ADVANCED POWER TECHNOLOGIES

2.4kV-15kV APT Front Access Ultra-Compact Switchgear

APT VIEW ENABLED

FAC-Series
Metal Enclosed Switchgear
Solutions Brochure

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SAFE SMART SERVICEABLE SWITCHGEAR & ENGINEERED POWER SYSTEM SOLUTIONS

MADE IN THE USA

ALN: 541 Rev. 04

Applications – Why This Switchgear?

The safest, most compact air insulated SF6-free Medium Voltage Switchgear on the market

Figure 1: Switchgear Basic Overview of Typical Section*

2.4kV-15kV Ultra-Compact Switchgear

- FAC-Series Switchgear can be used in Critical Power Systems for Utility and Generator Paralleling, or Open/Closed Transition Automatic Transfer Switchgear Applications:
  - **Utilities**
    - Electric Supply Substations
    - Electric Substation Backup
    - Water Treatment Plants
    - Wastewater Treatment Plants
  - **Educational & Healthcare Institutions**
    - University Campuses
    - Hospitals – Medical Centers
    - Medical Clinics
  - **Government**
    - Federal, State, & Local Buildings
    - US Army & Navy Military Bases
  - **Manufacturing & Industrial**
    - Textile Plants
    - Stamping Plants
    - Recycling Plants
  - **Technology**
    - Data Centers
  - **Transit**
    - Airports
  - **Renewable Energy Collection & Control**
    - Solar
    - Wind
    - Geothermal
    - Biogas
    - Hydropower

APT FAC-Series Construction

Figure 2: APT FAC-Series Front Access Ultra Compact Vacuum Circuit Breaker External Construction NEMA 3R*

Figure 3: Optional 24VDC Control Power Batteries & Rack for Optional Remote Indoor Mounting for Convenience of Maintenance Keep the Controls On-line Even if the Power is out! *

Figure 4: Up to 15kV Maximum Vacuum Circuit Breaker*

2.4kV-15kV Ultra-Compact Switchgear

- Ultra-Compact Automated Switchgear for the High Demands of Tomorrow!
- Space saving Front Access Only design, can be placed against the back wall.
- Smallest footprint 15kV air insulated switchgear on the market, each section is only ~38.5" deep and 26" wide.
- Increased Operator Safety:
  - Remote controllable design
  - Completely metal enclosed dead front
  - Provision for connection of field grounding cables
  - Inline visible air-disconnect switch, pad-lockable in open and/or closed position, to ensure personnel safety during power system service, maintenance, and repairs.
  - Removable metal panel for viewing blades position of the visible disconnect air insulated switch (through Lexan protected viewing window)
- Ultra-Compact, easy to maintain, & environmentally friendly design:
  - 100% air insulated, no SF6 gas used.
- Complete front access to all the components, bus, and bolted joints.
- Modular, slide-out design of the major power switching components to minimize the down time, should component replacement or repair be needed.
- Lower cost of installation: Insulating barriers provided between the phases, no need to tape or boot field cable terminations.
- Enclosure Environment Rating Options:
  - Mild Carbon Steel Standard
  - Indoor Applications
    - (1S) – NEMA 1 - Front Sheets
    - (1D) – NEMA 1 - Front Doors
  - Outdoor Non-Walk-In
    - (3R) – NEMA 3R
    - (RA) – NEMA 3RX (5052 Aluminum)
    - (R4) – NEMA 3RX (304SS)
    - (R6) – NEMA 3RX (316SS)
  - Integrated onto APT PwrSkid Outdoor Non-Walk-In Switchgear Skid
- Integrated into APT PwrContainer ISO Container Based Outdoor Walk-In Switchgear Enclosure Module

Construction Details & Features

Figure 5: 5kV ATS Line-up*

Figure 7: Optional Bus PT Drawer*

Figure 8: Close-up of Main Bus Compartment*

Figure 11: 5kV ATS Typical Generator Section Configuration*

Figure 9: 15kV Max Vacuum Circuit Breaker over Vacuum Circuit*

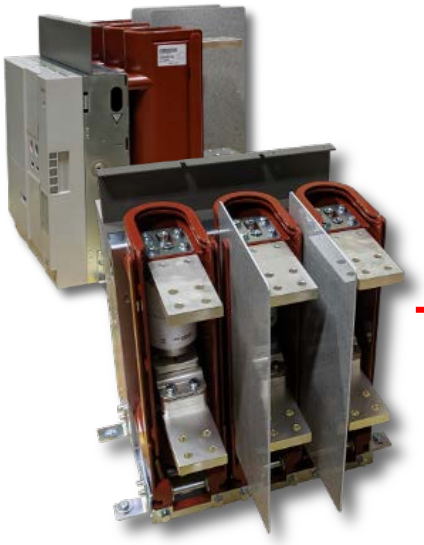


Figure 6: Rear Vacuum interrupters*

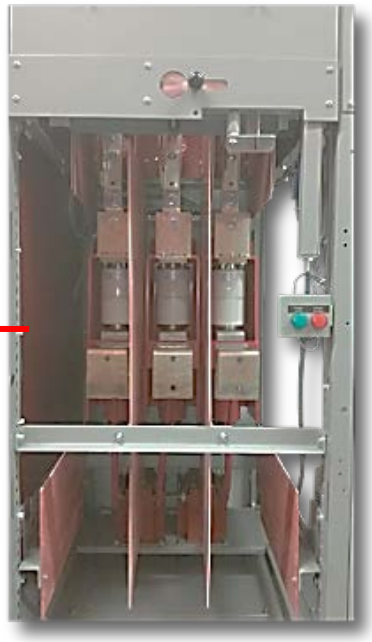


Figure 10: Close-up of Vacuum Interrupters from the front of the section*

APT Paralleling System Modules

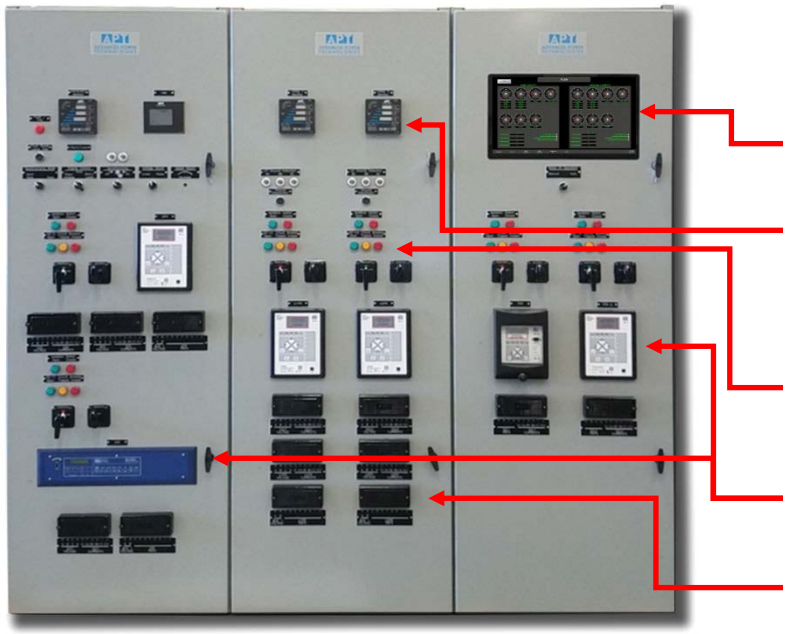


Figure 12: Stand-alone Fully Isolated Master Control Panel (MCP) built with APT Control System Modules: UI, ATC, MG

Figure 13: UP Master Control System with Manual Generator Operation Controls

Multi-source Paralleling & Transfer Controls

- (GP) – APT ACM Generator Paralleling – requires one per generator:
  - Automatic generator paralleling control for each generator, configured to synchronize, bring multiple generators on-line, and service the load.
  - Expandable system architecture allows for any number of generators in the system.
- (A2) – AdAPTor 2 Generator Only Paralleling Control Module – maximum one per two generators:
  - Automatic generator paralleling controls for use with synchronizing two generators in a non-expandable, cost effective system.
- (N1) – APT N+1 Redundant Generator Transfer Control – requires one per switchgear:
  - Control for systems with back-up generator(s) to the back-up generator(s) to provide facilities with levels of redundancy and protect against back-up generator failure.
- (LDC) – APT Load Demand Control – maximum one per switchgear:
  - Manually initiated automatic sequence to avoid extended operation of generators at light load after system has stabilized in emergency operation.
- (IM) – APT Island Mode Control – maximum one per switchgear:
  - Allows safe system operation in isolation from the local electricity distribution network
- (UP) – APT Utility Paralleling (Base Load) – requires one per utility source:
  - Integrated utility grade interconnection protection & control as required to meet ANSI/IEEE 1547 standard with source paralleling controls to parallel a utility source with other utility feeds or generator sources.
  - Includes APT Generator Base Load - Paralleled generator set(s) soft load to a desired constant load level against utility.
- (UI) – APT Utility Intertie – requires one per utility:
  - Stand-alone utility grade interconnection protection & control as required to meet ANSI/IEEE 1547 standard without paralleling or transfer controls.

APT Transfer Control System Modules

Figure 14: ATC & SL (selectable) Control System Local Operator Interface*

Figure 15: Control System Local Operator Interface with Premium Control Unit*

Multi-source Open & Closed Transition Transfer Control Modules

- (PS) – APT Peak Shaving (Base Load) – maximum one per switchgear:
  - Controls and adjusts the generator load levels to limit the amount of energy purchased from the utility during peak demand hours.
- (IE) – APT Import/Export Control (add-on to UP/PS) – maximum one per switchgear:
  - Maintains constant utility contribution to a site load by monitoring the utility contribution and trimming generator set load levels up and down as site loads change.
  - In Import Mode, generator kW remains constant while the utility kW loading follows load kW fluctuations
  - In Export Mode, utility kW remains constant while the generator kW loading follows load kW fluctuations
- (ATO) – APT Automatic Standby Open Transfer Control Module – maximum one per switchgear:
  - This module transfers power to the generator in a “break-before-make” fashion. When test/transfer mode is turned off, power transfer from generator back to utility is also “break-before-make.” This operation produces two brief power outages – one outage per transfer.
  - Upon sensing of the utility failure (utility voltage is not within undervoltage setpoint) the Time Delay Engine Start timer shall start timing. If utility failure condition remains upon expiration of the Time Delay Engine Start timer the generator set shall be automatically started and brought up to speed and voltage. At that time utility circuit breaker shall open and generator circuit breaker shall close (after adjustable time delay neutral). At this time the generator is supplying power to the site load. Upon sensing of utility return (utility voltage is within set undervoltage tolerance) the Time Delay Emergency to Normal timer shall start timing. If utility power remains healthy (utility voltage is within set undervoltage tolerance) upon expiration of the Time Delay Emergency to Normal timer the generator circuit breaker shall open and the utility circuit breaker shall close (after adjustable time delay neutral). At this time the generator set shall be put in the cooldown mode of operation.
  - Time Delay Neutral shall determine the minimum time period the load will be deenergized before the load is energized from the alternative source (normal or emergency).
  - If the generator set should fail (generator voltage is not within undervoltage setpoint) while Time Delay Emergency to Normal timer is timing, the Time Delay Emergency to Normal timer shall be bypassed, generator circuit breaker shall open and the utility circuit breaker shall close (after adjustable time delay neutral).
  - Operation of the overcurrent protection shall trip generator utility circuit breakers and disable closing of both circuit breakers until manually reset by placing the control switch in Off/Reset position.

