

***PHASETEC***<sup>®</sup>

**DIGITAL  
POWER CONDITIONERS**

**OPERATION & INSTALLATION  
MANUAL**

**PHASE TECHNOLOGIES, LLC**



*PHASETEC™* digital power conditioners are designed to safely operate electrical equipment in the harshest power quality environments. With a wide input voltage range, high efficiency, electronic power factor correction and tightly regulated output, *PHASETEC™* provides high quality power for demanding applications.

*PHASETEC™* digital power conditioners allow users to select output voltage and frequency to match utility power anywhere in the world. With 50 or 60 Hz input frequency and frequency conversion capability, *PHASETEC™* allows safe, efficient operation of electrical equipment anywhere in the world.

*PHASETEC™* digital power conditioners provide the ultimate power quality to protect the most sensitive electrical equipment. Employing double IGBT conversion, *PHASETEC™* isolates equipment from all but total power outage, covering 94% of adverse power events.

### **PHASETEC™ FEATURES AND BENEFITS**

- Accepts a wide range of input voltage while maintaining tight output voltage regulation
- Four user selected output voltages to operate a wide range of equipment
- 50 or 60 Hz input frequency and user selected output of 50 or 60 Hz allows operation anywhere in the world
- Double IGBT conversion isolates even the most sensitive equipment from dips, sags, surges, transients and harmonics
- Electronic power factor correction protects sensitive upstream equipment
- High momentary overload capacity for demanding applications
- Optional isolation transformer provides dual voltage output and protection from common mode noise

### **INSTALLATION**

Properly locating the *PHASETEC™* digital power conditioner is important to the performance and normal operating life of the unit. Models are available in indoor Type 1 rated enclosures. The unit should be securely mounted to a level surface and care taken to minimize the introduction of dust and other contaminants into ventilation openings.

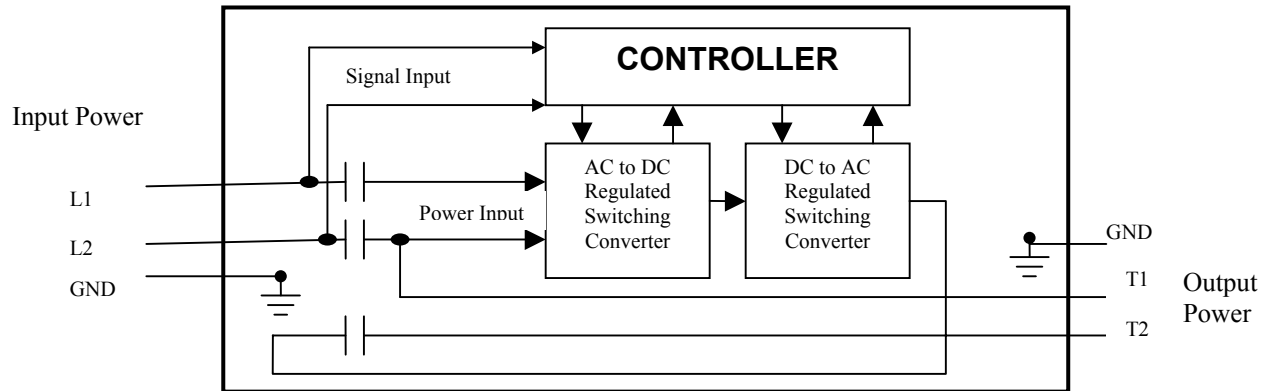
The unit should be installed in a location free from:

- Excessive dirt and dust
- Corrosive gases or liquids
- Excessive vibration
- Airborne metallic particles

Models ACC-55 and ACC-80 are provided with lifting brackets inside the enclosure. CABLES, STRAPS OR CHAINS USED FOR LIFTING THESE UNITS MUST BE ATTACHED ONLY TO THE PROVIDED BRACKETS. Access the brackets by removing the top cover of the enclosure. Brackets with a hole for attaching lifting equipment are located on each side-wall of the enclosure.

In order to provide proper ventilation, do not obstruct the open space under and around the enclosure. Make sure air intake and exhaust openings are not obstructed. If the unit is mounted in a cabinet or shed, make certain there is adequate ventilation to provide cooling for the unit.

