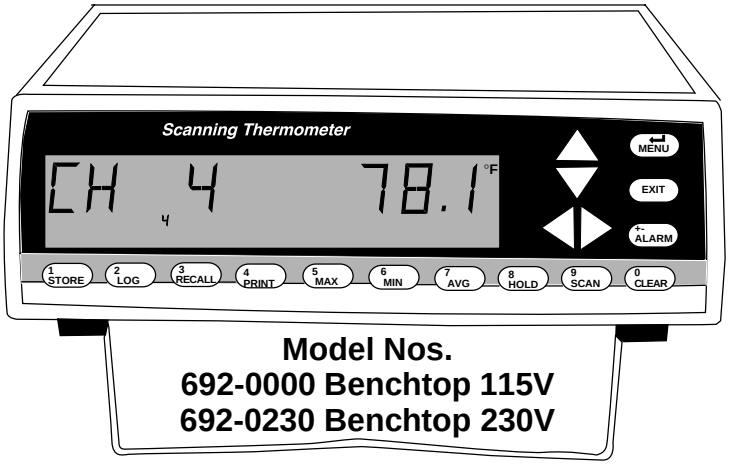
OPERATING MANUAL

12-Channel Scanning Thermocouple Thermometer



Model Nos.
692-0000 Benchtop 115V
692-0230 Benchtop 230V

Each of the up to 12 thermocouples is scanned once every four seconds to once every hour (settable). The current readings are displayed on the large liquid crystal display. Readings that exceed a maximum or minimum value can be set to trigger an alarm. Thermocouples of types: B, E, J, K, N, R, S or T can be used.

Up to 4,680 data points can be logged (stored) within the unit, including readings from all 12 channels and the date and time of the readings.

The unit can be directly connected to a printer to provide a continuous printout, and/or to your computer. Software to permit a personal computer using WINDOWS® 95/98 or WINDOWS NT® to store data from the unit, remotely operate the unit, and synchronize the operation of multiple units is included.

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Edition 05

ISO 9001 REGISTERED

EU Declaration of Conformity

Name of Apparatus: Scanning Thermocouple Thermometer

Model Number: 692-0230

Description of Apparatus: 12-Channel Benchtop Thermocouple Scanner

Barnant Company declares that the above model is in conformity to the following harmonized standards and directives:

Applicable Directives	Applicable Specifications	Manufacturer's Report Number
73/23/EEC 93/68/EEC	EN61010-1/A2: 1995	TR9866
89/336/EEC 92/31/EEC 93/68/EEC	EN61326-1/A1: 1998	TR9867

The last two digits of the year in which the current configuration of the the above model was assessed per the Low Voltage Directive is: 00.

Manufacturer:

Barnant Company Division
Cole-Parmer Instrument Company
28W092 Commercial Avenue
Barrington, IL 60010-2392
USA
Tel.: 847-381-7050

Manufacturer's Signature:

James W. Doll
Vice President, Engineering

10 November, 2000
Date

Printed in U.S.A.
050101

Introduction

This Scanning Thermocouple Thermometer continuously monitors temperatures at up to 12 locations. It is designed for laboratory or industrial applications for unattended temperature monitoring. An alarm is set off when any thermometer exceeds its preset minimum or maximum temperature. Temperature data is stored within the unit and can be output to a printer or PC.

Safety Precautions

DANGER: If thermocouples are at a high voltage, this voltage may be present at other points inside the instrument and outside at all the connectors.

WARNING: Disconnect or turn off power source before making connections.

WARNING: Turn power off and completely disconnect instrument. Disconnect power source, thermocouples, computer, links, and printer.

WARNING: Other than a lithium battery, there are no user serviceable parts inside. Replacement of the lithium battery must be performed per the Maintenance section of this Operating Manual. Refer servicing to your dealer.

CAUTION: Be sure available power matches instrument power requirements.

CAUTION: Protection provided by the unit may be impaired if the unit is installed and/or operated in a manner inconsistent with these instructions.

Table of Contents

Table of Contents continued

Features

Input

- Up to 12 thermocouple probes, each connected to a separate channel.
- Thermocouples can be different types.
- Thermocouples of types B, E, J, K, N, R, S or T can be used.
- Channels can be individually enabled or disabled.