*Due to continued product improvement, products delivered may differ from what is pictured.
*Optional Equipment Features Are Often Shown in Most Figures.
*Option Availability Subject to Product Series.

APT Optional Control System Modules

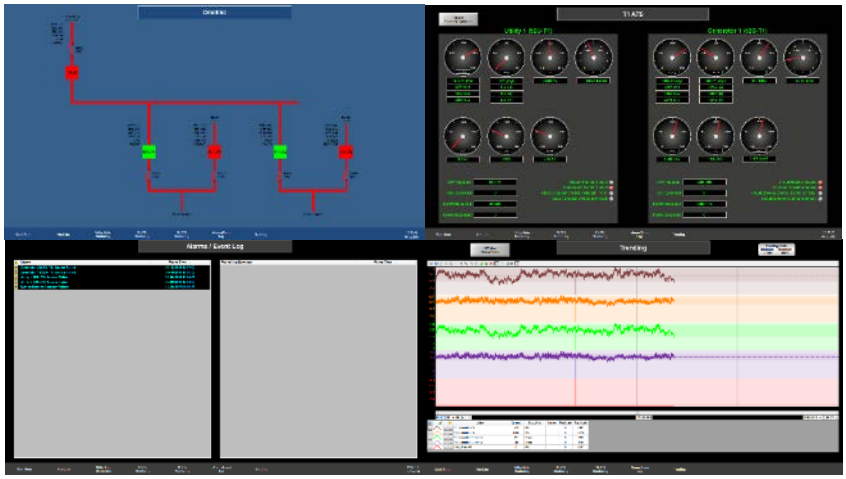
Figure 16: ATC, SL, IM, IE Control System Modules in Master Control Panel*

Figure 17: PS Control System Module in Master Control Panel*

Generators, Utilities, Renewables Source Control

- (ATC) – APT Automatic Standby Closed Transfer Control Module – maximum one per switchgear:
  - This mode provides a method of testing the back-up system without ever producing a power outage. Power is transferred from utility to generator in a "make-before-break" fashion by utilizing active generator synchronizing. When test/transfer mode is turned off, power is transferred back from generator to utility again using "make-before-break." This mode can also be used as an effective means of "peak shaving" facility loads to reduce utility bills.
  - This mode can be also initiated remotely by a utility RTU of facility energy control system.
  - If utility failure condition remains upon expiration of the Time Delay Engine Start timer the generator set shall be automatically started and brought up to speed and voltage. At that time utility circuit breaker shall be automatically open and generator circuit breaker shall close (after adjustable time delay). At this time the generator is supplying power to the site load.
  - Upon sensing of utility return (utility voltage and frequency are within set tolerances) the Time Delay Emergency to Normal timer shall start timing. If utility power remains healthy (utility voltage and frequency are within set tolerances) upon expiration of the Time Delay Emergency to Normal timer the transition of the load to the utility shall begin.
  - The generator shall be synchronized with the utility source and when in synchronism (as determined by the synchronizing check relay), close the utility circuit breaker. At this time the generator breaker shall be tripped immediately.
  - At this time the genset shall be put in the cooldown mode of operation.
  - The utility under/over voltage and under/over frequency setpoints, all the automatic standby operation timers, unloading rate and unload trip setpoints shall be adjustable from the operator interface panel mounted on the control panel door.
- (AR) – APT Automatic Return to Normal – maximum one per switchgear:
  - Fully automated transfer back to the primary source, upon sensing a healthy primary source, without operator initiation.

APT Optional Control System Modules



In-House Designed & Built SCADA Controls with Electrical Interlocking Systems

Figure 18: APTView SCADA HMI with System One-line (top left), Source Metering Data (top right), Event Log (bottom left), Power Usage Time Adjustable Trend Chart (bottom left)*

Generators, Utilities, Renewables Source Control

- (SL1) – APT Automatic Soft-loading/Unloading – maximum one per switchgear:
  - Upon receipt of an Isolate signal initiated locally by the operator or remotely by customer SCADA or DCS system (via closure of a dry contact or MODBUS TCP/IP), the switchgear shall verify that utility phase voltages and frequency are within acceptable tolerances and issue a start signal to the generator set. At that time, generator set's speed and voltage shall be controlled by the switchgear.
  - The generator set's voltage shall be automatically matched with the utility bus and the genset shall be automatically synchronized with the utility under the supervision of the synchronizing check relay. When all the synchronizing conditions are met the synchronizing circuit breaker shall close. At that time, the generator set shall be gradually (soft) loaded to assume the entire site load (entire site load minus adjustable "zero power level" setpoint) and utility circuit breaker shall be tripped open. At this time the site load has been transferred to the generator power.
  - Upon receipt of an automatic stop signal initiated locally by the operator or remotely by customer SCADA or DCS system the generator shall be synchronized with the utility source and when in synchronism (as determined by the synchronizing check relay), close the utility circuit breaker. At this time soft unloading of the generator set shall begin. When the genset load is gradually reduced to the level of the unload trip setpoint the generator synchronizing breaker shall trip open and the genset shall be put in the cooldown mode of operation. At this time the site load has been transferred to the utility power.
  - Loading and unloading rates and "zero power level" setpoints shall be viewable and adjustable from the operator interface panel mounted on the control panel's front door.
- (MT) – APT Manual Transfer – maximum one per switchgear:
  - System operator executes a sequence of manual operational steps to actuate electrically or mechanically interlocked source disconnects, preventing inadvertent paralleling of sources.
- (NA) – APT Non-Automatic Operator Supervised Return to Normal – maximum one per switchgear:
  - Operator initiated automatic transfer back to the primary source after an automatic transfer sequence has occurred.

APT SCADA Control System Modules

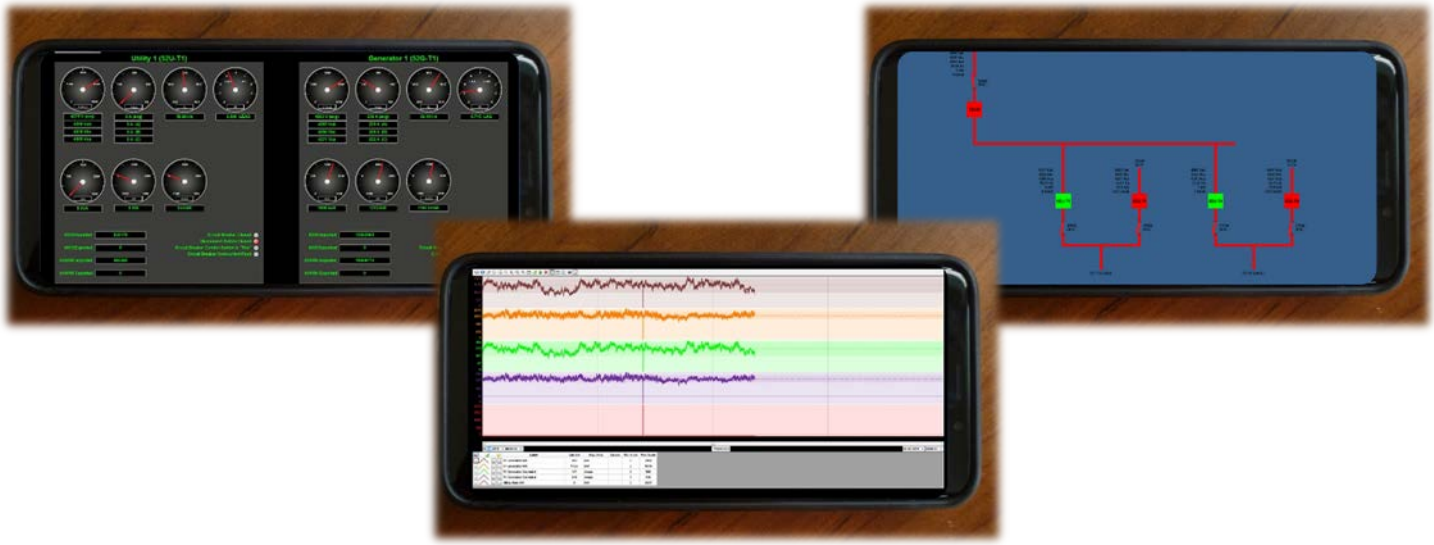


Figure 19: Mobile Version of APTView SCADA HMI with Source Metering Data (top left),
System One-line (top right),
Power Usage Time Adjustable Trend Chart (bottom)*

Generators, Utilities, Renewables Source Control

- (LS) – APT Load Shed Control – maximum one per switchgear:
  - Opens designated feeders during an outage and allows for only critical & life safety loads to be connected to the secondary source.
- (BI) – APT Maintenance Bypass/Isolation with Captive Key – maximum one per switchgear:
  - Manually bypass live power flow from source to load in the case that parts of the equipment are disabled/need to be isolated, de-energized for maintenance, testing, or repair.
- (MG) – Microgrid Interconnection – maximum one per switchgear:
  - Provides real time integrated control of power production/supply by renewable energy sources, natural gas / diesel generators, and energy storage for load power consumption for large scale (500kW – 50 MW) microgrid systems.
- (EX) – External (Paralleling and/or Transfer, Load Shed) By Others:
  - Controls facilitated by other manufacturers than APT are to be used in APT switchgear to meet the desired Sequence of Operations. (Customer to Specify Controls Manufacturer & Controls Location)
- (AV) – APTView Remote SCADA System:
  - Utilizes Human Machine Interface (HMI) systems to monitor and control both APT and 3rd party equipment via personal computers or your web/network-connected mobile device.
  - Emails can be sent in order to notify the user of any occurring alarm.
  - All system alarms and events are logged and date/time stamped.
  - Equipment operating parameters are periodically stored for future record/retrieval
  - Customer specified security features to limit access only to the people who need access for maximum security.