## PHASETEC™ BLOCK DIAGRAM



**IMPORTANT!** Because L2 passes directly through the unit, the output has no neutral connection at the same potential as ground for source voltage that is derived from a phase-to-phase connection. Dual voltage output such as 120/240V can only be obtained by passing the output through an isolation transformer which reestablishes a neutral to ground connection.

**When source voltage is derived from a phase-to-neutral connection, always connect neutral to L2.** If the neutral is not connected to input terminal L2, dangerously high voltages between the output and earth may result. When input neutral is connected to L2, output neutral will be on output terminal T1.

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## ELECTRICAL CONNECTIONS

Electrical connections to PHASETEC™ are made behind the front panel of the enclosure as indicated in Table 1.

**Table 1**

CONNECTION	FUNCTION	COMMENTS
GND	Earth Ground For Input Power	
L1, L2	Single-Phase Input Power Terminals	For connection to single-phase power derived from a phase-to-neutral voltage, such as 230V in Europe, always connect neutral to L2
CONTROL A & B	Remote switching circuit	Shipped from factory with <b>METAL</b> jumper from A to B. Replace jumper with switch leads for remote control
GND	Earth Ground For Output Power	
T1, T2	Output Power Terminals	T2 is the generated output If neutral is connected to input L2, output neutral will be T1

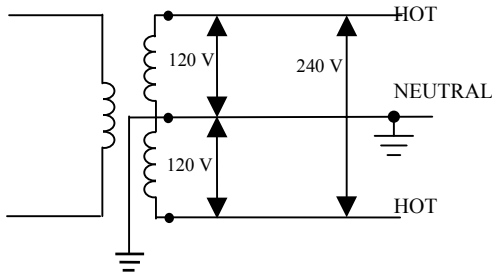
Installations must comply with all national and local electrical code requirements. General wiring considerations include:

1. This Unit Is Suitable For Use In A Circuit Capable Of Delivering Not More Than 5 kA RMS Symmetrical Amperes, 240 V Maximum.
2. Use 600 V vinyl-sheathed wire or equivalent. The voltage drop of the leads needs to be considered in determining wire size. Voltage drop is dependent on wire length and gauge.
3. Wire used within the circuit and all field wiring terminals must be rated for 60 C
4. Wires fastened to the terminal blocks shall be secured by tightening the terminal screws to a torque value listed in Table 2.
5. Use wire size suitable for Class 1 circuits.
6. The maximum wire gauge for the input terminals is listed in Table 2.
7. Never allow bare wire to contact the metal surfaces.
8. Never connect AC main power to the output terminals T1, T2.
9. PHASETEC™ should be wired by a qualified electrician into a circuit no greater than 240 VAC with adequate current carrying capacity and the appropriate sized breaker. Branch circuit protection to the power conditioner should be provided by an appropriate size 2 pole, linked circuit breaker. Circuit breaker size for each model is listed in Table 2 .

**Table 2**

Model:	ACC-30	ACC-55	ACC-80
<b>Input Terminals</b>			
Tightening torque	16 in.-lb.	45 in.-lb (4-6 AWG) 40 in.-lb. (8AWG) 35 in.-lb. (10-16 AWG)	50 in.-lb.
Max. wire size	14 - 6 AWG	6 - 14 AWG	6 - 1/0 AWG
<b>Output Terminals</b>			
Tightening torque	16 in.-lb.	45 in.-lb (4-6 AWG) 40 in.-lb. (8AWG) 35 in.-lb. (10-16 AWG)	50 in.-lb.
Wire size	14 - 6 AWG	6 - 14 AWG	6 - 1/0 AWG
<b>Circuit Breaker</b>			
Amps	40	70	100

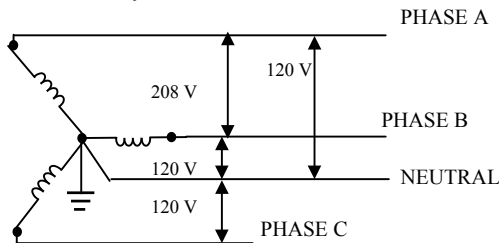
**Figure 1**  
Single-phase  
Power Source



