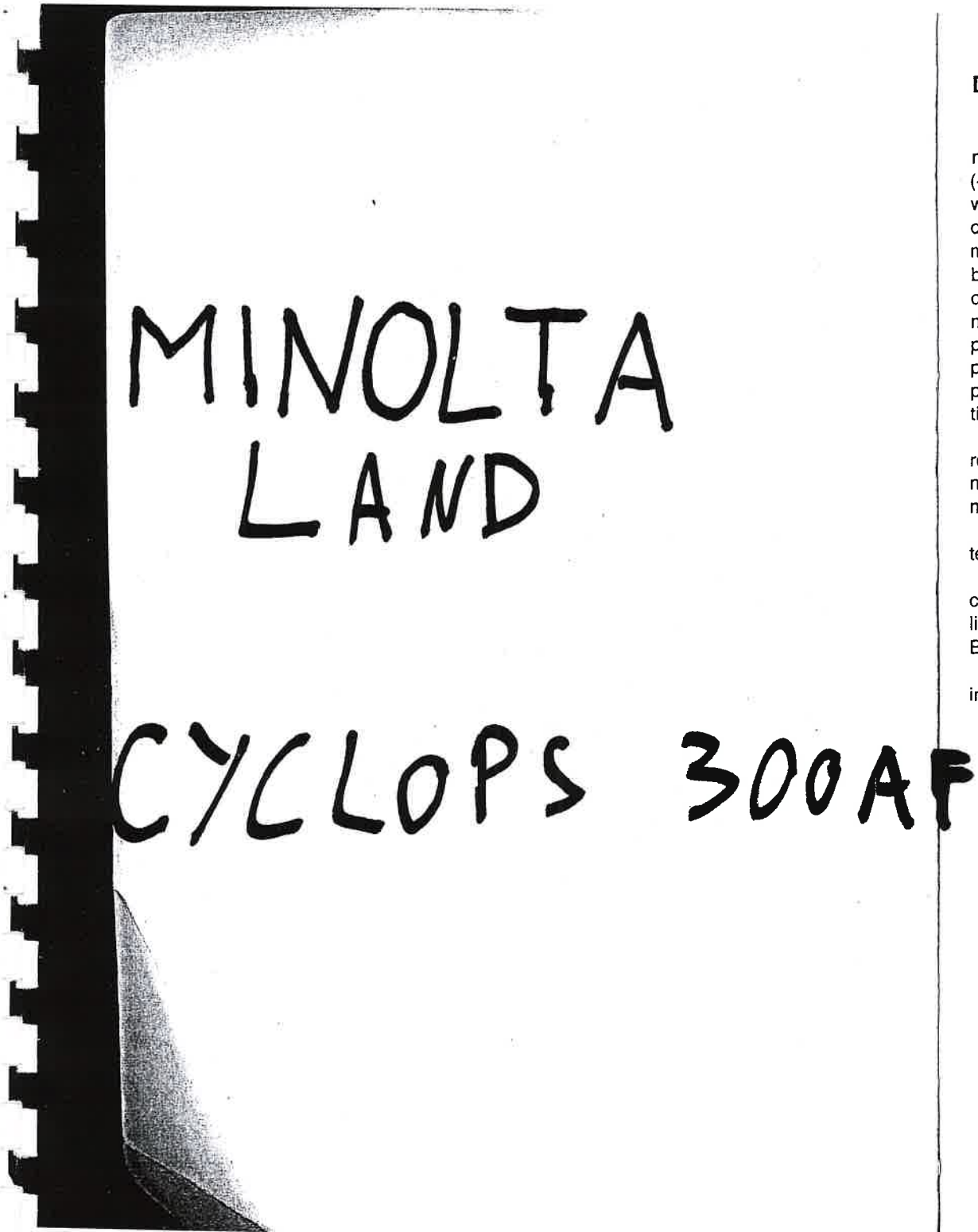


DESCRIPTION

The Minolta/Land Cyclops 300AF and 300 are infrared thermometers with 1° measuring angles designed for non-contact temperature measurements from -50 to 1000°C (-50 to 1800°F). With the Cyclops 300AF, focus is continually adjusted automatically while the measuring button is held pressed, making accurate temperature measurements of even moving objects extremely easy; with the Cyclops 300, focus must be adjusted manually. Both models share a variety of features. Measured temperatures are shown both inside the viewfinder and in an external display. Measured temperatures can be displayed in any of four modes: NORM. for display of continuously updated measurements, PEAK for display of the highest temperature measured in the present measuring period, AVG. for the display of the average of the ten most recent measurements in the present period, and VALLEY for display of the lowest temperature measured in the present period. Measurements can be taken by pressing the measuring button or continuously by setting either model to monitor mode.

Both models are equipped with memory for up to ten measurements, which can be recalled to the display at any time. Data is automatically stored in memory at the time of measurement. In addition, both models can calculate the mean of up to 65,535 measurements, and can determine the maximum or minimum of any number of measurements.

An alarm function, which automatically determines whether or not the measured temperature is within limits set by the user, is also included.

Bidirectional data communication is possible with both models. With either model connected to a computer, virtually all functions, including setting emissivity or alarm limit data, can be performed, and measurement data can be output from the thermometer. Both models also hare analog output terminals for output to a data recorder.

Before using either model for the first time, take a moment to read these operating instructions carefully and keep them with the unit for future reference.

WARNING

NEVER AIM THE CYCLOPS DIRECTLY AT THE SUN AND LOOK THROUGH THE VIEWFINDER.
DOING SO CAN DAMAGE YOUR EYES AND THE CYCLOPS.

Caution

- Do not use the Cyclops in areas with ambient temperatures of less than 0°C (32°F) or greater than 50°C (122°F). Also, avoid subjecting the Cyclops to rapid temperature changes which may result in condensation.
- Rapid changes in ambient temperature may affect measured values.
- Do not mix battery types or ages. Mixing battery types or ages may result in battery leakage or bursting, or in shorter battery life.
- Never attempt to disassemble the Cyclops. Any necessary repairs should be done only by an authorized Land service technician.

Care

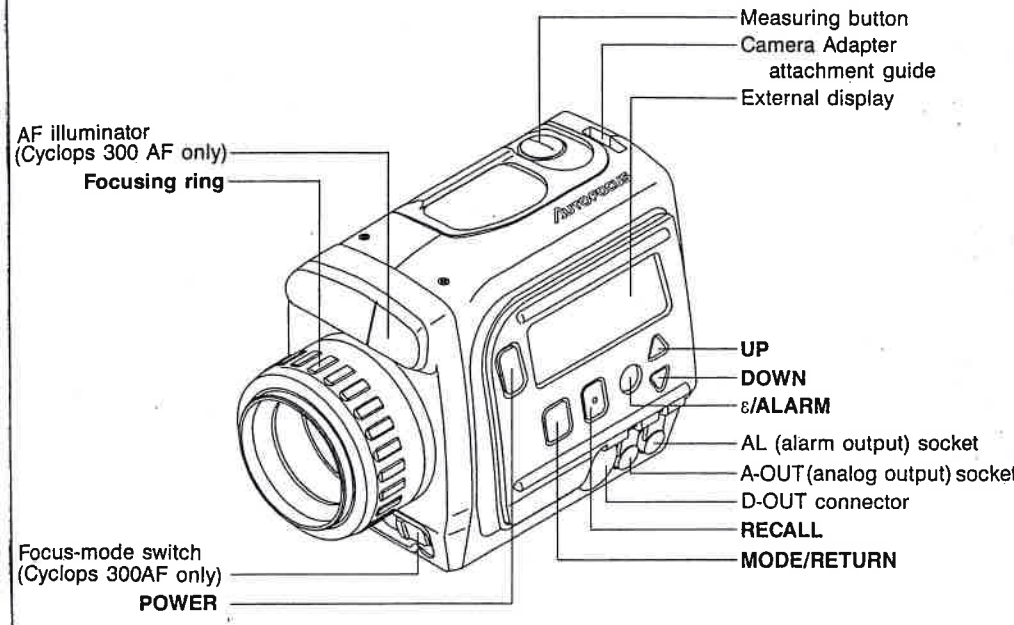
- After use, switch off the power of the Cyclops and cover the lens with the lens cap.
- If the Cyclops becomes dirty, it can be cleaned with a soft, dry cloth. Never use organic solvents, such as benzene or thinner, for cleaning; such solvents may damage the Cyclops.
- Be extremely careful to keep the protective filter clean. If the filter becomes dirty, use a blower to blow off loose dust; if necessary, the filter can then be wiped lightly with lens tissue.
- If the viewfinder eyepiece becomes dirty, use a blower to remove loose dust and then wipe with lens tissue if necessary.

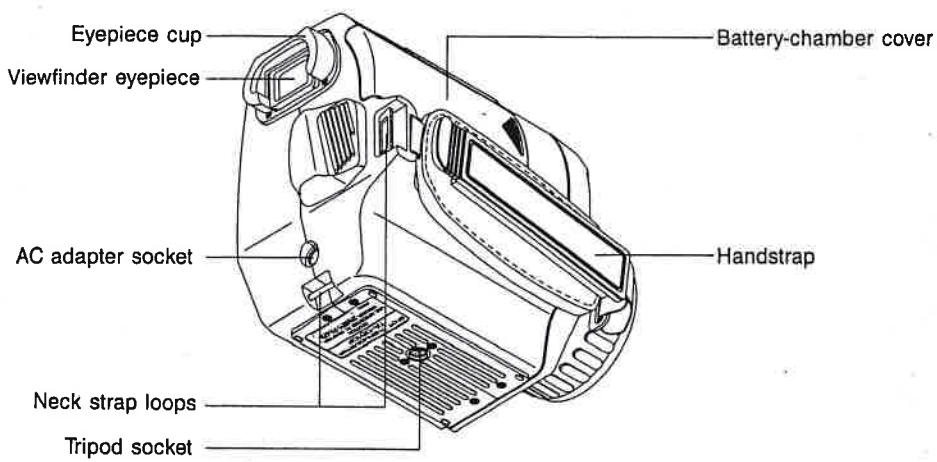
Storage

- The Cyclops should be stored in a cool, dry place at temperatures between -20°C (-4°F) and +55°C (+131°F) and relative humidity of 85% or less (at 35°C). Do not store the Cyclops in areas subject to high temperatures or humidity. In damp environments, store the Cyclops in a sealed airtight container with silica gel or a similar drying agent.
- Do not leave the Cyclops in extremely dusty areas.
- Do not leave the Cyclops in areas subject to high temperatures, such as inside a closed motor vehicle, in direct sunlight, or near sources of heat such as stoves, strong lights, etc.
- If the Cyclops will not be used for longer than two weeks, remove the batteries to avoid the possibility of damage due to corrosion.

CONTENTS

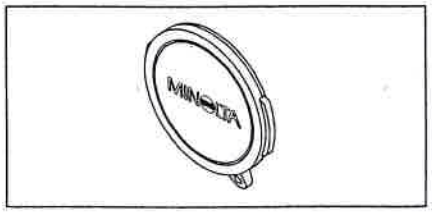
NAMES OF PARTS



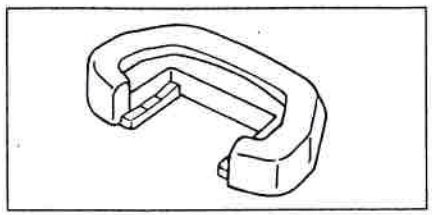


Standard Accessories

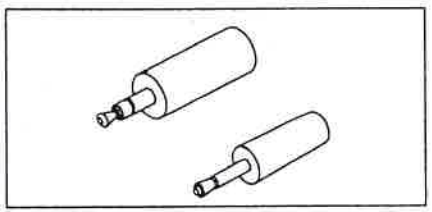
Lens cap



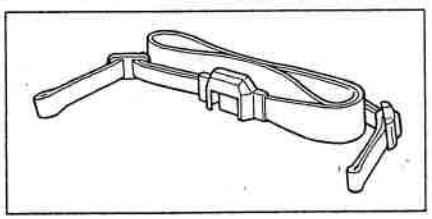
Eyepiece cup



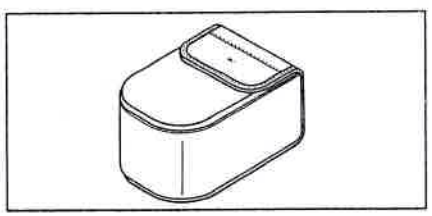
∅3.5mm (1/8″) subminiature plugs (one 2-contact for analog output; one 3-contact for alarm output)



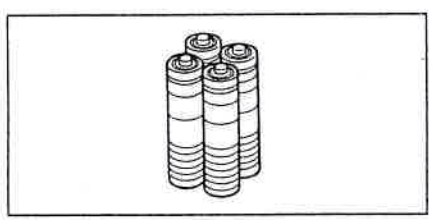
Neck strap (Strap included with Cyclops 300 AF has eyepiece cap attached)



Soft case



AA-size batteries (4)



FUNCTIONS OF CONTROLS

Focus-mode switch

(On Cyclops 300AF only) Selects focusing mode: Set to AF for autofocusing, set to MANU. for manual focusing.

