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MODEL 1140A COUPLED TO MULTIPLE DEVICES

In source mode the Model 1140A can handle several devices connected in parallel. This capability arises because it was specifically designed to feed multiple loads. In source mode this instrument incorporates a very low noise amplifier feeding the output terminals rather than an output divider used in many calibrators. As a result as a simulator (both in thermocouple and dc modes) this product features a very low output impedance (<0.05 Ω) and a 50 mA output capability.

However, some precautions must be observed when connecting multiple loads in order to maintain this instrument's very high accuracy. Even if under normal circumstances several devices can be successfully connected in parallel, it is possible for a defective device to affect the results of others in parallel. The same is potentially true if one of the paralleled devices is not powered up while another is being tested. If one device is rejected, it may be desirable to perform separate tests on the other paralleled devices to ensure their results were not adversely affected.

For instance, a common use of the Model 1140A is to calibrate temperature transmitters and temperature indicators. However, the success of doing this depends on the input characteristics of the temperature instruments. Any input to a device like this presents some load to the thermocouple simulator and the more devices connected in parallel the greater the loading effect. Again, if one transmitter or indicator fails and its load to the simulator becomes too great it could affect the calibration of the other paralleled instruments.

It is sometimes difficult to anticipate these effects, and qualification tests should be made to ensure accuracy of measurements with paralleled devices.

For instance, when the instruments being calibrated incorporate open-probe detection this can present a problem. Open-probe detection is often accomplished by feeding a current back to the temperature source, often for only a small portion of the device's measurement cycle. However, when multiple transmitters are connected to the same source, one may be feeding its open-probe current while another transmitter is measuring the temperature source. If this current is coupled to any length of high-resistance thermocouple wire a measurable error can be generated. For this reason open-probe detection should be disabled on all devices connected in parallel.

Another source of error is using one length of thermocouple wire from the simulator to a junction point, and branching from there to each transmitter. Thermocouple wire inherently has much higher resistance than copper, and when wired this way the

loading of one transmitter will affect the readings of others. A much better wiring technique is to run wires from each instrument under test all the way back to the Ectron simulator. A short length of thermocouple wire may be used at the simulator if there is not room in the terminals to connect all the wires at once.

It is usually not possible to reliably determine the magnitude of these adverse effects in advance, and tests must be performed to ensure reliability of measurements with devices connected in parallel.

The usual method is to first connect only one device to the thermocouple simulator and perform all needed tests. Then, after one or two other devices are connected in parallel with the first, repeat the tests on the first device to see if any of the readings have changed. Continue to add more devices in parallel while noting any change in the results of tests on the first device. In this way it should be possible to determine the maximum number of devices which can reasonably be connected to the simulator in parallel.

A conservative strategy would be to determine the point at which the readings of the first device become out of tolerance, then establish a lower maximum number of allowed parallel devices to provide some margin.

Keep in mind that things like ambient temperature variation, ventilation system air flow, time to settle to final value, and others may also affect calibration accuracy.

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