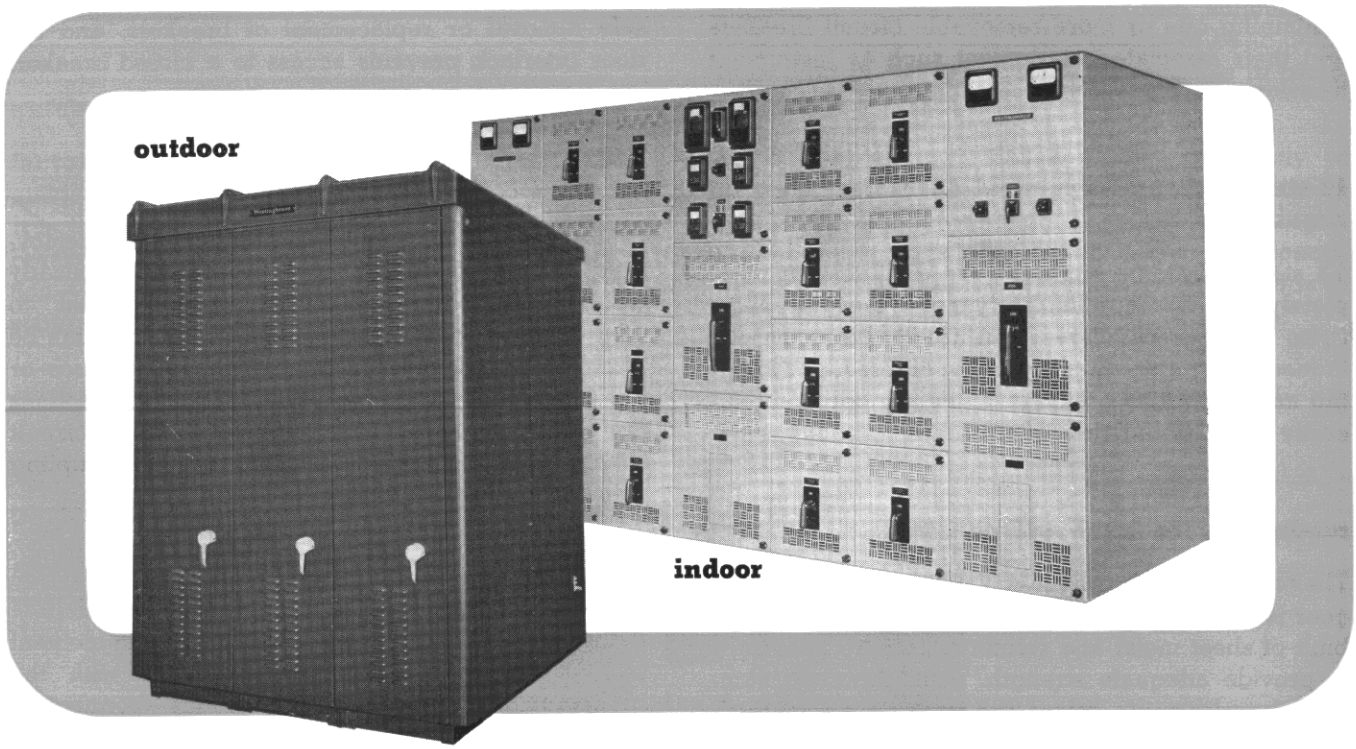
assembled switchgear

standardized low-voltage metal-enclosed switchgear

600 volts a-c maximum • 15 to 6000 amp
15,000 to 150,000 amp int cap. • indoor and outdoor

descriptive bulletin **32-150**

utilizing type DB De-ion® drawout air circuit breakers



application

central stations

auxiliary power circuits for
- fans
- blowers
- pumps
- compressors
- lighting circuits

industrial plants

- power and lighting networks
- power feeders
- lighting feeders
- power generation and auxiliaries
- power drives for machine tools and material-handling equipment

commercial buildings

- power feeders for fans, pumps, blowers
- lighting feeders
- elevator service
- air-conditioning systems

For the control and protection of power circuits for fans, pumps, lighting and machines at 208, 240, 480 or 600 volts a-c . . . especially adapted for power centers.

Factory-assembled from standardized units wired and tested to meet the specific requirements for any desired installation. Widely applied in industrial plants, electric utility stations and commercial buildings. Breakers can be applied for selective tripping to give maximum of service continuity, or the breakers can be applied in cascade to provide adequate interrupting ability at a minimum cost.

advantages

modern design and construction: Completely metal-enclosed, self-supporting metal structure . . . modern in appearance and construction throughout . . . inherently dead front . . . 3-position drawout breaker design.

maximum protection and continuity of service: DB De-ion air circuit breakers provide superior power circuit protection, operating and maintenance features.

standardized design affords minimum complete cost: Standardized design throughout eliminates special design and engineering costs . . . sufficiently "custom-assembled" to meet all normal application requirements.

quick and easy installation: Standardized units are grouped in the size assembly best handled at customer site . . . ready to be placed on the foundation and connected easily to the primary and secondary control circuits.

January, 1958
new information
mailed to: E/263/DB; D64-5B; C26-5S

outstanding design features

Low-voltage metal-enclosed switchgear consists of a completely enclosed, self-supporting metal structure containing one or more removable circuit breakers and their associated equipment such as instrument transformers, buses and connections.

12 standardized units meet normal requirements

12 standardized, basic units are available as completely engineered, completely tooled designs. From these 12 units, switchgear can usually be assembled to meet any requirements of main and feeder switching and protective equipment. Future additions are easily made to the structure.

modern appearance and construction

The construction of low-voltage metal-enclosed switchgear is modern throughout. The welded structure is built of sheet metal and reinforced where necessary to provide adequate strength. All hinges are concealed; instruments, relays and meters are semi-flush mounted. Flexitest cases are provided for relays and meters, eliminating separate test switches.

finish

Standard paint finish ASA #61 gray is used for all exterior and interior surfaces. Structures are completely bonderized after fabrication. This provides an excellent base for the final finish, inhibits rust, improves general appearance and assures a long-lasting finish.

Outdoor low-voltage switchgear, in addition to bonderizing, has the bottom undercoated for protection against rust and corrosion.

safety in operation and maintenance

Low voltage metal-enclosed switchgear is inherently dead-front. All breakers may be closed or tripped without opening doors or otherwise exposing live parts. Each breaker is enclosed in an individual metal compartment. Bare buses, cable connections and instrument transformers are placed in full-height rear compartments and separated from breaker compartments. Interlocks and positioning devices assure safe removal or replacement of breakers, and the door interlock prevents access to a closed breaker.

type DB De-ion drawout breakers assure maximum service continuity

All DB De-ion air circuit breakers are of the removable drawout type. They can be moved physically (through horizontal travel) from the "connected" to "test" and "disconnected" positions. Or they can be removed completely for inspection, maintenance or replacement. Main power and control connections are established between the removable circuit breaker and the housing by means of self-coupling primary and secondary disconnecting devices.

3-position DB breaker design

A sliding faceplate on the removable breaker element permits closing the compartment door with the breaker in any of its 3 standard positions—connected, test or disconnected. This feature provides a free aisle in front of the switchgear and closed door protection for the breakers when necessary to have them disconnected for safety during installation and maintenance.

"walk-in" space for outdoor type

Outdoor low-voltage switchgear is enclosed in strong weather-proof housings with adequate ventilation through filtered louvers.

"Walk-in" aisle space is provided at the front of the assembly. Outer weatherproof door may be closed with breaker compartment door open and breaker pulled out on extension rails. This arrangement permits inspection during inclement weather.

minimum complete cost

Westinghouse standardized design eliminates special design and engineering costs. Yet it is custom-built in that it meets specific application requirements with respect to number and rating of the circuit breakers and the selection of attachments, instru-

ments and relays. The chart of standard units on pages 20 and 21 enables adequate selections to meet requirements.

quick installation as an assembly

factory assembled and tested: Every switchgear unit is completely assembled and wired at the factory. It is then given sequence and overpotential tests—breakers and control devices are checked for operation—instruments, meters and relays are tested for accuracy.

shipped as a unit: Where handling facilities at the purchaser's plant permit, the complete switchgear is shipped as an assembly. In any case, shipment is made in completely assembled groups of basic units, depending in size upon handling facilities in transportation and at destination.

easily installed: Installation consists merely of properly anchoring the complete assembly to its foundation and connecting the main cables and control connections. The switchgear is self-supporting. It can be lifted by crane or moved on skids to location.

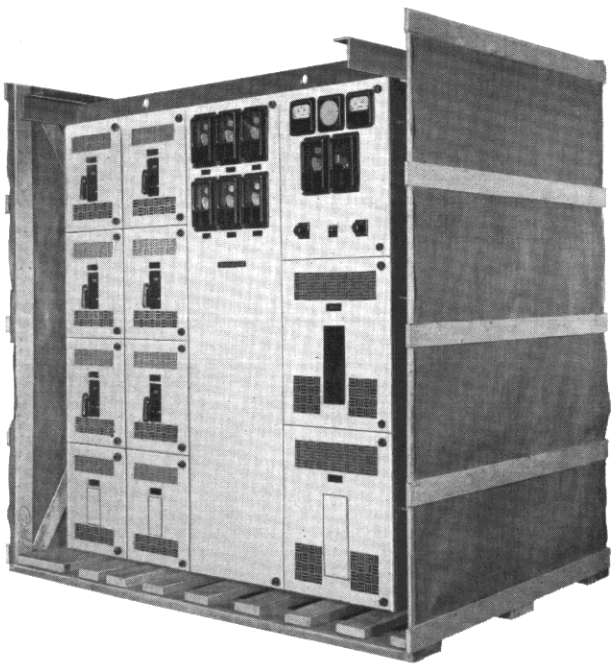


fig. 1—Complete switchgear unit, partially crated for shipment. Can be lifted by crane or moved on skids to location. Note that the DB-50 breaker is shipped separately, while the smaller DB-25 breakers are shipped in their compartments.

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low-voltage metal-enclosed switchgear

indoor applications

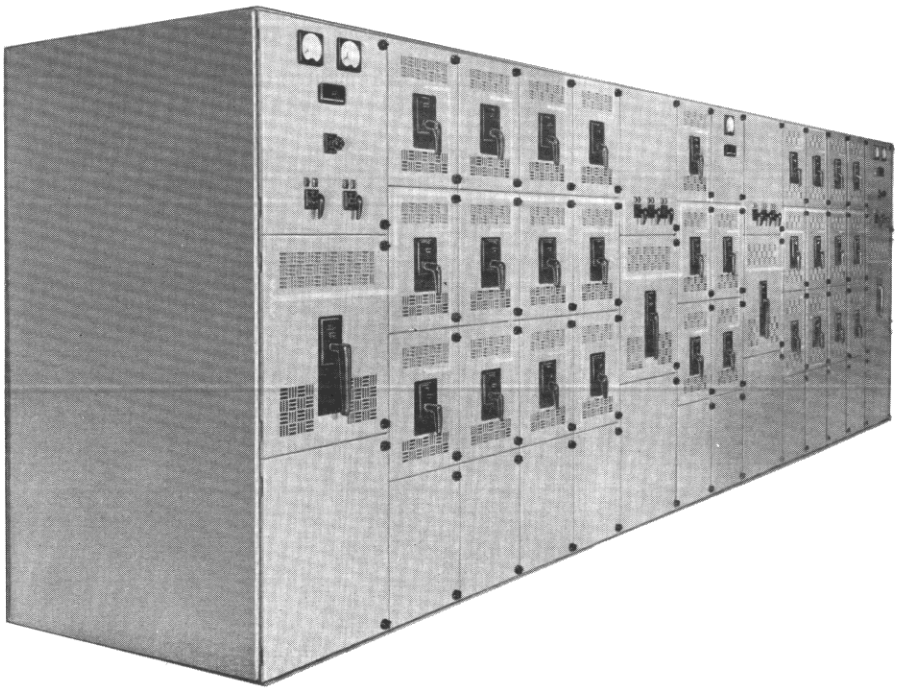


fig. 2—A large assembly of indoor switchgear for generating station auxiliaries. Two transformer secondaries, two tie breakers and many feeder circuits are protected and controlled.

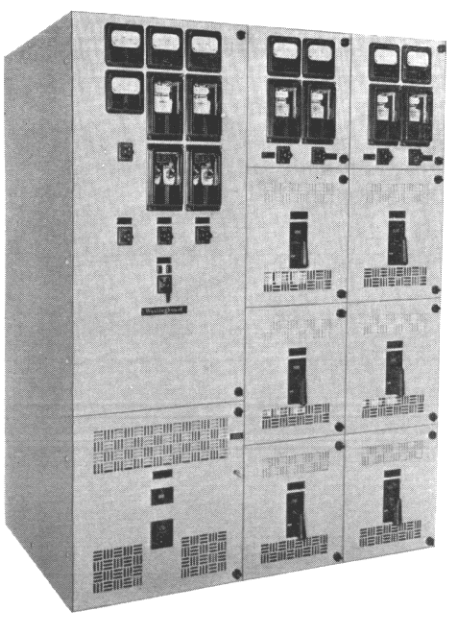


fig. 3—Typical assembly of low-voltage switchgear with DB-75 main breaker and six feeder breakers.

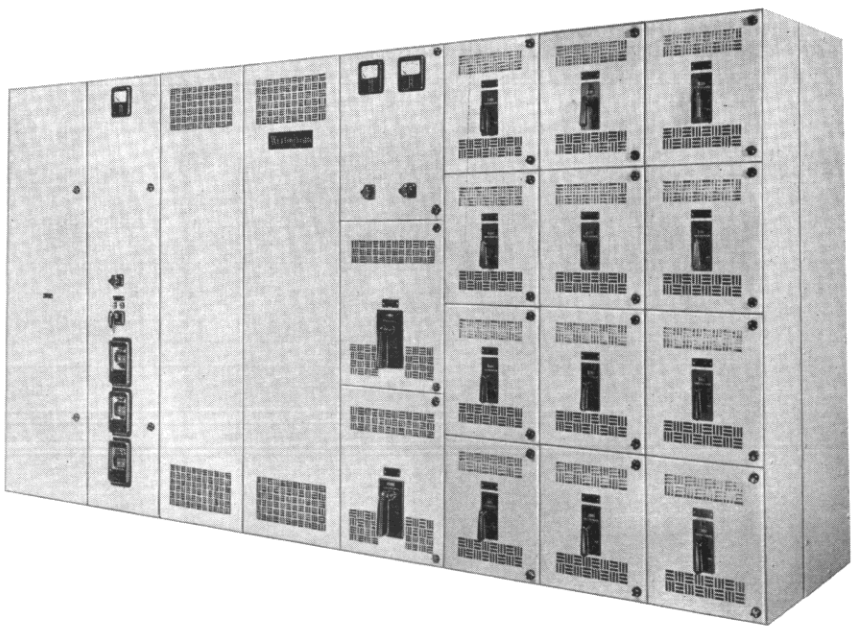


fig. 4—Westinghouse low-voltage switchgear blends perfectly with air-cooled transformers and high-voltage metal-clad switchgear to form attractive power centers.

outdoor applications

In addition to retaining the basic design features of the indoor type, outdoor low-voltage metal-enclosed switchgear is enclosed in weatherproof housings with adequate ventilation and heaters to eliminate condensation.

