American Rotary

Rotary Phase Converter Installation Manual

MODELS:

ALL HD/CNC 240V models w/ built-in starters

GENTEC/American Rotary
215 S. Park Street
Port Washington, WI 53074

Technical Support
Phone 262-268-7014
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or visit

www.AmericanRotary.com

WARNING! INSTALLATION MUST BE PERFORMED BY A LICENSED ELECTRICIAN!

IMPORTANT SAFETY INSTRUCTIONS! READ CAREFULLY BEFORE INSTALLING

FAILURE TO FOLLOW THESE INSTRUCTIONS AND COMPLY WITH ALL CODES MAY CAUSE SERIOUS BODILY INJURY AND/OR PROPERTY DAMAGE.

! 1) Before installing or servicing your converter, **BE CERTAIN THE CONVERTER POWER SOURCE IS TURNED OFF AND DISCONNECTED.**

! 2) All installation and electrical wiring must adhere to state and local codes. Check with appropriate community agencies, or contact your local electrical professionals for help.

! 3) **INSTALLATION MUST BE PERFORMED BY A LICENSED ELECTRICIAN.** Converter must be connected to a separate electrical circuit directly from the entrance box. There must be an appropriately sized fuse or circuit breaker in this line. Tying into existing circuits may cause circuit overloading, blown fuses, tripped circuit breakers, or a burned up converter, motor or equipment.

! 4) Do not connect converter to a power supply until the converter is grounded. For maximum safety, a ground fault interrupter should be used. CAUTION: FAILURE TO GROUND THIS UNIT PROPERLY MAY RESULT IN SEVERE ELECTRICAL SHOCK.

! 5) WARNING: Reduced risk of electric shock during operation of this converter requires the provision of acceptable grounding:

a) If the means of connection to the converter box is other than grounded metal conduit, ground the converter and generator back to the service by connecting a copper conductor, at least the size of the circuit conductors supplying the converter, to properly sized grounding screw inside the converter wiring area.

b) To reduce the risk of electric shock from contact with adjacent metal parts, bond supply box to the converter box and generator, and to all accessible metal parts by means of.

1) an equipment-grounding conductor at least the size of the total converter cable conductors (measured in current carrying capability).

! 6) The voltage and phase of the power supply must match the voltage and phase of the converter.

! 7) Do not use an extension cord; splices must be made with an approved splice kit and should be checked for integrity before applying power. All joints must be made in an approved junction box.

! 8) Do not work on this converter while the power is on.

! 9) Never operate a converter with a frayed or brittle power cord, and always protect it from sharp objects, hot surfaces, oil and chemicals. Avoid kinking the cord.

! 10) Never service a motor or power cord with wet hands or while standing in or near water or damp ground.

! 11) The converter must be wired by a qualified electrician, using an approved starter and switching device(if not supplied).

! 12) Make sure the converter box matches the generator in voltage, horsepower, and phase.

! 13) Three-phase generators should be protected by proper, thermal and amperage protection. (Check local codes.)

! 14) Check for nicks in the wire insulation supplied with the converter by using an Ohm meter and checking resistance to ground before installing the converter and after installing the converter. If in doubt on the proper procedure check with a qualified electrician.

! 15) Do not run this converter with any external load on the generator rotor or generator shaft (if using other than supplied generator).

! 16) The shaft of a generator supplied supplied by other than American Rotary Converter must be removed to prevent body parts, clothing, and other object from touching the generator rotor shaft.

CAUTION!

! 17) The following may cause severe damage to the converter and voids warranty. It could also result in personal injury:

Running the converter on too high or too low of voltage

Running the converter on imbalanced voltage

Failure to protect the converter from below freezing temperatures.

Starting the converter with load in circuit.

Failure to protect the converter from temperatures above 70 degree C.

Running the converter with a generator supplied by other than American Rotary Converter.

! 18) Never work on the converter or system without disconnecting the main power.

! 19) Do not run converter above 40 degrees C.

! 20) Never exceed the current rating of any sys!

! 21) Do not run converter above 40 degrees C.

! 22) Never exceed the current rating of any system component.tem component.

! 23) GENTEC BALDOR Generators 3-60HP must be wired for proper voltage. Lead pairs for 240 volt operation are as follows: 1-7, 2-8, 3-9. 4,5,6 are connected as one point and insulated.

