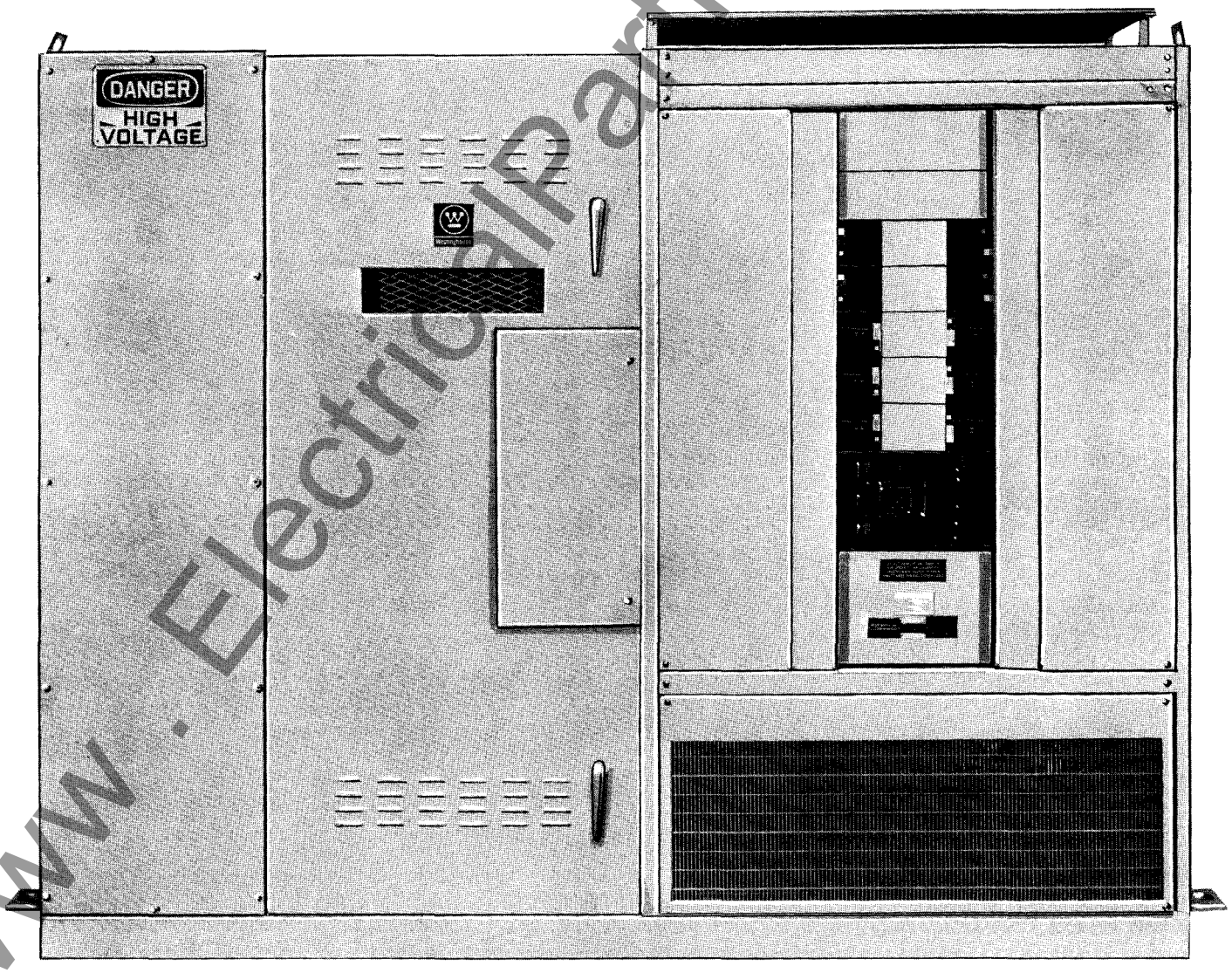
Unitized Dry Type Power Centers



Unitized Dry Type Power Centers

In This Publication

Application

Unitized dry type power centers are self-contained metal enclosed unit substations especially designed to supply and distribute low voltage power from medium voltage lines in modern commercial and industrial systems. They are ideal where considerations of equipment size, accessibility, maintainability, ease of installation, and overall economy are uppermost.

Due to the inherent compactness of unitized power centers, they are easily and conveniently applied in multiple throughout a distribution system at physical locations close to centers of load concentration. The distribution voltage is thus stepped down to the utilization voltage only at or near the areas of demand with KVA being allocated as required for new construction or renovation of existing buildings. The application of unitized power centers in this manner results in several advantages not available with single large substation lineups.

Advantages

1. Unitized power centers are completely assembled and tested as a unit at the factory and arrive at the job site in one shipping unit. Moving into place is facilitated by the rugged channel base construction and lifting pads included with each unit. Field installation consists merely of connecting the incoming and outgoing cables after rolling or lifting the unit into place.

2. All standard unitized power centers are especially designed to minimum dimensions consistent with safety and reliability. The depth dimension of the assembled unit will allow passage through a standard 36 in. doorway without turning the assembly from its upright position.

