EXERGEN D501-RS IR Sensor Thermometer Remote Sensor Instruction Manual

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Sensor Instruction Manual

D501

D501-RS

High-Performance Models

Instruction Manual

Welcome to Infrared!

Exergen's high-performance microprocessor-based infrared thermometers have been designed to provide you with new dimensions of accuracy and versatility. They literally put the power and speed of infrared in your hand!

By combining computer calibration and advanced software technology with our patented Automatic Emissivity Compensation System, this generation of Microscanner™ D-Series provides precision temperature measurements over a wide range of environmental and target temperatures.

For added versatility, your high-performance Microscanner™ D-Series features:

- Full range resolution to 0.1 °F or °C
- SCAN, MAX and MIN modes of operation
- A 10-second display lock
- An audible beeper to signal functional or conditional changes
- Fahrenheit/Celsius Conversion

This manual provides complete instructions on how to operate and use your Microscanner – the fastest, most accurate instrument for measuring temperature available.

Contents

Operations and Controls

Your high-performance Microscanner™ D-Series is equipped with an ON/OFF power pushbutton and a mode selector switch. The mode selector switch allows you to choose one of three modes of operation: SCAN, MAX or MIN.

On/Off, Lock and Reset:

- TO TURN the unit ON, PUSH and HOLD the ON/OFF power pushbutton.
  The display will momentarily read 8888, an indication that the microprocessor is performing its self-diagnostic testing. After the test, the unit will measure and display temperature in the selected mode of operation for as long as the power button is depressed.
- RELEASE the power pushbutton TO LOCK the display on the last reading. A single beep will audibly indicate that the display is locked. The instrument will hold the last reading on the display for 10 seconds before it automatically turns itself OFF.
- To RESET the display and initiate a new set of readings, PUSH the power pushbutton at any time.

Operation Mode:

- **SCAN** – In the SCAN mode, the target's instantaneous temperature is continuously displayed and updates 10 times per second for as long as you hold the power button down. After you release the power button, the display will lock on the last temperature measured and hold that reading for 10 seconds.
- **MAX** – In the MAX mode, the display will lock on the highest temperature measured for as long as you hold the power button down. Each time a new peak temperature is measured or repeated an audible beep will sound. After you release the power button, the display will lock on the maximum recorded temperature and hold that reading for 10 seconds.
- **MIN** – In the MIN mode, the display will lock on the lowest temperature measured for as long as you hold the power button down. Each time a new low temperature is measured or repeated, an audible beep will sound. After you release the power button, the display will lock on the minimum recorded temperature and hold that reading for 10 seconds.

Understanding How Your Microscanner™ Operates

The ability of an infrared thermometer to measure an accurate temperature depends on the following:

1. **The ability of the object's surface to emit heat**

   In general, infrared thermometers can easily measure non-metallic surfaces because they emit most of their potential heat. Metallic surfaces, on the other hand, are poor emitters and require special treatment before infrared thermometers can accurately measure their temperature. Fortunately, that special treatment is simple and can be easily accomplished by marking the metallic surface you wish to measure with a non-metallic substance such as paint, grease, oil or even transparent tape. We recommend marking metallic surfaces with a solid paint marker.* To make things easy, Exergen provides a marker with each unit.

   * It is only necessary to mark an area slightly larger than your Microscanner's nosepiece. In the MAX or MIN mode you may want to check several points over an area. In this case, it may be more efficient to coat the entire area with a non-metallic finish.

2. **The ability of the instrument to properly detect and interpret the object's emitted heat signal.**

   Measuring and interpreting an object's emitted heat signal can be complex. Once again, Exergen's innovative design makes it simple. If you look at the Microscanner's nosepiece, you will see that it is really a small reflective cup with the sensor's window at its base. When the Microscanner's nosepiece touches the surface of an object, that reflective cup automatically controls what the sensor sees by eliminating variables such as target emissivity and extraneous radiation. Patented by Exergen as our Automatic Emissivity Compensation System (AECS), this unique design ensures accurate readings every time.

Taking Exact Temperature Measurements

> **CAUTION...Shock Hazard.**
> **Do Not Touch the Instrument to**
> **Electrical Conductors***

The Microscanner™ D-Series measures temperature very quickly. An accurate reading is almost instantaneous. It is only necessary to touch the surface for a fraction of a second.