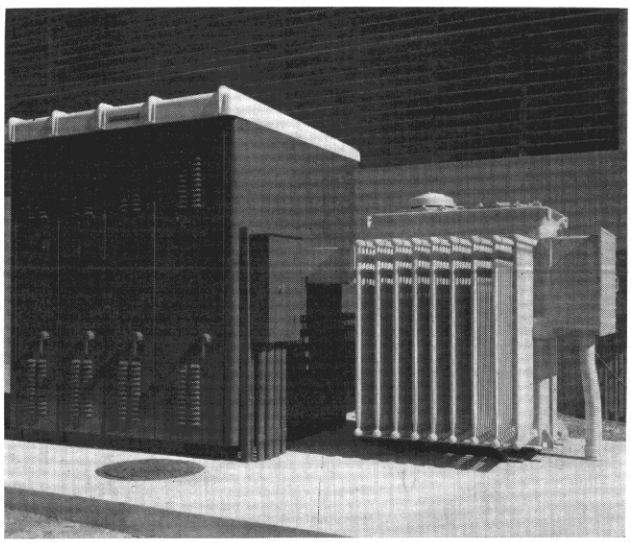


fig. 5—Typical outdoor power center with transformer throat-connected to the low-voltage metal-enclosed switchgear in weatherproof enclosure.

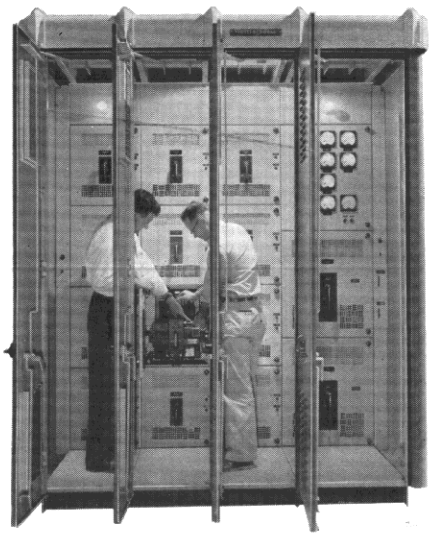


fig. 6—Opening the door of the weatherproof housing provides the same ease of operation, inspection and maintenance offered by indoor type units. Note compactness of the assembly.

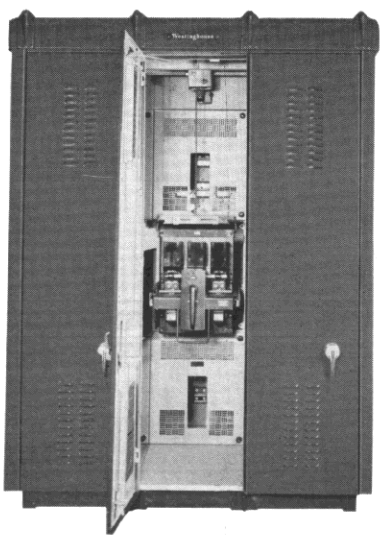


fig. 7—Westinghouse outdoor type low-voltage metal-enclosed switchgear showing DB-50 breaker on extension rail and travelling geared lifter attached to breaker.

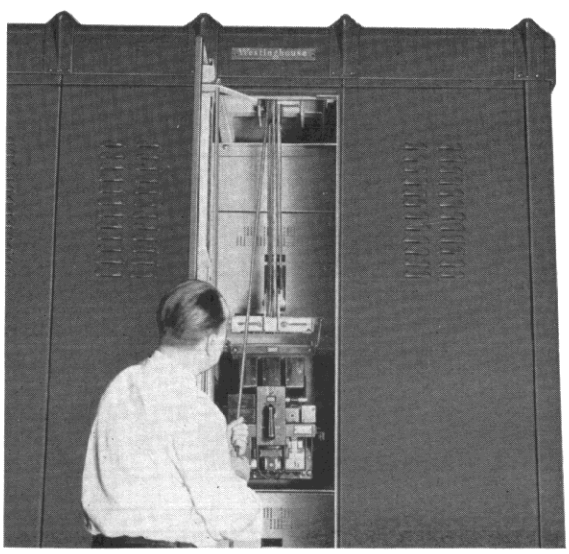


fig. 8—Lifting DB-25 breaker from extension rails with standard rope lifter.

drawout construction for maximum continuity of service

Drawout construction of this metal-enclosed switchgear offers three distinct advantages all of which are important for continuity of service:

Inspection—easier and more thorough.

Disconnection—when drawn out of operating position, breaker serves as disconnect.

Replacement—any breaker can be replaced with a reserve breaker of same type and rating.

De-ion air circuit breakers incorporate the most modern and advanced principles of arc interruption and are capable of performing repeated interrupting cycles without material change of their operating characteristics.

To insure that the circuit breakers will be in good repair at all times, periodic inspections are necessary. Careful consideration has been given to this problem in the design of all drawout units to reduce inspection time to the minimum.

All floor-wheeled drawout units can be quickly rolled out of their housings. All other units roll onto rail extensions which are easily attached on the enclosing structure. In the withdrawn position, complete accessibility of all parts requiring inspection is attained.

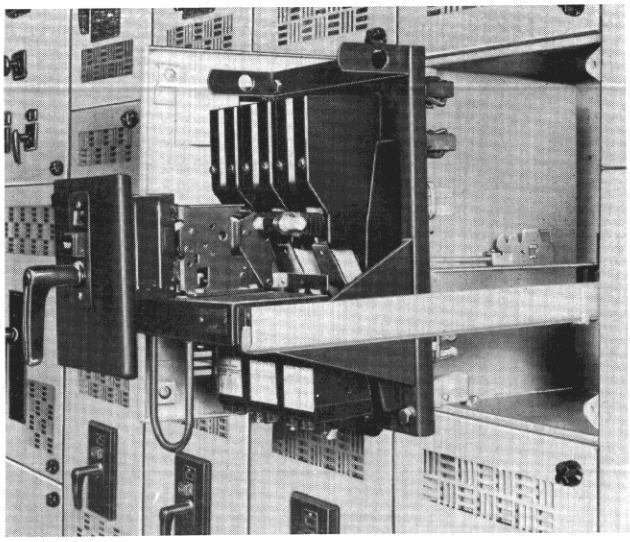


fig. 9—DB-25 on extension rails. Note large clearance behind breaker to permit full inspection of contacts and compartment.

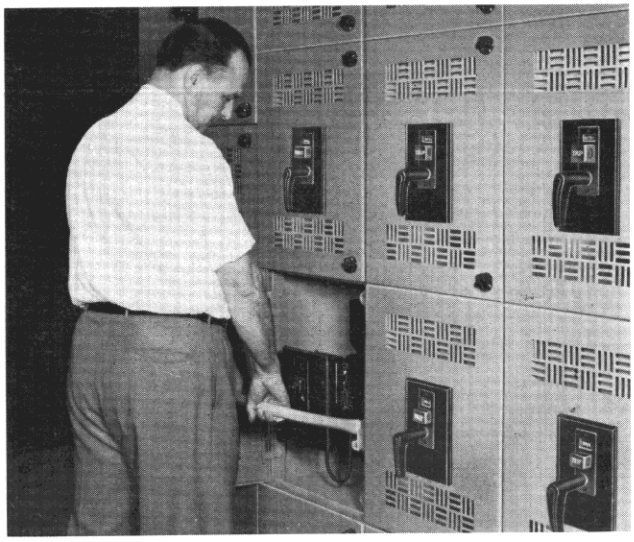


fig. 10—Levering DB-25 into connected position.

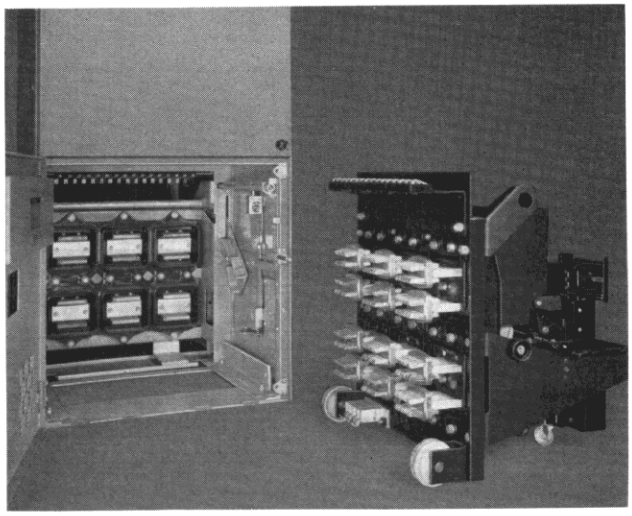


fig. 11—DB-75 R.H. side of compartment showing interlock assembly including key interlock and rear view of DB-75 breaker.

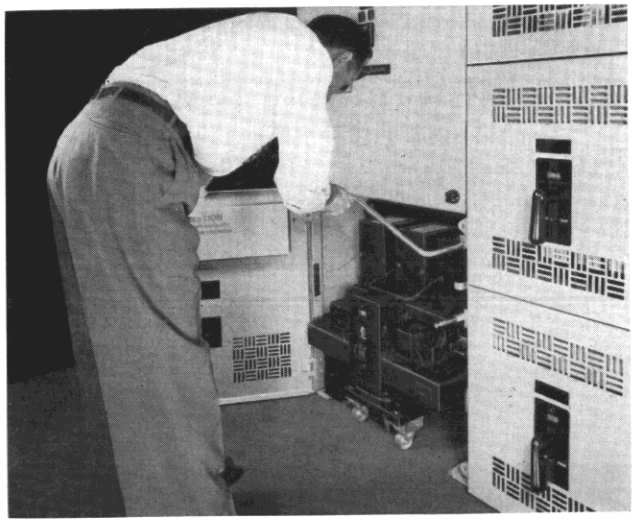


fig. 12—Cranking DB-75 (or DB-100) breaker into connected position.

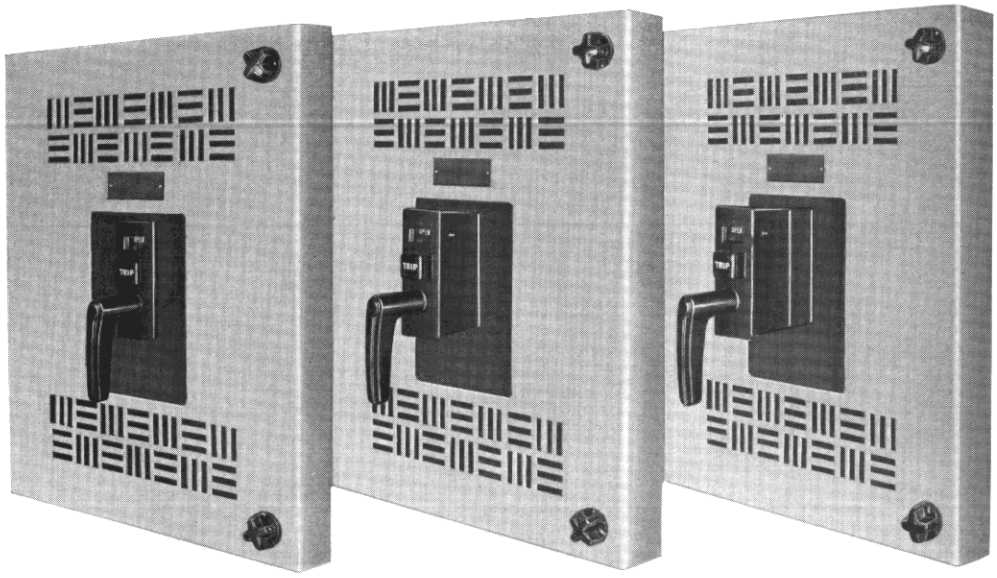
three breaker positions with panel closed

This feature permits the panel door to be kept closed at all times except when maintenance is actually being performed on the breaker or its compartment.

automatic position indication: The breaker position, if extended, is indicated at a glance by the light colored lines against the dark foreplate.

safety and protection: During installation or maintenance periods the breaker may be disconnected for the safety of personnel working on the circuits with full closed door protection of the breaker against dust or meddling hands.

standard dimensions: Switchgear depths have not changed to achieve this feature. DB-15 and DB-25 are now both built in 18″ width units to provide greater flexibility in designs.



operating position test position disconnected position

fig. 14—The DB-25 breaker shown in all three positions. The position of the breaker in the compartment is indicated by the light colored lines.

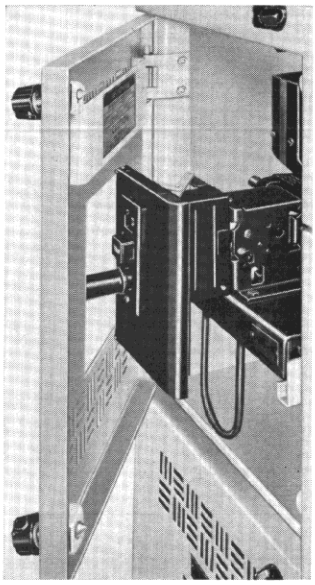


fig. 15—Panel door shown operating sliding faceplate.

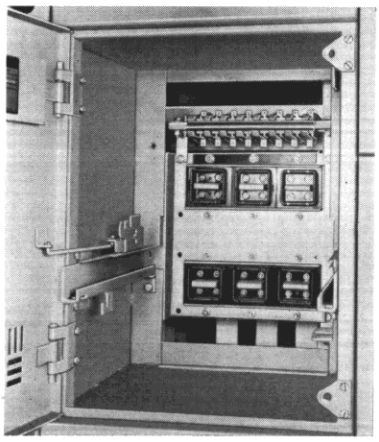
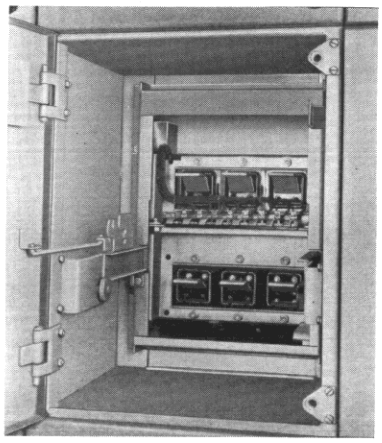


fig. 15—Interior view of the 18″ compartment equipped for a DB-25 at left and for a DB-15 at right. By using different rails and contacts the same basic compartment serves for both breaker sizes.



type DB De-ion low-voltage air circuit breakers

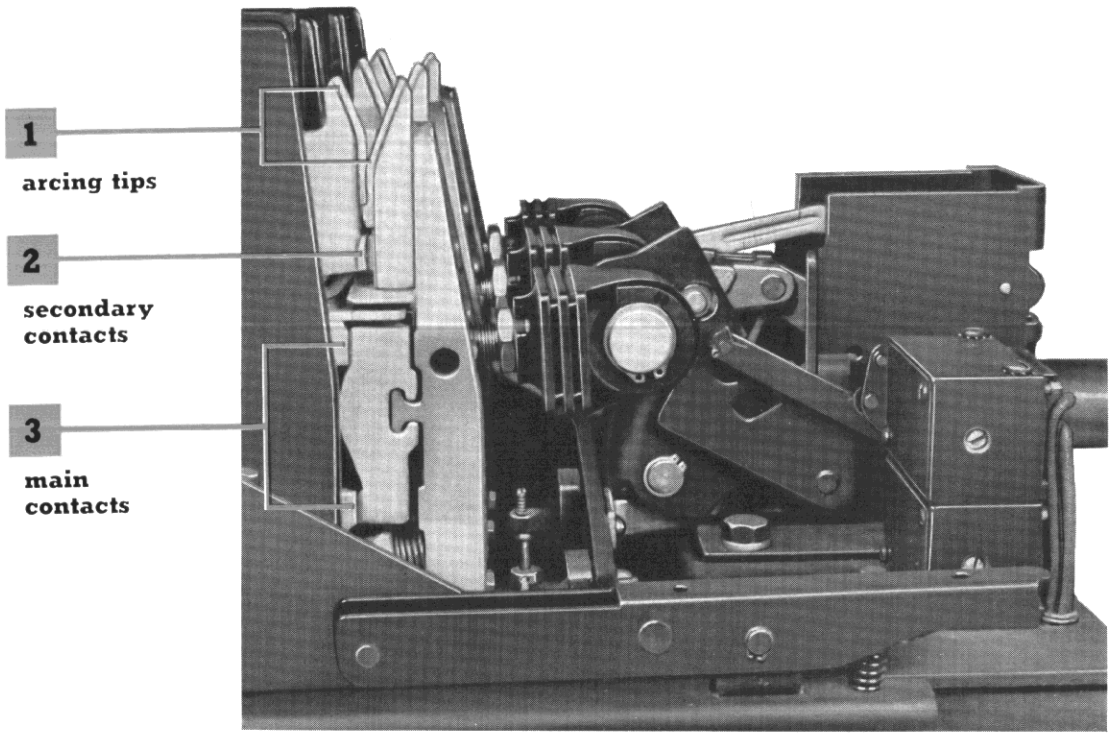


fig. 16—One-two-three action keeps arcing away from main contacts. When breaker opens, main contacts part first, then secondary contacts and finally arcing tips. When arcing tips break, arc flashes at this point and is blown into De-ion arc chute.