1. BEFORE YOU BEGIN INSTALLATION

American Rotary's Heavy-Duty/CNC All Purpose Phase Converter is designed for quick, simple installation. All connections are made with 1/4 inch bolts so wires should be terminated with the proper ring lugs with 1/4 inch holes.

We recommend that you read through these instructions and then temporarily install the phase converter to insure proper installation, i.e. wire size, breaker/fuse size etc. Returns of phase converters that are not in new condition are subject to a 25% restocking fee.

These instruction are intended as a guideline for proper operation of the phase converter. Installation should follow Article 455 of the N.E.C. (National Electric Code) and all local codes.

Common Installation Questions!

The following are responsible for the majority of technical support calls. Please Read and Observe these carefully before installation.

#1 **Undersized wire...** The minimum wire and circuit current capacity on the single phase side is close to twice the three-phase current (1.73 (square root of 3) times the three-phase current plus a little loss for the generator. This is the minimum for proper phase converter operation, however, the National Electric Code (N.E.C.) requires the single phase branch circuit rating be 2.5 times the three-phase current load. This will also aid in hard starting loads. We also recommend increasing the wire one size for every 50 feet of run. The wire on the three-phase side (from the panel to the generator and from the panel to the load) should be sized to the maximum three-phase current. See Page 6 for more on wire sizing.

#2 **Don't bolt down the motor generator...** If the motor generator is bolted to a rigid structure, the bearings and rotor take all the mechanical vibration. This is evident by a loud motor generator. This can cause the bearings to fail and overheating of the motor generator. American Rotary has several types of rubber isolation mounting feet available. These rubber isolation mounting feet are well worth the money. Otherwise, a rubber pad will work.

#3 **Follow the correct motor/generator wiring diagram...** For 240 volt operation, pair up the following leads: (1&7, 2&8, 3&9) each pair gets connected to one of the T1, T2 or T3 output lines. Leads 4,5 & 6 are bolted together as one electrical point and then insulated. See page 4.

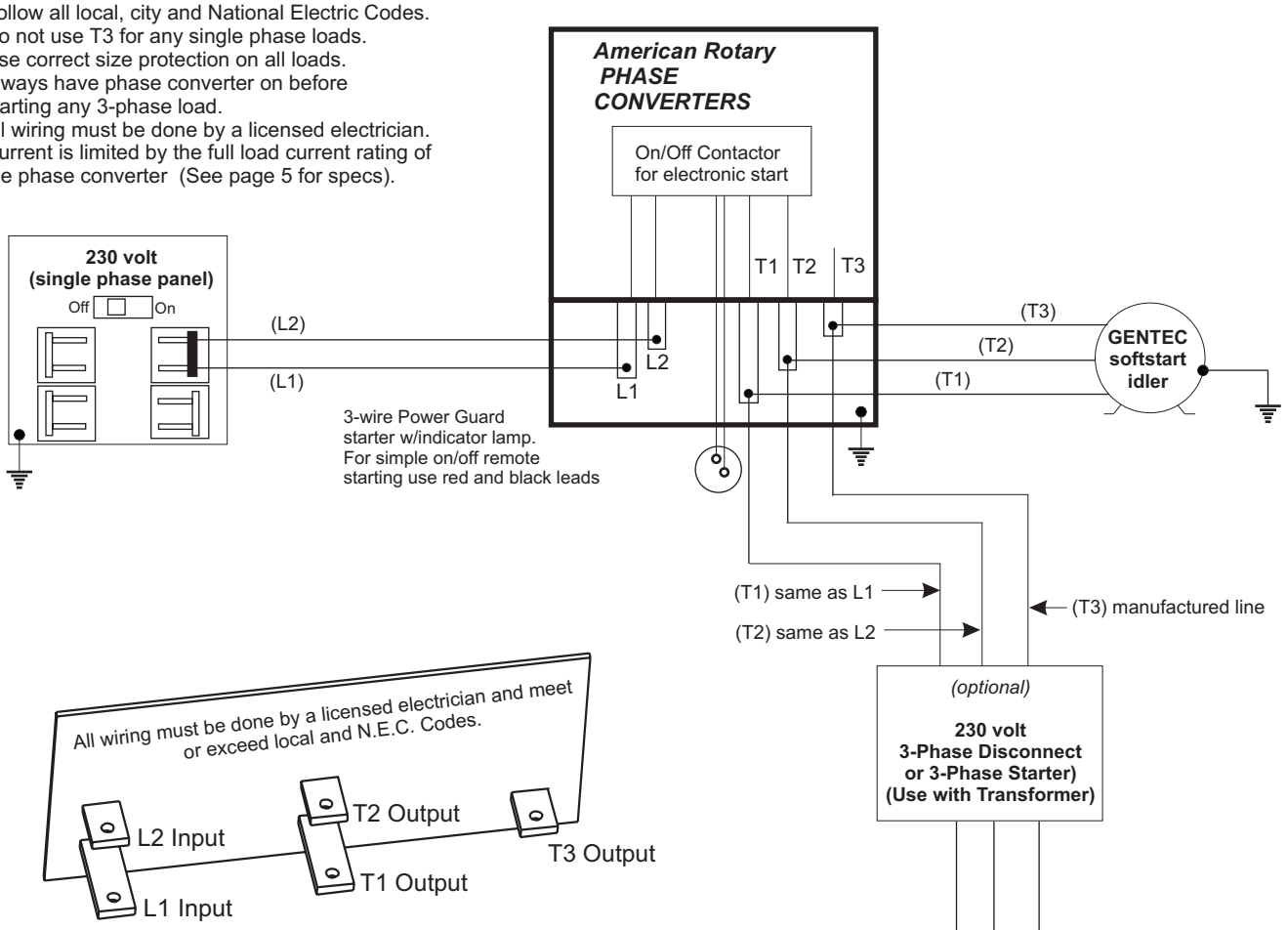
#4 **Fine tune your voltage...** First hook up the pairs (1&7, 2&8, 3&9) to T1, T2 and T3. Measure and record your line to line voltage (T1 to T2, T1 to T3, and T2 to T3). Now hook the pairs in the order of T1, T3, T2 and record the line to line . voltage. Finally hook the pairs in the order of T2, T3, T1 and record the voltage. One of these combinations will give the best line to line voltage balance.