Data storage

- Up to 4,680 data records can be stored in the unit (a record includes readings of all 12 channels plus time and date).
- Data can be logged (automatically stored).
- Current data can be manually stored by pushing the STORE button.
- Data is maintained even when the instrument is turned off or unplugged from power.

Display

- Displays the thermocouple number and temperature as scanned.
- Operator can set the scan interval from a minimum of 4 seconds to a maximum of 1 hour.
- Readings can be stored and displayed in °C, °F, K, or °R.
- Resolution to 0.1° can be displayed.
- Display can show: current, maximum, minimum, or average temperature.
- Average temperature display also displays the number of readings being averaged.
- Hold function freezes all 12 channels.

Data output

- All 12 channels can be output to a printer simultaneously.
- Current, stored, or logged data can be directly sent to a printer (CENTRONICS® parallel).
- Time between printing cycles is adjustable.
- Current, stored, or logged data can be sent to a personal computer (PC)(RS-232 serial).

Calibration

- Channels can be individually calibrated manually.
- Factory calibration remains in memory and can be restored at any time.

Software

- Software (for a PC running WINDOWS 95/98 or WINDOWS NT) is included.
- Software use is optional.
- Software installation instructions and software manual are on the provided CD-ROM. See readme.txt for latest information.
- Software permits control of up to 8 units.
- Real time data collection.
- Data can be input to spreadsheet or graphing software.

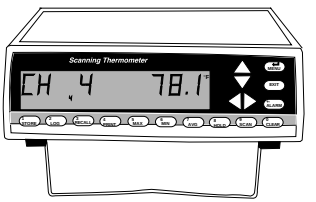
Alarms

- High and low alarm temperatures can be set for each channel individually.
- An open thermocouple automatically triggers an alarm.
- An alarm causes the alarm icon to be displayed, and emits an audible beep.
- The audible beep can be disabled.

Error messages

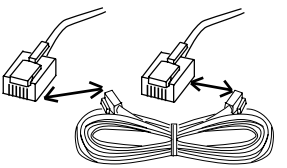
- Messages indicate channel and fault condition.

Package contents

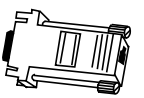


Scanning thermometer
Includes wire stand for desktop convenience.

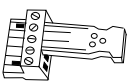
Link cable
RJ-11 to RJ-11 seven feet long. Use to interconnect scanning thermometer instruments.



PC adapter
RJ-11 to DE-9 female. Used to connect instrument to your PC, using the link cable.



Trigger Connector



Operating Manual
This book.

Warranty card

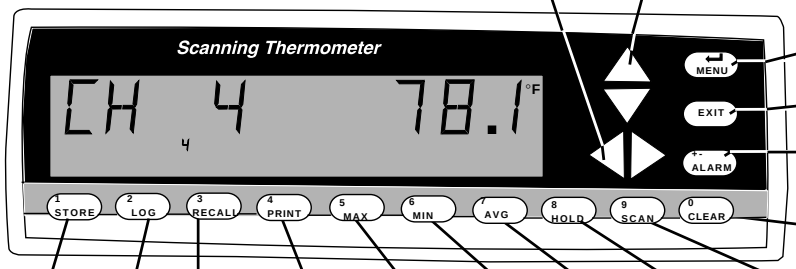
AC Adapter - as supplied.

Software
WINDOWS 95/98 and WINDOWS NT on CD-ROM. Serial software specifications on CD-ROM.

Not supplied
Printer cable
DB25 male to the input connection of your parallel printer.

Quick Reference
Front Panel Controls

See the page number (in parenthesis) for full information about the item.



Use **Left-Right arrow keys** to select a channel for display. Scanning stops. Push SCAN to resume. (22)

Use **Up-Down arrow keys** to scroll thru the MENU. Otherwise inactive. (21)

MENU Push to sequence through menu choices for instrument setup. (21)

EXIT Push to exit any menu or display mode. Operation continues. (23)

ALARM Push to silence the audible alarm. Alarm icon remains. (23)

CLEAR Push CLEAR then push STORE, LOG, MAX, MIN, AVG or ALARM. Clears respective value(s) from memory. (20)

SCAN Push to resume scanning display after pushing Left-Right arrow keys. Also, this immediately initiates a new scan. (20)

HOLD Push to freeze current display readings. Scanning continues. Left-Right arrow keys select channel displayed. To exit push HOLD. (19)