3. Standard unitized power centers are front accessible making against-the-wall installations possible.

4. Future load growth is easily accommodated by the addition of unitized power centers to the system without affecting the units serving the original load areas.

5. Losses in the medium voltage portion of the distribution are lower resulting in a continuous operating saving.

6. Secondary output voltage may be adjusted at each unitized power center to compensate for unusual load conditions without affecting the voltage settings of other units in the system.

7. Trouble is more quickly isolated with individual units located at or near their served loads.

8. Primary power is purchased from the utility at the lower primary power rates resulting in operational cost savings throughout the life of the equipment.

9. Overall installed cost is lower because of the cost benefits of medium voltage distribution cable as compared to low voltage cable. The apparent negative cost effect of multiple small units versus one large unit is more than offset by the relatively low cost of secondary overcurrent devices that may be applied on each integral unit.

Ratings

Primary Voltages: 3 ph. 60 hz. Delta
- 2.5 kV Class - 20 kV BIL.
- 7.2 kV Class - 30 kV BIL.
- 15 kV Class - 60 kV BIL.

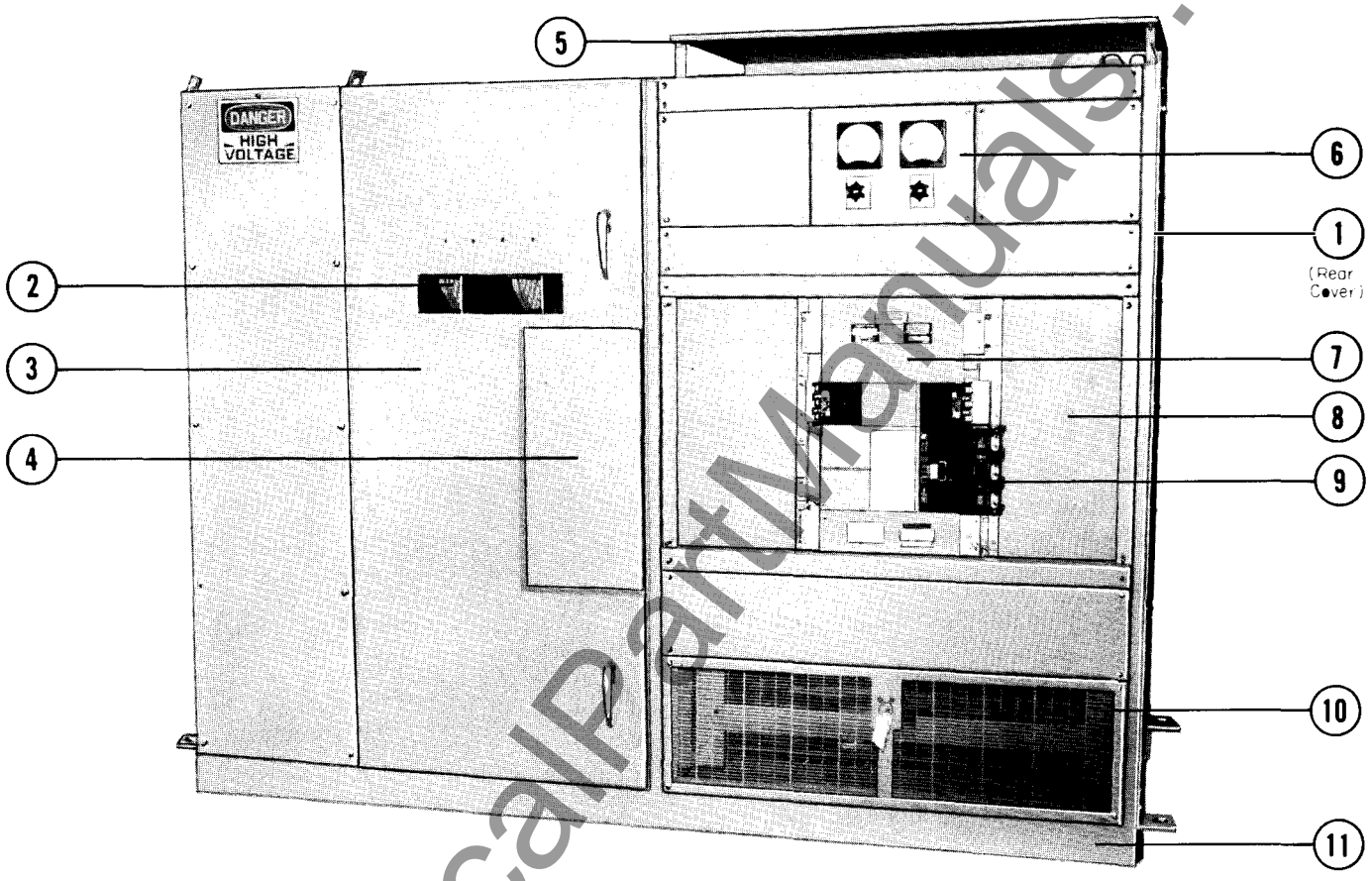
kVA:
- 112.5 thru 1000

Transformer:
- Aluminum (or copper)
- Type AA - Ventilated Dry Type
- NEMA Class H Insulation – 150°C Rise
- 115°C and 80°C Rise available
- Type FA (Forced Air) available – increases kVA ratings by 33⅓%.
- Primary Taps ±2 - 2½%.