There are three basic means of extinguishing an arc: lengthening the arc path; cooling, by gas blast or contraction; de-ionizing, or physically removing the conduction particles from the arc path. It was the discovery, by Westinghouse, of this last method which made possible the first large power air circuit breakers.

the De-ion principle

The De-ion principle is incorporated in all these circuit breakers. The arc is forced upward into the arc quencher by strong magnetic fields; rising gas blasts carry the ionized air particles out of the arc path. De-ion action makes possible faster arc extinction for given contact travel; assures positive interruption and minimum contact burning.

contacts

All De-ion air circuit breakers have solid block, silver-inlaid main contacts. Their construction insures lasting current-carrying ability, which is not seriously impaired even after repeated fault interruptions or repeated momentary overloads.

In choosing the circuit-breaker current rating for a given application, it is not necessary to provide a substantial margin of safety above the actual circuit load current to prevent contact deterioration.

electrically or manually operated air circuit breakers

fig. 17
DB-15

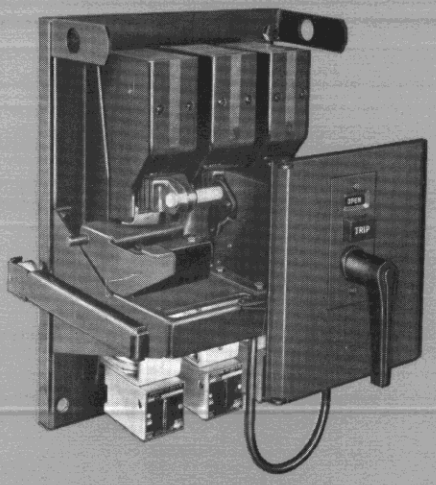


fig. 18
DB-25

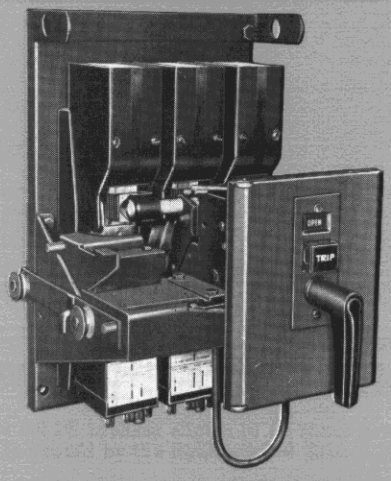
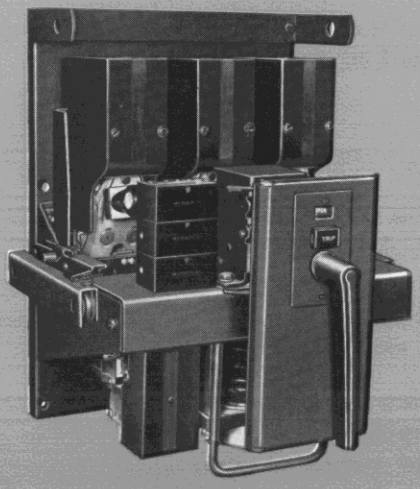


fig. 19
DB-50



electrically operated air circuit breakers

fig. 20
DB-75

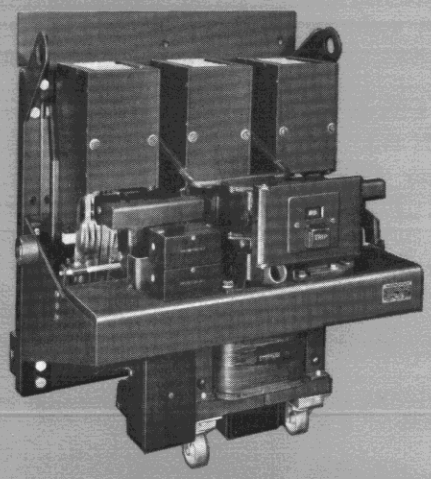


fig. 21
DB-100

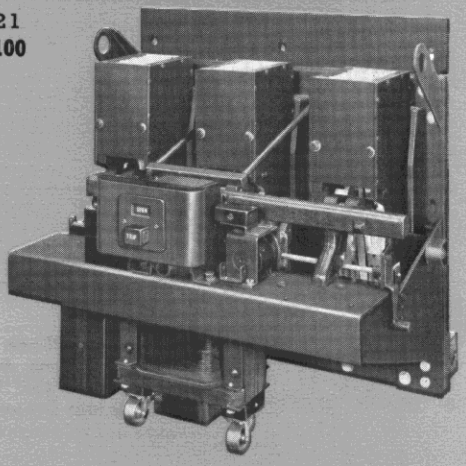
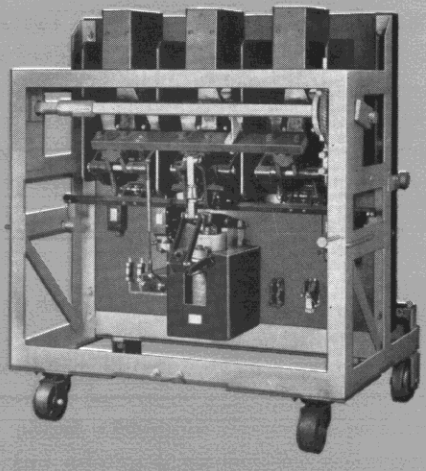


fig. 22
DA-100



interrupting rating 15,000 to 150,000 amperes

Low-voltage (600 volts or less) air circuit breakers are generally instantaneous in operation at high-fault currents, and part their contacts during the first half cycle. This fact must be taken into account when selecting the interrupting rating of air circuit breakers.

Low voltage air circuit breaker interrupting ratings have been based on total asymmetrical r.m.s. current of the first half cycle. For 3-phase circuits this total current is taken as the average of all three phases. AIEE and NEMA standards have for many years recognized a factor of 1.25 (based on a system X/R ratio of 11.72) to convert the more easily calculated symmetrical short circuit current to total first half cycle current.

NEMA standards have recently been revised to include a table of symmetrical interrupting ratings. Also the NEMA standards have been modified to reflect an investigation which showed the above factor to be very conservative and a factor of 1.17 (based on a system X/R of 6.6) to be a better approximation of the majority of low voltage systems.

The following tabulation shows both the asymmetrical total current and the new symmetrical current interrupting ratings. The charts on pages 23, 24 and 25 are based on the asymmetrical total current and the 1.25 factor. For most applications the breaker sizes in the charts will not be affected by the rating modification, however, in some cases an advantage can be gained by a careful analysis of the system and application of the breakers on the basis of the new symmetrical ratings.

To determine the instantaneous symmetrical short circuit current, use the sub-transient reactance of the rotating apparatus (both synchronous and induction machines) and the impedance values of all intervening portions of the circuit to the point of fault. Note that for these low-voltage systems the impedance of short runs of conductors, bus runs, current transformer and intervening circuit breakers themselves, may become important elements in limiting the total short circuit as they usually represent a relatively high percentage of the total system impedance.

current ratings

standard current ratings (amperes)

DB-15	DB-25	DB-50	DB-75	DB-100	DA-100
15	...	...	....	....	....
20	...	...	....	....	....
30	...	...	....	....	....
40	40	...	....	....	....
50	50	...	....	....	....
70	70	...	....	....	....
90	90	...	....	....	....
100	100	...	....	....	....
125	125	...	....	....	....
150	150	...	....	....	....
175	175	...	....	....	....
200	200	200	....	....	....
225	225	225	....	....	....
...	250	250	....	....	....
...	300	300	....	....	....
...	350	350	....	....	....
...	400	400	....	....	....
...	500	500	....	....	....
...	600	600	....	....	....
...	...	800	....	....	....
...	...	1000	....	....	....
...	...	1200	....	....	....
...	...	1600	....	....	....
...	...	....	2000	....	....
...	...	....	2500	....	....
...	...	....	3000	....	....
...	...	....	....	4000	5000
...	...	....	....	①5000	6000
...	...	....	....	①6000	① 8000
...	...	....	....	....	①10000
...	...	....	....	....	....

① d-c rating only.

interrupting ratings

system nominal	breaker type	interrupting rating current measured at instant ½ cycle after fault, amperes		30 cycle short-time rating without series trip device, amperes	
		asymmetrical (average 3-phase rms)	symmetrical rms	asymmetrical	symmetrical
481-600	DB-15	15,000	14,000	15,000	14,000
	DB-25	25,000	22,000	25,000	22,000
	DB-50	50,000	42,000	50,000	42,000
	DB-75	75,000	65,000	75,000	65,000
	DB-100	100,000	85,000	100,000	85,000
241-480	DB-15	25,000	22,000	15,000	14,000
	DB-25	35,000	30,000	25,000	22,000
	DB-50	60,000	50,000	50,000	42,000
	DB-75	75,000	65,000	75,000	65,000
	DB-100	100,000	85,000	100,000	85,000
240 & below	DB-15	30,000	25,000	15,000	14,000
	DB-25	50,000	42,000	25,000	22,000
	DB-50	75,000	65,000	50,000	42,000
	DB-75	100,000	85,000	75,000	65,000
	DB-100	150,000	130,000	100,000	85,000

accessibility for inspection and maintenance

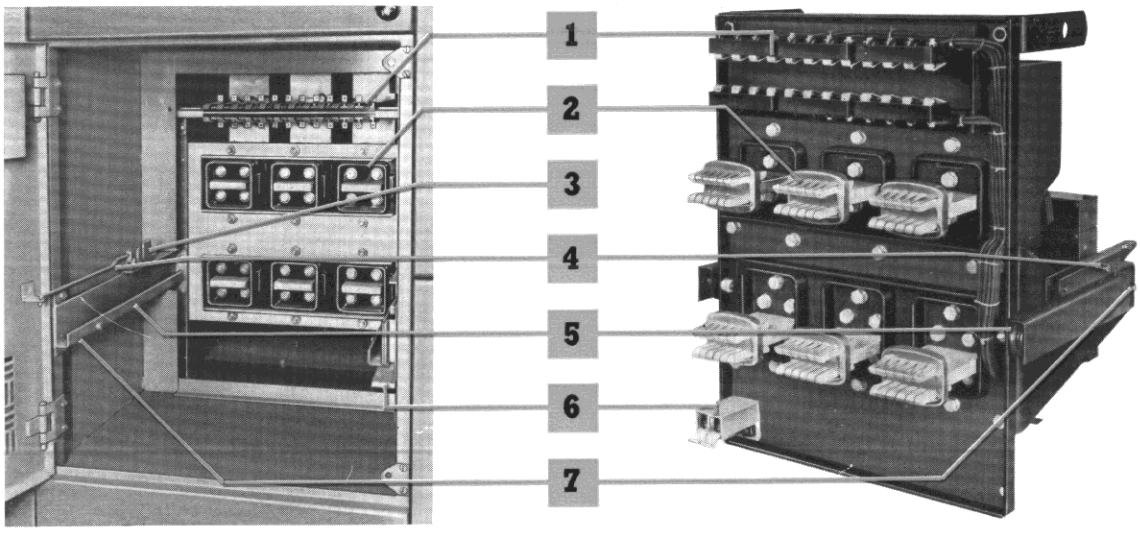


fig. 23

1 Secondary contacts establish control circuits in "test" and "connected" positions.

2 Stationary primary contacts are in compartment; finger-type female contacts are on removable element for ease of inspection and maintenance.

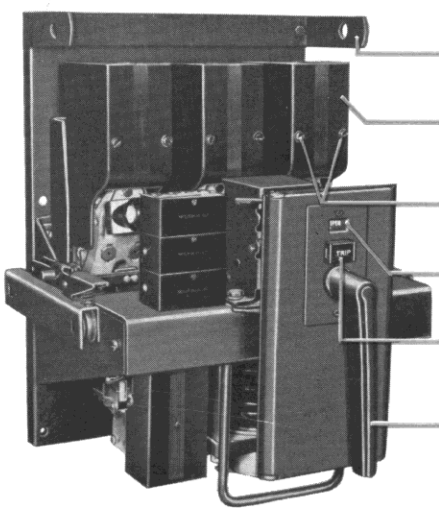
3 Self-engaging, definite-positioning stops for "disconnected" "test" and "connected" positions.

4 Interlock engages floating lever, trips breaker if breaker is closed when door is opened.

5 Wheels running in jig-located rails insure accurate contact alignment.

6 Ground shoe engages floating contact on removable-unit frame in "connected" and "test" positions.

7 Levering device operating between the pins on the stationary structure and the removable element moves element into or out of contact engagement.



1 lifting bracket.

2 De-ion arc chutes eliminate need for arc-resisting cell lining for circuits up to 600 volts a-c and 250 volts d-c.

3 Arc chute easily removed from front by loosening two screws.

4 Indicator (red-closed; green-open) shows breaker positions with door closed.

5 trip pushbutton with protective side brackets can be padlocked to keep breaker trip-free.

6 operating handle to close breaker (handle omitted on electrically operated breakers).

fig. 24

Access to buses, cable connections, instrument transformers and secondary terminal blocks is provided by removing the rear covers of the switchgear. For ease of handling, two separate removable back covers are used for each basic unit. (Photograph shows four basic units, three with three manually operated type DB-25 breakers per unit, and one basic unit with three type DB-50 breakers.)