AVG Push to display the average reading and number of readings since last power up or last cleared. Left-Right arrow keys select channel displayed. To reset push CLEAR then AVG. To exit push EXIT. (19)

MIN Push to display the minimum reading and reading time since last power up or last cleared. Left-Right arrow keys select channel displayed. To reset push CLEAR then MIN. To exit push EXIT. (18)

MAX Push to display the maximum reading and time since last power up or last cleared. Left-Right arrow keys select channel displayed. To reset push CLEAR then MAX. To exit push EXIT. (17)

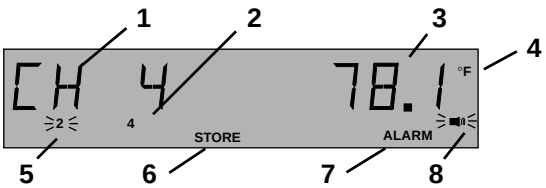
PRINT Push to turn printing on or off. (16)

LOG Push to toggle data logging. (14)

STORE Push to store the current set of readings in memory. “STORE” appears in the display. (13)

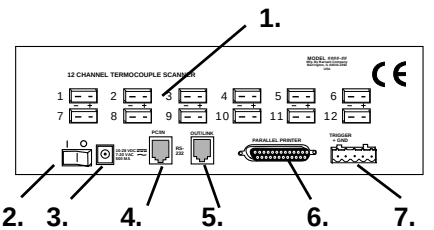
RECALL Push to scroll through logged readings. Up-Down arrow keys scroll through reading numbers. Left-Right arrow keys select channel displayed. RECALL cycles through reading date, reading time, and reading temperature. Push and release EXIT to exit. (15)

Quick Reference Continued
Front Panel Display
Rear Panel Connections

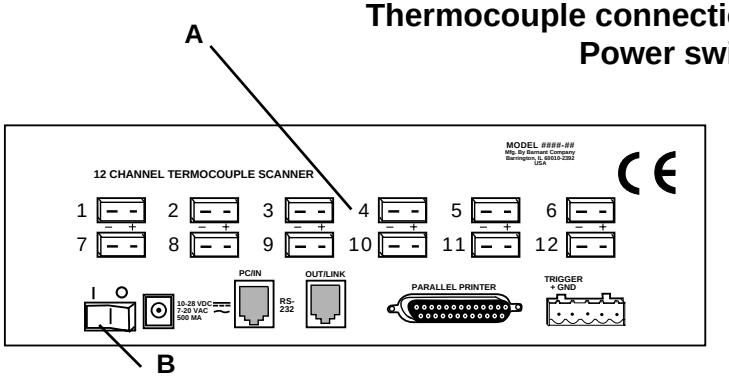


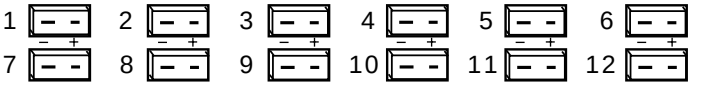
Note: Example display

1. CH and the channel number display the thermocouple that is being read.
2. The number of the channel being displayed is repeated here.
3. The temperature is displayed.
4. The temperature scale is given.
5. A flashing channel number shows a problem with that probe.
6. Words across the bottom of the display indicate status of the instrument. (Example: STORE indicates that temperature records are logged or stored.)
7. The word ALARM flashes when an alarm is present.
8. When flashing, indicates an alarm.



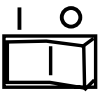
1.	**1-12**	Connect thermocouples here (two blade mini-ANSI connectors).
2.		Power switch: I = on, O = off.
3.	**10-28V DC**	Power supply input. Connect the input connector of the supplied AC adapter here.
4.	**PC/IN**	Connect (using supplied cable) to a serial port on your PC computer (RS-232 connection).
5.	**OUT/LINK**	For linking additional 12-Channel Scanning Thermocouple Thermometer instruments. Connect OUT/LINK on one instrument to PC/IN, using RJ-11 connectors.
6.	**PARALLEL PRINTER**	Use a standard parallel printer cable (25 pin D-sub connector) to directly connect a PC printer.
7.	**TRIGGER + GND**	Connect for external events to trigger printing or data storage.





