

TECHNICAL NOTE

September 28, 1993

SUBJECT: OVER TEMPERATURE DAMAGE TO TRACERS

PROBLEM: Frequently customers will ask what tolerance Tracers have to over temperature conditions, i.e., how much over the 150°C maximum temperature can a Tracer be taken without causing damage.

The key defining feature of an over temperature situation is that the internal temperature of the Tracer exceeded 150°C. While a Tracer can experience short excursions slightly above 150°C without damage, it is difficult for the user to identify when the Tracer's internal temperature actually exceeds 150°C and avoid the damage that results when an over temperature condition exists.

PROCEDURE:

The fact that Tracers went over temperature is generally clear and the actual temperature range can be estimated by one of three separate damage indicators. The first level of damage occurs to the thermistor/probe, the second to soldered electrical connections as well as individual electronic components, and the third level, to the ULTEM Insulator Rings.

The following describes the sequence of damage that occurs as a Tracer is exposed to increasing temperatures above 150°C.

Permanent damage to individual Tracer components will begin between 180°C and 190°C. However, it should be noted that between 160°C and 180°C permanent shifts in calibration of varying degrees would usually occur. These can usually be corrected by calibration.

The Lithium in the battery starts to liquefy at approximately 170°C. This will cause the battery to lose power and the data collected will be lost. While the battery can usually recover, its useful life will be seriously degraded.

At 180°C, the epoxy bead on the Standard Temp thermistor will start to char. By 190°C, the epoxy, and therefore the thermistor/probe assembly, is permanently damaged.

Also at approximately 190°C the solder on various electronic connections starts to reflow. This causes wires to disconnect and usually causes permanent damage to the pads on the hybrid. Temperatures of this magnitude will also permanently damage one or more of the hybrid components.

Between 200°C and 210°C the ULTEM Insulator Rings start to deform. Since the two rings (one internal and one external) are normally under compression, this softening/deformation relieves the compression causing the rings to ultimately leak.

Some of these failures are observable, while others can only be confirmed through testing by our Service Technicians. Deformed IR rings are the only visible indicators without disassembly. Reflowed solder is the most noticeable when the Tracer is opened, unless the battery has ruptured from extreme over temperature excursions.

CAUTIONS/NOTES:

IT IS RECOMMENDED THAT A TRACER NEVER KNOWINGLY BE EXPOSED TO AN OVER TEMPERATURE CONDITION.

While Tracers can tolerate short excursions slightly above 150°C without damage, it is difficult for the user to identify when the Tracer's internal temperature exceeds the 150°C maximum specified temperature. As a result, it is impossible to adequately control this situation and avoid the resulting damage that can occur to Tracer components when an over temperature condition exists. Furthermore, the Tracer is not calibrated beyond 150°C and any data returned must be considered suspect.