

300-3.2.6.2 Ground Detector Lights. Ground detector lights consist of two (or three) indicator lights connected in such a way that they burn continuously at a low intensity. Closing a momentary contact switch connects the lights to ground. On a perfectly balanced, 3-phase, ungrounded system the voltage between phase and ground is equal to line voltage divided by the square root of three. If there is an imbalance of impedance to ground on one leg of the system, one light will become dimmer, or extinguished if the unbalance is large, and the other one (or two) lights will become brighter. Depending on the magnitude of the unbalance, the lights will burn at varying intensities. Since no system is perfectly balanced, lights can be expected to glow at varying intensities under normal conditions. Operating personnel should become familiar with the normal test appearance of ground lights. Any appreciable change, such as a light going very dim or going dark, is an indication of a low impedance to ground and the cause should be investigated and corrected (see paragraph [300-3.2.6](#)).

NOTE

Lamp wattages of between 5 and 25 watts when operating at 1/2 phase-to-ground voltage have been found to perform adequately, giving a viewer adequate illumination contrast for high impedance grounds. Should a solid ground occur, the lamps will still be within their rating and will not be damaged. For lesser grounds, the lumen output of the lamps will vary approximately proportional to the cube of the voltage. This exponential change in lamp brightness (increasing in two and decreasing in one) provides the necessary contrast.

300-3.2.6.2.1 Typical circuits for two-wire dc and for three-phase ac systems are shown in [Figure 300-3-2](#). The transformer ratios and resistors are selected to give approximately full rated voltage on the light, if one line is grounded with zero resistance.

300-3.2.6.2.2 The circuit for dc systems in [Figure 300-3-2A](#) is such that the voltage across one lamp, as compared to the other lamp, is determined by the difference between the two ground resistances. The lamp having the higher resistance in parallel with it will be brightest. Regardless of how high or how low the ground resistance is, if it is the same on all legs, the lights will all burn at the same brightness. Therefore, a ground detector light system cannot show the condition of general distributed insulation resistance. It does, however, show readily when one leg of the system has a much lower resistance than the others. It can be shown that one light will be approximately twice as bright as the other (on a two-wire 250-Vdc system) when a ground resistance of 10,000 ohms or lower appears on one side.

300-3.2.6.2.3 Ground detector lights do not indicate the absolute level of ground resistance. They only give an indication of the unbalance between line voltage and ground caused by the difference in ground resistances. For this reason some variance in light intensity can be expected and should be considered normal. On the other hand, ground lights cannot injure any equipment since system voltage is all that can appear between any line and ground as a result of depressing the pushbutton.

300-3.2.6.2.4 On ac systems, as shown in [Figure 300-3-2B](#), any capacitance to ground that exists as a result of distributed capacitance of cables or filters connected to ground will affect the brightness of the lamps in the same manner as leakage resistance. The greater the unbalance of capacitance to ground between phases, the greater the difference in light intensities between the ground light lamps. On relatively small distribution systems, a small capacitor connected from phase-to-ground can cause a large unbalance in phase-to-ground voltage and cause ground lights to glow at various intensities or even cause a light to go dark. When it has been confirmed that one light barely glows or goes dark because of an unbalance in capacitance and not because of a low-resistive path to ground and the circuitry does not permit balancing of filter capacitance to ground between phases (see

paragraph 300-3.2.6), the addition of 0.5 microfarad capacitors to the ground detector panel, as shown in Figure 300-3-2D, is an approved method to increase the system capacitance artificially. The addition of these capacitors reduces the capacitance unbalance to a level that should cause the ground detector lights to burn closer to equal intensities. This modification will not reduce the effectiveness of the lights to indicate a breakdown of insulation between phase and ground.

