to withstand repeated shocks and stresses imposed by high currents of a magnitude corresponding to the momentary rating of the *Ruptair* power circuit breaker connected to the bus.



ALLIS-CHALMERS

HORIZONTAL DRAWOUT METAL-CLAD SWITCHGEAR

5- and 15-kv, 75 to 1000 mva interrupting capacity, 1200 to 3000 amperes continuous



THOROUGH COMPARTMENTATION FOR

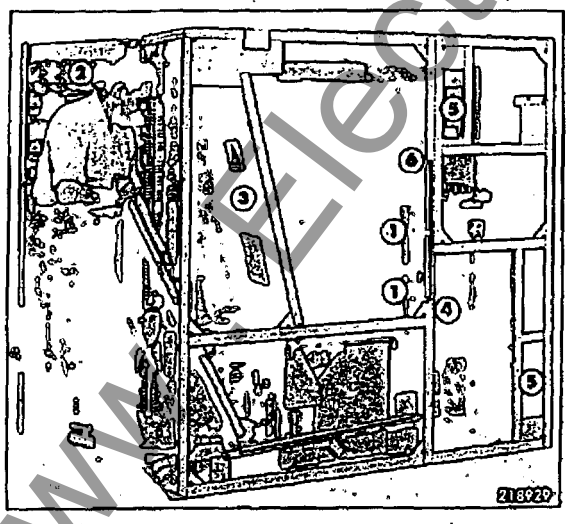
Maximum compartmentation for maximum safety is an integral part of Allis-Chalmers advanced design. Such thorough compartmentation means complete enclosure of all live parts and segregation of circuits. Removable plates permit easy access to compartments.

MAJOR COMPARTMENTS

Instrument control compartment
Intercompartment wiring trough
Circuit breaker compartment
Current transformer compartment
Auxiliary equipment compartment
Cable entrance compartment
Potential transformer compartment
Bus compartment
Load compartment

ALL-STEEL BARRIERS

All metal barriers are completely grounded. Sheet steel interunit barriers extend the full height and depth of unit for isolating each unit from adjacent units. The stationary elements are equipped with a ground bus which extends through the complete switchgear lineup.



1. Separate compartments for current transformers.
2. Full-panel metering and relaying.
3. Double-lock panel for operator safety.
4. *Pyro-Shield* insulation throughout.
5. Separate up-feed and down-feed cable compartments.
6. Grounded metal shutters behind current transformers protect personnel.

DUST-RESISTANT DESIGN

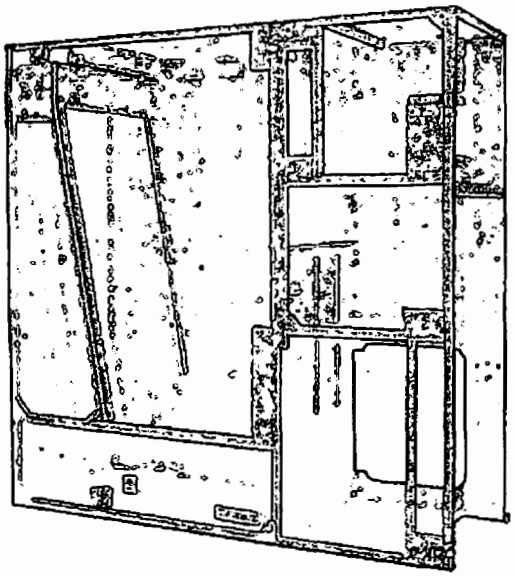
This switchgear is designed and built to minimize entry of dust and other foreign matter. Carefully placed louvers give controlled unit ventilation.

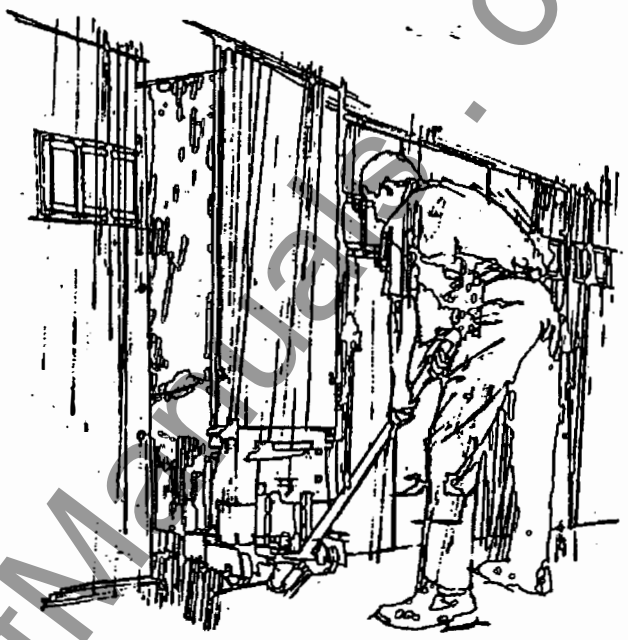
RIGID, REINFORCED FRAMEWORK

The framework is constructed of steel angles and formed plates accurately welded together in a jig and reinforced to form a rigid, self-supporting structure. Where welded joints are made, angles are spot welded (gusset construction) and arc welded (offset) for maximum strength and accurate alignment.

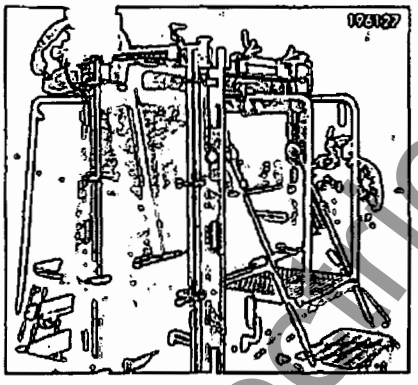
EASY COMPARTMENT ACCESS

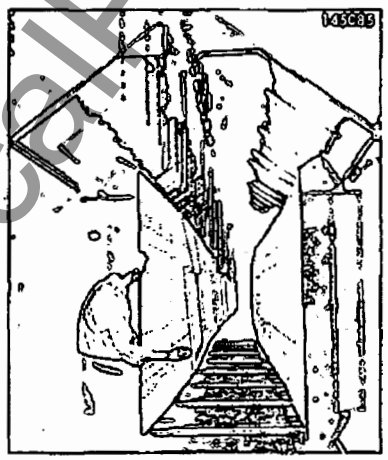
Allis-Chalmers switchgear compartments retard spread of faults to other compartments. Maintenance is safer and easier. Each compartment is accessible by easy-to-handle steel plates. Panels in rear of switchgear cubicle are removable, and the top cable compartment is furnished with a convenient access panel. The potential transformer compartment is entered from the rear of the cubicle by means of a hinged access panel.





MAXIMUM SAFETY, READY ACCESSIBILITY





PLUMB AND SQUARE THROUGH JIG WELDING

Floor plate assembly, side sheets, secondary contact supports, rear bushing support plates and other components are jig welded in an assembly fixture to insure correct location and provide plumb and square switchgear units. Jig welding insures interchangeability of standard units and associated removable elements. The use of welding jigs and checking fixtures give perfect alignment of component equipment. This results in minimum installation time of switchgear at the job site.

HIGH-DURABILITY FINISH

After grit blasting, the framework is conveyed through a spray tunnel. Here it is degreased and exposed to a hot phosphate chemical treating mixture followed by a hot sealing solution and drying agent. The panels, too, are treated similarly, except for grit blasting.

The hot phosphate bath effects a chemical conversion of the metallic surface to a nonmetallic phosphate coating. Insoluble in water, this coating is effective in retarding corrosion. It is an excellent undercoating for paint.

After cleaning and stabilization, the framework and panels receive a priming coat of rust-resisting paint. The framework, panels and other detail parts are conveyed through an infrared light baking tunnel to insure adequate drying. All exterior surfaces are given an additional coat of light gray paint. Standard indoor finish is gray ASA 61; for outdoor, gray ASA 24.

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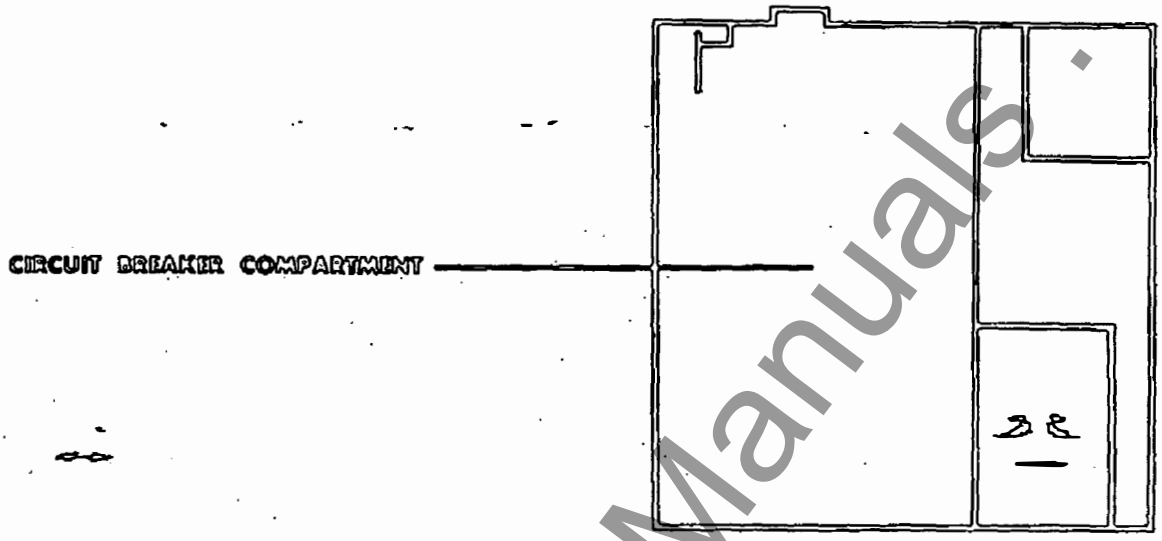
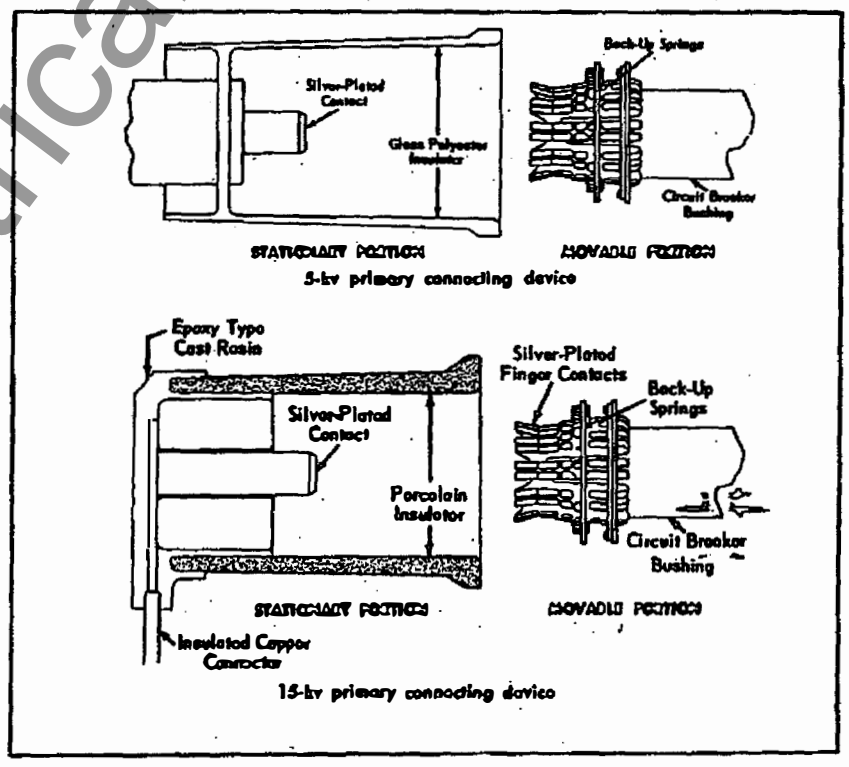


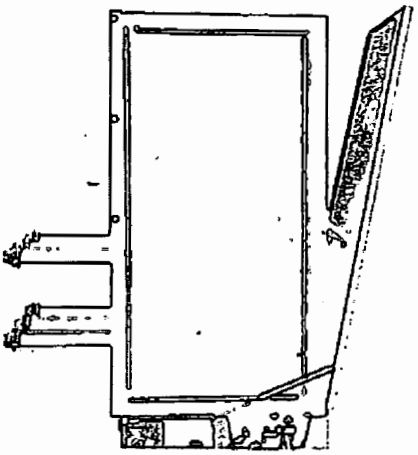
BREAKER-TO-CUBICLE PRIMARY DISCONNECTS

BREAKER MOUNTED DISCONNECT FINGERS

The primary circuit between the circuit breaker and the cubicle is made by sets of silver-plated finger contacts which engage with silver-plated, cylindrical contacts. The primary disconnect contacts, mounted on the ends of the breaker bushings, are of the multiple-finger type and are compression-spring loaded. The multiple-finger arrangement offers a large number of contact points which are self-aligning. This facilitates proper match-up between the removable breaker and the stationary cubicle. These breaker finger assemblies are removed when the breaker is withdrawn . . . and are available for inspection without the need of de-energizing the main switchgear bus.

The cubicle contact members inside the insulator assemblies are recessed and shielded to prevent accidental contact.





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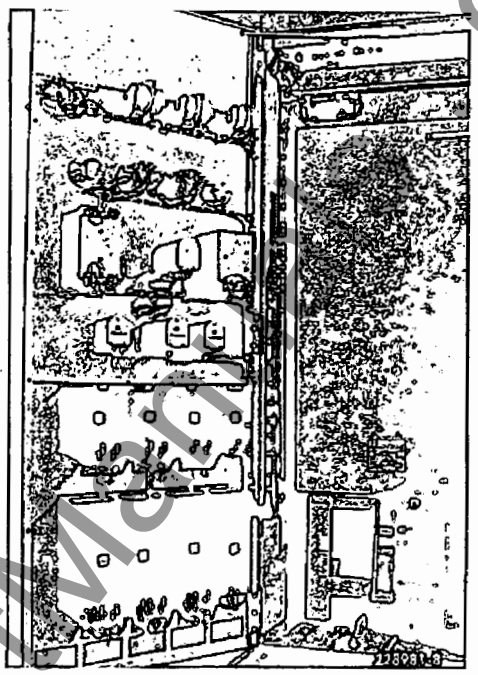
LOCKED-ON PROTECTIVE BARRIER. An Allis-Chalmers exclusive. The tilt-front steel panel on the circuit breaker automatically locks to the cubicle as the breaker is inserted into the operating position. This design means a steel barrier is between the operator and the high-voltage current — even *when the door is open.*

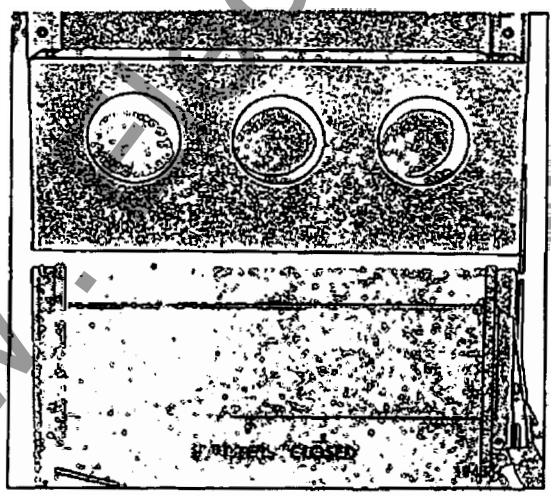


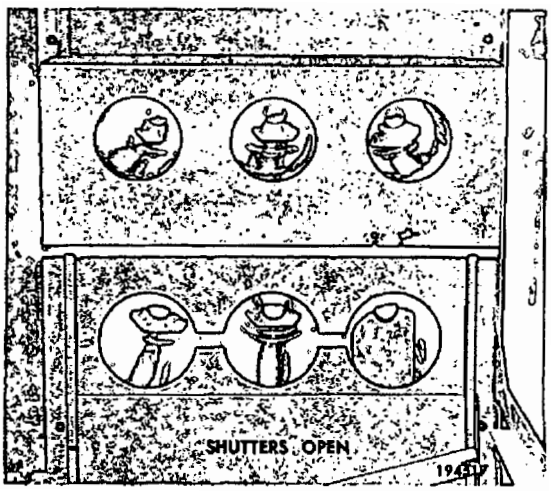
ARE SELF-ALIGNING, MULTICONTACT DEVICES FOR POSITIVE MATCH-UP

COUNTERBALANCED AUTOMATIC SHUTTERS

These shutters automatically close the openings to the cubicle primary disconnects when the circuit breaker is withdrawn from its connected position. The protective shutters guard against accidental human contact with the cubicle primary disconnect members. They also keep foreign matter from entering the disconnect chambers. Shutters are designed to remain closed until the movable primary disconnects on the breaker are in position to enter the cubicle disconnect chambers.

The two shutter blades operate with a counterbalanced action. One blade moves up while the other moves down. This design requires a minimum of operating force with smooth shutter operation. Blades are actuated through a common link bar from a cam mounted on the circuit breaker frame.