Dead Break APT MV Isolation Switch

Figure 20: Dead Break Isolation Switch*

Figure 24: Air Insulated Visible Disconnect*

Figure 21: Mechanical Interlock & Padlocking Provision (In Open or Closed Position) *

Figure 23: Operation of Isolation Switch to Create Visible Disconnect *

Figure 22: Access to The Racking Mechanism*

Main Bus

Figure 25: Power Source Cable Connection*

Figure 26: Optional Insulated Main Bus*

Figure 27: Load Take-Off Connection*

500A – 2000A Main Bus

- Main Bus Compartment:
  - Silver-plated copper
  - Optional insulation with bolted connections covered by insulating boots
  - Optional Glastic barriers mitigate the risk of fault propagation between major component compartments
- Symmetrical Bracing Capacity:
  - 2.4kV-15kV:
    25kA, 31.5kA, 40kA, 50kA, 100kA
- Optional Surge Arresters for main bus protection and individual incoming utilities/outgoing feeders
  - Distribution Class
  - Intermediate Class
  - Station Class

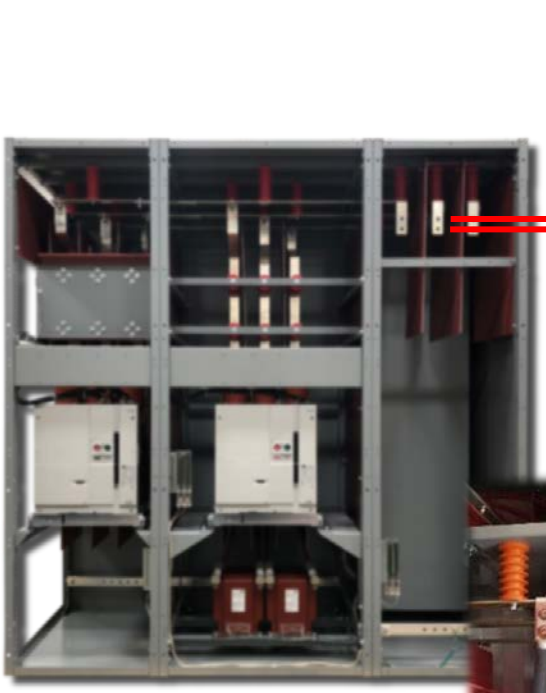


Figure 28: 15kV ATS With Panels Removed*

Figure 29: Load Take-Off Cable Connections*

Vacuum Circuit Breakers (VCBs)

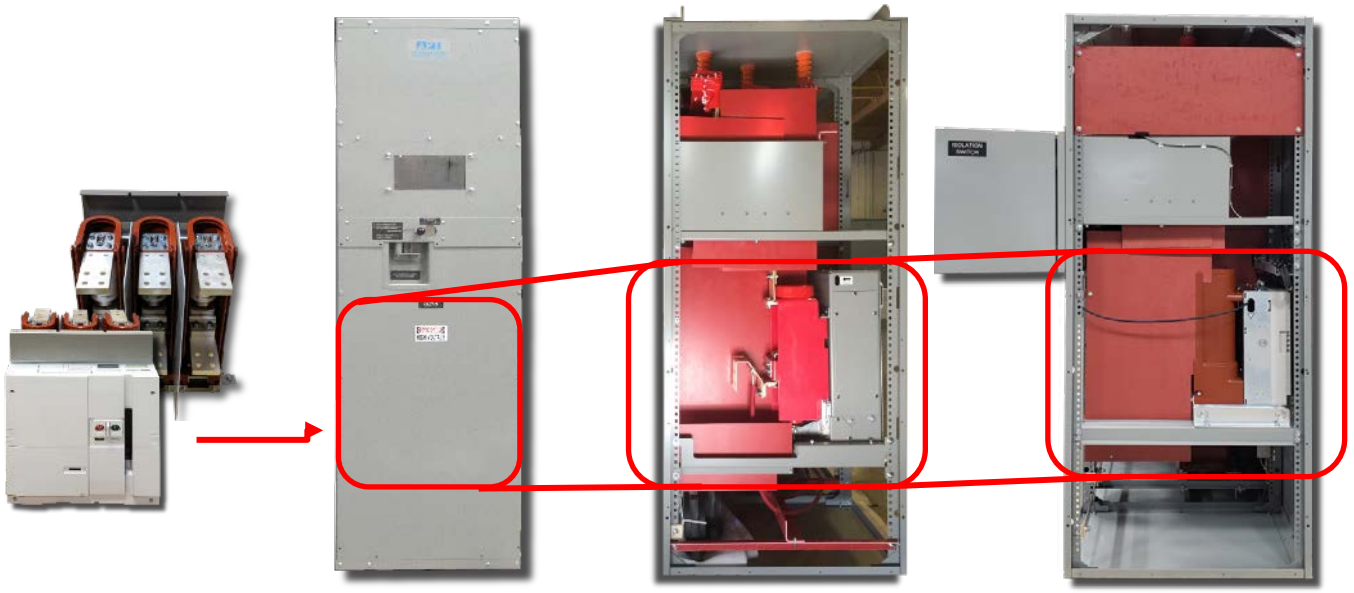


Figure 30: Front Access Compact Vacuum Circuit Breaker Compartment (Front)*

Figure 31: Side Views of Section NEMA 1 (Left) & NEMA 3R (Right)*

High Performance, Robust, Fixed Mount On-Rollers

- Fixed mounted vacuum circuit breakers installed on rollers
  - Rollers provided to simplify the field removal of the circuit breakers
- Integral manual charging handle
- Where visible disconnect is required, mechanical & electrical interlocks will trip and prevent circuit breaker closing when the inline visible disconnect isolation switch is in the transitional position or when its mechanism is exposed to insertion of the racking handle.
  - Breaker cannot be electrically or mechanically closed under these conditions for operator safety
- High-speed operation – complete fault clearing in less than 3 cycles
- Hermetically sealed vacuum interrupters protect contacts from corroding elements and contamination
- Vacuum interrupters with copper chrome contacts provide superior dielectric strength and very low
- Easy maintenance with contact wear indicator is provided on the vacuum interrupter moving stem
- Periodic visual inspection is recommended to verify that the contacts have not worn out
- Symmetrical Interrupting Capacity at 2.4kV-15kV voltage class:
  12kA, 25kA, 31.5kA, 40kA, 50kA

Available VCB Ratings

Figure 32: 5-15kV Max Vacuum Circuit Breakers*

Table 1: Standard Vacuum Circuit Breaker Ratings*												
			Voltage		Dielectric Ratings		Short Circuit Current					Mechanical Endurance
MVA Rating (reference only)	Actual MVA @ Maximum Rated Voltage	Rated Continuous Current	Max Rated Voltage	Range Factor	Power Frequency	Impulse 1.2 x 50µs	System Interrupting	Close and Latch Rating	Short-Time Current Rating	Short-Time Current Duration	Interrupting Time	No Load Mechanical Operations
		A RMS	kV RMS	K	kV RMS	kV peak	kA RMS	kA peak	kA RMS	s	Cycles	
250	330	1200	4.76	1.24	19	60	40	104	40	2	3	10,000
500	572	1200	8.25	1.24	36	95	40	104	40	2	3	10,000
750	1039	1200	15	1.24	36	95	40	104	40	2	3	10,000
200	207	1200	4.76		19	60	25	81.9	31.5	2	3	10,000
		1200	4.76		19	60	31.5	81.9	31.5	2	3	10,000
		2000	4.76		19	60	31.5	81.9	31.5	2	3	10,000
		1200	15		36	95	25	81.9	31.5	2	3	10,000
		1200	15		36	95	31.5	81.9	31.5	2	3	10,000
		2000	15		36	95	31.5	81.9	31.5	2	3	10,000

Optional PELT-FM CB Removal

Figure 33: Lift Truck with Vacuum Circuit Breaker*

PELT-FM Fixed Mounted on Rollers VCB Lift Truck

Figure 34

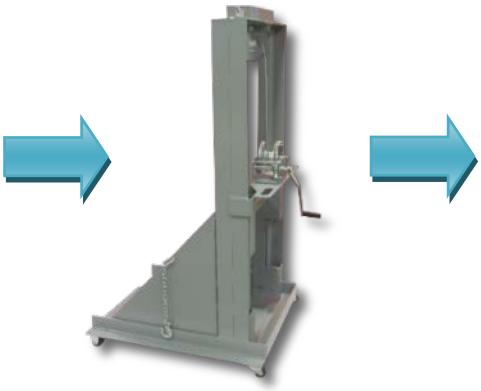


Figure 35

Figure 36

Figure 37

Figure 38

Protective Relaying & Switches

Figure 39: ANSI/IEEE 1547 Utility Intertie Protection Relays, Test Switches, Pistol Grip CB Switch & (86) Knob Grip Lockout Relay*

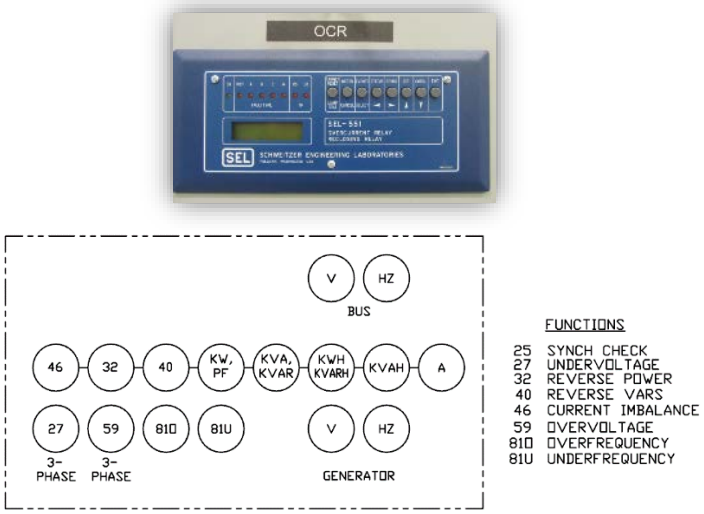


Figure 40: Phase & Ground Fault Time-Overcurrent with Instantaneous Protection Protective Relay & Functions*

