



Power Management Module²

30–300 kVA

Installation



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Safety

Safety Instructions

This manual contains important instructions for the Power Management Module² that must be followed during operation and maintenance of the equipment.



WARNING: Opening enclosures expose hazardous voltages. Always refer service to qualified personnel only.



WARNING: As standards, specifications, and designs are subject to change, please ask for confirmation of the information given in this publication.



Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at user's own expense.



WARNING: To reduce the risk of fire or electric shock, install in a controlled indoor environment free of conductive contaminants. This equipment is intended only for installations in a RESTRICTED ACCESS LOCATION.



WARNING: HIGH LEAKAGE CURRENT. Earth connection essential before connecting supply.

Certification Standards — Three Phase

- FCC Part 15, Subpart J, Class A.
- UL/cUL 60950 Standard for Safety of Information Technology Equipment.
- NFPA 70 – National Electrical Code.
- ISO 9001.

Product Safety

- A protection circuit breaker must be installed upstream and be easily accessible.

Special Precautions

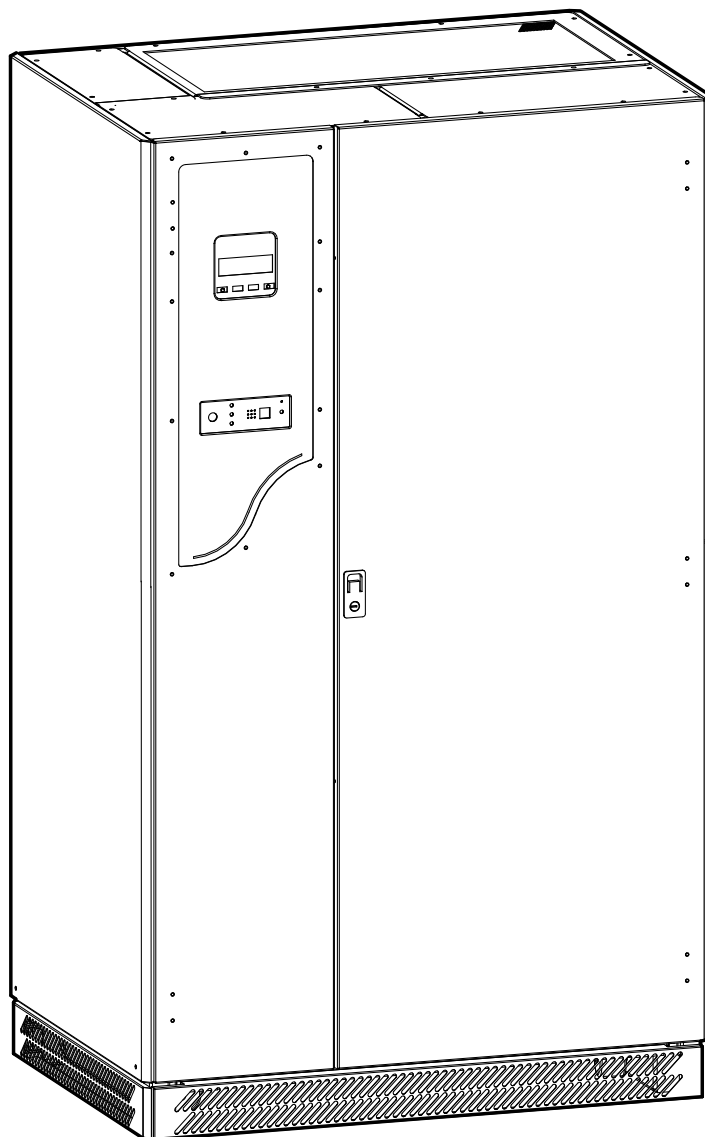
- The PMM connection instructions and operation described in the manual must be followed in the indicated order.
- Check that the indications on the rating nameplate correspond to your AC powered system and to the actual electrical consumption of all the equipment to be connected to the PMM².

System Description

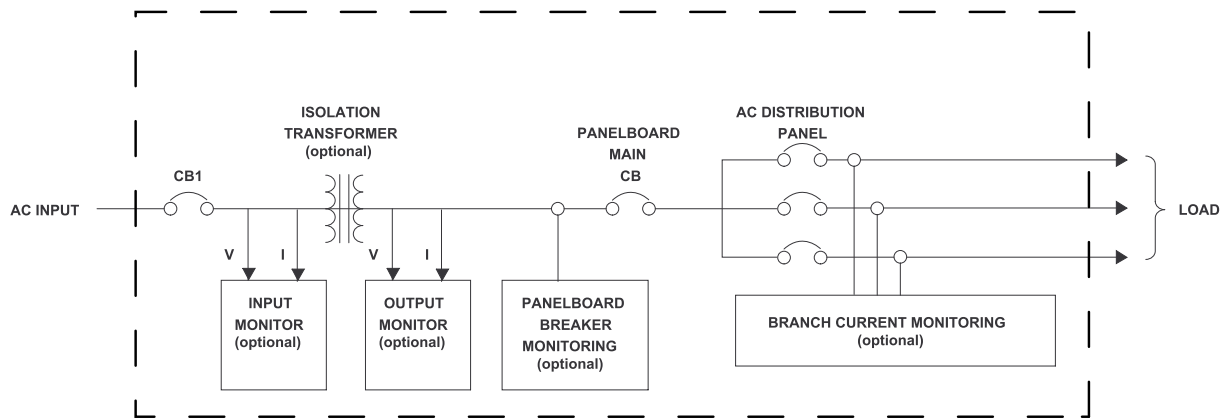
General Description

The PMM² is available in power ranges from 30 kVA to 300 kVA, with a wide range of models. For most applications, the PMM² is completely self-contained within a single enclosure. The system may include an optional meter, and up to six 42-pole distribution panelboards (for a total of 252 poles). Panelboards may be substituted by larger molded-case circuit breakers (up to four 225A amps maximum).