Secondary Voltages: 3 ph. 60 hz.
- 208Y/120 Volts - 4 wire
- 240 Volts - 3 Wire
- 480Y/277 Volts - 4 Wire
- 480 Volts - 3 Wire

Unitized Dry Type Power Centers

Design Features



① Shallow depth of the assembled unit not only makes it totally front accessible but enables it to be moved through standard doorways into mounting positions against the wall, in corners and on mezzanines. Rear covers, however, are removable for greater access when rear space is available.

② A viewing window is provided in the loadbreak switch door so that the position of the switchblades (open - closed) may be visually confirmed at any time.

③ An interlocked door over the primary switch compartment prevents opening the door when the switch is closed. The interlock system ensures that when changing primary tap switch positions, the primary switch and its compartment door must be open.

④ A separate door covers the access opening to the quick-make, quick-break manual mechanism. The operating handle, whether standard removable or optional non-removable type is wholly contained behind this door except when in actual use by operating personnel.

⑤ A steel drip shield covers the ventilation opening in the top cover of the enclosure. This shield prevents entry of debris through the perforated top cover while allowing proper exhaust of ventilating air.

⑥ Indicating instruments may be mounted on the upper front panel of the secondary distribution section or on the primary switch door.

⑦ Molded case circuit breakers are arranged in compact panelboard construction and are recessed to protect operating handles during transit and installation.

⑧ Wiring gutters for outgoing cables are oversized to prevent crowding and facilitate installation.

⑨ A secondary main breaker is available as an option in the secondary distribution assembly. This breaker provides a convenient means to disconnect the total load as well as to prevent transformer overloads.

⑩ A grilled opening in the lower portion of the unit front cover provides a cool air intake for natural or forced air ventilation of the transformer.

⑪ A welded steel channel frame forms a common base for the integral assembly making it possible to roll or jack the unit as a single package.

Unitized Dry Type Power Centers

Description

The Westinghouse dry type unitized power center is a truly integrated assembly in which all of the major components making up a functioning unit substation are self-contained within a steel enclosure having a common steel framework base. The interior of the structure is sectionalized by steel barriers so as to segregate the primary side equipment from low voltage work areas. The necessary interconnections are factory installed. Provisions are made for terminating all incoming line and outgoing load cables utilizing front access.

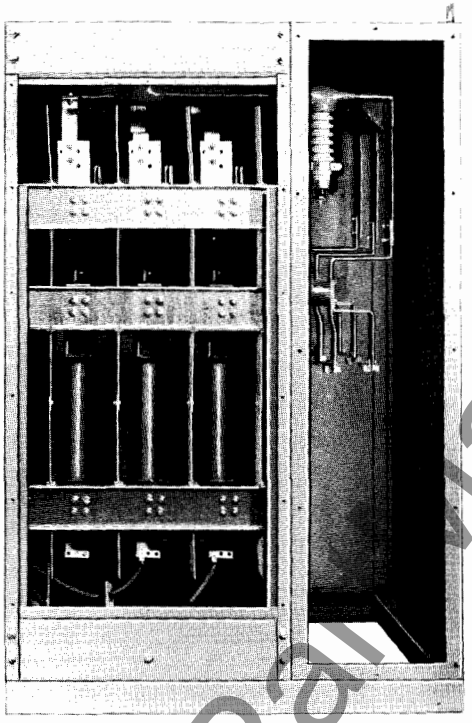
Primary Disconnect Switch

The standard composite unit incorporates a manually operated two position quick-make, quick-break type WLI load interrupter switch as the primary disconnect. Where transformer overcurrent protection is required, current limiting fuses are included within the switch compartment. In either the fused or unfused assembly, a safety door interlock system prevents opening the compartment door with the switch closed. This interlock is positive and not defeatable. A viewing window in the compartment door enables the position of the disconnect blades to be determined with the door closed.

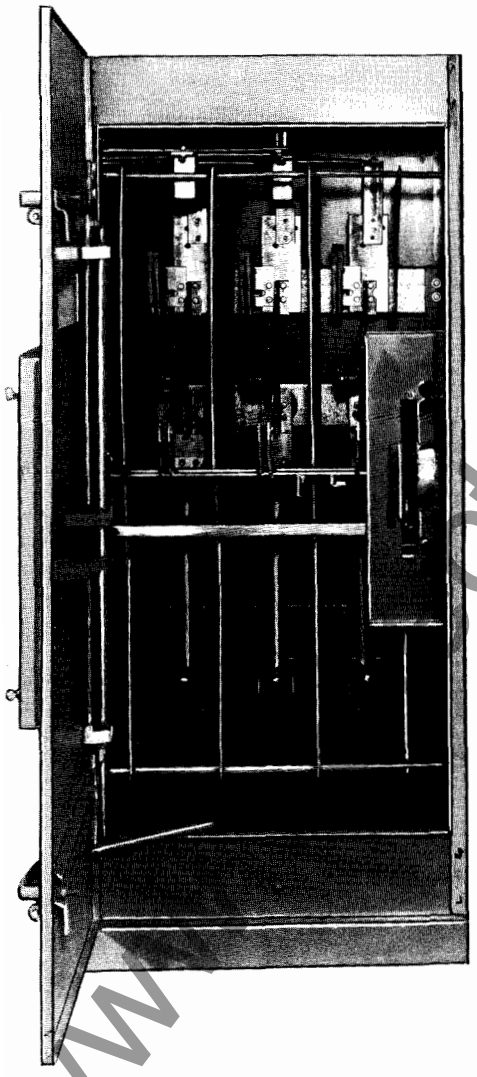
The switch operating handle may be either fixed mounted or removable as desired. In both versions, the handle is designed so that when not in actual use, it is stored or concealed behind an auxiliary door.