Utility Intertie, Generator Syncing, Feeder Protection

- Applications:
  - Utility Intertie & Paralleling Protection
  - Advanced Generator Protection
  - Tie Protection
  - Transformer Protection
  - Feeder Protection
  - Various Differential Protection Schemes
- Typical Relaying functions*:
  - 25 – Synch Check
  - 32 – Reverse Power
  - 50/51 – Inst./Time Overcurrent
  - 50N/51N – Inst./Time Ground Overcurrent
  - 27/59 – Under/Overvoltage
  - 59N – Ground Overvoltage
  - 81U/81O – Under/Overfrequency
  - 40 – Loss of Excitation
  - 60 – Current Balance
  - 67 – Directional Overcurrent
  - 86 – (LO) Lock-Out Relay (Knob Grip)
  - 87 – Differential Protective Relay
  - 87B – Bus Differential
  - 87G – Generator Differential
- (PG)* – Pistol Grip CB Control Switches
  - Red & Green Target to Indicate Circuit Breaker Position Status
- (TS)* – Test Switches
  - Provide a safe, simple, fast and reliable method to isolate, test, and service installed equipment without disturbing the power system
  - Permits convenient isolation of relays, meters, and instrument transformers (PTs & CTs)
  - Allows for quick and easy multi-circuit testing by conventional test methods
- (TP)* – Test Plugs
  - Enables easier measurement, calibration, verification and maintenance of relays, meters, PTs, & CTs
  - Conveniently connects devices measuring the currents and voltages being applied to the relays, meters, PTs, & CTs without interrupting or short-circuiting the circuit

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*Option Availability Subject to Product Series.

Instrument Transformers – PTs, CTs

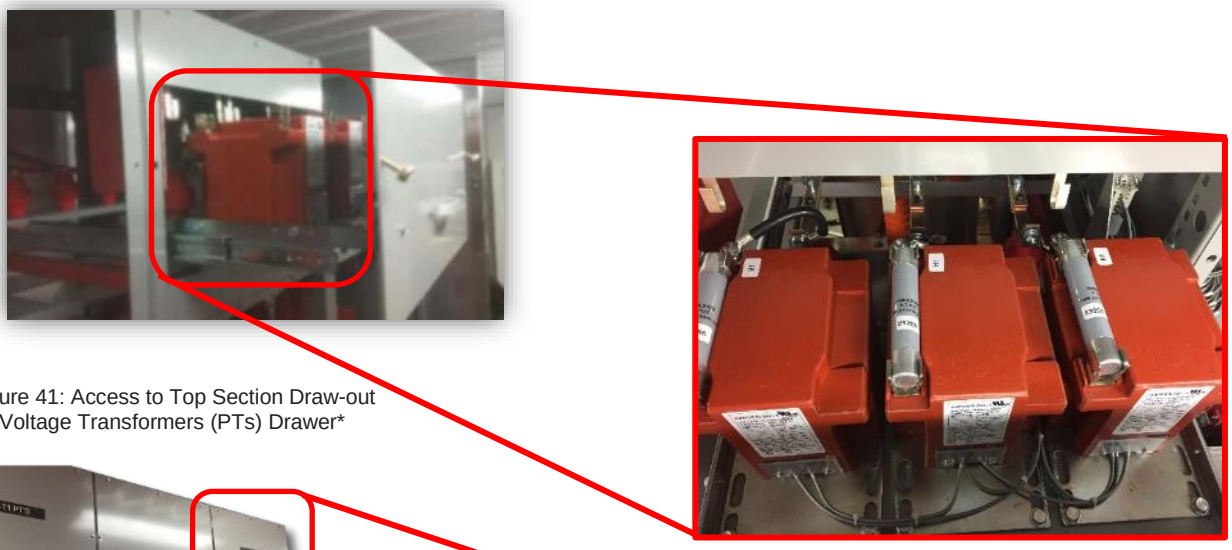


Figure 41: Access to Top Section Draw-out Voltage Transformers (PTs) Drawer*

Figure 43: 5kV - Top, 15kV – Bottom Drawer Mounted Voltage Transformers (PTs) & Access to Primary Fuses*

Figure 42: Auxiliary Drawer with Self-Aligning Contacts*

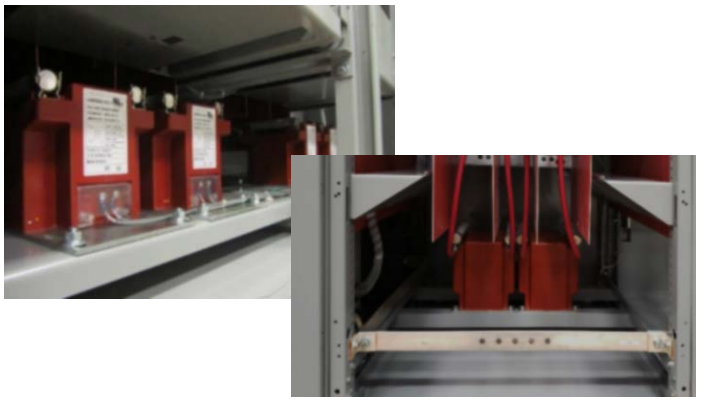


Figure 44: 5kV (Left) 15kV (Right) Fixed mounted Voltage Transformers (PTs)*

Voltage Transformers (PTs) & Current Transformers (CTs)

- Auxiliary Drawers
  - Accommodate Fuses, Control Power Transformers or Voltage Transformers
  - Secondary Self-aligning Contacts accommodate up to six independent circuits
  - For operator safety these devices are automatically grounded during movement to disconnected position
- PTs Available in Wye or Open Delta Voltage Sensing Configurations
- CTs for Relaying/Power Sensing, Differential, or Ground Fault sensing available in standard or Revenue Grade Metering Accuracy

Figure 45: Relaying and metering Current Transformers (CTs)*

Switchgear Accessories & Options

Customize Your Switchgear with These Premium Options

Table 2: Switchgear Accessories & Options*	
(LT) – Circuit Breaker Lift Truck	(GL) – Both Generator & Load Bank (Dual sets of Cam-loks)
(BM) – Equipment Mounted to X" Base	(HH) – Humidistat
(CC) – Harsh Environment Conformal Coating	(HR) – Generator Block Heater Receptacle
(GS) – Grounding Studs	(IR) – Infrared Windows
(GT) – Ground & Test Device (Manual or Electric)	(KK) – Kirk Key Interlocking
(LF) – PELT-FAC Circuit Breaker Lift Truck	(LK) – Cable Lead Kit
(LO) – Lock Out Relay (86)	(MB) – Industrial Vinyl Mimic Bus
(MC) – MOC	(PA) – Remote ATS Position Annunciation
(PG) – Pistol Grip CB Control Handles	(PB) – Top Mounted Cable Pull Box
(SL) – Specified Indication Lights (XXmm, XXVDC)	(PL) – Phase Loss Relay
(SS) – SafeStop Circuit Breaker Guard	(PM) – Phase Rotation Meter
(TO) – TOC	(PR) – Phase Rotation Monitoring
(UR) – Undervoltage Release	(RD) – Hinged Rear Doors
(WM) – PELT-WM Premium Winch Circuit Breaker Lift Truck	(RP) – Redundant PLC
(1G) – 100% Ground	(RR) – Remote Racking Device
(4G) – 40% Ground	(SC) – Specified Color:
(AC) – Alternate Portable Generator Lug Connections	(SE) – Service Entrance
(AM) – APT Power Metering	(SM) – Specified Power Metering
(AR) – 120VAC Battery Charger/Convenience Receptacle	(SP) – Spare Parts
(AV) – APTView SCADA System	(SR) – Seismic Rated (By Calculations)
(BT) – Bus Duct Throat	(TB) – Generator Remote Start/Stop Terminal Blocks
(CI) – SCADA Connection Interface Terminal Blocks	(TC) – CB Test Cabinet
(CL) – Convenience Light	(TG) – Temporary Generator Only
(CP) - Customer Provided XXXX	(TI) – Modbus TCP/IP Interface
(DR) – Load Dump Receptacle/Terminal	(TL) – Temporary Load Bank Only
(EI) – Ethernet Interface	(TP) – Test Plugs
(EN) – Engraved Nameplates	(TS) – Test Switches
(FA) – Front Access Only	(VB) – Glastic Vertical Barriers Between Sections (Full Height)
(FI) – Fiber Interface	(XL) – Extra Large Enclosure for Conduit Entry/Exit

*Due to continued product improvement, products delivered may differ from what is pictured.
*Optional Equipment Features Are Often Shown in Most Figures.
*Option Availability Subject to Product Series.

Shipping Splits & Lifting Provisions

Figure 46: NEMA 1 Switchgear Line-Up with Individual Section Shipping Splits*

Figure 47: Ship Loose Switchgear Bus Splices for Contractor Installation During On-site Shipping Split Reassembly & Installation*

On-Site Installation Made Easy Is Standard!

