

**Regulator Steps**  
Voltage to ground

16	2,500	5,000	7,620	13,800	14,400	19,920
15	250	500	762	1380	1440	1992
14	234	469	714	1294	1350	1868
13	219	438	667	1208	1260	1743
12	203	406	619	1121	1170	1619
11	188	375	572	1035	1080	1494
10	172	344	524	949	990	1370
9	156	313	476	863	900	1245
8	141	281	429	776	810	1121
7	125	250	381	690	720	996
6	109	219	333	604	630	872
5	94	188	286	518	540	747
4	78	156	238	431	450	623
3	63	125	191	345	360	498
2	47	94	143	259	270	374
1	31	63	95	173	180	249
N	16	31	48	86	90	125
S	0	0	0	0	0	0
1	16	31	48	86	90	125
2	31	63	95	173	180	249
3	47	94	143	259	270	374
4	63	125	191	345	360	498
5	78	156	238	431	450	623
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\*These values are approximate and will vary slightly with regulator loading and actual input voltage.

\*Contact resistance may prevent an actual 0 reading on the meter. Additional rubbing of the electrodes against the conductor or moving to a different location will aid in obtaining a zero or near zero reading (less than 5 volts), if the regulator is in the neutral position.

**SPECIFICATIONS & FEATURES**

**PHYSICAL/MECHANICAL**

**Size**

16" W x 8" L x 3.5" H

**Weight**

1.4 pounds without case

**Probes**

Stainless steel — will work on conductors with a spacing between 6 and 15 inches.

**Switch**

Single three position water resistant toggle switch (OFF - ON - ON with LIGHT)

**Operating temperature**

- 20 to 60 C (- 4 to 140 F)

**Storage temperature**

- 20 to 70 C (- 4 to 158 F)

**ELECTRICAL**

**Power Source**

9 volt battery

**Power drain**

11 milliamperes with meter only

125 milliamperes with meter and light

**Battery life**

40 hours with meter only

4 hours with meter and light

**Output**

3 1/2 digit .500 inch tall LCD with backlight

**Range**

0 to 1,999 volts

**INSTRUCTIONS**

for

**REGULATOR  
NEUTRAL  
DETECTOR  
(RND)**

(RND)

Cat. No. 6709-1

Patent No. 5,144,227



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# INSTRUCTIONS

## WARNING

This unit **must** be used in conjunction with an insulated hot stick. For the purpose of determining clearances, the RND must be considered conductive. Failure to do so could result in injury or death.

Do **not** use on system voltages above 35 kV phase to phase.

Verify which conductors are the Load, Source, and Neutral before testing.

Do **not** make contact between either of the phase conductors and the neutral.

Do **not** allow only one side of the probe of the RND to bridge the gap between any of the conductors or between the conductors and ground.

Do **not** attempt to measure phase to phase voltage with the RND.

The RND **must** be mounted on a universal stick of appropriate length to allow contact to be made between the RND electrodes and the regulator being tested. The stick **must** be long enough to meet OSHA and your utility's clearance requirements. For the purpose of determining clearance, the RND **must** be considered conductive.

Prior to testing, the conductors at the regulator **must** be identified. The RND is designed to test the voltage difference between the Source and Load conductors only. Contact with other conductors can result in a phase to ground fault.

The power switch has three positions, OFF, ON and ON WITH LIGHTED FACE. The RND will operate for about 40 hours in the ON position. Operating it in the ON WITH LIGHT position will reduce the battery life to approximately 4 hours. Low battery condition is indicated by the letters "BAT" appearing in the upper left hand corner of the display.



When this occurs the battery **must** be replaced.

Extremely cold conditions may affect the performance of the RND and the battery. The RND should not be stored in a location where the temperature will be below -20C (-4F).

The RND has encapsulated resistors in the molded end between the electrodes. These resistors are rated for 2,000 volts between the electrodes. This is the maximum voltage difference that should appear on a 34.5 KV regulator at the extreme end of its adjustment. The current flowing through the RND at 2,000 volts is .001 amperes. This current is then measured to determine the voltage difference between the load and source. The RND **does not** indicate whether the load voltage is higher or lower than the source, only the difference.

Voltage steps of some common size regulators are listed in these instructions for reference. It should require only one step change of the regulator to determine if the regulator is moving closer to, or further away from its neutral position.

The RND **must** be placed **only** between the Source and Load conductors of the regulator, in a position away from any ground potential. On heavily oxidized conductors it may be necessary to rub the electrode and conductor together to get a good contact. Failure to make a sufficiently low resistance contact will result in a slight reading, instead of zero, when in the neutral position. If this is suspected, try additional rubbing or move to a different location on the conductors to find a better contact point.

After observing the initial reading, the regulator should be stepped once in the direction that the operator thinks is towards neutral, based on the regulator indicator and knowledge of the system. Another reading should then be taken with the RND. If this reading is lower than the first, the direction taken was correct. The difference between

the first and second reading is the amount of regulation available in each step. Based on the chart, you can tell exactly how many steps are required to reach the neutral position. The regulator can then be operated the required number of times, checking the regulator periodically until neutral is reached.

The regulator should be checked at the completion of any adjusting of the steps to verify it is in the neutral position. The neutral position will be the position in which the lowest reading is obtained. The meter may not indicate zero on a loaded regulator due to the electric field. The reading should be less than 5 volts when the regulator is in the neutral position. If the regulator cannot be stepped to both sides of neutral (for verification of the neutral position), or if it appears that the regulator is stuck between steps, the line should be de-energized before the regulator is bypassed. The regulator can then be bypassed and disconnected for maintenance.

## SUMMARY OF OPERATING INSTRUCTIONS

1. Install RND on approved hot stick.
2. Identify Source and Load conductors.
3. Take initial reading between Source and Load conductors.
4. Operate regulator one step (up or down).
5. Take second reading. Note voltage change.
6. Adjust regulator to achieve lowest reading on RND.

The neutral position may indicate a voltage greater than zero. This can be caused by a poor connection between the RND and the conductors. Readings of less than 5 volts should always be obtainable by rubbing the conductor with the electrodes to improve the contact. If a voltage of more than 5 volts is the lowest obtainable, **do not** attempt to switch the regulator.