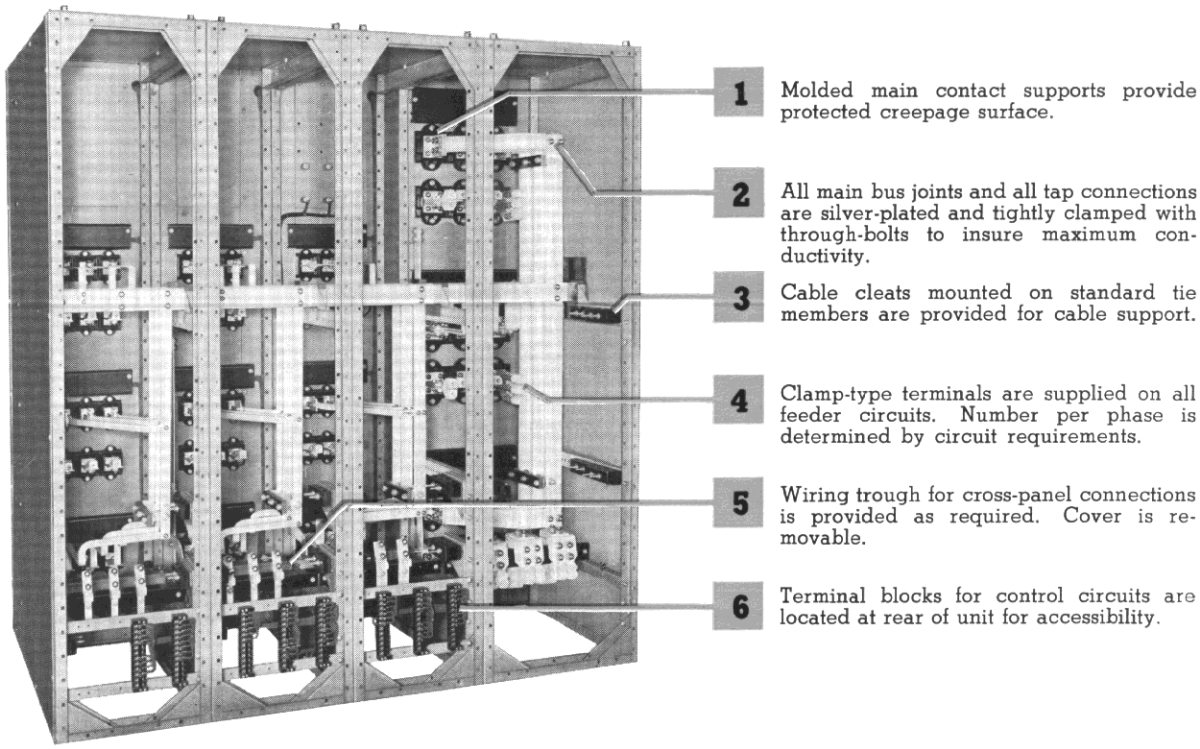


fig. 25

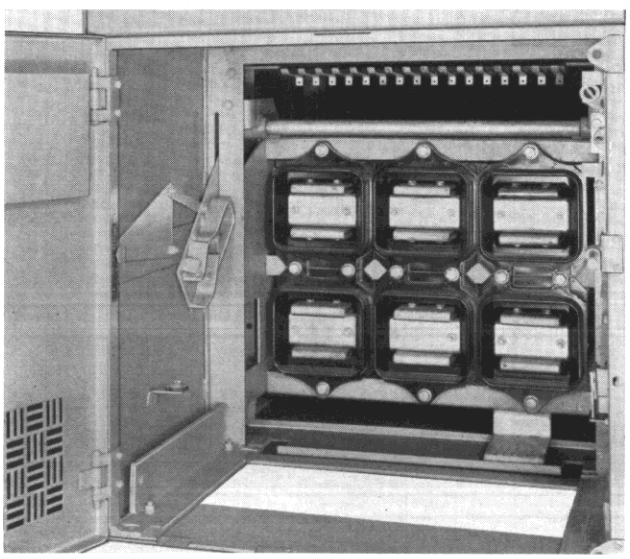


fig. 26—DB-75 3000-ampere compartment showing levering device position indicator on left side.

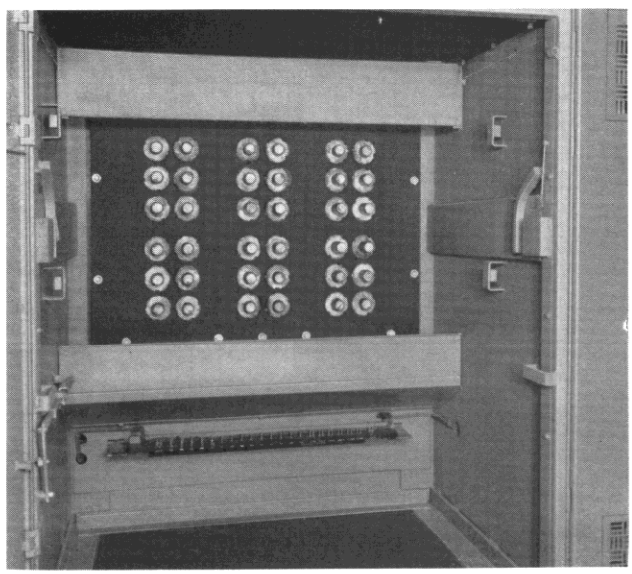


fig. 27—View of stationary contacts for 5000 or 6000 ampere type DA-100 circuit breaker.

Parts for low-voltage metal-enclosed switchgear assemblies shown on these two pages are carried in stock to insure quick delivery on all orders. These assemblies will suffice for almost any combination of breaker ratings desired by a purchaser. Recommended unit depths are as indicated. However, these depths can be increased in 6-inch steps to line up with adjacent units or to meet special requirements such as rating of main buses, number and size of conduits and cables entering each unit, or complications due to bus risers or bus run connections. Auxiliary units can be added to the switchgear assembly to provide adequate panel space for control switches or unusual instrument and relay requirements, or to enclose involved bus connections that may arise on high-current installations.

notes applying to dimension drawings

Terminal blocks are mounted so that control tables may enter at top or bottom of unit.

External primary connections may be brought in at top or bottom.

Cable cleats may be easily shifted as required to provide adequate support for the cables.

Current transformers are shown in typical locations but are included only when specified on order.

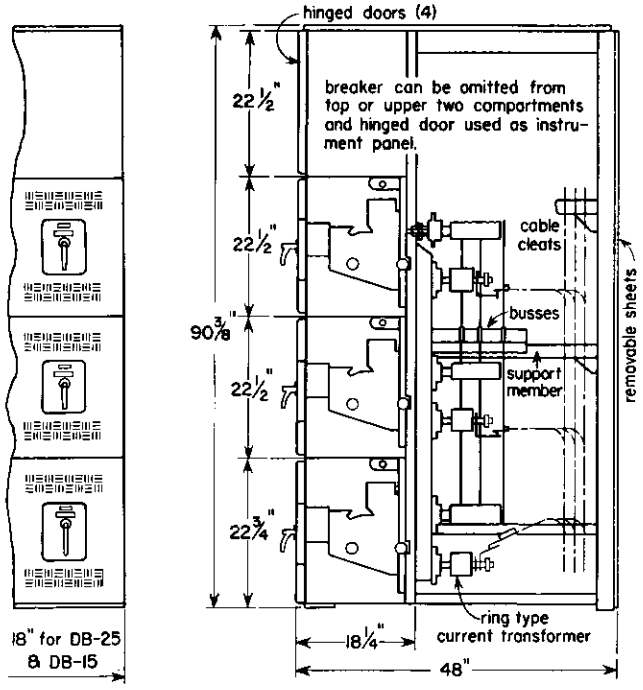


fig. 28—DB-15 or DB-25 breaker basic unit 2, 3 or 4, from pages 20 and 21.

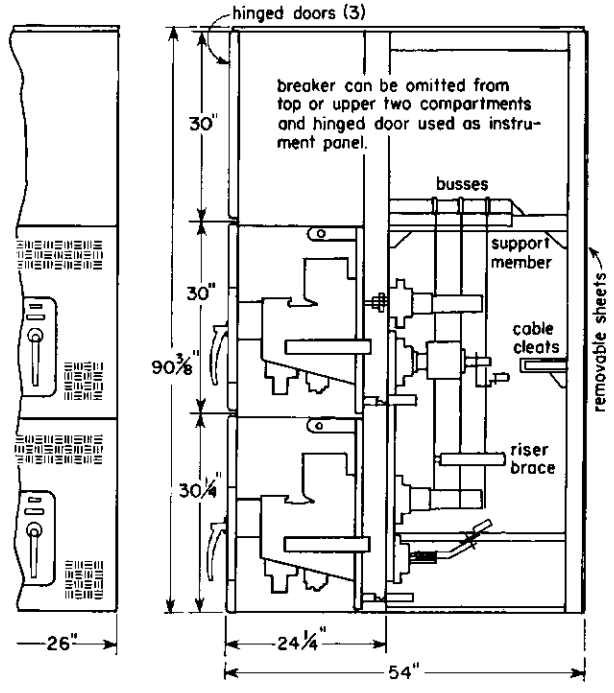


fig. 29—DB-50 breaker using basic unit 5, 6 or 7, from pages 20 and 21.

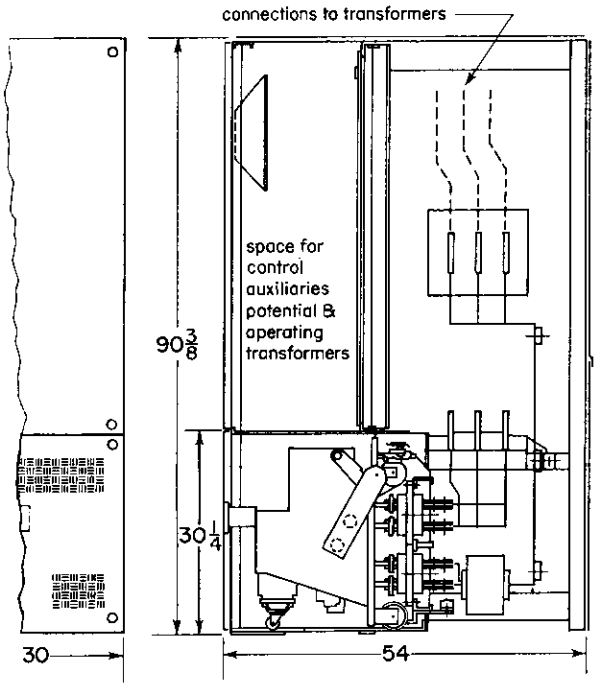


fig. 30—DB-75 breaker structure, 3-position.

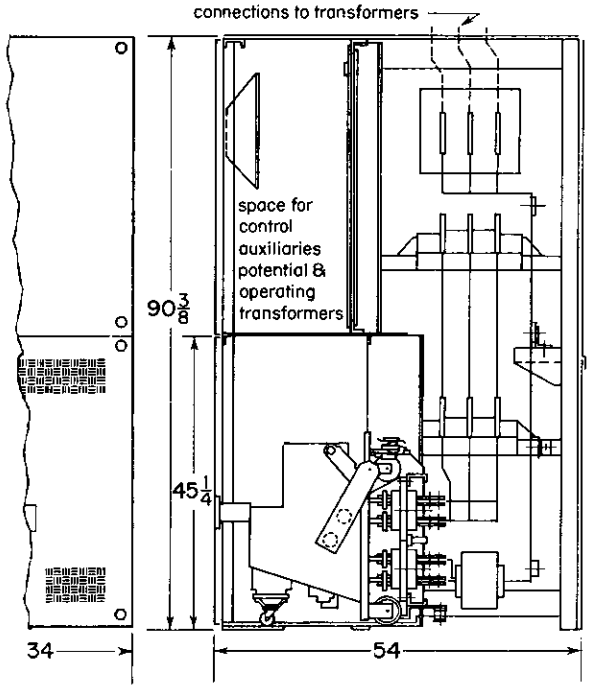


fig. 31—DB-100 breaker structure, 3-position.

method of anchoring low voltage switchgear

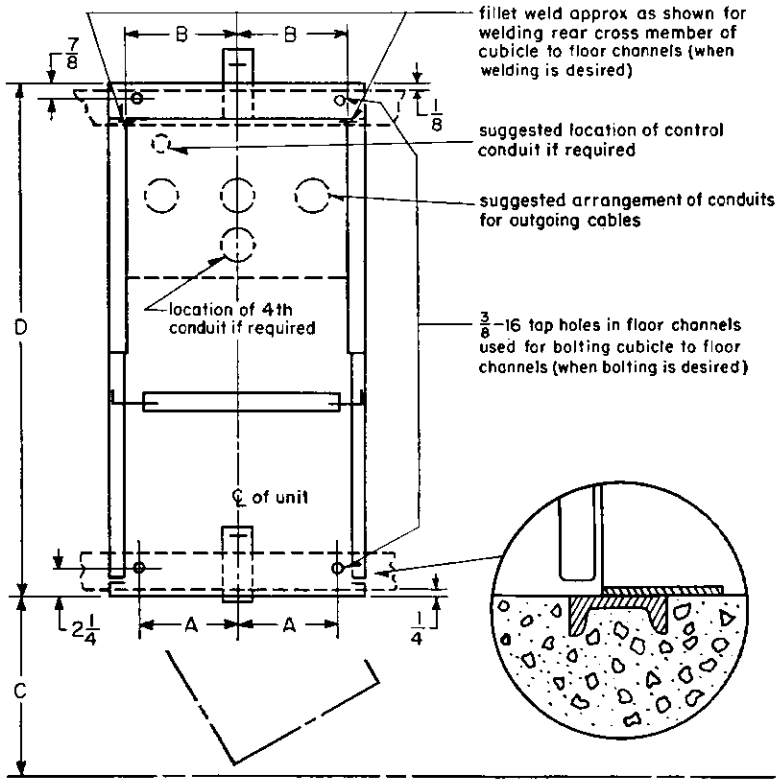


fig. 32—typical floor plan of indoor units.

unit	unit width	dimensions in inches			
		A	B	C①	D②
DB-15-25	18	7	7 7/16	36	48
DB-50	26	11	11 7/16	44	48
DB-75	30	13	13 7/16	48	54
DB-100	34	15	15 7/16	48	54
DA-100	60	28	26	70	72

① Minimum 60" aisle required for DB breaker units if transport truck type of handling carriage is to be used.

② Recommended minimum depth.

outdoor

The outdoor housing for low voltage switchgear is strong . . . weatherproof . . . functional. Weatherproof features include front and rear doors, end trims, a sloping roof and an interior floor raised above the foundation. Ventilation is provided through louvers in the doors backed by disposable filters to prevent entry of water and foreign material. Heating elements are included in each unit. The combination of free-moving ventilating air and heating elements provide outdoor units which are free of condensation.

Accessibility is provided by full height front and rear doors equipped with quick-acting latches and locking provisions. An enclosed aisle is provided in front of the basic units permitting maintenance without exposure to inclement weather conditions. Each outdoor switchgear assembly is equipped with a lifting device for handling the circuit breakers in the aisle. Lights and power outlets are installed for the convenience of the operator or maintenance man.

The unit type design is also used for the weatherproof roof, base and doors. The formed end trims are easily removable so later additions can be readily made and the trims re-installed at the end of the new assembly.