POWER

- Switches power on when pressed once, switches power off when pressed again.
- If pressed to switch on power while measuring button is held pressed, sets Cyclops to monitor mode (p. 26).

MODE/RETURN

- In measuring mode, selects measuring display mode (p. 23). Measuring display mode changes in the following order each time **MODE/RETURN** is pressed:
  ...→PEAK→AVG.→VALLEY→NORM.→PEAK→...
- In emissivity setting mode, memory recall mode, or alarm setting mode, returns to measuring mode immediately when pressed.

RECALL

Selects memory functions (p. 27). Memory function changes in the following order each time **RECALL** is pressed:
...→MAX→MEAN→MIN→MEM.DATA→MAX→...

ε/ALARM

Enters mode for setting emissivity value (p. 21) and alarm settings (p. 29). Item to be set changes between the following items each time **ε/ALARM** is pressed (exact order of changes depends on previous operations):

- ε (emissivity value)
- High limit value
- Low limit value
- Alarm sound (on/off)

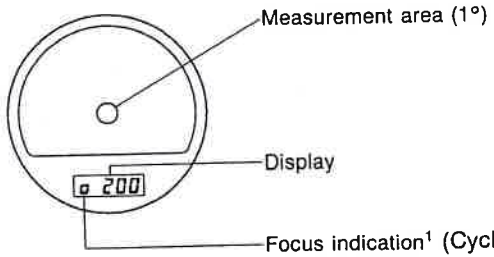
UP
DOWN

- Increases (**UP**) or decreases (**DOWN**) value being set (emissivity, low or high limit value) or data number recalled from memory; switch alarm sound on and off.
- If both **UP** and **DOWN** are pressed together, they switch off alarm for limit value (high or low) being set.

Measuring button

- In manual measuring mode (p. 25): With focus-mode switch set to AUTO, causes autofocusing to be performed and measurement to be taken; with focus-mode switch set to MANU., causes measurement to be performed. In either case, the process will be repeated continuously while the measuring button is held pressed.
- If held pressed when **POWER** is pressed, sets Cyclops to monitor mode (p. 26). While in monitor mode, causes autofocusing to be performed.

VIEWFINDER

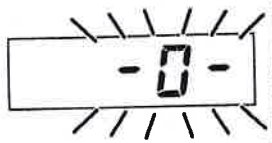


- Measured temperatures will be displayed in 0.1°C increments from -55 to 199.9°C (-60 to 249.9°F); measured temperatures will be displayed in 1°C increments from 200 to 1050°C (250 to 1900°F).

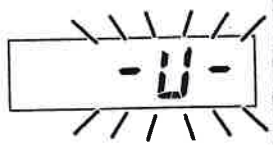
1 Focus indication (when using the Cyclops 300AF with the focus-mode switch set to AF):
"O" Focus has been achieved.
"II" Focus could not be achieved.

If the measured temperature is slightly outside the measuring range (between -55 and -50.1°C/-60 and -50.1°F or between 1001 and 1050°C/1801 and 1900°F), the display will blink as shown at right.

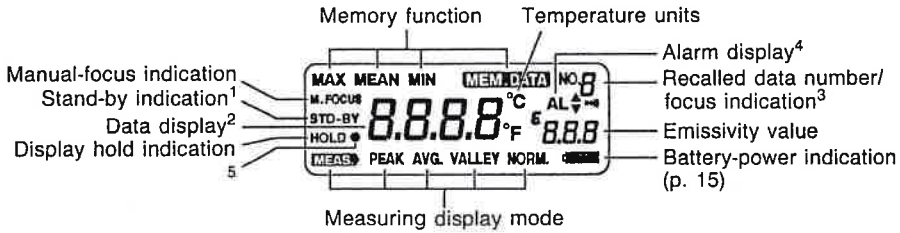
If the measured temperature is over 1050°C (1900°F), the display shown at right will appear.



If the measured temperature is below -55°C (-60°F), the display shown at right will appear.



EXTERNAL DISPLAY



1 Stand-by indication
Appears in the following circumstances:
- When power is switched on but no measurement has been taken.
- When temperature unit has been changed but no measurement has been taken.
- Blinks when Cyclops is in stand-by mode; displayed with out blinking when stand-by mode is ended.

2 Data display
Shows temperature data, including measured data, recalled data, results of calculations on data in memory, and alarm limit data or setting.
- Temperatures will be displayed in 0.1° increments from -55 to 199.9°C (-60 to 249.9°F); temperatures will be displayed in 1° increments from 200 to 1050°C (250 to 1900°F).

3 Recalled data number/focus indication
- Shows number of recalled data when "NO." is also displayed.
- Focus indication (Cyclops 300AF only; when measurements are taken with focus-mode switch set to AF):
  "O" Focus has been achieved; disappears for approximately two seconds if AF illuminator was used.
  "II" Focus could not be achieved.
  Either mark disappears when measuring button is released.

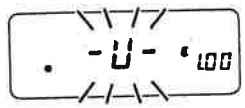
4 Alarm display
- "▲" appears if upper limit value has been set; "▲" blinks if the measured temperature is equal to or greater than the upper limit.
- "▼" appears if lower limit value has been set; "▼" blinks if the measured temperature is equal to or less than the lower limit.
- "))" appears if the alarm sound is set to "On".

5 Blinks while autofocus is being performed or while temperature is being measured.

If the measured or memory-function (MAX, MEAN, MIN, or MEM.DATA) temperature is slightly outside the measuring range (between -55 and -50.1°C/-60 and -50.1°F or between 1001 and 1050°C/1801 and 1900°F), the display will blink as shown at right.

If the measured or memory-function temperature is over 1050°C (1900°F), the display shown at right will appear.

If the measured or memory-function temperature is below -55°C (-60°F), the display shown at right will appear.

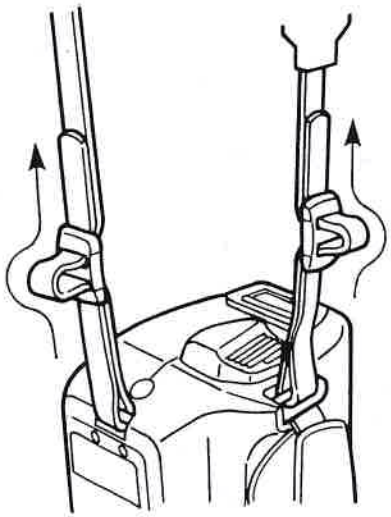


When using memory functions in any of the following circumstances, the display shown at right will appear:

- If any data in memory is less than -55°C (-60°F) or more than 1050°C (1900°F) and MEAN is selected as the memory function. (Mean value cannot be calculated.)
- If data for calculating MAX, MEAN, and MIN values have been cleared (p. 28).

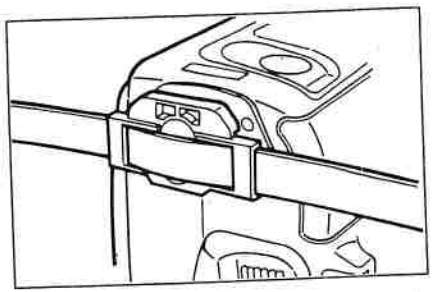
ATTACHING NECK STRAP

Attach both ends of the neck strap to the neck strap loops as shown below.



USING EYEPIECE CAP

When the Cyclops 300AF is taking measurements without someone looking through the viewfinder (such as when performing remote-ontrol measurements), autofocus may not function properly if bright light enters the viewfinder. Although this has no direct effect on temperature measurements, it could cause the subject to be out of focus and the measurement area would thus be slightly different from the area indicated in the viewfinder. To prevent this problem, attach the eyepiece cap (included on the neck strap) as shown at right.



CORRECTING EYEPIECE FOR USER'S EYESIGHT

In order for the actual measurement area to match the measurement area inside the viewfinder, it is necessary that the Cyclops be correctly focused on the subject. If the Cyclops is not correctly focused on the subject, emissions from other than the desired subject area may affect measurements. To be sure that the Cyclops is focused correctly on the desired subject, the corrective power of the eyepiece must correspond to the eyesight of the user. When the power of the eyepiece is correct, the frame of the measurement area in the viewfinder will appear sharp. If autofocus is selected on the Cyclops 300AF, check that the subject focused on is the desired subject; when using the Cyclops 300 or if manual focus is selected on the Cyclops 300AF, turn the focusing ring until the subject appears sharp.

The eyepiece of the Cyclops is designed to have a corrective power of -1 diopter. In most cases, no further correction will be needed, even for those people who wear eyeglasses or contact lenses. If further correction is necessary (if the outline of the measurement area in the viewfinder cannot be seen clearly), optional Eyepiece Corrector 1000 lenses (available in powers from -4 to +3 diopters) can be purchased and the appropriate one attached to the eyepiece.

PREPARATIONS

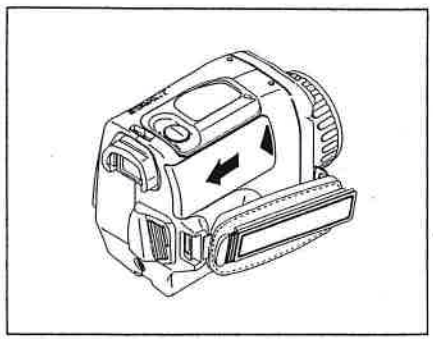
Power

The Cyclops can be powered by four AA-size batteries, by the optional AC Adapter AC-A10 (AC 220V) or AC-A10N (AC 120V), or by the optional Data Processor DP-C2 or Data Printer DP-3.

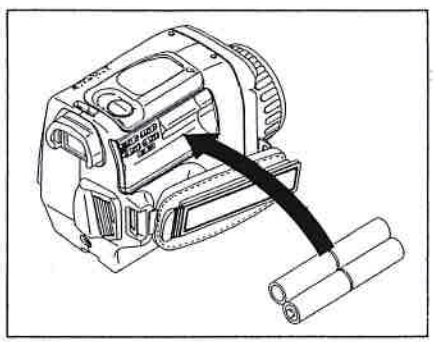
•For details on powering the Cyclops from the Data Processor DP-C2 or Data Printer DP-3, refer to the instruction manual for that product.

INSTALLING BATTERIES

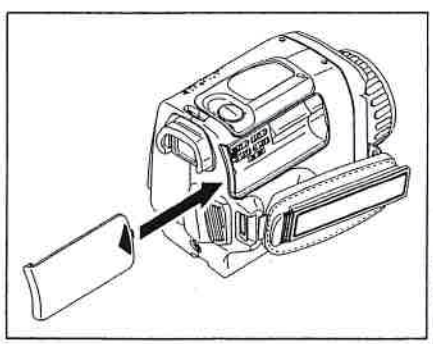
1. Press on the arrow-shaped ribbed portion of the battery-chamber cover and slide the cover in the direction indicated by the arrow.



2. Install four AA-size alkaline-manganese or carbon-zinc (1.5V) batteries in the battery chamber with the battery terminals positioned as shown inside the battery chamber.
   - Do not mix battery types or ages.

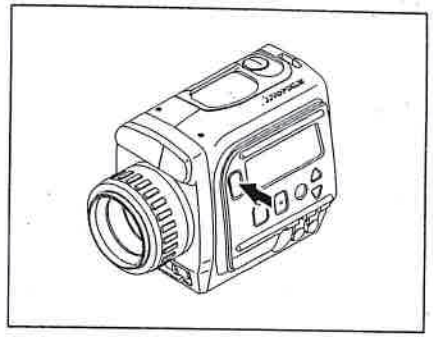


3. Replace the battery-chamber cover, sliding it toward the lens until it locks in place.



BATTERY CHECK

After installing batteries, press **POWER** to switch on the Cyclops. The Cyclops will check the battery power.



•If no display appears, batteries are installed incorrectly or are completely exhausted. Check that the batteries are installed correctly; if they are and still no display appears, replace the batteries or use the optional AC adapter, Data Processor DP-C2, or Data Printer DP-3.

If the battery-power indication is displayed and is entirely black, the batteries contain full or almost full charge. The battery-power indication will disappear after approximately five seconds.

If the battery-power indication is displayed but only half of it is black, the batteries have been partially used but there is still sufficient power for operation and the batteries do not need to be replaced yet. The battery-power indication will remain in the display.

If the battery-power indication blinks, battery power is low and the batteries should be replaced with fresh ones.

- Even if the battery power is low (battery-power indication blinks), the Cyclops may be used until other values in the display are no longer shown.

If the battery-power indication blinks and no other displays are shown, the batteries should be replaced with fresh ones immediately or the optional AC adapter, Data Processor DP-C2, or Data Printer DP-3 should be connected to the Cyclops.

AUTOMATIC STAND-BY FUNCTION

The Cyclops is equipped with a stand-by function to reduce power consumption. The Cyclops automatically enters stand-by mode if the following conditions continue for five minutes:

- No buttons or switches are operated.
- When timer-controlled measurements are performed using the optional Data Processor DP-C2 and the interval time is set to more than five minutes.
- CTS (pin 11) is low with the Cyclops connected to a computer as shown on p. 36.