#5 **Voltage to ground...** Lines T1 and T2 are the same as L1 and L2, your single phase lines. They will read approximately 120 volts to ground (earth ground). T3 references a floating ground and will somewhere between 190 and 210 volts to ground. This is normal. Make sure all controls run from either L1 and L2 or T1 and T2.

#6 **Delta Voltage...** All phase converters produce a Delta voltage which is a line to line voltage. If a four-wire Wye voltage output is needed, a Delta-Wye three phase transformer is needed. American Rotary has these transformers in stock.

1. WIRING DIAGRAMS

1. Follow all local, city and National Electric Codes.
2. Do not use T3 for any single phase loads.
3. Use correct size protection on all loads.
4. Always have phase converter on before starting any 3-phase load.
5. All wiring must be done by a licensed electrician.
6. Current is limited by the full load current rating of the phase converter (See page 5 for specs).



Single Phase Input

(from source to panel)

L1 & L2

HP	1-Phase Breaker Range	Recommended (copper wire)
3	10-20	12
5	10-30	10
7.5	15-40	8
10	20-50	6
15	20-80	4
20	30-100	2
25	40-125	1/0
30	50-160	2/0
40	60-200	4/0
50	75-250	300MCM
60	100-300	350MCM

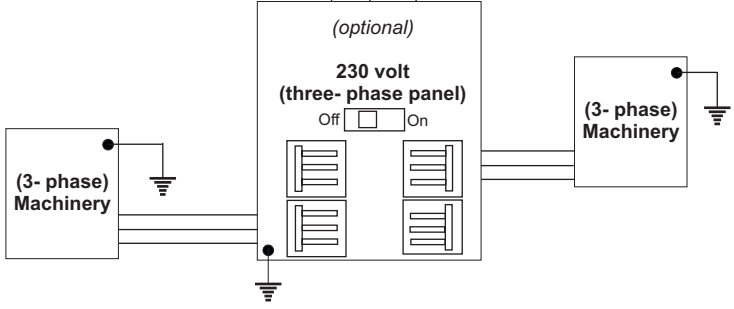
* breaker size = 2 x three-phase amps

Three Phase Output

(to idler & load. See #4)

T1, T2 & T3

HP	3-Phase Amp (Maximum)	Copper Wire (to idler & load)
3	9.5	12
5	15	12
7.5	22	10
10	28	10
15	42	8
20	54	6
25	68	4
30	80	3
40	104	2
50	130	1/0
60	154	2/0



1. T1, T2 & T3 output to Idler Motor **AND** Load
2. T1, T2 to ground = 120V, T3 to ground = 190-220V
3. Wire sizes are MINIMUMS for proper operation
4. Increase wire size one gauge for every 50 feet
5. Controls must feed from T1 & T2 (including CNC)
6. Try different combinations of T1, T2 & T3 to Idler Motor for best voltage balance

3. INSTALLATION PICTURES (for more pictures, visit www.AmericanRotary.com)

1. Remove cover and backplate from the enlosure.

Set aside the cover, backplate and lock nuts.