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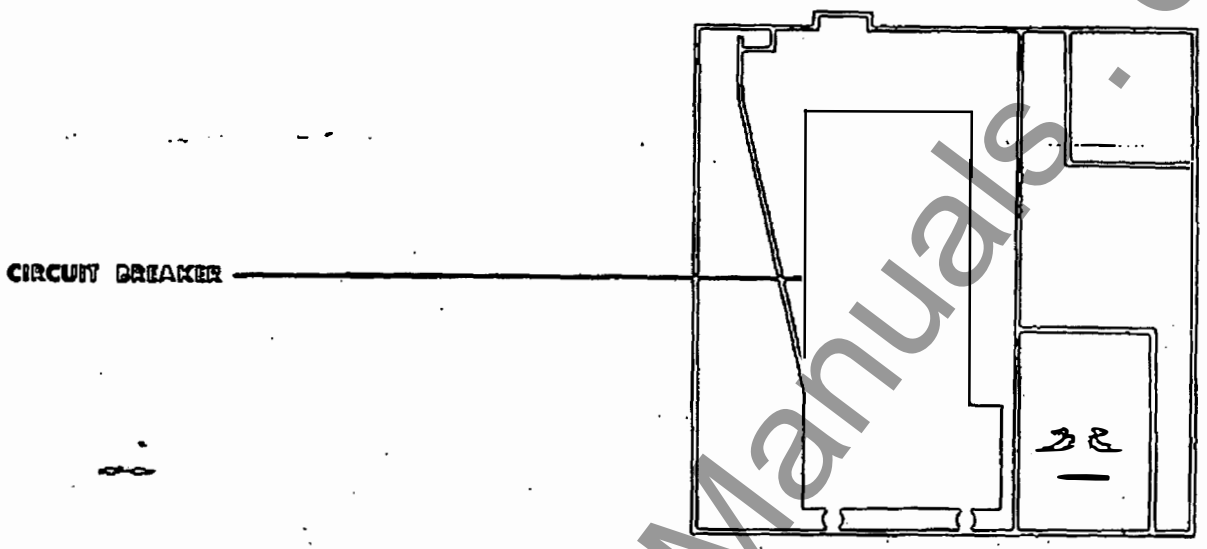


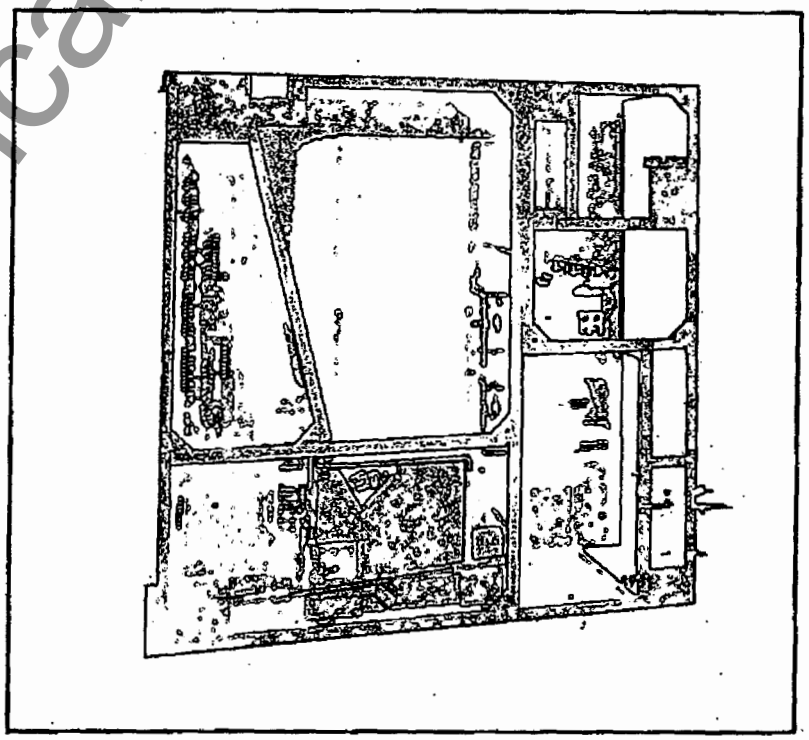
COMPACT RUPTAIR AIR-MAGNETIC CIRCUIT BREAKER

The *Ruptair* power air circuit breaker includes new materials and improved design techniques for fast-acting and highly dependable circuit or fault interruption.

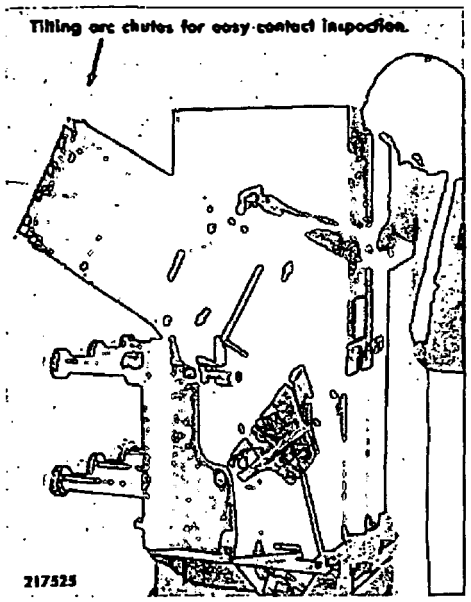
The breaker consists of three principal parts: (1) the interrupting device; (2) the contact structure; (3) the operating and control mechanism.

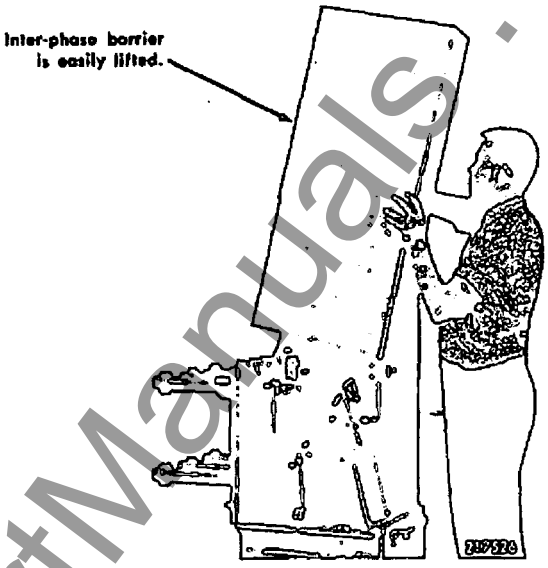
This breaker is available in 75 to 1000 mva interrupting capacity up through 3000 amperes continuous . . . with exclusive features such as ground potential dual puffer mechanism, self-locking protective barrier, four-bar trip-free mechanism, multicompression spring backing of contacts and 12-position adjustment of auxiliary switch.

The *Ruptair* breaker offers advantages of safety, ease of maintenance and simple installation. Easily removable, it can be conveniently withdrawn from the cubicle for inspection or maintenance, or to substitute a spare unit.



Side view of 5-kv unit with breaker in connected position.





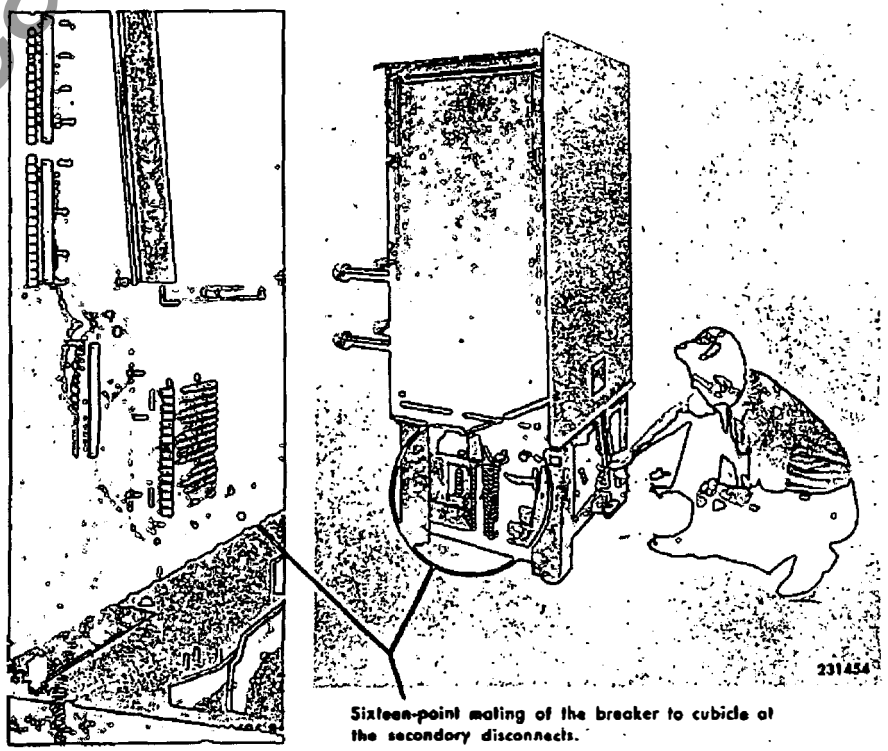
SAFE ○ COMPLETELY SELF-CONTAINED ○ EASY TO HANDLE

BREAKER-TO-CUBICLE SECONDARY DISCONNECTS ARE EASILY ADJUSTED . . . MATE IN BOTH THE OPERATING AND TEST POSITIONS

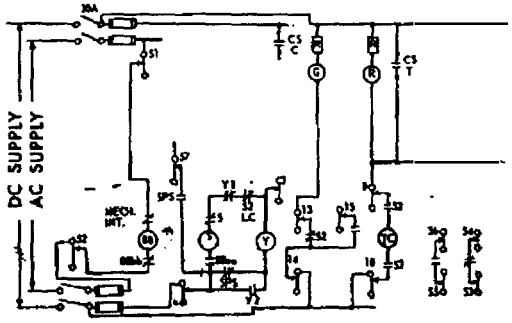
The movable secondary control contacts mounted on the breaker are self-aligning, line-contact, slip-type connectors. The multiple-finger type arrangement on the breaker make contact with a stationary-mounted element. The contact surfaces on the stationary element are recessed to prevent accidental short-circuiting of the control circuits.

These secondary disconnects mate in both the operating and test positions. No special jumper is required . . . no hand setting of secondary disconnects for testing.

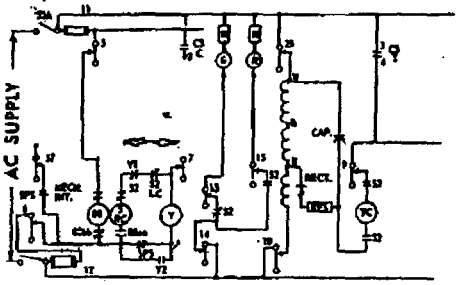
Mechanical stops prevent overtravel and avoid damage to the disconnecting devices when the circuit breaker is levered into operating position.



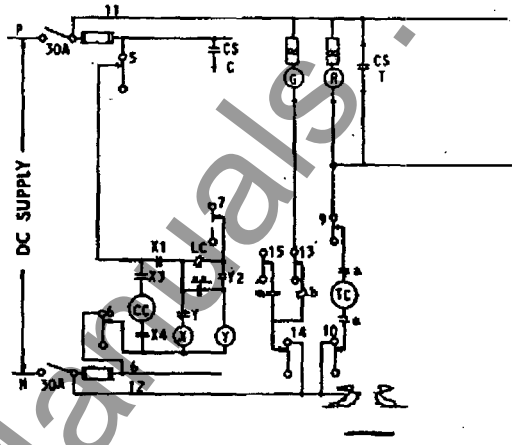
Sixteen-point mating of the breaker to cubicle at the secondary disconnects.



DC/AC close, DC trip, stored energy.



AC close, capacitor trip, stored energy.

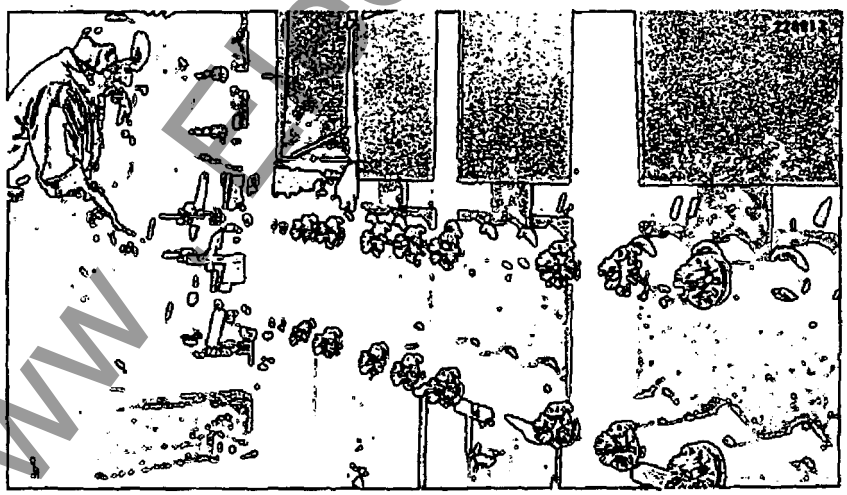


DC close, DC trip, solenoid.

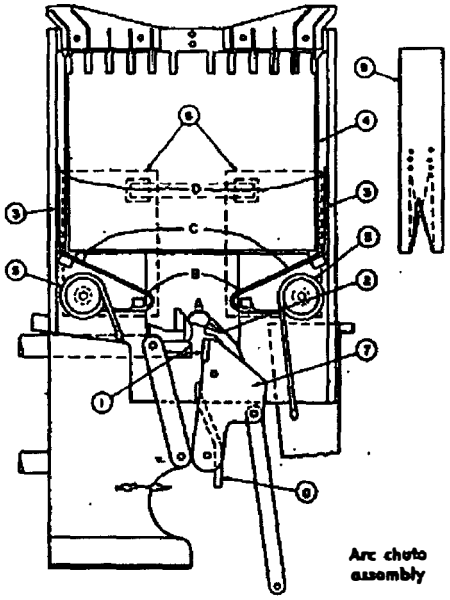
RUPTAIR BREAKER'S HIGH EFFICIENCY

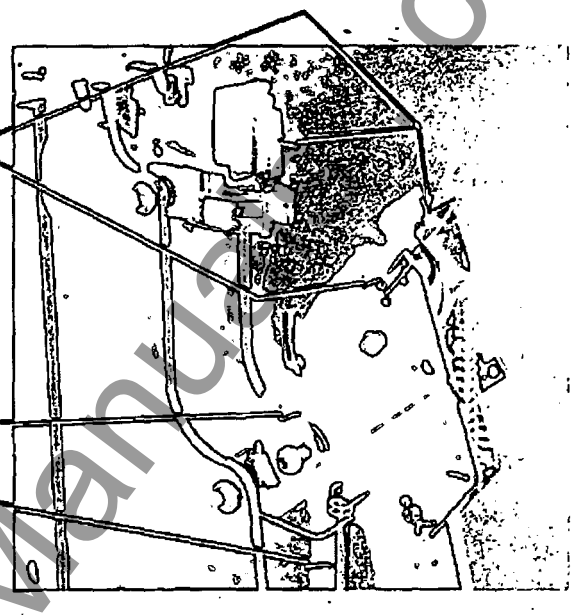
ARC INTERRUPTION

The *Ruptair* circuit breaker does not depend on any prestored medium, such as oil or compressed air, for arc interruption. Interruption is accomplished in air at atmospheric pressure, with the aid of a self induced magnetic blowout field and air draft. At the tilne the trip coil is energized, current is being carried through the main contacts. As the movable contact blade separates from the main contact, the current is transferred to the arcing contact to protect the main current carrying surfaces. As the arcing contacts part, a power arc is drawn which is transferred first to the head and then the tail arc runners as the moving contact passes close to them on its opening stroke. Transfer of the arc to the arc runners establishes the full flow of current through the blowout coils, setting up the magnetic field. The magnetic field, in accompaniment with the natural thermal effects of the heated arc, and configuration of the current carrying circuit, forces the arc upward into the barrier stack. The cool surfaces of the barrier stack cool and deionize the arc while the slots in the stack reduce its cross section and elongate it. The arc runners are made of wide, heavy material for maximum heat dissipation and help to minimize metal vaporization. To facilitate interruption of low currents, a puffer assembly provides a movement of air through the contact area to aid the magnetic field in moving the arc into the barrier stack. All these effects collaborate to increase the resistance of the arc and enable it to be extinguished at an early current zero.



Final assembly of 5-kv circuit breakers.





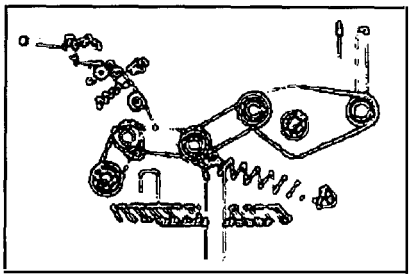
MEANS FAST ARC TRANSFER AND EXTINCTION

BREAKER INTERCHANGEABILITY

The stationary element of the switchgear unit and the removable element (circuit breaker) are built to master jigs so that circuit breakers of the same rating are interchangeable with each other. All removable elements of like rating are checked with one stationary element jig. Each stationary element is checked with the same removable element jig . . . to insure complete interchangeabiilty between elements of like rating.

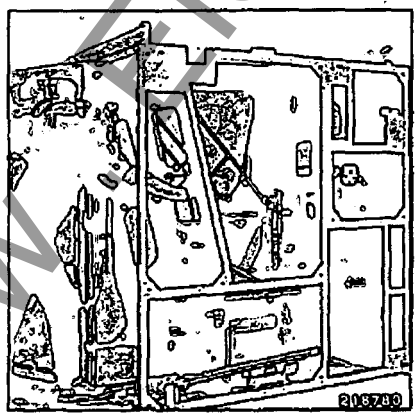
SIMPLE, TRIP-FREE LINKAGE

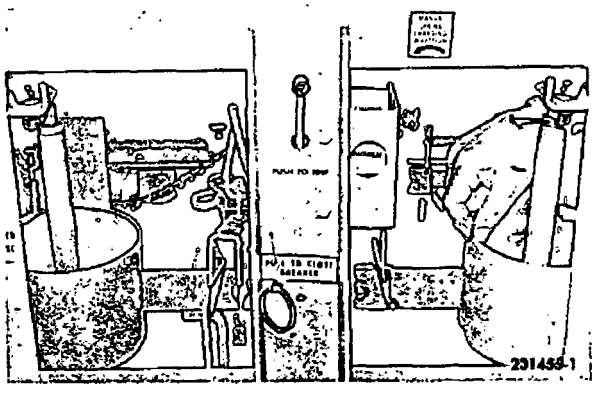
Time-proven operating mechanism used on breakers up to 345 kv is the Allis-Chalmers "four-bar linkage." This design features compression latches, rolling surfaces, with shims for critical adjustments. Sound engineering in the basic breaker operation results in ease of maintenance and service.