Power fuses, when used, are Westinghouse Type CX current limiting, which provide minimum let-through current on interruption, and which expel no gas or vapor. The fuses are held in firm contact in their mountings and are easily removed from the front when necessary.

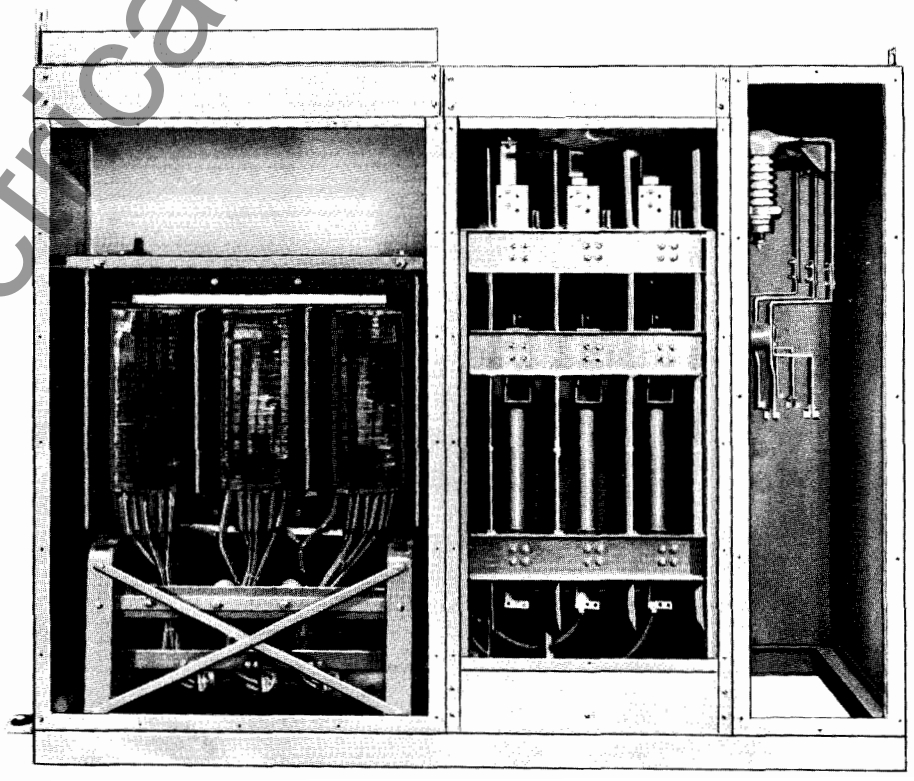
To protect the dry type transformer windings from damaging lightning surges, arresters are available in either distribution or intermediate types. Distribution-type arresters are mounted in the primary equipment compartment. Intermediate type arresters are mounted in an adjacent terminal compartment.



Rear View, Primary Disconnect and Terminal Compartment



Primary Disconnect - WLI Switch



Rear View, Power Transformer, Primary Disconnect, Terminal Compartment

Unitized Dry Type Power Centers

Although standard units are designed for front access to all line and load connections, the rear cover over the primary switch and fuse compartment is removable. This allows even greater access in installations where the rear of the unit is not required to be against the wall.

Connections between the primary disconnect assembly and the power transformer in the adjacent section are by means of insulated cables passing through openings in the segregating steel barrier.

Power Transformer
The power transformer is a ventilated dry type of compact 3 phase core form construction. The winding insulation system is Class H, allowing normal operation at 150°C temperature rise above a 30°C average and 40°C peak ambient.

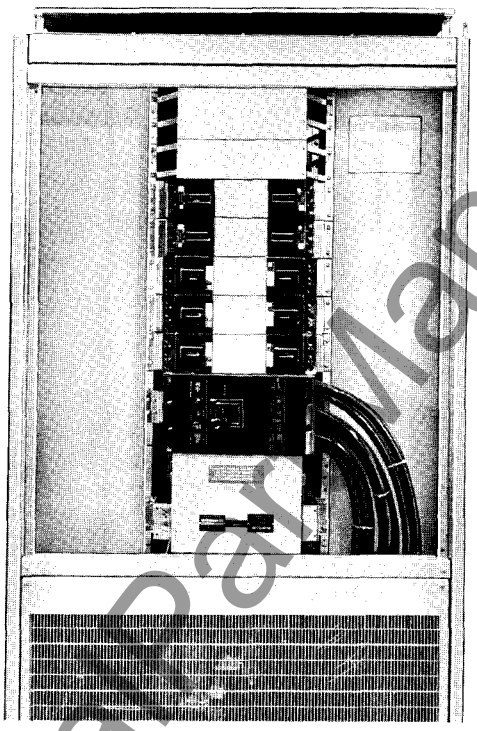
Core and coil assemblies are built to ANSI - NEMA standards and meet or exceed requirements for sound levels and impedance called out by this standard.

