Somet Integration

PDI creating the perfect wave

PowerCube™

POWERCUBE™ TRANSFORMER

OWNER'S MANUAL

Revision 1

TABLE OF CONTENTS

POWERCUBE™ TRANSFORMERS

GENERAL

Dry type transformers are suitable for indoor use, depending upon the enclosure construction. They are cooled by free circulating air through the enclosure. The maximum ambient temperature should not exceed 40^{O}C. (104^{O}F).

Overheating may occur when:

- The air flow is restricted.
- The transformer is overloaded.
- The input voltage exceeds the unit rating.
- The supplied frequency is different than the rated frequency.

RECEIPT

Upon receipt, PowerCube™ units should be inspected for damage that might have occurred during shipment. Unpack and examine the unit(s) for any broken or loose parts. Carefully inspect the transformer coils and wiring. What appears to be minor damage to these areas may result in an open or short circuit. Damage claims should be filed with the transportation company, and your supplier must be notified immediately.

HANDLING

All transformers should be kept in the upright position in which they were shipped. Lifting cables or chains should be used with spreader bars to avoid damaging the unit(s).

Lifting the unit(s) with hand trucks or fork lift trucks is permissible if the fork truck blades are distributed to adequately balance and support the unit and are long enough to pass completely under the enclosure. Since most dry type transformers have a high center of gravity, extreme caution should be exercised when lifting or moving units in this manner.

If the shipping pallet remains attached to the base of the dry type transformer, rolling may be used to move the unit.

STORAGE

Storage areas should be clean and dry without extreme temperature variations. Protective wrappings should be left intact until the transformer is moved to its permanent location. Dry type transformers stored under extremely wet or dusty conditions must be cleaned and dried before the unit can be safely energized. (Please see the maintenance section for instructions).

INSTALLATION

LOCATION

The following provisions should be considered when installing a dry type transformer:

- Accessibility
- Ventilation
- Environmental conditions
- Pad mounting

The location of the transformer must comply with local codes and industry standard practices. Installation should be made in an area reasonably free from dust, excessive moisture, fertilizers, chemicals and corrosive fumes or vapors. Please reference NEC code for required/mandatory distances between flammable materials and dry type transformers.

ROOM REQUIREMENTS

Dry type transformers installed indoors should comply with NEC application requirements and local codes. In all locations, dry type transformers must be installed in an upright position, where there is free circulation of air. The room in which dry-type transformers are located should have sufficient spacing between units and sufficient clearances from walls and other obstructions to permit the free circulation of air around each unit. Sufficient space should also be provided to permit routine inspection and maintenance. Exact distances are based on local electrical code (state specific).

Adequate clean and dry air is essential for proper cooling of dry type transformers. Using a filtered air ventilation system may reduce maintenance. When dry type transformers are located in rooms or other restricted spaces, sufficient ventilation should be provided to maintain appropriate air temperature. Air temperature measurement should be performed near the transformer inlets. The quantity and size of ventilation openings depends on the height of the room, the location of the openings, and the maximum loads to be carried by the transformer. Room ventilation should not impede normal circulation of air through the transformer.

When possible, the air inlet to the room should be near the floor. The air outlet should be located on the opposite wall, near the ceiling. The exhaust air should not exceed $15^{O}C$ over the inlet air temperature. The required effective ventilation area should be at least a 3 square inch inlet and outlet area per kVA of transformer capacity, except under 50 kVA, where the effective area should be at least 1 square foot.

The manufacturer should be consulted before a PowerCube™ unit is installed in locations at altitudes greater than 10,000 feet above sea level.

CONNECTIONS

Busbars can be orientated for top or bottom facing configuration. Consult Appendix C for specific details of drawings.

All cable entrances should be in the terminal compartment located in the lower part of the transformer enclosure. This will allow for the use of standard insulated cables (conductor size and type specified in NEC Article 310.)

Make only authorized connections illustrated by the nameplate or connection diagram. Check all tap jumpers for proper location and tightness.

Depending upon the kVA rating, the transformer may have flexible leads with bolted type wire terminals, copper/aluminum (CU/AL) lug connectors, termination pads for mounting or customer specific crimp type or lug type terminations. The table in Appendix B shows the required torque for installing bolted wire connectors and cables in lug type connectors.