A. Thermocouple connections

- Connect up to twelve thermocouples here.
- Jacks are for two blade mini-ANSI connectors.
- Thermocouples of types B, E, J, K, N, R, S, or T can be used. See Appendix B for a description of thermocouple types.
- Any combination of thermocouple types can be used at the same time.
- If a thermocouple connection (channel) is not used it may be disabled using the Menu. See Menu - How to: Enable/Disable channels on page 30.

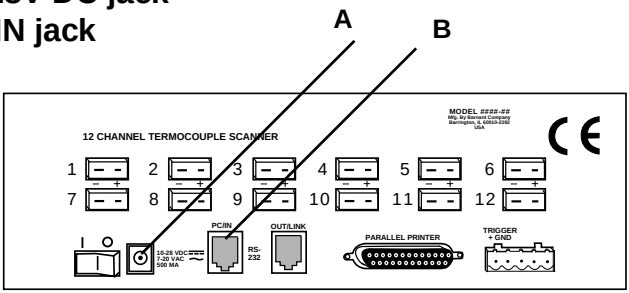


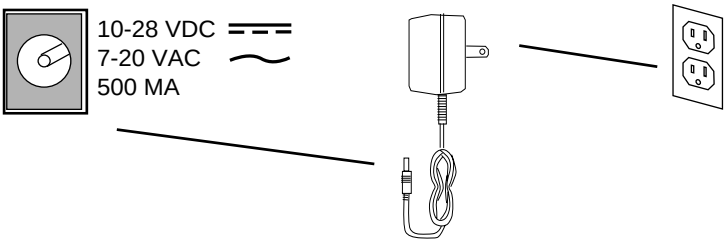
B. Power switch

Toggle to **I** to turn power to the instrument on.
Toggle to **0** to turn power to the instrument off.

When power is turned on the display goes through a display check sequence: all display elements are turned on momentarily, then the 1,2,...12 icons (small numbers) turn off in sequence, and then the display switches to normal operation.
An internal lithium battery maintains the real-time clock for power outages for over a year.

Rear Panel Connections continued
10-28V DC jack
PC/IN jack





A. 10-28V DC jack (Power supply input)
Connect the input connector of the supplied AC adapter here.

Polarity may be either center +, or center –, or AC.

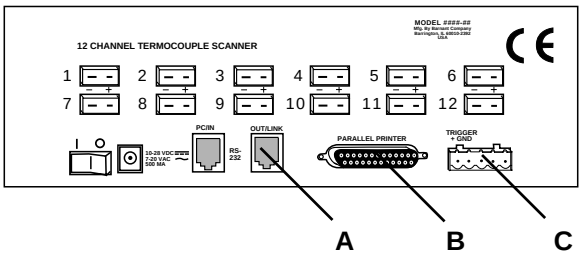
The instrument will accept: 10-28V DC (non-polarized) input @ ~ 300 mA, or 9-20V AC, 50-400 Hz @~ 500 mA.
The input connector is a 2.5 mm ID, 6.4 mm OD power jack. (Switchcraft 760 or 765 or equivalent.)

PC/IN

B. PC/IN jack (Computer or link connection)
Computer connection Connect (using supplied cable) to a serial port on your PC computer (RJ-11 connector to DE-9 female using the RS-232 protocol). Software commands and instructions are available on the supplied CD-ROM. See package contents page 5.

Link connection Connect PC/IN (using wire with RJ-11 connectors) to OUT/LINK connection on additional instruments. Uses Linkable Instrument Network connectors and software protocol.

Rear Panel Connections continued
Out/Link jack
Parallel Printer connection
Trigger + Gnd connection

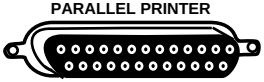


OUT/LINK

RS-232

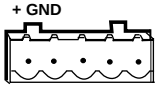
A. OUT/LINK jack
Link connection. Connect OUT/LINK (using wire with RJ-11 connectors) to PC/IN connection on additional instruments. Uses Linkable Instrument Network connectors and software protocol. Either end of the chain can be used as the computer connection.

PARALLEL PRINTER



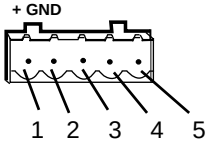
B. Parallel Printer connection
Use a standard parallel printer cable (DB-25 male to 36 position CENTRONICS male) to directly connect a PC printer. See PRINT button on page 16. No additional software or hardware is required for printing.