- Ships as a completely assembled line-up for drop in place easy installation and little on-site assembly time
  - Connect your incoming/outgoing cables and field control wiring, test, and commission without all the additional labor of reassembling and interconnecting sections of switchgear
- Shipping Splits Available Upon Request
  - Gives the flexibility to bring switchgear through narrow hallways and doors
  - Bus Splice Pieces Shipped Loose for customer installation
- Maneuverability:
  - Option 1: Heavy Duty Lifting Angles allow for less time and errors in the field
  - Option 2: Fork Truck Pockets

Figure 48: Top Mounted, Removeable Heavy Duty Lifting Angles Allow for Crane Maneuvering*

PwrContainer Walk-In Switchgear

Figure 49: PwrContainer Outdoor Walk-In Medium Voltage Metal Enclosed Utility & Generator Automatic Paralleling & Transfer Switchgear Enclosure*

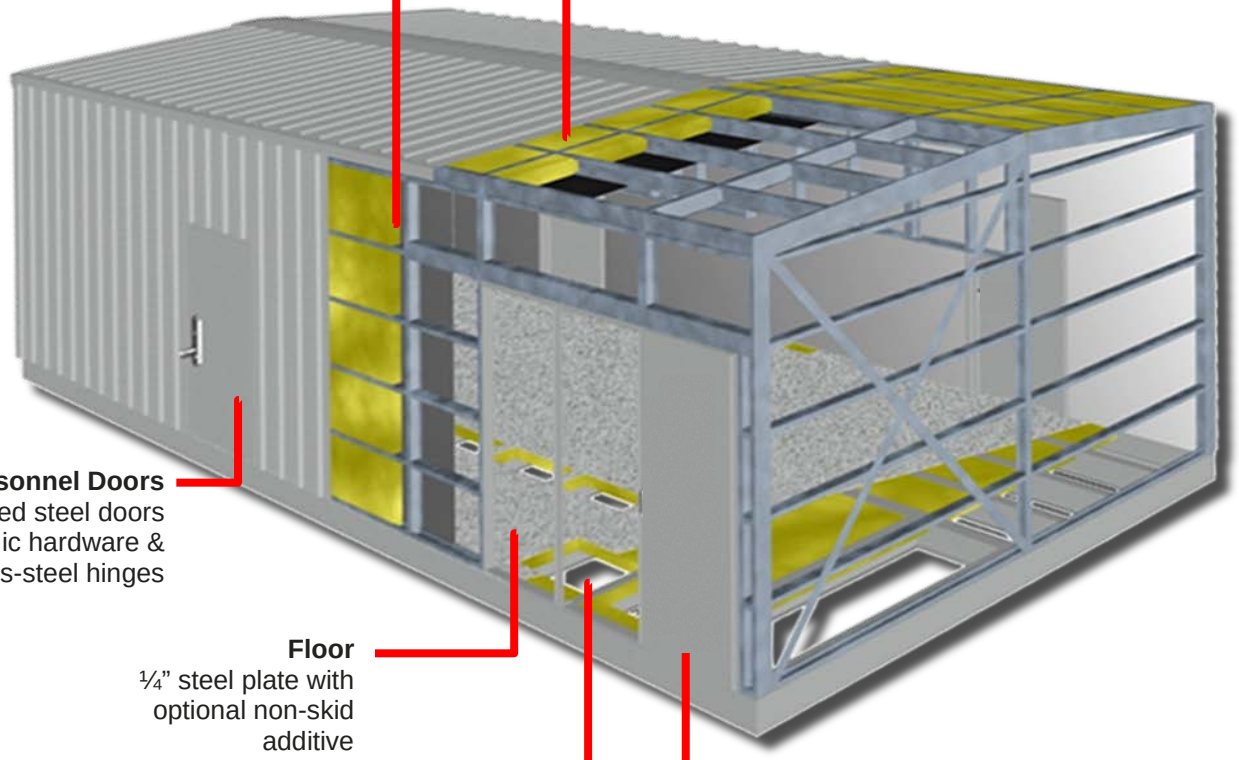
APT PwrContainer walk-in switchgear e-house offers a clean and safe work environment in an optional climate-controlled aisle

Figure 50: PwrContainer Inside Aisle of 30' Medium Voltage Utility & Generator Paralleling & Automatic Transfer Switchgear E-House with Isolated Master Control Panel*

Figure 51: PwrConatiner Relative Aisle Space (VCB withdrawn & in Aisleway) Includes Plenty of Space for Circuit Breaker Removal Devices*

Figure 52: PwrContainer Inside Temperature Controls with 24VDC Battery Rack' *

PwrContainer E-House Construction



Optional Walls & Roof Insulation
Walls & Roof insulated to customer requirements

Personnel Doors
Insulated steel doors with panic hardware & stainless-steel hinges

Floor
¼" steel plate with optional non-skid additive

Optional Base Cutout
Cutouts in base plate for cable access

Optional Rear Access Plates
Exterior Rear Hinged Doors to access equipment/cable

HVAC (not pictured)
Optional heating and/or cooling as customer specified

Figure 53: PwrContainer Construction Features Diagram*

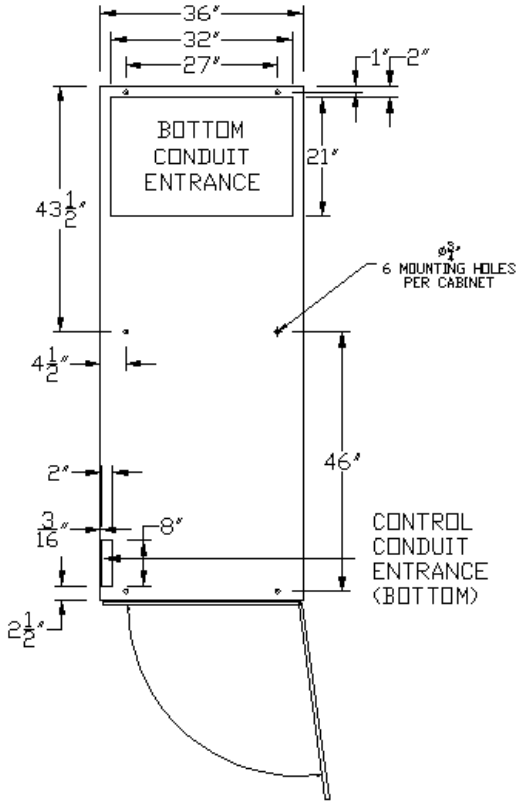
Base/Skid Mounted

Figure 54: PwrSkid Base/Skid Mounted Medium Voltage Metal-Clad Utility Intertie & Distribution Switchgear with Side Mounted 90° Turned Isolated Master Control Panel*

Outdoor Equipment Pad Mounted without Base

Figure 55: NEMA 3R Non-Walk-In Switchgear for Concrete Pad Mounting without Base/Skid*

Traditional Vs. Ultra-Compact Switchgear



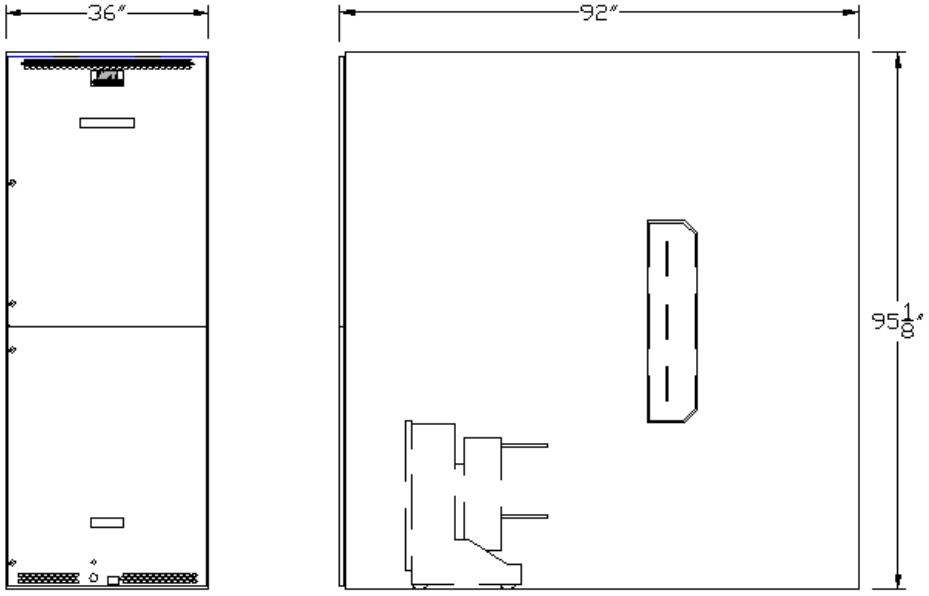
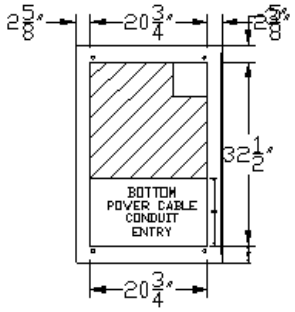


Figure 56: Traditional Switchgear Single Section Dimensions (rear access required)

Our traditional air insulated SF6-free Medium Voltage Switchgear utilizes drawout circuit breakers to provide visible disconnect. This gives the switchgear a larger, heavier, and bulkier footprint.

Our Front Access Compact air insulated, SF6-free utilizes state-of-the-art innovative switchgear design methods & technology, utilizes an air insulated isolation switch on the line side of the circuit breaker, and a clear Lexan viewing window to provide visible disconnect.



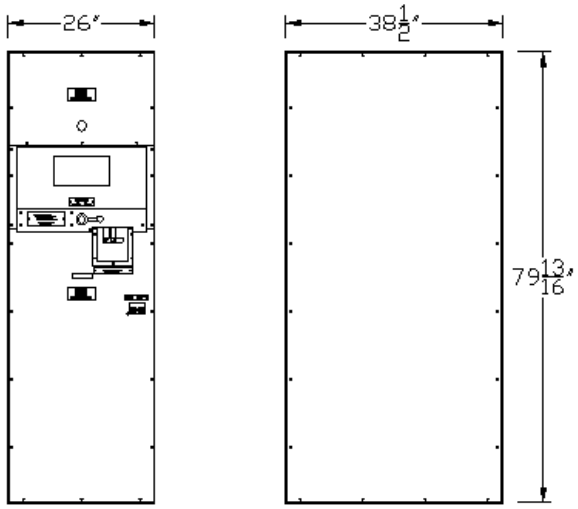


Figure 57: Ultra Compact Front Access Switchgear Single Section Dimensions (rear access is not required)

