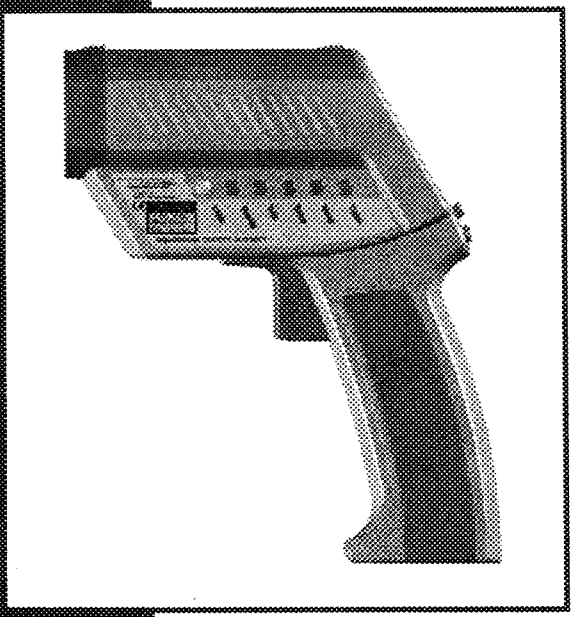
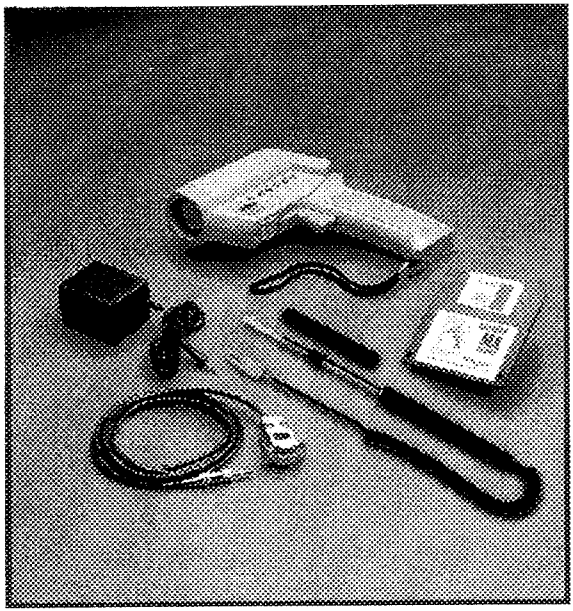
MANUAL



HIGH PERFORMANCE
INFRARED THERMOMETER

Rev. F2
01/1999
51599



INTRODUCTION

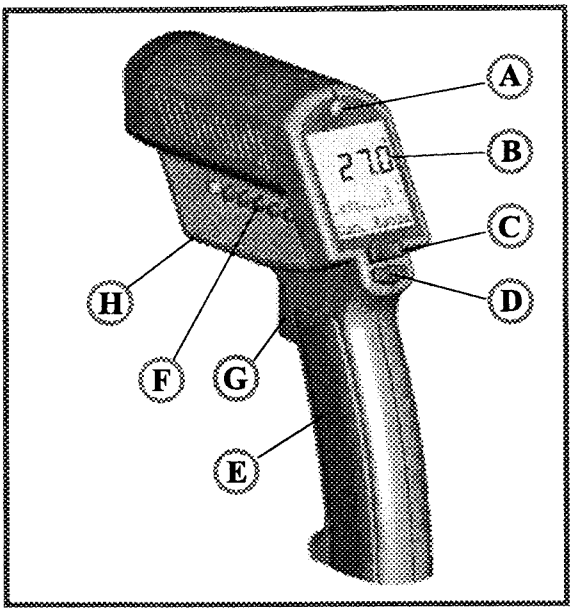
We hope you enjoy using your infrared thermometer!
It measures the amount of infrared energy emitted by a target object, and calculates the temperature of that object´s surface.

FEATURES

Your thermometer includes:
- Laser sighting
- Adjustable emissivity
- High/Low Alarm
- MAX, MIN, DIF, AVG
- Data Logger (100 points)
- Trigger lock
- Graphic display ... and more!

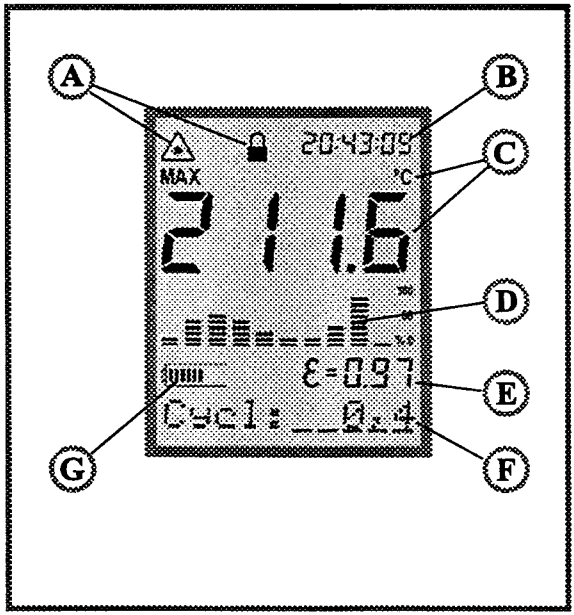
ACCESSORIES

The accessories package for your infrared thermometer includes:
- external power supply
- thermocouple type K
- Windows-based software
- RS232 cable



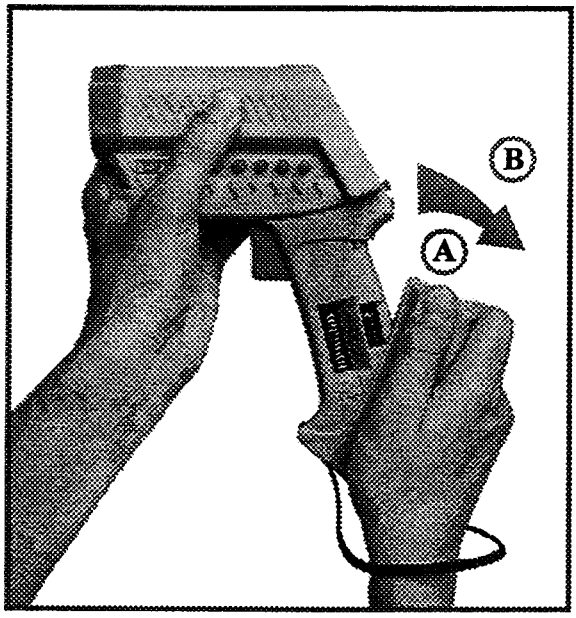
Function keys and display:
(A) Visual and audible alarm
(B) Display
(C) Up and Down keys
(D) Enter
(E) Switches for adjustments
(F) 6 main function keys
(G) Trigger
(H) Tripod mount

FUNCTIONS
USER
INTERFACE



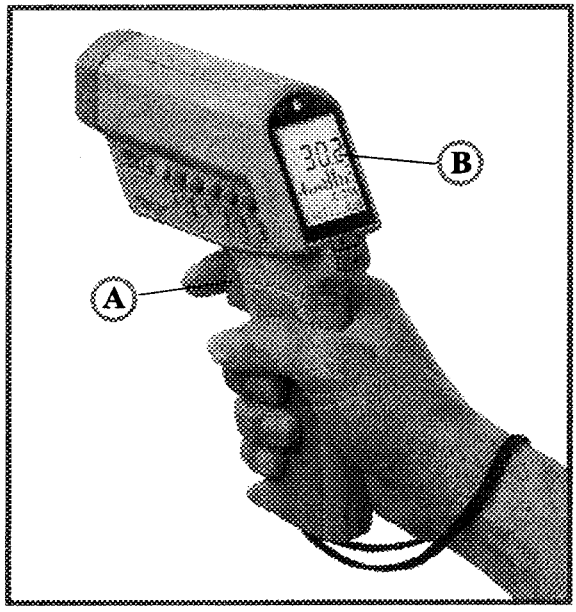
DISPLAY

Displayed functions:
(A) Laser condition / Lock symbol
(B) Time (or date)
(C) Main temperature display
(D) Graphic display
(E) Emissivity value
(F) Status bar
(G) Battery life indicator



BATTERIES

To open the battery compartment, press gently on the top part of the handle (A) to release the catch (B) and pivot the grip as shown in the figure. Orient the batteries (two alkaline R6 (AA, UM3)) as shown on the housing.