When cable terminations are supplied by the user, it is recommended that proper sized, UL listed screw type or crimp type connectors be used. These terminations should be attached to the cables as specified by the termination or cable manufacturer.

Minimum electrical clearances in the installation of lugs and cables are required per ANSI and NEMA Standards.

GROUNDING

The transformer core and clamps are connected to the enclosure for grounding purposes. It is the installer's responsibility to ground the transformer enclosure assembly to the ground system. This should be done in accordance with the latest revision of NEC Section 450-10, NEC Article 250 and ANSI/IEEE Std. 144.

PRIOR TO ENERGIZING

After the transformer is installed, but before it is energized, performed the following:

- Remove all shipping braces.
- Remove any debris from the bottom of the wiring compartment and under the transformer.
- Tighten all external mounting bolts to prevent vibrations.
- Torque all electrical connections with the proper torque setting per NEC code

MAINTENANCE

Dry type transformers should be periodically cleaned and annually inspected. The unit must be de-energized before checking for loose connections or parts, dirt on insulating surfaces, and dust. Dirt and dust may restrict air flow. Clean the unit with compressed air or nitrogen. The compressed air or nitrogen should be clean, dry and supplied at a relatively low pressure (not more than 25 psi). Lead supports, taps, terminal boards, bushings or other major insulating surfaces should be brushed or wiped with a dry cloth. The use of liquid cleaners is not recommended.

If moisture is present, it should be dried using heated air (maximum temperature of $110^{O}C$). The heat must be distributed in the enclosure. Incandescent lamps or heaters may also be used (maximum temperature of $110^{O}C$).

Re-tighten all connecting lugs and bolts after the first 30 days of service.

SOUND LEVEL

Transformer noise originates within the steel core. It is an inherent characteristic of all transformers and cannot be completely eliminated. Careful selection of the transformer location and proper installation will help attenuate this noise.

AMBIENT TEMPERATURE: LOADING

Limiting ambient temperatures for normal service conditions are specified in ANSI Standards for transformers. For each degree centigrade that the average temperature of the cooling air is above or below $30^{O}C$, a transformer may be loaded above or below it's kVA rating as follows:

- **DECREASE LOAD FOR HIGHER TEMPERATURE...0.6% OF RATED KVA**
- **INCREASE LOAD FOR LOWER TEMPERATURE….0.6% OF RATED KVA**

Average air temperature that is greater than $40^{O}C$ should not be exceeded for greater than 24 hours. The use of transformers in ambient air temperature above $50^{O}C$ is not covered by this guide. The manufacturer should be consulted before such installations are made.

REFERENCES

All transformers are manufactured per NEMA and ANSI/IEEE Standards. An affixed UL label will indicate the transformer conforms to UL requirements.

Further information may be found in ANSI/IEEE Standard C57.94, *Recommended Practice for Installation, Application, Operation and Maintenance of Dry Type General Purpose Distribution and Power Transformers.*

DISCLAIMER

These instructions do not purport to cover all details or variations in equipment or to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the supplier or manufacturer.

APPENDIX

APPENDIX A: POWERCUBE™ TRANSFORMER PHYSICAL DATA

kVA	Input Current (Amps)			Output Current (Amps)			Heat Rejection (BTUH @ Full load)	Weight/ Lbs.
	600 VAC	480 VAC	208 VAC	600VAC	480VAC	208VAC		
30	29	36	83	29	36	83	1.6	380
45	43	54	125	43	54	125	2.5	490
75	72	90	208	72	90	208	4.1	700
100	96	120	278	96	120	278	5.5	750
125	120	151	347	120	151	347	6.8	830
150	145	181	417	145	181	417	8.2	980
225	217	271	625	217	271	625	12.3	1200
300	289	361	834	289	361	834	16.4	1600
500	482	602	1390	482	602	1390	27.3	2400
750	723	903	2084	723	903	2084	41.0	3600

APPENDIX B: ELECTRICAL TORQUE SPECIFICATIONS

Retighten all accessible connections to the manufacturer's torque specifications. Tighten steel hardware parts (except pressure wire connectors and Belleville type/spring washers) to the values given in the table below:

Bolt Diameter	Tightening Torque
#8 (5/32")	15 in. lb.
#10 (3/16")	20 in. lb.
¼"	84 in. lb.
5/16"	144 in. lb.
3/8"	240 in. lb.
½"	600 in. lb.