The PMM² is capable of serving as a power distribution center for most types of loads. The PMM² takes input power and distributes that power to load devices. The PMM² monitors the supplied power. Models with an isolation transformer electrically isolate the load.



Single Line Diagram



Options

Most options must be specified at the time of the original order for factory installation. Some options can be field installed; contact your APC certified service partner for further information.

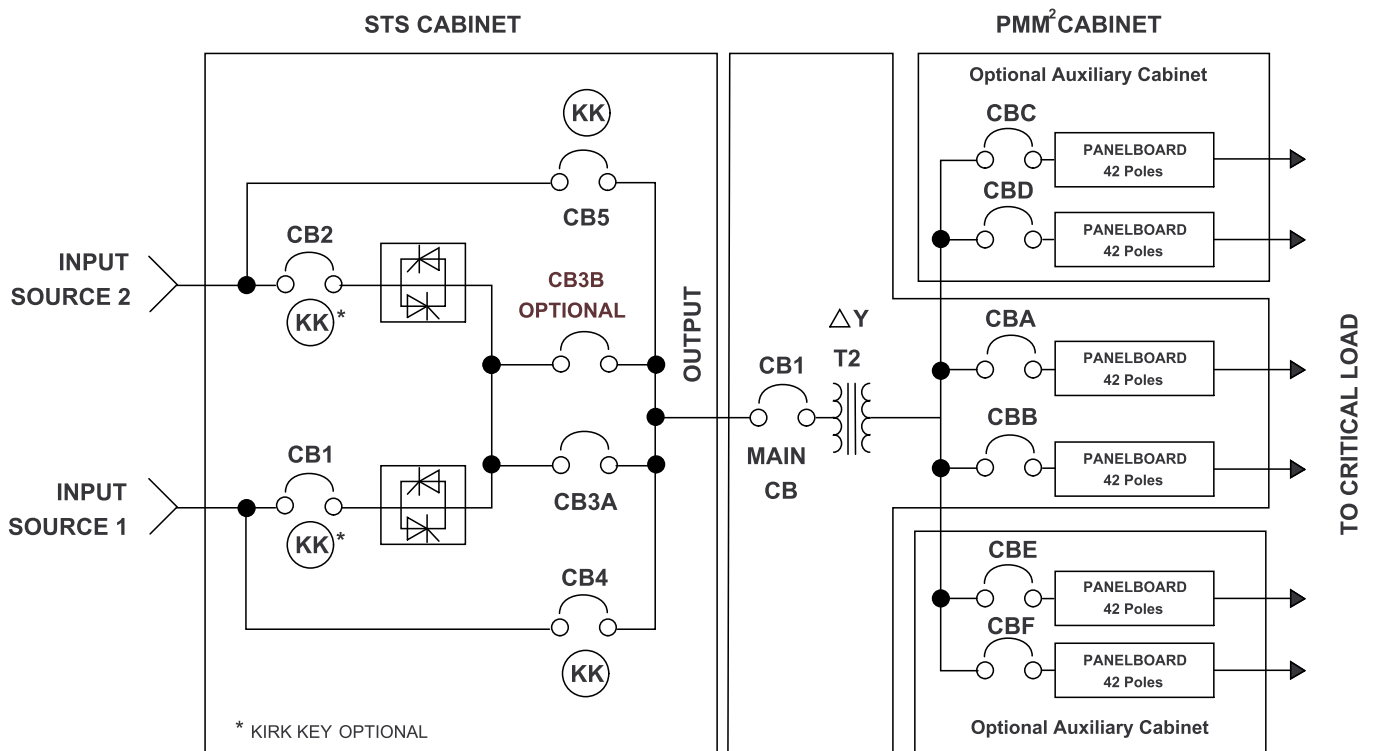
Junction Box (J-Box)	Junction box (J-Box) provides power connection points for the input of the PMM ² . A lightning surge arrestor is installed in a power junction box. It is used to protect the PMM ² and the transformer primary against extremely high- and short-duration voltage spikes impressed on the utility power by lightning strikes or similar abnormalities. The lightning arrestor conducts surges to ground and away from the PMM ² . The lightning surge arrestor can discharge 20,000 amperes up to eight times for 20 μseconds for each discharge.
Distribution Circuit Breakers	Distribution circuit breakers can be factory installed. Up to 125 ampere pole circuit breakers can be installed on panelboards.
Main Frame Circuit Breakers	Main frame circuit breakers can be installed in place of panelboards.
Higher Interrupting Input Circuit Breaker	Higher interrupting input circuit breakers can be installed in place of the standard interrupting breaker rating.
Output Isolated Ground Bus	Output isolated ground bus provides a termination point for the second ground wire from isolated ground receptacles. Option is installed internally in the PMM ² .
Branch Current Monitoring	Branch Current Monitoring provides individual currents for each of the poles of a SquareD panelboard. Each current sensor can monitor conductors carrying up to a maximum of 50 amperes. The maximum wire size capacity is #6 THHN, 0.35" diameter.
Panelboard Main Circuit Breaker Monitoring	Panelboard main circuit breaker monitoring provides the phase currents of the breaker.
Input Cable Entry	Input cable entry can be selected for either bottom or top.
Seismic Bracing	Seismic bracing is available to secure the frame of the PMM ² to the floor for installations where such strengthening is required.
Remote Emergency Power Off (REPO)	REPO makes it possible to disconnect output power at the PMM ² from a remote location in an emergency. When the REPO is activated, it trips the main input circuit breaker. The PMM ² shuts down, along with all connected loads. Any number of REPO stations can be connected as required.
Manual Restart	The manual restart can be enabled by closing the switch located on the fuse panel. Refer to <i>"PMM² Major Internal Components"</i> . If the manual restart is enabled (switch closed /vertical position) and if the input power to PMM ² is removed for more than two seconds, then the main input breaker of the PMM ² will open automatically. If the manual restart is disabled (switch open / horizontal position), then the main input breaker of the PMM ² will remain closed after the input power is removed.
Transient Voltage Suppression System (TVSS)	Transient voltage suppression system (TVSS), which is connected to the output (secondary) side of the main isolation transformer, is used to clip voltage transients. Provides 100,000 amperes of surge protection per phase or 50,000 amperes line to ground, line to neutral or neutral to ground. Option is installed internally in the PMM ² .
Transient Suppression Plate	Transient suppression plate is used to minimize the effects of high frequency electrical noise. The plate, ten square feet (one square meter), is mounted in direct contact with the masonry floor. The transient suppression plate and the reinforcement bars (rebars) of the masonry form a capacitor, shunting high frequency electrical noise, through the rebar, to earth ground.
Distribution Cables	Distribution cables include an appropriately sized circuit breaker (bolt-on or plug-in, as specified); phase, neutral and ground conductors, as required; receptacle(s) as specified; and sealed, liquid-tight flexible conduit in the length specified. Cables are colored blue and are UL listed for use per the National Electrical Code (ANSI/NFPA 70, latest issue).
Floor Stand	Floor stands are used in applications where a raised floor installation is not possible and top or side conduit landings cannot be used.
Monitoring Systems	See Power Management Module ² Operation manual (990–3988–001) for details.