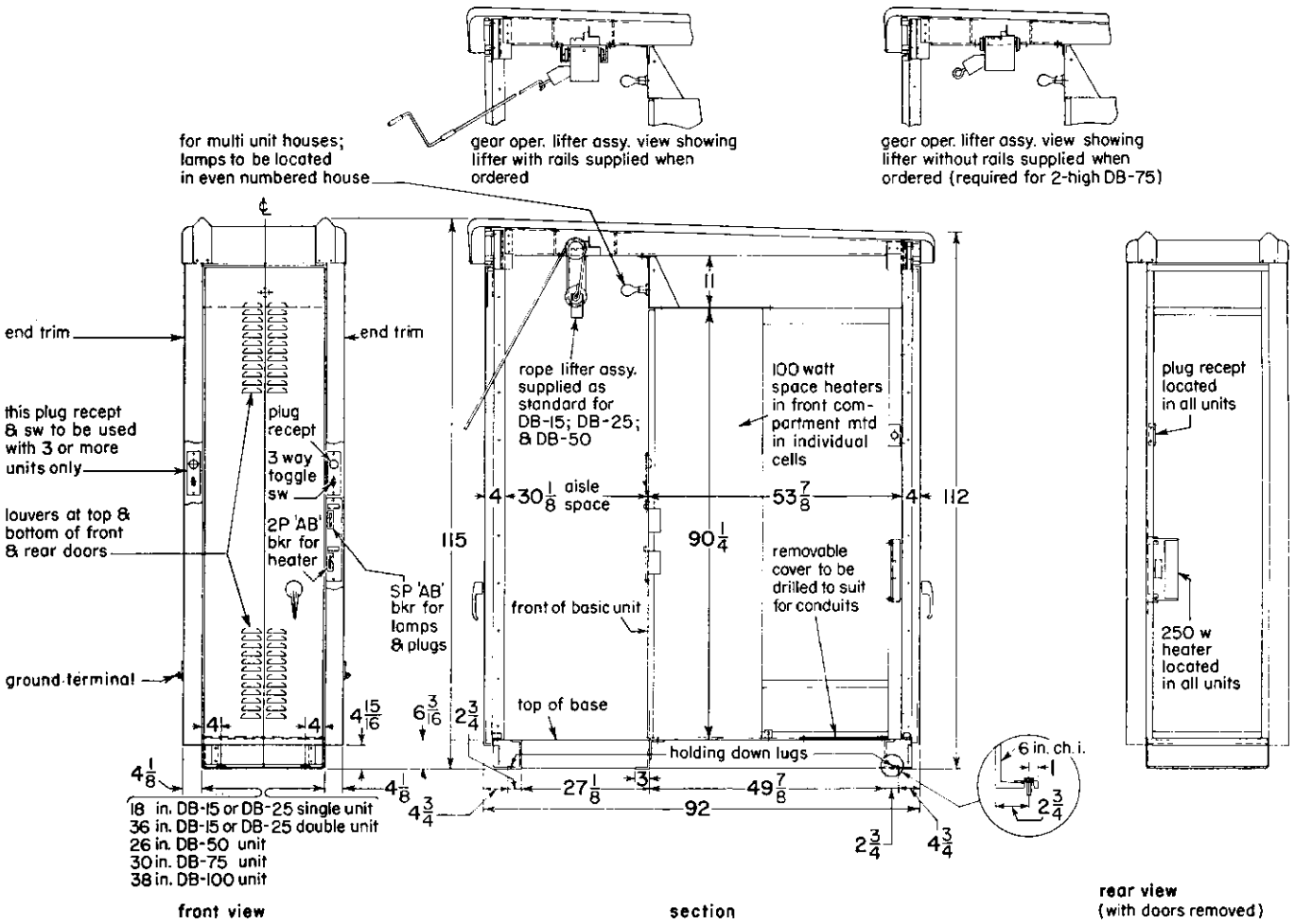


fig. 33—Typical assembly of outdoor housings.

universal frames provide flexibility . . . speed assembly

Low-voltage metal-enclosed switchgear structures are made of formed and welded sheet steel enclosures for the air circuit breakers and bolted frames with sheet steel covers to provide support and a housing for the bus, cables, instrument transformers and other details. A variety of breaker enclosures, as required for the twelve listed basic units, is carried in stock, as well as associated parts necessary to complete the structures.

housing—Standard switchgear housings for all sizes of low-voltage air breakers must be suitable for line assembly in any desired combination. It must be possible to locate busses and arrange cables as the circuits and breaker positions require. This has been accomplished by building up each breaker unit from the eight following parts:

(1) the breaker cell structure, (2) top members, (3) bus support member, (4) a rear frame, (5) bottom members, (6) top cover, (7) upper half rear cover and (8) lower half rear cover.

The first five parts are illustrated below. An assembly of two units each suitable for four 15,000 or 25,000 ampere interrupting capacity circuit breakers as below (right), which is a complete structure.

connections—Terminal blocks are usually located at one side approximately at mid-height on the rear frame, so as to be equally accessible for control circuits entering from above or below the units. Cable cleats are mounted on stub brackets which can be easily relocated at 1½″ steps to provide adequate support of the power cables. These tie members are stocked in several lengths, so that over-all structure depths can be selected in 6-inch steps. This gives greater flexibility in lining up units for different sizes of breakers and permits varying the size of the bus compartment as the equipment requires.

assembly—The frames and tie members are punched with rows of square holes, and carriage bolts are used to assemble these parts. Holes are located so that by using standard members, terminal blocks, cable clamps, wiring troughs, bus supports, fuse mountings, etc., can be located as desired. Additions and changes can be made in the field without cutting, welding or drilling.

installation—Universal frame structures are well adapted to unusual conditions such as interference from building columns. Since the parts are bolted together, they can be assembled around such obstructions if necessary. Special housings to enclose reactors or similar equipment can be made up largely of standard parts. The same flexibility of construction and general appearance results where these special units are set into a "switchgear" group.

Universal frame structures for low-voltage air breakers provide much greater flexibility and adaptability for present and future use than equivalent all-welded construction.

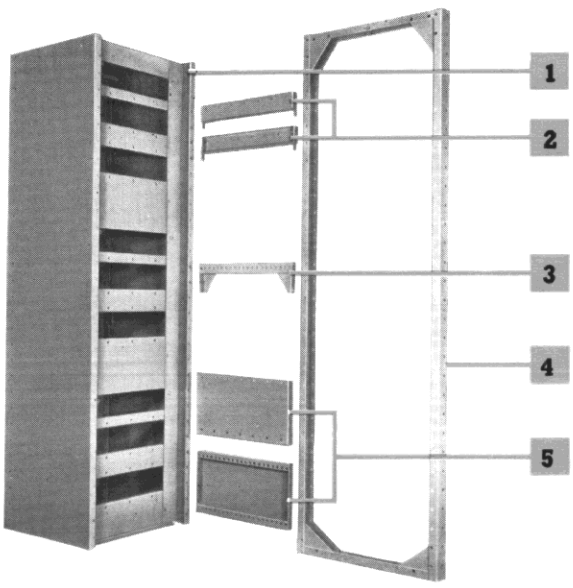


fig. 34—Standard housing parts for a Type DB-50 breaker unit. Parts are: (1) breaker cell structure, (2) rear frame, (3) bus support member, (4) rear frame and (5) bottom members.

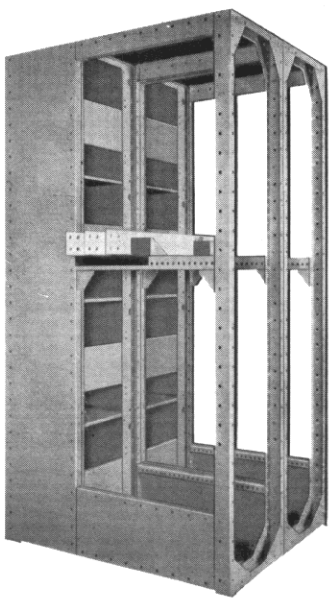


fig. 35—Assembly of standard parts for two units, each suitable for four 15,000-or 25,000-ampere interrupting capacity circuit breakers.

bus supports meet all current-carrying requirements

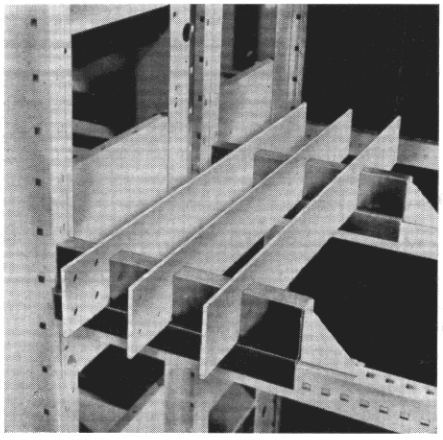


fig. 36—Micarta bus supports arranged for one bus bar per phase.

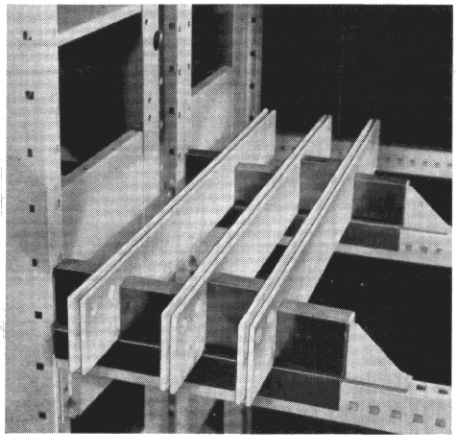


fig. 37—bus supports arranged for two bars per phase.

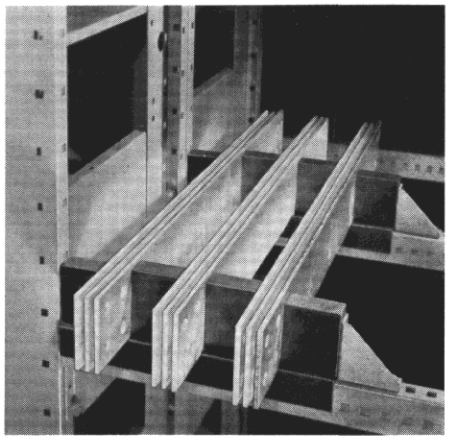


fig. 38—Micarta block arrangement for three bus bars per phase.

The standard bus supports for universal frame structures are arranged for 3-phase buses having current-carrying capacities up to 4000 amperes. The use of slightly different parts provides for a neutral conductor or two bus bars when single-phase or direct-current circuits are involved. The mechanical strength of the arrangement shown in figures 36, 37 and 38 is adequate for short-circuit currents up to 50,000 amperes, average 3-phase rms current. By the addition of standard clamping units and intermediate braces, this figure can be raised to 150,000 amperes.

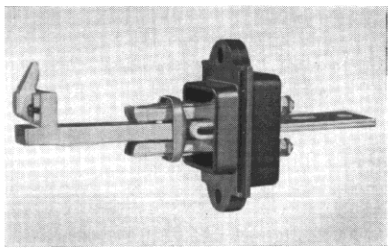
Standard bus supports permit mounting 3-phase buses with one-two, or three bars per phase, in widths up to 6 inches, thus giving a maximum current-carrying capacity. For a different number of bars per phase it is only necessary to rearrange the bus supports, and they then can accommodate the additional bus bars

The bus support parts are made up of Micarta and are arranged for mounting on the steel bus support member, one of the standard universal frame parts. As shown in figure 36, the bus support can be located against the back of the breaker cubicle with the outer end against an angle bracket. An angle bracket can be used at each end of the support assembly if the bus is located back from the breaker units. The insulating members are made up of five parts, one being a quarter-inch thick Micarta channel which straddles the steel support member, and the other four are Micarta blocks. These are deeply tapped on two edges for ⅜-inch bolts which enter from the bottom through the steel and Micarta channel.

Figure 36 shows the support arranged for one bar per phase. Figure 37 shows the block nearest the breaker unit and the second block from it turned upright. The horizontal dimension of the block is shorter with this mounting, and permits the addition of one more bar per phase. The original three bars were on 4-inch centers and their position remains unchanged, so that with a bus having two bars per phase, the actual centers of the conductors are no longer equally spaced. Figure 38 shows all of the blocks turned upright, with three bus bars used in each phase conductor. In this case the center bar of each group is in the same position as when a single bar was used and the buses are again on 4-inch centers.

disconnecting contacts

fig. 39 — Primary contact assembly for 600-ampere, type DB-25 breakers.



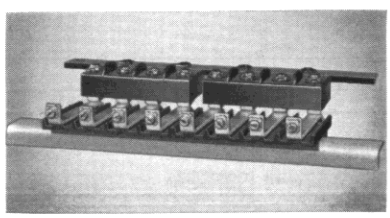


fig. 40—Partial view of DB breaker secondary contacts shown in "test" position.

current transformers bushing-type

The space economy and high mechanical short time current ratings inherent in the design of bushing-type current transformers are particular advantages in metal-enclosed switchgear. They are used where their performance characteristics meet application requirements.

Type BT current transformers have been designed to meet the needs of low-voltage metal-enclosed switchgear. These transformers are primarily intended for use with instruments and meters, but have sufficient relaying accuracy to handle the modern low energy relays.

The transformers are approximately 4 inches long and are built with three different diameters as required to fit the connections associated with DB-25, DB-50 and DB-75 breakers.

The table below lists the available ratios and the ASA standard accuracy classes for various breakers. These accuracies are adequate for all metering and most relaying normally occurring on low-voltage metal-enclosed switchgear.

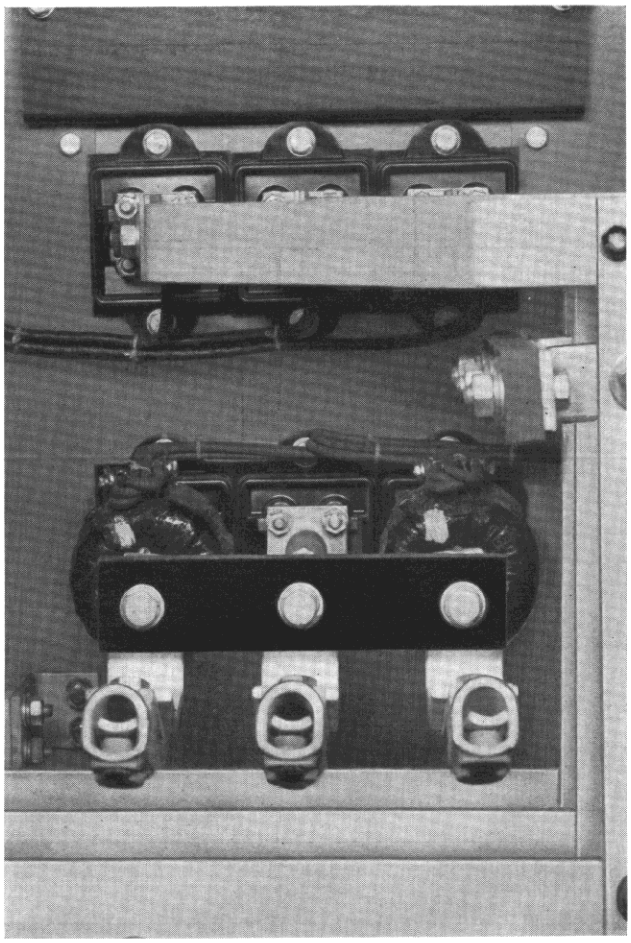


fig. 41 — current transformers mounted on stationary primary studs.

primary current ratings amperes	ASA standard accuracy classifications					
	metering accuracy at indicated burdens					relaying accuracy
	B-0.1	B-0.2	B-0.5	B-1	B-2	
100	1.2	2.4	...	...	...	.....
150	0.6	1.2	2.4	...	...	.....
200	0.6	1.2	1.2	2.4	...	10L10
300	0.3	0.3	0.6	1.2	2.4	10L10
400	0.3	0.3	0.6	0.6	1.2	10L20
600	0.3	0.3	0.6	0.6	1.2	10L20
800	0.3	0.3	0.3	0.6	0.6	10L20
1000 ①	0.3	0.3	0.3	0.6	0.6	10L20
1200 ①	0.3	0.3	0.3	0.6	0.6	10L20
1500 ①	0.3	0.3	0.3	0.6	0.6	10L20
2000 ①	0.3	0.3	0.3	0.6	0.6	10L20
2000 ②	0.3	0.3	0.3	0.3	0.3	10L100
2500 ②	0.3	0.3	0.3	0.3	0.3	10L100
3000 ②	0.3	0.3	0.3	0.3	0.3	10L100
4000 ②	0.3	0.3	0.3	0.3	0.3	10L100

① for use on DB-50 breaker
② for use on DB-75 breaker

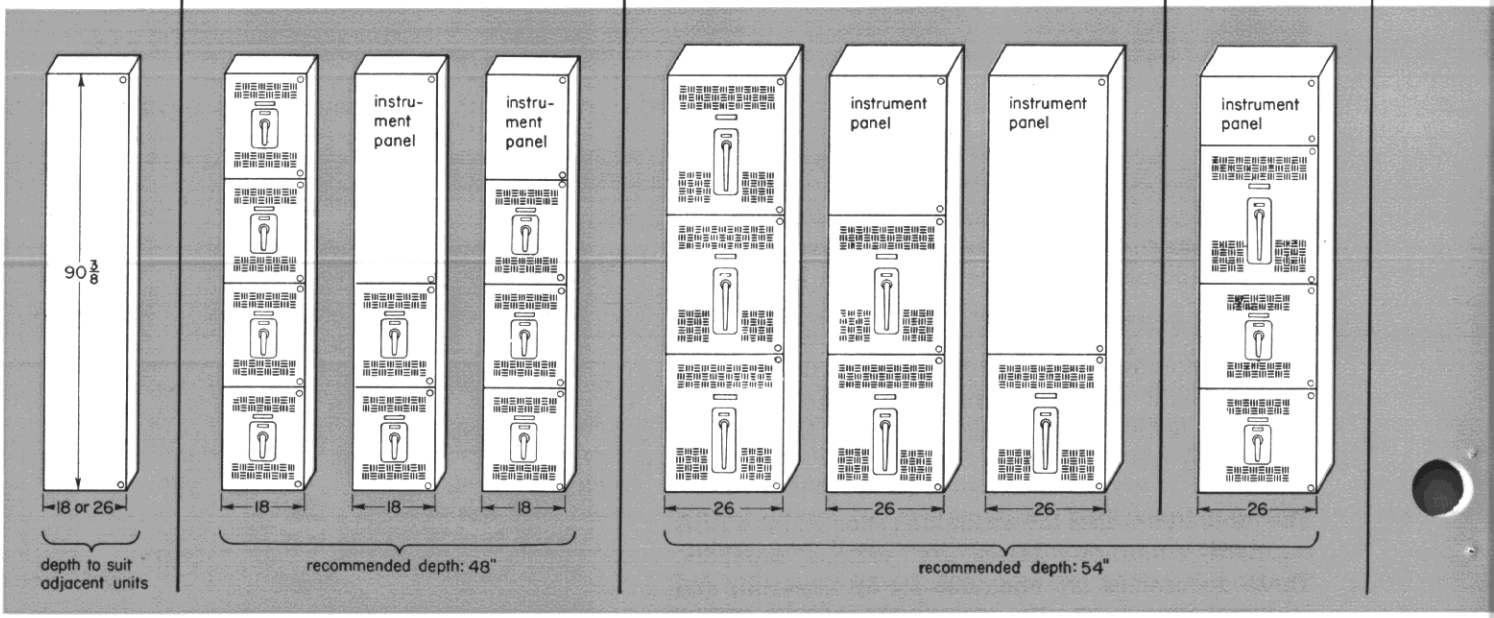
selector guide of standardized units to meet normal requirements

1 auxiliary unit

2 **3** **4** 15,000 or 25,000 ampere interrupting capacity type DB-15 or DB-25 air circuit breakers, manually or electrically operated.