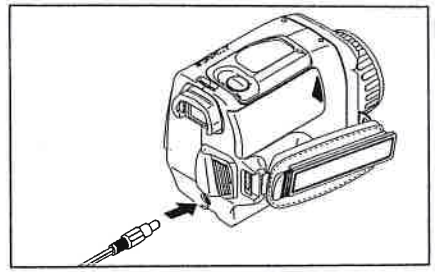
When the Cyclops is in stand-by mode, the latest value will be held in the display and "STD-BY" will blink the display as shown at right.

While the Cyclops is in stand-by mode, only the measuring button or **POWER** can be used; other switches will have no effect. To exit stand-by mode, press the measuring button or set CTS high, "STD-BY" will stop blinking but measurements will not begin. To take a measurement, press the measuring button again.

USING OPTIONAL AC ADAPTER

When using the Cyclops for a long time (such as for monitor mode), power can be supplied by the optional AC Adapter AC-A10 (AC 220V) or AC-A10N (AC 120V).

1. Check that the Cyclops is switched off.
2. Insert the output plug of the AC adapter into the AC adapter socket of the Cyclops.
3. Plug the AC adapter into an AC wall outlet.

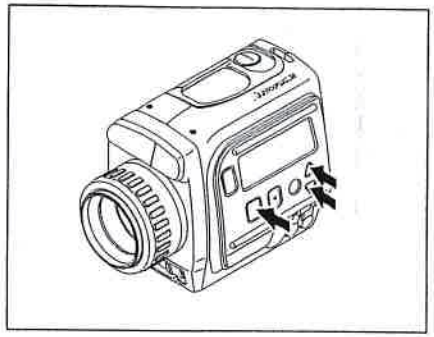


- Use only the AC Adapter AC-A10 or AC-A10N. Do not use other AC adapters to power the Cyclops.
- When disconnecting the AC adapter, be sure to switch off the Cyclops before disconnecting. Also, pull on the plug itself, not on the cord.
- When using the Cyclops with the AC adapter for a long period of time, it is recommended that the batteries be removed to avoid the possibility of corrosion due to battery leakage.

Selecting Temperature Units

The Cyclops can measure temperatures in either degrees Celsius (°C) or degrees Fahrenheit (°F). To change between the two temperature units, press **MODE** while holding **UP** and **DOWN** pressed.

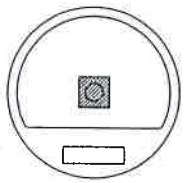
- When temperature unit is changed, all measurement data in memory will be deleted.



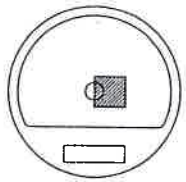
MEASUREMENTS

Notes on Taking Measurements

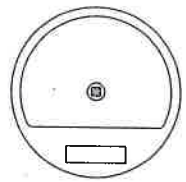
- Be sure the subject is in focus when taking a measurement. If the subject is not in focus, the measured temperature may be incorrect. When focusing manually, be sure the eyepiece correction (p. 13) corresponds to the user's eyes.
- When taking a measurement, be sure that the subject being measured completely fills the measurement area indicated in the viewfinder. If the subject does not completely fill the measurement area, the background may cause the measured temperature to be incorrect.



Good subject positioning; measurement area inside viewfinder is completely filled by subject.



Poor subject positioning; only one side of measurement area inside viewfinder is filled by subject.

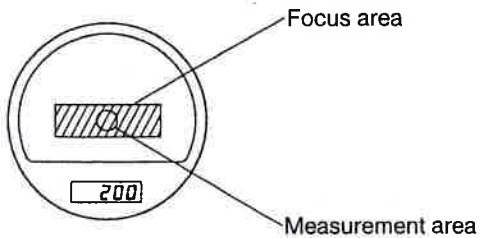


Poor subject positioning; subject is too small to fill measurement area inside viewfinder.

- Measurements of subjects behind common glass cannot be taken with the Cyclops because glass does not transmit the wavelength of infared radiation that the Cyclops measures. If measurements of a subject behind common glass are attempted, the measured temperature will be the temperature of the glass surface, not the temperature of the subject. (Special glasses such as BaF_2 transmit the wavelength measured by the Cyclops and thus subjects behind such special glasses can be measured.)
- Measurements of subjects in direct sunlight may result in temperature values which are higher than the actual temperature of the subject, since infrared radiation in the sunlight may be reflected by the subject.

Notes on Autofocus (Cyclops 300AF only)

- The focus area of the Cyclops 300AF is shown at right. If an object within the focus area but outside of the measurement area is closer to the Cyclops 300AF than the subject, the closer object will be focused on.



- Autofocus may not be possible in the following circumstances:
  - If the subject does not have enough contrast.
  - If the subject is too bright or is highly reflective.
  - If the subject has a repeated pattern.

  In these cases, do either of the following:
  - Set the focus-mode switch to MANU. and focus manually by turning the focus ring.
  - Aim the Cyclops 300AF at another object which is at the same distance as the measurement subject and press the measuring button to cause the autofocus system to focus on the object. Then release the measuring button and aim the Cyclops 300AF at the measurement subject and press the measuring button to start measurements. If the measurement subject has no contrast, focus will not be readjusted by the autofocus system.
- The Cyclops 300AF is equipped with an AF illuminator which automatically illuminates the subject with red light if the subject is dark. The range of the AF illuminator is approximately 0.5 to 5m (1.6 to 16.4 ft.).
  - Be careful not to cover up the AF illuminator when using the Cyclops 300AF.
- When using the optional Data Processor DP-C2 or Data Printer DP-3, autofocus will not be performed when **MEASURE** (on the DP-C2) or **MEAS.** (on the DP-3) is pressed. To perform autofocus when using the Cyclops 300AF with either of these units, press the measuring button of the Cyclops 300AF.
- Do not turn focus ring manually while the focus-mode switch is set to AF. If the focus ring is turned manually, the autofocus accuracy may be reduced. If the ring is turned accidentally, set focus-mode switch to MANU. ("M.FOCUS" will appear in the external display) and then back to AF, or switch the power of the Cyclops 300AF off and then back on.

Setting Emissivity

The Cyclops determines the temperature of a subject by measuring the intensity of infrared radiation emitted by the subject. The intensity of the emitted radiation depends on both the subject's temperature and its emissivity. Emissivity is the ratio of the radiation emitted by a subject and the radiation emitted by a blackbody at the same temperature as the subject. The emissivity depends on the subject being measured, and also on the wavelength range which is detected by the Cyclops.

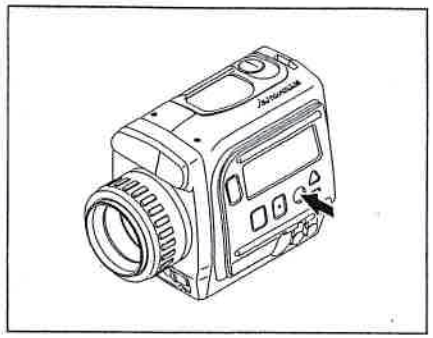
To correctly measure the temperature of the surface being viewed, the emissivity must be set to the value appropriate for that surface. The appropriate value can be determined in either of the following ways:

A. 1) Measure the temperature of the subject with a contact-type thermometer (such as a thermocouple, thermistor, etc.)
   2) Measure the same area of the subject with the Cyclops (p. 25).
   3) Adjust the emissivity value until the temperature shown in the display is the same as the temperature measured in step 1. The emissivity value set is the emissivity of the subject.

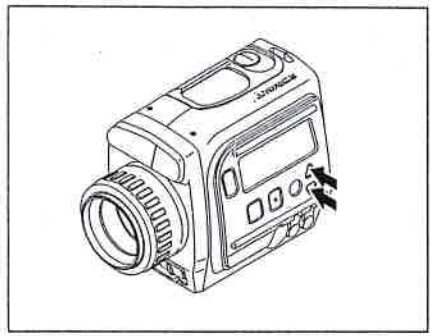
B. 1) Attach something of known emissivity (such as one of the following) to the subject to be measured.
   For normal temperatures ..... Black paint or tape
   For temperatures up to 300°C (572°F)..... Black paint
   For temperatures up to 600°C (1112°F) ..... Silicon-fibre-reinforced heat-resistant paint
   2) Set the emissivity of the material attached to the subject and measure the temperature of the attached material using the Cyclops (p. 25).
      - For the materials listed in step 1, setting the emissivity to 1.00 will result in a great error.
   3) Use the Cyclops to measure an area of the subject to which the material has not been attached (p. 25).
   4) Adjust the emissivity value until the temperature shown in the display is the same as the temperature measured in step 2. The emissivity value set is the emissivity of the subject.

To set the emissivity:

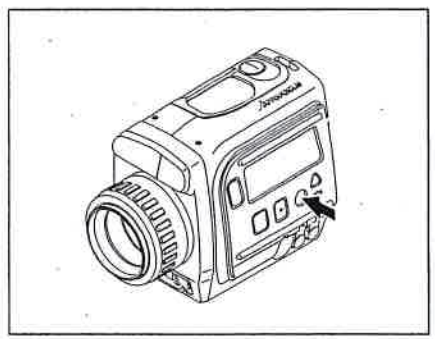
1. Press ε/**ALARM** repeatedly if necessary until "ε" is blinking in the display.



2. Press **UP** or **DOWN** to set the desired value. Value will increase (**UP**) or decrease (**DOWN**) by 1 each time **UP** or **DOWN** is pressed; holding either key pressed will cause valued to change rapidly.
   - Emissivity can be set between 0.10 and 1.00.



3. Press ε/**ALARM** repeatedly to return to measurement mode.
   - Pressing **MODE** once will also return to measurement mode.

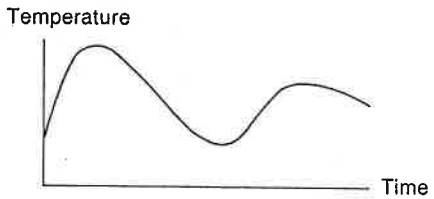


Setting Measuring Display Mode

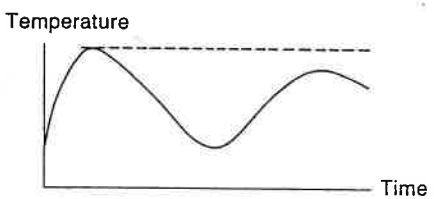
The Cyclops is equipped with four measuring display modes: PEAK, AVG., VALLEY, and NORM. For PEAK, AVG., and VALLEY, the selected mode is indicated below the measurement value; for NORM. mode, no indication appears below the measurement value.

The measurement value shown in the external and viewfinder displays depends on the measuring display mode selected:

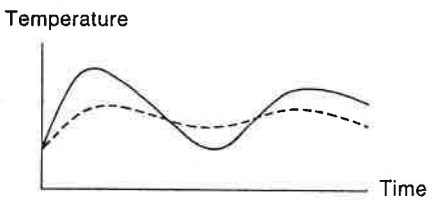
If NORM. is selected, the displayed temperature will be the temperature presently being measured.



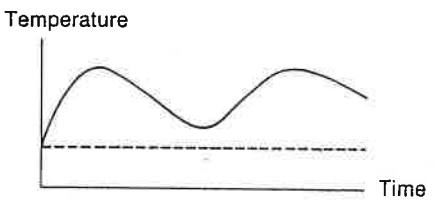
If PEAK is selected, the displayed temperature will be the highest temperature measured during the period form when the measuring button was pressed until the measuring button was released (in manual measuring mode) or from when the power was switched on (in monitor mode).



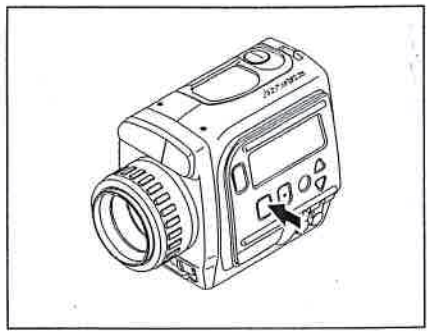
If AVG. is selected, the displayed temperature will be the average of the ten most recent measurements from the time the measuring button was pressed (in manual measuring mode) or from when the power was switched on (in monitor mode). If ten measurements have not been taken yet, all measurements already taken will be averaged.



If VALLEY is selected, the displayed temperature will be the lowest temperature measured during the period from when the measuring button was pressed until the measuring button was released (in manual measuring mode) or from when the power was switched on (in monitor mode).



To select the desired measuring display mode;



Press **MODE**. The indications for all four modes will be displayed; the indication for the selected mode will be blinking. Pressing **MODE** again will cause the selected mode to change. The selected mode will change in the following order each time **MODE** is pressed:

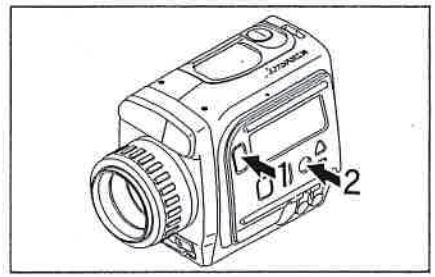
...→NORM.→PEAK→AVG.→VALLEY→NORM.→...