For exact surface temperature measurements, simply:

- Press the power button
- Touch the nosepiece to the target surface**
- Read the temperature on the LED display
- Release the power button

* Exergen manufactures specific instruments for safe and convenient inspection of electrical equipment. If electrical inspection is of particular importance, contact Exergen for more information relative to the dedicated electrical inspection instruments.
** If the surface is metallic, be sure to mark it as previously described (see pg. 2).

Taking Exact Temperature of Moving Targets

For moving targets which are not possible to touch even for an instant, simply

- Set slide switch to MAX for targets warmer than ambient, or MIN for targets cooler than ambient.
- Point at target
- Press the power button
- Bring nosepiece as close as possible to the target, preferably within 1/32 inch (1mm)
- Release power button
- Read the temperature

High Temperature Targets

When using the D501 on high temperature targets, momentarily touch the target's surface – a fraction of a second is long enough to get an accurate reading.

If these instruments are used in contact with a hot surface for an extended time (10 seconds or more) the target's heat will be conducted into the nosepiece. Although this will not harm the unit, the indicated temperature may be a few degrees too high. If this happens, allow a few minutes between readings for the nosepiece to cool down and stabilize.

If the instrument is used in contact with a hot surface and the display message reads (HI), remove the instrument from the object immediately

At a distance, the D-Series operates as a high-speed infrared scanning thermometer.
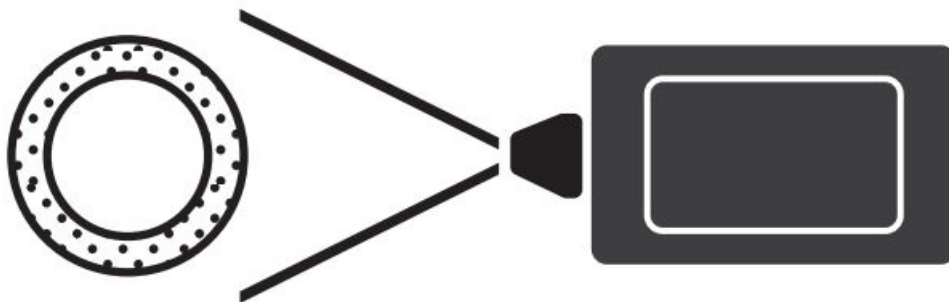
Contact the nosepiece to the surface and the D-Series will display an accurate surface temperature.
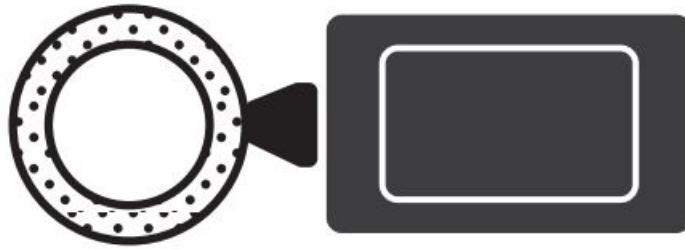
Thermal Scanning

The high-performance Microscanner™ D-Series can also be used to measure temperatures at a distance.

When not touching or close to a surface:

- The Microscanner™ is a wide-angle thermal scanner with a fixed emissivity of .98.
- The displayed reading is an average temperature of everything that the sensor sees within its field of view.

Thermal scanning is very useful in many applications such as evaluating insulation, monitoring machinery, and inspecting electrical equipment.

The MAX or MIN modes of operation can be particularly useful in thermal scanning. The highest (or lowest) temperature measured during a scan is indicated by the audible beeper. Once a hot spot (or cold spot) is identified, the exact temperature of that spot can be measured by touching the surface as previously explained.

When using the D-Series as a scanner, keep the following in mind:

- The instrument's field of view is 1:1. Also referred to as a distance-tospot ratio, 1:1 field of view means that the sensor sees a circular area with a diameter equal to the distance between the sensor and target. For example, at a 6-inch distance, the sensor sees a 6-inch diameter spot; at a 10-foot distance, the sensor sees a 10-foot diameter spot.
- The Microscanner™ measures the average temperature of everything in its field of view.
- A small hot spot may get lost in a large viewing area. The closer you hold the instrument to a surface, the better its target resolution.

Measuring Relative Humidity with the Microscanner™ D501

A unique benefit of the Microscanner™ D501 is its ability to measure wet and dry bulb temperatures faster and more accurately than ever before.