Front Access Compact NEMA 1

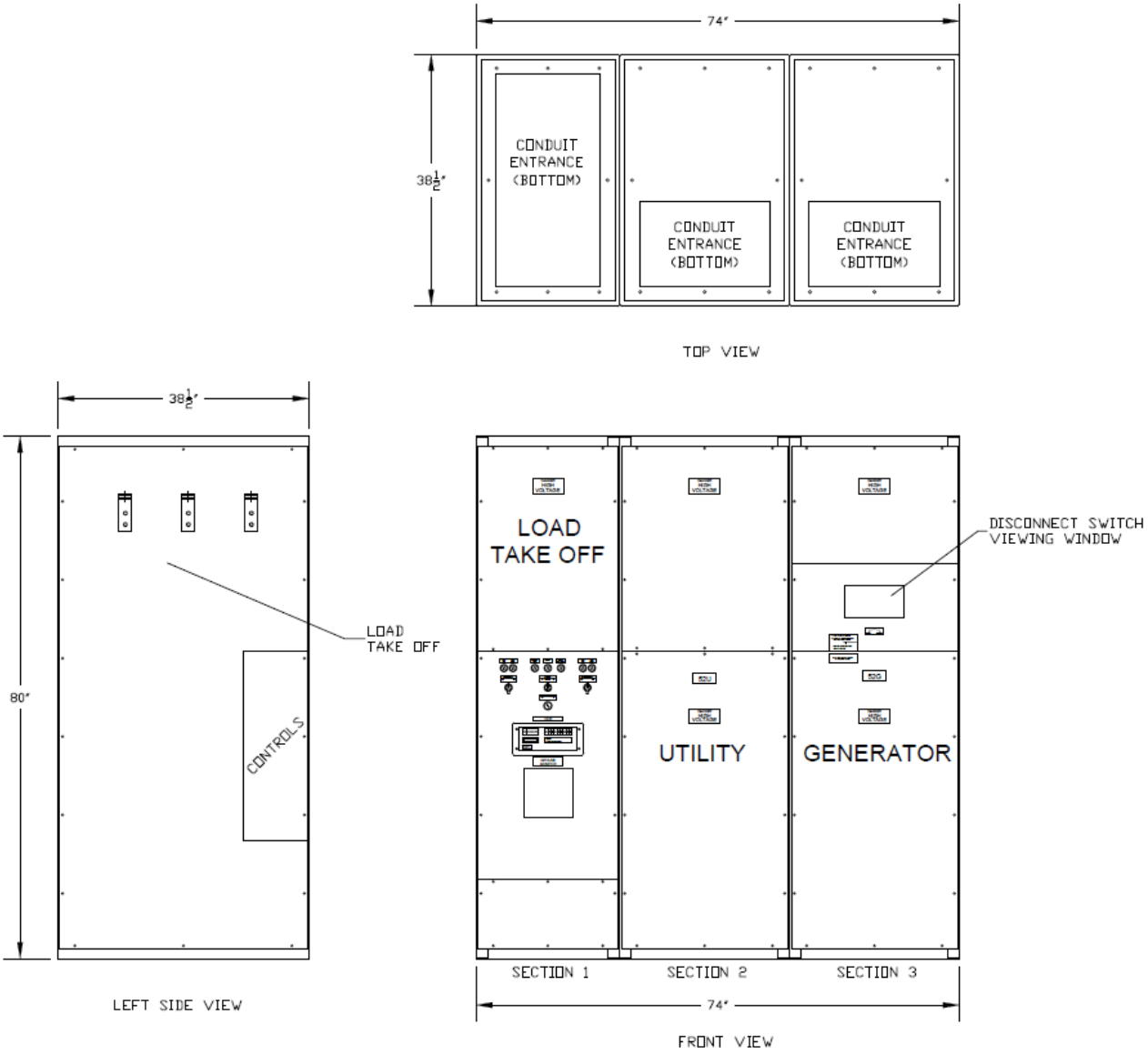


Figure 58: 5 kV Metal-Enclosed Switchgear Front, Side, & Top Views – Dimensions
Typical of NEMA 1 Section; NEMA 3R adds several inches to the Height & Depth*

Table 3: Standard Section Weights*	
Component	Weight Per
NEMA 1 Section (Less Breakers)	1800 lbs.
NEMA 3R Section (Less Breakers)	2700 lbs.
1200A Circuit Breaker	360 lbs.
2000A Circuit Breaker	410 lbs.
3000A Circuit Breaker	480 lbs.

*Due to continued product improvement, products delivered may differ from what is pictured.
*Optional Equipment Features Are Often Shown in Most Figures.
*Option Availability Subject to Product Series.

Front Access Compact NEMA 3R

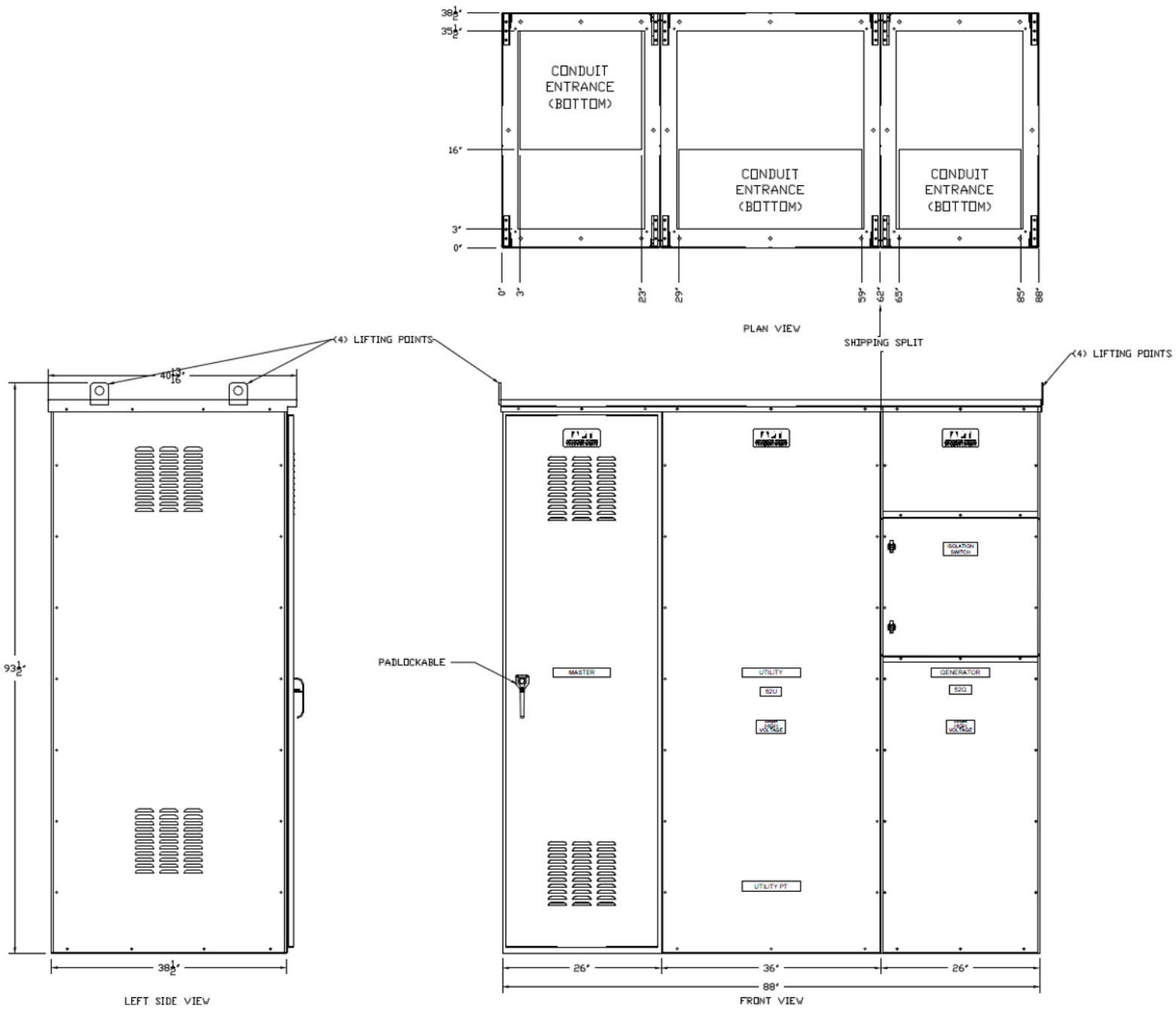


Figure 59: 5-15 kV Metal-Enclosed Switchgear Front, Side, & Top Views – Dimensions NEMA 3R*

*Due to continued product improvement, products delivered may differ from what is pictured.
*Optional Equipment Features Are Often Shown in Most Figures.
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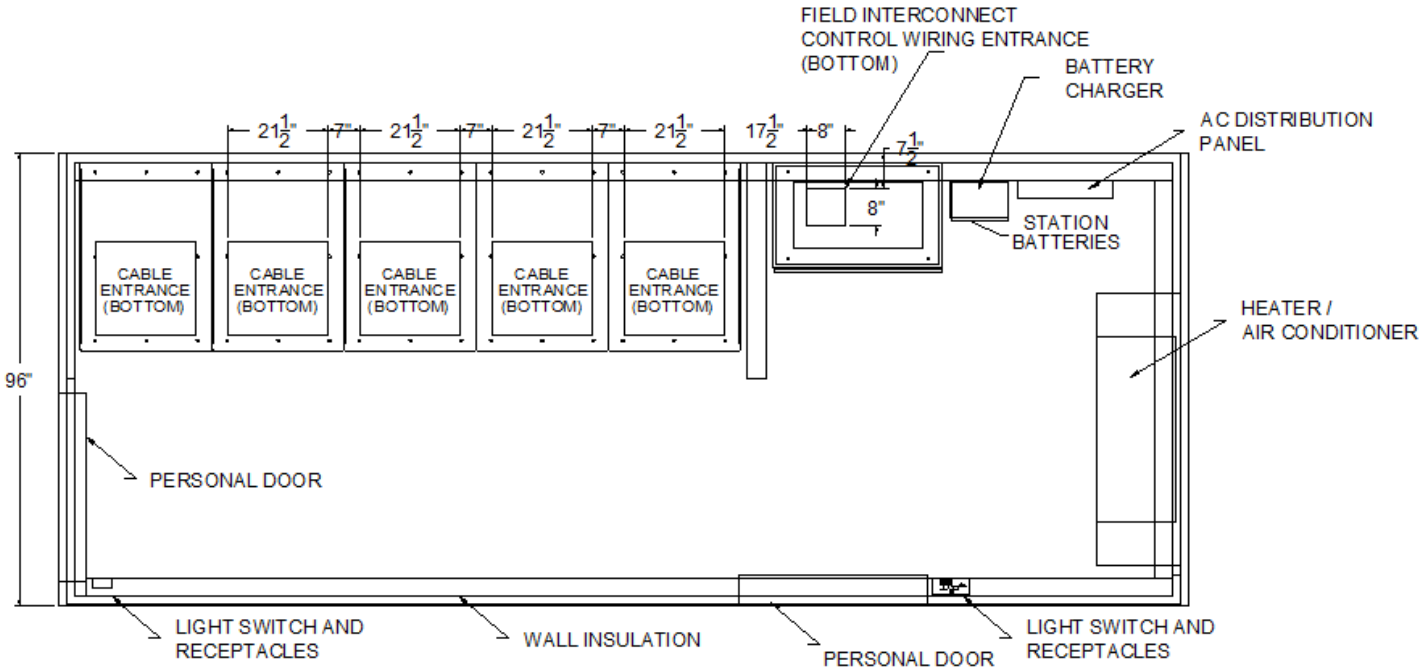
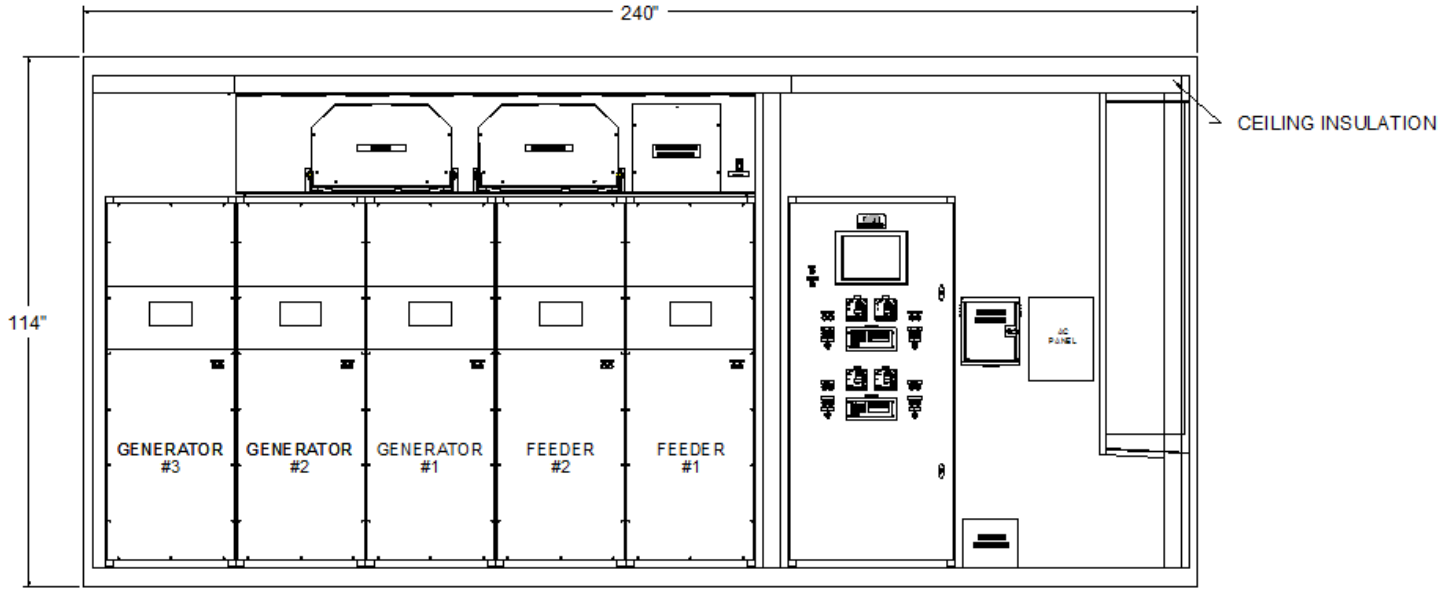
20’ Outdoor Walk-in Switchgear Module