The primary windings of all transformers are equipped with rotary tap changing switches connected to standard taps, such that output voltage may be adjusted to compensate for voltage drop or abnormal input voltage. The adjustment handles on the tap switches are physically positioned in the transformer compartment so that they are accessible only after the primary disconnect switch and its compartment door have been opened, de-energizing all equipment. This interlocked system ensures that taps are not changed under load and that live parts are not inadvertently contacted during the changing operation.

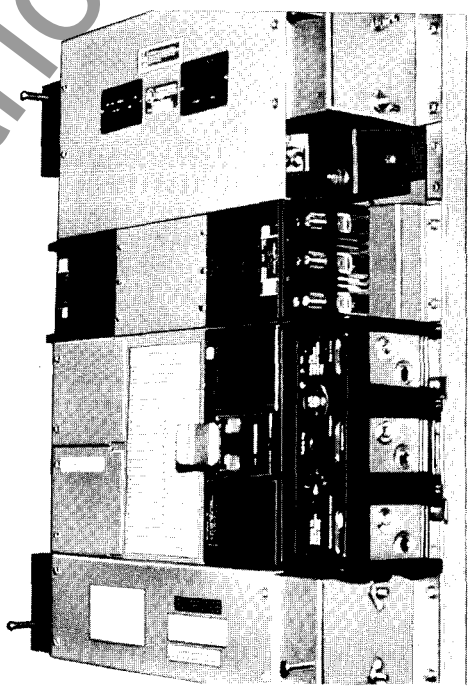
Access to the core and coil assembly for inspection and maintenance can be obtained by removing rear covers from the unit enclosure. In very confined installations the maintenance and inspection can be performed through the top ventilating opening for exhausting hot air. A removable drip shield is installed over this top opening making top access possible.

Forced cooled units incorporate an exhaust fan mounted within the transformer compartment in such a way as to continuously purge hot air generated in the compartment. Cool incoming air is drawn in through a grilled opening located in the lower portion of the low voltage compartment front cover.

Secondary Distribution
A low voltage distribution compartment is located in the same structure with the core and coil assembly but is completely segregated from it by means of a solid steel vertical barrier. Molded case circuit breakers are mounted in panelboard configuration with operating handles operable from the front of the unit. The front panel space available for mounting breaker devices is the maximum consistent with the desirable feature of reduced unit height. When secondary instrumentation or metering devices are required, space for breaker mounting may be reduced.



Low Voltage Distribution Compartment



Distribution Section With Covers Removed

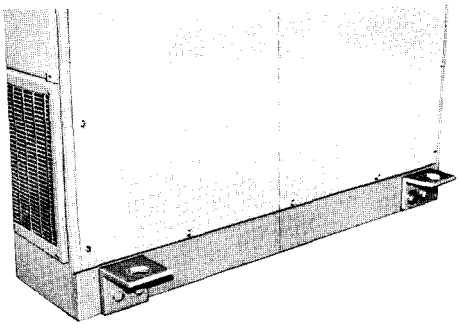
The panelboard sub-assembly may be supplied with a secondary main breaker as a means of conveniently disconnecting all secondary load. It also serves to protect the transformer from excessive overloads rather than relying on primary overload protection.

Covers over wiring gutters are removable and cable to load circuits can be pulled in through conduit clear areas located near the front. All enclosing front covers on the distribution section are removable for easy front access during installation and maintenance.

Openings for entrance of ventilating air are located in the lower front cover of the secondary distribution section. Air entering these openings is directed to the transformer compartment as it passes through the barrier separating the core and coil assembly from the distribution panel assembly. Connections from the transformer secondary to the distribution panel assembly pass through the same barrier opening as the incoming cooling air. These secondary connections are front accessible.

The panelboard assembly itself is a Westinghouse Type CDP breaker chassis into which can be fitted molded case breakers from 100A through 1200A frame sizes as mains or branches in compact construction. The flexibility afforded by this construction makes it possible and economical to alter the initial breaker complement to suit changing system load requirements.

The integral power center unit is designed for simplicity in lifting handling and moving into the installed position. To accomplish this, lifting or jacking brackets are provided on the

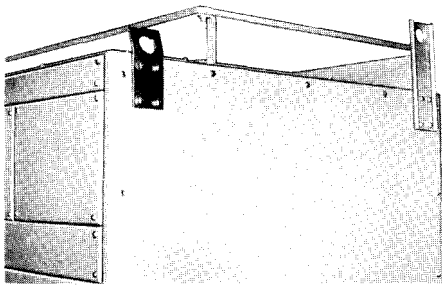


Bottom Lifting or Jacking Brackets

Unitized Dry Type Power Centers

one-piece welded bottom frame. In addition, lifting plates are attached to the unit near the top which provide a means of lifting with an overhead crane when space permits. The heavy floor frame protects the unit enclosure from damage when rolling in any direction.

