

PhāzR

Three-Phase Power Analysis and Direction of Rotation

Operation Manual



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Specifications

Maximum Input Voltage	600 Volts AC
Unit Size	6.5"L. x 4.5"W. x 2.25"H.
Unit Weight	13 oz.
Warranty	One Year Limited Warranty
Battery Life (9V Alkiline)	About 300 Tests
(Not including shelf life. Each test ~ = 2 minutes.)	

This manual has information to help you safely use your *PhazR* to test 3-Phase voltages. Please read it completely before using your tool.

Safety Information

Electricians and Technicians everywhere have the highest respect for the potential of 3-Phase voltages to harm or kill. Use the utmost caution when working with high voltages, including when using this tool.

- **Always** start by hooking the Green Safety Ground wire to a ground connection first.
- Never connect any lead from this tool to any connection if there is power in excess of 600 Volts present in the cabinet or connection box.
- Inspect this tool before each use: If any part of the tool (including, but not limited to case; wire insulation; connection clips; or connection clip insulators) becomes damaged, loose, broken, or frayed, discontinue use of the tool until repaired or replaced.
- When finished, first turn the unit OFF. Next, disconnect the phase input leads. Finally, disconnect ground lead LAST.

Safety (continued)

- When connecting the ground and input leads, keep your fingers well away from the alligator connection clips and the electrical connection points. Use electrically insulated gloves when making these connections.
- Disconnect all leads before opening the case to replace the battery. Never use the tool unless completely and properly assembled.
- Never use the tool if it is wet, or has become wet. If your *PhazR* has become wet, disassemble it, dry it thoroughly, and inspect it completely before using.

Be Careful!

Using Your PhazR

The *PhazR* gives you important information about the quality of the 3-phase power you are using when servicing equipment. It displays:

- Phase Order: either A-B-C or C-B-A rotation
- Phase Balance: if each leg's voltage is within 3.5% of each of the other legs' voltage
- 'Pseudo-Phases': when 2 or more of the phases are actually the same phase angle

The *PhazR* is normally connected to the incoming 3-phase lines at the contactor or safety switch for the equipment. This way, you will know the phase order *before* energizing any equipment which might not tolerate reverse phase order, like some newer compressors. This method also allows you to wire in fans, motors, and compressors properly *the first time*, without having to energize and observe; and then possibly reverse the wiring.

Using (continued)

The *PhazR* uses visual and audio indicators to help you determine the quality of the 3-phase power under different conditions. The LED's and the Beeper have *specific patterns and codes* that help you determine if the equipment is wired properly before energizing.

The *PhazR* beeps once every few seconds whenever the switch is in ON-BEEPS as a reminder for you to turn the unit OFF when finished. The ON-SILENT position is for times where audio responses would be undesirable.

Keep the leads stored inside the latched case when not using your *PhazR* to give your tool long life and protect its parts from damage.

DO NOT remove the 4 screws from the front of the case to access the battery; instead, remove the 2 screws "hidden" (countersunk) on the sides of the case. The panel and circuit board will not easily come out or go back in to the case if you remove the 4 panel screws.

Hook-Up

Before hooking your *PhazR* up to a 3-phase voltage source, first MAKE CERTAIN that there is no voltage over 600 VAC present in or near you or the tool. Proceed only if certain.

When hooking up the leads to the proper terminals, keep your fingers and hands back from the exposed alligator clips. Wear electrically insulated gloves when using the *PhazR*.

For safety's sake, first securely attach the ground wire to a good earth/electrical ground. Turn on the *PhazR*. It will beep once every second. Next, attach the RED lead to the terminal that you think is the "A" phase. *PhazR's* "A" LED should light and the beeps will get faster. After you attach the WHITE lead to what you think is the "B" terminal, the "B" LED should light and the beeping gets faster yet. Finally, after attaching the BLUE lead to the last terminal, the "C" LED should light and the beeps (if selected) will sound a response for the results of the power's quality tests.