5 **6** **7** 50,000 ampere interrupting capacity type DB-50 manually or electrically operated air circuit breakers.

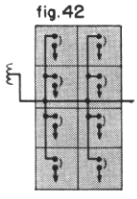
8 Combination unit with one DB-50 and two DB-15 or DB-25 air circuit breaker.



typical power requirements

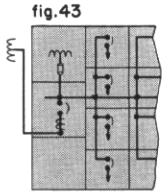
connection between transformer and switchgear

fig.42



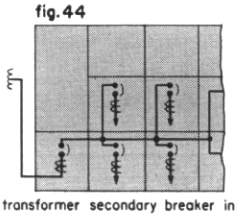
transformer feeding basic units 2

fig.43



transformer feeding basic units 2 through a transformer secondary breaker mounted in basic unit 6.

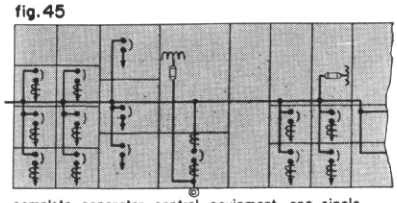
fig.44



transformer secondary breaker in unit 10 feeding breakers in basic units 6

generator feed for non-parallel operation

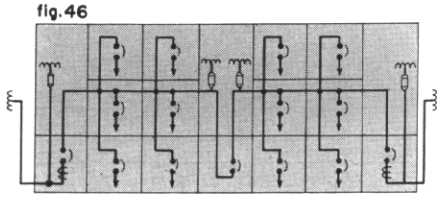
fig.45



complete generator control equipment. one single breaker unit and one instrument compartment basic units 7 or 10, and 1 are used depending on the required circuit breaker rating. basic units 3, 4, & 5 are shown for feeder breakers.

dual transformer feed & bus tie connection

fig.46

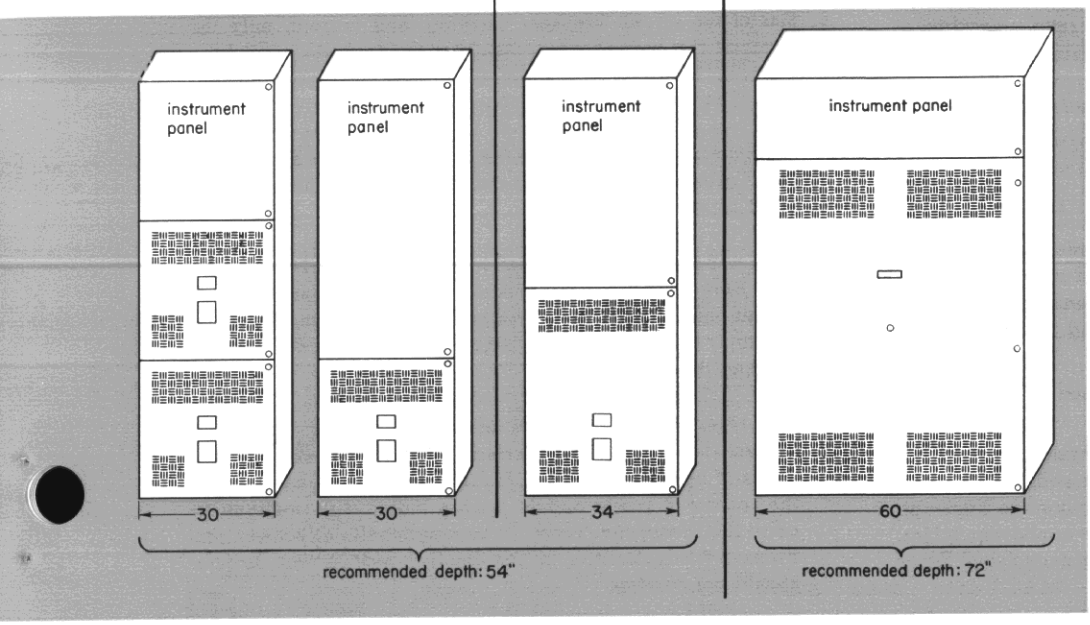


two transformers and bus tie controlled by basic units 10 & feeder breakers in basic units 5.

9 **10**
75,000 ampere interrupting capacity type DB-75 electrically operated air circuit breakers.

11
100,000 ampere interrupting capacity type DB-100 electrically operated air circuit breakers.

12
100,000 ampere interrupting capacity type DA-100 electrically operated air circuit breaker 5,000 and 6,000 amperes.



typical instrument panels

for feeder breakers
unit no. 3
fig. 47 option "A"

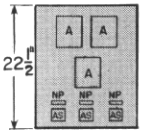
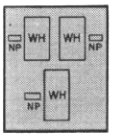
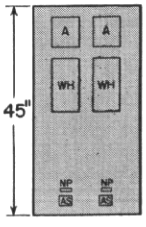


fig. 48 option "B"



unit no. 4
fig. 49 option "A"



unit no. 6
fig. 50 option "A"
fig. 51 option "B"

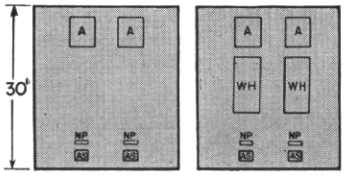
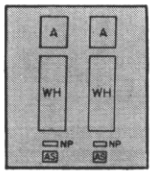


fig. 52 option "C"



for main breakers
unit nos. 7 and 10
fig. 53 option "A"
fig. 54 option "B"

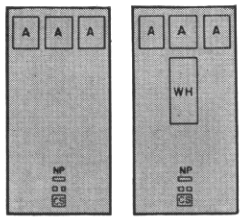
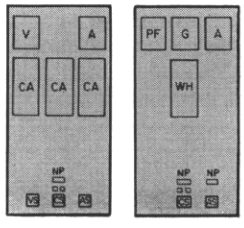


fig. 55 option "C"
fig. 56 option "D"



unit depths

Recommended unit depths are as indicated, but depths can be increased or decreased in 6-inch steps to suit combination of units and bus space requirements. When exceptional bus work or several bus duct entrances are involved, extra depth must be allowed.

Any decrease in unit depths from recommended dimensions should be carefully investigated to assure adequate bus-space.

Maximum unit depth for all units is 72 inches.

weights

type breaker	net weight, lbs. (approx.)	
	vertical section	each breaker
manual operated		
DB-15	700	70
DB-25	800	90
DB-50	1000	280
electrically operated		
DB-15	700	85
DB-25	800	110
DB-50	1000	355
DB-75	1500	500
DB-100	1800	700

key to instrument panel abbreviations

A	ammeter
AS	ammeter switch
CA	ratio-differential relay
CS	circuit breaker control switch
G	ground detector
NP	name plate
V	voltmeter
VS	voltmeter switch
WH	watthour meter

Low-voltage air circuit breakers are normally applied on the basis of adequate interrupting and current-carrying ratings, both for normal loads and fault currents for short time intervals. Under these conditions, standard interrupting-duty cycles apply and this type of application is shown as "fully-rated non-selective" in the tables which follow.

Breakers may also be applied on the cascade principle. Cascading is the application of circuit breakers in which the breakers nearest the source of power have interrupting ratings equal to, or greater than, the maximum available fault current, and where one or more breakers further removed from the power source have interrupting ratings less than the maximum available fault current at the point of their application.

In the cascade arrangements, circuit breakers toward the source of power are provided with instantaneous tripping for currents that may flow for faults beyond other circuit breakers nearer the load. Hence, the main breaker (or group feeder breaker as the case may be) may trip for a feeder fault and interrupt load on the remaining feeder circuits. Such arrangements are used where the possible sacrifice in service continuity and possible damage to equipment are acceptable.

Cascading is limited to one step and as outlined in the following paragraphs:

1. The interrupting rating of the circuit breaker or breakers nearest the source should be equal to, or exceed, the maximum available fault current that it may be required to interrupt. This applies to breakers M, F and GF in the application tables. These breakers must be equipped with instantaneous series overcurrent tripping devices.
2. The source breakers (breakers M and GF) must give backup protection to the cascaded feeder breakers. To accomplish the backup protection, the instantaneous series overcurrent tripping devices on the source breakers must be set at such a value of current that the source breakers are tripped instantaneously whenever the fault current through the cascaded feeder breaker exceeds 80 percent of interrupting rating of the cascaded feeder breaker.
3. The cascaded feeder breakers (CF) should be selected so that the maximum available fault current at that point does not exceed the breaker interrupting rating by more than the values in the table I on page 24. The breakers should be equipped with instantaneous trips set to override the inrush of the load.
4. All circuit breakers subjected to fault currents in excess of their interrupting rating should be electrically operated from a remote position only, to provide protection for the operator in the event of closing into a fault. In switchgear assemblies, it is permissible to locate the breaker control switch or push button on an adjacent unit.
5. Where cascading is proposed, recommendations shall be obtained from the manufacturer in order to insure proper coordination between circuit breakers.
6. The operation of circuit breakers in excess of their interrupting rating is limited to one interruption, after which inspection, maintenance, or complete breaker replacement may be required.
7. Molded-case circuit breakers are not recommended for use in cascade with air circuit breakers of a non-molded case design.

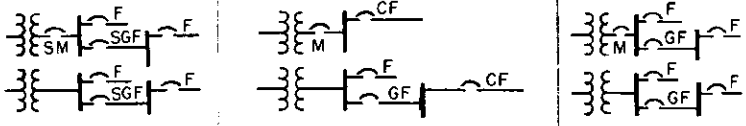
For essential circuits, such as those supplying power station auxiliaries, it is highly desirable to have selective tripping, which is the term used to describe time discrimination between the overload tripping of circuit breakers connected in series so that the section where a fault occurs is isolated, and service to other essential circuits is maintained.

Selective tripping is the application of circuit breakers in series so that of the circuit breakers carrying fault current, only the one nearest the fault opens and isolates the faulted circuit from the system. This type of system gives maximum continuity of service. The following requirements should be observed:

1. Each circuit breaker must have an interrupting rating equal to or greater than the short-circuit current available at the point of application.
2. Each circuit breaker, equipped with selective tripping devices, must have a short-time rating equal to or greater than the short-circuit current available at the point of application. This does not apply to feeder breakers having instantaneous overcurrent tripping devices.
3. The tripping characteristics of each circuit-breaker overcurrent device must be so selected that the breaker nearest the fault opens to clear the faulted circuit. Breakers nearer the source of power should remain closed and continue to carry their respective loads. To accomplish this selectivity, the tripping characteristics of the breaker overcurrent devices should not overlap.
4. Manually operated circuit-breakers shall be limited to applications in which the delayed tripping requirements do not exceed 15000 amperes. In the other words, breakers having short-delay overcurrent tripping that are applied to systems where the available short-circuit current is above 15000 amperes should be electrically operated; breakers applied to the same system but having instantaneous trips set at 15000 amperes or less may be manually or electrically operated.
5. A maximum of four low-voltage air circuit breakers can be operated selectively in series, one of these being a feeder breaker with instantaneous overcurrent tripping.
6. Attention is directed to the fact that selective tripping requires coordination with the rest of the system; for instance, circuit breakers on the low-voltage side of a transformer bank require proper coordination with relays or fuses on the high-voltage side.
7. It is important that the selective tripping requirements be considered in the initial design of the system. The distribution of load should be such that the relative continuous current ratings of the various breakers (trip coil ratings of their overcurrent tripping devices) can give the required selectivity.

note: Application data 33-760 elaborates on both cascade and selective applications of DB breakers and also provides valuable information on many other applications of DB breakers.

table A: 208 volts—3 phase • recommended type DB air circuit breakers • note (2)



transformer rating 3 phase kva and impedance percent	maximum short circuit kva available from primary system	rated load continuous current amperes	short-circuit current (1) average rms asymmetrical amperes: transformer alone	motor load: 50%—208v, 100%—240v	combined	selective trip systems: SM selective main breaker	SGF selective group feeder breaker	F feeder breaker	cascade systems: M main breaker	CF cascaded feeder breaker	F or GF feeder or group feeder breakers	CF cascaded feeder breaker	fully-rated non-selective: M main breaker	F or GF feeder or group feeder breaker
300 **5%**	50000	834	18600	2100	20700	DB-50	DB-25	DB-15	DB-50	DB-15	DB-15	DB-15	DB-50	DB-15
	100000		19600		21700									
	150000		20000		22100									
	250000		20300		22400									
	500000		20500		22600									
	unlimited		20800		22900									
500 **5%**	50000	1388	28900	3500	32400	DB-50	DB-50	DB-25	DB-50	DB-15	DB-25	DB-15	DB-50	DB-25
	100000		31500		35000									
	150000		32500		36000									
	250000		33300		36800									
	500000		34000		37500									
	unlimited		34600		38100									
750 **5.75%**	50000	2080	35800	5200	41000	DB-75	DB-50 / DB-75	DB-25 / DB-50	DB-75	DB-15	DB-25 / DB-50	DB-15	DB-75	DB-25 / DB-50
	100000		40000		45200									
	150000		41700		46900									
	250000		43000		48200									
	500000		44100		49300									
	unlimited		45200		50400									
1000 **5.75%**	50000	2780	44800	7000	51800	DB-75	DB-75	DB-50	DB-75	DB-15 / DB-25	DB-50	DB-15 / DB-25	DB-75	DB-50
	100000		51400		59400									
	150000		54200		61200									
	250000		56500		63500									
	500000		58400		65400									
	unlimited		60400		67400									