Unitized power centers, depending on the application, are built with or without the secondary distribution panel. However they are always supplied with a primary disconnect switch. A terminal compartment is used in addition to the integral primary switch to accommodate certain cable entrance situations or to house lightning arresters other than distribution types when specified.



Top Lifting Brackets

All dry type unitized power center enclosures are finished inside and outside with ANSI 61 light gray hard dried enamel applied over a hot phosphatized undercoating.

Application Data

Molded Case Breaker Layout Guide

2X	2P	EB, EHB, FB	EB, EHB, FB
3X	3P	EB, EHB, FB, HFB	EB, EHB, FB, HFB
2X	2P	CA, CAH	CA, CAH
3X	3P	CA, CAH	CA, CAH
3X	3P	KB①, HKB①	KB①, HKB①
4X	3P	DA, LB①, HLB①	DA, LB①, HLB①
6X	3P	LC, HLC	LC, HLC
6X	3P	MC, NC	

① KB, HKB, LB, HLB Breakers may not be used as main devices.

FDP Fusible Switch Layout Guide

4X	30A	30A
4X	60A	60A
5X②	100A	100A
5X	100A	
6X	200A	
11X	400A or 600A	
16X	800A or 1200A③	

② 4X if 240V.
③ Requires 48"-wide structure.

Circuit Breaker Interrupting Ratings

Breaker Type	Ampere Rating	Interrupting Rating, Amps. Sym. 240 Volts	480 Volts
Standard Breakers			
EB	15-100	10,000	.....
EHB	15-100	18,000	14,000
FB	15-150	18,000	14,000
CA	125-225	10,000	.....
CAH	125-225	22,000	.....
KB	70-250	25,000	22,000
DA	250-400	22,000	.....
LB	70-400	42,000	30,000
LC	75-600	42,000	30,000
MC, MCG	400-800	42,000	30,000
NC, NCG	600-1200	42,000	30,000
MARK 75® Breakers			
HFB	15-150	65,000	25,000
HKB	70-250	65,000	25,000
HLB	125-400	65,000	35,000
HLC	75-600	65,000	35,000

FDP for Quick Make-Quick Break Switches④ -Short Circuit Ratings

Ampere Rating	Trans. Sec. Volts	Short Circuit Rating RMS Sym. Amps. W/CL Fuse	W/Non-CL Fuse
30-1200	208 or 480	200 KA	10 KA

● Switches furnished without fuses.

Ventilated Dry-Type Transformer Standard Ratings

All units are 3 Phase, 60 Hz, 150° Rise, 220°C Insulation System

kVA	Impedance	kV Class	ΔPrimary Volts	Primary Taps	Y Secondary Volts	Self-Cooled Sec. FLA 208V	480V	Fan Cooled kVA	Sec. FLA 208V	480V	Transformer Max. S.C. Amps, RMS Sym. 208V	480V
112½	2.7				208Y/120	312	135	150	416	180	11566	5012
150	3.5				or	416	180	200	555	241	11896	5155
225	4.4		2400,		480Y/277	625	271	300	833	361	14194	6151
300	5.5	5	4160,	± 2-2½%		833	361	400	1110	481	15140	6561
500	5.75		or			1388	601	667	1850	802	24136	10459
750	5.75		4800			2082	902	1000	2776	1203	36205	15689
1000	5.75					2776	1203	1333	3701	1604	48274	20918
112½	5.0				208Y/120	312	135	150	416	180	6245	2706
150	5.0		7200,		or	416	180	200	555	241	8327	3608
225	5.0		12470,		480Y/277	625	271	300	833	361	12481	5413
300	5.5	15	13200	± 2-2½%		833	361	400	1110	481	15140	6561
500	5.75		or			1388	601	667	1850	882	24136	10459
750	5.75		13800			2082	902	1000	2776	1203	36205	15689
1000	5.75					2776	1203	1333	3701	1604	48274	20918

Unitized Dry Type Power Centers

Application Data, *Continued*

Primary Disconnect Switch
Type WLI Load Interrupter

Ampere Rating	5 kV Class 60 kV BIL	15 kV Class 95 kV BIL
Continuous Load	600 Amp.	600 Amp.
Load Interrupting	600 Amp.	600 Amp.
10 Hz. Momentary	40 KA (Asym)	40 KA (Asym)
Fault Closing	40 KA (Asym)	40 KA (Asym)

Primary Fuse Application
Current Limiting Type CX, 50,000 Amp. Symmetrical Interrupting Rating

kVA	Primary Fuse Ampere Rating at, kV (Self-cooled Ratings)						
	2.4	4.16	4.8	7.2	12.0	13.2	13.8
112½	45	25	18	15	7	7	7
150	50	35	25	18	10	10	10
225	75	45	40	25	15	15	15
300	100	60	50	35	25	20	18
500	200	100	80	60	40	30	30
750	...	...	120	100	60	45	45
1000	...	...	200	125	95	60	60