MEASUREMENT

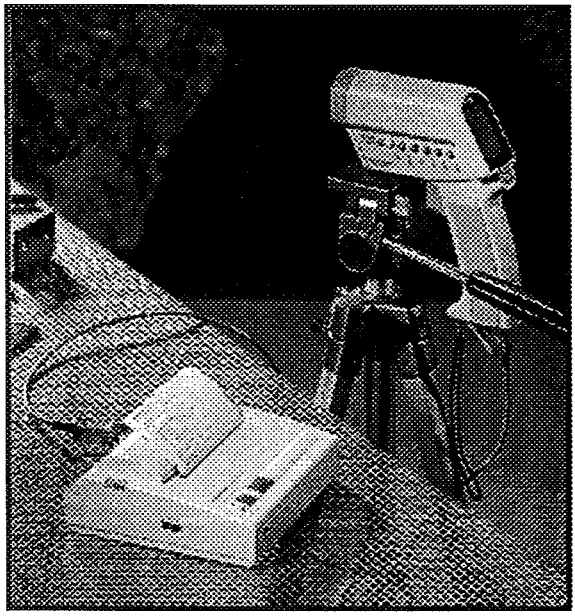
QUICK START

To take a temperature measurement, hold the unit as shown. Aim at the target. Pull the trigger (A). The temperature of the object being measured is shown on the display (B). The temperature will be displayed for seven seconds after the trigger is released.

HOLD TIME

DISPLAY-FUNCTIONS

The unit automatically switches "off" after 7 seconds if a function key is not pressed. The last settings are stored. The display returns to the last mode selected. To recall last reading, press ENTER without pulling the trigger.

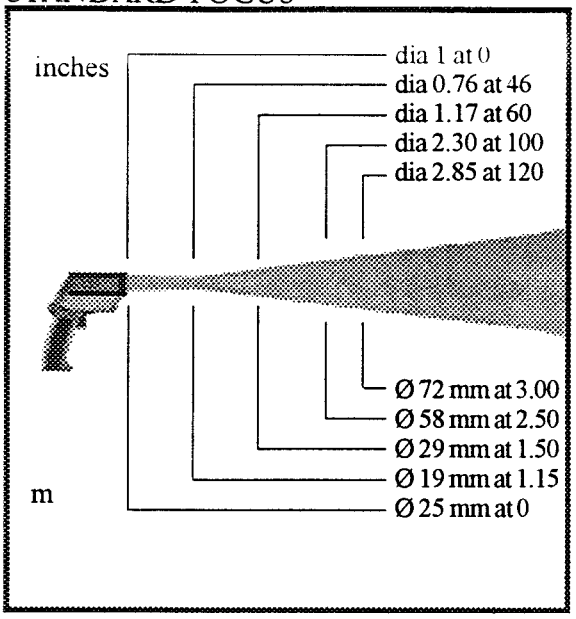


MEASUREMENT

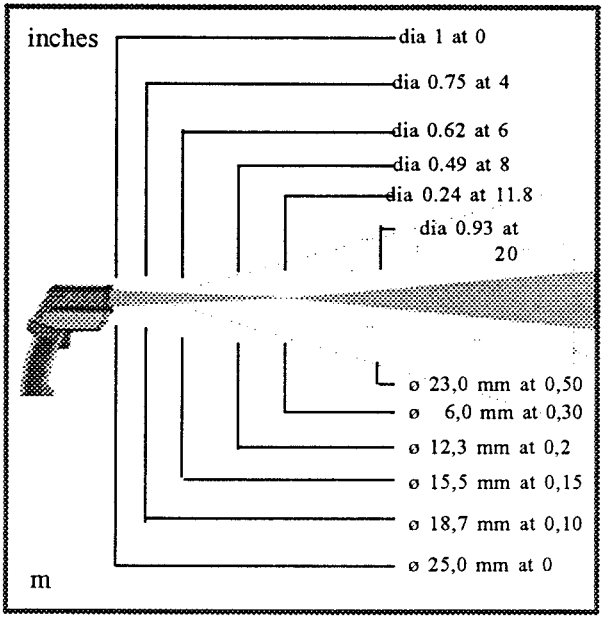
CONTINUOUS

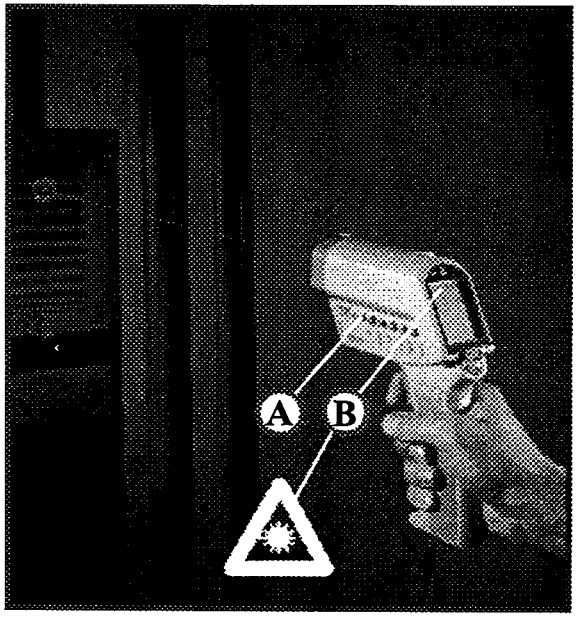
Open battery compartment and switch LOCK "on" to lock the unit on. You may mount the unit on a tripod, utilizing the tripod mount. Pull the trigger for continuous temperature measurement. (The laser will not be locked on.) To unlock, switch LOCK "off".

STANDARD FOCUS



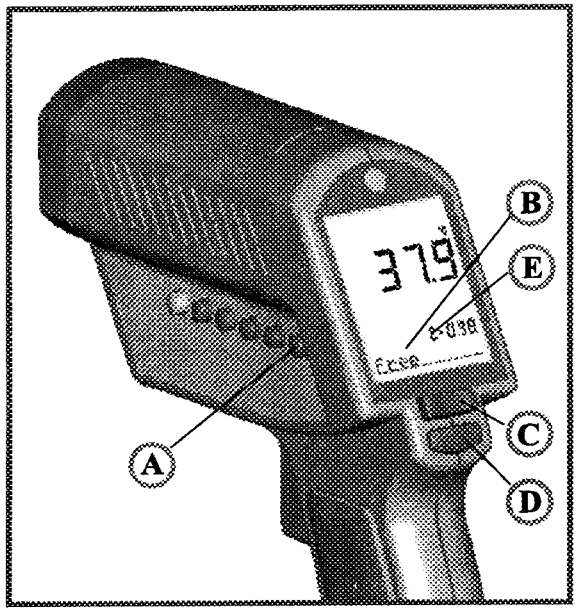
CLOSE FOCUS

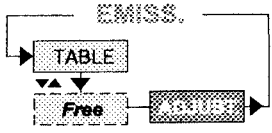




LASER
ON/OFF

The laser circle shows the spot size that includes the measured target. To turn the laser on or off press the LASER button (A) when the trigger is pulled. A laser symbol (B) appears when the laser is on. The laser automatically turns off if you release the trigger.



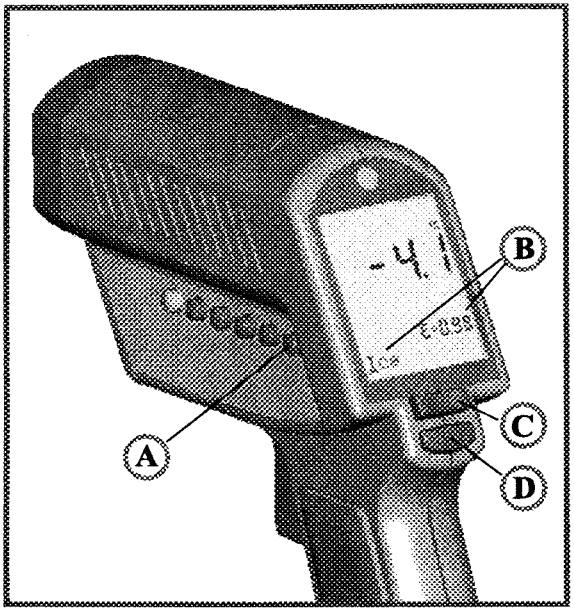


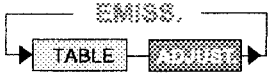
EMISSIVITY

The amount of infrared energy radiated by an object depends on its emissivity and its temperature. The emissivity depends on the material and its surface characteristics. For more accurate readings, adjust the emissivity value for the type of material being measured (see Emissivity table, Appendix E).

