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The White Rubber Corporation

Operating Instructions
PD80OW
Cordless Phasing Tester

Bierer Patent No. 6,617,840 B2 and 6,734,658. Other patents pending.

CAUTION

The equipment covered in these operating instructions should be used by qualified employees, trained in and familiar with the safety-related work practices, safety rules and other safety requirements associated with the use of this type of equipment. These instructions are not intended as a substitute for adequate training, nor do they cover all details or situations which could be encountered in relation to the operation of this

WARNING

Use appropriate length live line tool for voltage being worked and maintain minimum approach distances as outlined in OSHA 1910.269,Table R-6. Do not let live line tool fittings become grounded in any way. This may damage the equipment

Meter housing shall be considered **non-insulating.** Meter should NOT be used as an insulating tool. The high voltage probe assemblies shall be wiped clean prior to each use with a silicone impregnated cloth and kept clean and free of contaminates to prevent tracking on the outside of the probe, which could affect the accuracy of the meter and/or failure;

NOTICE

Before operating this equipment, read, understand and follow all instructions contained in this manual. Keep instructions with equipment.

CONTENTS

DESIGN AND FUNCTION

The cordless PD80OW is designed to operate similar to a conventional phasing tester, but is easier to use because it does not require an interconnect cable. The unit consists of a Reference Probe (transmitter) and a Meter Probe (receiver) and will operate reliably at distances up to 70 feet. The phasing tester is useable from 240V to 8OOkV.

Each unit has a five-position switch for the following functions:

- Off – Unit off for storage or transport.
- Deg - Phase angle measurement in degrees for use on Secondary, URD and Overhead.
  Direct contact from 240V to 69kV **(including capacitive test points).**
  Non-contact from 69kV to 800kV (without the use of extension resistors).
- URD – Phasing Underground Residential Distribution with Voltage Indications.
  Direct contact from 4kV to 35kV **(not for capacitive test points).**
- OH – Phasing Over-Head conductors with voltage indications
  Direct contact from 4kV to 69kV.
- T – Tests basic meter function and displays the internal 9V battery voltage.

Voltage indications and degree readings are supplemented with phase indicator lights on the Meter Probe for dual confirmation of the phase relationship between the Reference Probe and Meter probe.

- **White** - indicates an in-phase condition.
- **Blue** - indicates out-of-phase condition of 120 degrees.
- Red - indicates an out-of-phase condition of 240 degrees.
- **Yellow "DY"-** blinking light indicates a Delta/Wye transformation (30 degree phase shift) in conjunction with one of the other three phase indicator lights.

Note 1: For best results, always hold the Reference Probe and Meter Probe perpendicular to the conductors being tested and away from all other conductive surfaces such as adjacent phases, neutrals and grounded structures. Maintain a minimum distance of two feet between the body of the probes and all other conductors or grounded surfaces. Maintain a minimum distance of two feet between your hands and the body of the probe regardless of the voltage being tested. Never hold the tester with rubber gloves when in use.

Note 2: When phasing on URD transformer bushings use 8128TBALB Bushing Adapters on both the Reference and the Meter Probe.

SET UP - TESTING and INSPECTION

Testing the Meter Probe:
The Meter Probe completes a self check each time the selector switch is moved from one position to another. It displays the number 510 +/- 5 (full scale) and blinks 0, 120, 240 phase sequence indicator lights followed by a blinking DY (Delta/ Wye Transformation) indicator light.

Test:
The internal 9V battery voltage may be checked by turning the rotary selector switch to the T position and holding for several seconds until the indicator lights stop blinking. If the battery voltage displayed is less than 8 volts, shown on the meter as 80, the battery should be replaced. A standard 9 volt battery is located behind the live line tool attachment.

Testing the Reference Probe:
Turn the Meter Probe selector switch to the URD or OH position. The results of the Reference Probe self checks will be displayed on the Meter Probe. Each time the selector switch on the Reference Probe is moved from one position to another, the number 51 0 will be displayed on the Meter Probe for several seconds.

