Quick Start Instructions

Amprobe Model IR-100

IR-Probe™

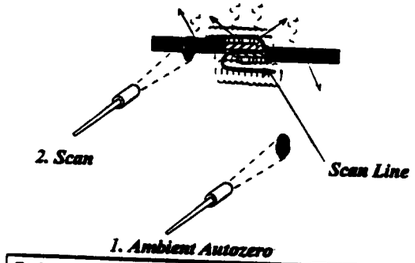
Infrared Scanning Probe for Digital Multimeters

Operation

To scan electrical connections:

1. Plug the red connector into the V dc input jack and the black connector into the common or ground input jack of the DMM to be used.
2. Set the DMM into its most sensitive scale for voltage. At least 1 mV resolution is required.
3. Point the probe at the connections to be scanned, and scan the area while monitoring the DMM display. Note the highest reading.

Refer to the Severity Criteria Chart, or other experience, to assess possible action.



It is not necessary to "turn on" or "turn off" your IR-Probe since its revolutionary design requires no battery: it is powered by the radiating infrared heat energy only.

Bare Metals - Scan the Insulators

Clean unoxidized metals emit little radiated energy (ie. have a low *emissivity*) compared to coated metals or insulators at the same temperature. Therefore, when scanning clean bare connections, be sure to thoroughly scan the insulators around the conductors. The insulators will be a better indicator since they will be nearly as hot as the conductors, but radiate considerably more energy.

Scanning Distance - 8 inches (20 cm) or less normally

IR Probe clipped to case for one-handed operation

Your ***IR100 IR-Probe*** has a field of view of 4:1, which means that at 4 ft. distance it will "see" a one ft. circular area. Since most connections are 1 to 2 inches (2.5 to 5 cm) in size recommended scanning distance is 8 inches (20 cm) or less. If a scan shows a source of heat, move the probe closer to the scan area for a closer look at the heat source.

Always maintain a safe distance from the conductors, and observe your normal safety procedures.

Severity Criteria

The Severity Criteria Chart printed on your ***IR-Probe*** card are intended as guidelines only. They have been used by many experienced electrical professionals for years. The responsibility for interpretation of the severity of a heat related electrical problem is with the professional using the scanner. For best results allow your ***IR-Probe*** sensing head to equilibrate to the local ambient temperature, or measure the differential between a local ambient and the target.

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p/n 818234

LIMITED WARRANTY

Congratulations! You are now the owner of an AMPROBE® Instrument. It has been quality crafted according to quality standards and contains quality components and workmanship. This instrument has been inspected for proper operation of all its functions. It has been tested by qualified factory technicians according to the long established standards of AMPROBE INSTRUMENT.

Your AMPROBE Instrument has a limited warranty against defective materials and/or workmanship for one year from the date of purchase provided that, in the opinion of the factory, the instrument has not been tampered with or taken apart.

Should your instrument fail due to defective materials, and/or workmanship during the one-year warranty period, return it along with a copy of your dated bill of sale which must identify instrument by model number and serial number.

For your protection, please use the instrument as soon as possible. If damaged, or should the need arise to return your instrument, it must be securely wrapped (to prevent damage in transit) and sent prepaid via Air Parcel Post insured or UPS where available to:

Service Division
AMPROBE INSTRUMENT
630 Merrick Road (For U.P.S.)
P.O. Box 329 (For P.P.)
Lynbrook, NY 11563-0329

Outside the U.S.A. the local Amprobe representative will assist you. The above limited warranty covers repair and replacement of instrument only and no other obligation is stated or implied.

Temperature Rise

The operating condition of electrical connections can be conveniently judged by the temperature rise above ambient. (Ambient is simply the temperature of the environment surrounding the equipment). If conductors and connections had no resistance while carrying current, no heat would be generated and both the conductors and connections would be at the same temperature as the surrounding environment. However, that is not the case. All conductors have some resistance and some heat will always be generated. A minimal amount of heat is normal and will vary depending on the amount of current. Excess heat (temperature rise above ambient) indicates excess resistance for the amount of current present. This can result from a bad connection, overloaded circuits, or some other fault.

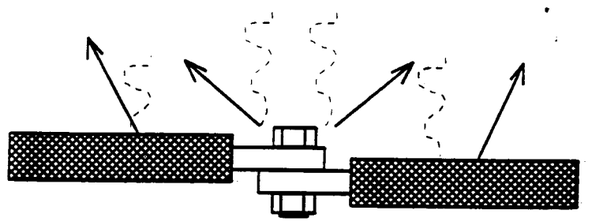
Keep in mind that the sun is a powerful influence on the surface temperature of objects: it heats up and reflects off exposed objects, making their condition seem worse than actual. If possible, you should wait until targets are in the shade before measuring.