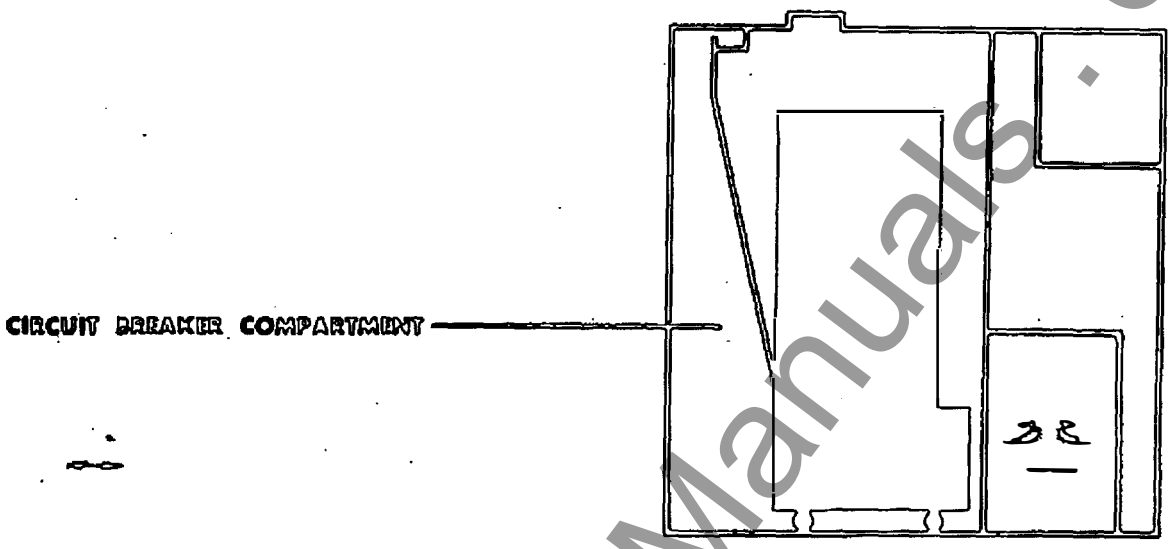
DUAL PUFFERS

Ground potential puffer mechanism with dual cylinders accelerates low-current arcs to insure short arcing times throughout the entire breaker interrupting range. Puffers are at ground potential — not line — and are mounted on the breaker frame — not on the moving contact arm.





ALLIS-CHALMERS



POSITIVE INTERLOCK BAR-STOPS

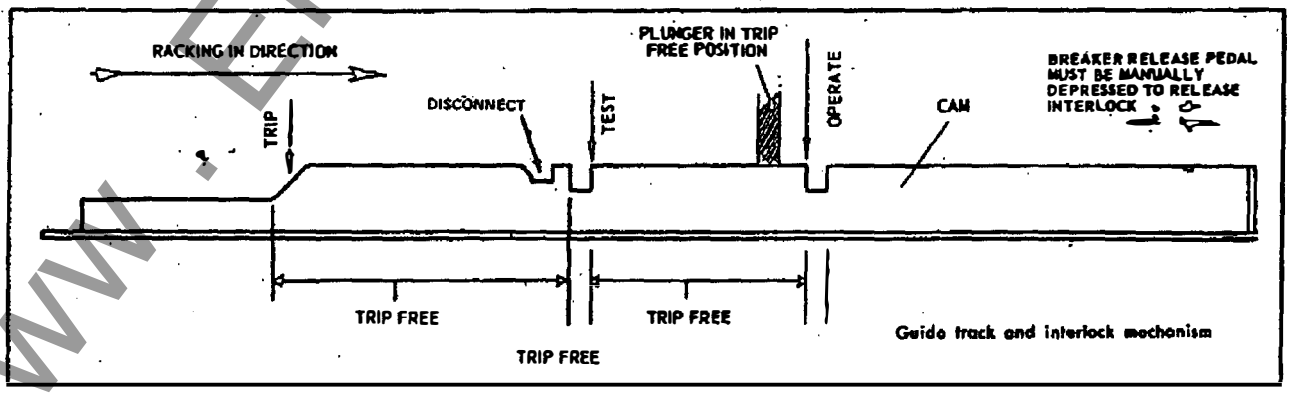
A rugged interlock bar has positive stops in the disconnected, test and operating positions to regulate safe and controlled movement of the breaker in the unit. Interlocks prevent (1) movement of breaker when it is closed and (2) closing of the circuit breaker unless the primary disconnecting devices are in full contact or separated by a safe distance.

Located on the breaker, this interlock bar engages close-fitting slots along the guide track on the switchgear unit floor for the disconnect (or storage), test and operating positions. The circuit breaker cannot be moved while the interlock is engaged. The breaker release pedal on the breaker must be depressed manually to release the interlock, permitting the circuit breaker to be moved. During transition from one position to another, the interlock rides on the guide track between slots holding the breaker in the "trip-free" position.

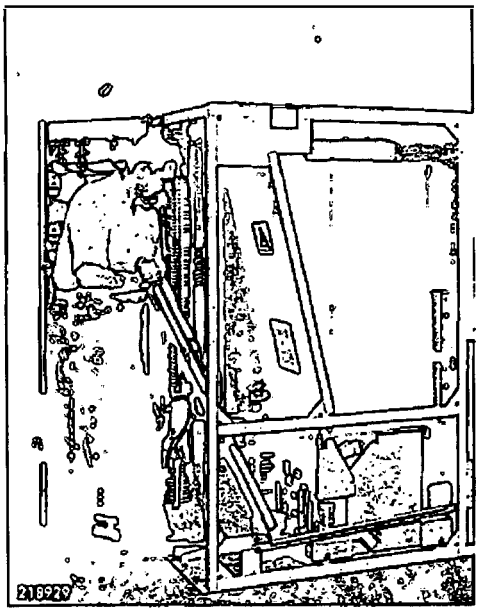
Positive straight-line, in-and-out movement of the breaker is assured by the guide track. Failure of the breaker guide follower to enter the guide track prohibits entry of the breaker into the unit.

When the breaker is inserted, it is rolled into the unit and pushed until it stops and automatically locks in the disconnected position. The manual breaker release must be depressed to move it to the test position.

The *Ruptair* breaker can be padlocked in any of its three positions. It can also be padlocked to prevent insertion into the unit.

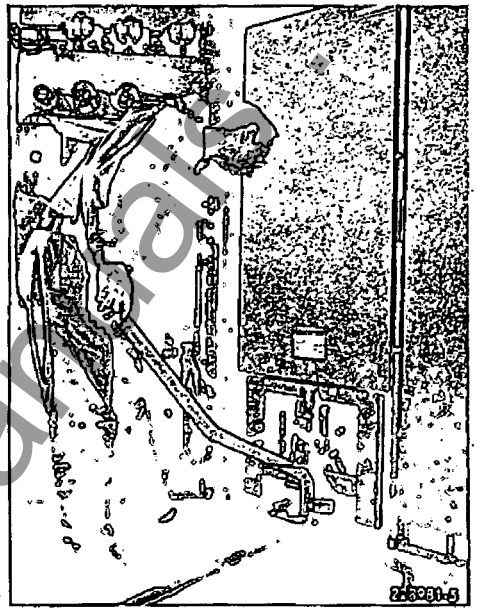


Guide track and interlock mechanism



5-kv

Levering-in action moves breaker to operating (left) and disconnect (right) positions.


15-kv

FOR SAFE AND CONTROLLED RACKING OF CIRCUIT BREAKER

5-kv breaker — Safe and quick racking in of the breaker to connected position is achieved by one stroke of a lever crank.

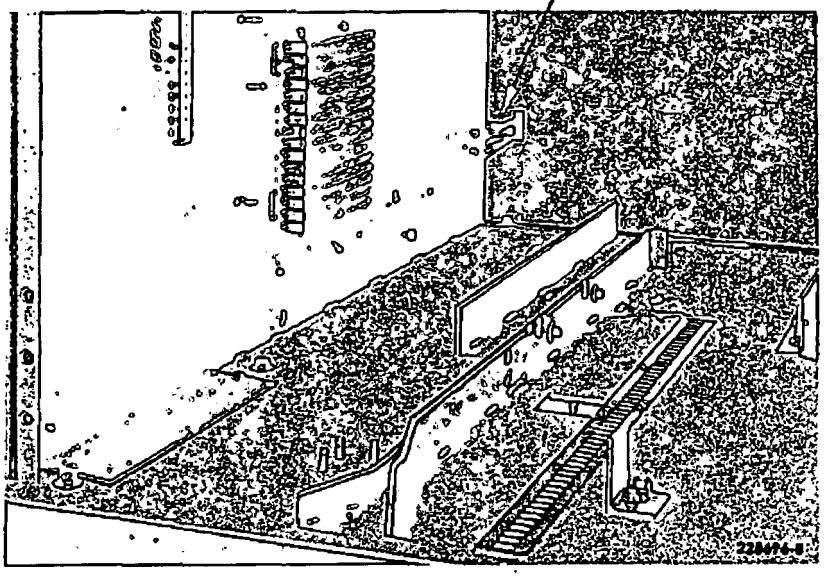
The pivot point of the lever crank is inserted into its mating hole in the fulcrum angle mounted on the compartment floor. A short upward stroke of the crank levers the breaker into the full operating position. The breaker can be closed only when in the full operating position.

To withdraw the breaker, the fulcrum pin is inserted into its mating hole in the bearing block of the breaker carriage. Pivoting about the fulcrum angle with a short downward stroke quickly withdraws the breaker. The breaker release pedal must be depressed, raising the interlock and tripping the breaker before the breaker can be moved from the connected position.

15-kv breaker—To use the racking lever, the pivot point of the lever is inserted into the mating hole on the lower front edge of the breaker. The pawl engages a rack on the floor of the cubicle, and a simple pumping of the racking lever moves the breaker into desired position.

Before the breaker can be moved from the connected position, the breaker release pedal must be depressed. This raises the interlock and trips the breaker for safe removal.

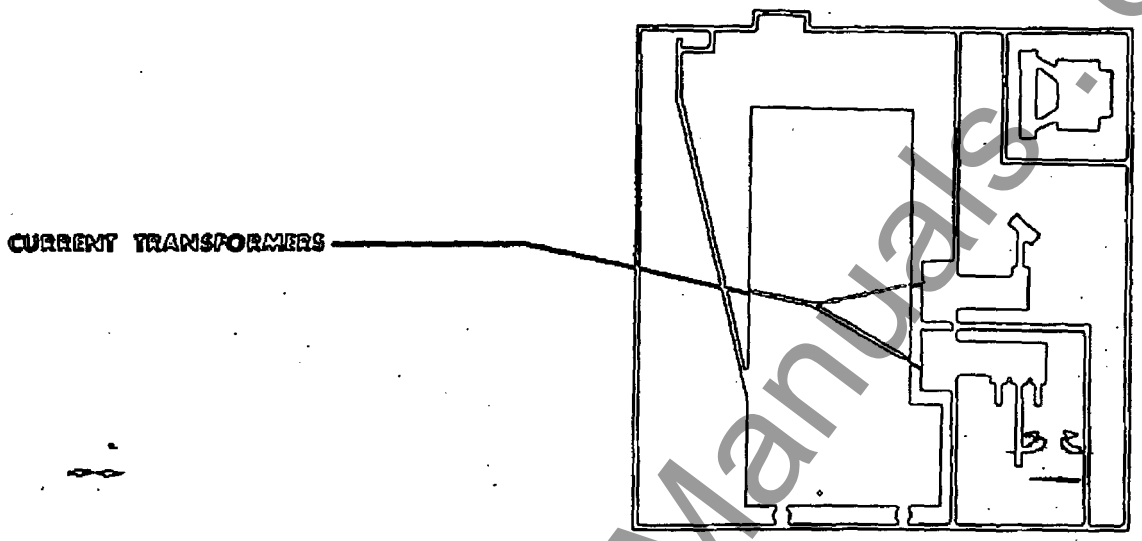
Picture does not show space heater cover which is provided to protect people from being burned.



Interior of 15-kv cubicle, showing breaker guide track, and interlock mechanism and racking strip.

HORIZONTAL DRAWOUT METAL-CLAD SWITCHGEAR

5- and 15-kv, 75 to 1000 mva interrupting capacity, 1200 to 3000 amperes continuous



INSPECT, MAINTAIN, REPLACE THESE FULLY ISOLATED FRONT-

5-kv

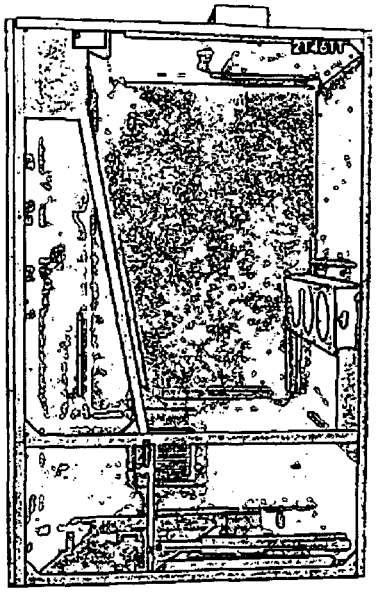
Type	Ratio	Current		Accuracy					
		One Second Thru	Momentary	Metering Burden (ohms)				Relaying Class	
				B-0.1	B-0.5	B-1.0	B-2.0	2.5C	10C
DO	200/5	Breaker Rating		0.6	1.2	4.8	—	15	20
DD	300/5	Breaker Rating		0.3	0.6	2.4	4.8	35	40
DD	400/5	Breaker Rating		0.3	0.3	1.2	2.4	50	55
DD	600/5	Breaker Rating		0.3	0.3	0.6	1.2	75	80
DD	800/5	Breaker Rating		0.3	0.3	0.3	0.6	95	105
DD	1200/5	Breaker Rating		0.3	0.3	0.3	0.3	110	120
DD	1500/5	Breaker Rating		0.3	0.3	0.3	0.3	135	165
DD	2000/5	Breaker Rating		0.3	0.3	0.3	0.3	200	120
DD	3000/5	Breaker Rating		0.3	0.3	0.3	0.3	190	210
OD	2000/5	Breaker Rating		0.3	0.3	0.3	0.3	150	160
DD	3000/5	Breaker Rating		0.3	0.3	0.3	0.3	130	140
				B-0.1	B-0.5	B-2.0		2.5H	10H
MKS-1	10/5	20000	60000	4.8	—	—		—	5
MKS-1	15/5	20000	60000	4.8	2.4	—		—	10
MKS-1	25/5	*37500	60000	2.4	2.4	—		—	10
MKS-1	30/5	*37500	60000	2.4	2.4	—		—	10
MKS-1	40/5	*37500	60000	1.2	2.4	—		—	20
MKS-1	50/5	*37500	60000	1.2	1.2	2.4		—	20
MKS-1	75/5	*37500	60000	0.6	0.6	1.2		—	50
MKS-1	100/5	*50000	80000	0.3	0.3	0.6		—	50
MKS-1	150/5	*50000	80000	0.3	0.3	0.6		—	100
MKS-1	200/5	*50000	80000	0.3	0.3	0.6		—	100
MKS-1	300/5	*50000	100000	0.3	0.3	0.6		—	100
MKS-1	400/5	*50000	100000	0.3	0.3	0.6		—	100
MKS-1	600/5	57000	141000	0.3	0.3	0.6		—	100
MKS-1	800/5	68000	141600	0.3	0.3	0.6		—	100
				B-0.1	B-0.5	B-2.0		2.5H	10H
YSC	1200/5	140000	140000	0.3	0.3	0.3		—	100
YSC	1500/5	140000	140000	0.3	0.3	0.3		—	100
YSC	2000/5	140000	140000	0.3	0.3	0.3		—	100
YSC	3000/5	140000	140000	0.3	0.3	0.3		—	200

*With B-0.2 burden or greater on secondary.