EMISSIVITY
ADJUST
EMISSIVITY

To adjust the emissivity value, press EMISS (A). Use the Up and Down keys to select "Free" (B). Press EMISS again. The emissivity icon (E) flashes. Use the up and down keys (C) to adjust. Press ENTER (D) to activate this setting.

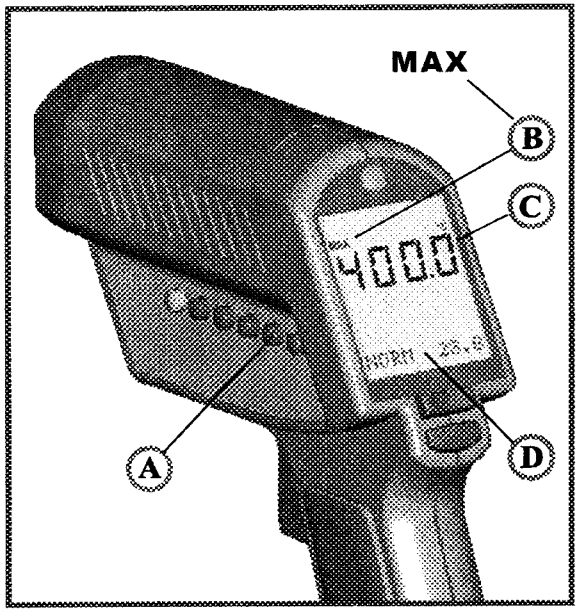


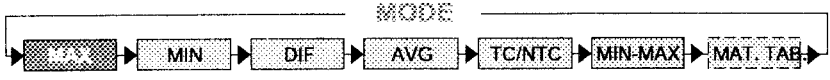


To choose the emissivity of a material, press EMISS. (A). The display shows a material name, an emissivity value and the calculated temperature value (B). To choose another material, use the Up and Down keys (C). Press ENTER (D) to activate this setting.

EMISSIVITY

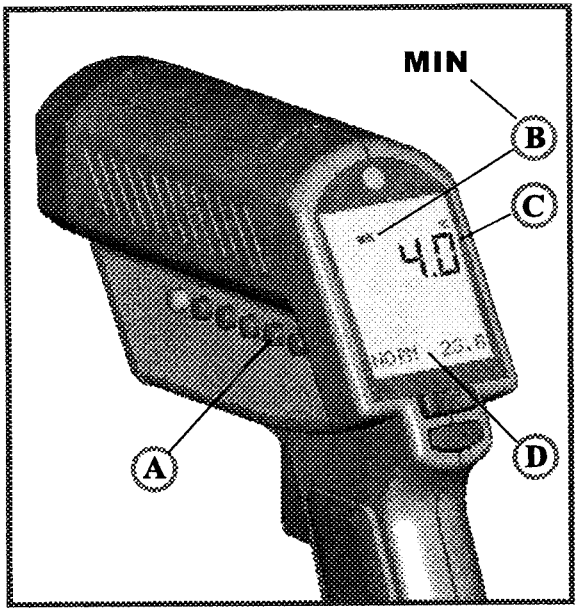
TABLE OF VALUES

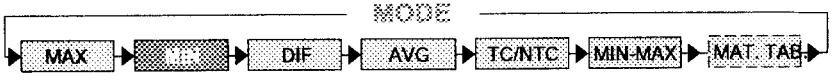




MODE
MAXIMUM

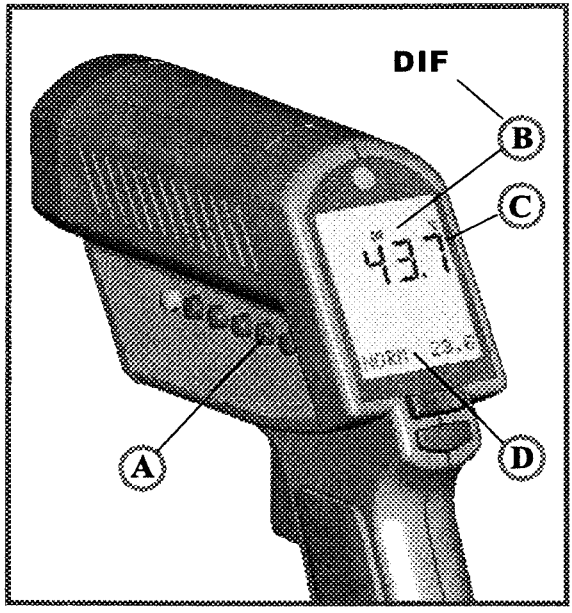
To activate the MAX mode, press MODE (A) until the MAX symbol appears (B). The measured maximum temperature is displayed (C) as long as the trigger is pulled or locked on. The real time temperature is shown in the lower part of the display (NORM) (D).





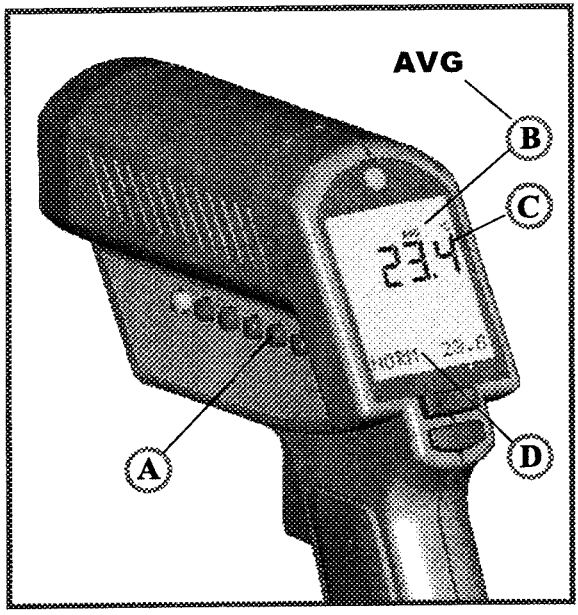
MODE
MINIMUM

To activate the MIN mode, press MODE (A) until the MIN symbol (B) appears. The measured minimum temperature (C) is displayed as long as the trigger is pulled or locked on. The real time temperature is shown in the lower part of the display (NORM) (D).



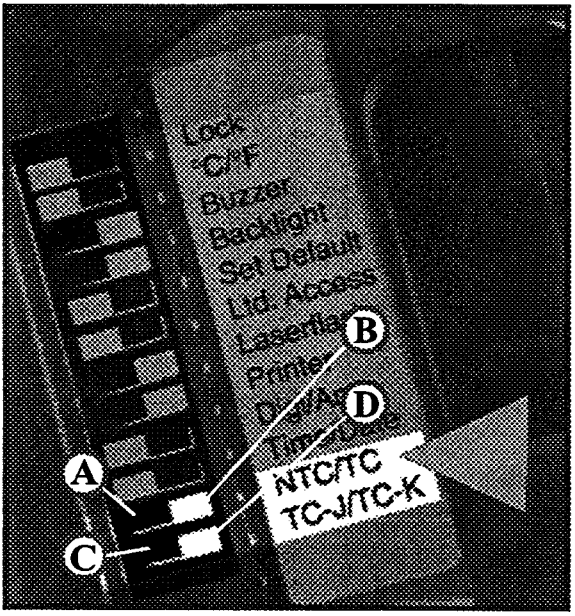
MODE
DIFFERENCE

To activate the DIF mode, press MODE (A) until the DIF symbol (B) appears. The difference between the measured max and min temperatures is displayed (C) as long as the trigger is pulled or locked on. The real-time temperature is shown in the lower part of the display (NORM) (D).