2. Mount enclosure to wall or other suitable structure with (4) 1/4 inch fasteners.

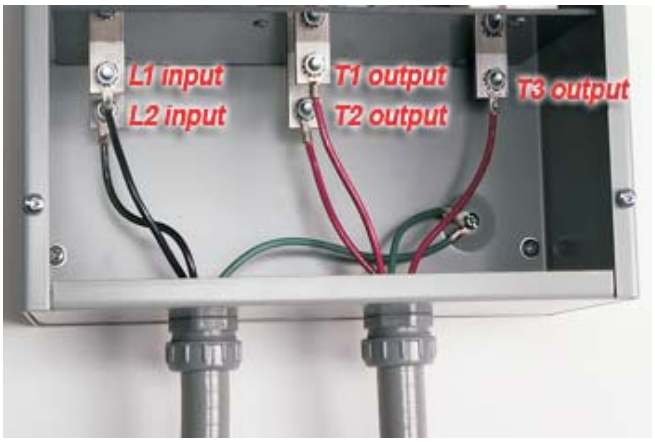
Drill or punch holes for conduit fittings.

3. Pull wires through conduit. Leave enough wire for connecting to busbars. Terminate wires with a ring lug that takes a 1/4 inch bolt.

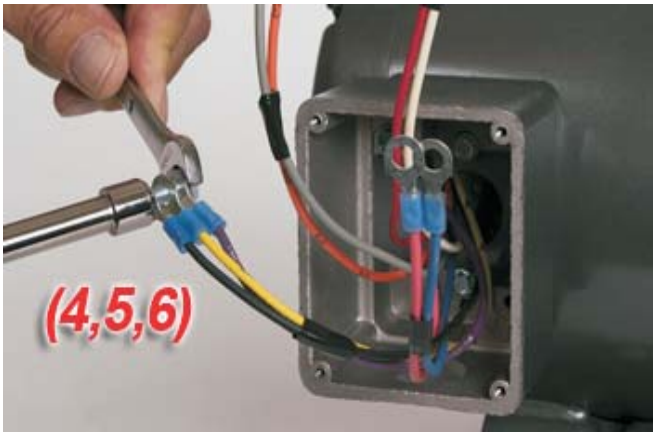
4. Secure backplate to back of enclosure by hanging it on the 1/4 inch studs and threading on the 1/4 inch lock nuts.

6. Terminate motor side wiring with ring lugs that take a 1/4 inch bolt. Bolt these wires to motor lead pairs (1,7) (2,8) (3,9). Insulate connections.

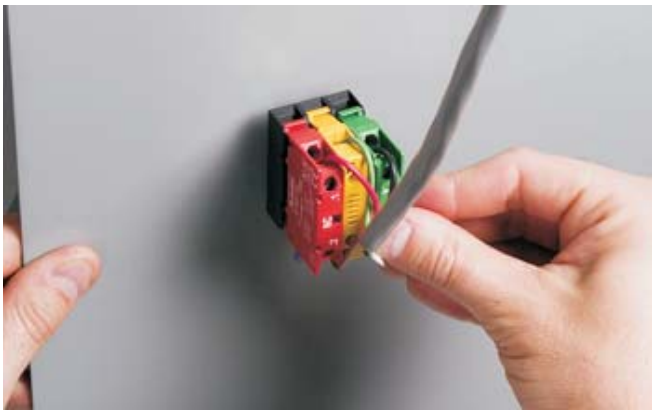
8. Just to make it easier, hang the enclosure upside down with the buttons facing the wall.



5. Bolt the wire terminals to the busbars using the 1/4 inch bolts and nuts provided. Ground the enclosure. If terminals come closer than ½ inch to each other, insulate them.



7. Bolt motor leads (4,5,6) together. Insulate this connection with electrical tape or heat shrink tubing.



9. Snap the red yellow and green switch terminals into the switch receptical on the back side of the cover. Red on the left with the cover hanging upside down as in **#8**.