**Single-phase nominal 240VAC or 220VAC source:**

Single-phase power in North America is commonly supplied as center-tapped 240/120V. Connect the hot wires to input L1 and L2 terminals and ground to the ground lug of the power conditioner. **Do not connect the unit to a 120V or 110V source!**

**Figure 2**  
Three-phase 208Y/120V  
Grounded-Wye Power

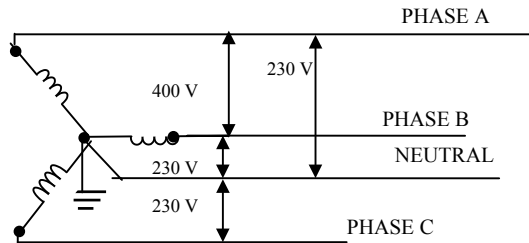


**Single-phase nominal 208VAC from a three-phase 208Y/120V source:**

Many commercial facilities and large buildings are supplied with 208Y/120V three-phase grounded-wye power. Single-phase power derived from a source as depicted in Figure 3 can be either 208V (phase-to-phase) or 120V (phase-to-neutral).

Connect any two of the three phases to input L1 and L2 terminals and ground to the ground lug of the power conditioner. **Do not connect the unit to a 120V or 110V source!**

**Figure 3**  
Three-phase 400Y/230V  
Grounded-Wye Power



**Single-phase nominal 230VAC from a three-phase 400Y/230V source:**

In Europe and many other countries, single-phase power is nominal 230V derived from a 400Y/230V source. This 230V is derived from a phase-to-neutral connection.

Connect any one of the three phases to input terminal L1, and connect the neutral to L2 of the power conditioner. Output terminal T1 will be the output neutral.

**WARNING!** Always connect the neutral wire to input terminal L2. Failure to do so may result in dangerously high voltage between one of the power conditioner output lines and ground.

**WARNING!** When operating from generator power, never start the generator while directly connected to the power conditioner. A power source ramping up from zero voltage and zero frequency can damage the power conditioner. Connect the power conditioner to the generator source only after the output is stable.

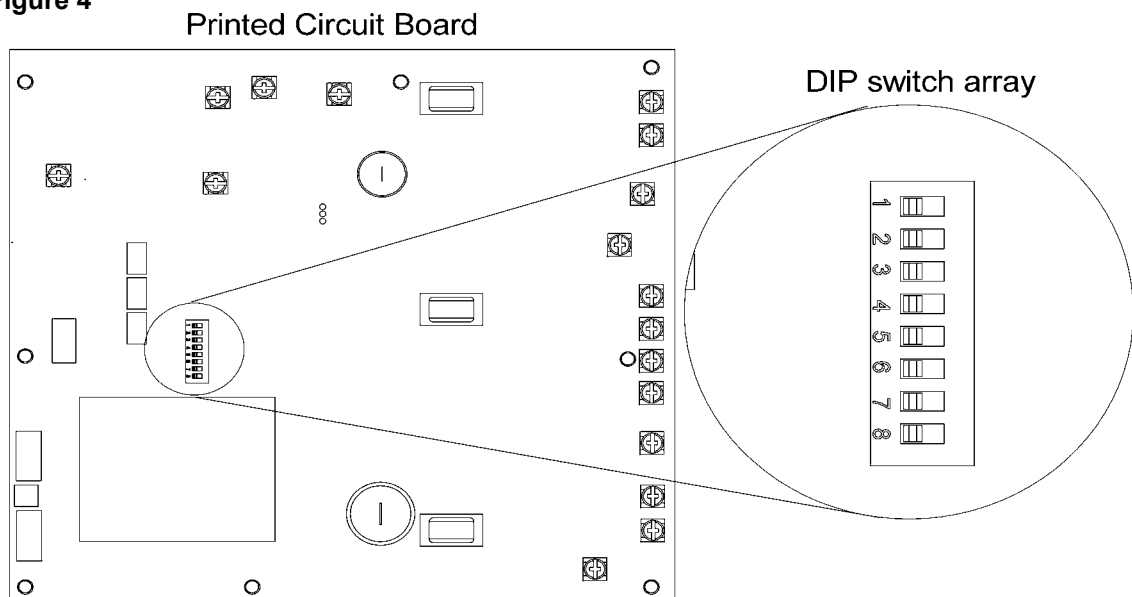
## SELECTING OUTPUT VOLTAGE AND FREQUENCY

