

MICROSCANNER™
E AUTOZERO

*Infrared Scanner
for Electrical Inspection*

**I N S T R U C T I O N
M A N U A L**

EXERGEN
CORPORATION

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*Infrared Scanner
for Electrical Inspection*

Your Microscanner™ E Autozero, with its unique circuitry and color-coded scale, is the only instrument specifically designed to allow you to perform an infrared scan of the operating condition of energized electrical connectors quickly and easily.

For your convenience, the color-coded scale and suggestions on the side of the case are general guidelines for judging electrical connectors. The responsibility for judging the seriousness of a fault, however, must remain with personnel who are familiar with the equipment. Please read our "Infrared Inspection Guide for Electrical Equipment" for more specific details.

**CAUTION: DO NOT TOUCH UNIT
TO ELECTRICALLY ENERGIZED
SURFACES!**

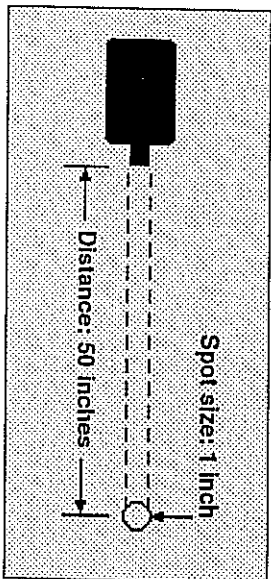
How it Works

A differential temperature scanner, the Microscanner E Autozero is designed to compare the temperature of electrical equipment, or any target, to the surrounding environment (ambient). Like all infrared instruments, it sees and measures heat radiation (infrared). It is a passive device and does not send any signal out; instead, it responds to the natural infrared radiation emitted by every object.

Your Microscanner E sees heat radiation in a target area called the *field of view*. Think of the area as being similar to a spot lit up by a flashlight. As you move the flashlight closer to a wall, the lighted spot gets smaller. As you move farther away from the wall, the spot becomes larger. Your Microscanner E works the same way. The farther away you are from your target, the larger the area that it sees.

The lens on the Microscanner E has a resolution of 50:1. To know how large a spot the Microscanner E sees, simply divide your distance from the target by 50. For example, if you are 50 inches away from the target, the Microscanner E can measure a spot about 1 inch in diameter. At 200 cm distance, the spot would be 4 cm. If you get very close to your target, the smallest spot you can measure is about 3/4 inch (2 cm) in diameter.

When scanning objects which are smaller than the Microscanner's field of view, care must be taken in interpreting the results because the Microscanner averages the temperature of everything it sees within its spot size. For example, if a target wire is smaller than the spot



size, the Microscanner sees not only the temperature of the wire, but also of the surrounding objects. For best results, the target should fill the Microscanner's field of view.

The Model EG is similar, except that the resolution is 70:1.

Maximum Distance

Because of lens scattering, atmospheric and other effects, we recommend the following:

1. A maximum practical scanning distance no greater than about 5 feet (1.5 meters) for the Model E and about 7 feet (2.1 meters) for the Model EG.

2. If you see any rise above ambient (even a few degrees rise in the green), move closer for a more precise reading. *Keep safety in mind. Do not touch the unit to any energized surfaces!*

3. The green, yellow, and red criteria are only guides. Experience with your equipment will be the best way to judge the severity of potential problems.

4. The closer you are, the better your accuracy will be. If you see a large rise (in the yellow or red part of the display) even from a distance, you can assume that significant heat is present.

If you must routinely scan objects from greater distances, we strongly recommend using our versatile Microscanner™ II with its more powerful 200:1 lens option.

Please contact Exergen if you require more information on lens performance or scanning distances.