MODE
AVERAGE

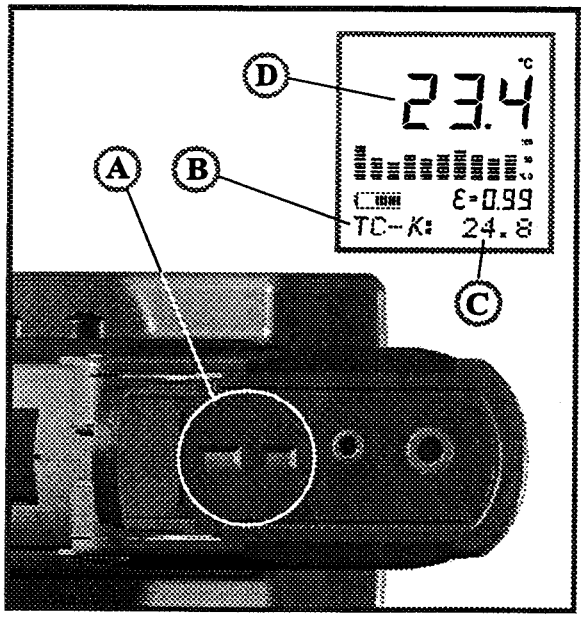
To activate the AVG mode, press MODE (A) until the AVG symbol (B) appears. The average value of measured temperatures (C) is displayed as long as the trigger is pulled or locked on. The real time temperature is shown in the lower part of the display (NORM)(D).



Open the battery compartment and set the switches ON or Off according to the desired probe type.
(A) NTC - thermistor
(B) TC - thermocouple
(C) Thermocouple type J
(D) Thermocouple type K

MODE TC/NTC

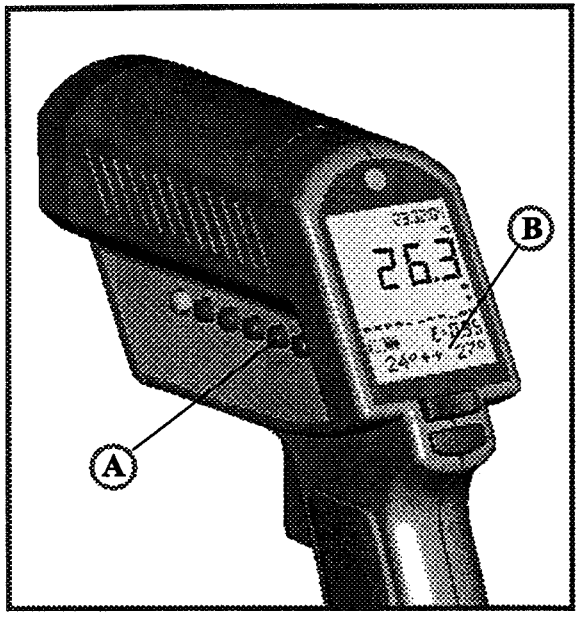
PROBE CONNECTIONS (PART 1)

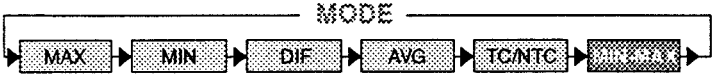


MODE TC/NTC

PROBE CONNECTIONS (PART 2)

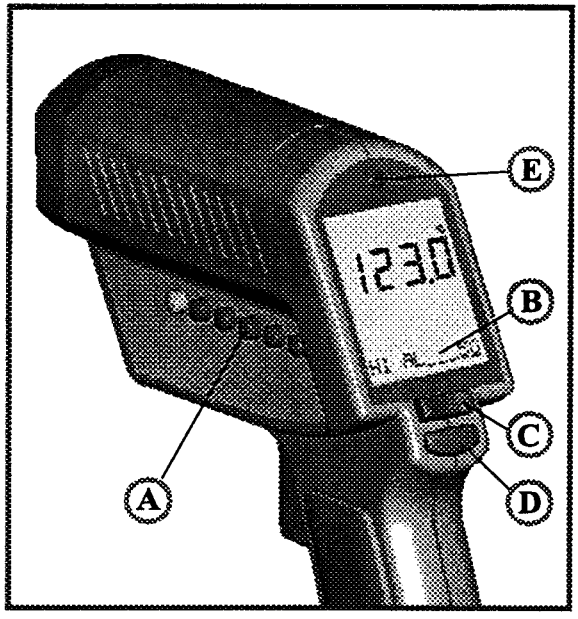
Connect the probe to the input (A). Press MODE, until the desired probe symbol (B) appears. The probe temperature is shown in the lower part of the display (C). The real time infrared temperature is shown in the main display (D).

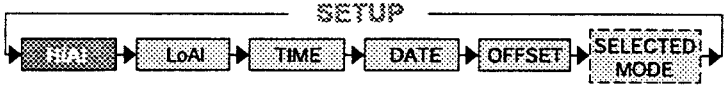




MODE
MIN-MAX
VALUES

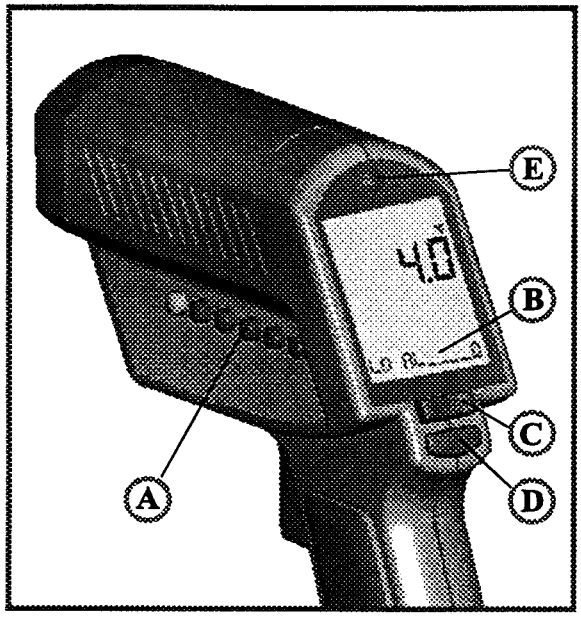
To show the minimum and maximum temperature values during a measurement at the bottom of the display, press MODE (A) until the two values appear (B).

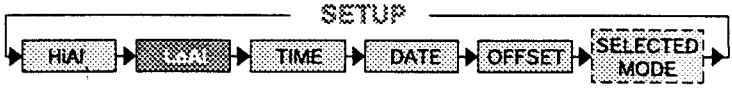




SETUP
HIGH ALARM

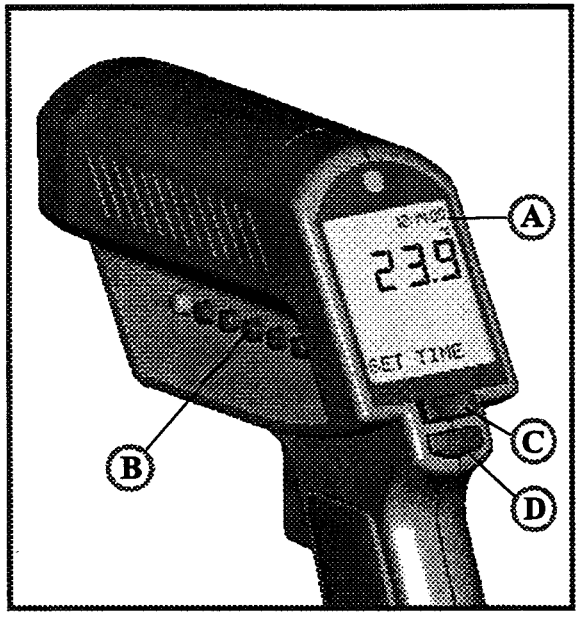
The high alarm (HiAl) generates an audible and visual (flashing LED and laser) (E) alarm if the temperature is above the setpoint.
To set the alarm value (B), Press SETUP (A) once and use the Up and Down keys (C). Then press ENTER (D) to activate this setpoint.