Dimensions Individually Mounted Main Devices

Breakers

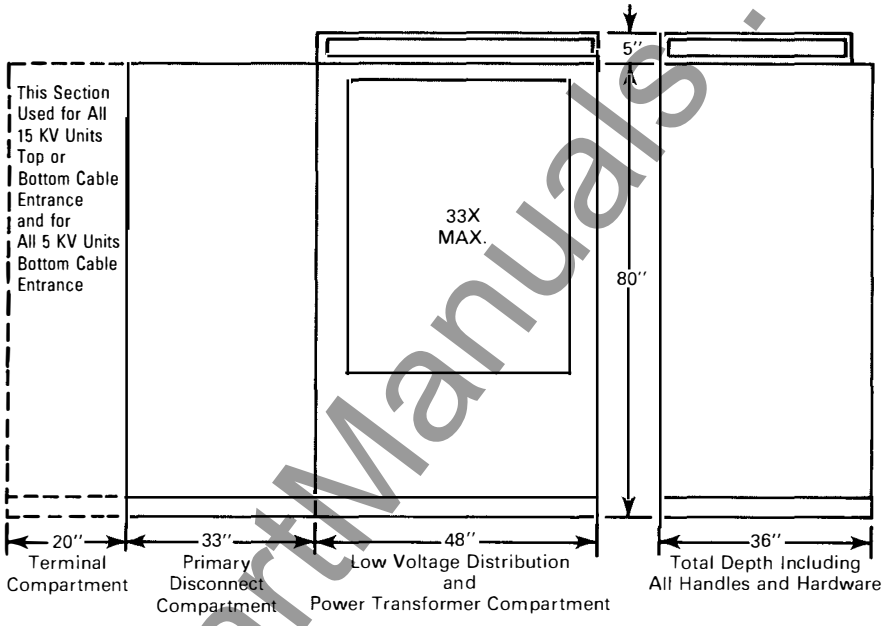
Type	Amperage	Unit Width Required	Maximum Feeder Space
PC	1000-2000	48"	22X
PCC	1000-2000	48"	22X
PC	1400-2500	48"	22X
PCC	1400-2500	48"	22X
PC	1600-3000	48"	22X
PCC	1600-3000	48"	22X

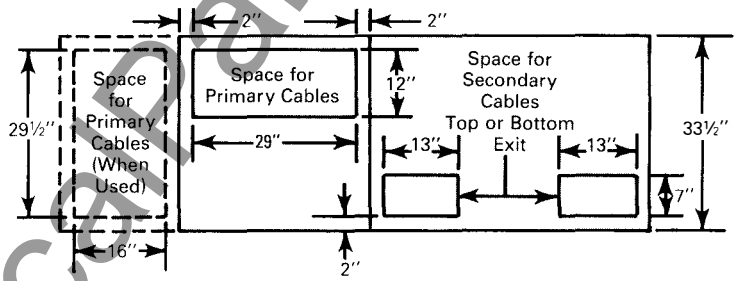
Fusible Bolted Pressure Contact Switches
(Less Fuse)

Amperage	Unit Width Required	Maximum Feeder Space
800	38"	36X
1200	38"	36X
1600	38"	36X
2000	38"	22X
2500	48"	22X
3000	48"	22X

① Required for fan cooled transformer rated 750 or 1000 kVA.
② Will be 60" wide for 1000 kVA transformer or 750 kVA, 115°C and 80°C rise.
③ Width may vary with main device selected.
④ Required unless 5 kV top entry.
⑤ Will decrease when main device individually mounted. See tables above.

Layout Dimensions, Inches—Standard Indoor Unit (For Estimating Purposes Only)