If **MODE** is not pressed for approximately three seconds, the last mode selected will be set as the measuring display mode. For display modes of PEAK, AVG., or VALLEY, the selected mode will blink for three seconds and then will be displayed without blinking; for NORM. display mode, "NORM." will blink for three seconds and then will disappear. Setting the measuring display mode is then complete. The setting of the measuring display mode is stored in memory and will be automatically set the next time the Cyclops is switched on.

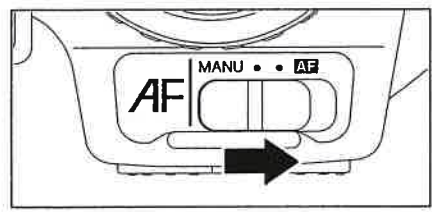
Taking Measurements

MANUAL MEASURING MODE

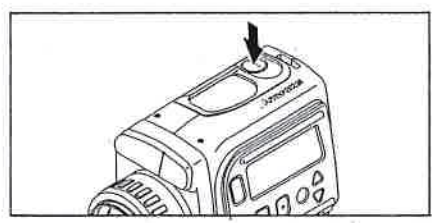
1. Press **POWER** to switch on the Cyclops.



2. Set emissivity to the value appropriate for the subject being measured (p. 21).
3. Select measuring display mode (p. 23).
4. (Cyclops 300AF only): Set the focus-mode switch to AF if autofocus is desired.



5. Aim the Cyclops at the subject and check that the subject completely fills the measurement area.
   - If the subject does not completely fill the measuring area, the background may affect measured values.
   - When using the Cyclops 300 or if the focus-mode switch of the Cyclops 300AF is set to MANU., turn the focusing ring until the subject appears sharp.
6. Press the measuring button and hold it pressed until the measured value appears in the viewfinder.

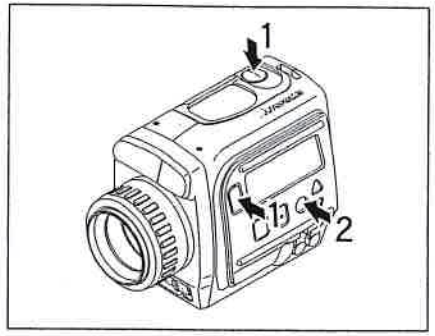


   - When using the Cyclops 300AF with the focus-mode switch is set to AF, focus will be adjusted automatically when the measuring button is pressed. When focus has been achieved, a beep will sound and "□" will appear in the viewfinder and external displays. As long as the measuring button is held pressed, focus will continue to be checked and adjusted (if the focus-mode switch is set to AF) and measurements will continue to be taken.
   - When using the Cyclops 300AF with the focus-mode switch set to AF, each measurement cycle (autofocus and measurement) requires a minimum of approximately 0.25 seconds; when using the Cyclops 300 or when using the Cyclops 300AF with the focus-mode switch set to MANU, each measurement cycle requires approximately 0.19 seconds.
   - When the measuring button is released, the most recent measurement value will be held in the display and stored in memory.

MONITOR MODE

In monitor mode, measurements are taken continuously until the Cyclops is switched off.

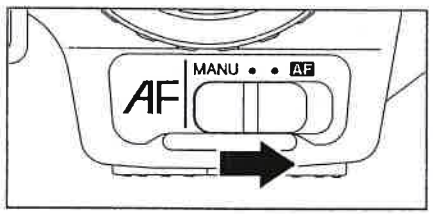
1. While holding the measuring button pressed, press **POWER**. The Cyclops will be switched on and will enter monitor mode.



2. Set emissivity to the value appropriate for the subject being measured (p. 21).

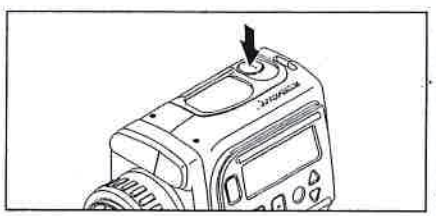
3. Select measuring display mode (p. 23).

4. (Cyclops 300AF only): Set the focus-mode switch to AF if autofocus is desired.



5. Aim the Cyclops at the subject and check that the subject completely fills the measurement area.
   - If the subject does not completely fill the measuring area, the background may affect measured values.
   - When using the Cyclops 300 or if the focus-mode switch of the Cyclops 300AF is set to MANU., turn the focusing ring until the subject appears sharp.

6. When using the Cyclops 300AF with the focus-mode switch set to AF, press the measuring button to activate autofocus.



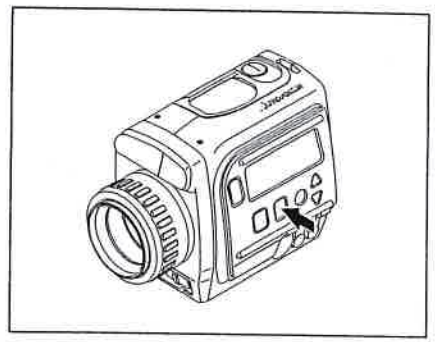
   - When using the Cyclops 300AF with the focus-mode switch is set to AF, focus will be adjusted automatically when the measuring button is pressed. When focus has been achieved, a beep will sound and "□" will appear in the viewfinder and external displays. When the measuring button is released, focus will be fixed at that position.
   - Measurements will be taken continuously at 0.19-second intervals.

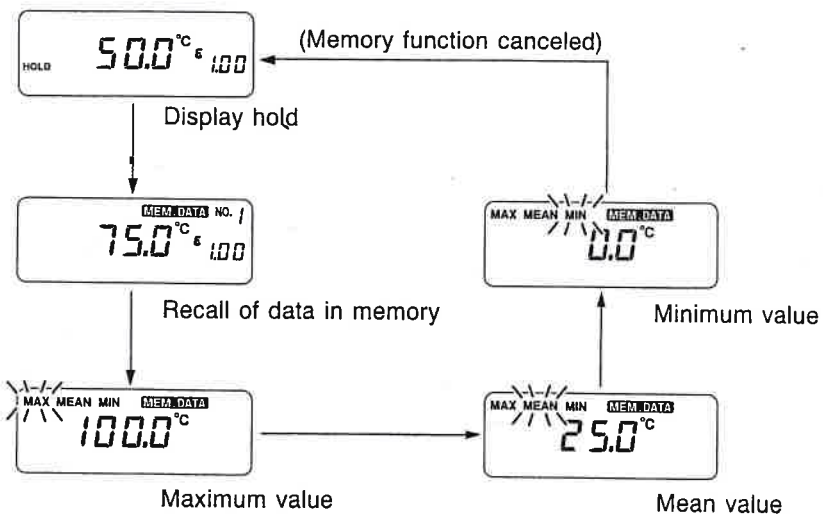
MEMORY FUNCTIONS

The Cyclops is equipped with memory space for up to ten measurements. The data held in the display when the measuring button is released is automatically stored in memory, and can be recalled to the external display ("MEM. DATA"). In addition, the mean ("MEAN") of up to 65,535 measurements can be calculated, and the maximum ("MAX") or minimum ("MIN") of any number of measurements can be determined.

- All values in memory will be erased if the Cyclops is switched off.

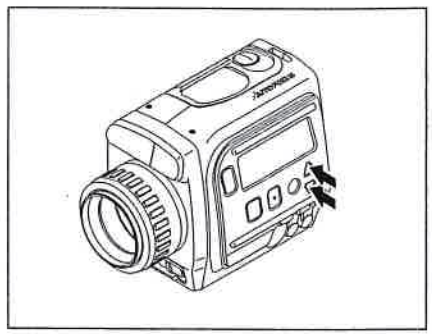
To enter memory mode, press **RECALL**; to select the desired memory function, press **RECALL** repeatedly. Memory functions will change in the order shown below:





- When "MEM. DATA" is selected, the measurement number for which data is displayed can be changed by pressing **UP** or **DOWN**. Measurement number from 0 (most recent) to 9 (oldest) can be selected. Data for measurement number 0 is the measurement data held in the display when **RECALL** was pressed to enter memory mode.
- Pressing **MODE**, ε/**ALARM**, or the measuring button will cancel memory mode and initiate the function corresponding to the button which was pressed.
- The memory function initially selected when **RECALL** is pressed to enter memory mode will be the memory function selected the last time memory mode was canceled.
- The displayed value will be rounded off to the nearest 0.1° for values from -55 to 199.9°C (-60 to 249.9°F) and to the nearest 1° for values from 200 to 1050°C (250 to 1900°F). However, all decimal places of the measured value are stored in memory. The MEAN value is calculated from the stored values and then rounded off; for this reason, the displayed MEAN value may be different than that calculated by the user from the displayed measurement values.

- To erase all data used in determining maximum, minimum, and mean values, press and hold both **UP** and **DOWN** for two seconds when "MAX", "MEAN", or "MIN" is selected. "CLr." will appear in the display and all data used in determining maximum, minimum, and mean values will be erased. However, data for the last ten measurements can still be recalled to the display using the MEM.DATA memory function.



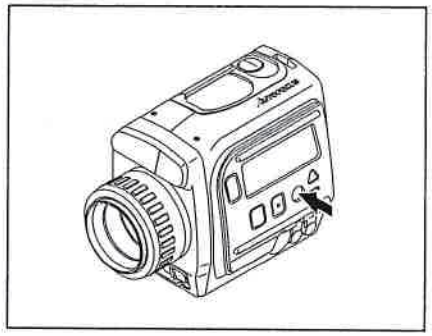
ALARM FUNCTION

The Cyclops is equipped with an alarm function to indicate when the measured temperature is at or beyond upper and lower limits set by the user. When the measured temperature is at or beyond these limits, a tone will sound (if the alarm sound is set to on) and the values displayed in the viewfinder and the external display will blink; the appropriate alarm indication ("▲" if measurement is over upper limit or "▼" if measurement is below lower limit) will also blink in the external display to indicate which limit was equalled or exceeded. In addition, the contacts of the AL (alarm) socket (p. 32) will be shorted and character 2 of the output data (p. 43) will be "A". These conditions will continue until a temperature within the limits is measured or the Cyclops is switched off.

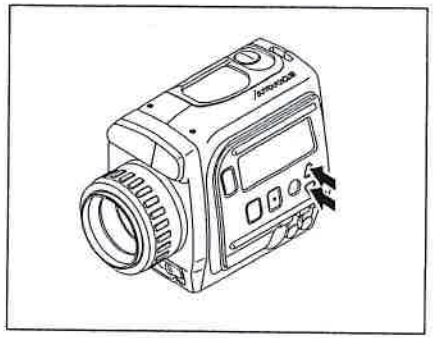
- Lower and upper alarm limits can be set to any temperature between -50 and +1000°C (-50 and +1800°F).
- Pressing **MODE**, ε/**ALARM**, or the measuring button will cancel the mode for setting alarm values and initiate the function corresponding to the button which pressed.

To set the lower alarm:

1. Press ε/**ALARM** repeatedly until "Lo" is shown in the lower right of the external display and "AL▼" is blinking.



2. Press **UP** or **DOWN** to set the desired lower limit.

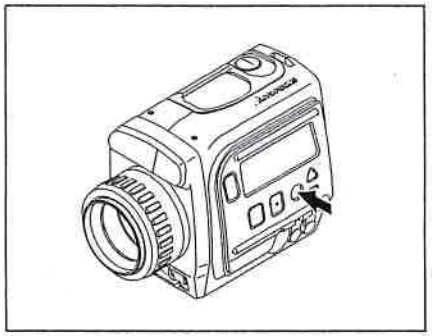


   - Limit value will increase by 1 each time **UP** is pressed; value will decrease by 1 each time **DOWN** is pressed. Holding either key pressed will cause values to change quickly in the corresponding direction.
   - To set lower alarm "OFF", press **UP** and **DOWN** at the same time.

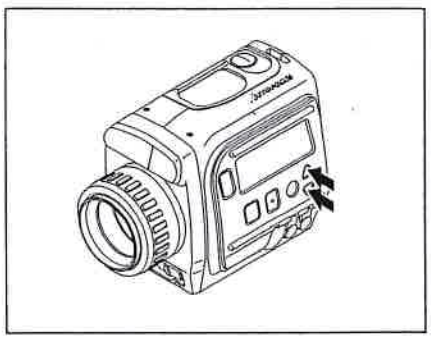
3. a) To continue setting alarm values, continue with step 1 in the following section.
   b) To end setting alarm values and return to measurement mode, press **MODE** once or press ε/**ALARM** repeatedly until neither "ε" nor any of the alarm indications are blinking in the display.