Retighten connections using Belleville type (spring) washers until washer is flat.

Retighten the wire clamping members of all accessible mechanical (pressure wire) type connectors to the torque value (inch-pounds) for the largest wire size the connector will accept as given in the following table, unless otherwise noted on the equipment

SLOTTED HEAD SCREWDRIVER		
Wire Size installed, AWG or MCM	**Slot Width 3/64 or less Slot Length ¼ or less**	**Slot width over 3/64", Slot width over ¼"**
#14	15 in. lb.	25 in. lb.
#12	15 in. lb.	25 in. lb.
#10	15 in. lb.	25 in. lb.
#8	20 in. lb.	25 in. lb.
#6	25 in. lb.	35 in. lb.
#4	n/a	35 in. lb.
#3	n/a	40 in. lb.
#2	n/a	40 in. lb.
#1	n/a	40 in. lb.
1/0	n/a	40 in. lb.
2/0	n/a	40 in. lb.
3/0	n/a	40 in. lb.
4/0	n/a	40 in. lb.

SCREW CONNECTORS

SLOTTED SCREW CONNECTORS

Wire Size	Torque Value
#14	35 In. Lb.
#12	35 In. Lb.
#10	35 In. Lb.
#8	40 In. Lb.
#6	45 In. Lb.
#4	45 In. Lb.
#2	50 In. Lb.
#1	50 In. Lb.
1/0	50 In. Lb.
2/0	50 In. Lb.

SOCKETHEAD SCREW CONNECTORS

Hex Socket Size	Torque Value
1/8”	45 In. Lb.
5/32”	100 In. Lb.
3/16”	120 In. Lb.
7/32”	150 In. Lb.
¼”	200 In. Lb.
5/16”	275 In. Lb.
3/8”	375 In. Lb.
½”	500 In. Lb.
9/16”	600 In. Lb.

HEX SOCKET SCREW (ALLEN)

Hex Socket Size	Torque Value
1/8”	35 In. Lb.
5/32”	80 In. Lb.
3/16”	100 In. Lb.
7/32”	120 In. Lb.
¼”	150 In. Lb.
5/16”	225 In. Lb.
3/8”	300 In. Lb.
½”	400 In. Lb.
9/16”	500 In. Lb.

APPENDIX C: DRAWINGS

GENERAL NAMEPLATE DRAWING:
DRAWING: 92-10001-00_3-X0

POWERCUBE™ HIGH EFFICIENCY MECHANICAL SPECIFICATIONS:
DRAWING: 92-10001-00_4-X0

POWERCUBE™ HIGH EFFICIENCY WEIGHTS, DIMENSIONS AND ELECTRICAL SPECIFICATIONS:
DRAWING: 92-10001-00_2-X0

POWERCUBE™ WEIGHTS, DIMENSIONS AND ELECTRICAL SPECIFICATIONS:
DRAWING: POWERCUBE™ STANDARD TRANSFORMERS

PDI HIGH EFFICIENCY POWER QUALITY TRANSFORMER

GENERAL NAMEPLATE DRAWING

DRY TYPE POWER TRANSFORMER (1)

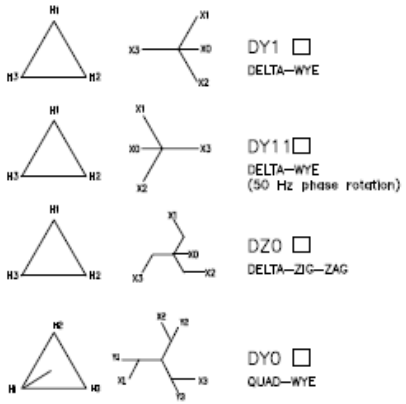
POWER DISTRIBUTION, INC.
4200 OAKLEYS COURT,
RICHMOND, VA 23223