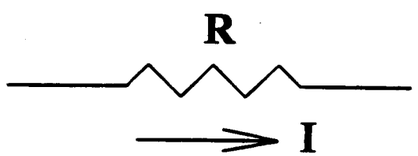
Theory of Operation

Infrared inspection has proven to be a very fast, easy and effective way to locate electrical problems, which are always given away by the heat that they generate. Inspections using infrared are safe--no contact is required. Inspections using infrared are performed with the equipment operating--shutdowns are not required. Because of this, there are no practical substitutes for an infrared inspection.

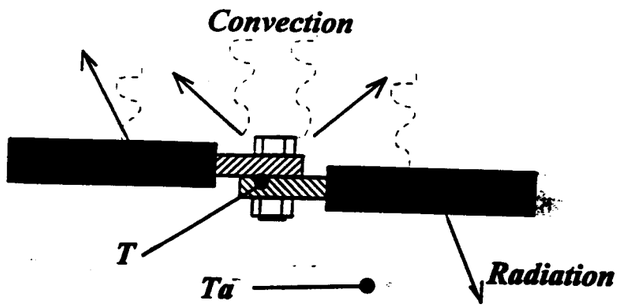
What heat tells us about connections

Over time, when two metals are mechanically connected, normal heating and cooling cycles (from both the environment and normal on-off current loading) cause the metals to expand and contract. This expansion and contraction can eventually loosen the connection. The poor connection will generate excess heat due to higher resistance to current flow as indicated by the well-known power loss equation:





The quantity of excess heat is related to temperature rise by the fact that the connection must rise to whatever temperature is required to dissipate the energy. The heat dissipation is by two mechanisms: convection (transfer to the surrounding air) and radiation (transfer to the surrounding solid surfaces). Accordingly, the temperature rise can be related to the radiated heat as



$$\textit{Energy Radiated} \sim (1/2) \times I^2 \times R \quad \textit{(Watts)}$$

$$\textit{Energy Radiated} \sim h \times (T - Ta)$$

$$\textbf{Energy Radiated} \simeq h\,(T\text{-}T_a) \simeq (1/2)\,I^2\,R$$

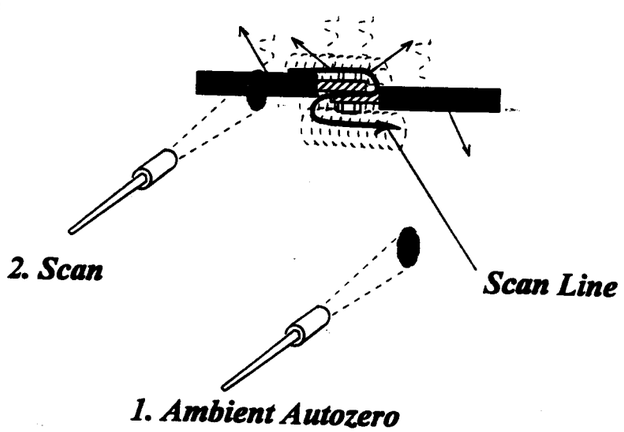
where **h** is a constant, **T** is the temperature of the radiating surface, and T_a is ambient temperature.

Note the strong influence of the current flow **I**. For a given resistance, the temperature rise will increase as the square of the current. **This means that a scan showing 10°C rise will show 40° C rise if the current is doubled.**

Accordingly, it is important that circuits be well loaded for an infrared scan to successfully find a fault. A clamp-on ammeter is recommended in order to verify loading.

Inspection Recommendations

A very important concept to follow is to scan the entire area for heat! You will not always know where a hot spot might be, and therefore a deliberate scanning pattern will ensure that you do not miss it.



*A reading in this range (0 to 10°C) does not mean that a problem cannot exist. It means only that an infrared scan indicates normal temperature rise. For critical equipment, obtain the opinion of an inspection professional. If you detect even a small temperature rise, always move closer, if safety permits, and scan again.

AC/DC Battery Back-up

During the annual battery equalizing charge, a higher or lower temperature cell is an indication of a problem. Also, during a load test, a scan of the bolted connections will turn up any problem areas before they cause a system failure. Telephone companies have established their own standards for these tests for their most critical battery back-up equipment.

Motors and bearings

In general, to locate abnormalities, compare similar motors with similar loads. For motors that are not totally enclosed fan-cooled units, or other specialty motors, surface temperature will generally be about 10°C less than the internal temperature. For a quick comparison to the rating, scan the motor for the highest °C rise and add 10°C. Most class B motors are rated at about 80°C (144°F) rise.

Scan large machines closely. Abnormal hot spots on the body may indicate flaws in the stator windings.

If the bearing area scans hot compared to similar bearings or the motor body, the bearing may be in distress. Make a note of it and watch closely.

Power transformers

Scan for abnormal heat, especially at any visible connections. Localized heating may indicate flaws in the windings or insufficient ventilation in surrounding areas.

Scan cooling fins or tubes. Temperature variations can indicate internal cooling problems (loss of coolant or plugging).

In a bank of transformers of the same type, any significant difference between them may indicate a defective internal gauge, unbalanced loading, or a defective transformer.

Ballasts in Fluorescent Lighting

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