Users can select the desired frequency (50 or 60 Hz) and one of four possible voltage outputs (208V, 220V, 230V or 240V) of *PHASETEC*™ digital power conditioners by setting a series of dip switches located on the control circuit board inside the enclosure. Refer to Table 3 for the desired settings. The dip switch component is a vertical row of switches that can be set in either a left or right position. Refer to Figure 4 to locate the dip switch array.

## TEMPERATURE SENSOR STATUS CHECK OVERRIDE

Upon start-up, software in the control electronics checks the status of the internal temperature sensor to ensure that it is functioning. If the software does not detect a signal from the sensor, it will not allow the unit to start. If the ambient temperature is below -10C, the electronic temperature sensor may not generate a signal, even though it may be functional. The temperature sensor status check function can be turned off with dip switch no. 5. Turning off the status check will not disable the temperature sensor, but may allow the converter to start and run with a faulty temperature sensor. The unit is equipped with a redundant bimetallic temperature sensor that will disable the unit in the event of overheating. The temperature sensor status check override should only be used if the power conditioner is operating in cold environments that prevent it from starting.

Figure 4



**CAUTION! ONLY THE BOTTOM FOUR SWITCHES, NO. 5, 6, 7 AND 8 SHOULD BE USED TO SELECT FREQUENCY AND VOLTAGE OUTPUT OR TO OVERRIDE THE TEMPERATURE SENSOR STATUS CHECK. SWITCHES 1-4 MUST REMAIN IN THE LEFT-HAND POSITION, OR THE UNIT WILL NOT OPERATE!**

### Dip Switch Setting Procedure:

1. Verify the input power is disconnected from the power conditioner.
2. Remove the front panel to gain access to the circuit board.
3. **CAUTION!** Before touching the circuit board, make sure that you place your hand on an unpainted surface of the enclosure to avoid a static discharge to the circuit board.
4. Locate the dip switches in the lower left quadrant of the circuit board.
5. Select the proper combination of settings for switches 5, 6, 7 and 8 as indicated in Table 3 below.
6. **CAUTION! NEVER CHANGE THE DIP SWITCH SETTINGS WHEN THE POWER CONDITIONER IS ENERGIZED!**
7. Re-attach the front panel.
8. Provide power to the power conditioner.

Table 3

Desired Output	Switch No. 5 position	Switch No. 6 position	Switch No. 7 position	Switch No. 8 position
50 Hz		right		
60 Hz		left		
208 VAC			left	left
220 VAC			right	left
230 VAC			left	right
240 VAC			right	right
Temp sensor status check on	left			
Temp sensor status check off	right			

*PHASETEC*<sup>™</sup> digital power conditioners are shipped from the factory with a default setting of 60 Hz, 240 VAC.

### USING THE REMOTE ON-OFF SWITCH CIRCUIT

*PHASETEC*<sup>™</sup> is equipped with a remote switch circuit that allows the unit to be turned on and off with a simple low power, 240 volt rated switch circuit. Terminals for connecting a remote switch are located on the small terminal block labeled "Control" near the Input and Output wiring terminals. Below are instructions for configuration of the remote switch.

1. Verify the input power is disconnected from the power conditioner.
2. Remove the front panel to gain access to the wiring terminals.
3. Remove the small **metal** jumper between the Control terminal contacts A and B.  
**Warning!** The wire connecting A to C on top of the Control terminal is NOT the jumper. Connect the remote switch leads to control terminals A and B. **When the remote switch circuit is closed power will be provided to the load after an approximately five to eight second delay.**
4. The control switch should have a minimum rating of 240 VAC, 0.5 amp. The fuse in the wiring panel provides protection to the control circuit in the event of a short or fault.
5. Re-attach the front panel.
6. Provide power to *PHASETEC*<sup>™</sup>. When the remote switch is closed, the unit will energize and power will be provided to the load after an approximately five second delay.
7. When replacing the fuse in the control circuit, use only a 240 V, 3 A rated fuse.