Test:
The internal 9V battery is checked by turning the selector switch to the T position and holding for several seconds. The internal battery voltage of the reference will be displayed on the Meter Probe. If the battery voltage displayed on the Meter Probe is less than 8V, shown on meter as 80, the battery should be replaced. A standard 9 volt battery is located behind the live line tool attachment.

Physical Inspection:
Both the Reference Probe and Meter Probe should be clean and free of dirt, grease and other contaminants. The unit should not be used if any portion of either the Meter Probe or the Reference Probe is cracked or damaged in any way.

Battery Replacement
A standard 9 volt battery is located behind the 5/8" x 1 1 " threaded live line tool fitting on the probe housing. Two flat edges are furnished for use with a wrench or slip joint pliers to remove and install the fitting from the probe housing. To avoid damaging the antenna, it is recommended that the antenna be removed prior to unscrewing the live line tool fitting from the housing to remove the antenna, rotate counter clockwise and reinstall finger tight.

PHASE ANGLE MEASUREMENTS
Direct Contact from 240V to 69kV
Including Capacitive Test Points

1. Inspect and test the PD800W as described in the Meter Setup Section, Page 2.
2. Attach the Reference and Meter Probe to the appropriate length live line tool for the voltage being tested. Minimum 2 feet (See Note 1 on Page 1).
3. Set the selector switch on both probes to the Deg position.
4. With the Reference Probe, touch all conductors one at a time to verify all of the phases are energized. (See Note 2 on Page 1).
5. The White phase indicator light will be on if there is at least 240 volts present on the conductor.
6. Touch both the Reference Probe and the Meter Probe to a single (the same) energized conductor. The Meter Probe should indicate near zero degrees on the digital display and show a White zero degree indicator light. Two White lights on both probes indicate an in phase condition. (See Note 2 on Page 1).
7. Leave the Reference Probe on the first energized conductor. Touch the Meter Probe to another energized conductor.
8. If the conductors are in phase, the Meter Probe should indicate near zero degrees on the digital display and show a White zero degree indicator light.
9. If the conductors are out of phase, the Meter Probe will indicate either of the following:
    a. Nominal 120 degrees and a Blue 120 degrees indicator light or
    b. Nominal 240 degrees and a Red 240 degrees indicator light.
10. Retest PD800W as described in the Meter Setup Section, Page 2.

Delta/ Wye Transformation

The PD80OW provides an additional feature of flagging a Delta Wye Transformation with a blinking yellow indicator light labeled "DY'.
Expected phase angles when phasing a three-phase system are 0 degrees, 120 degrees, and 240 degrees. The PD800W continuously monitors all phase angles between the Reference Probe and the Meter Probe when used in either the **Deg, URD, or OH** mode. If the phase angle deviates more than +/ - 20 degrees from any of the three expected values of 0, 120, or 240 degrees the Yellow "DY" light will blink.

WARNING: When in operation the selector switches on the Reference Probe and Meter Probe must be in the same position. Failure to do so could produce false readings, resulting in equipment damage and/or personal injury. Always check the selector switch on both units before and after each use.

PHASE ANGLE MEASUREMENTS
Non-Contact from 69kV to 800kV
Without Extension Resistors

1. Inspect and test the PD800W as described in the Meter Setup Section, Page 2.
2. Attach the Reference and Meter Probe to appropriate length live line tools for the voltage being tested. Minimum 2 feet (See Note 1 on Page 1).
3. Select the OH position on the Reference Probe.
4. Bring the Reference Probe to a distance from each conductor that is close to the minimum approach distance for the voltage being tested to verify all conductors are energized. **(See OSHA 191 0-269, Table R-6 for** a minimum approach distance).
5. The White phase indictor light will be on if the electric field present at the minimum approach distance equals at least 600 volts.
6. Reset the **selector switches on both probes to the Deg position.**
7. Bring both the Reference Probe and Meter Probe close to the minimum approach distance of a single (the same) conductor. The Meter Probe should indicate near zero degrees on the digital display and show a White zero degree indicator light. White lights on both probes indicate an in phase condition.

NOTE 3: On lines 69kV to 600kV the Reference Probe may be suspended from the conductor with optional insulated support hook attachment PD800SH2. Above 600kV use PD800SH4. Meter Probe must be used in non-contact mode as described above in No. 7.