LED & Beep Responses

As each lead is connected to proper 3-phase voltage sources (from 100-575 Volts AC), its corresponding Phase LED will light to indicate that a voltage is present on that leg.

If **ON-BEEPS** is selected, beeping will speed up as each of the three Phase LED's light up until, when all three Phase LED's are lit, the beeping will either:

- (1) Be silent, meaning the quality of the voltage has **failed** one or more tests. - or -
- (2) Be a continuous tone, indicating the voltage quality has **passed** all the tests made by the *PhazR*, and phase order is clockwise (or Normal, or A-B-C). - or -
- (3) Be a pattern of three beeps, indicating the voltage quality has **passed** all the tests made by the *PhazR*, and phase order is counter-clockwise (Reversed, or C-B-A).

When 3 phases are present, the Phase LED's will chase each other either in a CW direction (A-B-C order) or CCW direction (C-B-A order).

Error Codes

When all three phases are connected, a test is performed to see if each phase's voltage, as compared to each of the other phase's voltages, are all within 3.5% of each other. The **CHK** LED lights to indicate voltages out of range, otherwise the **OK** LED will light. The test may take about 5 seconds after the third phase is connected to report any errors. Because of some phase configurations, this should be verified with an accurate voltmeter as to just how out-of-balance the legs actually are. The error code only tells you it's above 3.5%. Out-of-balance voltages are responsible for premature motor and compressor failures, overheating, and waste electricity.

A less common error code is when two (or more) of the phase LED's flash simultaneously. This pattern says that those legs are actually the same source (Pseudo-Phasing.) This might be caused by improper building wiring, or if one phase is disconnected from its source, and another phase is feeding back through that leg. (Might happen if only 1 of 3 breakers tripped.)

Battery Replacement

The battery is getting weak when the 'ON' LED starts flashing. You may still be able to perform a few tests, but replace the battery soon.

SAFETY WARNINGS! (1) *Disconnect every lead from a power source before replacing the battery. Never connect any lead to any power when the PhazR is not completely assembled.* (2) *The battery must be resting in its padded area inside the case when re-assembled. If it is not, the battery will be able to slide around and the battery's metal case will contact the bottom of the circuit board, and will cause shorts, and probably RUIN YOUR TOOL. It might also contact the internal high-voltage connections, causing a safety hazard.*

DO NOT open the case by removing the 4 screws from the front panel! It's very difficult to remove the panel and circuit board that way. INSTEAD - remove the 2 screws in the sides of the plastic case (they are countersunk into the plastic.) When finished installing a new battery, re-align the holes and then replace the screws.

DO NOT disassemble the tool by removing the four faceplate screws. Instead, follow the instructions under “Battery Replacement”.

Be careful when disassembling the *PhazR*. IC’s inside the *PhazR* are sensitive to static charges that might occur if they are touched. Before any disassembly, disconnect all inputs.

If you will not be using the tool for months, disconnect and remove the battery. Install a fresh battery when ready to put the tool back into service again. A partially discharged battery can leak acid or alkali compound into the *Phazr*, possibly ruining it. Protect your tool with a fresh battery whenever necessary.

Please visit our website for useful hints and to see our other quality tools and products. (www.Zebralnstruments.com)

One Year Limited Warranty

For a period of one year from the original end-user's date of purchase, Zebra Instruments warrants that this tool is without manufacturing defects. Should you encounter any problems, please contact us and we will attempt to resolve your problem as quickly as possible. This resolution may include replacement, exchange, or repair of a defective tool; at our option. This warranty does not apply to tools that have been exposed to: voltages and/or currents that are higher than those specified in this manual; abuse or rough handling; any damage to connectors, or damage from moisture or exposure to chemicals. Out-of-warranty repairs are available for a nominal charge plus shipping. Please contact us for an RMA (return authorization number) before returning a tool for repair.

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