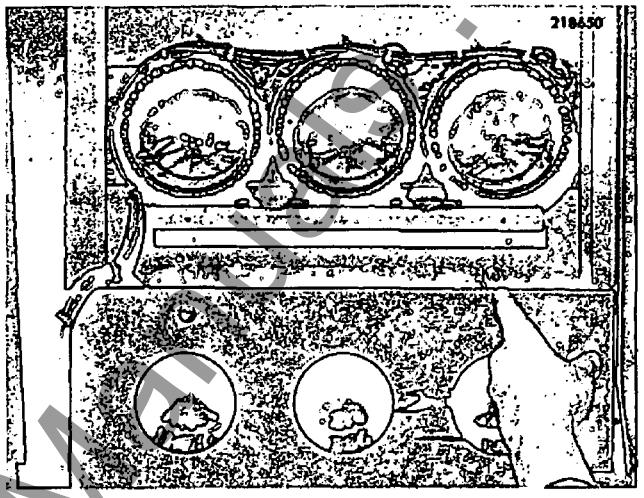
15-kv

Type	Ratio	Current		Accuracy						
		One Second Thru	Momentary	Metering Burden (ohms)					Relaying Class	
				B-0.1	B-0.2	B-0.5	B-1.0	B-2.0	2.5C	10C
FD	200/5	Breaker Rating		1.2	1.2	1.2	2.4	4.8	35	40
FD	250/5	Breaker Rating		1.2	1.2	1.2	2.4	4.8	45	50
FD	300/5	Breaker Rating		0.3	0.6	0.6	1.2	2.4	55	60
FD	400/5	Breaker Rating		0.3	0.6	0.6	1.2	2.4	80	85
FD	500/5	Breaker Rating		0.3	0.3	0.3	0.6	1.2	90	100
FD	600/5	Breaker Rating		0.3	0.3	0.3	0.3	0.6	130	140
FD	800/5	Breaker Rating		0.3	0.3	0.3	0.3	0.6	180	190
FD	1000/5	Breaker Rating		0.3	0.3	0.3	0.3	0.3	160	170
FD	1200/5	Breaker Rating		0.3	0.3	0.3	0.3	0.3	195	205
FD	1500/5	Breaker Rating		0.3	0.3	0.3	0.3	0.3	240	250
FD	1600/5	Breaker Rating		0.3	0.3	0.3	0.3	0.3	260	270
FD	2000/5	Breaker Rating		0.3	0.3	0.3	0.3	0.3	375	390
FD	2500/5	Breaker Rating		0.3	0.3	0.3	0.3	0.3	240	250
FD	3000/5	Breaker Rating		0.3	0.3	0.3	0.3	0.3	280	300
FD	4000/5	Breaker Rating		0.3	0.3	0.3	0.3	0.3	280	300
FD	5000/5	Breaker Rating		0.3	0.3	0.3	0.3	0.3	350	375
FD	6000/5	Breaker Rating		0.3	0.3	0.3	0.3	0.3	—	—
FD	7000/5	Breaker Rating		0.3	0.3	0.3	0.3	0.3	—	—
				B-0.1		B-0.5	B-1.0	B-2.0	2.5H	10H
MKS-3	10/5	20000	60000	4.8		—	—	—	—	5
MKS-3	15/5	20000	60000	4.8		2.4	—	—	—	10
MKS-3	25/5	37500	60000	2.4		2.4	—	—	—	10
MKS-3	30/5	37500	60000	2.4		2.4	—	—	—	10
MKS-3	40/5	37500	60000	1.2		2.4	—	—	—	20
MKS-3	50/5	37500	60000	1.2		1.2	—	2.4	—	20
MKS-3	75/5	37500	60000	0.6		0.6	—	1.2	—	50
MKS-3	100/5	50000	80000	0.3		0.3	—	0.6	—	50
MKS-3	150/5	50000	80000	0.3		0.3	—	0.6	—	100
MKS-3	200/5	50000	80000	0.3		0.3	—	0.6	—	100
MKS-3	300/5	50000	100000	0.3		0.3	—	0.6	—	100
MKS-3	400/5	50000	100000	0.3		0.3	—	0.6	—	100
MKS-3	600/5	57000	141000	0.3		0.3	—	0.6	—	100
MKS-3	800/5	68000	141600	0.3		0.3	—	0.6	—	100
				B-0.1		B-0.5	B-1.0	B-2.0	2.5H	10H
YSC	1200/5	140000	140000	0.3		0.3	—	0.3	—	100
YSC	1500/5	140000	140000	0.3		0.3	—	0.3	—	100
YSC	2000/5	140000	140000	0.3		0.3	—	0.3	—	100
YSC	3000/5	140000	140000	0.3		0.3	—	0.3	—	200

Note — Continuous thermal rating of rated primary current at 40 C of switchgear room ambient 1.0



Side view of 15-kv metal-clad switchgear shows accessible current transformers from circuit breaker compartment.



Current transformers are mounted in separate enclosure against the circuit breaker compartment rear plate which supports the stationary high-voltage bushings.

ACCESSIBLE CURRENT TRANSFORMERS WITHOUT EXPOSURE TO ANY HIGH-VOLTAGE AREAS

Current transformers covered by this specification are of Allis-Chalmers manufacture, insulated and built to NEMA and IEEE standards.

Unless otherwise specified, the mechanical rating of the current transformers in RMS amperes is at least equal to the momentary rating of the breaker in RMS amperes at circuit voltage. The one-second thermal rating in RMS amperes is at least equal to the symmetrical interrupting current rating of the circuit breaker in RMS amperes at circuit voltage.

Adequate protection of the transformers from possible damage due to circuit breaker interruption is offered by enclosing them in an easily removable grounded metal barrier.

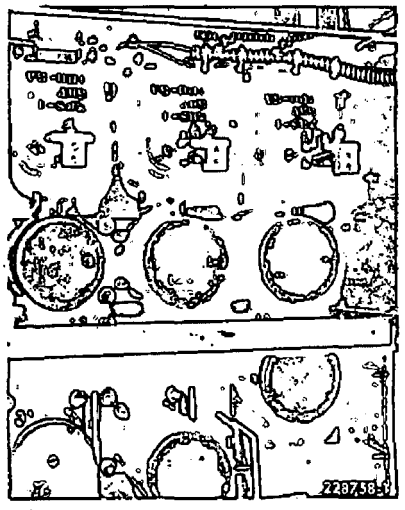
The current transformers may be mounted either on the bus, load, or bus- and load-side of the circuit breaker, depending on the requirements of the application.

TOROIDAL TYPE DD and FD current transformers are used for ratios from 200:5 through 7000:5. Metering accuracies at low ratios are obtained by using high-quality core steel wound on a circular mold until the desired cross-section area is obtained. The core is then insulated with varnished cloth and paper. To further improve the accuracies, each transformer has a compensated, fully distributed secondary winding.

Mounted in the circuit breaker compartment, it is possible to test the transformers without removing them from the unit. Maximum operator safety is maintained since removal of the circuit breaker automatically removes the primary bar and closes off the high-voltage bus compartment.

WOUND TYPE MKS current transformers are used for applications where ratios below 200:5 are required. They are mounted in a rear compartment that is isolated from the bus compartment by a steel barrier. Isolation from the cable compartment is provided by the cable support block or pothead support plate and pothead.

This type of CT consists of several turns of primary conductor and a cylindrical secondary coil inserted inside the primary winding. One leg of the precut rectangular steel laminations is stacked through the opening of the secondary winding. The primary winding may consist of several turns, depending on accuracy and ratio desired.



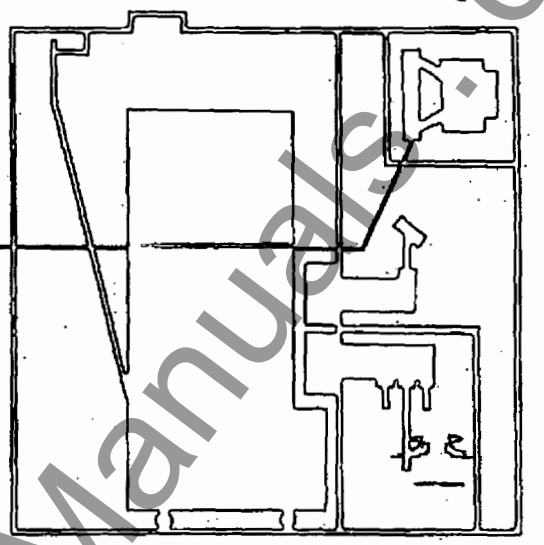
Wound type current transformers mounted in rear of 5-kv unit.

ALLIS-CHALMERS

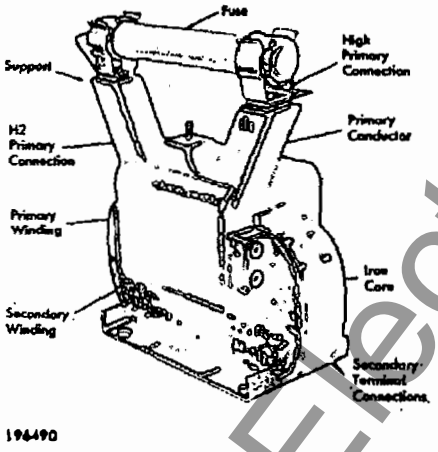
HORIZONTAL DRAWOUT METAL-CLAD SWITCHGEAR

5- and 15-kv, 75 to 1000 mva interrupting capacity, 1200 to 3000 amperes continuous

POTENTIAL TRANSFORMER COMPARTMENT



TRUNNION-MOUNTED POTENTIAL TRANSFORMERS



Potential transformers covered by this specification are of Allis-Chalmers manufacture, built and tested in accordance with the latest NEMA and IEEE standards.

The use of epoxy resin as the insulation between primary and secondary windings permits corona control with less space between coils. Smaller in size than conventional dry-type transformers, three PT's can be mounted on one tilt-out carriage.

This drawout compartment for potential transformers is located in the top rear of the breaker unit at convenient shoulder height. Or units can be mounted in an auxiliary unit. The transformers are mounted on a separate base which pivots in a pair of trunnions. The pivoted base is easily rotated 180 degrees to disconnect position. Three potential transformers may be mounted on one tilt-out carriage.

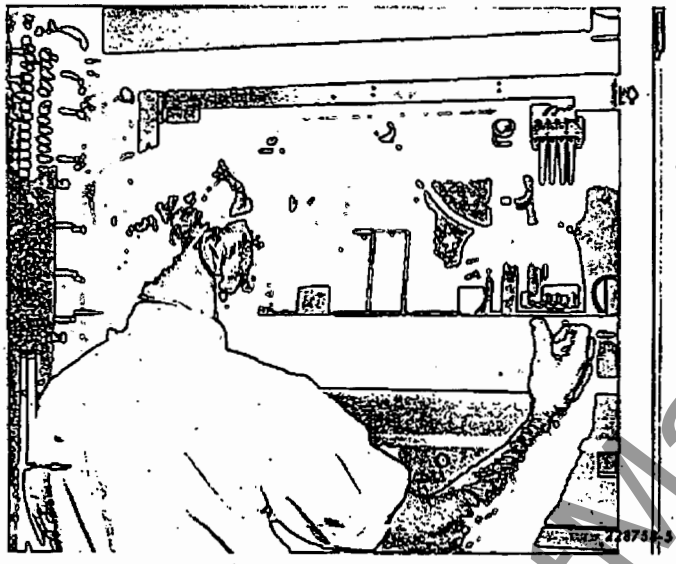
While pivoting from the connected to the disconnected position, the transformer primary windings and transformer-mounted current-limiting fuses are automatically and safely grounded to remove any charge from the windings. When the transformers are in the disconnect position, the base acts as a barrier between the stationary primary studs and the operator. The weight is distributed so that a minimum amount of effort is needed to revolve the carriage.

Type DP (5-kv) Potential Transformers

Ratio	Accuracy Class				Volt-Amp Thermal Rating	Cycles
	W	X	Y	Z		
4200/120	0.3	0.3	0.3	1.2	400	50/60
2400/120	0.3	0.3	0.3	1.2	400	50/60
4800/120	0.3	0.3	0.3	1.2	400	50/60
3000/150	0.3	0.3	0.3	1.2	400	50/60
3000/120	0.3	0.3	0.3	1.2	400	50/60
3300/120	0.3	0.3	0.3	1.2	400	50/60
3600/120	0.3	0.3	0.3	1.2	400	50/60

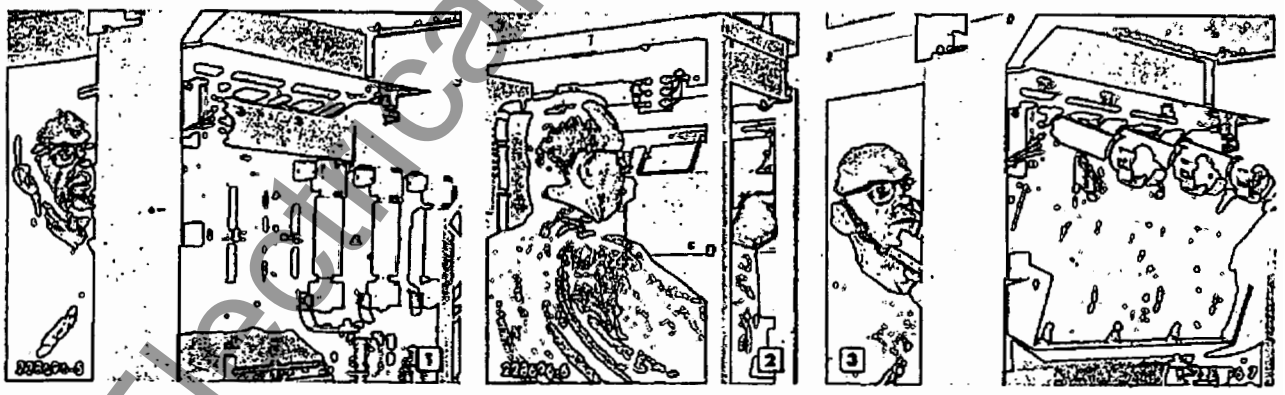
Type PP (15-kv) Potential Transformers

Ratio	Accuracy Class				Volt-Amp Thermal Rating	Cycles
	W	X	Y	Z		
14,400/120	0.3	0.3	0.3	1.2	400	50/60
12,000/120	0.3	0.3	0.3	1.2	400	50/60
8400/120	0.3	0.3	0.3	1.2	400	50/60
7620/120	0.3	0.3	0.3	1.2	400	50/60
7200/120	0.3	0.3	0.3	1.2	400	50/60
4800/120	0.3	0.3	0.3	1.2	400	50/60
4200/120	0.3	0.3	0.3	1.2	400	50/60

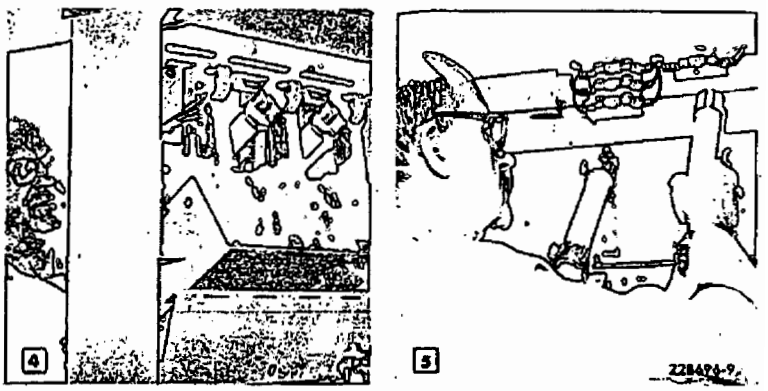


Trunnion-mounted potential transformers in 15-kv unit.

AUTOMATIC DISCONNECTION, EASY WITHDRAWAL FOR TEST OR INSPECTION



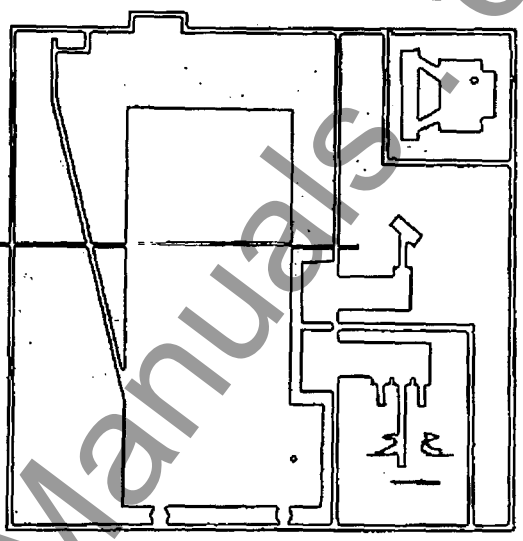
1. Potential transformers in connected position.
2. Latches are turned to release trunnion mounted carriage.
3. Carriage is rotated to disconnect transformers. Fuse strikes grounding strap to remove static charge.
4. Transformers are completely disconnected and fuses are in contact with grounding strap.
5. Transformer carriage rotation is completed, placing grounded fuses outside of unit for safe and convenient removal and replacement.



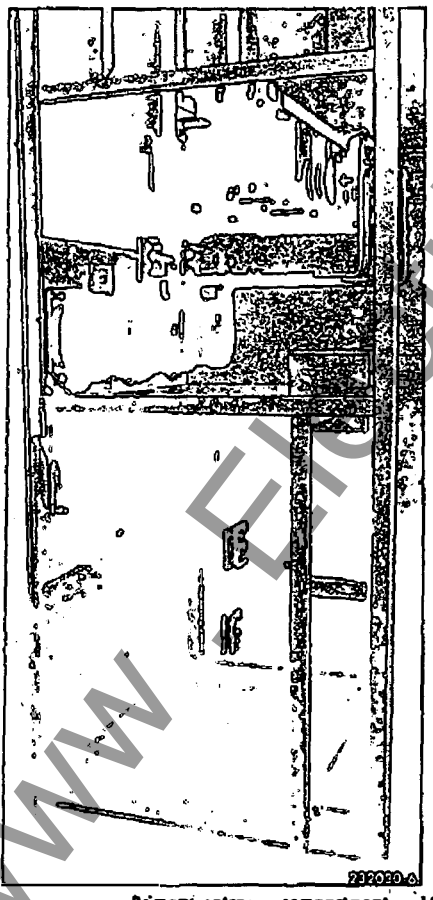
HORIZONTAL DRAWOUT METAL-CLAD SWITCHGEAR

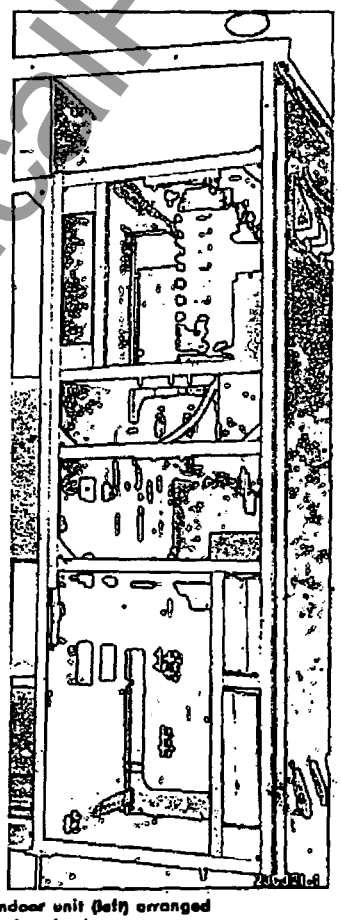
5- and 15-kv, 75 to 1000 mva interrupting capacity, 1200 to 3000 amperes continuous

PRIMARY ENTRANCE COMPARTMENT



PRIMARY ENTRANCE COMPARTMENT IS UNIVERSALLY ADAPTABLE





Primary entrance compartment — 15-kv unit. Indoor unit (left) arranged for upfeed; outdoor unit (right) arranged for downfeed.