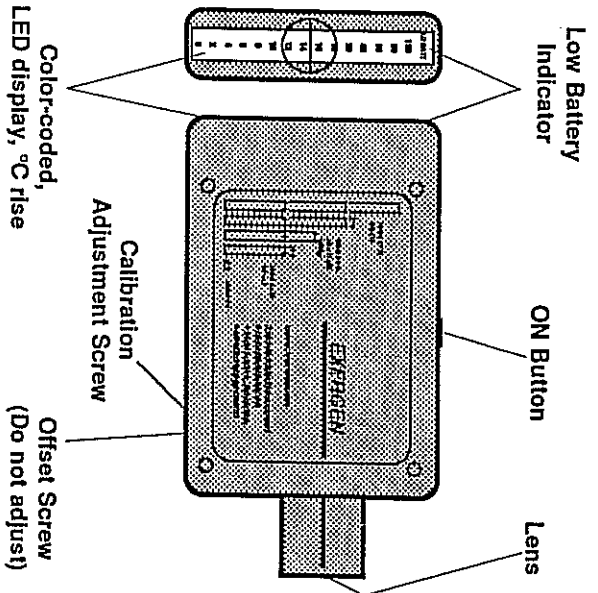


Figure 2. The Microscanner E

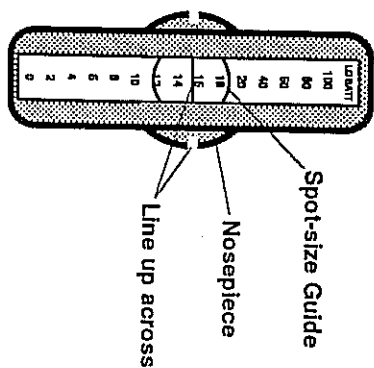


Figure 3. Aiming the Microscanner E

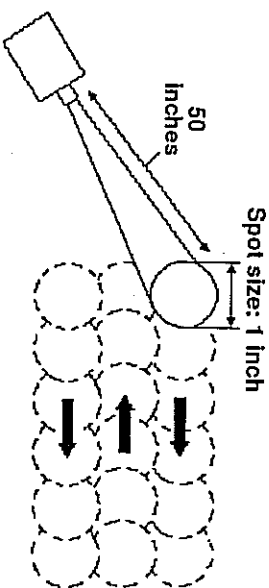


Figure 4. Move the Microscanner in a deliberate scan pattern over your target area to make sure you don't miss a hot spot.

Aiming at Targets

The Microscanner E has easy-to-use aiming marks and a spot-size guide built in on the case, nosepiece and display (see Fig. 3 on pg. 6). It is important to use the aiming marks when your target is more than a few feet away because the beam is narrow and you may miss your target.

To aim:

1. Hold the Microscanner E at arm's length.
2. Line up the line going across the LED display with the dots on the nosepiece.
3. Use the circle on the display as a convenient guide for judging spot size.

Practice aiming at targets -- use a light bulb, cigarette, or other common heat source. Scan from different distances until you are comfortable with the way the unit performs. You will notice that as a hot target enters the circle, the Microscanner E sees its heat. When it leaves the circle, the scanner no longer sees it.

Always move the Microscanner E in a deliberate scan pattern (see Fig. 4 on pg. 6) to make sure you don't miss a hot spot. When safe, move closer to the target for best results.

Operating Instructions

1. Aim at ambient reference.

2. Push and hold power-on button.

When turned on, the unit's unique autozero circuitry automatically locks onto the temperature of your ambient reference. The display momentarily lights up (an indication that the unit is working correctly) and then drops to the green LED at the bottom of the scale.

3. Scan your target.

As you scan, the unit will compare the temperature of your target to the ambient reference and indicate the difference in °C rise above ambient. The color-coded scale is divided into green, yellow, and red areas. Each LED in the green and yellow areas represents a 1°C rise. Each LED in the red area represents a 10°C rise.

When you scan a surface that is above a 100°C rise, the red LEDs will flash for as long as you scan it. You can reliably auto-zero on an ambient surface with a temperature range of 0°C to 50°C (32°F to 120°F).

4. Release to turn off.

If you release the power button, you must re-reference on your ambient target. If you turn the unit off and on again during the

scan, the flashing and dropping display alerts you to the fact that you have re-zeroed.

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.

When outdoors, or in any environment where light makes it difficult to see the LED display, push the SUNSHADE (optional) into place over the display. To install the sunshade, compress the center section lightly, and push it into the display so the friction tabs hold it in place. Pull off to remove.

Shiny Metals (emissivity effect)

Exact temperature measurement using infrared is a complex science. In the vast majority of your scanning situations, the Microscanner E will give you good results. Keep in mind, however, that clean, shiny, metal surfaces can give misleading results. The reason for this is that shiny metals are highly reflective (like mirrors) to infrared radiation. When any infrared instrument tries to measure the surface temperature of a clean, shiny metal, it really sees the infrared reflections from objects in its environment. Thus, a clean, shiny metal surface can read cooler or hotter than it really is. In comparing two similar shiny metal surfaces in the same environment, however, the hotter one will always appear hotter and the cooler one will always appear cooler.

Dirty, oxidized, painted, or corroded metal surfaces along with non-metallic surfaces will give good infrared readings. Scan the insulation

material. Scan the entire area (mounting points, enclosure, etc.) around the connections for any significant heat. Scan the area from a couple of different angles. If there is any significant heat shown by the Microscanner E, the probability is very strong that it is being generated by an electrical problem in that area. Even if the metal connectors are clean and shiny, any significant heat that they generate will heat up the attached insulators or painted surfaces, and be more accurately measured by the Microscanner E.

Keep in mind that the rises indicated by insulation, etc., are usually less than the actual temperature rises of the conductor inside the insulation. It is best to assume that the rise indicated by the Microscanner E is a minimum for the area -- it is at least that hot.

On those rare occasions when you must scan only clean, shiny metal (large exposed bus bars with no insulation nearby and uninsulated connections, for example), it is best to investigate any temperature rise by applying some electrical tape on the areas of the metal you wish to inspect covering the shiny reflective finish. The Microscanner E will read the degrees of rise with better accuracy.