To set the upper alarm:

1. Press ε/**ALARM** repeatedly until "HI" is shown in the lower right of the external display and "AL▲" is blinking.



2. Press **UP** or **DOWN** to set the desired upper limit.



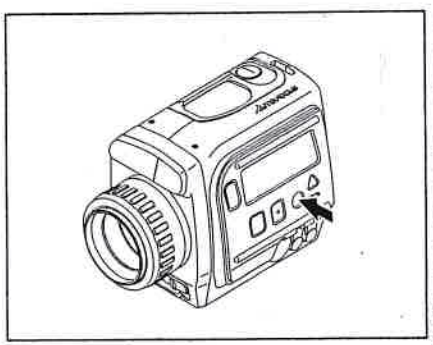
- Limit value will increase by 1 each time **UP** is pressed; value will decrease by 1 each time **DOWN** is pressed. Holding either key pressed will cause values to change quickly in the corresponding direction.
- To set upper alarm to "OFF", press **UP** and **DOWN** at the same time.

3. a) To continue setting alarm values, continue with step 1 in the following section.
   b) To end setting alarm values and return to measurement mode, press **MODE** once or press ε/**ALARM** repeatedly until neither "ε" nor any of the alarm indications are blinking in the display.

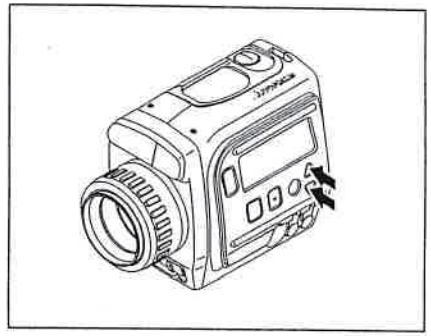
To set alarm sound on or off:

- If both lower and upper limits are set to "OFF", setting alarm sound on or off cannot be performed.

1. Press ε/**ALARM** repeatedly until "Aud" is shown in the lower right of the external display and "AL •))" is blinking.



2. Press **UP** or **DOWN** to set alarm sound "On" or "OFF".

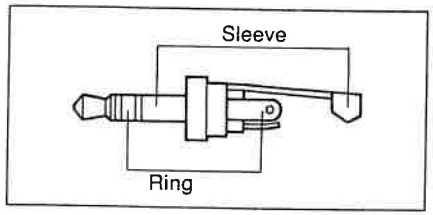


3. To end setting alarm values and return to measurement mode, press **MODE** once or press ε/**ALARM** repeatedly until neither "ε" nor any of the alarm indications are blinking in the display.

Alarm Socket

When the AL (alarm) socket of the Cyclops is connected to an external device, the external device can determine if an alarm condition occurs.

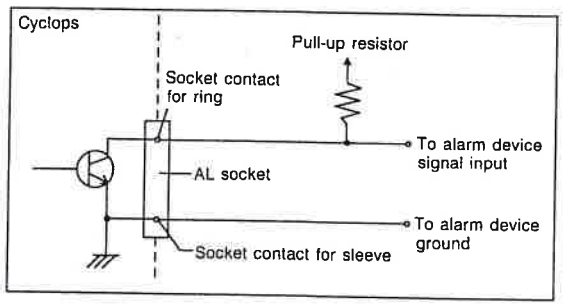
The connector for use with the AL socket is the 3-contact subminiature plug (shown at right) included with the Cyclops as a standard accessory.



The internal circuit for the AL socket is an open-collector circuit. The circuit and the connections that should be made are shown below.

- Shielded cable should be used for the connections.
- Be sure to use the 3-contact subminiature plug not the 2-contact plug. Use of the 2-contact plug could damage the Cyclops.
- Do not apply an exceedingly high voltage or current to the alarm socket. Also, the external circuit should be designed to prevent a negative voltage from being applied to the sleeve of the plug.

Output transistor: 2SC 2412K
Maximum ratings:
V_{CBO}: 40V
I_C: 100mA
P_C: 200mW



When an alarm condition occurs (when the measured temperature is less than the lower limit or more than the upper limit), the socket contacts for the ring and the sleeve of the plug will be shorted. When no alarm condition is present, the contacts will be open.

ANALOG OUTPUT

The A-OUT (analog output) socket of the Cyclops outputs a signal for use with an analog data recorder or similar device.

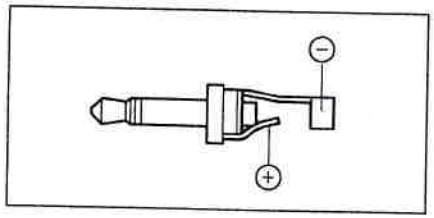
Output Format

Output socket	∅3.5mm subminiature plug, 2-contact (center positive, outside negative)
Output voltage	1mV per degree (°C or °F)
Output range	-60 to 1900mV
Accuracy	Within ±1mV ±2% with digital output (18 to 28°C)
Drift with ambient temperature	Within ±0.02%/°C
Output impedance	1kΩ

- It is recommended that analog output be performed with the Cyclops set to monitor mode.
- When the measured temperature is below the display range (below -55°C/60°F; "-U-" is shown in the display), -55mV (for °C) or -60mV (for °F) will be output.
- When the measured temperature is over the display range (above 1050°C/1900°F; "-O-" is shown in the display), 1050mV (for °C) or 1900mV (for °F) will be output.
- If measurements will be taken over a long period of time, it is recommended that the optional AC adapter be used to power the Cyclops.

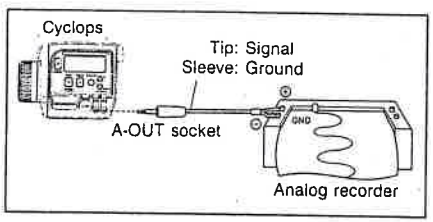
Connections

The 2-contact ∅3.5mm subminiature plug (shown at right) included with the Cyclops as a standard accessory should be used for connection to the A-OUT socket. Connections should be made using a shielded cable as the connecting cable. The wire for the signal should be soldered to the tab for the plug center; the ground wire should be soldered to the tab for the outside of the plug.



Once a cable has been attached to the plug, the Cyclops can be connected to an analog recorder as shown below.

- Be sure that the power of both the Cyclops and the analog recorder are switched off before connecting the two units to avoid possibility of damaging the circuits of either unit.
- The external circuit should be designed to prevent any voltage from being applied to the A-OUT socket.

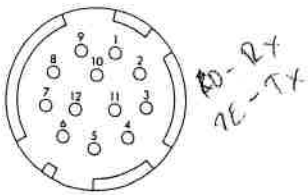


DATA COMMUNICATION

The D-OUT terminal of the Cyclops allows bidirectional communication between the Cyclops and a separate computer according to RS-232C standards. Data can be transferred between the two units and all button functions of the Cyclops can be controlled by the computer.

D-OUT Terminal

The D-OUT terminal of the Cyclops uses a 12-pin connector as shown at right; the corresponding male connector is a Hirose HR-10A-10R-12SB plug.



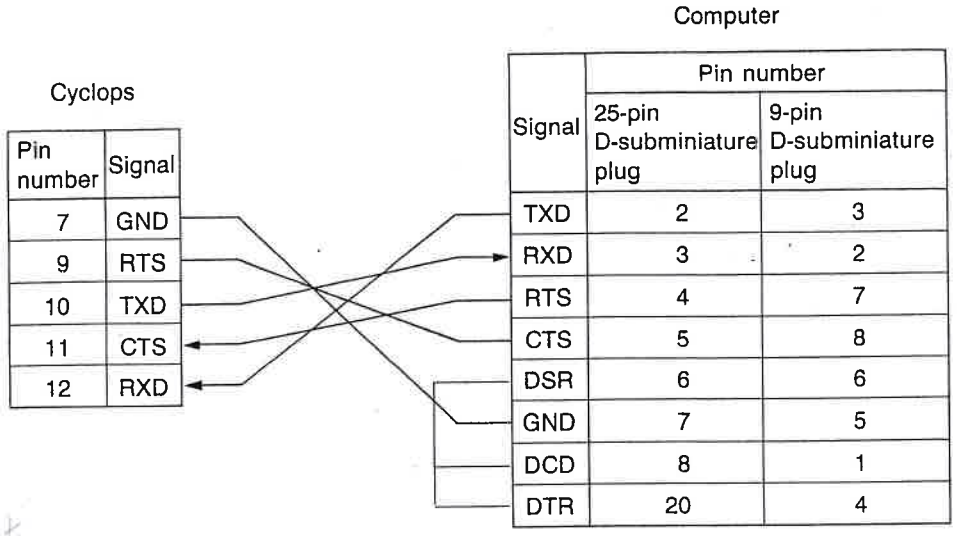
PIN FUNCTIONS

Pin number	Input/Output	Signal	Voltage	Function
7		GND	0V	Ground
9	Output	RTS	10V or -10V	Indicates Cyclops is ready to receive data from computer.
10	Output	TXD	10V or -10V	Transmit data.
11	Input	CTS	10V or -10V	Indicates whether or not computer is ready to receive data.
12	Input	RXD	10V or -10V	Receive data. When pin 9 is high (+10V), data can be input to the Cyclops via this pin.

- Pin 2, 3, and 6 are not connected internally.
- Pins 1, 4, and 5 are used by the optional Data Processor DP-C2 or Data Printer DP-3.
- Pin 8 is used for calibration and checking of the Cyclops and is constantly at +5V. Do not connect anything to this pin; if something is connected, calibration data may be changed or destroyed.

Connection to a Computer

The connections between the Cyclops and the computer should be made as shown below.



- Be sure that the power of both the Cyclops and the computer are switched off before connecting or disconnecting the two units. If the two units are connected or disconnected while the units are switched on, the internal circuits of the units may be damaged.
- When connecting the Cyclops to a computer, check that the connectors are correctly oriented.
- Do not apply excessive force to the cable or bend the cable sharply.
- When disconnecting the cable from the Cyclops or computer, be sure to pull on the plug, not on the cable.
- Do not touch the pins of the cable plugs, do not get the pins dirty, and do not apply excessive force to the pins.
- Be sure that the cable is long enough to connect the two units. If the cable is taut between the two units, the connection may be faulty or intermittent.

Communication Parameters

The communication parameters of the Cyclops are listed below. The parameters of the computer should be set to the same values.

Baud rate:	4800bps
Start bit:	1
Character bits:	7 (ASCII code)
Parity:	Even
Stop bits:	2

Data Input

INPUT COMMANDS

Command	Function	Response from Cyclops
AF (Cyclops 300AF only)	Causes autofocus to be performed once.	· OK!" if focus was achieved. · "DF?" if focus could not be achieved. · "MAN" if focus-mode switch is set to MANU. p.42
AR	Requests output of alarm settings (upper limit, lower limit, and sound on or off).	Alarm settings data p.42
AS&*******	Sets alarm upper limit value, lower limit value, and sound on or off according to the value of **********	· OK!" if input values are acceptable. · "E34" if input values are unacceptable. p. 42
AVRG	Causes measuring display mode to be changed to AVG. AVG. (average) data is output when Cyclops enters display hold.	Measurement data p. 43
CE	Causes the Cyclops to cancel monitor mode and return to manual measuring mode. The most recent measured data is held in the display and output. This command can only be used while the Cyclops is in monitor mode.	Measurement data p. 43
CS	Causes the Cyclops to enter monitor mode and output the resulting measurement data.	Measurement data p. 43
ES&*.**	Sets emissivity to the value indicated by *.**.	· OK!" if put value is acceptable. · E34" if input value is unacceptable. p. 44

Command	Function	Response from Cyclops
MS	(In manual measuring mode): Causes the Cyclops to take a measurement and output the resulting measurement data. This command can only be used while the Cyclops is in display hold.	Measurement data p. 43
NRML	Causes measuring display mode to be changed to NORM. Measurement data is output when Cyclops enters display hold.	Measurement data P. 43
PEAK	Causes measuring display mode to be changed to PEAK. PEAK data is output when Cyclops enters display hold.	Measurement data p. 43
SR	Status request: Causes Cyclops to output data about temperature units, emissivity value, measuring mode, focus mode, and alarm status.	Status word: **.***** p. 45
VLLY	Causes measuring display mode to be changed to VALLEY. VALLEY data is output when Cyclops enters display hold.	Measurement data p. 43

INPUT FORMAT

Command AS&**********

The format of the command "AS&"********** is as follows:
"AS&" (upper limit on/off) (upper limit value) (lower limit on/off) (lower limit value) (alarm sound on/off) <CR>

Upper limit on:	"S"
off:	"C"
Upper limit value:	-50 to 1000 (°C) or -50 to 1800 (°F)
Lower limit on:	"S"
off:	"C"
Lower limit value:	-50 to 1000 (°C) or -50 to 1800 (°F)
Alarm sound on:	"S"
off:	"C"

For example, to set the upper limit value to 100°, the lower limit value to 0°, and the alarm sound on, input the following command:
"AS&S_100S____0S"<CR>

- _indicates space.
- <CR> indicates carriage return.

Command ES&*.**

The format of the command "ES&"*.** is as follows:

"ES&" (emissivity value) <CR>

For example, to set the emissivity value to 0.30, input the following command:
"ES&0.30" <CR>

- Emissivity value can be set between 0.10 and 1.00.
- <CR> indicates carriage return.