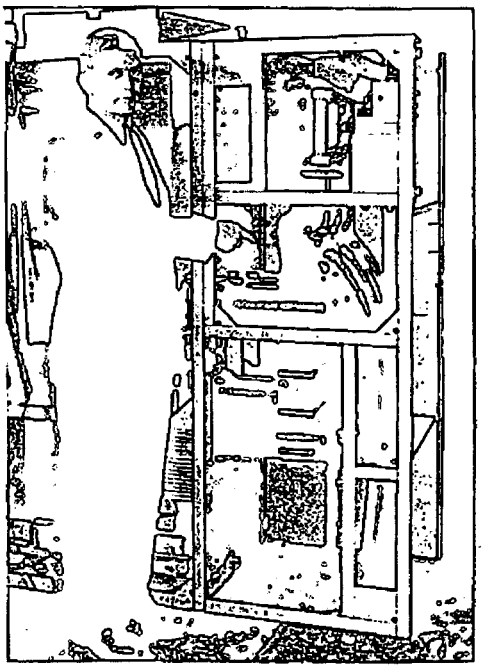
The rear of a breaker unit is divided into three high-voltage compartments, each separated from the others by steel barriers. The rear frame is of combination welded and bolted construction to give overall rigidity while allowing easy access to the equipment. The main bus location is placed as close as possible to main disconnects to eliminate unnecessary connectors and to provide maximum insulation. The cable entrance space provides complete flexibility of termination without any structural or conductor modifications. Either upfeed or downfeed pothead or lug connections may be made by reversing the lugs or mounting the pothead in its alternate position for upfeed. Adequate space for the building of stress cones has been provided.

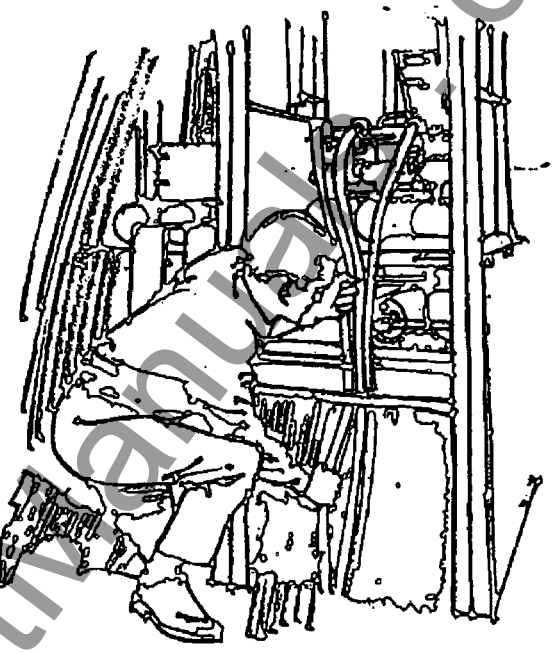
TOP FEED

No major structure changes are necessary for top feed.

BOTTOM FEED

This design is used in standard indoor metal-clad switchgear units. Steel floor does not extend to rear of unit. Absence of a bottom rear cross-member permits stubbing of conduit or pulling of cable before receiving the switchgear.





REGARDLESS OF CABLE DIRECTION, TYPE OR TERMINATION

CABLE TYPE AND SIZE

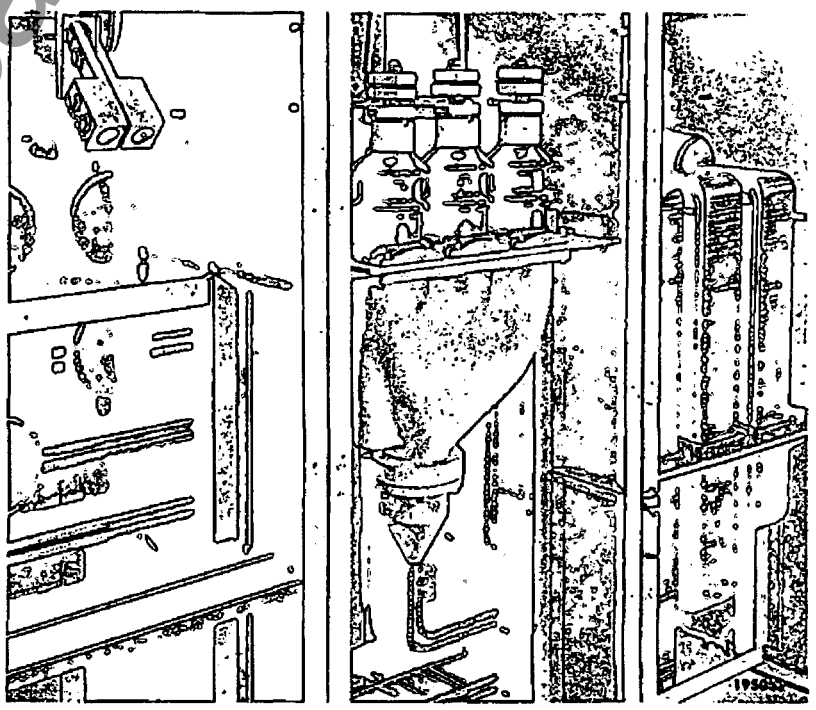
Type and size of incoming cable are important when choosing the terminating method. A complete description of entering cable is necessary. Connection of cables to potheads can be by wiping sleeves, stuffing box gland, cable clamp or conduit adapter — depending on type of cable used.

POTHEADS

Allis-Chalmers potheads are designed with liberal insulation to meet switchgear dielectric standards. Cast iron body construction, rather than welded, minimizes compound leakage. Offset body construction of three-conductor potheads makes cable installation easy when two potheads are used. Maximum of one three-conductor and three single-conductor potheads can be mounted in a standard unit.

ACCESSIBILITY

Inspection of cable compartment is made easy by removing rear panels. Top cable compartment is also fitted with a convenient access panel.

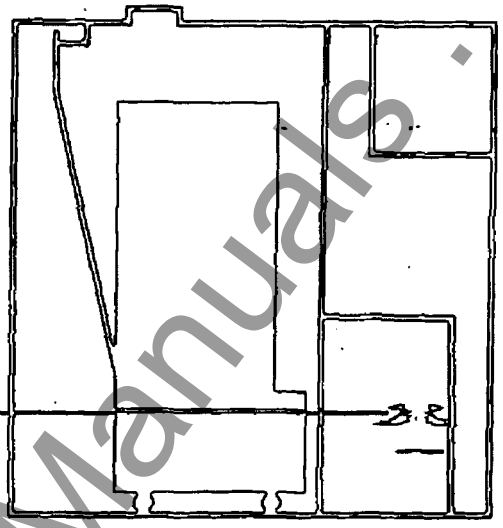


View of three adjacent breaker units with rear access panels removed. From left to right: feeder unit with cable-lug connectors; feeder with pothead, and bus tie unit. Note that no auxiliary unit is required for connecting bus tie unit to adjacent feeder unit.

ALLIS-CHALMERS

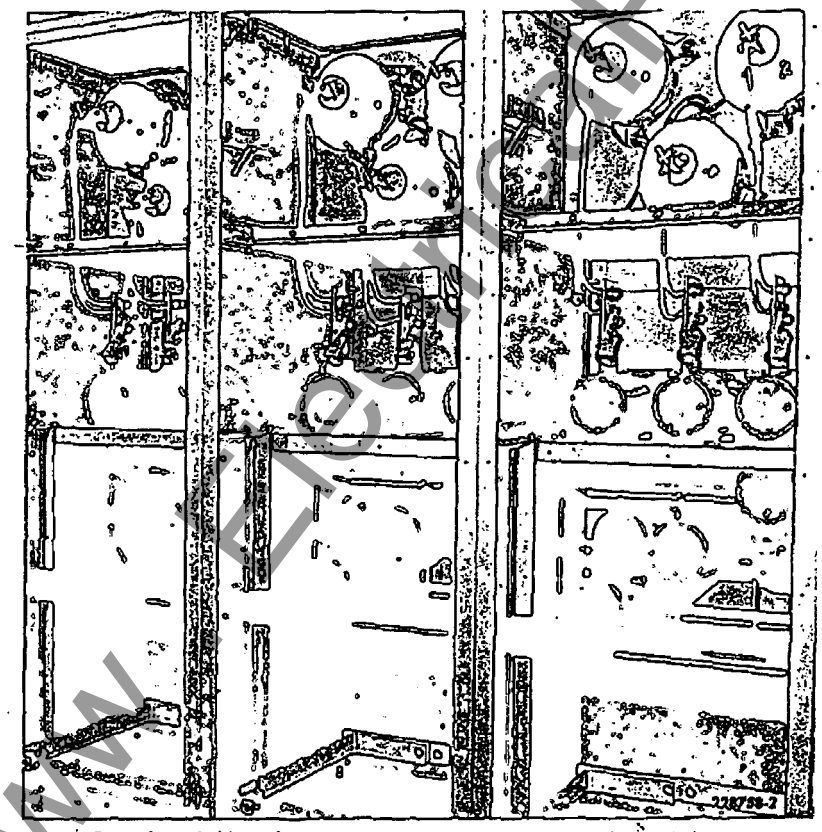
HORIZONTAL DRAWOUT METAL-CLAD SWITCHGEAR

5- and 15-kv, 75 to 1000 mva interrupting capacity, 1200 to 3000 amperes continuous



5-KV
BUS COMPARTMENT

PERFORMED SUPER PYRO-SHIELD INSULATION



Rear view of 5-kv unit shows location of ground bus, mounting of lightning arresters and cable lugs arranged for downfeed connection.

Preformed *Pyro-Shield* track-resistant insulation of flame-retardant glass polyester insures a uniformly high level of insulation quality throughout the switchgear. All bus bar supports and primary disconnect bushings are made of high impact strength *Pyro-Shield* insulation with high dielectric strength and low moisture absorption characteristics.

BUS BARS

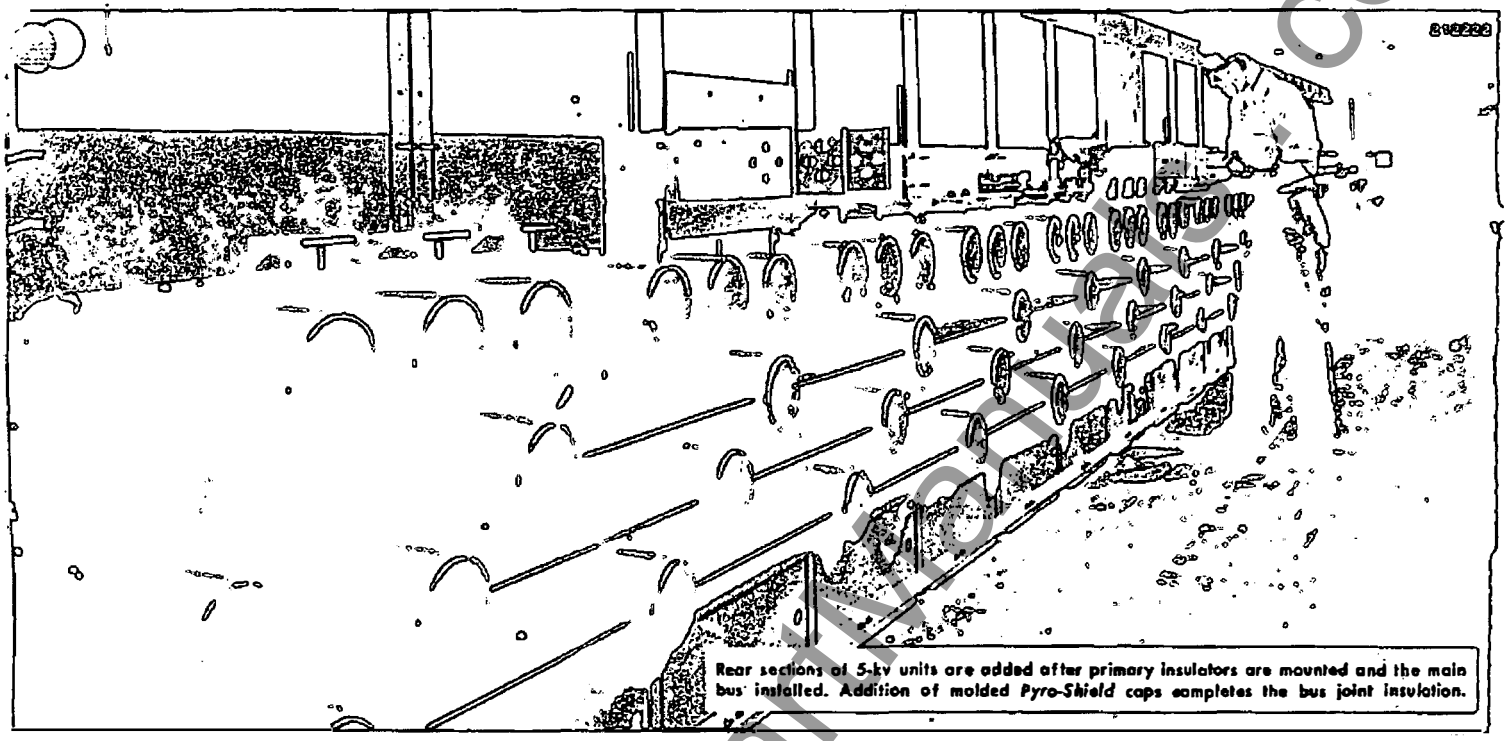
Full rounded-edge tin-plated aluminum bus bars are provided as standard. Bus bars are insulated by means of a tight fitting, fire-retardant tubing.

A combination of high strength steel bolts, flat washers and conical washers assure constant pressure to bolted connections and guarantees proper contact at all times.

The preformed insulated materials eliminate the need for molding or

HORIZONTAL DRAWOUT METAL-CLAD SWITCHGEAR

5- and 15-kv, 75 to 1000 mva interrupting capacity, 1200 to 3000 amperes continuous



Rear sections of 5-kv units are added after primary insulators are mounted and the main bus installed. Addition of molded *Pyro-Shield* caps completes the bus joint insulation.

GIVES YOU FACTORY-QUALITY BUS JOINTS, ELIMINATES COMPOUNDS AND TAPING WITH HANDY INSULATING CAPS

taping joints when connecting shipping groups in the field. After bolting the main bus to the primary disconnect bushing assembly, a molded *Pyro-Shield* cap is placed over the joint and fastened to the main bushing with a reusable nylon pin. Field assembly time is reduced by as much as 30 minutes per joint and you are also assured of uniform insulation of conductor joints. Insulation quality, then, is no longer dependent on the quality of field workmanship with this new A-C look.

GROUND BUS

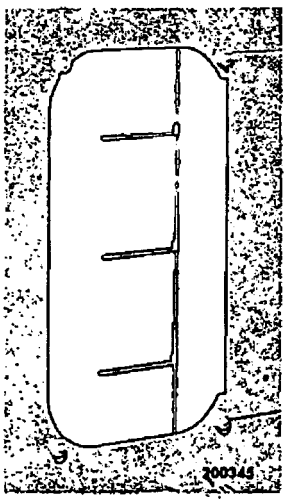
A common ground bus is incorporated in all units for properly grounding the equipment after installation. The ground bus extending through the switchgear is accessible in the primary cable area of the left-hand end of the group.

PREFORMED *PYRO-SHIELD* INSULATED JOINT CAPS

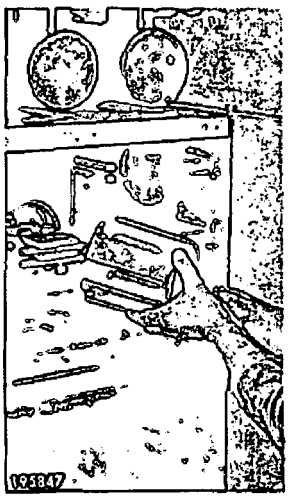
The overlapping design of the Allis-Chalmers cap creates a long path for an arc to travel, thus maintaining high impulse strength in a minimum of space. Extensive testing on the new bus joint showed that audible corona was not detected on a joint with cap under 21 kv — well above the nominal operating voltage.

These glass polyester parts are outstanding in electrical and mechanical properties and in ease of molding . . . making *Pyro-Shield* ideal for application as electrical insulation.

Specially insulated parts include bus insulation, bus bar supports, primary disconnect bushings, phase barriers on breaker, contact support structure, bushing tubes, operating rods and arc chute parts.



Pyro-Shield used in 5-kv interunit bus bar supports results in a rigid, well-supported main bus, resistant to arc tracking and moisture.

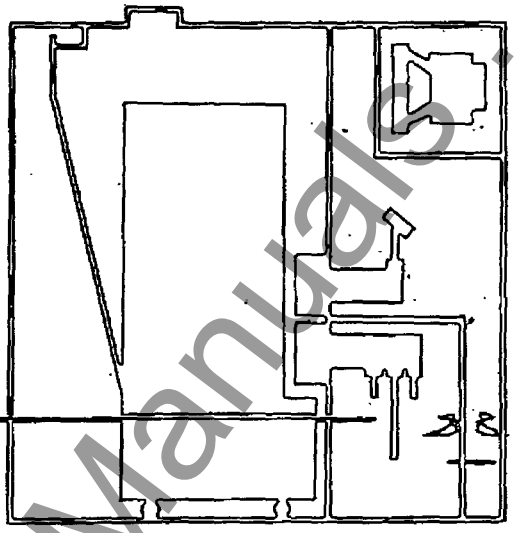


Placing polyester cap over bolted joint of 5-kv unit.