A Relative Humidity Kit is available as an accessory. Contact Industrial Sales Customer Support for more information. This kit is comprised of a calculator card and a tube of water. The calculator card incorporates two circular membranes, an RH calculator and a Dew Point calculator.

The Microscanner™ is used to measure the wet bulb and dry bulb temperatures of the atmosphere. From these two temperatures, both the relative humidity and the dew point can be calculated.

To calculate Relative Humidity:

1. Wet the absorbent membrane identified as WET with a few drops of water (a small tube of tap water is provided with the kit).
2. Rapidly wave the card in the air for several seconds. This assures that the water on the wet membrane is evaporating at its maximum rate.
3. With the Microscanner™ in the MIN mode, quickly measure the temperature of the WET membrane immediately after you stop waving it.

   This is the atmosphere's wet bulb temperature.
4. Set the Microscanner™ in the SCAN mode and measure the DRY spot.

   This is the atmosphere's dry bulb temperature.
5. Use the calculator card as directed to compute the relative humidity and dew point.

Fahrenheit to Celsius Conversion

The D501 Microscanners™ are equipped with a convenient method for Fahrenheit/Celsius conversion:

1. Find the small hole on the left side of the red display filter.
2. Insert the end of a straightened paper clip into the hole and push to activate the small switch underneath.
3. While holding the paper clip pressed into the switch, turn the instrument on by pressing the red POWER ON button.
4. Remove the paper clip.
5. The instrument now reads °C instead of °F. To return to the original setting, simply repeat the process. Each time you repeat the process, the instrument switches between °F and °C.

The Display Messages

The high-performance D-Series Microscanner™ continuously monitors its ability to produce accurate temperature readings. If either the target's temperature or the unit's ambient temperature exceeds the operational limits, the beeper will sound one beep per second and the LED display will default to a display message.

For example, the D501 is designed to display temperature only if that temperature is within its specified measurement range. If the target temperature is greater than 565°F (296°C), the display will read "HI."

The battery voltage is also monitored. A low battery is indicated by a double beep each second. Temperatures will continue to be displayed as long as accuracy can be assured. If the battery drops below 5.7 volts the battery is considered "dead" and the display defaults to [—-].

If a problem is discovered during the initial self-diagnostic test, the instrument will display an error message (E-01), (E-02), etc. If any (E-##) error message is displayed, the unit will not function and must be returned to the factory for repair. (See section on Warranty for return instruction).

The following chart summarizes the fault conditions, and the associated indications:

Condition	Display	Sound	Range
High Target	[HI]	1/sec	>565°F (296°C)
Low Target	[LO]	1/sec	<-65°F (-54°C)
High Ambient	[HI A]	1/sec	>122°F (50°C)
Low Ambient	[LO A]	1/sec	<32°F (0°C)
Low Battery		2/sec	<6.2v
Dead Battery	[----]	2/sec	<5.7v
Processing Error	[E-##]	Return Instrument to Exergen for Repair	

Helpful Hints

Although transparent materials pass visible light, many visible transparent materials are opaque in the infrared and can be directly measured by the Microscanner™ D-Series.

To test for infrared transparency, touch the Microscanner™ to the surface and pass a heat source, such as your hand, through the sensor's field of view on the other side of the material. If the Microscanner™ responds to the heat source, the material is transparent in the infrared.

To measure a transparent surface, use one of the following techniques:

1. Mark the surface with an opaque nonmetallic coating.
2. Put a shiny metallic surface such as aluminum foil behind the transparent material. The shiny metal will reflect the transparent material's heat back to the Microscanner™.

Wet or icy surfaces may interfere with the Microscanner's readings. Water and other liquids are good targets, but evaporation lowers their surface temperatures.

Frost forms on a surface at the freezing point of water. Frozen foods or similar targets will form frost unless the environment is controlled. If frost forms, the Microscanner™ will read the temperature of the frost instead of the subsurface (object's) temperature.

Melting ice will read slightly higher than 32°F (0°C) because the instrument actually measures the air condensing on the ice, a reaction which generates a small amount of heat. As long as the ice is not melting, the Microscanner™ will accurately read its temperature. For true object temperature, remove any ice or moisture before measuring.

Maintenance

The high performance Microscanner™ D-Series products are rugged and durable instruments. They are designed to be used as a tool with long temperature measurement reliability.