PMM² / Static Transfer Switch Configurations

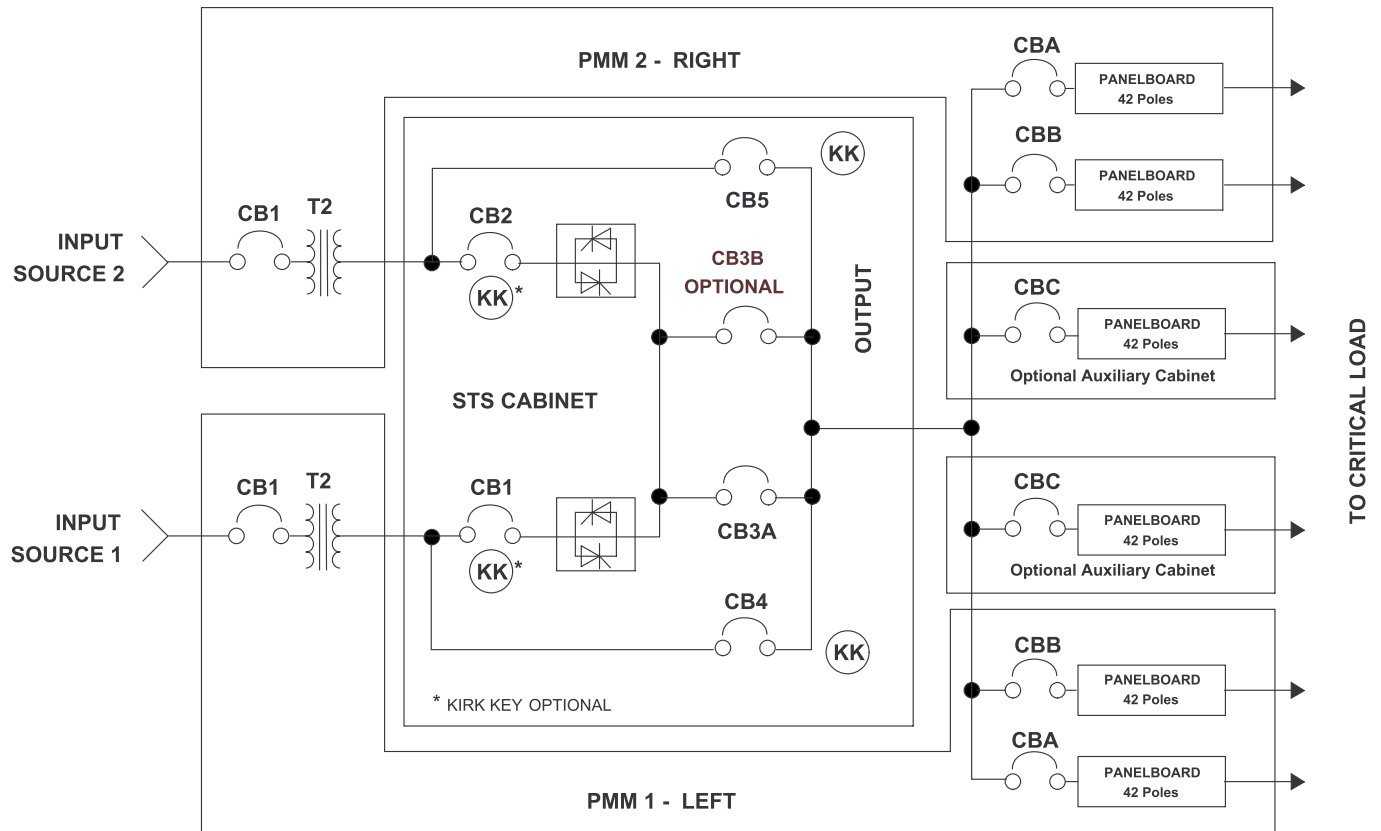
In the PMM² Plus configuration, the input of the PMM² cabinet is supplied by the output of the STS. The dual input distribution system accepts two independent AC input sources feeding to the STS. If the preferred source power is not available, the STS will transfer to the alternate input source, avoiding interruption to the critical load. The output power is conditioned and stepped down to distribution voltage via an isolation transformer, feeding panelboards or main frame circuit breakers. Refer to **“PMM² Plus Diagram”** below and go to www.apc.com for more details on the MGE Epsilon STS™.