NOTE: Please contact Exergen if you require more information on the subject of exact temperature measurement using infra-

red technology. Our Hot Stick models with digital readout eliminate possible errors. They are designed to mount on a hot stick for close-up inspection of exposed, live electrical gear. For general purpose, non-electrical accurate temperature measurement, the Microscanner D-Series is recommended.

Other Hints

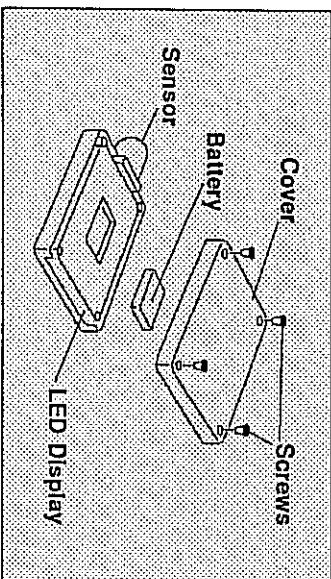
For best results, always allow the Microscanner E to acclimate to the environment when taking it from very hot to very cold areas or vice versa. For example, if it was stored in a cold automobile overnight, allow at least 10 minutes for it to reach room temperature before scanning or you may see some drift.

Do not aim your Microscanner E directly at the sun on a clear day. The intense solar heat, focused by the lens, could damage the sensor element.

Battery and Maintenance

This instrument uses a 9-volt alkaline battery. When the battery is low, the LO BATT at the top of the LED display will light. Your Microscanner E will continue to operate for several minutes of scanning (ON) time without any loss of accuracy. If you notice the display lighting up erratically, install a new battery.

To replace the battery, remove the four screws on the case. Gently remove the cover. Remove the old battery, snap the connector from the old to the new and place the new battery in the same position. Carefully replace and line up the cover and reinsert the four screws. Tighten all four screws.



The alkaline 9-volt battery will require replacement dependent on how often you use the instrument and how many LEDs you constantly light up. It will supply about 200 minutes of continuous power. Since each scan only takes a few seconds, most users will have to replace the battery only a few times per year.

Lens Care

If dirty, clean the lens with alcohol and dry with a soft cloth.

For the Microscanner E, constant exposure of the lens to direct sunlight will cause *crazing*. In normal use this is not a problem. Do not store the instrument outside of its carrying pouch where it is constantly exposed to strong sunlight.

The Microscanner EG has a germanium lens that is not affected by sunlight.

Calibration

The instrument does not normally require calibration during the first two years. If you wish to check the calibration of your Microscanner E, all you need is a metal pot for boiling water and some black electrical tape.

1. Cover a 2 or 3 inch (5 to 8 cm) square on the outside of the pot with a layer of black electrical tape.
2. Fill the pot about 3/4 full with water, or until the water level is higher than the black square. Bring to a rapid boil.
3. Aim the instrument at an ambient surface of about 20°C (70°F) and push the power-on button to autozero. Then, aim the Microscan-

ner at the black square on the pot from no more than about an inch (3 cm) away.

Note the degrees of rise -- it should read 80 or 90°C rise. If it does not, recalibration is necessary. Continue steps 4 through 6.

4. Lift off the piece of tape or plug to access the second screw from the front of the instrument (see Fig. 2 on pg. 5). Do not turn the first screw (Offset adjustment), use the second screw adjustment only.

5. Autozero on ambient surface. Then, while aiming the Microscanner at the black square, turn the screw until the Microscanner reads 80 to 90°C rise.

6. Repeat your measurement a few times to make sure it reads properly.

Note: For more precise calibration, specially calibrated temperature sources are needed. The adjustment procedure is similar, except use a 0.9 emissivity source including several test points within the range.

Technical Specifications

Range: 0°C to 100+°C rise
(0°F to 180+°F rise)

Sensitivity: 1°C (2°F)

Ambient autozero set range: 0 to 50°C
(32 to 120°F)

Accuracy: ± one LED in each range

Calibration: Emissivity E = 0.9 with 21°C
(70°F) background (approx).

Battery: One 9-volt alkaline

Weight: 7 oz (200 gr)

Field of view: Model E--50:1

Warranty

Exergen Corporation warrants the Microscanners E and EG will be free of defects in material and workmanship for a period of one year from the date of purchase, and will repair or replace the returned instrument at no charge during that period. No other warranties are implied.

If repair is required:

- Contact the factory for a Return Materials Authorization number.
- Mark the RMA number on both the shipping box and the packing slip.
- Include a description of the unit's problem.
- Ship the instrument prepaid. Exergen will return ship prepaid.
- After you have received an RMA Number, send to:

Exergen Corporation

Repair Department

██████████
400 Pleasant St.

Watertown, MA 02472