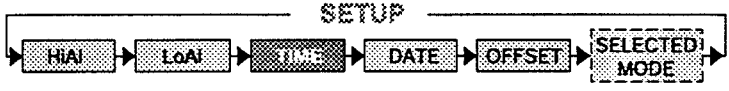




SETUP
LOW ALARM

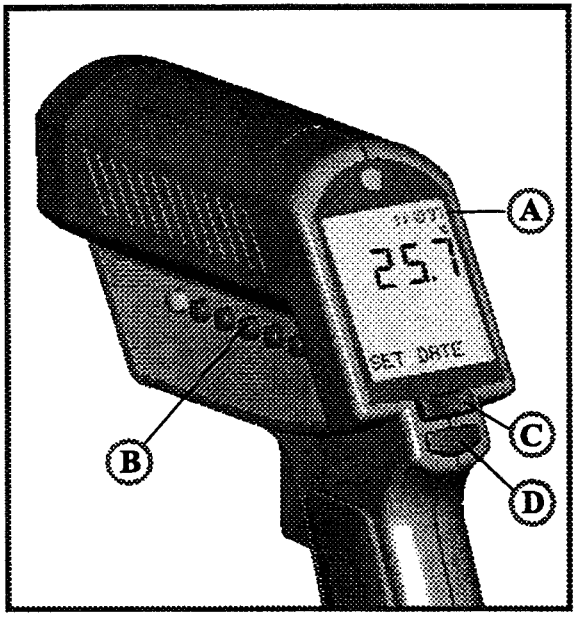
The low alarm (LoAl) generates an audible and visual (flashing LED and laser) (E) alarm if the temperature is below the setpoint.
To set the alarm value (B), Press SETUP (A) twice and use the Up and Down keys (C). Then press ENTER (D) to activate this setpoint.

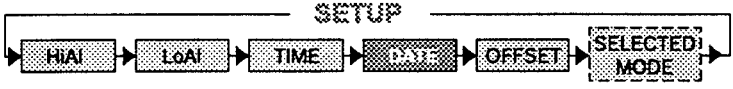




SETUP
TIME

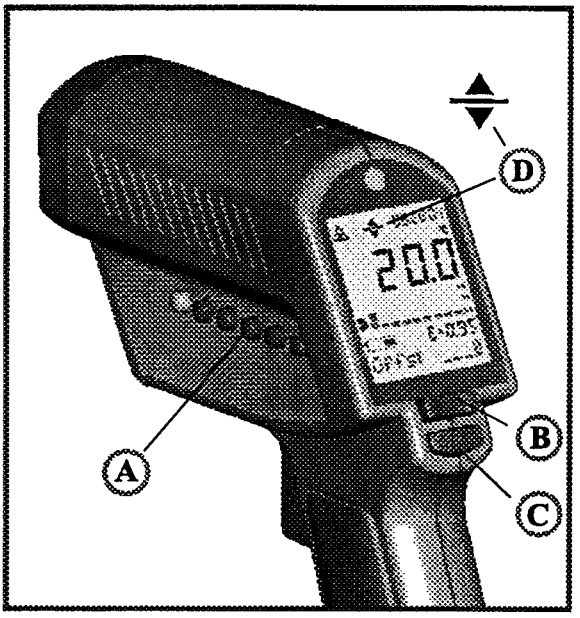
To set time, press SETUP (B) three times. Change the time (A) using the Up and Down keys (C). Then press ENTER (D) for each time segment to activate this time setting. The time appears on the display, is stored within the data logger and is part of the printer output.

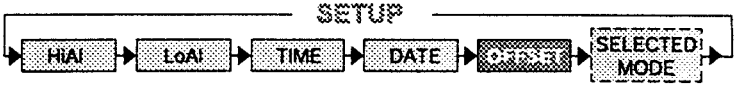




SETUP
DATE

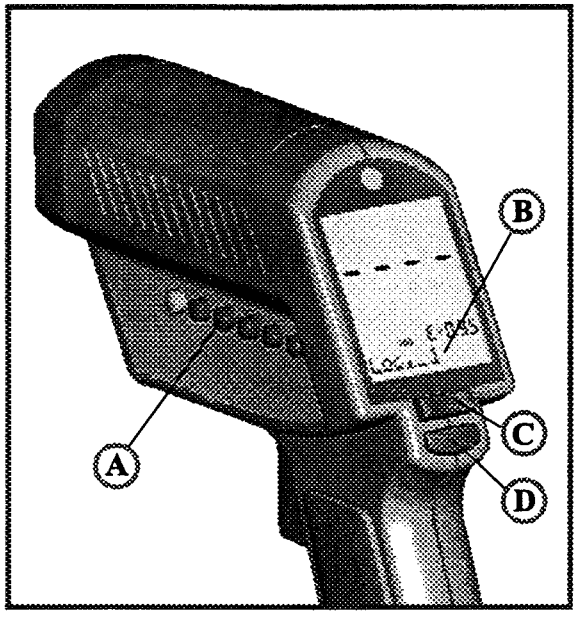
To set date, press SETUP (B) four times. Change the date using the Up and Down keys (C). Then press ENTER (D) for each date segment to activate this date setting. The date (A) is stored within the data logger and is part of the printer output.





SETUP
OFFSET

This function is used with a selected emissivity to add or subtract an offset value (±10°C/±18°F) to the temperature value. This allows several units or a specific temperature range to be matched. Press the Setup button (A) until "Offset" appears in the display. With the arrow keys (B) choose the value. Press enter (C) to confirm. If offset is used, a symbol (D) appears in the display.



DATA LOGGER

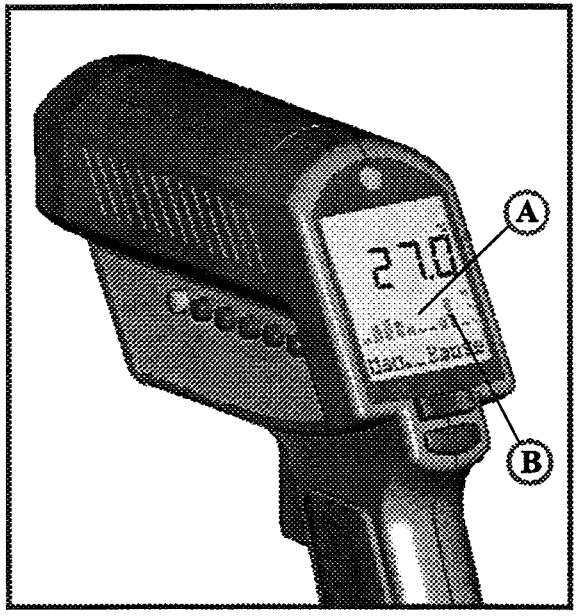
HOW TO STORE DATA

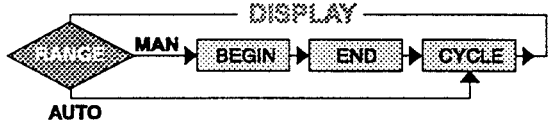
To store data, press DATA (A) once. "RCL" will flash and a log location will be shown at the status bar (B). To select another log location, use the Up and Down keys (C). Press ENTER (D). "LOG" will be shown. Pull the trigger, release again. Store by pressing ENTER (D). You will hear a tone. To exit, press DATA once.

DATA

RECALL

To Recall, press the ENTER button (D), without pulling the trigger. Then press the DATA button (A). A log location will be shown (B). To select another log location, use the Up and Down keys (C).