In the PMM² Ultra configuration, an isolation transformer feeds each STS input source upstream of the STS. The transformer secondary output of the PMM²-1 (cabinet) supplies the Source-1 input and PMM²-2 (right cabinet) supplies Source-2 input of the STS cabinet. If the preferred source power is not available, the STS will transfer to the alternate input source, avoiding interruption to the critical load. The output of the STS connects to the output busbars of the PMM²-1 and PMM²-2 cabinets, feeding panelboards or main frame circuit breakers. Refer to **“PMM² Ultra Diagram”** below and go to www.apc.com for more details on the MGE Epsilon STS™.

PMM² Plus Diagram



PMM² Ultra Diagram

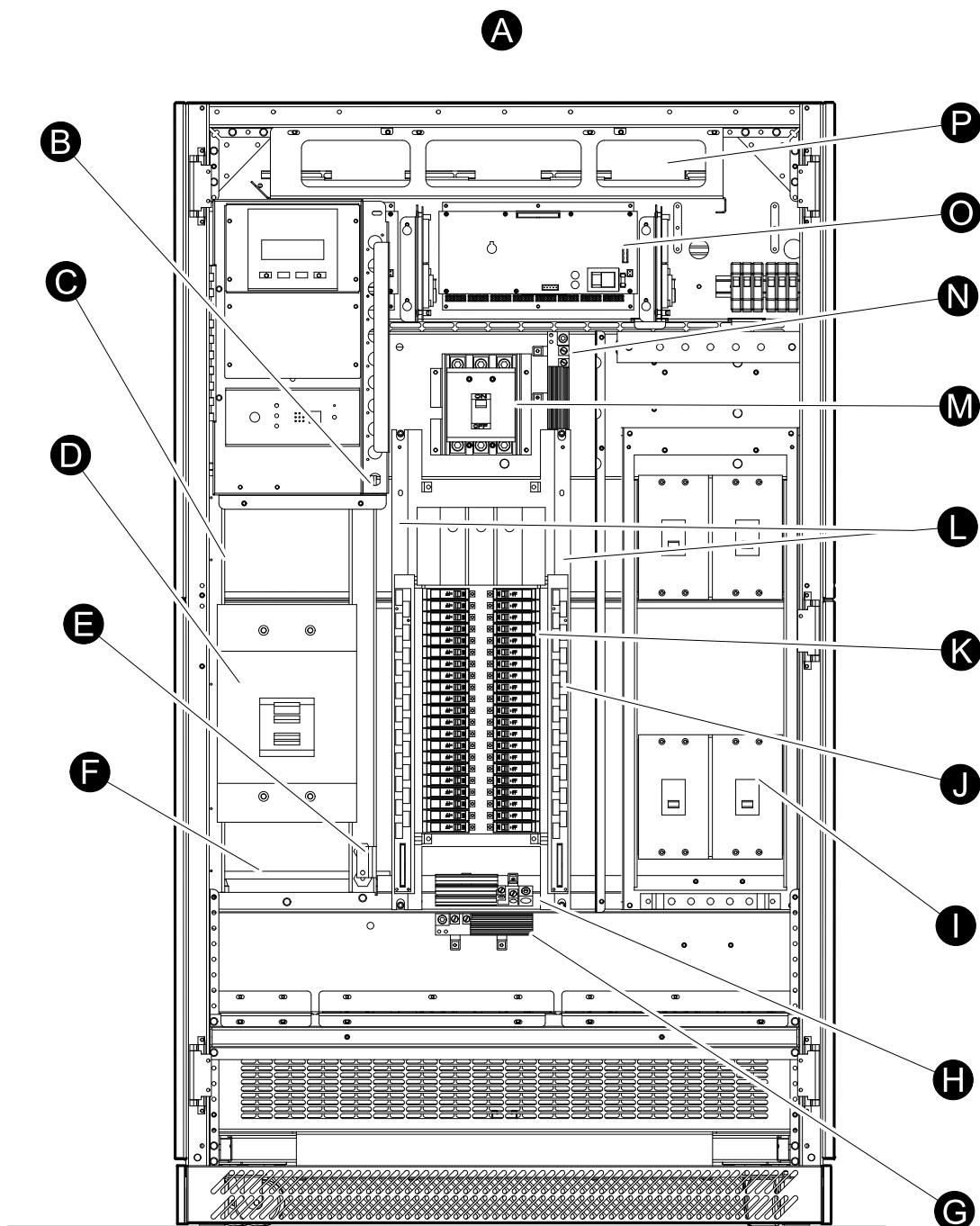


System Major Components

The following is a description of the major components of the PMM² as shown in “*PMM² Major Internal Components*”.

Main Input Circuit Breaker	Sized according to your PMM ² system. Refer to “ <i>Main Circuit Breaker Ratings</i> ” table for ratings. Higher interrupting ratings are optional.
Panelboard Main Circuit Breaker	Rated at 225 amperes with an interrupting rating of 22K amperes.
42-pole Dist. Panelboards	SquareD, type NQOM Universal
Transformer	High efficiency, K20 rating
Control Terminal Blocks (TB1, TB2)	For remote power off, alarms, and communication.
Meter (optional)	Refer to Power Management Module ² Operation manual (990–3988–001) for details.