4. CIRCUIT AND WIRE SIZING

HP	1-Phase Breaker Range	Recommended (copper wire)
3	10-20	12
5	10-30	10
7.5	15-40	8
10	20-50	6
15	20-80	4
20	30-100	2
25	40-125	1/0
30	50-160	2/0
40	60-200	4/0
50	75-250	300MCM
60	100-300	350MCM

HP	3-Phase Amp (Maximum)	Copper Wire (to idler & load)
3	9.5	12
5	15	12
7.5	22	10
10	28	10
15	42	8
20	54	6
25	68	4
30	80	3
40	104	2
50	130	1/0
60	154	2/0

These wire sizes are the minimum for proper operation. N.E.C. Code requires that the single phase branch circuit (including wire) be sized to 2.5 times the 3 phase load current. This may increase the wire size needed to meet code. Multiply your three phase current by 1.73 to get the single phase current.

The maximum three-phase current is roughly half of the single phase current available, therefore if a 100 amp single phase service is used, no more than about 50% or 50 amps will be able to be supplied as three phase.

Size the three phase wire (from the panel to the generator and from the panel to the load) to a minimum of the size shown in the table above.

5. MAINTENANCE

American Rotary Phase Converters only require occasional lubrication.
Exxon Polyrex EM high temperature bearing grease or equivilent polyurea lubricant is recommended for the GENTEC/Baldor generator.

The bearings come pre lubricated and will typically last the lifetime of the converter. For converters that are run continuously or in extreme heat, moisture or with limited ventilation, occasional lubrication may be required.

Frame	HP Range	Hours running	Grease Type
210	3-5	12000	Polyrex EM
210-280	7.5-20	9500	Polyrex EM
280-360	25-50	7400	Polyrex EM
>360	60 & larger	3500	Polyrex EM

Be careful not to force so much grease into the bearings that the excess finds its way into the windings of the motor/generator. If you grease the bearings several times, the grease may build up and work its way into the windings. Removal of excess grease before greasing may be necessary.

Do not use Lithium based lubricants. These may cause premature bearing failure.

American Rotary's GENTEC/Baldor generator has sealed bearings and windings for longevity. It is important to reduce dust and debris from building up around a motor generator. In the case of TEFC motors, dust and debris can accumulate on the exterior fins, causing over heating and premature failure of windings and bearings. In the case of ODP motors, the bearings and windings may not be protected from dust and debris entering the motor, inhibiting proper cooling and again causing premature failure. American Rotary's GENTEC/Baldor generator successfully addresses these concerns with sealed windings and bearings, rodent screens and fully guarded louvers. To optimize cooling, keep all debris, dust and water clear of the unit.

6. TROUBLE SHOOTING

1. Machine does not seem to have enough power to start. A,B,C,K,M
2. Converter does not start. It makes a growling sound. B,C,D,E,N,M
3. Converter does not start. Absolutely nothing happens. C,D
4. Converter does not have a smooth quiet sound. D,F
5. My machine runs backwards. E,H
6. I blew a start capacitor on start-up. O,N
7. The Idler has a squealing noise. F,G
8. The Idler is very hot. G
9. My machine has contactors that are clicking or lights that are flickering. H
10. My CNC machine kicks out when I start the spindle. H,I
11. My voltage is too high. J
12. My voltage is too low. K
13. My voltage balance is not as good as I want. E,J,K
14. I measure 120 volts from T1 and T2 to ground, but not from T3 to ground. L

Answer A. Check to make sure your converter is big enough. If not, a second converter of equal size can be installed in parallel to your converter to double its size. Ask about our Autolink

Answer B. Make sure your wire is big enough. Use the minimum wire size on the front of this page. Go up at least one size for every 50 feet of run. Wire may need to be upsized for hard loads.

Answer C. Check the connections. L1 and L2 are the single phase input and should measure 240 volts from line to line. These lines measure 120 volts line to ground.

Answer D. Check to make sure the Idler is hooked up for low voltage (208-240 volts) Make sure lines 4,5 & 6 are electrically tied together and then insulated.

Answer E. By switching any two of the three output lines to the Idler, the direction can be reversed Trying different combinations of T1, T2 and T3 will result in a slightly varying voltage balance

Answer F. Although small, the vibrations caused by the Idler can resonate depending on how it is mounted. Never bolt the motor to a rigid structure. Visit www.AmericanRotary.com

Answer G. The GENTEC/BALDOR Idlers are rated up to 150 degrees C. It may be normal for them to run hot. High current on one or more line may also cause them to run hot. A good voltage balance means a good current balance.