[ ] KVA 3 PH [ ] Hz
CLASS AA [150] °C RISE
HV [DELTA] V [ ] A
LV [ ] V [ ] A
LV2 [ ] V [ ] A (4)
RATED K FACTOR [ ]
TYPE [KHES2]
INS. SYSTEM [240] °C
[ ] % IMP @ 170°C (2)
WEIGHT [ ] LB APPROX.
PDI P/N: [ ]
DATE CODE [ ]
SERIAL NO. [ ]
TEMP. SENSOR [N/O] [120] V [5] A
YEAR OF MANUFACTURE [ ]

VOLTAGE TAPS (5)

HV CONNECTION (H1-H2-H3)	
%RATED VOLTAGE	CONNECTIONS
105	3T04
102.5	2T04
100	3T05
97.50	2T05
95	2T06

VECTOR TYPE (3) (note selected vector)



MADE IN USA

c UL us
E258267

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HIGH EFFICIENCY POWER QUALITY TRANSFORMER	
DWG NO. 92-10001-00_3-X0	REV X0
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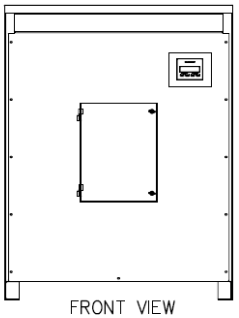
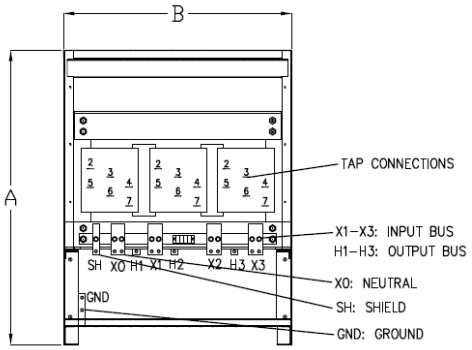
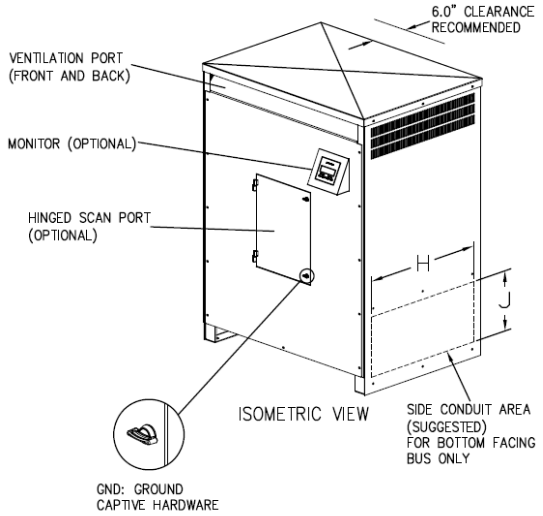
PDI HIGH EFFICIENCY POWER QUALITY TRANSFORMER

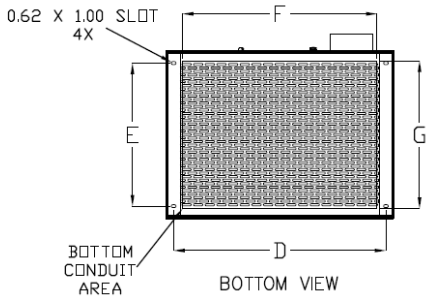
MECHANICAL SPECIFICATIONS



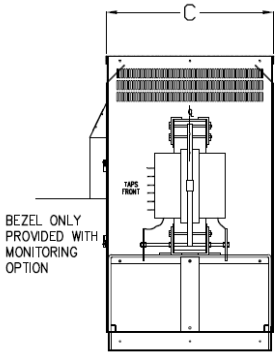


FRONT VIEW
BOTTOM FACING BUS
(FRONT PANEL REMOVED)





BOTTOM VIEW



SIDE VIEW
(SIDE PANEL REMOVED)

NOTES:

1. BUS BARS CAN BE CONFIGURED FOR TOP OR BOTTOM FACING CONFIGURATION. SPECIFY AT TIME OF ORDER.
2. REFER TO SPECIFIC TRANSFORMER CONSTRUCTION DRAWING FOR BUS DETAIL AND HOLE DIAMETERS.
3. CERTAIN MONITORING AND TVSS OPTIONS MAY OCCUPY A PORTION OF BOTTOM CONDUIT AREA. CONSULT JOB SPECIFIC DRAWINGS WHEN ORDERING TVSS AND/OR MONITORING OPTIONS.
4. DOOR SWING RADIUS IS 1/3 THE WIDTH OF THE ENCLOSURE.
5. DRAWING IS SPECIFIC TO NEMA 1 ENCLOSURE. CONSULT NEMA 3R ENCLOSURE DRAWING FOR OUTDOOR APPLICATIONS.
6. HINGED SCAN PORT, IR TRANSPARENT SCAN WINDOW, MONITOR AND TVSS ARE ALL OPTIONAL ACCESSORIES NOT PROVIDED UNLESS SPECIFIED.
7. STANDARD PAINT COLOR IS PDI BLUE.

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DWG NO. 92-10001-00_4-X0	REV X0
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PDI HIGH EFFICIENCY POWER QUALITY TRANSFORMER

WEIGHTS, DIMENSIONS AND ELECTRICAL SPECIFICATIONS

	DIMENSIONS AND WEIGHTS											
	KVA	A	B	C	D	E	F	G	H	J	H(MTG SLOT)	WT/LB
☐	30	36.00	28.00	17.00	25.14	14.00	22.50	15.50	15.50	6.75	.625 X 1	380
☐	45	36.00	28.00	17.00	25.14	14.00	22.50	15.50	15.50	6.75	.625 X 1	490
☐	75	42.00	35.00	21.00	32.14	18.00	29.50	19.00	19.00	10.75	.625 X 1	700
☐	100	42.00	35.00	21.00	32.14	18.00	29.50	19.00	19.00	10.75	.625 X 1	750
☐	125	50.00	40.00	28.00	37.04	25.00	34.50	26.00	26.00	12.75	.625 X 1	830
☐	150	50.00	40.00	28.00	37.04	25.00	34.50	26.00	26.00	12.75	.625 X 1	980
☐	225	63.00	49.00	30.00	45.52	24.59	42.00	28.00	28.00	14.75	.625 X 1	1200
☐	300	63.00	49.00	30.00	45.52	24.59	42.00	28.00	28.00	14.75	.625 X 1	1600
☐	500	63.00	49.00	30.00	45.52	24.59	42.00	28.00	28.00	14.75	.625 X 1	2400
☐	750	72.00	66.00	44.00	45.52	24.59	42.00	28.00	28.00	14.75	.625 X 1	3600

(REFER TO MECHANICAL SPECIFICATION DRAWING)

KVA	INPUT CURRENT (AMPS)			OUTPUT CURRENT (AMPS)			HEAT REJECTION
	600 VAC	480 VAC	208 VAC	600 VAC	480 VAC	208 VAC	(BTUH @ FULL LOAD)
30	29	36	83	29	36	83	1.6
45	43	54	125	120	54	125	2.5
75	72	90	208	201	90	208	4.1
100	96	120	278	268	120	278	5.5
125	120	151	347	335	151	347	6.8
150	145	181	417	402	181	417	8.2
225	217	271	625	602	271	625	12.3
300	289	361	834	803	361	834	16.4
500	482	602	1390	1339	602	1390	27.3
750	723	903	2084	2008	903	2084	41.0

NOTE: OBSERVE ALL NEC AND LOCAL GUIDELINES WHEN SELECTING OVERCURRENT PROTECTION AND CABLING

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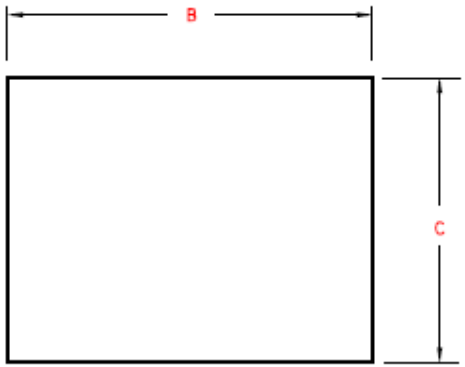
POWER QUALITY TRANSFORMER

