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Application Notes

ESA620 Operation on alternative power systems (US Navy Shipboard)

The ESA620 Electrical Safety Analyzer is designed to operate on different electrical power systems. The primary configuration is the USA 120 Volt system that has a high side (HOT), a return side (NEUTRAL) and a power ground reference (EARTH). In this configuration, the power system operating voltage (HOT) is referenced to ground (EARTH) by connecting the neutral line, at the power transformer secondary, directly to ground (EARTH). With the full line voltage referenced to ground (EARTH), basic protection is provided by the breaker or fuse in the power panel. Also, maximum leakage current is generated in this configuration since any conductive, grounded surface is an active return for the full line voltage. This power system is specified in the NFPA-99 safety code for testing medical equipment.

In this particular US Navy shipboard application, a different power system configuration is utilized to increase the safety and limit shock hazard to the user and patient. Instead of the grounded neutral configuration, described above, the transformer secondary is ground referenced at a center-tapped connection point. This technique delivers the needed operating line voltage while limiting the available line-to-ground voltage to 50 %. This technique will limit the generation of leakage current. It is normal to measure 50 % of the leakage current when compared to the primary configuration utilized in land-based applications.

Expected Outcome:

1. This configuration ensures that the maximum line-to-ground fault voltage is only 50 % of the total secondary; this condition limits the hazard to patient, staff and equipment during a single-fault condition.
2. Additionally, the total leakage current (case/enclosure and earth leakage) measurements will be approximately 50 % of that measured on a conventional grounded neutral US power system.

To operate the ESA620 in this particular US Navy shipboard application, follow the instructions supplied for the indicated firmware revisions available in the unit.

ESA620 Electrical Safety Analyzer firmware versions 1.15 to 1.18:

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1. With these earlier versions of firmware, the ESA620 will display: "Internal fault detected... ground open" when initially connected to the ship-board center-tapped secondary line voltage.
2. Turn OFF power to the ESA620.
3. Press and hold down both the F3 and the UP ARROW keys on the top panel of the ESA620.
4. Turn ON power to the ESA620.
5. Release both the F3 and the UP ARROW keys on the top panel of the ESA620.
6. Operate the ESA620 as desired to complete electrical safety tests.

ESA620 Electrical Safety Analyze firmware versions 2.00:

1. With this firmware, the ESA620 will display either "Fault detected… No ground or isolated mains detected" and then "Fault detected...Polarity Reversed" when initially connected to the center-tapped secondary line voltage.
2. Press F5 for OK to proceed through both messages.
3. Operate the ESA620 as desired to complete electrical safety tests.

ESA620 Electrical Safety Analyze firmware versions 2.01 or higher:

4. With this firmware, the ESA620 will display either "Fault detected… No ground or isolated mains detected" when initially connected to the center-tapped secondary line voltage.
5. Press F5 for OK.
6. Operate the ESA620 as desired to complete electrical safety tests.

ESA620 Electrical Safety Analyzer: international only testing to IEC62353

The ESA620 is also capable of performing medical equipment tests in accordance to the International Electrotechnical Committee Standard: IEC62353. These tests are not required to be performed under the requirements of the USA Electrical Safety Standards. Please note that the Direct AP, Alternate(substitute) AP and Alternate Equipment tests will indicate measurements that are double unless the "Nominal Voltage" is changed to the actual (i.e: 60 or 57.5 or whatever is utilized in the power system). To accomplish this set-up task use a PC to remotely access the ESA620 and enter the following commands:
ENTER
REMOTE, ENTER, (wait for '*'),
NOMINAL=60, ENTER , (wait for "*").
The nominal value is saved automatically.

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