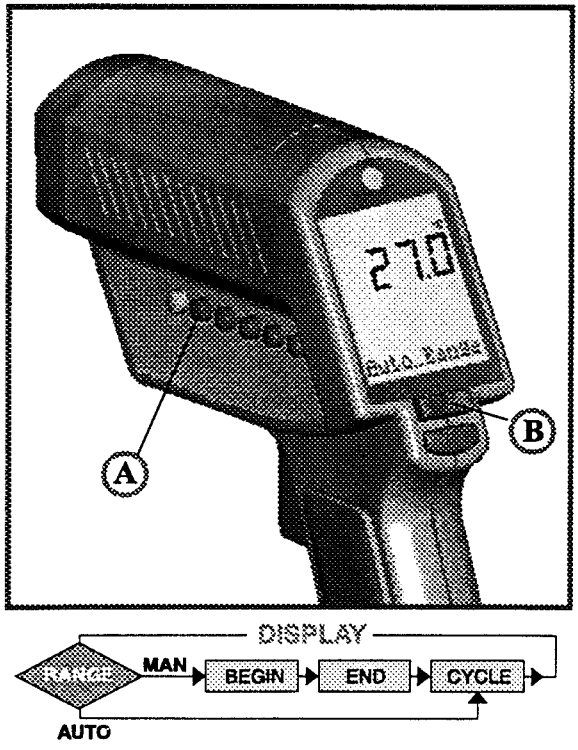




DISPLAY

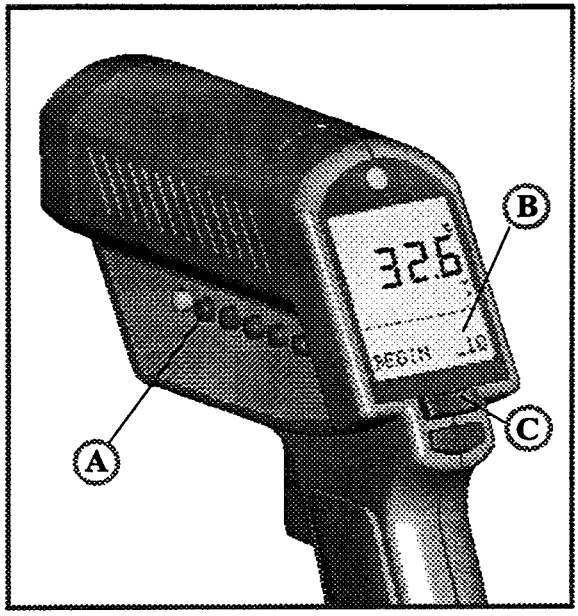
GRAPHIC DISPLAY

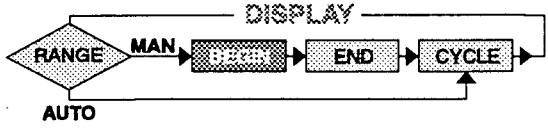
The graphic display (A) shows the temperature as a picture. The last ten measurements are shown (B). It is possible to choose between Auto Range and Manual Range. In manual range the user defines the beginning and ending temperature points of the graph.



Press DISPLAY (A) once. Use the Up and Down keys (B) to toggle between ranges. Auto Range is automatically defined by the measured maximum and minimum value. Manual Range (Man Range) is user defined (see DISPLAY BEGIN section).

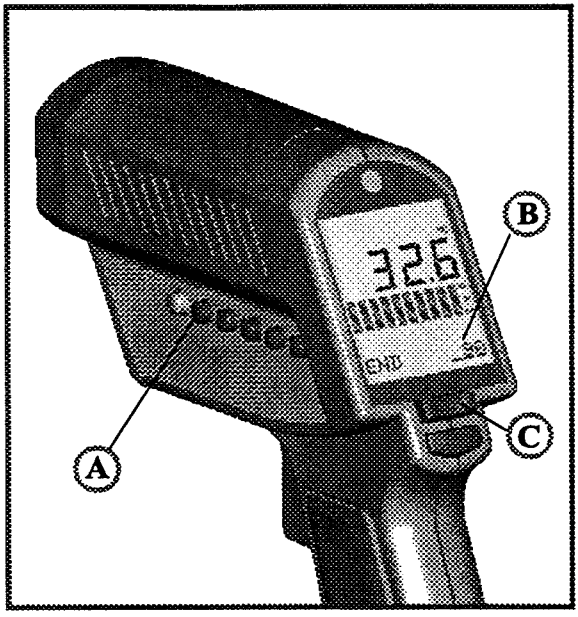
DISPLAY
AUTO OR MAN
RANGE

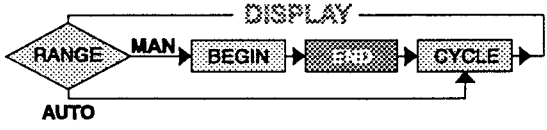




To set the BEGIN value for the graphic display (Man Range is activated) press DISPLAY (A) until "Begin" is shown at the status bar. Use the Up and Down keys (C) to select the value (B).

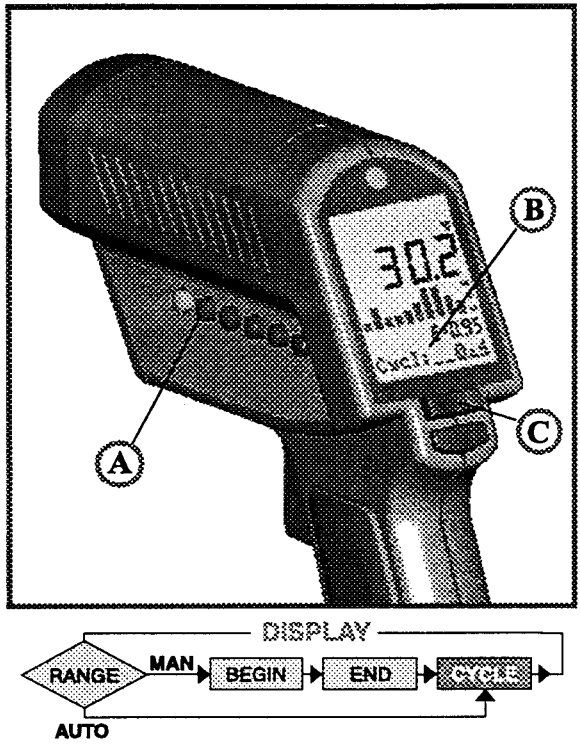
DISPLAY
BEGIN
(Man. Range)





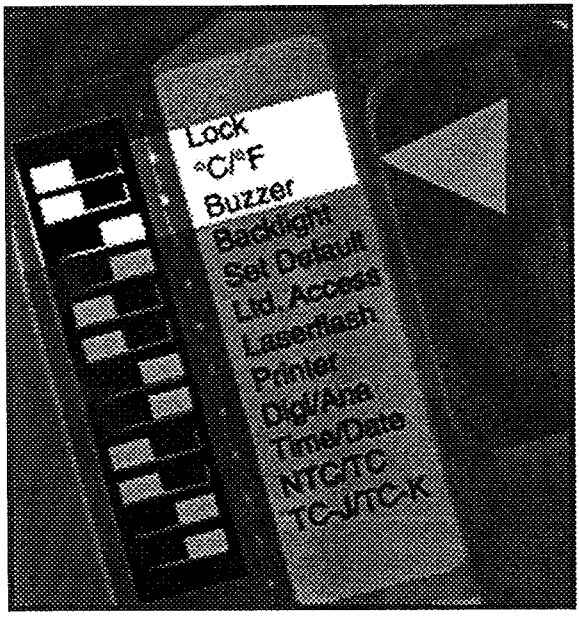
To set the END value of the graphic display (Man. Range) press DISPLAY (A) until "End" is shown at the status bar. Use the Up and Down keys (C) to select the value (B).

DISPLAY
END
(Man. Range)



DISPLAY
CYCLE

CYCLE allows the adjustment of the display interval. Press DISPLAY (A) until Cycl.: (B) is shown at the status bar. To select the interval time, use the Up and Down keys (C). The default value is pre-set for 0.5 sec.



Factory defaults

Lock	OFF
°C/°F	US: °F Other: °C
Buzzer	ON
Backlight	OFF
Set Default	OFF
Ltd. Access	OFF
Laserflash	ON
Printer	ON
Digi/Ana	Analog
Time/Date	Time
NTC/TC	TC
TC-J/TC-K	TC-K

SETTINGS
(PART 1)

Change the setting in the unit by using the DIP switches located in the battery compartment (see BATTERIES section). **Lock:** Trigger locked (on) or unlocked (off). **°C/°F:** changes between °C and °F and date and time format. **Buzzer:** Audible alarm On or Off.

SETTINGS
(PART 2)

Backlight: Backlight On or Off.
Set Default: Activates the factory defaults by overwriting listed settings (see specifications).
Ltd.Access: No buttons will work.
Laserflash: The laser flashes in case of over- or underranging of the alarm values.

SETTINGS
(PART 3)
PRINTER

Printer: (ON) The printer's data output (RS232) is working as long as the trigger is pulled. The protocol includes:
(A) Date
(B) Time
(C) Target temperature - infrared
(D) Target temperature- probe "X"
See software manual for other printout options.

