

# Technical Bulletin

A POLARIS Laboratories Publication



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## Electrical Test for Voltage in Dry Land and Marine Equipment Cooling Systems

### Equipment Required:

A multi-meter or voltmeter capable of reading both AC and DC currents is required. The meter needs to read 0 to the maximum voltage of the system being tested in tenths of a volt. The meter leads must be long enough to reach between the coolant and the ground side of the battery. We do not recommend a digital voltmeter.

### Test Procedure for Dry Land Machinery:

1. Attach the proper meter lead to the ground side of the battery, negative to negative or positive to positive.
2. Install the second lead in the coolant, touching the coolant only.
3. Read the DC and AC voltage with all systems off. If a block heater is present, also take a reading with the heater turned on. If an automatic battery charger is present, as in a stand-by system, also take a reading with the system running. Turn engine off and read DC and AC voltage.
4. Read the DC and AC voltage with the electrical starter engaged.
5. Read the DC and AC voltage with the engine running and all systems turned on; lights, heaters, air conditioning, two-way radio, and the radio on both stand-by and transmit.
6. Remove the lead from the coolant and repeat the DC and AC voltage tests with the lead touching the top radiator tank metal hose connection.
7. Remove the lead from the coolant and repeat the DC and AC voltage tests with the lead touching the outside of the engine block.

The above procedure will test a complete system except for an electrical current which can be generated by the rear end and transmission. This is particularly true with air bag suspensions, rubber pad suspensions, and rubber mounted transmissions. Any current generated will travel up the drive shaft to ground through the engine coolant. We recommend grounding rear ends and transmissions to the frame rail the battery is grounded to.

### Test Procedure for Marine Equipment:

1. Test each engine as outlined in steps one through four.
2. Test DC and AC voltage of each engine coolant with all lights, electronics, air conditioning, and every electrical item turned on. Stand-by generators and main engine props should be running for this test.
3. Also, test from the outside of the engine block to the ground side of the battery.

**Meter Reading:**

1. Zero (0) to 0.3 volts is normal in a coolant of a cast iron engine. .5 volts will destroy a cast iron engine with time and engine manufacturers are reporting .15 volts will damage an aluminum engine with time.
2. The current will be AC if the problem is due to static electricity or a diode problem in the alternator.
3. If the coolant shows an electrical problem with all the equipment turned on, turn off one system at a time until you turn off the system that stops the electrical current. When the current stops, this will indicate which electrical system is causing the problem.
4. Be particularly careful of starters. They can cause as much damage to an engine as a direct connection to an arc welder. This is due to the amperage present.
5. Always change the coolant if a current is detected. The iron protecting chemicals in a properly inhibited coolant will be destroyed by the electrical current.
6. If aluminum damage has occurred, check the oil cooler and radiator to be sure they are not stopped up with aluminum oxide corrosion products. This can lead to liner scoring and cause engine failure.
7. If a current is present with the engine turned off and battery disconnected and the current reverses direction, this usually indicates capacitor problems in the computer.