- **Calibration**

  Calibration is performed by a computer through an optical link with the unit's microprocessor. Because there are no mechanical adjustments, the instrument is able to maintain its calibration through normal use.

- **Cleaning**

  The only maintenance required is to keep the sensor window clean. This window, located at the base of the nosepiece's reflective cup, is made of a special crystal which passes infrared heat. Dirt, greasy films or moisture on the window will interfere with the passage of infrared heat and affect the accuracy of the instrument. If necessary, clean the sensor window and reflective cup with a cotton swab dipped in alcohol or water. Periodic cleaning is a good practice. When not in use, store in a clean environment.

- **Battery**

  The battery is accessed by removing the instrument's cover. Loosen the four screws on the body of the instrument to remove the cover.

Troubleshooting

If the accuracy of the measurement is in question, check the following:

Is the sensor window clean?
Check the sensor window and reflective cup for cleanliness and remeasure.

Is the target's surface non-metallic?
Coat metallic surfaces with a non-metallic finish and remeasure.

Is the target's surface transparent?

- Coat transparent surfaces with an opaque non-metallic finish and remeasure.
- Put a shiny metallic surface such as aluminum foil behind the transparent target and remeasure.

Was the instrument's nosepiece in contact with the surface?

Touch the nosepiece flush to the target's surface and remeasure.

If after applying all of the above solutions the instrument's accuracy is still in question, contact Exergen for further directions.

Warranty

Exergen warrants the Microscanner™ D-Series to 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 Exergen's discretion) at no charge during the period. No other warranties are implied.

If repair is required:

- Contact the factory for a Return Material Authorization (RMA) 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 Street
Watertown, MA 02472 U.S.A.

Specifications

Target Temperature Range
D501: -50°F to 550°F or -45°C to 287°C

Absolute accuracy for any non-metallic, non transparent surface
+/- (1 + 0.02 (Reading less ambient)) deg F
+/- (0.6 + 0.02 (Reading less ambient)) deg C

Minimum spot size diameter Approx. ¼" (6.4mm)
Repeatability +/- .02% of absolute temperature
Display Resolution 0.1°F or 0.1°C
Display Update 10 times /second
Response Time Constant 60 mSec
Field of View 1:1 (53 degrees)
Spectral Sensitivity 2 to 20 microns
Battery One 9 volt alkaline
Battery life 5000 readings (10 seconds each)

Instrument Ambient Temperature
Operating Range: 32° to 122 °F (0° to 50 °C)
Storage Range: -22° to 140 °F (-30° to 60 °C)*

*Extended storage at temperature extremes will reduce battery life.

Model D501

Sensor Window

Nosepiece with Reflective Cup (AECS)

Digital Infrared Temperature Scanner
With Automatic Emissivity Compensation System
(AECS)

AECS not active: Ambient radiation enters and measurement subject to emissivity errors.

AECS active: Ambient radiation excluded and replaced by reflected source radiation. Blackbody created at probe tip.

GUIDELINES
• Keep sensor window clean and dry
• Place probe tip directly on target when possible
• Use MAX (MIN) mode to lock onto highest (lowest) reading measured
• Mark uncoated metal or transparent surface before measuring
• See Instruction Manual for complete information

• World-wide calibration standards
• NIST Traceable
• Certified Accuracy

MAX

SCAN

ON/OFF

CE

69439

CAUTION: DO NOT DIRECTLY CONTACT ELECTRICAL CIRCUITS

Mode Selector Switch

On/Off Power Pushbutton

High-impact ABS Case

Digital LED Display

Model D501-RS

Remote
Sensor
Probe

The Gold Standard for
Surface Temperature
Accuracy

Microscanner™
D-Series

Infrared Scanner / Thermometer
Model D501

Temperature Measurement Range
-50 to 550°F (-45 to 287°C) with 0.1 resolution

Relative Humidity Measurement

EXERGEN
C O R P O R A T I O N

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MODEL D501-RS

Microscanner™ D-Series

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Documents / Resources

	EXERGEN D501-RS IR Sensor Thermometer Remote Sensor [pdf] Instruction Manual D501, D501-RS, D501-RS Remote Sensor, D501-RS IR Sensor Thermometer Remote Sensor, Thermometer Remote Sensor, Remote Sensor

Manuals+,