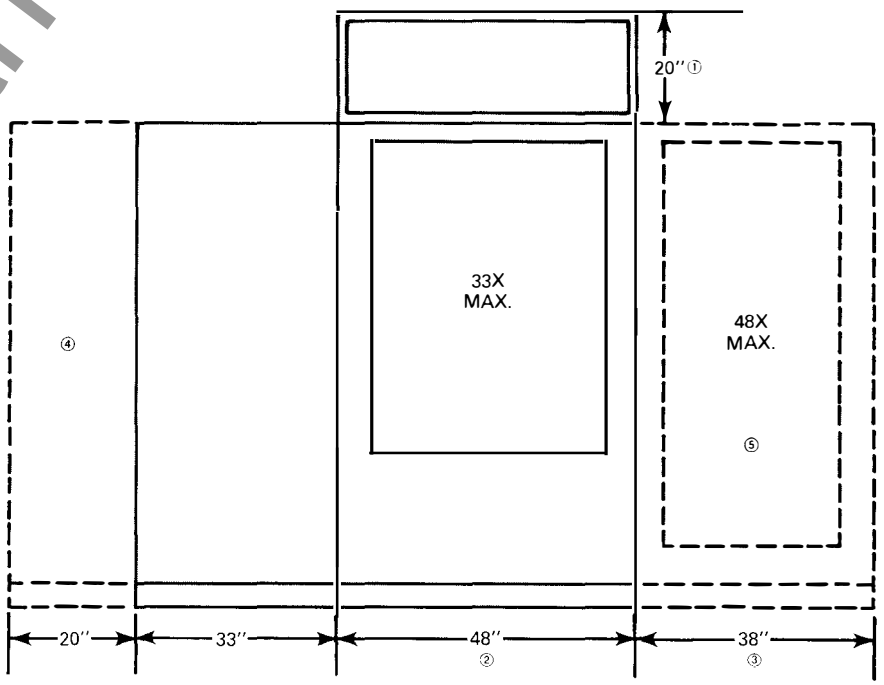




Unit Weights

kVA	Wt. Lbs.
112½	2975
150	3225
225	3550
300	3970
500	4580
750	5660
1000	6910

Example of Expanded Low Voltage Distribution



Unitized Dry Type Power Centers

Typical Specifications

General
(A) secondary unit substation(s) of the compact, self-contained type shall be furnished and installed where indicated on the drawings. Each unit substation shall be complete with a primary incoming line section, a two winding transformer section and a secondary low voltage outgoing cable section. All three sections shall be combined in a unitized steel structure having internal steel barriers effectively segregating the three sections into separate compartments.

The manufacturer shall supply a one piece welded channel base permanently attached to the integral assembly so as to facilitate movement into position by rolling or jacking and to provide the means for bolting the unit securely to the floor. Interconnections between the transformer and the primary and secondary equipment shall be factory installed.

The unitized construction shall enable the complete assembly to be moved through a standard commercial doorway without partial disassembly or tilting the unit from its vertical position. The unit shall be front accessible for normal maintanance and suitable for installation against a wall.

Ventilating openings in the enclosure shall be located such that mounting of the unit against the wall does not interfere with proper cooling.

The unit shall be completely assembled and tested at the factory and all components of the assembly shall meet applicable portions of the latest NEMA and ANSI standards.

External and internal steel surfaces to be painted shall be cleaned and hot phosphatized prior to the application of high quality hard dried acrylic enamel.

Primary Switch Section

The primary switch section shall have provisions for terminating the incoming feeder cable entering the section from the (bottom) (top). The type of termination and the size and type of incoming cable shall be as shown on the drawings.

The primary disconnect switch shall be load interrupting with quick-make, quick-break stored energy manual operating mechanism. It shall be 3 pole, two position gang operated with a current rating of 600 amperes continuous and full load break. The stored energy charging system shall contain rigid mechanical linkages only in its assembly. Arc interruption shall take place in air, aided by deionizing arc chutes operating in conjunction with high speed moving arcing contacts. A viewing window shall provide observation of contacts.

The switch and all components within the primary incoming section shall have a minimum NEMA basic impulse level (BIL) corresponding to the system voltage class of (5KV) (15KV) as indicated on the drawings.

Current limiting fuses with a short circuit interrupting rating of 50,000 amperes RMS symmetrical shall be supplied fixed mounted on the load side of each switch pole. The fuse continuous current rating shall be in accordance with the manufacturer's recommendation to adequately protect the transformer from damaging overloads. Fuses shall be of the non-indicating type removable from the front without special tools.

Access to fuses while energized shall be positively prevented through a mechanical interlock system which keeps the section front door locked closed when the switch is in the closed position.

Any internal parts that remain energized with the switch open shall be guarded by a fixed internal safety barrier to prevent inadvertent contact by operating or maintenance personnel with the door open. Interphase insulating barriers shall be provided, as needed for the system voltage class, to isolate switch and fuse poles from each other and from grounded metal.

The switch operating handle shall be (removable and stored out of sight in the unit) (fixed mounted and hidden behind a hinged cover) when not in use.

Means shall be provided to padlock the switch in the open or closed position.

Transformer Section
A three phase, 60 Hz, ventilated dry type transformer shall be supplied as part of the unitized assembly. The insulation system shall be based on 220°C insulating materials providing a transformer temperature rating of 150°C rise above a 40°C maximum ambient. The KVA, primary and secondary voltage ratings shall be as shown on the drawings. Primary taps shall consist of 2 - 2½% above normal and 2 - 2½% below normal voltage. The tap leads shall be connected to three single phase tap switches so that taps can be changed from the front without removing covers or unbolting connections. A mechanical interlock system shall prevent access to the tap switches with the primary energized. The transformer shall be rated for the KVA shown on the drawings.

Low Voltage Section
The low voltage distribution section shall contain (molded case circuit breakers arranged in group mounted construction) (outgoing low voltage feeder cables to remote distribution equipment). The quantities and frame/trip sizes shall be as scheduled on the drawings. Molded case breakers used in the assembly shall be thermal-magnetic type for frames below 600 amperes and solid state trip for frame sizes 600 amperes and above. A secondary main breaker sized per the drawings shall be installed in the low voltage group mounted assembly. All breakers shall be bolt-on type.

Operating handles shall face the front of the unitized equipment and the complete group mounted assembly shall be front accessible for installation and maintenance of outgoing cables. Equal conduit space shall be provided for cables exiting the top or bottom of the section. Outgoing cable shall be confined to front accessible gutters where they do not interfere with the free flow of cooling air.

Circuit breakers and all low voltage bus bar and connections shall have short circuit ratings compatible with the maximum available transformer short circuit current.

Instruments and selector switches detailed on the drawings shall be supplied in semi-flush mountings on the front panel of the unit.

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