8. Leave the Reference Probe in position with the first conductor. Bring the Meter Probe close to the minimum approach distance of another energized conductor.
9. If the conductors are in phase, the Meter Probe should indicate near zero degrees on the digital display and show a White zero degree indicator light.
10. If the conductors are out of phase, the Meter Probe will indicate either of the following:
    a) Nominal 120 degrees and a Blue 120 degrees indicator light or
    b) Nominal 240 degrees and a Red 240 degrees indicator light

1 1. Retest the PD800W as described in the Meter Setup Section, Page 2.

WARNING: When in operation the selector switches on the Reference Probe and Meter Probe must be in the same position. Failure to do so could produce false readings, resulting in equipment damage and/or personal injury. Always check the selector switch on both units before and after each use.

TESTING PHASE SEQUENCE

Phase sequence will be either:

(1 -2-3)	or	(3-2-1)
(A - B - C)	or	(C - B -A)

Phase sequence is the order in which the voltages of a three phase system rise and fall. Only two sequences are possible, sometimes referred to as Clockwise or Counter Clockwise rotation. However, three different physical connections are possible to achieve each sequence. Any one of the phases of a three-phase system may be assigned the status of leading phase. This convention is currently

Sequence: (1 - 2 - 3)

(A - B- C)	A-B-C	A-B-C-A-B-C-A-B-C
	or B-C-A	B-C-A-B-C-A-B-C-A
	or C-A-B	C-A-B-C-A-B-C-A-B

Sequence: (3 - 2 - 1)

(C -B - A)	C-B-A	C-B-A-C-B-A-C-B-A
	or B-A-C	B-A-C-B-A-C-B-A-C
	or A-C-B	**A-C-B-A-C-B-A-C-B**

Procedure:

1. Inspect and test the PD800W as described in the Meter Setup Section, Page 2.
2. Attach the Reference Probe and the Meter Probe to the appropriate length live line tools for the voltage being tested. (See Note 1 on Page 1).
3. Set the selector switches on both probes to the Deg position.
4. Touch or approach “1" ("A") phase with the Reference Probe.
5. Touch or approach "2" ("B") phase with the Meter Probe.
6. Sequence (1 - 2 - 3)
   (A - B - C) will be indicated by an nominal 120 degrees on the digital display and a Blue 120 degree indicator light.
7. Sequence (3-2-1)
   (A - B - C) will be indicated by a nominal 240 degrees on the digital display and a Red 240 degree indicator light.
8. Retest the PD800W as described in the Meter Setup Section, Page 2.

WARNING: When in operation the selector switches on the Reference Probe and Meter Probe must be in the same position. Failure to do so could produce false readings, resulting in equipment damage and/or personal injury. Always check the selector switch on both units before and after each use.

VOLTAGE INDICATIONS URD and OH

Direct Contact from 4kV to 69kV

(Does not include Capacitive Test Points)

By design, the PD80OW consists of two individual direct contact voltage detectors which communicate with each other via a radio link. When used to display voltage in the URD or OH positions, the readings are a composite of the actual voltage on the line and the capacitive coupling between the live line tool fitting (quick change, universal, or grip all) to other potentials in the vicinity.

If the live line tool fitting is close to another phase, ground or other voltage source, the reading will be higher than normal. If the live line tool fitting is close to conductors or equipment of the same phase, the reading will be lower than normal. In the PD80OW, the phase to phase voltage indications are derived from
the two phase to ground voltages present on the Reference Probe and the Meter
Probe. The resulting phase to phase reading will be proportional to the phase to

Example: If due to field conditions both the Reference Probe and Meter Probe sense 9kV phase-to-ground on a 7.2kV phase to ground system, the phase-to-phase indication would be 16kV rather than 12.4kV. In this example, the meter is
simply indicating that the two conductors are out of phase. The out of phase

Note 4: Higher than normal reading in the OH position can sometimes be lowered closer to normal by retesting in the URD position, especially when

Inspect and Test the Unit. Attach the Reference Probe and/or the Meter Probe to the appropriate length live line tool for the voltage being tested. Minimum 2 feet. (See Note I on Page 1).