Commands AF, AR, AVRG, CE, CS, MS, NRML, PEAK, SR, VLLY

The input format for the commands "AF", "AR", "AVRG", "CE", "CS", "MS", "NRML", "PEAK", "SR", and "VLLY" is as follows:

(command) <CR>

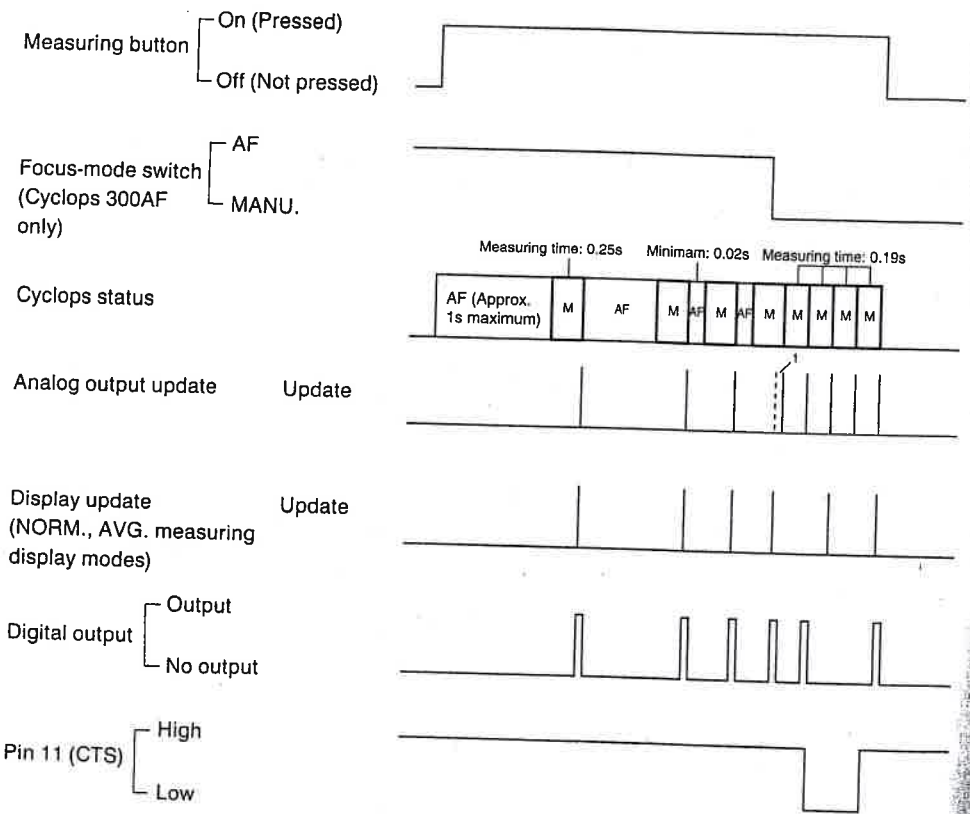
- <CR> indicates carriage return.

Data Output

Data is output by the Cyclops at the end of each measurement cycle while measurements continue to be taken. In manual measuring mode, this occurs while the measuring button is held pressed, when measurement is performed using optional Data Processor DP-C2 or Data Printer DP-3, when the measuring button of the viewfinder camera adapter is pressed, or when the command "MS" is input from a computer via the D-OUT terminal. In monitor mode, this occurs as long as the Cyclops is switched on.

- Data will no be output if pin 11 (CTS) of the D-OUT terminal is low (-10V).

DATA OUTPUT TIMING CHARTS



1 Because the analog signal is updated at the end of each measurement cycle, there is some time lag (maximum time lag: 0.05s).

Conditions for timing chart on previous page:

When focus-mode switch of Cyclops 300AF is set to AF:

Measuring time:	0.25s/measurement
Analog output update:	Once per measurement
Display update:	Once per measurement
Digital output:	Once per measurement

When using Cyclops 300 or when focus-mode switch of Cyclops 300AF is set to MANU.:

Measuring time:	0.25s for first measurement, 0.19s for subsequent measurements
Analog output update:	Once per measurement
Display update:	Once every 2 measurement
Digital output:	Once per measurement

- When pin 11 is low, digital output is not performed.

OUTPUT FORMAT

Command AF

When the command "AF" is input, the output data indicates the status of the focus system:

"OK!" <CR><LF>: Focus achieved.
"DF?" <CR><LF>: Focus could not be achieved.
"MAN" <CR><LF>: Focus-mode switch is set to MANU.

Command AR

When command "AR" is input, the Cyclops outputs an 11-character data word (followed by carriage return and line feed) as follows:

Character 1:	"S":	Upper limit value is set.
	"C":	Upper limit value is not set (is "OFF")
Characters 2-5:	Upper limit value: -50 to 1000°C/-50 to 1800°F	
Character 6:	"S"	Lower limit value is set.
	"C":	Lower limit value is not set.
Characters 7-10:	Lower limit value: -50 to 1000°C/-50 to 1800°F	
Character 11:	"S":	Alarm sound is "On"
	"C":	Alarm sound is "OFF".

Command AS& **********

When the command "AS&" ********** Is input, the data output by the Cyclops indicates whether or not the input alarm settings were acceptable:

"OK!" <CR><LF>: Input settings were acceptable.
"E34" <CR><LF>: Input settings were not acceptable.

- <CR> indicates carriage return (ASCII code: $0D_H$); and <LF> indicates line feed (ASCII code: $0A_H$).

Commands AVRG, CE, CS, MS, NRML, PEAK, VLLY

When the command "AVRG", "CE", "CS", "MS", "NRML", "PEAK", or "VLLY" is input, measurement data are output as an 8-character data word (followed by carriage return and line feed) as follows:

Character 1: Indicates selected temperature units:
- "L": °C is selected as the temperature unit.
- "M": °F is selected as the temperature unit.

Characters 2: Indicates measuring display mode selected (if measured temperature is within measuring range and within alarm limits):
- "N": NORM. is selected as the measuring display mode.
- "P": PEAK is selected as the measuring display mode.
- "G": AVG. is selected as the measuring display mode.
- "V": VALLEY is selected as the measuring display mode.

Indicates that measured temperature is beyond alarm limits:
- "A": Measured temperature is beyond alarm limits.

Indicates that measured temperature is beyond measuring range:
- "O": Measured temperature is over measuring range (1001°C/1801°F or greater).
- "U": Measured temperature is below measuring range (-50.1°C/-50.1°F or less).

Character 3: Indicates measuring condition of Cyclops:
- "C": Cyclops is in manual measuring mode and measuring button is held pressed or Cyclops is in monitor mode.
- "H": Cyclops is in display hold (measuring button has been released).

Characters 4-8: Characters 4 to 8 are the measured data:
- If 5 characters are not necessary for the measured data, the measured data will be preceded by spaces (ASCII code:20_H; indicated here by _).
- If the measured temperature is over the display range (1051°C/1901°F or greater) and "-O-" is shown in the display, "___-O-" will be output.
- If the measured temperature is below the display range (-55.1°C/-60.1°F or less) and "-U-" is shown in the display, "___-U-" will be output.
- If no measurements have been taken since the Cyclops was switched on, all five data words will be spaces: "_____".

OUTPUT EXAMPLES

- Temperature units for all examples are °C.
- "_" indicates space (ASCII code: 20_H); <CR> indicates carriage return (ASCII code: $0D_H$); and <LF> indicates line feed (ASCII code: $0A_H$).

	Data word: 1 . . . 5 . . 8
Over display range, measurements continuing	L O C _ _ - O- <CR><LF>
1005°C (over measuring range but within display range), measurements continuing	L O C _ 1 0 0 5 <CR><LF>
NORM. measuring display mode, 529°C, measurements continuing	L N C _ _ 5 2 9 <CR><LF>
AVG. measuring display mode, 12.3°C, display hold	L G H _ 1 2 . 3 <CR><LF>
PEAK measuring display mode, 0.8°C, measurements continuing	L P C _ _ 0 . 8 <CR><LF>
VALLEY measuring display mode, -5.3°C, measurements continuing	L V C _ - 5 . 3 <CR><LF>
-52.4°C (below measuring range but within display range), measurements continuing	L U C - 5 2 . 4 <CR><LF>
Below display range, measurements continuing	L U C _ _ - U - <CR><LF>
Above upper alarm limit (upper limit value: 100°C), 127.6°C, measurements continuing	L A C 1 2 7 . 6 <CR><LF>
Below lower limit (lower limit value: o°C), -21.0°C, measurements continuing	L A C – 21.0 <CR><LF>

Command ES& * . **

When the command "ES&" * . ** is input data output by the Cyclops indicates whether or not the input emissivity value was acceptable:

"OK!" <CR><LF>: Input emissivity value was acceptable.
"E34" <CR><LF>: Input emissivity value was not acceptable.

- <CR> indicates carriage return (ASCII code: $0D_H$); and <LF> indicates line feed (ASCII code: $0A_H$).

Command SR

When command "SR" is input, the Cyclops outputs as 8-character data word (followed by carriage return and line feed) as follows:

Character 1: "C": Selected temperature unit is °C.
"F": Selected temperature unit is °F.
Characters 2-5: Emissivity value: 0.10 to 1.00
Character 6: "H": Cyclops is in manual measuring mode.
"M": Cyclops is in monitor mode.
Character 7: "A": Focus-mode switch is set to AF.
"M": Focus-mode switch is set to MANU.
(For Cyclops 300, character 7 will always be "M".)
Character 8: "A": Measured temperature is beyond alarm limits.
"N": Measured temperature is within alarm limits.

Error Codes

When an error occurs during data communication between the Cyclops and a separate computer, either a warning tone will sound or an error code will be output.

Error code	Warning tone	Problem	Solution
(None)	Sounds	RS-232C communication parameter mismatch.	Check that communication parameters (baud rate, parity, etc.) set in the computer program are the same as those of the Cyclops. p. 36
E 32	None	Data of more than 32 characters were received.	Check number of characters in data.
E33	None	Delimiter code error	Use only <CR> (carriage return) as the delimiter when inputting commands.
E34	None	Unacceptable command and/or data were input.	Input only the commands listed on pp. 37-38 and the appropriate data for the commands.