PMM² Major Internal Components



A	Front View	I	Output Main Frame CBs (Optional)
B	Manual Restart (Optional)	J	Branch Current Monitor (Optional)
C	TB1 & TB2	K	42-Pole Dist Panelboard (Dist Breakers Optional)
D	Main Input CB1 Circuit Breaker	L	Output Neutral
E	Input Isolated Ground Busbar (Optional)	M	Panelboard Main Circuit Breaker 225A
F	Input Neutral Busbar (Optional)	N	Output Ground (Top Entry Only)
G	Output Isolated Ground (Optional)	O	Multi-Circuit Meter (Optional)
H	Output Ground (Bottom Entry Only)	P	Cable Trough (Top Entry Only)

Model Numbering

The model numbering of the unit, located on the inside of the main cabinet door, can be parsed to indicate important parameters of the PMM². Possible values are shown in “*PMM² Nomenclature*” table.

PMM² Nomenclature

PM	N	126—	4	2	150
Power Management Module	N = New Models	No. of Pole Positions	Input Voltage	Output Voltage	Power Rating
	U = Ultra Models	042 = 1 panelboard, 42 poles	1 = 208/120 VAC	2 = 208/120 VAC	030 = 30 kVA
		084 = 2 panelboards, 84 poles	2 = 208 VAC	3 = 380 VAC	050 = 50 kVA
		126 = 3 panelboards, 126 poles	3 = 380 VAC		075 = 75 kVA
		168 = 4 panelboards, 168 poles	4 = 480 VAC		100 = 100 kVA
		210 = 5 panelboards, 210 poles	6 = 600 VAC		125 = 125 kVA
		252 = 6 panelboards, 252 poles			150 = 150 kVA
					200 = 200 kVA
					225 = 225 kVA
					300 = 300 kVA

Specifications

Environmental Specifications

Temperature	
Operating	-10°C to 40°C (14°F to 104°F)
Non-operating	-40°C to 60°C (-40°F to 140°F)
Altitude	
Operating	152 meters below to 2,134 meters above sea level (500 feet below to 7,000 feet above sea level) without derating
Non-operating	152 meters below to 7,620 meters above sea level (500 feet below to 25,000 feet above sea level)
Acoustic noise level	45 dB 30 — 50 kVA 50 dB 51 — 150 kVA 55 dB 151 — 300 kVA (Average level, typical at 3 feet from front of cabinet)
Relative Humidity	
Operating	10 to 70% condensing
Non-operating	10 to 90% non-condensing

AC Input Ratings

Voltage	208/120, 208, 480, 600 VAC (380VAC optional)
Current	See <i>“PMM² Characteristics”</i>
Phase	3Ø, 3 wire plus ground (4 wire for 208/120V without transformer)
Frequency	60 Hz (50 Hz optional)

AC Output Ratings

Voltage	208/120 VAC (380V optional)
Current	See <i>“PMM² Characteristics”</i>
Phase	3Ø, 4 wire plus ground
Frequency	60 Hz (50 Hz optional)

Main Circuit Breaker Ratings

Frame Size (Amperes)	Interrupting Rating RMS Symmetrical Amperes at 480V
50	18 KA
70	18 KA
80	18 KA
90	18 KA
110	25 KA
125	25 KA
150	25 KA
175	25 KA
200	25 KA
225	25 KA
300	30 KA
350	30 KA
400	30 KA
450	30 KA
600	30 KA

PMM² Characteristics

kVA	Model Nos.	Input Voltage	Input Amps	Output Amps @ 208V	BTU per hr
030	PMN...-12-030	120/208V	83A	83A	600
	PMN...-22-030	208V	83A	83A	3200
	PMN...-42-030	480V	38A	83A	3200
050	PMN...-12-050	120/208V	139A	139A	600
	PMN...-22-050	208V	139A	139A	5300
	PMN...-42-050	480V	63A	139A	5300
	PMN...-62-050	600V	48A	139A	5300
075	PMN...-12-075	120/280V	208A	208A	600
	PMN...-22-075	208V	208A	208A	8000
	PMN...-33-075	380V	114A	114A	8000
	PMN...-42-075	480V	94A	208A	8000
	PMN...-62-075	600V	72A	208A	8000
100	PMN...-12-100	120/208V	278A	278A	600
	PMN...-42-100	480V	126A	278A	8800
125	PMN...-42-125	480V	157A	347A	10900
	PMN...-62-125	600V	120A	347A	10900
150	PMN...-33-150	380V	228A	228A	13100
	PMN...-42-150	480V	188A	416A	13100
	PMN...-62-150	600V	144A	416A	13100
200	PMN...-42-200	480V	251A	555A	13900
225	PMN...-33-225	380V	342A	342A	15700
	PMN...-42-225	480V	282A	625A	15700
	PMN...-62-225	600V	217A	625A	15700
300	PMN...-42-300	480V	377A	833A	20900

Shipping Weights (lbs.)

kVA	Model Nos.	PMN084	PMN126	PMN168†	PMN210	PMN252†
030	PMN...-12-030	675				
	PMN...-22-030	1075				
	PMN...-42-030	1075				
050	PMN...-12-050	675				
	PMN...-22-050	1200	1440	1615		
	PMN...-42-050	1200	1440	1615		
	PMN...-62-050	1200	1440	1615		
075	PMN...-12-075	675				
	PMN...-22-075	1325	1565	1740		
	PMN...-33-075	1525	1765	1940		
	PMN...-42-075	1525	1765	1940		
	PMN...-62-075	1525	1765	1940		
100	PMN...-12-100	675				
	PMN...-42-100	1575	1815	1990	2230	2405
125	PMN...-42-125	1825	2075	2260	2510	2695
	PMN...-62-125	1825	2075	2260	2510	2695
150	PMN...-33-150	2075	2325	2510	2760	2945
	PMN...-42-150	1900	2150	2335	2585	2770
	PMN...-62-150	1900	2150	2335	2585	2770
200	PMN...-42-200	2250	2500	2685	2935	3120
225	PMN...-33-225	2450	2700	2885	3135	3320
	PMN...-42-225	2325	2575	2760	3010	3195
	PMN...-62-225	2325	2575	2760	3010	3195
300	PMN...-42-300			3365		3800

†Front facing cabinet weights provided. For PMN168 with side cabinet subtract 200 lbs. For PMN252 subtract 300 lbs.