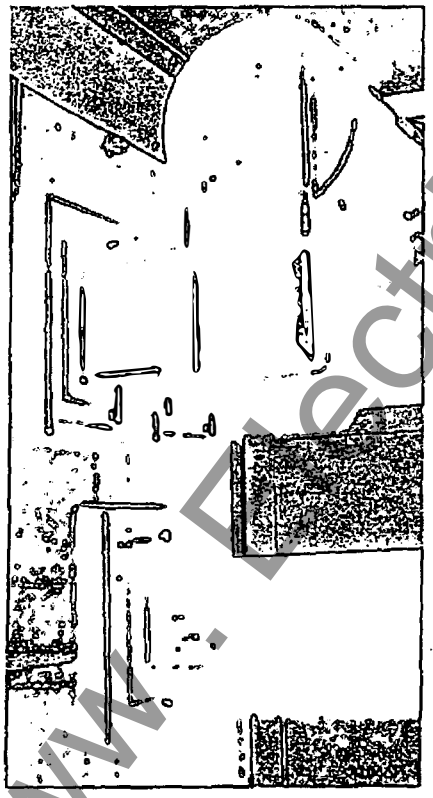
HORIZONTAL DRAWOUT METAL-CLAD SWITCHGEAR

5- and 15-kv, 75 to 1000 mva interrupting
capacity, 1200 to 3000 amperes continuous

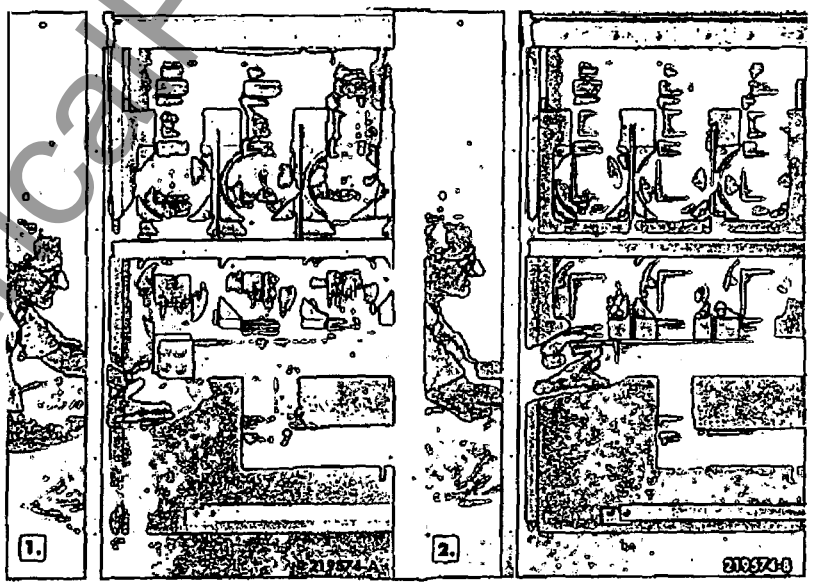
15-KV BUS COMPARTMENT



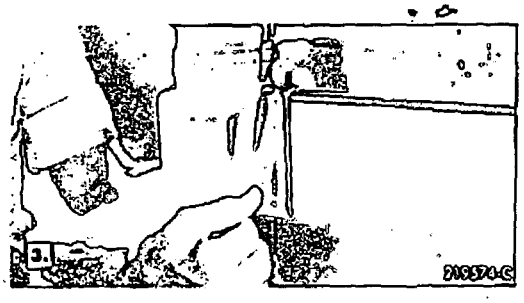
A UNIFORMLY HIGH LEVEL OF INSULATION QUALITY

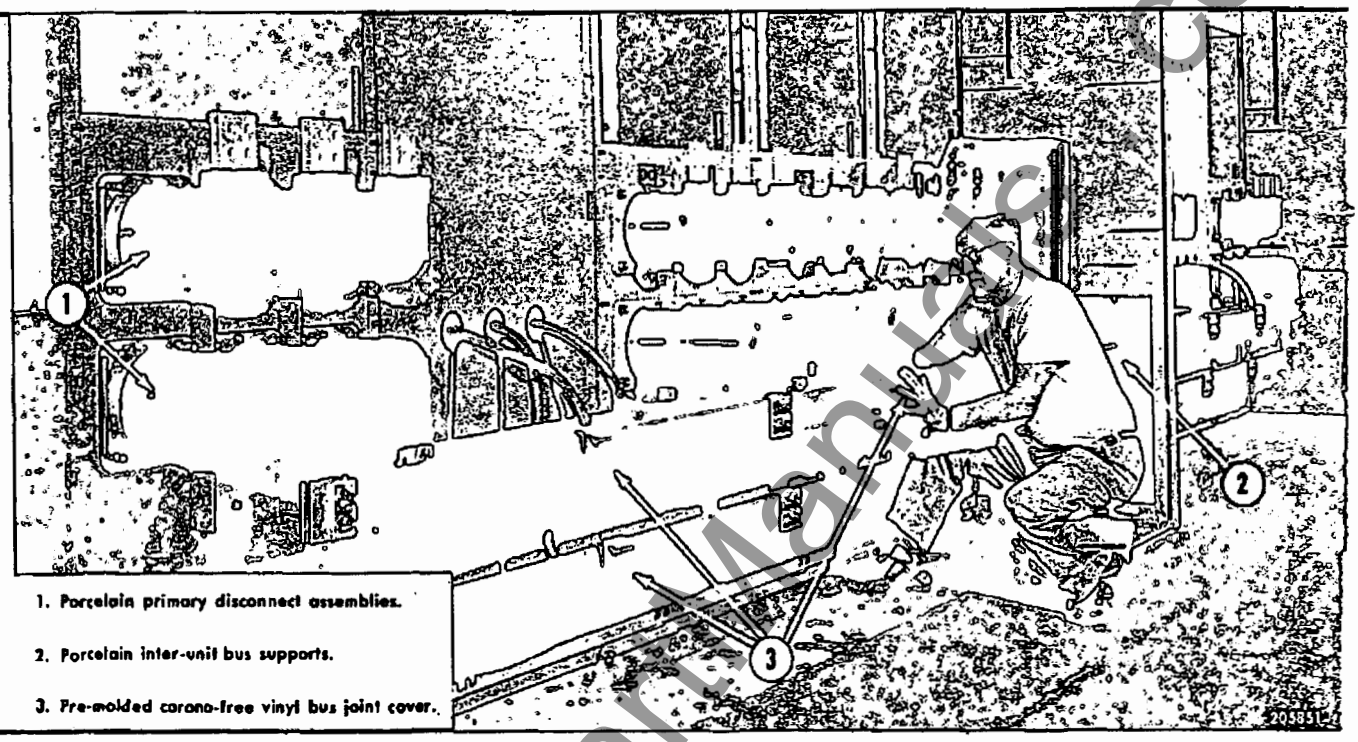


Contoured porcelain inter-unit bus supports, mounted in *Super Pyro-Shield* supporting barrier, are used in 15-kv class switchgear.



Molded polyvinyl boots are used to insulate bus joints of 13.8-kv switchgear. Molded boot is placed over bus joint (1, 2) and then (3) secured over bolted bus joint with vinyl tape.





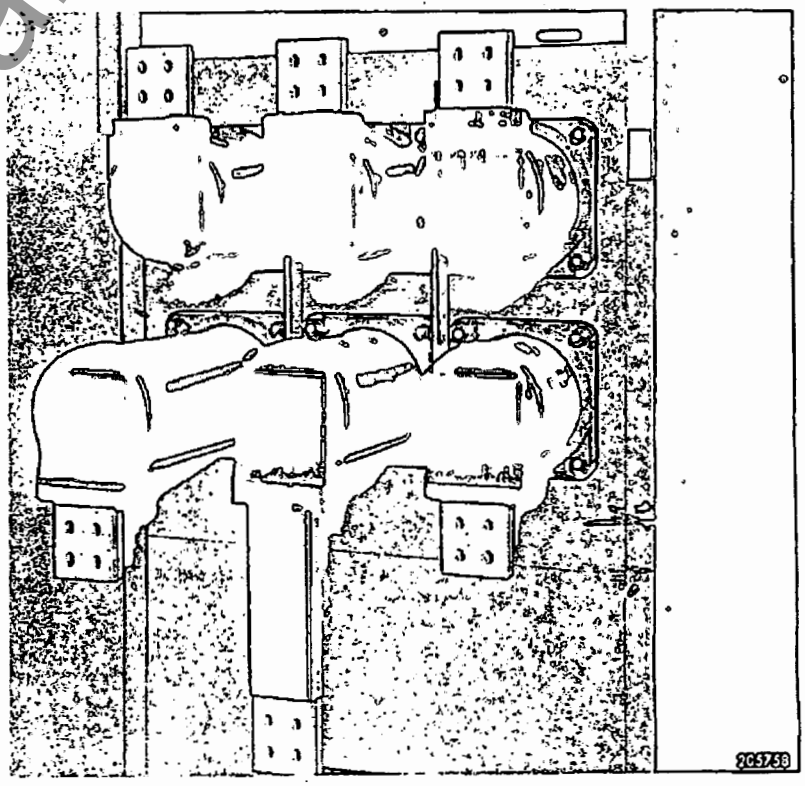
1. Porcelain primary disconnect assemblies.
2. Porcelain inter-unit bus supports.
3. Pre-molded corona-free vinyl bus joint cover.

IS MAINTAINED THROUGHOUT ALL ELECTRICAL CONNECTIONS

PORCELAIN INSULATORS

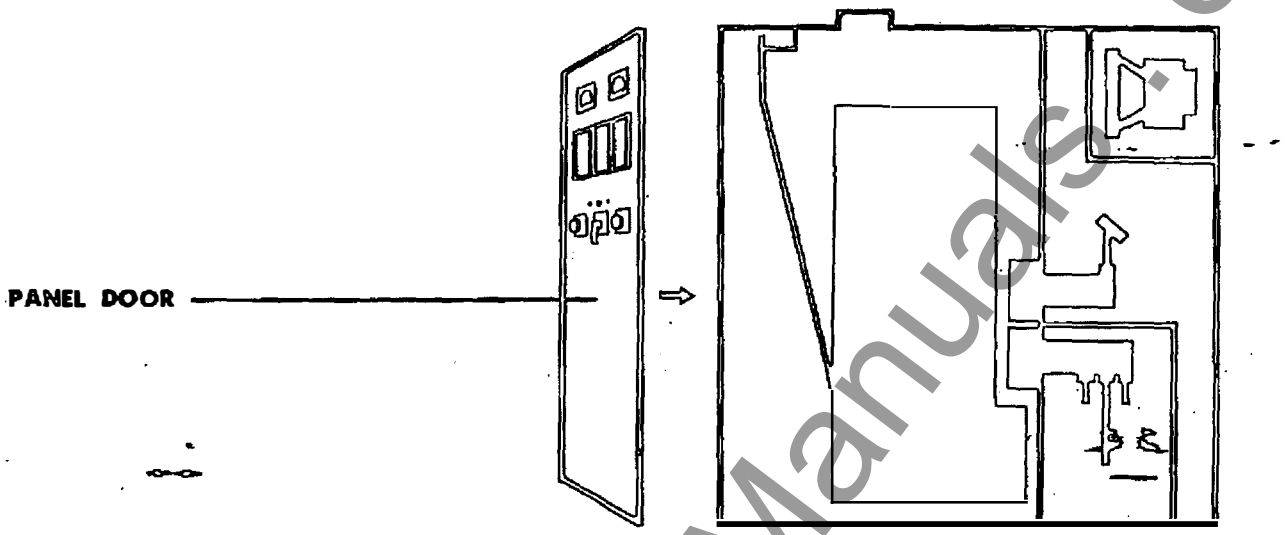
Electrical grade porcelain is used exclusively for all 15-kv main bus primary insulation. The low power factor, high dielectric strength, flame retardency and resistance to tracking make porcelain the optimum material for these critical applications.

The wide range of fabrication possibilities allows the use of porcelain in cylindrical forms for stand-off insulators and disconnect supports, as well as flat contoured pieces for inter-unit bus supports.



HORIZONTAL DRAWOUT METAL-CLAD SWITCHGEAR

5- and 15-kv, 75 to 1000 mva interrupting capacity, 1200 to 3000 amperes continuous



CONVENIENT FULL-PANEL METERING AND RELAYING

All instruments, meters and relays are standard switchboard type for mounting on the specially leveled steel panels. Conventional semiflush mounted case has a dull black finish. All meters and relays, if available as standard, are of the drawout type with built-in test devices. One test plug is furnished for testing drawout equipment.

The specified types of instruments, meters and relays are mounted as indicated in the specifications section SG 2.1, Pages 201-220.

Indicating and recording instruments, meters and relays are of the rectangular type, semiflush mounted. Special instruments will be furnished upon request. All scales have a suitable range and are designed with black letters on a white background.

CONTROL AND INSTRUMENT SWITCHES

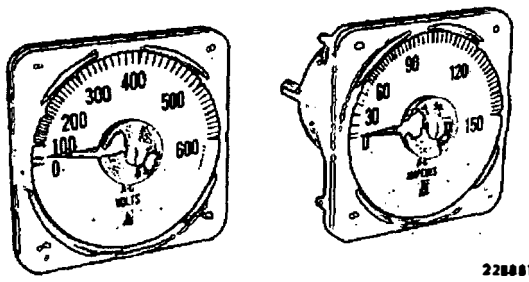
All switches furnished are Type 210, manufactured by A-C. They are of rotary-type construction, with two contacts per stage.

Control switches have pistol-grip handles, instrument switches have round notched handles, and transfer or auxiliary switches have oval handles. Standard switches have black handles.

In general, instrument switches are operated by removable key handles and control switches by fixed handles. The removable handles are labeled and so constructed that they can be inserted only in the proper switch and only in the "off" position.

All circuit breaker control switches have a mechanical flag indicator which shows a red or green marker to indicate the last manual operation of the switch.

Allis-Chalmers instruments furnished with metal-clad switchgear, switchboard type, maintain plus or minus 1% accuracy.



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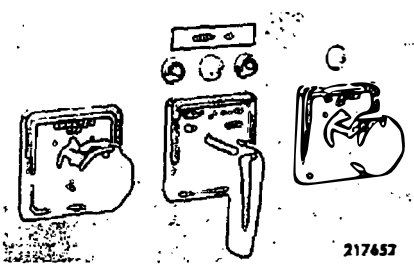

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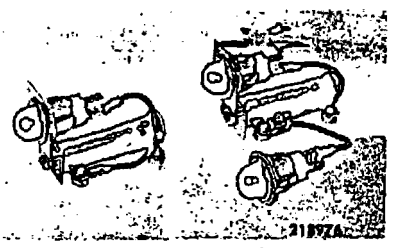
Typical Allis-Chalmers metal-clad switchgear handle types.



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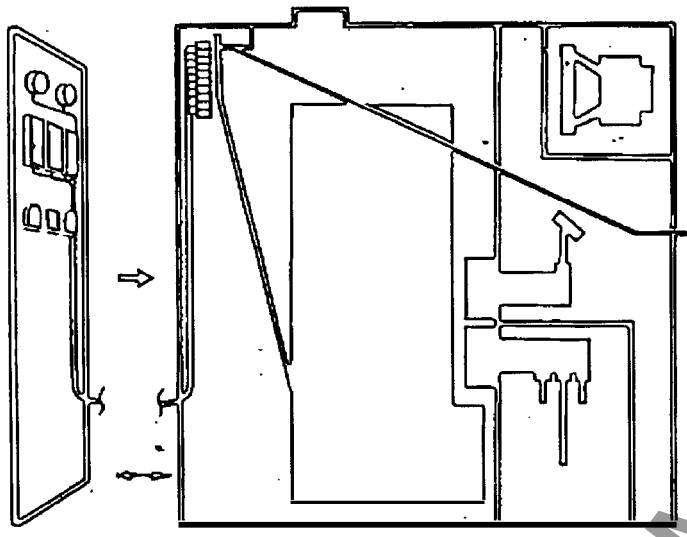
Indicating Lamps—Made by Allis-Chalmers, these indicating lamps may be specified with red, green, white or amber cops.



SECONDARY AND CONTROL WIRING IS COMPLETELY PRE-WIRED AT THE FACTORY

Metal-clad switchgear unit secondary and control wiring is brought to terminal blocks which have numbered points for identification. Additional terminal blocks are supplied for all secondary and control connections leaving the metal-clad units.

Standard secondary and control wiring in the metal-clad units is NEC Type SIS insulated for 600 volts and is no smaller than No. 14 AWG. Wiring between units is carried in an accessible wiring trough.

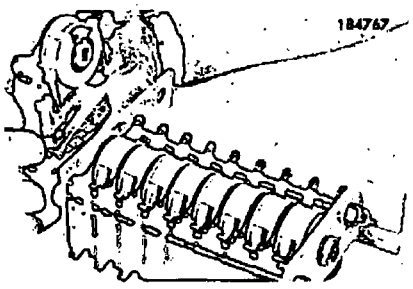
AUXILIARY SWITCH

The Type Q-10 auxiliary switch performs dependably with adequate current-carrying capacity to operate control circuits and indicating lights.

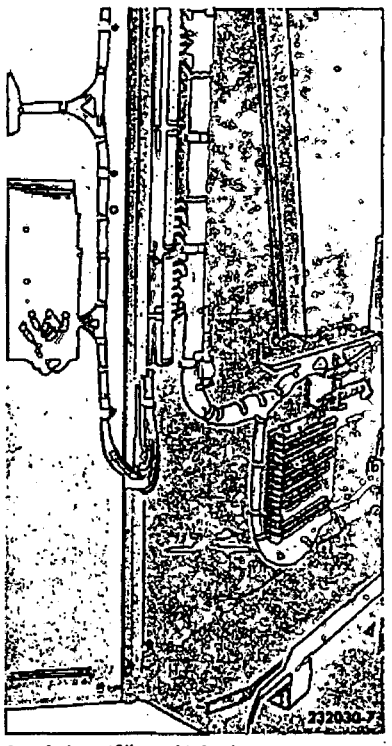
Each stage is adjusted individually without any disassembly or removal of wiring — a very desirable adjustment and maintenance feature.

CELL-MOUNTED AUXILIARY SWITCHES

When specified, extra auxiliary switches, in addition to the eight standard on the breaker, can be easily fitted on the cubicle. Switches are operated by a notched lug attached directly to the breaker mechanism main crank which is designed to accommodate this feature. Available in 4, 8, 12 and 16 stages. The making point of each stage can be adjusted individually in 15-degree steps throughout the entire 360 degrees. The rotor is adjusted by pressing the contact to side and rotating it within its insulated housing unit until it snaps into desired position.