1. Phase-to-Phase Voltage Indication - Direct Contact from 4kV to 69kV Does not include Capacitive Test Points

Normal phase-to-phase voltage indications may be obtained in the URD or OH position by touching one energized phase conductor with the Reference Probe and another energized phase conductor with the Meter Probe. (See Note 1 on Page 1).

2. **Zero-Voltage Indication - Direct Contact from 4kV to 69kV Does not include Capacitive Test Points**

Normal zero-voltage indication may be obtained in the URD or OH position by touching the Reference Probe and Meter Probe to energized conductors of the same phase and voltage. (See Note 1 on Page 1).

WARNING: When in operation the selector switches on the Reference Probe and Meter Probe must be in the same position. Failure to do so could produce false readings, resulting in equipment damage and/or personal injury. Always check the selector switch on both units before and after each use.

VOLTAGE INDICATIONS URD and OH (cont'd.)

Direct Contact from 4kV to 69kV

(Does not include Capacitive Test Points)

3. Phase-to-Ground Voltage Indication - Direct Contact from 4kV-to-69kV Does not include Capacitive Test Points

The Meter Probe may be used in the URD or OH position as a stand alone digital voltage detector to obtain a phase-to-ground voltage indication by touching the energized conductor directly. When using the Meter Probe in this manner, the Reference Probe must be switched off and should be stored in the padded box.

4. Reference Probe as a Voltage Detector - Direct Contact from 240V to 69kV Including Capacitive Test Points

The Reference Probe may be used as a stand alone voltage detector by touching the energized conductor or capacitive test point directly. The **White** indicator light will be on if the voltage is equal to or greater than the threshold values below **(See Note 1 on Page 1).**

a) **Deg** position: 240V

b) URD or OH position: 800V

Use (a) above for capacitive test points and voltages up to 480V and use (b) above for voltages 600V-to-69kV

5. Non-Contact from 69kV to 800kV

The Reference Probe may be used as a non-contact stand alone voltage detector.The presence of an electric field at the minimum approach distance will cause the **White** indicator light to come on. **(See OSHA 1910.269, Table R-6 for minimum approach distance).**

Deg	Position Electric field greater than 120V at the minimum approach distance.
URD or OH	Electric field greater than 800V at the minimum approach distance.

INSTRUCTION TO THE USER (if device contains a digital device)

This equipment has been tested and found to comply with the limit s for a class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

*Reorient or relocate the receiving antenna.
*Increase the separation distance between the equipment and receiver.
*Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
*Consult the dealer or an experienced radio/TV technician for help.

The user is cautioned that changes and modifications made to the equipment without the approval of manufacturer could void the user's authority to operate this equipment.

FCC COMPLIANCE INFORMATION STATEMENT

Trade Name: **Cordless Phasing Tester**
Model Number: **PD800W**

Compliance Test Report Number:

Compliance Test Report Dates:

Responsible Party: **Bierer & Associates, Inc.**
Address: **1 1 142 Wilson Blvd., Blythewood, SC 29016**
Telephone: **803-786-4839**

This equipment (Meter Probe) has been tested and found to comply with limits for a Class B, RF Receiver pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular situation. If the unit does cause harmful interference to radio or television, please refer to the three steps listed above under "FCC Instructions to the User"

Jan F Kennerly Jr. - VP Engineering **Date:** _____

PARTS & ACCESSORIES

PART NO.	DESCRIPTION
8128OTBALB	15 -25kV Bushing Adapter
81280LHM	Hook Probe Adapter
81280LPM	Straight Probe Adapter
3403	Quick Connect to Universal Adapter
3402TH5811	Quick Connect to Grip All Adapter
10022CHL	Handle w/Threaded Ferrule and Cap (2 required*)
10022HHSL	Handle w/Threaded Ferrule and Ferrrule w/Stud (2 or 4 required*)
PD800ANT	Antenna for Reference Probe or Meter Probe
PD800SH2	Support Hook 2 ft., 69kV to 600kV
PD800SH4	Support Hook 4 ft., above 600kV

* Nominal one inch in diameter and two feet in length. Handle assemblies may be two, four or six feet in length.

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