Receiving, Handling and Storage

Receiving

Before accepting the shipment from the freight carrier, inspect the exterior surfaces of shipping container(s), packaging, and equipment for damage that may have occurred during transit. If the shipping containers or equipment show evidence of damage, note the damage on the receiving document (bill of lading) prior to signing for receipt of equipment.

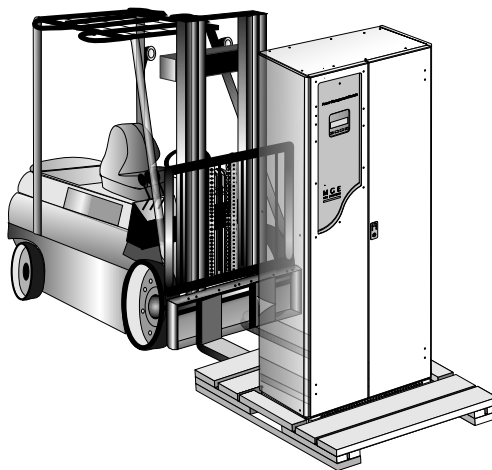
The equipment should be unpacked immediately after receipt, and inspected again for damage to external painted panels and doors and to determine if any internal damage (broken components, disconnected wiring, loose connections, etc.) has occurred. Verify that the equipment nameplate corresponds with the equipment ordered.

Damage claims should be filed directly with the carrier. Replacements for damaged components can be ordered by calling the Customer Support Center.

Handling

The PMM² has heavy-duty casters to allow the equipment to be moved easily into position once it has been removed from the shipping truck.

The main cabinet can be moved only from the rear, using a pallet jack or fork lift truck. Adjust the forks to avoid the casters and levelers. Once the PMM² is in its final position, the leveling jacks on all four corners should be lowered to keep the PMM² in place.



Storage

If the equipment is to be stored prior to installation, it should be stored in a cool, dry, well-ventilated location that is protected against rain, splashing water, chemical agents, etc. The equipment should be covered with a tarpaulin or plastic wrapper to protect it against dust, dirt, paint, or other foreign materials.

Prerequisite to Installation

Installation drawings are provided with each PMM². This section provides more information for a successful and efficient installation of the PMM². Installation of equipment must be handled by skilled technicians and electricians familiar with the requirements of high energy electrical equipment. The installation must comply with the requirements of the National Electrical Code (NEC, ANSI/NFPA 70, latest issue) and with local codes and requirements as applicable. We strongly recommend contracting your certified APC service partner for startup. Do not allow unqualified personnel to handle or operate the equipment.

Environment

The PMM² is intended for use in an environment where control of temperature and humidity is provided. Information on maximum operating and recommended environmental parameters is given in *“Environmental Specifications”*.

The PMM² generates heat and exhaust air through the top and rear of the enclosure. This added heat load may increase the ambient temperature of the room and this temperature should not exceed the specification in Section 1.4. The facility air conditioning system will need to be sized for handling this additional heat, to maintain the room temperature within specification. Heat load and heat loss data is given in the *“PMM² Characteristics”* table.

Mechanical Assembly

Cable Landing

PMM² dimensions are provided on installation drawings. The PMM² can be mounted on a raised or solid floor. Conduit landings are provided for bottom cable entry (top cable entry is an available option). A floor stand option is offered for solid floor installations if bottom cable entry is not possible.

Junction Box

When the junction box (J-Box) option is ordered, it is normally shipped in advance of the PMM², and may be installed prior to the arrival of the PMM². The J-Box must be placed within eight feet of the PMM², since the length of the optional supply cable is only ten feet.

Floor

The PMM² is suitable for mounting on concrete or other non-combustible surfaces only. For installations on a raised floor, a floor tile cut-out is required for passage of cables. Floor loading must be considered when installing on a raised floor or on an upper story of a multiple-story building. The floor loading data is provided on installation drawings supplied with your equipment. Consult a structural engineer while planning your PMM² installation. Place the PMM² so the leveling jacks are as close as possible to the corners of the tiles.

Noise

Consideration should be given to the specific location of the PMM² cabinet to minimize the potential for sound transmission to surrounding structures and sound reflection. It is suggested that the following installation methods be included.

1. If possible, mount the PMM² away from corners of walls or ceilings. For installations which must be near a corner, use sound absorbing materials on the walls and ceilings, if necessary, to eliminate reflection.
2. Provide a solid foundation for mounting the PMM².
3. Provide flexible conduit to make the connections to the PMM².
4. Locate the PMM² as far as practically possible from areas where high sound levels are undesirable.

Access

The PMM² requires a minimum of 36 inches front clearance for normal maintenance. Side facing cabinets require 36 inches side clearance for normal maintenance. A minimum of six inches rear clearance access is required for transformer ventilation. Refer to installation drawings for details on your configuration.

Cooling

The PMM² is convection cooled. Cooling air is drawn through the bottom section of the enclosure and exhausted through the top. The PMM² does not use forced air or air filters. Care should be taken to ensure that the air intake and exhaust areas are not obstructed for air flow.