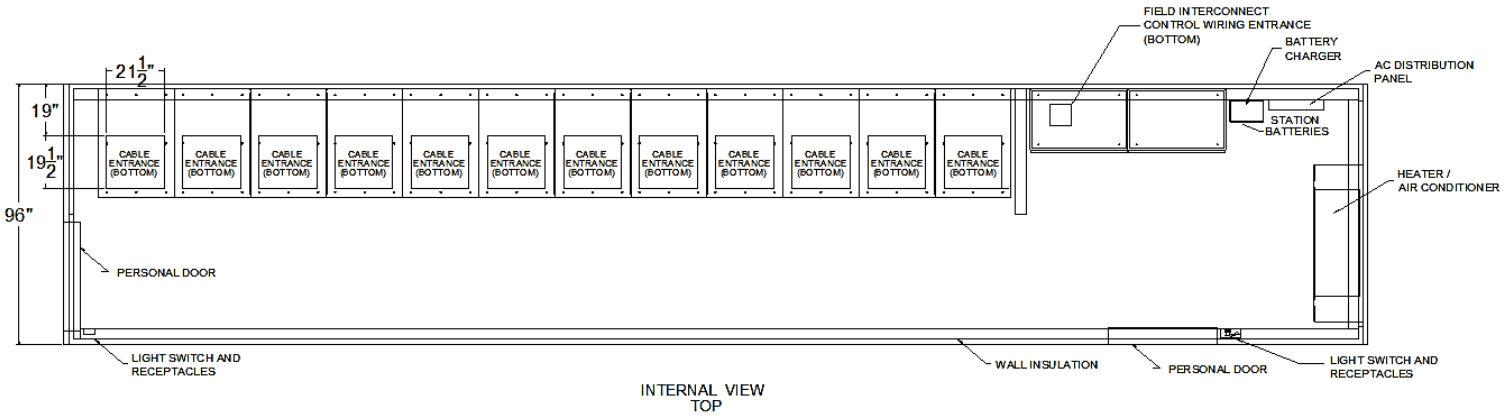
INTERNAL VIEW
TOP



INTERNAL VIEW
FRONT

Figure 60: 5-15 kV Metal-enclosed Switchgear Front, Side, & Top Views – Dimensions
Typical of NEMA 1 Section; NEMA 3R adds several inches to the Height & Depth*

40’ Outdoor Walk-in Switchgear Module



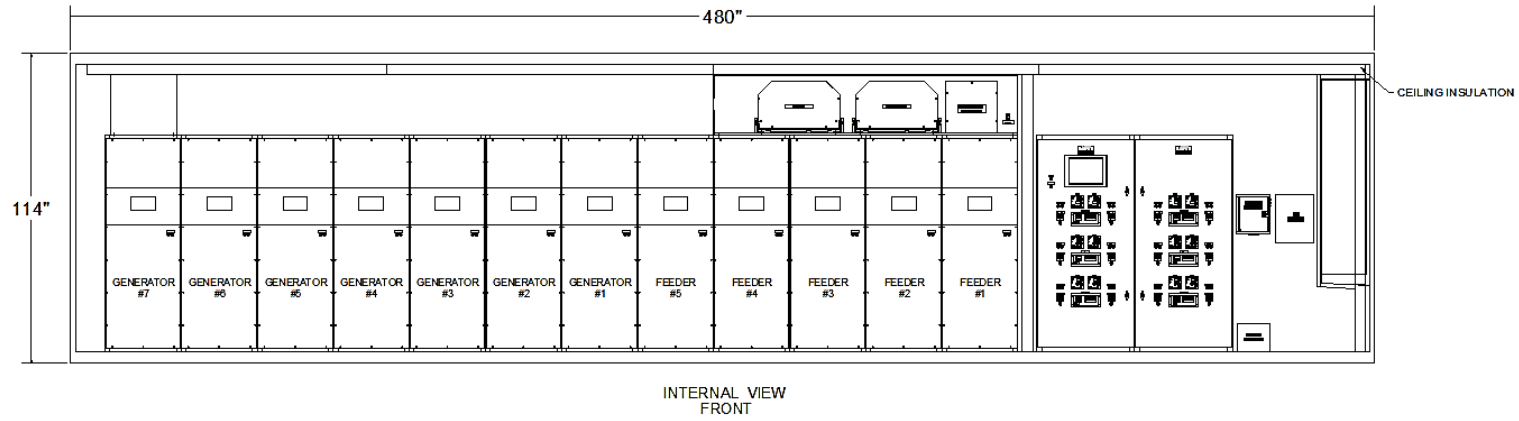


Figure 61: 5-15 kV Metal-enclosed Switchgear Front, Side, & Top Views – Dimensions
Typical of NEMA 1 Section; NEMA 3R adds several inches to the Height & Depth*

Application One-Line Diagrams

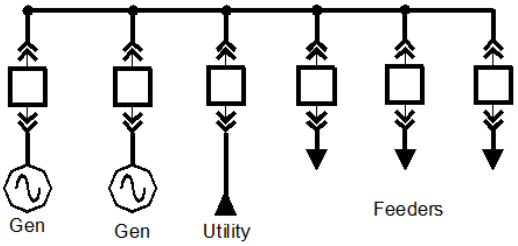


Figure 62: Utility & Two Generator Paralleling Switchgear with Distribution

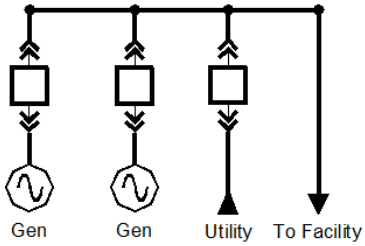


Figure 63: Utility & Two Generator Paralleling Switchgear with External Distribution

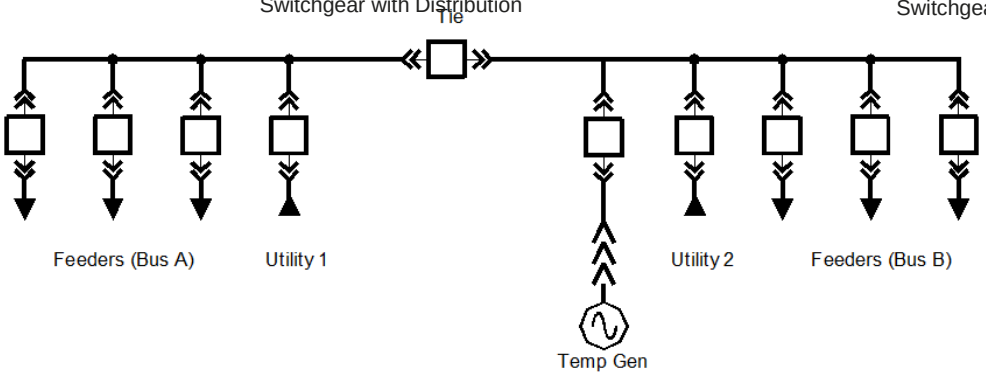


Figure 64: Two Utilities in Main-Tie-Main Switchgear with Optional Temporary Generator Quick Connection