TRIGGER + GND



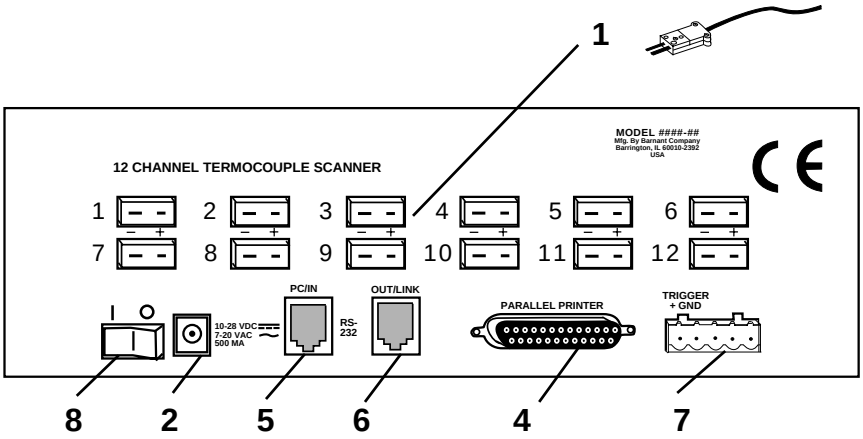
C. TRIGGER + GND connection
Optional. Connect for external events to trigger printing or data storage. Contact closure or open collector type logic signal to ground. (Internal 5V DC pull-up through 5K ohms resistance with 100pf capacitance to ground.) Mating connector supplied.

TRIGGER + GND



Use pins 1 & 2 for contact closure.
Pins 3-5 not used.

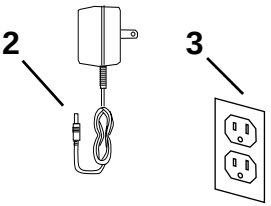
Installation



1. Attach up to 12 thermocouples.

2. Connect the AC adapter to the instrument.

3. Plug the AC adapter into an outlet.



4 - 7 are Optional

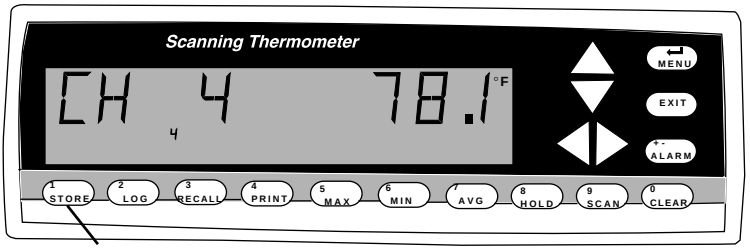
4. Connect the PARALLEL PRINTER output to a PC printer (standard parallel port cable - not supplied).

5. Connect the PC/IN jack to a serial port of your WINDOWS PC (use the supplied cable).

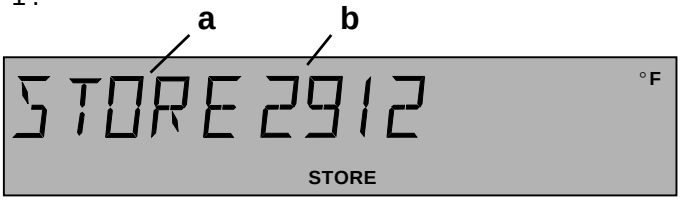
6. To interconnect instruments connect the OUT/LINK jack of one Scanning Thermocouple Thermometer to the PC/IN jack of the next (cable supplied).

7. To control printing or data storage by external events, connect momentary contact events to the TRIGGER + GND connector.

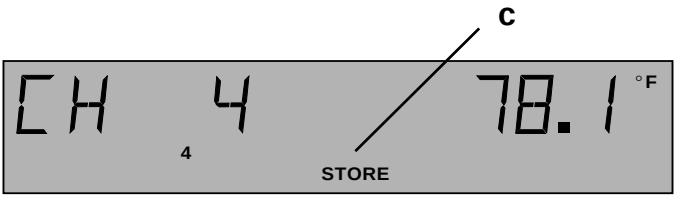
8. Switch power switch to on.



1 STORE button
Push to store one record cycle of the current set of readings in memory. (Same as LOG, except only one record is stored.)
When a numerical entry is required and the NUM icon is on, push to enter a ‘1’.