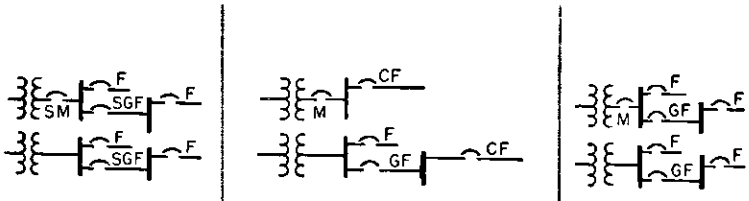
table B: 240 volts—3 phase • recommended type DB air circuit breakers • note (2)

300 **5%**	50000	722	16100	3600	19700	DB-50	DB-25	DB-15	DB-50	DB-15	DB-15	DB-15	DB-50	DB-15
	100000		17000		20600									
	150000		17400		21000									
	250000		17600		21200									
	500000		17900		21500									
	unlimited		18100		21700									
500 **5%**	50000	1203	25100	6000	31100	DB-50	DB-50	DB-25	DB-50	DB-15	DB-25	DB-15	DB-50	DB-25
	100000		27300		33300									
	150000		28200		34200									
	250000		28900		34900									
	500000		29500		35500									
	unlimited		30100		36100									
750 **5.75%**	50000	1804	31200	9000	40200	DB-75	DB-50 / DB-75	DB-25 / DB-50	DB-75	DB-15	DB-25 / DB-50	DB-15	DB-75	DB-25 / DB-50
	100000		34700		43700									
	150000		36100		45100									
	250000		37400		46400									
	500000		38300		47300									
	unlimited		39200		48200									
1000 **5.75%**	50000	2406	38900	12000	50900	DB-75	DB-75	DB-50	DB-75	DB-15 / DB-25	DB-50	DB-15 / DB-25	DB-75	DB-50
	100000		44600		56600									
	150000		46900		58900									
	250000		48900		60900									
	500000		51700		63700									
	unlimited		52300		64300									
1500 **5.75%**	50000	3609	51500	18000	69500	DB-100	DB-75 / DB-100	DB-50 / DB-75	DB-100	DB-25	DB-50 / DB-75	DB-25	DB-100	DB-50 / DB-75
	100000		62200		80200									
	150000		66800		84800									
	250000		71100		89100									
	500000		74700		92700									
	unlimited		78600		96600									

refer to notes on page 25

continued

table C: 480 volts—3 phase • recommended type DB air circuit breakers • note (2)



transformer rating 3 phase kva and impedance percent	maximum short circuit kva available from primary system	rated load continuous current amperes	short-circuit current (1) average rms asymmetrical amperes			selective trip systems			cascade systems				fully-rated non-selective	
			transformer alone	100% motor load	combined	SM selective main breaker	SGF selective group feeder breaker	F feeder breaker	M main breaker	CF cascaded feeder breaker	F or GF feeder or group feeder breakers	CF cascaded feeder breaker	M main breaker	F or GF feeder or group feeder breakers
300 5%	50000	361	8100	1800	9900	DB-25	DB-15	DB-15	DB-25	DB-15	DB-15	DB-15	DB-25	DB-15
	100000		8500		10300									
	150000		8700		10500									
	250000		8800		10600									
	500000		8900		10700									
	unlimited		9000		10800									
500 5%	50000	601	12500	3000	15500	DB-50	DB-25	DB-15	DB-50	DB-15	DB-15	DB-15	DB-50	DB-15
	100000		13700		16700									
	150000		14100		17100									
	250000		14500		17500									
	500000		14800		17800									
	unlimited		15100		18100									
750 5.75%	50000	902	15500	4500	20000	DB-50	DB-25	DB-15	DB-50	DB-15	DB-15	DB-15	DB-50	DB-15
	100000		17300		21800									
	150000		18100		22600									
	250000		18700		23200									
	500000		19200		23700									
	unlimited		19600		24100									
1000 5.75%	50000	1203	19500	6000	25500	DB-50	DB-50	DB-25	DB-50	DB-15	DB-25	DB-15	DB-50	DB-25
	100000		22400		28400									
	150000		23500		29500									
	250000		24500		30500									
	500000		25300		31300									
	unlimited		26200		32200									
1500 5.75%	50000	1804	25800	9000	34800	DB-75	DB-50	DB-50	DB-75	DB-15	DB-50	DB-15	DB-75	DB-50
	100000		31200		40200									
	150000		33500		42500									
	250000		35600		44600									
	500000		37300		46300									
	unlimited		39200		48200									
2000 5.75%	50000	2406	30900	12000	42900	DB-75	DB-50	DB-50	DB-75	DB-15	DB-50	DB-15	DB-75	DB-50
	100000		38200		50200		DB-75			DB-25		DB-25		
	150000		42600		54600									
	250000		45900		57900									
	500000		48700		60700			DB-75			DB-75			DB-75
	unlimited		52400		64400									
2500 5.75%	50000	3008	34900	15000	49900	DB-100	DB-75	DB-50	DB-100	DB-25	DB-50	DB-25	DB-100	DB-50
	100000		45400		60400		DB-100	DB-75			DB-75			DB-75
	150000		50700		65700									
	250000		55700		70700					DB-50		DB-50		
	500000		60200		75200						DB-100			
	unlimited		65400		80400			DB-100						DB-100

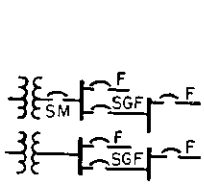
refer to notes on page 25

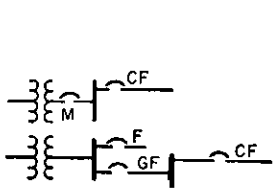
table I

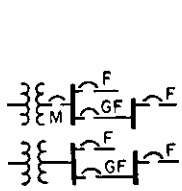
breaker type	limit of fault current through breaker when cascaded		
	481-600 volts①	241-480 volts①	240 and below①
DB-15	30,000	50,000	60,000
DB-25	50,000	70,000	100,000
DB-50	100,000	100,000	120,000
DB-75	100,000	100,000	150,000
DB-100	100,000	100,000	150,000

① Nominal system voltage. For frequencies less than 50 CPS use the current value in the 481-600 volt column.

table D: 600 volts—3 phase • recommended type DB air circuit breakers • note (2)







transformer rating 3 phase kva and impedance percent	maximum short circuit kva available from primary system	rated load continuous current amperes	short-circuit current (1) average rms asymmetrical amperes			selective trip systems			cascade systems				fully-rated non-selective	
			transformer alone	100% motor load	combined	SM selective main breaker	SGF selective group feeder breaker	F feeder breaker	M main breaker	CF cascaded feeder breaker	F or GF feeder or group feeder breakers	CF cascaded feeder breaker	M main breaker	F or GF feeder or group feeder breakers
300 **5%**	50000	289	6450	1450	7900	DB-25	DB-15	DB-15	DB-25	DB-15	DB-15	DB-15	DB-25	DB-15
	100000		6850		8300									
	150000		6950		8400									
	250000		7050		8500									
	500000		7150		8600									
	unlimited		7250		8700									
500 **5%**	50000	481	10000	2400	12400	DB-25	DB-15	DB-15	DB-25	DB-15	DB-15	DB-15	DB-25	DB-15
	100000		11000		13400									
	150000		11300		13700									
	250000		11600		14000									
	500000		11800		14200									
	unlimited		12000		14400									
750 **5.75%**	50000	722	12400	3600	16000	DB-50	DB-25	DB-25	DB-50	DB-15	DB-25	DB-15	DB-50	DB-25
	100000		13900		17500									
	150000		14400		18000									
	250000		14900		18500									
	500000		15300		18900									
	unlimited		15700		19300									
1000 **5.75%**	50000	962	15500	4800	20300	DB-50	DB-25	DB-25	DB-50	DB-15	DB-25	DB-15	DB-50	DB-25
	100000		17800		22600									
	150000		18700		23500									
	250000		19600		24400									
	500000		20200		25000									
	unlimited		20800		25600		DB-50	DB-50			DB-50			DB-50
1500 **5.75%**	50000	1444	20700	7200	27900	DB-50	DB-50	DB-50	DB-50	DB-15	DB-50	DB-15	DB-50	DB-50
	100000		24900		32100					DB-25		DB-25		
	150000		26800		34000									
	250000		28500		35700									
	500000		29900		37100									
	unlimited		31400		38600									
2000 **5.75%**	50000	1924	24700	9600	34300	DB-75	DB-50	DB-50	DB-75	DB-25	DB-50	DB-25	DB-75	DB-50
	100000		31000		40600									
	150000		34000		43600									
	250000		36800		46400									
	500000		39200		48800									
	unlimited		41800		51400		DB-75	DB-75		DB-50	DB-75	DB-50		DB-75
2500 **5.75%**	50000	2405	28000	12000	40000	DB-75	DB-50	DB-50	DB-75	DB-25	DB-50	DB-25	DB-75	DB-50
	100000		36400		48400									
	150000		40500		52500		DB-50	DB-50		DB-50	DB-75	DB-50		DB-75
	250000		44600		56600									
	500000		48200		60200									
	unlimited		52300		64300									

M = Main Breaker selected to have adequate interrupting and continuous current ratings.

SM = Selective Main Breaker selected to have adequate interrupting, short-time and continuous current ratings and equipped with selective series overcurrent tripping devices.

GF = Group Feeder Breaker selected to have adequate interrupting rating. The breaker is assumed to have adequate continuous current capacity.

SGF = Selective Group Feeder Breaker selected to have adequate interrupting and short-time ratings, and equipped with selective series overcurrent tripping devices. The breaker is assumed to have adequate continuous current capacity.

F = Feeder Breaker selected to have adequate interrupting rating.

CF = Cascaded Feeder Breaker where the available fault current exceeds the breaker interrupting rating and selected to comply with cascade rules on page 22.

(1) = Short-circuit currents are the average of the rms values of asymmetrical fault current in the three phases, based on an average asymmetry factor of 1.25.
The short-circuit currents are based on bolted, 3-phase faults with the transformer as the only source of power and include motor feedback from the percent motor load shown in the tables.

(2) = Standard ranges of trip-coil current ratings are listed in a table on page 11.

low-voltage metal-enclosed switchgear

information to be furnished with orders

1. Single-line diagram showing main connections and sketch showing desired order of assembly of Basic Units.

2. Interrupting capacity, voltage and trip coil rating of each air circuit breaker.

3. Type of operating mechanism; whether manual or electric. If electric control is from source remote from switchgear, specify a-c or d-c voltage.

4. Type and number of trip or other desired attachments for each air circuit breaker.

5. Name of manufacturer, ratings and wiring diagrams of all equipment to be controlled by the switchgear. Generator information should include: machine name-plate reading, outline of field-discharge resistor, type of governor motor, exciter rating and outline of exciter-field rheostat. Motor information should include: locked-rotor, starting and full-load currents.

6. Complete information on equipment furnished by others, but mounted on the switchgear panels or structure.

7. Number and size of power cables and conduits for each circuit and where they are to enter (top or bottom).

8. Where control cables are to enter (top or bottom).

9. Instrument transformer ratios.

10. Instrument scales, unless manufacturer is to select them.

11. Maximum length of shipping section which can be handled and installed at destination.

12. Complete name plate wording for each circuit-identification name plate.

standard specifications

The following specifications are based on 600-volt maximum, 3-phase, 3-wire service, with ungrounded neutral. The specifications can be readily adapted to cover switchgear for lower voltage, for 3-phase, 4-wire, or single-phase, 3-wire a-c or for 2 or 3-wire d-c.

general: Low-voltage metal-enclosed switchgear will consist of a stationary structure assembly and one or more removable "De-ion" air circuit-breaker units fitted with disconnecting devices and other necessary equipment. The switchgear will be suitable for 600 volts maximum service and will receive a dielectric test for that voltage class in accordance with NEMA standards. It will be designed, manufactured and tested in accordance with the latest standards of the AIEE and NEMA.

stationary structure: Each steel unit forming part of the stationary structure will be a self-contained housing having one or more individual breaker or instrument compartments and a full-height rear compartment for the bare buses, instrument transformers and outgoing cable connections.

The individual circuit-breaker compartments will be equipped with primary and secondary contacts, rails, stationary disconnecting mechanism parts, and the cell interlock which prevents moving the removable unit into or out of the "connected" position while the circuit breaker is closed. A formed steel door equipped with ornamental grilles and supported by concealed hinges, will be provided for each circuit breaker compartment. The door of the unit will be inter-locked so that access is not permitted to a closed breaker. (This interlock can be omitted to allow opening of the door when the breaker is closed.)

The top of the structure will be enclosed with removable steel sheets.

The structure will be so designed that future additions may readily be made at any time. The steel structure will be thoroughly cleaned and Bonderized prior to the application of the priming and finishing coats of paint.

A black, engraved circuit-designation plate, 1¼ inches high and 3½ inches wide will be provided on each circuit breaker door.

buses and connections: Each circuit will include the necessary 3-phase bus and the connections between the bus and one set of circuit-breaker studs. Solderless type terminals for the outgoing cables will be provided on the other set of circuit breaker studs. The buses will consist of high-conductivity bare bars mounted in heavy Micarta supports. The main bus joints and all tap connections will be silver-plated and tightly clamped with through-bolts to insure maximum conductivity.

Cleats will be mounted on support members for securing of outgoing cables.

Moldarta† terminal blocks with integral-type barriers will be provided for the secondary circuits. The terminal blocks will be mounted at the rear of the units, and will be accessible through a removable cover. They will be mounted at top or bottom as required by purchaser.

disconnecting devices: The stationary part of the primary disconnecting devices for each circuit breaker will consist of a set of contacts mounted on an insulating base. Buses and outgoing cable connections will be directly connected to them. The corresponding moving contacts will consist of a set of contact fingers suitably spaced on the circuit breaker studs. In the connected position, these contact fingers will engage the stationary contacts, forming a current-carrying bridge. The assembly will provide a multitude of silver-to-silver high-pressure point contacts. High uniform pressure on each finger will be maintained by individual short leaf springs. The entire assembly will be full floating and will provide ample flexibility between the stationary and moving elements. Contact engagement will be maintained only in the "connected" position.

The secondary disconnecting devices will consist of floating fingers mounted on the removable unit and engaging flat contact segments located at the rear of the compartment. The secondary disconnecting devices will be silver-plated to insure permanence of contact. Contact pressure will be provided by helical springs. Contact engagement will be maintained in the "connected" and "test" positions.

A heavy-duty, finger-type ground contact will be provided and mounted on the frame of the removable unit and a stationary ground contact of ample capacity will be bolted to the ground bus. Contact engagement will be maintained in the "connected" and "test" positions.

removable element: The removable element will consist of a type DB① "De-ion" air circuit breaker equipped with the necessary disconnecting contacts, wheels, and interlocks for drawout application. Breakers with 3 position features shall have a sliding faceplate with adequate movement to permit closing the compartment door with the breaker in connected, test or disconnected position.

air circuit breakers: The air circuit breakers will be the Westinghouse Type DB①, operating on the Westinghouse principle of "De-ion" arc interruption. These breakers will incorporate specially designed circuit-interrupting devices which provide improved interrupting efficiency and minimize the formation of arc flame and gases. The air circuit breakers have solid silver-inlay, butt-type contacts which operate under high pressure. The auxiliary and main arcing contacts will be of arc-resisting tungsten alloy. The breaker will be equipped with "De-ion" arc chutes which effectively enclose the arcing contacts and confine the arc to reduce the disturbance caused by short-circuit interruption.

Each breaker will be equipped with a visible position indicator, mechanically connected to the circuit breaker mechanism and located so that the position of the circuit breaker is indicated from the front door of the compartment.

factory assembly and tests: The switchgear will be completely assembled, wired, adjusted and tested at the factory. After assembly, the complete switchgear will be tested for operation under simulated service conditions to assure the accuracy of the wiring and the functioning of the equipment.