Answer H. All controls should be run from T1 and T2 (the single phase lines). These lines do not fluctuate voltage as much as T1 to T3 or T2 to T3. If your machine does not have these clearly marked, try different combinations of T1, T2 and T3.

Answer I. You are probably getting a low voltage error. Slow the acceleration down on the spindle in order to reduce the inrush current.

Answer J. First check your single phase input voltage. The phase converter output voltage is based on the single phase input voltage. To lower your voltage, remove run capacitors from across T1 to T3 and or T2 to T3. Call American Rotary for assistance.

Answer K. First check your single phase input voltage. The phase converter output voltage is based on the single phase input voltage. To raise your voltage, extra capacitors can be added across T1 to T3 and or T2 to T3. Call American Rotary for assistance.

Answer L. T3, the manufactured line references a floating ground. Voltage from T3 to ground usually is between 190 and 220 volts. This is correct. The output of a phase converter is a Delta three phase voltage. If a neutral or 120 volts to ground is needed from all three lines, a Delta-Wye transformer is needed. American Rotary stocks the correct transformers for this.

Answer M. You may need a bigger service. Everything may be big enough on your end, but sometimes the power company's transformer is not big enough. Call your power company for service.

Answer N. Adding start capacitors can help get a motor started. Please contact American Rotary for help

Answer O. Blowing a start capacitor is a result of too frequent starts, or having a load on when starting. Make sure all loads are disconnected when starting including transformers.

American Rotary Converter
LIMITED WARRANTY
ROTARY PHASE CONVERTERS

During the time periods and subject to the conditions hereinafter set forth, **American Rotary Converter (ARC)** will repair or replace to the original user or consumer any portion of your new **ARC product which proves defective due to defective materials or workmanship of ARC.** Contact your nearest authorized **ARC** dealer for warranty service. At all times **ARC** shall have and possess the sole right and option to determine whether to repair or replace defective equipment, parts or components. Damage due to equipment, environment or conditions beyond the control of **ARC**are NOT COVERED BY THIS WARRANTY.

WARRANTY PERIOD

Converter Boxes: 24 months from the date of purchase.

Generator Motors: 24 months from date of purchase.

Voltage Stabilizers & Autolinks: 24 months from date of purchase.

LABOR, COSTS: ARC shall IN NO EVENT be responsible or liable for the cost of field labor or other charges incurred by any customer in removing and/or reaffixing any **ARC** product, part or component thereof.

THIS WARRANTY WILL NOT APPLY: (a) to defects or malfunctions resulting from failure to properly install, operate or maintain the unit in accordance with printed instructions provided; (b) to failures resulting from abuse, accident, or negligence; (c) to normal maintenance services and the parts used in connection with such service; (d) to units which are not installed in accordance with applicable codes, ordinances and good trade practices; or (e) to unit used for purposes other than for what it was designed and manufactured, and (f) if three phase motors or any motors other than **ARC** supplied motors are connected to the converter box.

RETURN OR REPLACED COMPONENTS: any item to be replaced under this Warranty must be returned to **ARC** at Port Washington, Wisconsin, or such place as **ARC** may designate, freight prepaid. All returns are subject to a minimum 25% restocking charge plus the cost of replacement parts and labor as determined by American Rotary.

PRODUCT IMPROVEMENTS: ARC reserves the right to change or improve its products or any portions thereof without being obligated to provide such a change or improvement for units sold and /or shipped prior to such change or improvement.

WARRANTY EXCLUSIONS: as to any specific **ARC** product, after the expiration of the time period of the warranty applicable thereto as set forth above. THERE WILL BE NO WARRANTIES, INCLUDING ANY IMPLIED WARRANTIES OR MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. No warranties or representations at any time made by any representative of **ARC** shall vary or expand the provisions hereof.

LIABILITY LIMITATION: IN NO EVENT SHALL ARC BE LIABLE OR RESPONSIBLE FOR CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES RESULTING FROM OR RELATED IN ANY MANNER TO ANY **ARC** PRODUCT OR PARTS THEREOF. **ALL INSTALLATION MUST BE PERFORMED BY A LICENSED ELECTRICIAN.**

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This Warranty gives you specific legal rights and you may also have other rights which vary from state to state. In the absence of other suitable proof of this installation date, the effective date of this Warranty will be based upon the date of manufacture plus one year. Direct All Notices To: Warranty and Product Service Department, GENTEC/American Rotary Converter, 215 South, Park Street, Port Washington, Wisconsin, 53074.

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