SETTINGS
(PART 4)

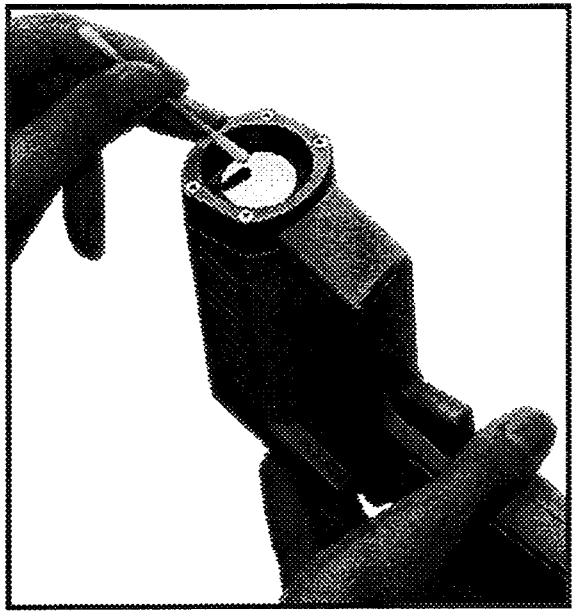
Digi/Ana: Digital or Analog output. Digital (RS232) output must be used with the printer or a PC. Analog output (mV/°) is usually used for data logger.
Time/Date: Time or date shown on the display.

SETTINGS
(PART 5)
CONTACT PROBES

NTC/TC: Thermistor (NTC) or thermocouple (TC)
TC-J/TC-K: Type of thermocouples
The temperature range for the probes:
K: -30°C to 400°C (-25°F to 750°F)
J : -30°C to 650°C (-25°F to 1200°F)
NTC:-30°C to 120°C (-25°F to 250°F)

TROUBLESHOOTING

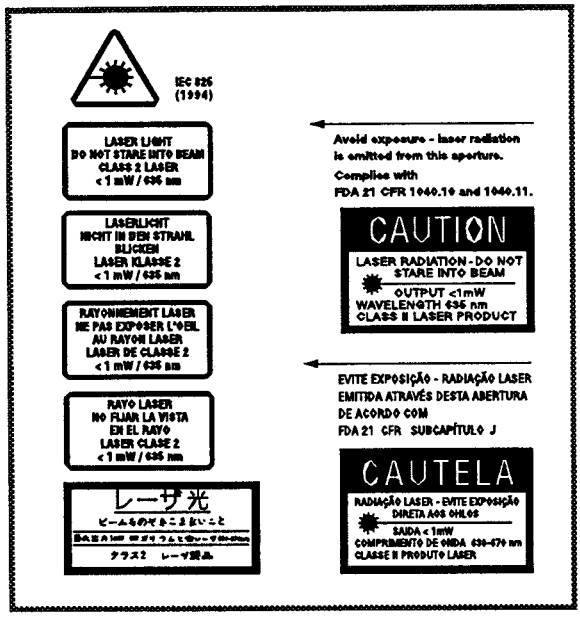
Code	Problem	Action
-O- -U-	Target temperature is over or under range	Select target within units specs
EEPROM-Err	EEPROM error	Contact Factory
CalAreaErr ProbCalErr	calibration errors	Contact Factory
Battery icon flashes or LowBatt	Battery is low	Replace batteries
Blank display	Battery is dead	Replace batteries
Laser won't work	Low or dead battery Ambient above 45°C (113°F)	Replace batteries Operate unit in 45°C (113°F) ambient or below
Display "ON"	Display locked "ON"	Disconnect the unit from the PC or power supply



Lens Cleaning: Blow off loose particles using clean compressed air. Brush remaining debris away with a camel's hair brush. Wipe the surface with a moist cotton swab. The swab may be moistened with water or a water based glass cleaner. NOTE: DO NOT use solvents to clean the plastic lens.

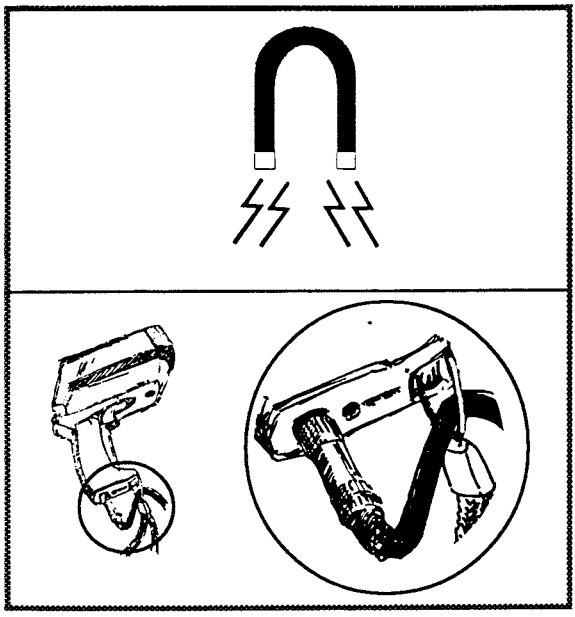
Case Cleaning: To clean the exterior housing, use soap and water or a mild commercial cleaner. Wipe with a damp sponge or soft rag.

APPENDIX B
MAINTENANCE



Caution!
Do not stare into beam!
Avoid indirect exposure via
reflective materials!

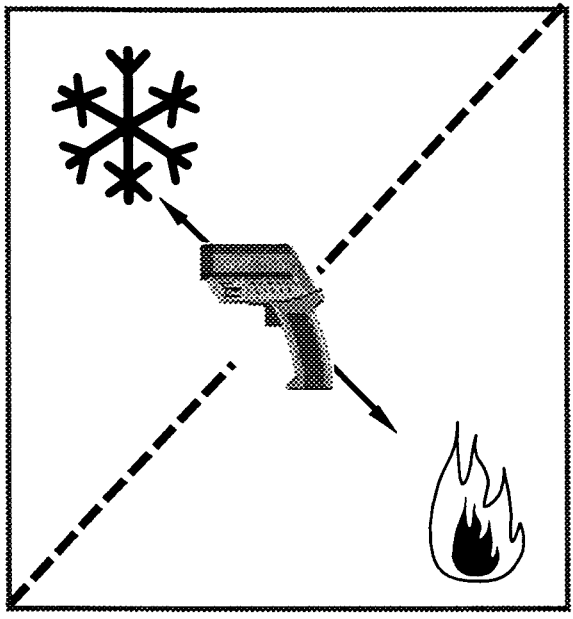
APPENDIX C
LASER
WARNING
LABEL



Keep away from EMF (electromagnetic fields). Avoid static electricity, arc welders, induction heaters. Don't leave the unit on or near objects of high temperature. **WARNING: DO NOT touch live voltage with contact probe.** Use the wrist strap for cable support.

APPENDIX D

CAUTIONS



Avoid abrupt changes in temperature. If this occurs, allow 40 minutes for thermal stabilization before use to prevent the possibility of inaccurate temperature readings.Please use only the Power Supply from the manufacturer.