The main circuits will be given a dielectric test of 2200 volts for one minute between live parts and ground and between opposite polarities. The wiring and control circuits will be given a dielectric test of 1500 volts for one minute between live parts and ground.

†Trade Mark ①Type DA for 5000 or 6000 ampere rating.

basic unit 1

Metal-enclosed switchgear auxiliary unit. Equipment will include:

1—Set of 3-phase bare bus risers, ... amperes.

control equipment for transformer, bus tie or feeders

basic unit 2

Metal-enclosed switchgear unit for the control of four 3-phase, 60-cycle feeders. Dimensions and bus arrangements will be in accord with fig. 28, page 14. Equipment will include:

4—type (DB-15) (DB-25) De-ion air circuit breakers, ... amperes, 3-pole, single-throw, (manually) (Electrically) operated.
1—set of bare buses and connections.
4—sets of terminals for outgoing cables.
4—circuit nameplates.

basic unit 3

Metal-enclosed switchgear unit for the control of three 3-phase, 60-cycle feeders. Dimensions and bus arrangements will be in accord with fig. 28, page 14. Equipment will include:

3—type (DB-15) (DB-25) De-ion air circuit breakers, ... amperes, 3-pole, single-throw, (manually) (electrically) operated.
1—set of bare buses and connections.
3—sets of terminals for outgoing cables.
3—circuit nameplates.

arrangements for 22½-inch high instrument panel

option A (fig. 47, page 21)

3—type KA-25 ammeters, suitable scale, 5-ampere coil.
3—type W ammeter switches.
6—current transformers, ... ratio.
3—circuit nameplates.

option B (fig. 48, page 21)

3—type CB-2F polyphase watthour meters, two-element, 5-ampere, 115-volt, Flexitest case.
2—potential transformers, with fuses.
note: Only one set of potential transformers is required per bus section.
6—current transformers, ... ratio.
3—circuit nameplates.

basic unit 4

Metal-enclosed switchgear unit for the control of two 3-phase, 60-cycle feeders. Dimensions and bus arrangements will be in accord with fig. 28, page 14. Equipment will include:

2—type (DB-15) (DB-25) De-ion air circuit breakers, ... amperes, 3-pole, single-throw, (manually) (electrically) operated.
1—set of bare buses and connections.
2—sets of terminals for outgoing cables.
2—circuit nameplates.

arrangements for 45-inch high instrument panel

option A (fig. 49, page 21)

2—type KA-25 ammeters, suitable scale, 5-ampere coil.
2—type W ammeter switches.
2—type CB-2F polyphase watthour meters, two-element, ampere, 115-volt, with Flexitest cases.
2—potential transformers, with fuses.
note: Only one set of potential transformers is required per bus section.
4—current transformers, ... ratio.
2—circuit nameplates.

basic unit 5

Metal-enclosed switchgear unit for the control of three 3-phase, 60-cycle feeders. Dimensions and bus arrangements will be in accord with fig. 29, page 14. Equipment will include:

3—type DB-50 De-ion air circuit breakers, ... amperes, 3-pole, single-throw, (manually) (electrically) operated.
1—set of bare buses and connections.
3—sets of terminals for outgoing cables.
3—circuit nameplates.

basic unit 6

Metal-enclosed switchgear unit for the control of two 3-phase, 60-cycle feeders. Dimensions and bus arrangements will be in accord with fig. 29, page 14. equipment will include:

2—type DB-50 De-ion air circuit breakers, ... amperes, 3-pole, single-throw, (manually) (electrically) operated.
1—set of bare buses and connections.
2—sets of terminals for outgoing cables.
2—circuit nameplates.

arrangements for 30-inch high instrument panel

option A (fig. 50, page 21)

2—type KA-25 ammeters, suitable scale, 5-ampere coil.
2—type W ammeter switches.
4—current transformers, ... ratio.
2—circuit nameplates.

option B (fig. 51, page 21)

2—type KA-25 ammeters, suitable scale, 5-ampere coil.
2—type W ammeter switches.
2—type CB-2F polyphase watthour meters, two-element, 5-ampere, 115-volt, with Flexitest cases.
2—potential transformers, with fuses.
note: Only one set of potential transformers is required per bus section.
4—current transformers, ... ratio.
2—circuit nameplates.

option C (fig. 52, page 21)

2—type KA-25 ammeters, suitable scale, 5-ampere coil.
2—type W ammeter switches.
2—type CB-3F polyphase watthour meters, three-element, 5-ampere, 115-volt, with Flexitest cases.
3—potential transformers, with fuses.
note: Only one set of potential transformers is required per bus section.
6—current transformers, ... ratio.
2—circuit nameplates.

control equipment for transformer, bus tie or feeders *(continued)*

basic unit 7

Metal-enclosed switchgear unit for the control of one 3-phase, 60-cycle, transformer or bus-tie circuit. Dimensions and bus arrangements will be in accord with fig. 29, page 14. Equipment will include:

1—type DB-50 De-ion air circuit breaker, ... amperes, 3-pole, single-throw, (manually) (electrically) operated.
1—set of bare buses and connections.
1—set of terminals for outgoing cables.
1—circuit nameplate.

arrangements for 60-inch high instrument panel

option A (fig. 53, page 21)

3—type KA-25 ammeters, suitable scale, 5-ampere coil.
3—current transformers, ... ratio.
1—type W circuit breaker control switch with red and green indicating lamps.

option B (fig. 54, page 21)

3—type KA-25 ammeters, suitable scale, 5-ampere coil.
1—type CB-2F polyphase watthour meter, two element, 5-ampere, 115-volt, with Flexitest case.
2—potential transformers, with fuses.
note: Only one set of potential transformers is required per bus section.
3—current transformers, ... ratio.
1—type W circuit breaker control switch with red and green indicating lamps.

option C (fig. 55, page 21)

1—type KA-25 ammeter, suitable scale, 5-ampere coil.
1—type W ammeter switch.
1—type KA-25 voltmeter, suitable scale, 115-volt coil.
1—type W voltmeter switch.
2—potential transformers, with fuses.
3—type CA ratio-differential relays for transformer protection with Flexitest cases.
3—current transformer, ... ratio.
1—type W circuit breaker control switch with red and green indicating lamps.

option D (fig. 56, page 21)

1—type CB-2F polyphase watthour meter, two-element, 5-ampere, 115 volts, with Flexitest case.
2—potential transformers, with fuses.
1—type KA-25 ammeter, suitable scale, 5 ampere coil.
1—type W ammeter switch.
1—type KY-25 power factor meter, 3-phase.
1—type K-25 lamp type ground detector and necessary resistors.
2—current transformers, ... ratio.
1—type W circuit breaker control switch with red and green indicating lamps.

option E

1—type W circuit breaker control switch with red and green indicating lamps.

basic unit 8

Metal-enclosed switchgear unit for the control of one 3-phase, 60-cycle transformer and two 3-phase, 60-cycle feeders. Dimensions and bus arrangements will be in accord with fig. 29, page 14. Equipment will include:

1—type DB-50 De-ion air circuit breakers, ... amperes, 3-pole, single-throw, (manually) (electrically) operated.
2—type (DB-15) (DB-25) De-ion air circuit breakers, ... amperes, 3-pole, single-throw, (manually) (electrically) operated.
1—set of bare buses and connections.
2—sets of terminals for outgoing cables.
2—circuit nameplates.

basic unit 9

Metal-enclosed switchgear unit for the control of two 3-phase, 60-cycle feeders. Dimensions will be as per fig. 30, page 15. Equipment will include:

2—type DB-75 De-ion air circuit breakers, ... amperes, 3-pole, single-throw, electrically operated.
2—sets bare buses and connections.
2—sets of terminals for outgoing connections.
2—type W circuit breaker control switches with red and green indicating lamps.

basic unit 10

Metal-enclosed switchgear unit for the control of one 3-phase, 60-cycle transformer or bus-tie circuit. Dimensions and bus arrangements will be in accord with fig. 30, page 15. Equipment will include:

1—type DB-75 De-ion air circuit breaker, ... amperes, 3-pole single-throw, electrically operated.
1—set of bare buses and connections.
1—set of terminals for outgoing cables.
1—circuit nameplate.

options—see basic unit 7

basic unit 11

Metal-enclosed switchgear unit for the control of one 3-phase, 60-cycle transformer or bus-tie circuit. Dimensions and bus arrangements will be in accord with fig. 31, page 15. Equipment will include:

1—type DB-100 air circuit breaker, ... amperes, 3-pole, single-throw, electrically operated.
1—set of bare buses and connections.
1—set of terminals for outgoing cables.
1—circuit nameplate.

options—see basic unit 7

basic unit 12

Metal-enclosed switchgear unit for the control of one 3-phase, 60-cycle transformer or bus-tie circuit. Equipment will include:

1—type DA-100 air circuit breaker, ... amperes, 3-pole, single-throw, electrically operated.
1—set of bare buses and connections.
1—set of terminals for outgoing cables.
1—circuit nameplate.

control equipment for one generator *(nonparallel operation)*

basic units 1 and 7

basic unit no. 1—Metal-enclosed switchgear unit, 26 inches wide, for instrument compartment. Equipment will include:

1—type SRA Silverstat regulator, complete with accessories.
1—drilling for exciter-field rheostat.
1—type AB field circuit breaker, manually operated, complete with field-discharge clip and shunt trip coil.
3—type CA ratio-differential relays for generator protection, with Flexitest cases.

basic unit no. 7—Metal-enclosed switchgear unit for the control of one 3-phase, 60-cycle generator. Dimensions and bus arrangements will be in accord with fig. 29, page 14. Equipment will include:

1—type DB-50 De-ion air circuit breaker, ... amperes, 3-pole, single-throw, electrically operated.
1—set of bare buses and connections.
1—set of terminals for outgoing cables.
3—potential transformers, with fuses.
2—current transformers, ... ratio, double secondary.
4—current transformers, ... ratio, single secondary.
note: Three current transformers will be shipped unmounted for connection into the generator neutral leads.
1—circuit nameplate.

basic units 1 and 10

basic unit no. 1—Metal-enclosed switchgear unit, 26 inches wide, for instrument compartment. Equipment will include:

1—type SRA Silverstat regulator, complete with accessories.
1—drilling for exciter-field rheostat.
1—type AB field circuit breaker, manually operated, complete with field discharge clip and shunt trip coil.
3—type CA ratio-differential relays for generator protection, with Flexitest cases.

basic unit no. 10—Metal-enclosed switchgear unit for the control of one 3-phase, 60-cycle generator. Dimensions and bus arrangements will be in accord with fig. 30, page 15. Equipment will include:

1—type DB-75 De-ion air circuit breaker, ... amperes, 3-pole, single-throw, electrically operated.
1—set of bare buses and connections.
1—set of terminals for outgoing cables.
3—potential transformers, with fuses.
2—current transformers, ... ratio, double secondary.
4—current transformers, ... ratio, single secondary.
note: Three current transformers will be shipped unmounted for connection into the generator neutral leads.
1—circuit nameplate.

mounted on the hinged instrument panel

1—type KA-25 ammeter, suitable scale, 5-ampere coil.
1—type W ammeter switch.
1—type KA-25 voltmeter, suitable scale, 115-volt coil.
1—type W voltmeter switch.
1—type KY-25 polyphase wattmeter, suitable scale. 5-ampere, 115-volt.
1—type KY-25 power-factor meter, suitable scale.
1—type KX-25 ammeter, suitable scale, complete with shunt.
1—type KX-25 temperature indicator.
1—type W temperature-indicator switch.
1—type CB-2 polyphase watthour meter, two-element, 5-ampere, 115-volt, with Flexitest case.
1—type W governor-control switch.
1—type W circuit breaker control switch with red and green indicating lamps.

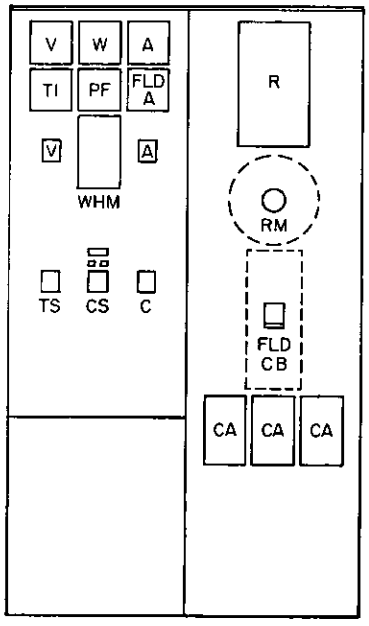


fig. 57

attachments

adjustable instantaneous series overload trip .... ②
long time delay series overload trip ..... ②
long time delay and instantaneous series overload trip ..... ②
long time delay and short time delay series overload trip ..... ②
shunt trip .....
undervoltage trip time delay or instantaneous ...
reverse current trip ..... ③
alarm switch .....
capacitor trip ..... ③
electric lockout coil ..... ③
key interlock .....
padlocking provisions ..... ③

② For DA-100 adjustable time delay or instantaneous transformer trip and instantaneous series overload trip are available.
③ Not available on DA-100

contacts

type of breaker	number of contacts
auxiliary switch	
DB-15	4 or 8
DB-25	4 or 8
DB-50	4, 8 or 12
DB-75 & 100	4 or 8
DA-100	3, 5, 7, 9 or 11
secondary contacts	
DB-15	8 or 16
DB-25	8 or 16
DB-50	12 or 24
DB-75	16
DB-100 (4000-A)	16
DA-100 (5000 & 6000-A)	22

wall mounting units

Large industrial plants having widely separated load locations often require isolated breaker units instead of a central distribution switchboard. Wall-mounted, low-voltage, drawout air circuit breaker units are designed to meet these requirements.

These individual units are available with air circuit breakers having interrupting capacities of 15,000, 25,000 and 50,000 amperes, manually or electrically operated. The housings are designed for cable entrances at either top or bottom. The units include all the safety and interlock features of standard, low-voltage drawout units.

1 Main housing for wall mounting with knockouts at top and bottom for conduits. Housing can be mounted in place and all cable connections made before breaker compartment is bolted in place.

2 Manually or electrically operated type DB-15 or DB-25 breaker on standard drawout element.

3 Breaker compartment includes door interlock, breaker position stops and all safety features of standard units.

4 External ground connection for solidly grounding housing and drawout welded frame.

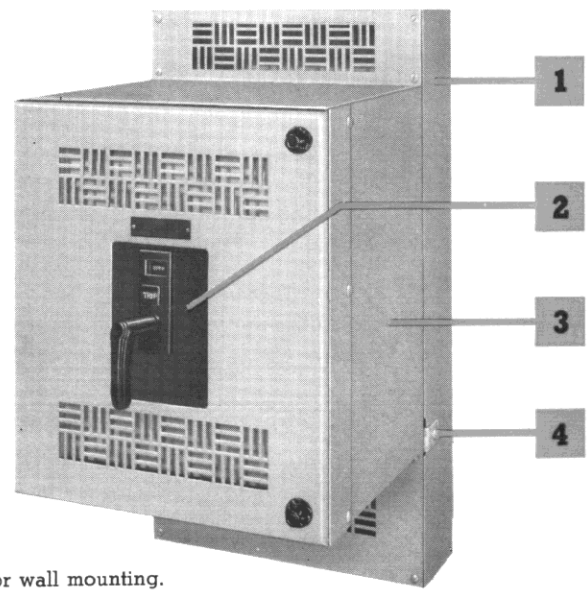


fig. 56—individual unit type DB breaker for wall mounting.

further information

prices: see price list 32-120
application: DB breakers, application data 33-760

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