## GENERAL TROUBLESHOOTING TIPS

If the unit fails to turn ON, and all status lights are OFF, check the following:

1. Verify that the appropriate circuit breaker in the building's electrical distribution box is set ON and is properly sized.
2. Check the control circuit fuse in the wiring panel.
3. Verify that the metal jumper on the Control Terminal Block is connected A to B. The unit will not operate unless the metal jumper or control circuit wires are connected to the appropriate control terminals.

## STATUS LIGHTS

Status lights provide information about the status of the PHASETEC™ unit, and about the system into which the unit is wired. The GREEN, YELLOW, and RED status lights are viewed through the window on the front panel. **Status lights and combinations of status lights are designed to indicate and help troubleshoot a wide range of potential problems.** A listing of status light indications is provided in Table 4.

**TABLE 4 STATUS LIGHTS**

STATUS LIGHT MODE	INDICATED PROBLEM	POTENTIAL CAUSES	SUGGESTED SOLUTION	NOTES
Steady Green	System normal			
Steady Yellow	Power conditioner overheated	Blockage of air intake and exhaust. Ambient temperature too high (should not exceed 40 C). Internal dirt buildup. Failed internal fan. Output overload.	Make certain vents are clear. Verify adequate clearance between unit and surroundings. Ensure that building is adequately vented. Note: fan is temperature controlled, and does not operate continuously. Reduce load to steady state rated current.	1
Flashing or Steady Red	Internal Fault		Contact manufacturer	2
Steady Red and Flashing Yellow	Input voltage too low	Utility line voltage below the minimum of 160 VAC	Ensure the input line voltage between L1 and L2 is above 170 VAC	3
Steady Red and Steady Yellow	Input current too high	Low utility line voltage	Power conditioner must be de-rated linearly as input voltage decreases.	2
Flashing Red and Flashing Yellow	Output current too high	Short between T1 & T2 Excessive load	Eliminate short Ensure steady state current is within ratings. Higher current is OK for momentary load startup	2
Steady Yellow and Flashing Red	Input voltage too high	High utility line voltage  Short between T1 & T2	Ensure input line voltage between L1 and L2 is below 277 VAC Eliminate short	3

### Notes:

1. WARNING: The unit will automatically turn back ON after internal temperature reaches acceptable levels.
2. The output will remain de-energized until input power to the unit is cycled OFF/ON, or the control signal is cycled OFF/ON.
3. WARNING: The unit will automatically turn back ON 15 seconds after the problem is corrected.

The red and yellow status lights may flash briefly when starting heavy loads. This is normal and can be ignored.

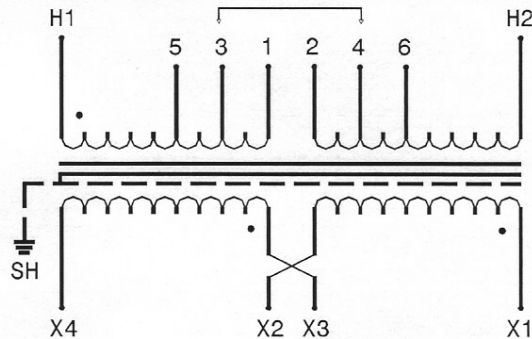
If problems cannot be corrected, contact the Field Support Manager at Phase Technologies, (605) 343-7934.

## SPECIFICATIONS

	ACC-30	ACC-55	ACC-80
<b>INPUT POWER</b>			
Input frequency	50 or 60 Hz		
Power factor	Near unity		
Input voltage	170 – 277 V AC		
<b>OUTPUT POWER</b>			
Output power characteristics	Sinusoidal, <3% total harmonic distortion		
Voltage regulation	+/- 2% for entire input voltage range		
Output voltage	User selected, 208/220/230/240 VAC		
Output frequency	User selected, 50/60 Hz		
Rated current, steady state	30 A	55A	80A
<b>GENERAL</b>			
Efficiency	95% typical		
Ambient temperature range	-10 – 40 C		
Storage temperature	-20 – 60 C		
Weight	123 lb. (56 KG)	230 lb. (105 KG)	330 lb. (150 KG)
Enclosure	Powder coated steel, indoor Type 1		
Dimensions H x W x D	22 x 21 x 12 in.	30 x 27 x 15 in.	32 x 36 x 15 in.
Connections	Hard wired, terminal blocks		