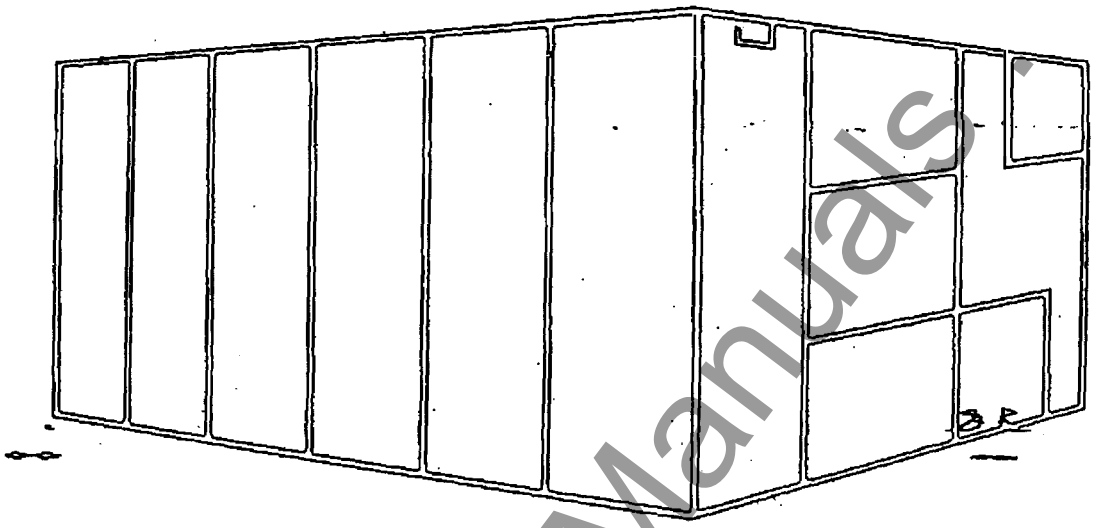
Cubicle mounted auxiliary switches are accessible for easy adjustment.



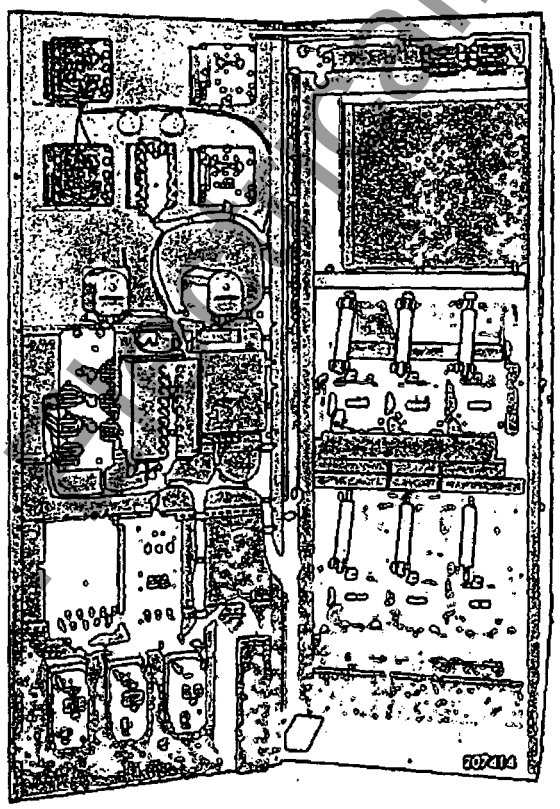
Panel door (5-kv unit) is shown open to reveal the newest wiring techniques and cubicle mounted auxiliary switches.

HORIZONTAL DRAWOUT METAL-CLAD SWITCHGEAR

5- and 15-kv, 75 to 1000 mva interrupting capacity, 1200 to 3000 amperes continuous



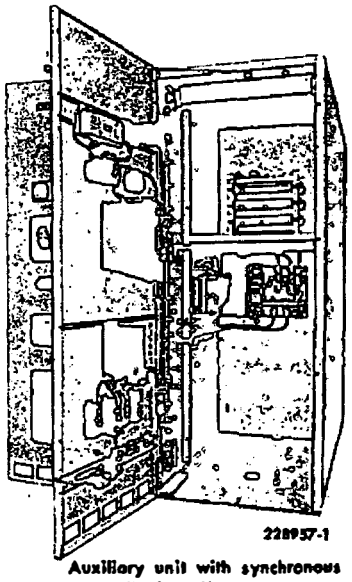
AUXILIARY IN-LINE UNITS



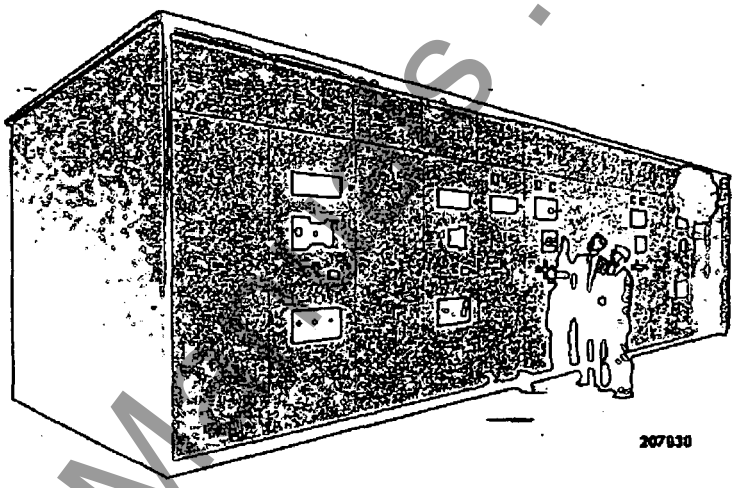
Auxiliary units are constructed in the same general manner as the stationary element (cubicle) except that no provision is made for either present or future mounting of circuit breaker removable element. Auxiliary units are used to house such equipment as potential transformers, control power transformer fuses, control transformers, generator or synchronous motor field control, rectifiers, reactors, batteries, chargers, voltage regulators, etc.

Compartments for housing buses, control wiring, potential transformers, etc., are separated by tightly fitted sheet steel barriers. Removable plates allow access to these compartments. The front of the unit is enclosed with a hinged steel panel equipped with knurled fasteners. These panels offer a convenient location for mounting instruments, meters and relays when the panels of adjacent units are crowded.

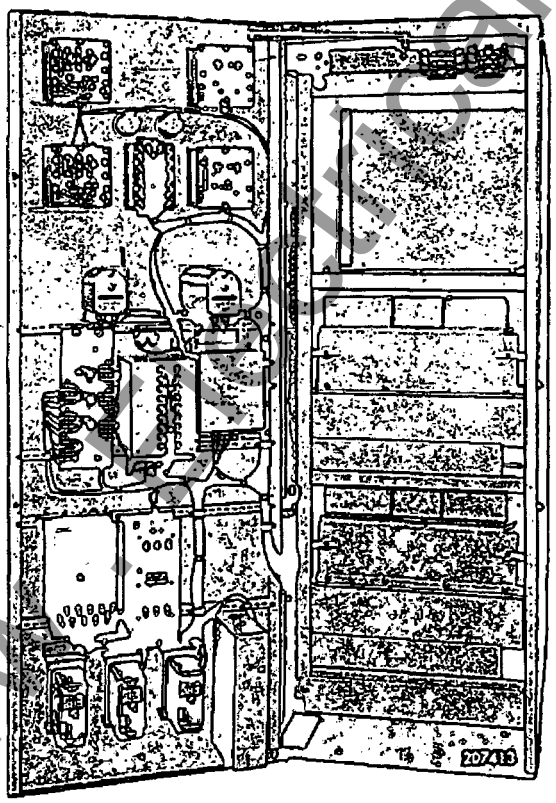
Auxiliary unit with meter panel door open showing potential transformer and fuse carriages, in the disconnected position.



Auxiliary unit with synchronous motor field equipment.

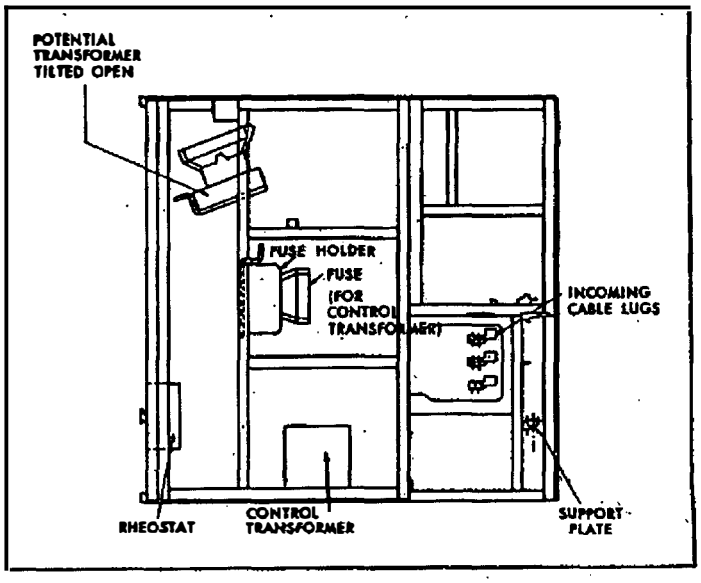


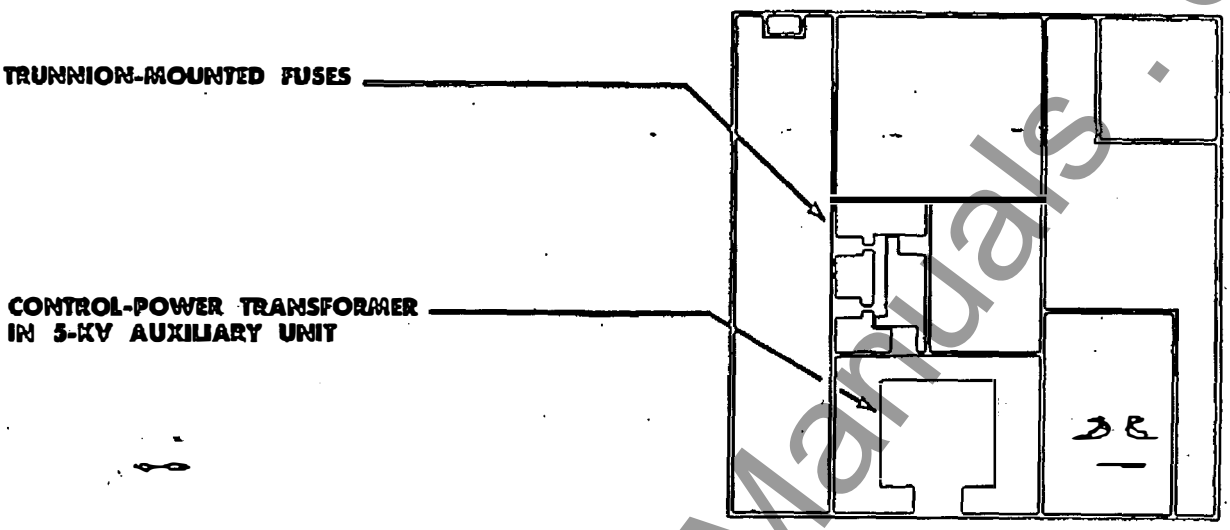
FULLY COMPARTMENTED COMPANION GROUPS FOR HOUSING ALL ADDITIONAL COMPONENTS EXCEPT CIRCUIT BREAKERS



Auxiliary unit with trunnion-mounted potential transformers in fully connected position, shielding operator from high-voltage compartment.

Side view of generator control auxiliary unit.





PERFORMANCE-TESTED CONTROL-POWER TRANSFORMERS

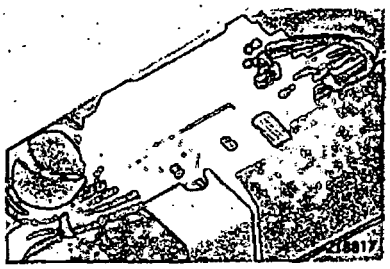
Control-power transformers are furnished when specified to supply power for the functions of the switchgear line. They are built and tested in accordance with the latest IEEE and NEMA standards. They meet these standards with respect to temperature in metal-clad switchgear and are designed with a uniformly low reactance to assure good regulation. The primary fuses are of the current-limiting type.

Control transformers are stationary mounted with tilt-out fuses. The fuses are mounted on a tilt-out carriage which operates in the same manner as the potential transformer carriage.

A thermal breaker on the secondary side of the transformer is interlocked with the carriage. It cannot be rotated unless the breaker is open. This prevents accidental circuit interruption with the main primary contacts.

The drawout fuse compartment for these units is located in the top rear of a breaker unit or in an auxiliary unit.

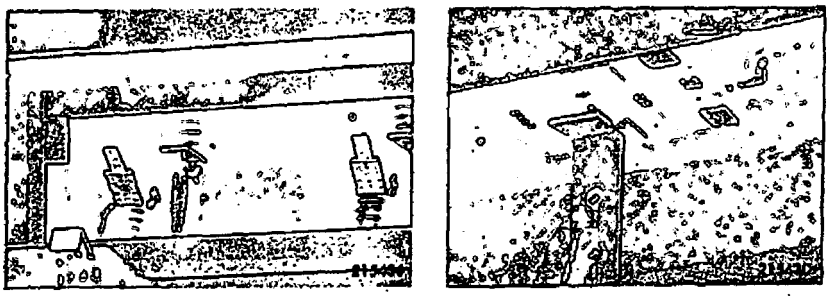
The drawout mechanism consists of a pair of trunnions with the transformer fuses mounted on a separate base which revolves 180 degrees from the connected position to the disconnected or test position. The weight of the revolving carriage is distributed so that it swings out easily. During the half-revolution required to fully disconnect, the current-limiting fuses are automatically grounded to remove any charge. When the complete disconnect position is reached, the stationary disconnect studs are behind a steel barrier. No accidental contact with the high-voltage circuit is possible.

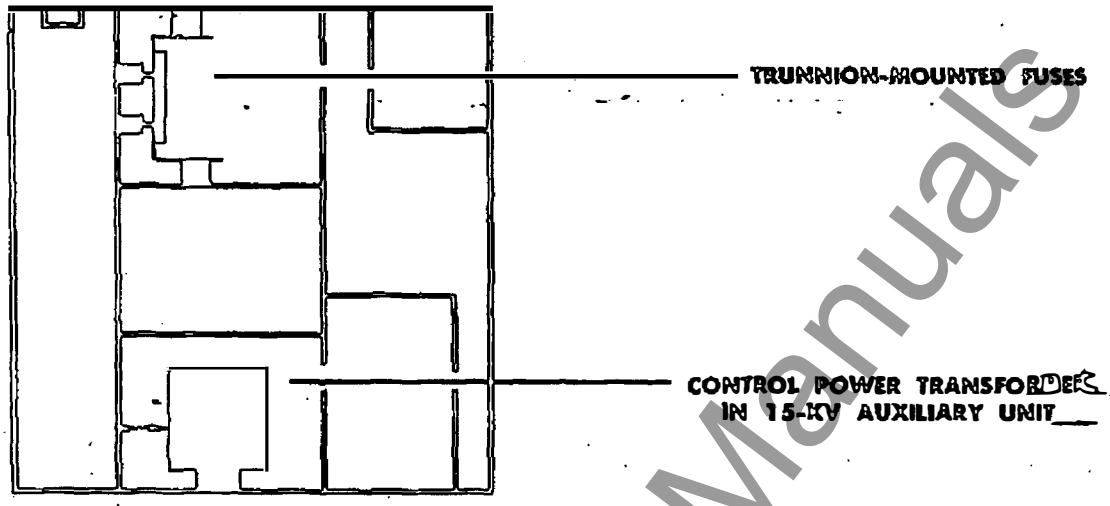


Trunnion-mounted fuses for the stationary-mounted control-power transformer are mechanically interlocked with secondary thermal breaker to prevent load break.

When the secondary breaker is closed, rotation of carriage is prevented as interlock engages breaker toggle.

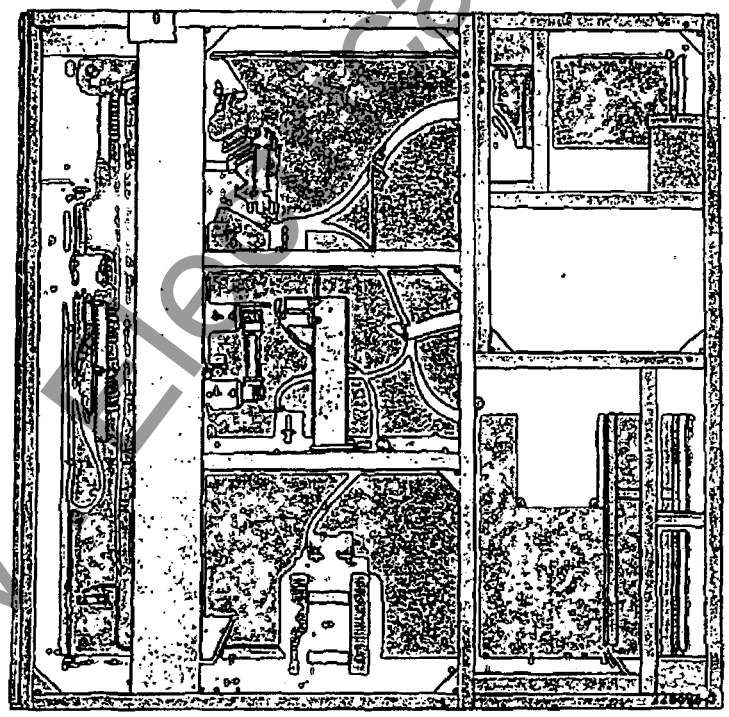
When the secondary breaker is open (right), rotation of carriage is possible (left).