Sample Programs

BASIC PROGRAM

The following is a BASIC program example which can be used when the Cyclops is connected to an IBM PC.

```
1000 '************************************************************
1010 '***                      Main Routine                      ***
1020 '************************************************************
1030 CLS
1040 OPEN "COM1:4800,E,7,2,CS5000" AS #1
1050 '
1060 '*** CLEAR ALARM VALUES
1070 ALDATA$="C0000C0000C"
1080 CMND$="AS&"+ALDATA$:GOSUB 1850
1090    IF RS$<>"OK!" THEN GOTO 1070
1100 GOSUB 1930
1110 '
1120 '*** SET EMISSIVITY
1130 CMND$="ES&1.00":GOSUB 1850
1140    IF RS$<>"OK!" THEN GOTO 1130
1150 CMND$="SR":GOSUB 1850
1160 GOSUB 2040
1170 '
1180 '*** MEASURE ONCE
1190 CMND$="MS":GOSUB 1850
1200 GOSUB 2270:GOSUB 2320
1210 '
1220 '*** NORM. MODE
1230 CMND$="NRML":GOSUB 1850
1240 GOSUB 2270
1250    IF CHR2$<>"N" THEN GOTO 1230
1260 '
1270 '*** SET ALARM: LOWER LIMIT=25°, SOUND ON
1280 ALDATA$="C0000S  25S"
1290 CMND$="AS&"+ALDATA$:GOSUB 1850
1300    IF RS$<>"OK!" THEN GOTO 1280
1310 CMND$="AR":GOSUB 1850
1320    IF RS$<>ALDATA$ THEN GOTO 1280
1330 GOSUB 1930
1340 '
1350 '*** AUTOFOCUS
1360 CMND$="AF":GOSUB 1850:GOSUB 2200
1370 '
1380 '*** MONITOR MODE
1390 CMND$="CS":GOSUB 1850
1400 GOSUB 2270
1410    IF CHR3$<>"C" THEN GOTO 1390
```



```
1420    FOR I=1 TO 10
1430       INPUT #1,RS$:GOSUB 2270
1440       GOSUB 2320
1450    NEXT I
1460 '*** CANCEL MONITOR MODE
1470 CMND$="CE":GOSUB 1850
1480 GOSUB 2270
1490    IF CHR3$<>"H" THEN GOTO 1470
1500 '
1510 '*** CLEAR ALARM DATA
1520 ALDATA$="C0000C0000C"
1530 CMND$="AS&"+ALDATA$:GOSUB 1850
1540    IF RS$<>"OK!" THEN GOTO 1520
1550 '
1560 '*** PEAK MODE
1570 CMND$="PEAK":GOSUB 1850
1580 GOSUB 2270
1590    IF CHR2$<>"P" THEN GOTO 1570
1600 PEAK$=TEMP$
1610 '
1620 '*** AVG. MODE
1630 CMND$="AVRG":GOSUB 1850
1640 GOSUB 2270
1650    IF CHR2$<>"G" THEN GOTO 1630
1660 AVRG$=TEMP$
1670 '
1680 '*** VALLEY MODE
1690 CMND$="VLLY":GOSUB 1850
1700 GOSUB 2270
1710    IF CHR2$<>"V" THEN GOTO 1690
1720 VLLY$=TEMP$
1730 '
1740 '*** DISPLAY DATA
1750 CLOSE #1
1760 LOCATE 7,40:PRINT "PEAK    =";PEAK$
1770 LOCATE 9,40:PRINT "VALLEY =";VLLY$
1780 LOCATE 11,40:PRINT "AVERAGE=";AVRG$
1790 END
1800 '
1810 '************************************************************
1820 '***                    SUBROUTINES                       ***
1830 '************************************************************
1840 '
1850 '*** TRANSMIT COMMAND
1860 PRINT #1,CMND$:INPUT #1,RS$
1870    IF LEFT$(RS$,2)="E3" THEN RETURN 1900
1880 RETURN
1890 '
1900 '*** ERROR MESSAGE
```

```
1910 LOCATE 20,20:PRINT "COMMUNICATION ERROR (";RS$;")":STOP
1920 '
1930 '*** ALARM DISPLAY
1940 UPLMT$=MID$(ALDATA$,2,4)+UNT$:LOLMT$=MID$(ALDATA$,7,4)+UNT$
1950    IF MID$(ALDATA$,1,1)="C" THEN UPLMT$="OFF"
1960    IF MID$(ALDATA$,6,1)="C" THEN LOLMT$="OFF"
1970    IF MID$(ALDATA$,11,1)="S" THEN ALBZR$="ON "
1980    IF MID$(ALDATA$,11,1)="C" THEN ALBZR$="OFF"
1990 LOCATE 15,40:PRINT "UPPER LIMIT=";UPLMT$
2000 LOCATE 17,40:PRINT "LOWER ALARM=";LOLMT$
2010 LOCATE 19,40:PRINT "ALARM SOUND IS ";ALBZR$
2020 RETURN
2030 '
2040 '*** STATUS DISPLAY
2050 UNT$="°"+MID$(RS$,1,1):EMS$=MID$(RS$,2,4)
2060    IF MID$(RS$,6,1)="M" THEN MODE$="MONITOR"
2070    IF MID$(RS$,6,1)="H" THEN MODE$="MANUAL "
2080    IF MID$(RS$,7,1)="A" THEN FOCUS$="AUTOFOCUS    "
2090    IF MID$(RS$,7,1)="M" THEN FOCUS$="MANUAL FOCUS"
2100    IF MID$(RS$,8,1)="A" THEN ALRM$="ON "
2110    IF MID$(RS$,8,1)="N" THEN ALRM$="OFF"
2120 LOCATE 1,1:PRINT "***** THERMOMETER STATUS *****"
2130 LOCATE 3,6:PRINT "          UNITS: ";UNT$
2140 LOCATE 5,6:PRINT "    EMISSIVITY: ";EMS$
2150 LOCATE 7,6:PRINT "OPERATING MODE: ";MODE$
2160 LOCATE 9,6:PRINT "    FOCUS MODE: ";FOCUS$
2170 LOCATE 11,6:PRINT "         ALARM: ";ALRM$
2180 RETURN
2190 '
2200 '*** AUTOFOCUS STATUS
2210    IF RS$="OK!" THEN AF$="FOCUSED"
2220    IF RS$="DF?" THEN AF$="CANNOT FOCUS"
2230    IF RS$="MAN" THEN AF$="MANUAL FOCUS"
2240  LOCATE 13,40:PRINT "FOCUS ADJUSTMENT: ";AF$
2250 RETURN
2260 '
2270 '*** TEMPORARY DATA
2280 CHR1$=MID$(RS$,1,1):CHR2$=MID$(RS$,2,1):CHR3$=MID$(RS$,3,1)
2290 TEMP$=MID$(RS$,4,5)+UNT$
2300 RETURN
2310 '
2320 '*** DISPLAY
2330    IF CHR2$="A" THEN TEMP$=TEMP$+" - AL"
2340    IF CHR3$="C" THEN MMODE$="MEASURING    "
2350    IF CHR3$="H" THEN MMODE$="DISPLAY HOLD"
2360 LOCATE 1,40:PRINT "***** MEASUREMENT DATA *****"
2370 LOCATE 3,40:PRINT "STATUS: ";MMODE$
2380 LOCATE 5,40:PRINT "MEASURED TEMPERATURE: ";TEMP$
2390 RETURN
```


MICROSOFT QuickBASIC* PROGRAM

* Microsoft and QuickBASIC are registered trademarks of Microsoft Corporation.

The following QuickBASIC program can be used to input data measured by the Cyclops into the computer.

```
'*****************************************************************
'***  QuickBASIC program for input data from the thermometer  ***
'*****************************************************************
  CLS : LOCATE 23, 1: PRINT "press [F1] to stop"
        LOCATE 1, 1: PRINT "waiting for data"
  N = 0: STOP.FLG% = 0: RECV.FLG% = 0
  ON KEY(1) GOSUB CLOSE.END
  OPEN "COM1:4800,E,7,2" FOR INPUT AS #1
  ON COM(1) GOSUB RECIEVE
  KEY(1) ON: COM(1) ON


WAIT.LOOP:
    IF STOP.FLG% <> 0 THEN END
    IF RECV.FLG% <> 0 THEN GOTO DSPLY
  GOTO WAIT.LOOP


DSPLY:
    N = N + 1: N = N MOD 19
    LOCATE N + 3, 1: PRINT RS$
    LOCATE N + 4, 1: PRINT SPACE$(10)
    RECV.FLG% = 0: COM(1) ON
  GOTO WAIT.LOOP

RECIEVE:
    COM(1) OFF
    RS$ = INPUT$(10, #1)
    RECV.FLG% = 1
  RETURN

CLOSE.END:
    KEY(1) OFF: COM(1) OFF
    CLOSE #1
    STOP.FLG% = 1
  RETURN
```

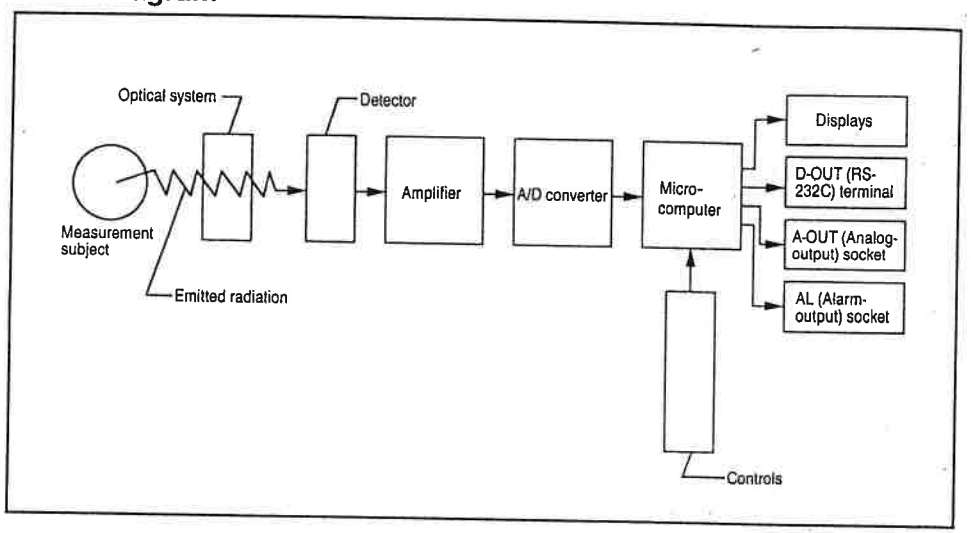
- The above program is written for a connecting cable having the internal connections shown on p. 36. If optional Connecting Cable DP-A42 or DP-A43 is used, change the OPEN statement to the following:
  OPEN "COM 1 : 4800, E, 7, 2, RS" FOR INPUT AS #1

MEASUREMENT PRINCIPLE

The Cyclops determines the temperature of a subject by measuring the intensity of the radiation emitted by the subject. Every object emits radiation whose intensity is proportional to the temperature of the object.

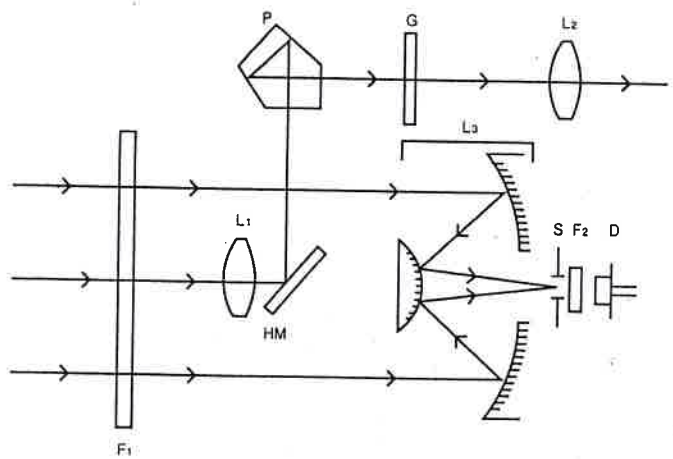
For exact temperature measurements, it is necessary to set the emissivity of the subject on the Cyclops. Emissivity is the ratio between the radiation emitted by the subject and the radiation which would be emitted by an ideal blackbody at the same temperature as the subject. The emissivity depends on both the subject being measured and the wavelength range detected by the Cyclops. On the Cyclops, emissivity is set using ε/**ALARM**, **UP**, and **DOWN**.

Block Diagram



Radiation emitted by the subject is focused by the optical system on the detector, which converts the radiation to an analog electrical signal. This analog signal is amplified and then sent to the A/D converter, where the analog signal is converted to a digital signal. The digital signal is received by the microcomputer, which calculates the temperature of the subject according to the digital signal and the emissivity value. The value calculated by the microcomputer is then shown in the displays according to the selected measuring display mode and is also output via the D-OUT terminal and A-OUT socket. The measured value is also checked against the alarm limit values, and if the measured value is beyond the limits, the display blinks, the alarm tone sounds (if set to "On"), and the contacts of the AL (alarm-output) socket are shorted. When the measuring button is released, the latest measured value will be held in the display and will be stored in memory. The most recent ten measured values can be recalled to the display; the maximum, mean, and minimum of all values stored in memory can also be calculated.

Optical System



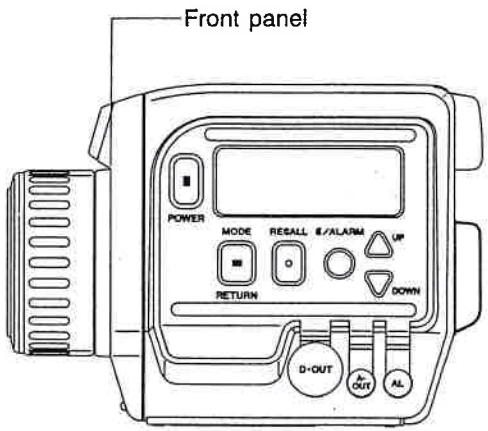
F_1 Protective filter
L_1 Objective lens of refracting optical system for viewfinder
HM Half-silvered mirror
P Pentaprism
G Viewfinder screen
L_2 Viewfinder optical system
L_3 Reflecting optical system for measuring subject temperature
D Thermopile
S Aperture plate
F_2 Spectral-sensitivity-compensation filter

MEASURING AREA

- Subject distance is measured from the front panel of the Cyclops.

Subject distance (m)	∞	100	50	20	10	7	5
Measurement area diameter (mm)	∞	1838	920	368	184	129	92

Subject distance (m)	3	2	1.5	1.2	1.0	0.75	0.5
Measurement area diameter (mm)	55	37	27	22	18	14	9



TROUBLESHOOTING GUIDE

If a problem occurs with the Cyclops, please check the following points before requesting service. If the problem continues even after taking the suggested corrective actions, contact the nearest Land authorized service facility.