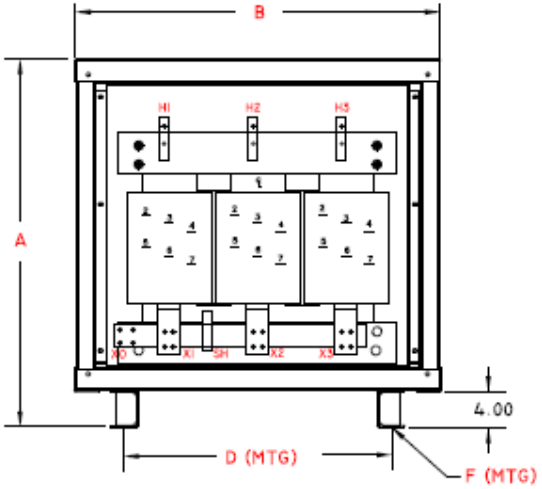
DWG NO. 92-10001-00_2-X0 REV X0

SHT 2 OF 4

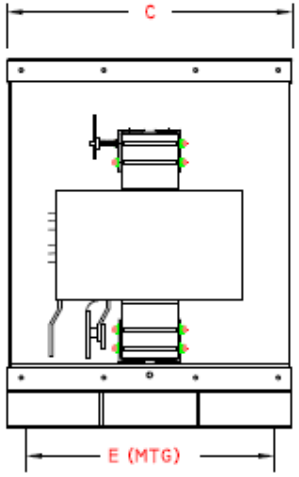
NEMA 1 ENCLOSURE & TRANSFORMER DIMENSIONS						
kVA	A	B	C	D (MTG)	E (MTG)	F (MTG) SLOT
15	36.00	28.00	17.00	25.14	14.00	.437 x 1.00
30	36.00	28.00	17.00	25.14	14.00	.437 x 1.00
45	36.00	28.00	17.00	25.14	14.00	.437 x 1.00
50	42.00	35.00	21.00	32.14	18.00	.437 x 1.00
75	42.00	35.00	21.00	32.14	18.00	.437 x 1.00
100	42.00	35.00	21.00	32.14	18.00	.437 x 1.00
112.5	50.00	40.00	28.00	37.04	25.00	.437 x 1.00
125	50.00	40.00	28.00	37.04	25.00	.437 x 1.00
150	50.00	40.00	28.00	37.04	25.00	.437 x 1.00
200	63.00	49.00	30.00	45.52	24.59	.563 x 1.00
225	63.00	49.00	30.00	45.52	24.59	.563 x 1.00
250	63.00	49.00	30.00	45.52	24.59	.563 x 1.00
300	63.00	49.00	30.00	45.52	24.59	.563 x 1.00
350	63.00	49.00	30.00	45.52	24.59	.563 x 1.00
400	63.00	49.00	30.00	45.52	24.59	.625 x 1.00
500	63.00	49.00	30.00	45.52	24.59	.625 x 1.00
625	72.00	66.00	44.00	45.52	24.59	.625 x 1.00
750	72.00	66.00	44.00	45.52	24.59	.625 x 1.00



TOP VIEW



FRONT VIEW



RIGHT VIEW

TRANSFORMER SPECIFICATION	
PHASE	3
FREQUENCY	60 Hz
PRIMARY VOLTAGE	480V DELTA
SECONDARY VOLTAGE	208/120 WYE
K– RATING	13 / 20
VECTOR GROUP	DY1
INSULATION CLASS	240A
TEMPERATURE RISE	150°C
ELEC. SHIELD	2
ENCLOSURE	NEMA 1