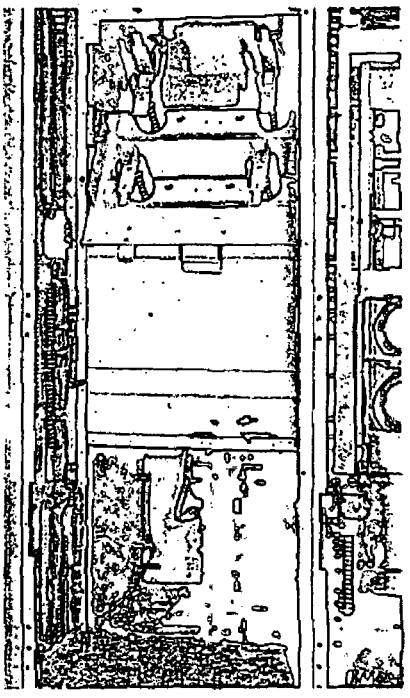


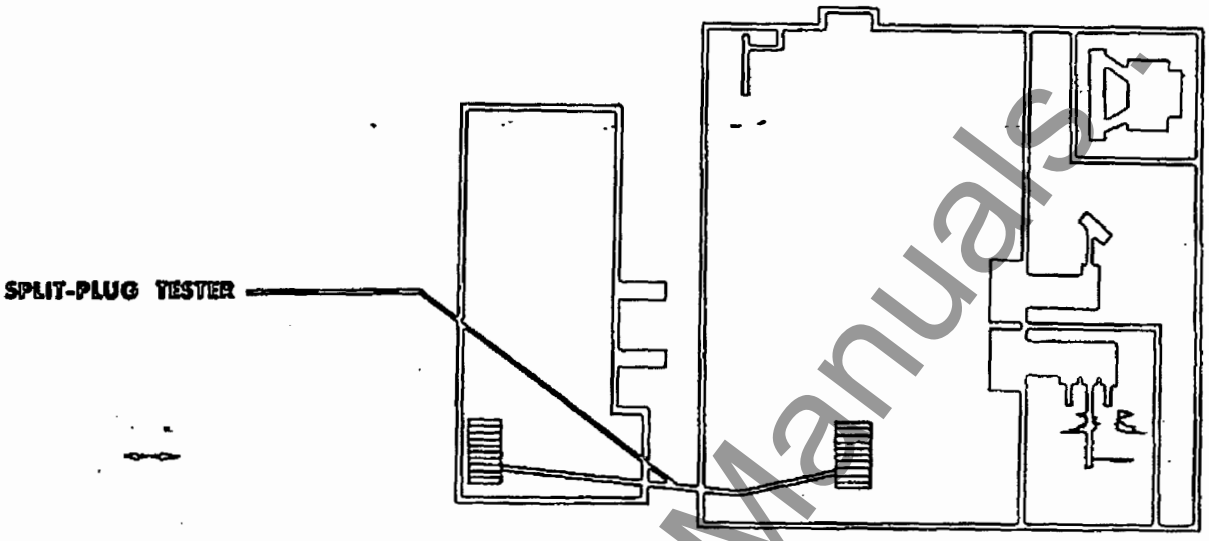
FOR OPERATING BREAKERS, COMPARTMENT LIGHTS, OUTLETS, HEATERS

Control power transformer mounted in bottom compartment of 5-kv auxiliary unit with its trunnion-mounted fuses in center compartment.

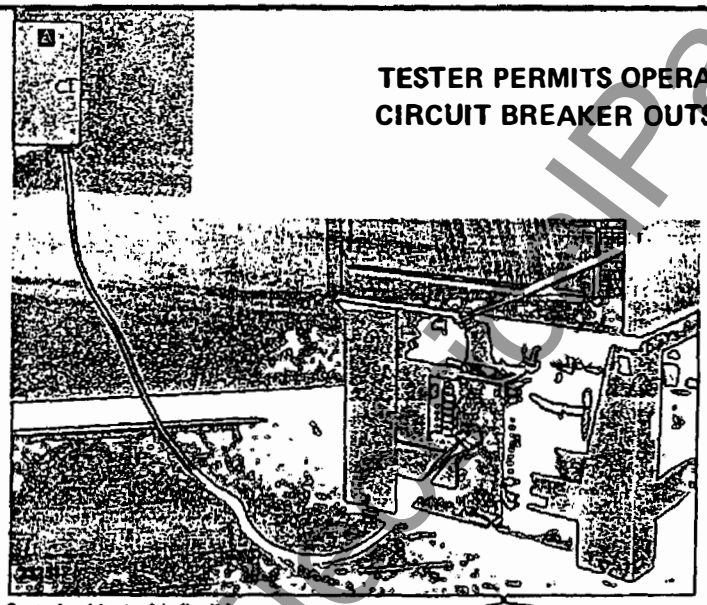


Control power transformer (bottom) and trunnion mounted fuse (top) arrangement in 15-kv auxiliary unit.





TESTER PERMITS OPERATION OF THE CIRCUIT BREAKER OUTSIDE OF THE CUBICLE



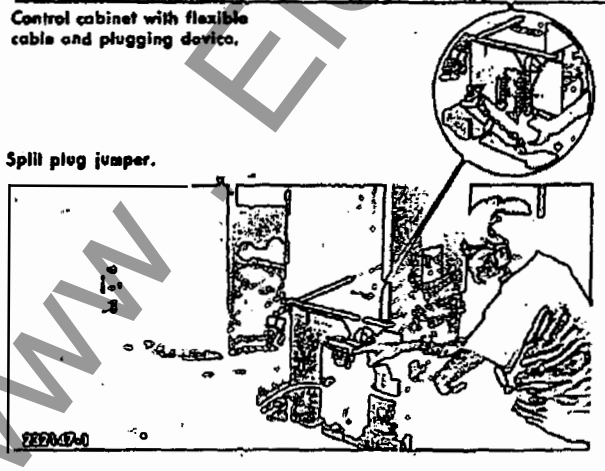
Control cabinet with flexible cable and plugging device.

Test devices — either a split plug jumper or control cabinet — are available for testing the circuit breaker outside of its cubicle.

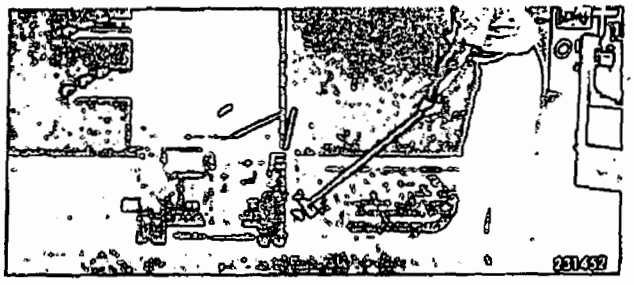
The plug jumper is used to bridge — with a flexible cable — the secondary disconnects so that the breaker can be electrically closed and tripped with the control switch on the instrument panel.

The steel control cabinet is connected to a plugging device by a flexible cable. It can be either bench- or wall-mounted remotely from the switchgear, near a suitable power source that must be wired into the cabinet by the user.

The plug jumper should be specified when normal maintenance is to be done in front of the switchgear. When circuit breakers are to be tested in a separate maintenance area, the control cabinet is recommended.



Split plug jumper.



Fifth wheel facilitates breaker handling.

CIRCUIT BREAKER DATA

BREAKER TYPE with either Stored Energy or Solenoid Operator	MA-75B	MA-250C	MA-250C	MA-350C	FA-350A	FB-500A	FC-500	FC-1000
Description								
Nominal voltage class — Kv, RMS	4.16	4.16	4.16	4.16	4.16	7.2	13.8	13.8
Nominal 3-phase Mva class (At 2.4-Kv: MA-75B = 50 Mva; MA-250B = 150 Mva; MA-350 = 200 Mva)	75	250	250	350	350	500	500	1000
Voltage Rating								
Rated maximum voltage — Kv, RMS	4.76	4.76	4.76	4.76	4.76	8.5	15.0	15.0
Rated voltage range factor — K	1.36	1.24	1.24	1.19	1.19	1.25	1.30	1.30
Current Ratings								
Rated continuous current at 60 cy. — Amp, RMS	1200	1200	2000	1200	3000	{1200 2000	{1200 2000	{1200 3000
Rated short circuit current at rated maximum voltage (symmetrical) — Ka, RMS	8.8	29	29	41	41	33	18	37
Rated Interrupting Time — Cycles	5	5	5	5	5	5	5	5
Insulation Level								
Rated Withstand Test Voltage								
Low frequency — Kv, RMS	19	19	19	19	19	36	36	36
Impulse crest — Kv	60	60	60	60	60	95	95	95
Related Required Capabilities								
Rated maximum voltage divided by K — Kv, RMS	3.5	3.85	3.85	4.0	4.0	6.6	11.5	11.5
Maximum symmetrical interrupting capability — Ka, RMS	12	36	36	49	49	41	23	48
Short-time (3 second) current carrying capability — Ka, RMS	12	36	36	49	49	41	23	48
Closing and latching capability — Ka, RMS								
Standard	19	58	58	78	78	66	37	77
Available (special order)	—	78	78	—	—	77	58	—
Operating Time, 60-Cycle Basis — Cycles								
From energizing trip coil until contacts part	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
From energizing close coil until contacts touch								
Solenoid	17	17	17	17	21	21	21	21
Stored energy	4	4	4	4	10	4.5	4.5	10
Spring charging time — stored energy	300	300	300	300	600	300	300	600
Length of Break Between Arcing Contacts (inches)	5.5	5.5	5.5	5.5	9.3	7.5	7.5	9.3

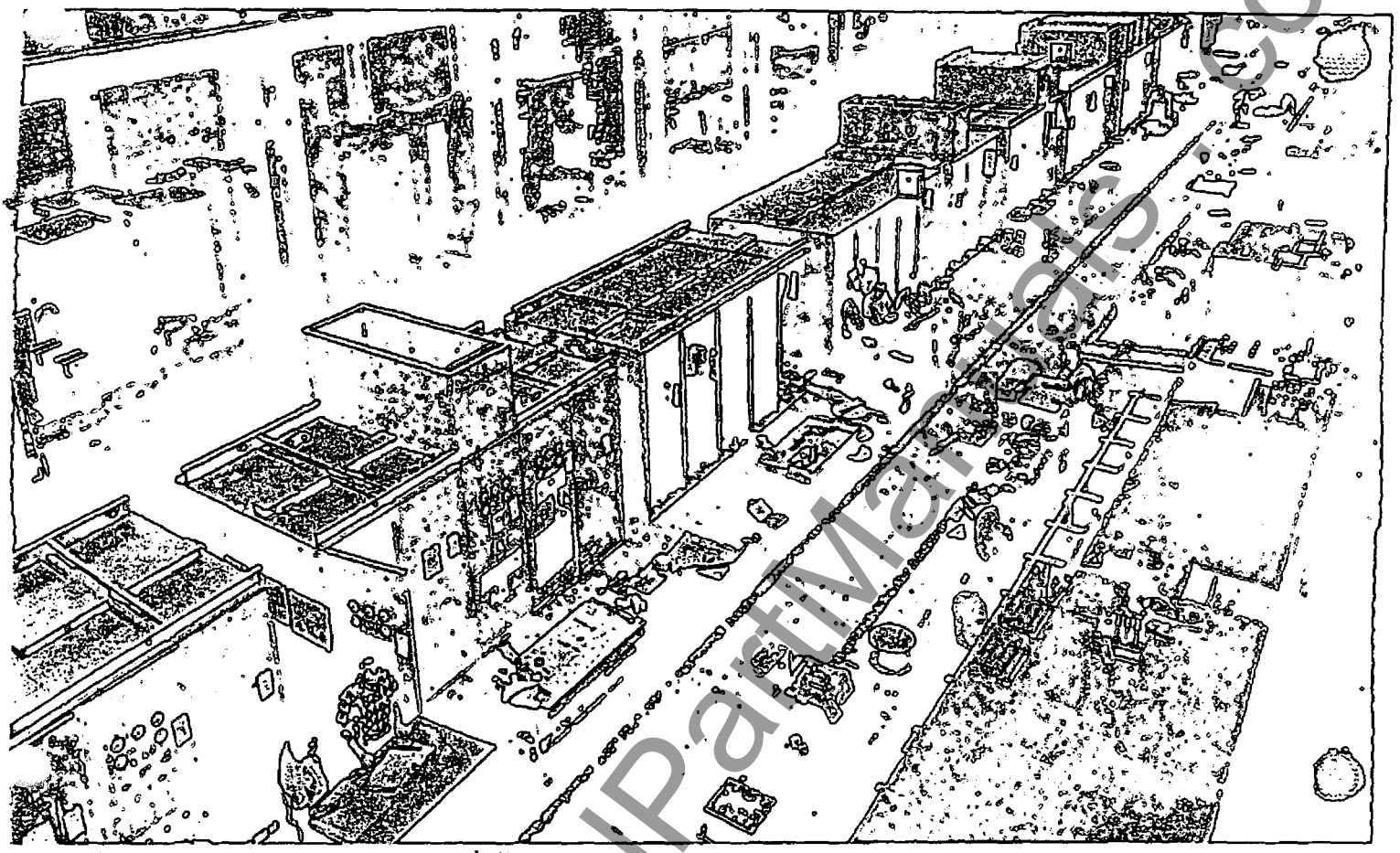
Control Data

Solenoid Closing Coil (80% E/R) — Amps								
125 volts dc (90-130)	58	58	77	77	92	74	66	92
250 volts dc (180-260)	30	30	56	56	48	40	34	48
115 volts ac (100 volts dc) (95-125)	73	73	73	73	—	—	85	—
230 volts ac (200 volts dc) (190-250)	37	37	71	71	62	44	43	62
Trip Coil (80 E/R) — Amps								
24 volts dc (14-30)	32	32	32	32	—	20	20	—
48 volts dc (28-60)	10	10	10	10	19	9	9	19
125 volts dc (70-140)	5	5	5	5	8	4	4	8
250 volts dc (140-280)	2.5	2.5	2.5	2.5	4	2	2	4
115 volts ac (95-125)	0.4	0.4	0.4	0.4	—	11	11	—
230 volts ac (190-250)	0.2	0.2	0.2	0.2	—	4	4	—
Capacitor (115/230)	1.0	1.0	1.0	1.0	—	1	1	1
Spring Charging Motor — Amps								
48 volts dc (35-50)	23	23	23	23	35	23	23	35
125 volts dc (90-130)	10	10	10	10	14	10	10	14
250 volts dc (180-260)	5	5	5	5	8	5	5	8
115 volts ac (95-130)	12	12	12	12	22	12	12	22
230 volts ac (190-250)	6	6	6	6	12	6	6	12
Spring Release Coil (E/R) — Amps								
24 volts dc (18-30)	32	32	32	32	19	19	19	19
48 volts dc (35-50)	10	10	10	10	9	9	9	9
125 volts dc (90-130)	5	5	5	5	4	4	4	4
250 volts dc (180-260)	2.5	2.5	2.5	2.5	2	2	2	2
115 volts ac (95-125)	7	7	7	7	10	7	7	10
230 volts ac (190-250)	4	4	4	4	5	4	4	5

*These columns contain tentative data subject to change.

HORIZONTAL DRAWOUT METAL-CLAD SWITCHGEAR

5- and 15-kv, 75 to 1000 mva interrupting capacity, 1200 to 3000 amperes continuous



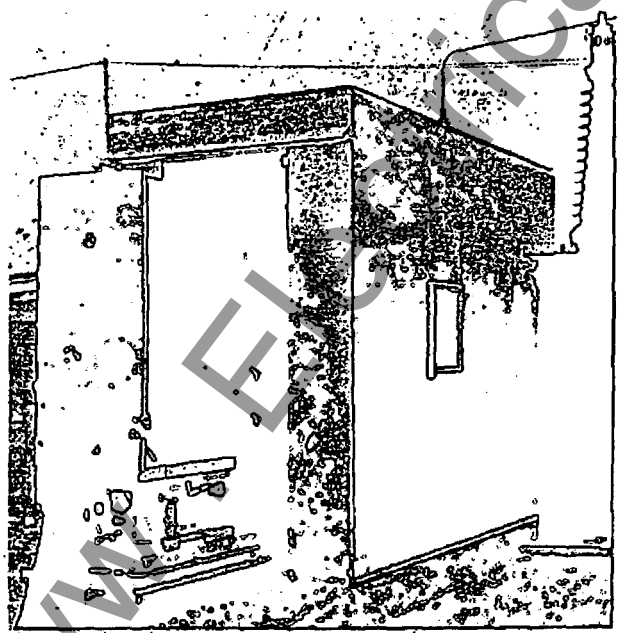
Portion of switchgear assembly area, West Allis (Wis.) Works.

Completed Switchgear Groups Must Pass Rigid Factory Tests

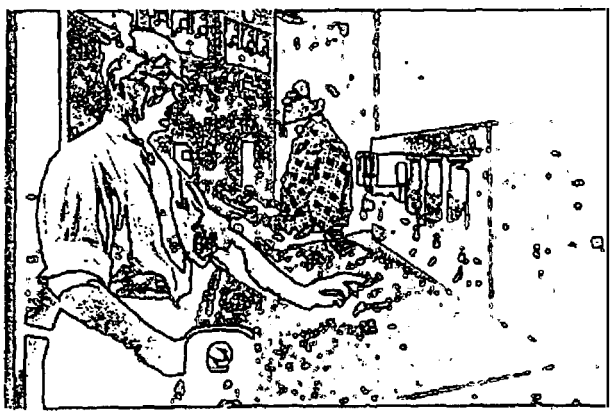
Primary and secondary connections are given standard dielectric tests, to insure that the insulation is ample for the rated voltage.

The assembled units are carefully inspected and all wiring is checked to insure proper functioning of the equipment.

The equipment covered by this specification is tested in accordance with NEMA standards. All wiring is checked at low voltage to prove correctness of the connections.



Complete switchgear/breaker unit is tested, under controlled temperature and humidity conditions, in this environment chamber.



SWITCHGEAR DIVISION