## Connection of Optional 60 Hz Isolation Transformer Supplied by Phase Technologies

Dia. 2		Catalog Series 85-14XXSH & 61-14XXSH	
Tap Arrangement	2 - 2½ FCAN (Full Capacity Above Normal) 2 - 2½ FCBN (Full Capacity Below Normal)		
% High Voltage	High Voltage 240 X 480	Inter-Connect	Connect High Voltage Lines To
105	252	H1 To 2 H2 To 1	H1 & H2
100	240	H1 To 4 H2 To 3	
95	228	H1 To 6 H2 To 5	
105	504	1 To 2	
102.5	492	2 To 3	
100	480	3 To 4	
97.5	468	4 To 5	
95	456	5 To 6	
% Low Voltage	Low Voltage 120 / 240	Inter-Connect	Connect Low Voltage Lines To
100	120	X1 To X3 X2 To X4	X1X3 & X2X4
100	120 / 240	X2 To X3	X1 & X2X3 & X4
100	240	X2 To X3	X1 & X4



*PHASETEC*™ digital power conditioners are available with an optional shielded isolation transformer. The transformer is provided in a separate enclosure. When connected to the output of the power conditioner, the isolation transformer provides protection against common mode noise and 60 Hz models provide dual voltage output (e.g. 240/120V) by reestablishing a neutral connection. Diagram 2 provides information on the connection of the transformer. Multiple taps allows adjustment of voltage to compensate for voltage drop in the event of a long run of wire between the transformer and the load.

1. Verify that no power is provided to the *PHASETEC*™ power conditioner
2. For 100% of the output voltage of the power conditioner, interconnect transformer leads H1 to 4 and H2 to 3
3. Using appropriate size wire, connect the output of the power conditioner to leads H1 and H2 of the transformer
4. For 120/240V output, interconnect transformer leads X2 to X3
5. The output of the transformer is configured as center tapped 120/240V with transformer leads X4 and X1 corresponding to L1 and L2 and the X2/X3 interconnection corresponding to ground/neutral
6. It is important to connect transformer lead SH from the electrostatic shield to a solid ground connection

## LIMITED WARRANTY

Phase Technologies equipment is warranted against defects in material and workmanship for a period of one year. This warranty covers both parts and labor for one year from the date of purchase by the original owner. Phase Technologies will repair or replace (at our option), at no charge, any part(s) found to be faulty during the warranty period specified. The warranty repairs must be performed by/at a Phase Technologies Authorized Service Center or at Phase Technologies LLC, Rapid City, SD 57702.

### Obligations of the Original Owner

1. The original Bill of Sale must be presented in order to obtain "in-warranty" service.
2. Transportation to Phase Technologies or an Authorized Service Center is the responsibility of the original purchaser. Return transportation is provided by Phase Technologies.

### Exclusions of the Warranty

This warranty does not cover any of the following: accident, misuse, fire, flood, and other acts of God, nor any contingencies beyond the control of Phase Technologies, LLC, including water damage, incorrect line voltage, improper installation, missing or altered serial numbers, and service performed by an unauthorized facility. Phase Technologies' liability for any damages caused in association with the use of Phase Technologies' equipment shall be limited to the repair or replacement only of the Phase Technologies' equipment. No person, agent, distributor, dealer, or company is authorized to modify, alter, or change the design of this merchandise without express written approval of Phase Technologies, LLC.

**INSTALLATIONS MUST COMPLY WITH ALL NATIONAL AND LOCAL ELECTRICAL CODE REQUIREMENTS.**

### **DANGER – Risk of Electric Shock**

**Please wait 30 minutes after power is disconnected before servicing**

### **DANGER: HIGH VOLTAGE**

**Electric shock could result in death or injury. Please consult qualified personnel for installation.**

# NOTES

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