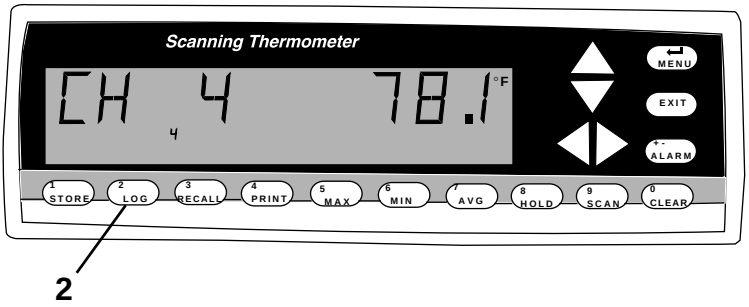
The word “STORE” **a** and the record number being stored **b** appear in the display for about 3 seconds. Then the display returns to normal.



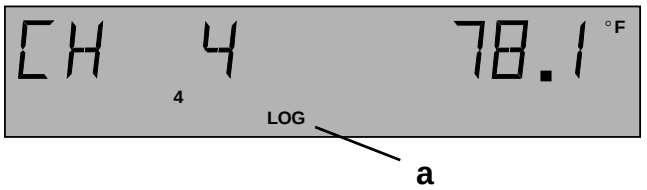
“STORE” **c** appears, and remains in the display when one or more record cycles are in storage (STORE and/or LOG).
Use to save a particular data record.

- A record includes readings from all 12 channels plus the time and date.
- Up to 4,680 records may be stored. Memory is shared with LOG. When no more data can be stored the display reads “STORE FULL”.
- To clear (erase) stored records, push CLEAR, then push STORE. “STORE” disappears from the display.

Front panel displays and controls continued
2 LOG button

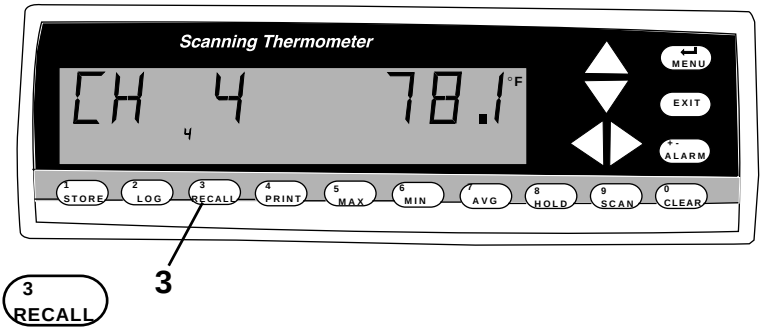


2 LOG button
Push to log record cycles as they are read. (Same as STORE, only continues automatically.)
When a numerical entry is required and the NUM icon is on, push to enter a '2'.
Push again to turn logging off.



The word "LOG" **a** appears and remains in the display while records are being logged.
"STORE" appears, and remains, in the display when one or more records are in storage.
Use to save a particular set of data records.

- Readings from all 12 channels are logged.
- How often records are logged is set using the MENU - LOG procedure, page 37, which may be different from the scan rate.
- The time and date of the reading is logged.
- Up to 4,680 records may be logged. Memory is shared with the STORE function. When no more data can be stored the display reads "LOG FULL".
- To clear (erase) stored records, push CLEAR, then push LOG. "STORE" will disappear from the display.



3 RECALL button
Push to recall stored (STORE or LOG) data.
When a numerical entry is required and the NUM icon is on, push to enter a '3'.

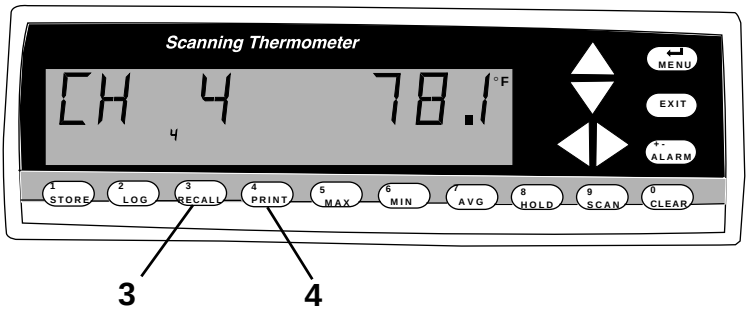
- "RECALL" appears and remains in the display during recall.
- The LOG or STORE record number and time of channel 1 are displayed first.