APPENDIX D

CAUTIONS

Aluminum*	Aluminium*	Aluminium*	Alumínio*	Aluminio*	0.30
Asbestos	Asbest	Amiante	Asbesto	Asbesto	0.95
Asphalt	Asphalt	Asphalte	Asfalto	Asfalto	0.95
Basalt	Basalt	Basalte	Basalto	Basalto	0.70
Brass*	Messing*	Laiton*	Latón*	Latão*	0.50
Brick	Ziegel	Brique	Ladrillo	Tijolo	0.90
Carbon	Kohlenstoff	Carbone	Carbono	Carbono	0.85
Ceramic	Keramik	Céramique	Cerámica	Cerâmica	0.95
Concrete	Beton	Béton	Hormigón	Concreto	0.95
Copper*	Kupfer*	Cuivre*	Cobre*	Cobrer*	0.95
Dirt	Schmutz	Saleté	Polvo	Poeira	0.94
Food, frozen	Lebensmittel, gefroren	Nourriture, surgelée	Alimento, congelado	Alimentos, congelados	0.90
Food, hot	Lebensmittel, heiß	Nourriture, chaude	Alimento, caliente	Alimentos, quentes	0.93
Glass (plate)	Glas (Platte)	Verre (plaque)	Vidrio (placa)	Vidro (prato)	0.85
Ice	Eis	Glace	Hielo	Gelo	0.98
Iron*	Eisen*	Fer*	Hierro*	Gelo	0.70
Lead*	Blei*	Plomb*	Plomo*	Chumbo*	0.50
Limestone	Kalkstein	Calcaire	Piedra caliza	Pedra calcária	0.98
Oil	Öl	Huile	Aceite	Óleo	0.94
Paint	Farbe	Peinture	Pintura	Tinta	0.93
Paper	Papier	Papier	Pape	Papel	0.95
Plastic**	Kunststoff**	Plastique**	Plástico**	Plástico**	0.95
Rubber	Gummi	Caoutchouc	Caucho	Borracha	0.95
Sand	Sand	Sable	Arena	Areia	0.90
Skin	Haut	Peau	Piel	Pele	0.98
Snow	Schnee	Neige	Nieve	Neve	0.90
Steel*	Stahl*	Acier*	Acero*	Aço*	0.80
Textiles	Textilien	Textiles	Textiles	Tecidos	0.94
Water	Wasser	Eau	Agua	Água	0.93
Wood***	Holz***	Bois***	Madera***	Madeira***	0.94

* oxidized; oxidiert; oxydé; oxidado; oxidado

** opaque, over 20 mils; lichtundurchlässig, über 50 µm; opaque, plus de 20 mils; opaco, más de 20 mils; opaco, acima de 20 mils

***natural; natürlich; naturel; natural; natural

SPECIFICATIONS

Temperature Range	- 30 to 900°C (- 25 to 1600°F)
Display Resolution	0.1°C (0.2°F)
Accuracy (Infrared)	± 1% of reading or ± 1°C (± 2°F), whichever is greater at 25°C ± 5°C (77°F ± 9°F) ± 2°C (± 4°F) for targets below 0°C (32°F)
Ambient derating	< 0.05K/K or 0.05 %/K, whichever is greater at < 20°C (68°F) or > 30°C (86°F)
Accuracy (Thermocouple K/J)	± 2K or ± 0.75 %, whichever is greater
Accuracy (Thermistor)	± 0.6K
Repeatability (Infrared)	±0.5% of reading or ±1°C (2°F), whichever is greater ± 2°C (± 4°F) for targets below 0°C (32°F)
Response Time (95%)	250 msec
Spectral Range	8 to 14 µm
Optical Resolution	60 : 1
Ambient Operating Range	0 to 50°C (32 to 122°F) Laser max 45°C (113°F)
Storage Temperature without batteries	- 20 to 50°C (- 25 to 122°F)
Analog output	1 mV/°C(°F)
Power	2 x 1.5 V Alkaline Type AA
Power supply (external)	7.5 V ≥ 200 mA (Using the power supply the display automatically switches on)
Dimensions	200 x 170 x 50 mm (7.9 x 6.7 x 2 inches)
Tripod Mount	1/4"-20 UNC

FACTORY DEFAULTS

	Default	Range
Emissivity/Gain	0.95	0.10 to 1.50 in steps of 0.01
Emissivity Table	Free	30 materials
Mode	normal	
Hi Alarm	50°C (100°F)	-30 to 900°C (-25 to 1600°F)
Lo Alarm	0°C (32°F)	-30 to 900°C (-25 to 1600°F)
Offset Adjust	0°C (0°F)	-10 to 10°C (-18 to 18°F)
Graphic Display	Auto Range	Auto Range / Man Range
- Cycle Time	0.5 sec	0.1 sec to 300 sec
Printer Mode	Data Recording	3 modes, selectable via software
Printer output	ASCII 8 bits 1 Stop bit No Parity Baud Rate 9600 bd	
Data logger	100, pre-set with emissivity 0.95 Lo-Al: 0°C Hi-Al: 50°C adjustable only via Software (Accessory).	

This instrument conforms to the following standards:

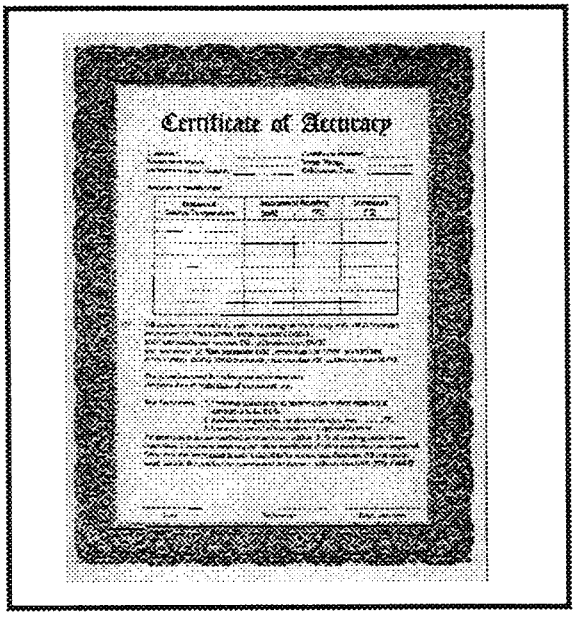
EMC: - EN50081-1:1992
- EN50082-1:1992

Safety: - EN 61010-1:1993 / A2:1995
- EN 60825-1:1994

This product herewith complies with the requirements of the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC.

This instrument conforms to the Standards of the European Community.

CE CONFORMITY



NIST/DKD CERTIFICATION

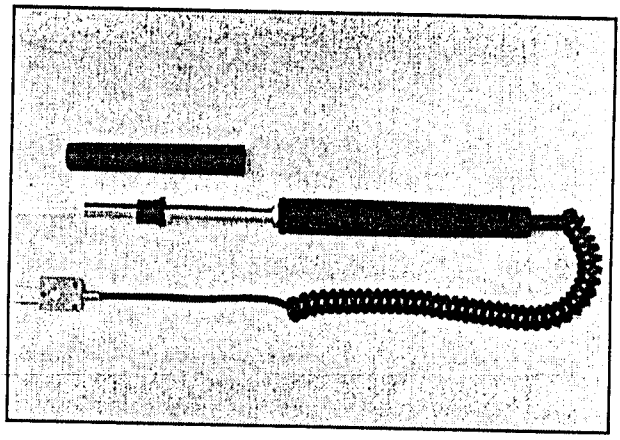
The temperature sources used to calibrate this instrument are traceable to the U.S. National Institute of Standards and Technology (NIST) and the Deutscher Kalibrierdienst (DKD). NIST and DKD certificates are available as an option from the manufacturer.

The manufacturer warrants this product to be free from defects in material and workmanship under normal use and service for a period of one year from date of purchase except as hereinafter provided. This warranty extends only to the original purchaser (a purchase from the manufacturer or the manufacturer's licensed distributors is an original purchase). This warranty shall not apply to fuses or batteries. Factory calibration is warranted for a period of one year. The warranty shall not apply to any product which has been subject to misuse, neglect, accident, or abnormal conditions of operation or storage. Should the manufacturer be unable to repair or replace the product within a reasonable amount of time, purchaser's exclusive remedy shall be a refund of the purchase price upon return of the product.

In the event of failure of a product covered by this warranty, the manufacturer will repair the instrument when it is returned by the purchaser, freight prepaid, to an authorized Service Facility within the applicable warranty period, provided the manufacturer's examination discloses to its satisfaction that the product was defective. The manufacturer may, at its option, replace the product in lieu of repair. With regard to any covered product returned within the applicable warranty period, repairs or replacement will be made without charge and with return freight paid by the manufacturer, unless the failure was caused by misuse, neglect, accident, or abnormal conditions of operation or storage, in which case repairs will be billed at a reasonable cost. In such a case, an estimate will be submitted before work is started, if requested.

The foregoing warranty is in lieu of all other warranties, expressed or implied, including but not limited to any implied warranty of merchantability, fitness, or adequacy for any particular purpose or use. The manufacturer shall not be liable for any special, incidental or consequential damages, whether in contract, tort, or otherwise.

ADDENDUM 1
NEW THERMOCOUPLE



Specifications

Temperature Range: -30 to 400°C (-25 to 750°F)

Accuracy: +/- 2.5°C (+/- 5°F)