TITLE: –OUTLINE–
POWERCUBE STANDARD TRANSFORMERS
(15–750) kVA (K13–K20) 480V/208–120V

DWG. NUMBER: POWERCUBE — 1 OF 1

DRAWN BY: — REVISION: –A–

DATE: 06–03–09

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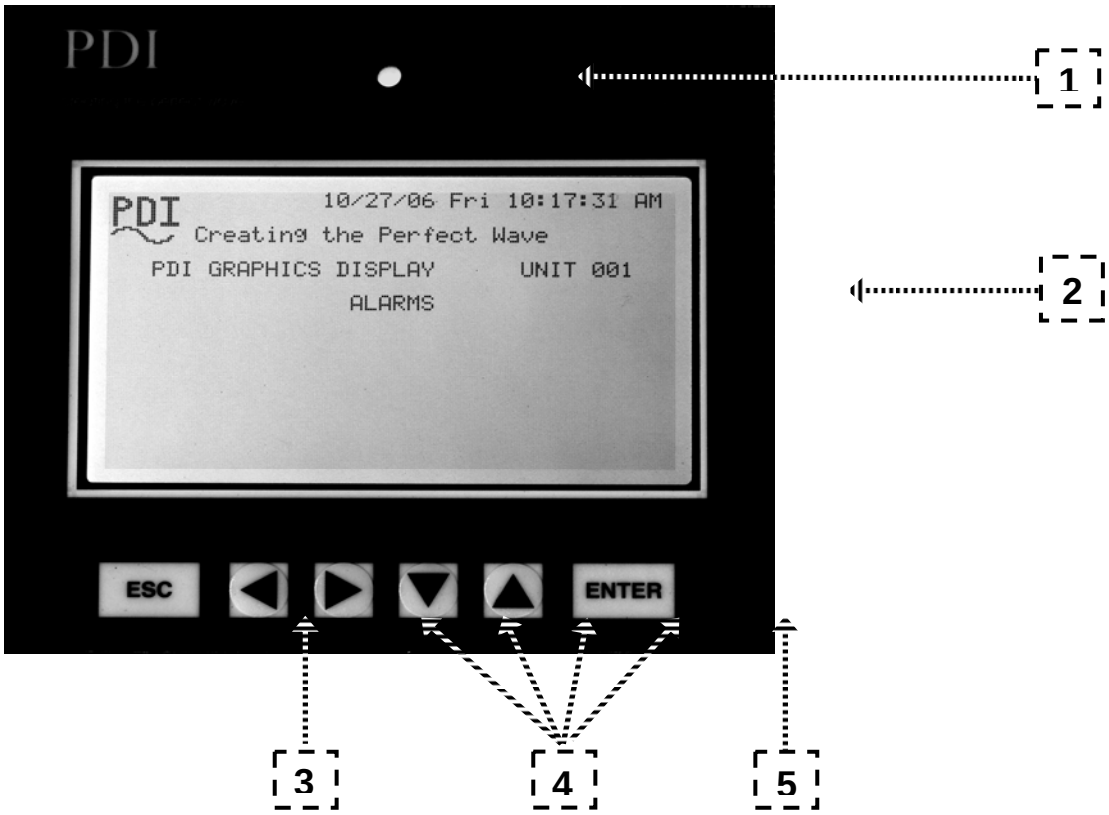
APPENIX D: POWERCUBE™ OPTIONS

Catalog #	Description	kVA
WS	Wavestar Monitor	
PL	PowerLogic PM810	
AL	Aluminum Windings	
LK	Lug Kit	
TV	60 kA TVSS	
LS	Non-linear Load Test	
SS	Surge Suppression	
IR	IR Scan Port	
SC	Special Color	
TE	Triple Electrostatic Shields	30-75
		100-125
		150-200
		225-300
		400-750
TSB	Terminal Safety Barrier	30-75
		100-125
		150-200
		225-300
		400-750
25	25-year Warranty	30-75
		100-125
		150-200
		225-300
		400-750
HD1	Hinged Door	<150
HD2	Hinged Door	200-300
HD3	Hinged Door	400-750

WaveStar™ Monitor

PDI's WaveStar™ monitor features a graphic LCD panel located on the front of the unit. This LCD display is part of the operator interface module that monitors analog power points within the PowerCube™ unit.

LCD Monitor Layout



1. LED Status Indicator
2. Graphics Display
3. Esc/Setup
4. Navigation Controls
5. Enter/Toggle Screen