Push RECALL again to display the temperature.

Push RECALL again to display the date.

(continued on next page)

Front panel displays and controls continued
3 RECALL button continued
4 PRINT button



3 RECALL button continued

- Any time during RECALL push the Up-Down arrow keys to scroll through the stored records.
- Any time during RECALL push the Left-Right arrow keys to scroll through the channels.
- To exit RECALL push EXIT.

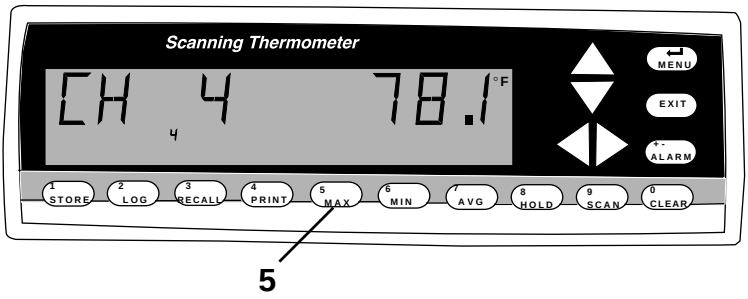
4 PRINT button

Push to print on the printer attached to the PRINTER port. Push again to stop printing.
When a numerical entry is required and the NUM icon is on, push to enter a ‘4’.

- “PRINT” appears and remains in the display.
- Records are printed at intervals set in the MENU.
  See MENU - How to adjust the print rate, see page 36.
- Push PRINT again to turn off printing.

Example printout:

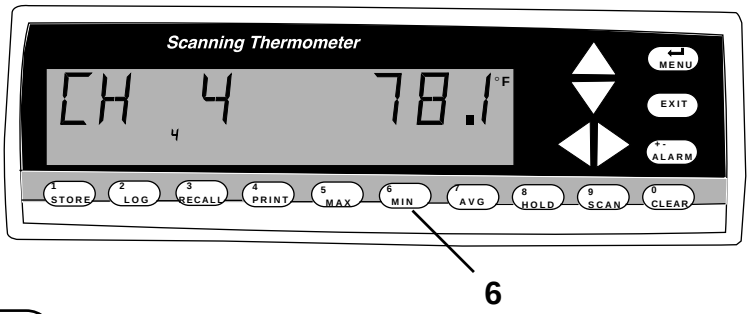
11:59:48	CH	1:	72.9	CH	2:	75.7	CH	3:	UNDER	CH	4:	74.6
04/24/99	CH	5:	74.5	CH	6:	74.5	CH	7:	76.0	CH	8:	74.5
	CH	9:	74.7	CH	10:	74.1	CH	11:	73.8	CH	12:	73.7



5 MAX button
Push to display the maximum temperature logged for each channel. The display continues to scan channels.
When a numerical entry is required and the NUM icon is on, push to enter a ‘5’.

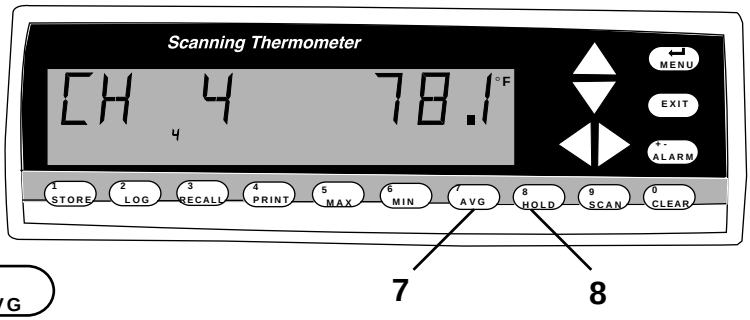
- “MAX” appears and remains in the display.
- The time and maximum reading for a channel are displayed (since power up or last cleared).
- Push MAX again to switch between the time and the date.
- Use Left-Right arrow keys to stop scanning and to choose the channel whose maximum value is displayed. Push SCAN to return to scanning channels while remaining in MAX.
- Push MIN to switch the display to the minimum logged value of the displayed channel.
- Push EXIT to exit.