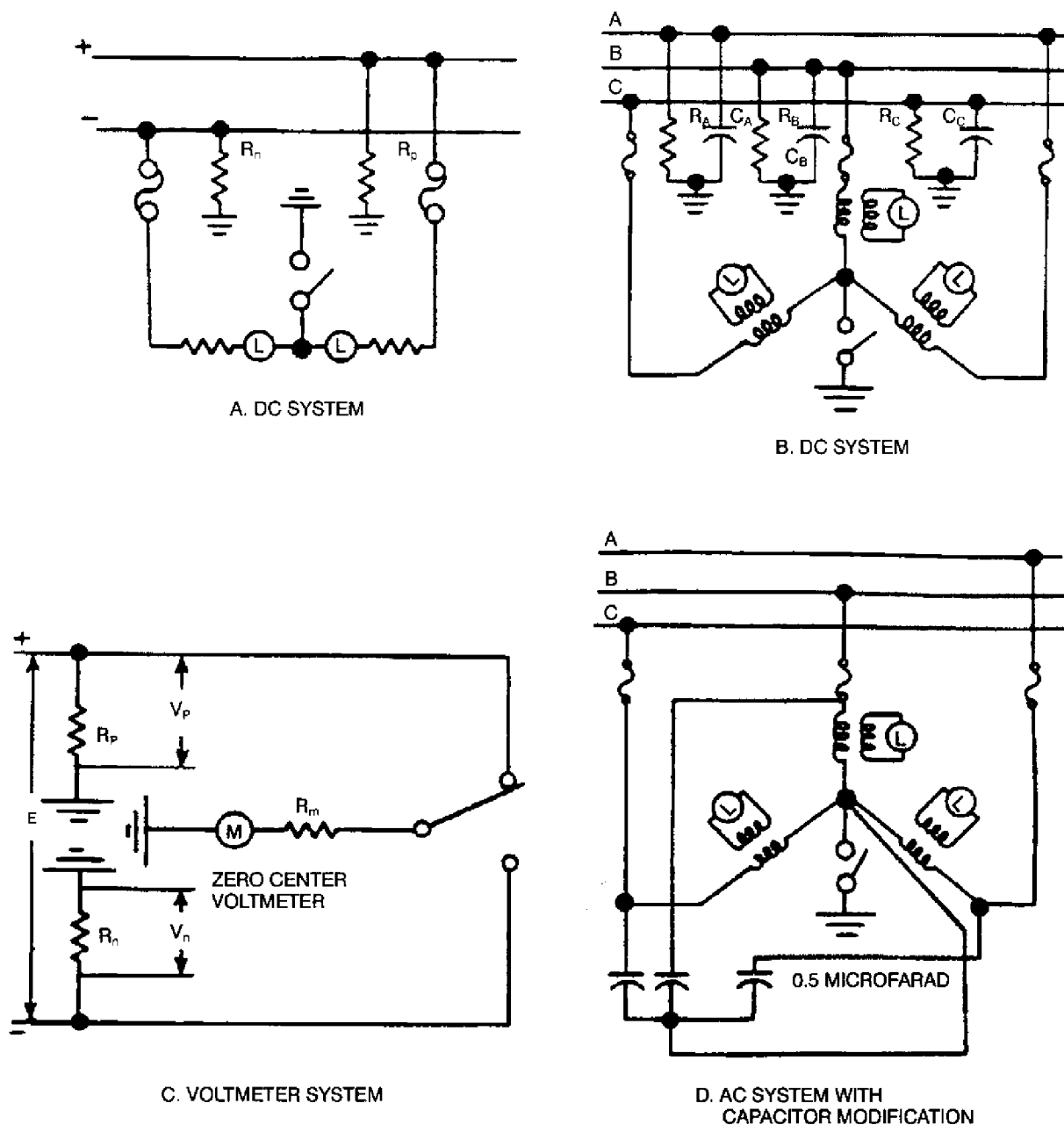


Figure 300-3-2 Typical Ground Detecting Circuitry

300-3.2.6.2.5 The only maintenance required on ground detector light systems is the replacement of defective parts. Care must be taken to replace lamps and resistors with units of identical characteristics to those originally installed.