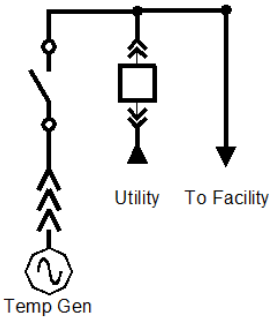


Figure 65: Utility & Temporary Generator Quick Connection Switchgear

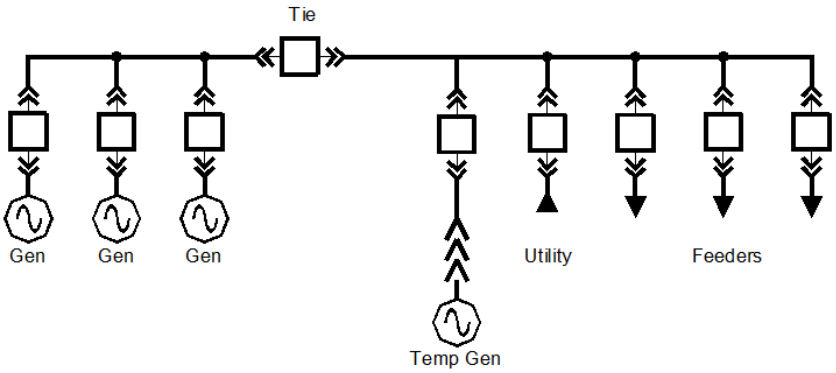


Figure 66: Utility & Emergency Generator Quick Connection with Multiple Generator Paralleling & Generator Bus Tie

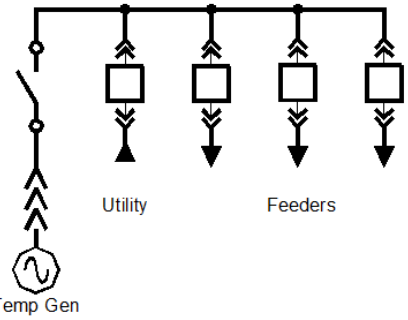


Figure 67 Utility & Emergency Generator Quick Connection with Distribution

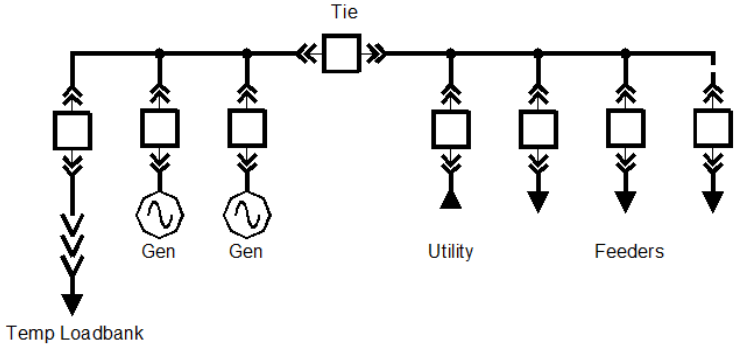


Figure 68: Utility with Multiple Generator Paralleling, Temporary Load Banking Capability & Generator Bus Tie

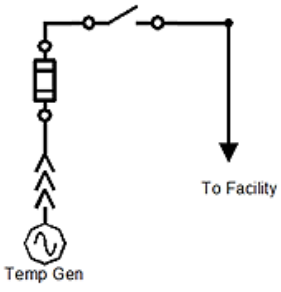


Figure 69: Medium Voltage Temporary Generator Quick Connection Switchgear

ATS Application One-Line Diagrams

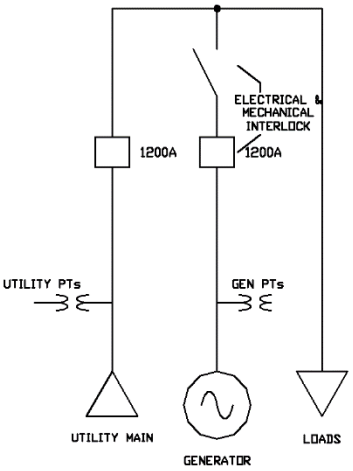


Figure 70: One Utility, One Generator Source Automatic Transfer Switchgear

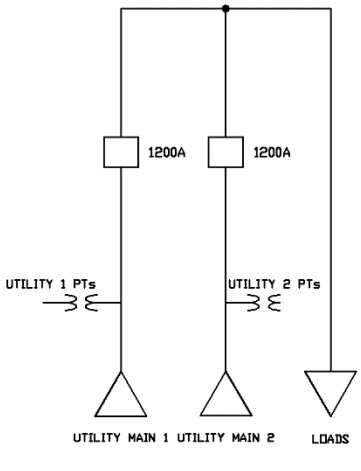


Figure 71: Two Utility Sources Automatic Transfer Switchgear

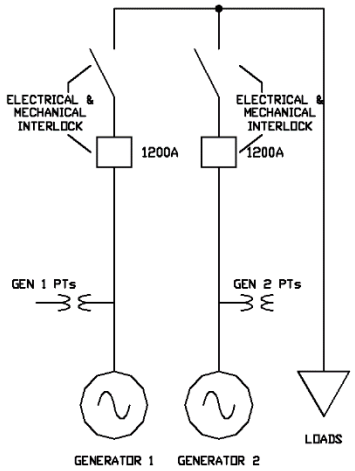


Figure 72: Two Generator Sources Automatic Transfer Switchgear

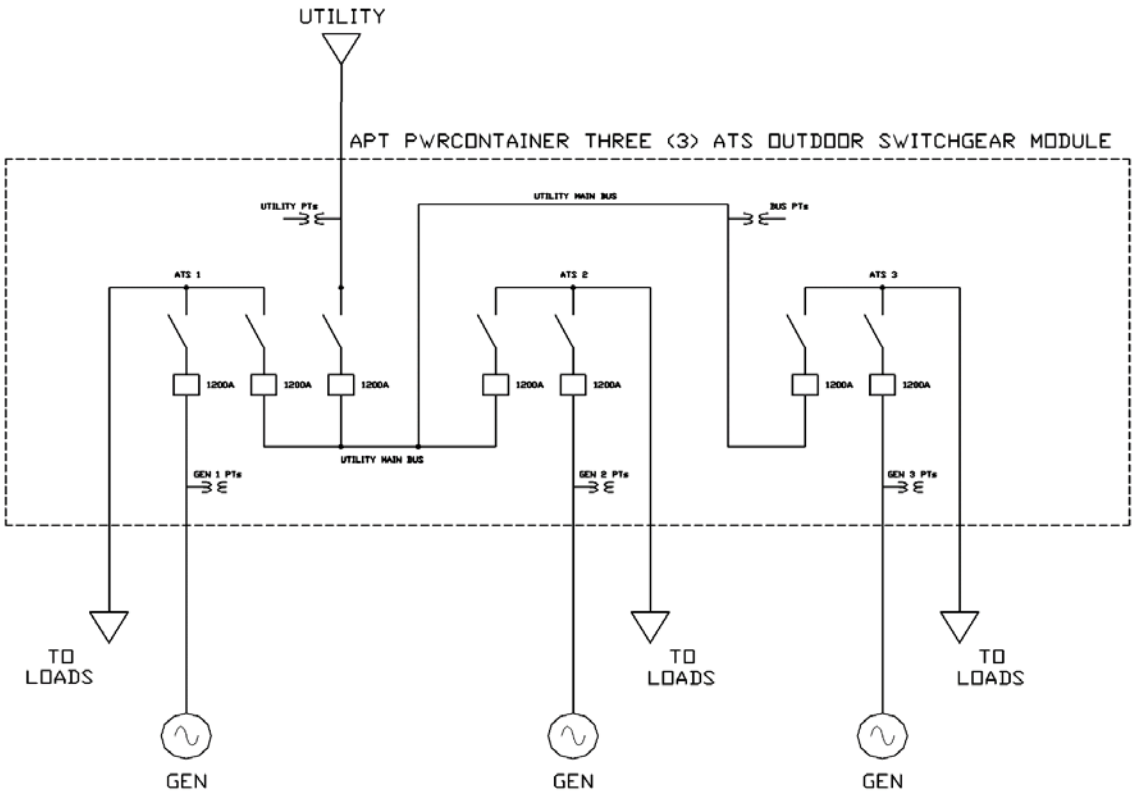


Figure 73: PwrContainer with Three (3) ATS Line-up

Part Number Builder – Coming Soon!

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*Option Availability Subject to Product Series.

About Advanced Power Technologies



Advanced Power Technologies (APT) is on the cutting edge of the latest engineered power system smart technologies, as it relates to microgrid & storage management, renewable & conventional energy source deployment, demand peak shaving, and facility back-up and co-generation power systems. Located in the central United States and headquartered in Lafayette, Indiana with solutions development engineers around the country, APT provides domestic and international products and services to industry leading companies from around the world. APT engineers have decades of power system experience from working with some of the largest companies in all industries. Over the last two decades, we have produced successful solutions for hundreds of large-scale electric power projects involving utility/generator paralleling, transfer, peak shaving, and distribution. We pride ourselves in providing electrical power systems that are engineered and custom built, utilizing state-of-the-art technologies to fit our customer's exact needs. The core of our business is low & medium voltage engineered power systems for a wide range of indoor & outdoor applications, such as:

- Utility(ies) and Generator(s) Paralleling/Transfer/Peak Shaving/Distribution Switchgear
- Microgrids, Microgrid Master Control Panels, SCADA systems
- Containerized Battery Energy Storage Systems (BESS)
- Photovoltaic (PV) Solar Power Collection/Distribution & Renewable Energy Storage Systems
- Low & High Resistance Grounding Systems, Grounding Systems for Photovoltaic Effective Grounding
- High Efficiency Combined Heat and Power Switchgear & Control Systems (CHP, Co-generation)
- Outdoor Walk-In Electrical Houses (E-Houses) & Skid-Mounted Switchgear
- Motor Control Centers & Motor Control Switchgear
- Automatic & Manual Load Transfer Switchgear
- Bypass/Isolation & Power Distribution Circuit Breaker Switchboards
- Generator/Loadbank Quick Connection Switchgear, Switchboards, & Tap Boxes
- Industrial Control Panels

Please see our product webpages on www.apt-power.com for product brochures and relevant information. Actual products may look different from images shown on the website and in brochures, based on actual specifications.
APT cares and understands that each power system is different. We will evaluate various solutions in order to develop the best solution for a site. APT focuses on our ability to a combine several traditional pieces of equipment/functionality into as little of a footprint possible. This saves on space, the cost of equipment, cost of installation, and accomplishes the most optimal/state-of-the-art design for your facilities. APT's desires to foster and grow a culture of continued open communication with each customer. Let APT be your source to provide fully engineered power system equipment solutions for the full customer facility on time, on or under budget, and in the smallest footprint possible. We are always available to assist customers and engineers representing customers in the development of complex power solutions for all facility types.