Condition	Checkpoint	Corrective action
No display appears even when the measuring button is pressed.	Is the Cyclops switched on?	Press POWER to switch on the Cyclops.
	Are batteries installed correctly?	Install batteries correctly. p. 14
	Is battery power exhausted?	Replace batteries with fresh ones. p. 14
The displayed value does not change even if a different subject is measured.	Is the Cyclops set to PEAK or VALLEY measuring display mode?	Change measuring display mode. (In PEAK mode, display will not change unless a subject at a temperature higher than the displayed temperature is measured; in VALLEY mode, display will not change unless a subject at a temperature lower than the displayed temperature is measured.) p. 23
	Was the Cyclops in stand-by mode before the measuring button was pressed?	Press measuring button again.
The displayed value seems strange.	Is protective filter dirty, scratched, or broken?	If dirty, clean the filter. If the filter is scratched or broken, purchase a replacement filter from the nearest Land authorized service facility.
	Is emissivity set to the correct value?	Set the emissivity to the correct value. p. 21
	Is the temperature unit (°C or °F) set correctly?	Set the desired temperature unit. p. 18
Cyclops does not change to display hold even when the measuring button is released.	Is Cyclops in monitor mode?	Switch off power to cancel monitor mode and then switch power back on to enter manual measuring mode. p.25

Condition	Checkpoint	Corrective action
Cyclops cannot be changed to memory mode.	Is Cyclops in monitor mode?	Switch off power to cancel monitor mode and then switch power back on to enter manual measuring mode. p. 25
	Have measurements been taken since the Cyclops was switched on?	Take measurements. (If measurements have not been taken and the Cyclops has never changed to display hold, there will be no data in memory.) p. 25
In memory mode, values for MAX, MEAN, and MIN cannot be displayed.	Was data in memory erased?	Take measurements.
	(For MEAN only) Was at least one measurement value in memory outside the display range?	Erase data in memory and take measurements again. p. 28
Data is not output even though measurements are taken.	Is pin 11 of the D-OUT terminal held low (-10V)?	Set pin 11 high (+10V).
	Is Cyclops in display hold?	Press measuring button to continue measurements or set pin 4 to high (5V).
The frame of measuring area is not sharp in the viewfinder.	Has viewfinder been corrected for the user's eyesight?	Match the viewfinder's power to the user's eyesight using the appropriate optional Eyepiece Corrector 1000. p. 13
The subject to be measurement does not appear sharp in the viewfinder.	Has focus been adjusted?	Adjust focus.
	Is the subject too close to be focused on?	Move back from the subject until it can be focused on.
Nothing can be seen in the viewfinder.	Is the lens cap still covering the lens?	Remove the lens cap.
Autofocus does not function.	Is focus-mode switch set to MANU.?	Set focus-mode switch to AF.

Condition	Checkpoint	Corrective action
Autofocus does not focus properly on the subject.	Is the subject similar to one of those described in Notes on Autofocus on p. 19?	Set focus-mode switch to MANU. and turn focusing ring to focus manually.
	Is light entering through the viewfinder?	When using autofocus without looking through the viewfinder, attach the eyepiece cap to the eyepiece to prevent light from entering the viewfinder. p. 12
After autofocus was performed by pressing the measuring button, autofocus does not function even though the Cyclops is aimed at a subject with sufficient contrast.	Is either of the focus indications shown in the displays?	If neither of the focus indications is shown in the displays, the autofocus system has locked the focus. When autofocus is performed using the autofocus illuminator, focus is locked once it has been achieved. Release the measuring button and press it again.
Even though the subject has sufficient contrast, autofocus does not function.	Was the focus ring turned while the focus-mode switch was at AF?	Set the focus-mode switch to MANU. for a moment, and then set it back to AF.
	Is something keeping the focus ring from turning?	After removing the object keeping the focus ring from turning, set the focus-mode switch to MANU. for a moment, and then set it back AF.
	Is the subject too close?	Subject must be at least 50cm (19-3/4 in.) away from the Cyclops.

OPTIONAL ACCESSORIES

Viewfinder camera set

Attaches to the eyepiece of the Cyclops to allow the image in the viewfinder to be photographed. This allows records of the measured area and the temperature to be easily made for maintenance purposes.

Angle Finder V_N

Attaches to the eyepiece of the Cyclops to allow the viewfinder image to be viewed easily when the Cyclops is mounted on a tripod, etc. Magnifications of 1× or 2× can be selected and the corrective power can be adjusted from -9 to +3 diopters.

Eyepiece Corrector 1000

Nine eyepiece correction lenses are available for dioptric adjustment of the eyepiece to match the user's eyesight. Corrective powers range from -4 to +3 diopters.

AC Adapter AC-A10 (AC 220V)
AC Adapter AC-A10N (AC 120V)

Supplies power to the Cyclops from an AC outlet; ideal when taking measurements over a long period of time.

Data Processor DP-C2

A compact multi-functioned unit that can be connected to the Cyclops to provide additional functions, including memory, printout, difference measurements, and timer-controlled measurements. The following standard accessories are also included: Connecting Cable DP-A42 (1m/3.3 ft.), AC Adapter AC-A10 (AC 220V) or AC-A10N (AC 120V), and Shoulder Case DP-A30; optional accessories available include Connecting Cable DP-A43 (5m/16.4 ft.) and Thermal Paper

Data Printer DP-3

A battery-powered data printer for connection to the Cyclops. The DP-3 also has a measuring button for taking measurements from the DP-3; timer-controlled measurements can also be performed. A connecting cable and shoulder strap are included as standard accessories.

Protective Case

For storing the Cyclops. Protects Cyclops from dust, etc.

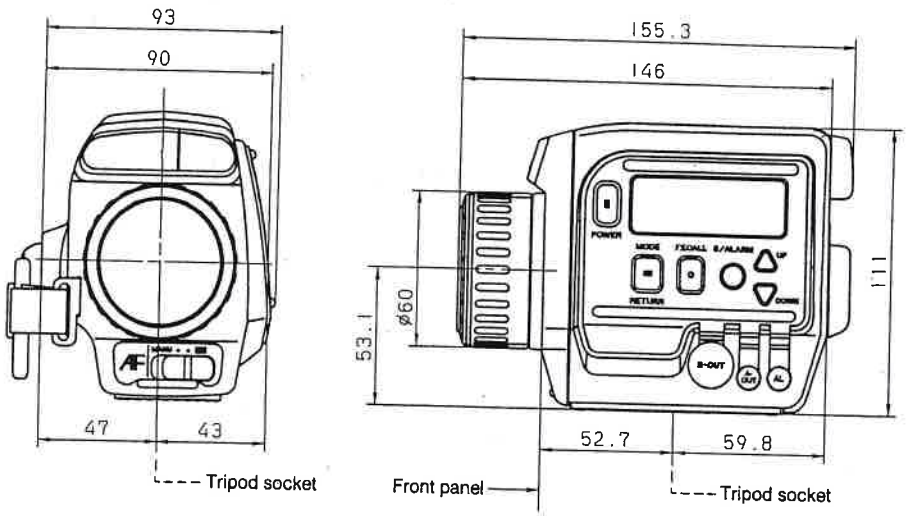
CASE TA-A60

A hard-case designed for storing the Spot Thermometer, its standard accessories, and optional accessories including:

- Data Printer DP-3
- Viewfinder Camera Set TA-A20
- Eyepiece Corrector Set
- AC Adapter AC-A10 (AC 220V) or AC-A10N (AC 120V) etc.

DIMENSIONS

(Units: mm)



SPECIFICATIONS

Type	Infrared the thermometer for non-contact temperature measurements
Detector	Thermopile
Spectral response	8 to 13μm
Optical system	Focusable mirror optical system; f = 60mm
Viewfinder	SLR (single-lens-reflex) viewfinder; corrective power: -1 diopter (fixed) Angle of view: 8° with 1° measurement area
Measurement angle	1°
Minimum subject size	∅9mm at 500mm subject distance
Focusing range	500mm to infinity (from focal plane)
Emissivity range	0.10 to 1.00 in 0.01 increments
Measurement range	-50.0 to 1000°C/-50 to 1800°F 0.1° increments from -50.0°C/-50.0°F to 199.9°C/249.9°F 1° increments from 200°C/250°F to 1000°C/1800°F
Display range	-55.0 to 1050°C/-60 to 1900°F 0.1° increments from -55.0°C/-60.0°F to 199.9°C/249.9°F 1° increments from 200°C/250°F to 1050°C/1900°F
Uncertai	Measured temperature 200°C/392°F or above: ±1% of reading ±1 digit Measured temperature 0 to 200°C/32° to 392°F: ±2°C ±1 digit Measurement temperature 0°C/32°F or below : ±3°C ±1 digit (Ambient temperature 18 to 28°C/64 to 82°F; emissivity approximately 1.00)
Repeatability	Measured temperature 100°C/212°F or above: Within 1°C Measured temperature 30 to 100°C/86 to 212°F (Ambient temperature 18 to 28°C/64 to 82°F; emissivity approximately 1.00)
Response time	Display, digital output, and analog output (90% response): 0.5s Display update time: 0.4s
Drift with ambient temperature	Measured temperature 200°C/392°F or above: ±0.05%°C of reading/°C Measured temperature less than 200°C/392°F: ±0.1°C/°C, ±0.2°F/°F
Measuring modes	Manual; monitor

Measuring display modes	NORM.: Displays most recent measured value. PEAK: Displays highest temperature measured during the period from when the measuring button was pressed until the measuring button was released (in manual measuring mode) or from when the power was switched on (in monitor mode). AVG.: Displays average of the ten most recent measurements from the time the measuring button was pressed (in manual measuring mode) or from when the power was switched on (in monitor mode). VALLEY: Displays lowest temperature measured during the period from when the measuring button was pressed until the measuring button was released (in manual measuring mode) or from when the power was switched on (in monitor mode).
Memory functions	Data automatically stored in memory when measuring button released; memory space for latest 10 measurements; additional memory for determining maximum, minimum, and mean values; all data erased when power is switched off. MEM.DATA: Recalls data from memory to external display. MAX: Displays maximum temperature. MEAN: Displays mean temperature (of up to 65,535 measurements). MIN: Displays minimum temperature.
Displays	Viewfinder: 4-digit LCD with green backlight External: LCD; 4-digit temperature display, 3-digit emissivity display; various function indications
Data communication	Bidirectional (input and output); RS-232C standard; baud rate: 4800bps
Analog output	Output: 1mV/°C or °F Accuracy: Within ±1mV ±0.2% with digital output (ambient temperature: 18 to 28°C/64 to 82°F) Output impedance: 1kΩ
Alarm function	Upper and lower limits can be set between -50 and 1000°C (-50 and 1800°F); measurements beyond range cause displayed temperature and corresponding alarm indication to blink, alarm tone to sound (if alarm sound set to on), and contacts of AL (alarm-output) socket to be shorted.
Autofocus system (Cyclops 300AF only)	TTL phase-detection type; activated by pressing measuring button Sensor: CCD line sensor AF illuminator: Automatically activated in low-light situations; range: approximately 0.5 to 5m (1.6 to 16.4 ft.)
Operating temperature range	0 to 50°C/32 to 122°F; relative humidity 85% or less (at 35°C/95°F) with no condensation
Storage temperature range	-20 to 55°C/-4 to 131°F; relative humidity 85% or less (at 35°C/95°F) with no condensation

Power source	4 AA-size batteries; optional AC-Adapter AC-A10 (AC 220V) or AC-A10N (AC 120V); optional Data Processor DP-C2; optional Data Printer DP-3
Power consumption	During measurement: Less than 50mA (when not using autofocus) Less than 400mA (when using autofocus) In display hold: Less than 40mA In stand-by mode: 0.5mA
Battery life	40 hours using AA-size alkaline batteries (according to Minolta's test method)
Other	Auto stand-by function; tripod socket; attached handstrap
Dimensions (W × H × D)	90 × 111 × 146mm (3-9/16 × 4-3/8 × 5-3/4 in.)
Weight	830g (29.3 oz.) including batteries
Standard accessories	Lens cap; eyepiece cup; soft case; 4 AA-size batteries; neck strap; φ3.5mm (⅛-inch) subminiature pulgs (one 2-contact, one 3-contact)
Optional accessories	Viewfinder Camera Set TA-A20; Angle Finder V_N; Eyepiece Corrector Set AC Adapter AC-A10 (AC 220V) or AC-A10N (AC 120V); Data Processor DP-C2; Data Printer DP-3; Connecting Cable DP-A43 (5m/16.4 ft.); Protective Case; Case TA-A60

WARRANTY

Land Infrared Ltd. warrants that the instrument has been inspected, tested and calibrated and found to meet the published specifications when shipped from the factory. Land Infrared Ltd. further warrants that the instrument will be free from defects in materials of workmanship for a period of one year from the date of shipment from the factory.

These warranties are in lieu of other warranties, express or implied and are the sole and exclusive warranties of Land Infrared Ltd.

In the event of a breach of warranty, Land Infrared Ltd.'s only obligation shall be, at their option:

a) to repair the instrument
b) to replace it with an equivalent
c) to make a credit adjustment not to exceed the original sale price providing that the following conditions have been met:
   1) Land Infrared Ltd. are notified in writing upon discovery of defects.
   2) Land Infrared Ltd. or their agents are satisfied on examination that defects have not been caused by negligence, misuse, improper installation, accident or unauthorized modification or repair.

Land Infrared Quality Management System is approved to BS EN ISO9001 for the design, manufacture, repair and on-site servicing of non contact infrared temperature measuring equipment. Calibration certificates are available from our NAMAS accredited calibration laboratory No.0034.

THIS PRODUCT complies with current European directives relating to electromagnetic compatibility and safety (EMC direcive 89/336/EEC).

All packaging material used for This product is 100% recyclable.