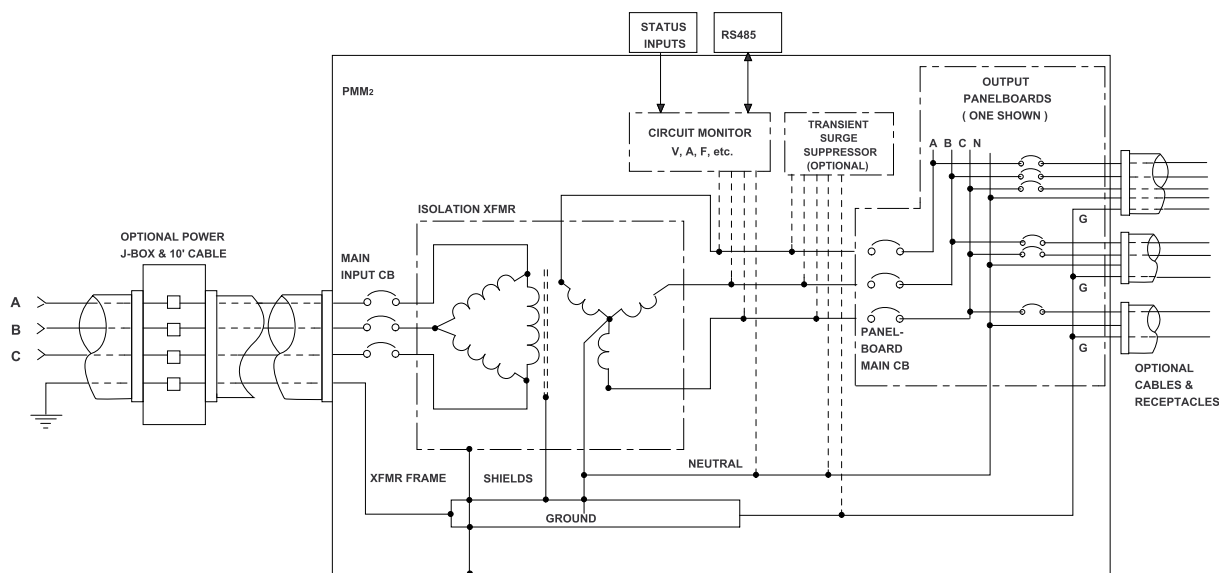
Prepare Installation

Grounding

An insulated grounding conductor must be installed as part of the input branch circuit supplying the PMM². Per the National Electrical Code, article 250, the grounding conductor is to have green insulation, with or without yellow stripes and be grounded to the utility service safety grounding point (or other acceptable building ground, such as the building frame in the case of a steel frame structure), at the service equipment entrance.

All attached plug receptacles in the vicinity of the PMM² must be grounded in the same way. The conductors for those receptacle grounds are grounded to the safety ground (or other acceptable building ground, such as the building frame in the case of a steel frame structure), at the service equipment entrance. See grounding path below.

Wiring for power and control cables is routed through the bottom of the enclosure (with an option for the top). This is shown in detail on the installation drawing for your configuration.



Installation Procedures

Installation procedures describe the general requirements for the PMM² installation. Specific requirements are described in the installation drawings shipped with your configuration.

The steps to be followed are

- Placement
- Output circuit breaker installation
- Connection of the input power, output power, and control cables
- Startup of the system

Installation of the PMM² equipment must be handled by skilled technicians and electricians familiar with the special requirements of high-energy electrical equipment. The installation must comply with the requirements of the National Electrical Code (NEC, ANSI/NFPA 70, latest issue) and with local codes and requirements as applicable.

We strongly recommend contracting your certified APC service partner for startup of the PMM². Do not allow unqualified personnel to handle or operate the equipment.

Placement

Using the mechanical prerequisite information, determine the final location for the PMM² and any applicable options, and move them into place. For Plus and Ultra configurations, the cabinets must be arranged in the required positions to insure proper connections. When facing the PMM² from the front, the PMM² Plus standard arrangement provides for the STS cabinet to be located on the left hand side. For the Ultra, the STS cabinet is located between the PMM² cabinets. The interconnect cables, and side barrier(s) are supplied with the PMM² cabinet. The interconnect brackets are supplied with the STS. Lower the leveling jacks on all four corners of the enclosure, to ensure proper stability. The load must be on the leveling jacks instead of the casters.

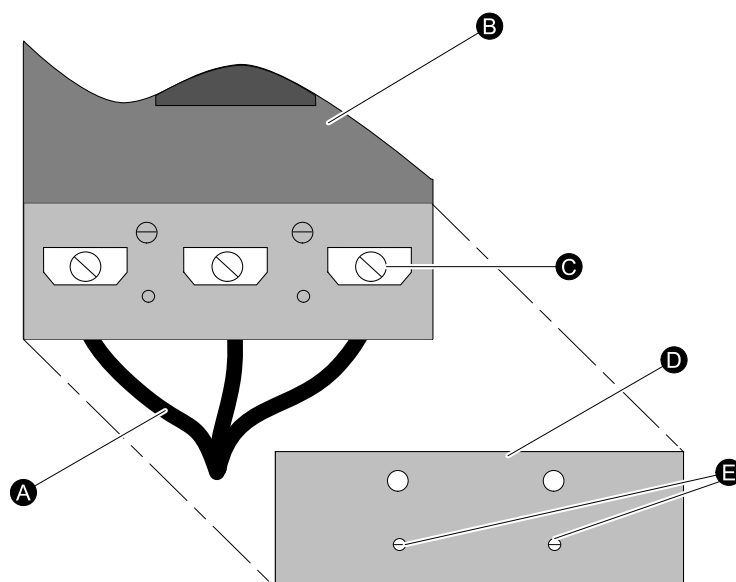
Connections

Make all connections in accordance with the “Cable preparation for field wiring” guide (MGE Part Number 9–00038–00). Make certain that all connections are properly torqued.

AC Input Connections

The AC input connections are made through the bottom, to the main circuit breaker, CB1. For optional top cable access refer to the installation drawing. Some main circuit breakers include a cover plate protecting the compression connectors; refer to figure below during the following procedure. To make the connections:

- Remove the cover plate from the bottom of the main circuit breaker CB1 and install input conduit.
- Make connections to the compression connectors. Phase sequence must be A, B, C.
- Install the cover plate at the bottom of the main circuit breaker CB1.



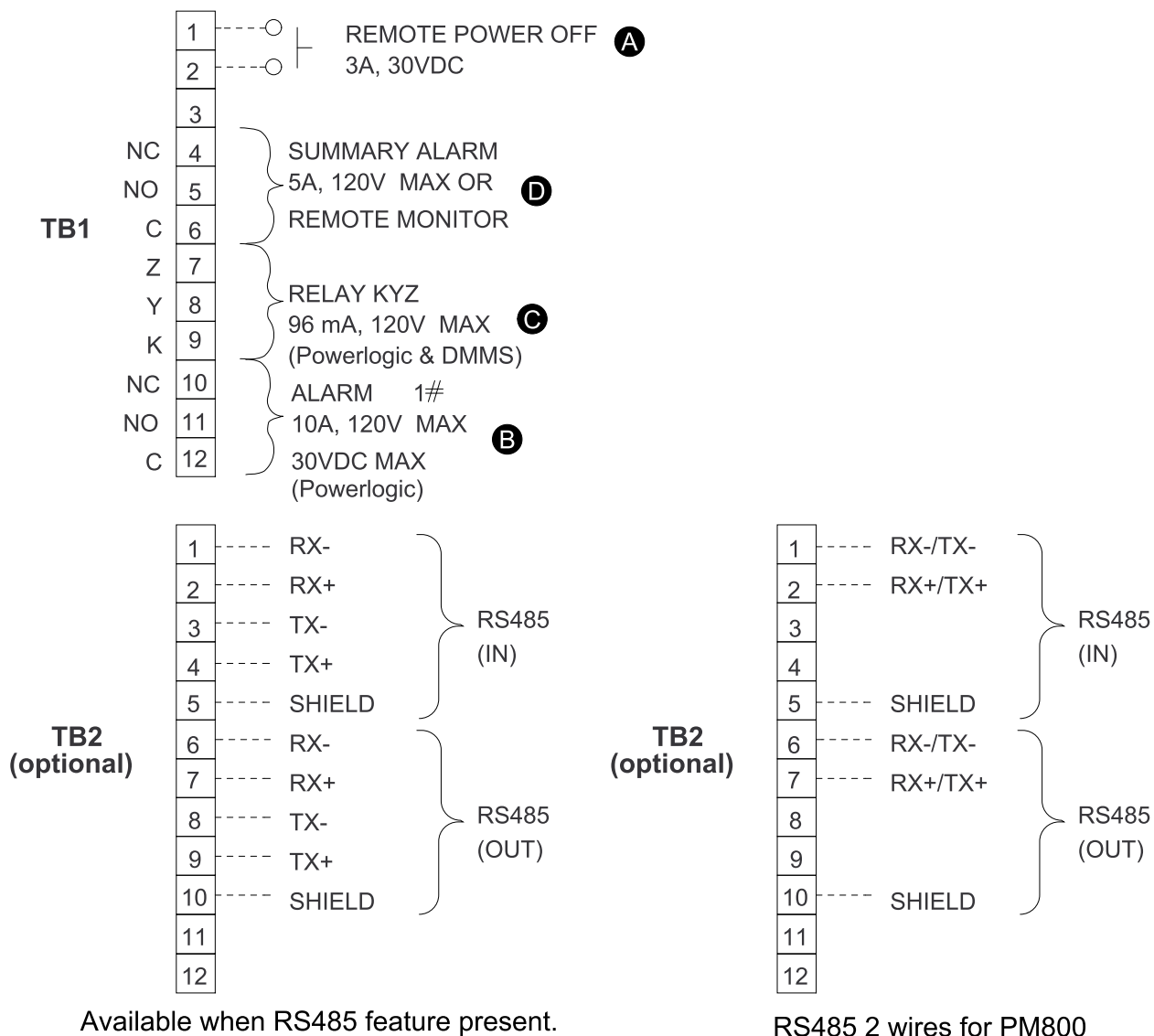
A	Input Cables
B	Circuit Breaker CB1
C	Compression Connectors
D	Plastic Cover Plate (Present on higher Amperage ratings only)
E	Retaining Screws

AC Output Connections

Conduit landing are located below each panelboard with appropriate 1/2 and 3/4” knock-outs. The load connections are made to the circuit breaker configuration which has been designed, installed, and identified by you to meet the requirements of your installation. The connections to be made are either, 2–, 3– or 4–wires and ground and are made in compression type connectors. Make the connections as required for the one, two, or three phase power. Connectors are marked on the circuit breaker and the phase sequence for all 3–phase power is A, B, C.

Control Connections (Optional)

Control connections are made at the terminal blocks located on the left side of the main cabinet near the main input circuit breaker. Refer to figure below for details.



A	Input from normally-open (NO) Form C contact closure trips main input circuit breaker.
B	Specified alarms provide normally-open (NO) or normally-closed (NC) Form C contacts for connection to remote alarms (optional).
C	Specified alarms provide low-power pulse output (optional).
D	Any alarm condition provides normally-open (NO) or normally-closed (NC) Form C contacts for connection to a remote device (optional).

Worldwide Customer Support

Customer support for this or any other product is available at no charge:

- Contact the Customer Support Center by telephone or e-mail. For local, country-specific centers: go to www.apc.com/support/contact for contact information.

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