Front panel displays and controls continued
6 MIN button



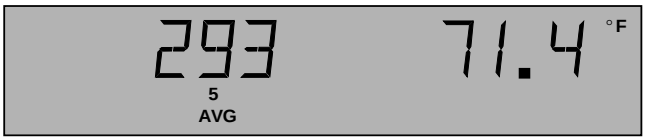
6 MIN button
Push to display the minimum temperature logged for each channel. The display continues to scan channels.
When a numerical entry is required and the NUM icon is on, push to enter a ‘6’.

- “MIN” appears and remains in the display.
- The time and minimum reading for a channel are displayed (since power up or last cleared).
- Push MIN again to switch between the time and the date.
- Use Left-Right arrow keys to stop scanning and to choose the channel whose minimum value is displayed. Push and release SCAN to return to scanning channels while remaining in MIN.
- Push MAX to switch the display to the maximum logged value of the displayed channel.
- Push EXIT to exit.



7
AVG

7 AVG button
Push to display the average temperature for each channel and the number of readings that are being averaged. The display continues to scan channels.
When a numerical entry is required and the NUM icon is on, push to enter a ‘7’.



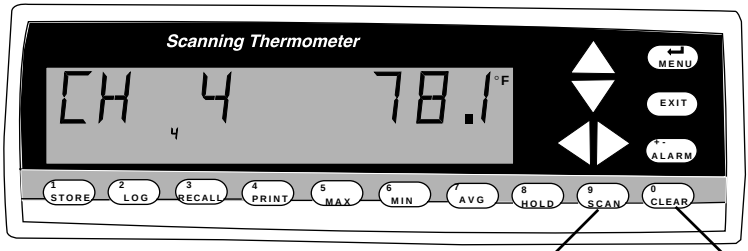
- “AVG” appears and remains in the display.
- Readings from when the instrument was last powered up or cleared are averaged.
- Opened channel readings are not averaged.
- Use Left-Right arrow keys to stop scanning and to choose the channel whose average is displayed. Push SCAN to return to scanning channels while remaining in AVG.
- Push AVG again to exit.

8
HOLD

8 HOLD button
Push to hold the current record in display.
When a numerical entry is required, and the NUM icon is on, push to enter an ‘8’.

- “HOLD” appears and remains in the display.
- Channel scanning, logging, printing continue normally but the display remains.
- Push HOLD or EXIT to exit.

Front panel displays and controls continued
9 SCAN button
0 CLEAR button



9 SCAN

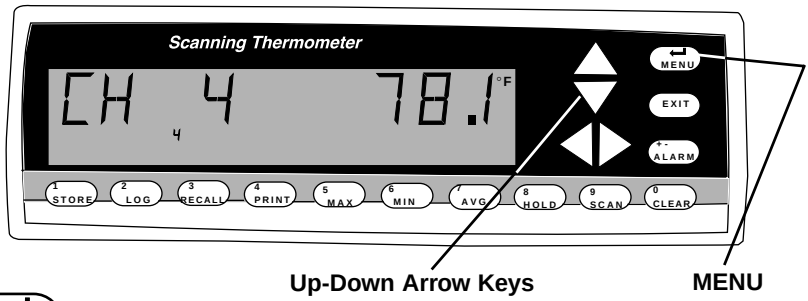
9 SCAN button
Push to start a channel scan.
When a numerical entry is required and the NUM icon is on, push to enter a '9'.

- Each channel is displayed for three seconds.
- Use to return to scanning after scanning is stopped by using the Left-Right arrow keys.
- Causes an immediate scan.

0 CLEAR

0 CLEAR button
Push CLEAR, then push AVG, ALARM, MAX, MIN, STORE or LOG to clear that value.
When a numerical entry is required and the NUM icon is on, push to enter a '0'.

- CLEAR - AVG erases the 12-Channel record containing the average temperature from memory.
- CLEAR - ALARM turns the alarm buzzer off, all alarm conditions, error messages, and temperature out of range alarms. Normally push ALARM when an alarm occurs, that stops the alarm buzzer and checks the alarm condition.
- CLEAR - MAX erases the 12-Channel record containing the maximum temperature from memory.
- CLEAR - MIN erases the 12-Channel record containing the minimum temperature from memory.
- CLEAR - STORE erases the 12-Channel records that have been logged or stored in memory (= CLEAR - LOG).
- CLEAR - LOG erases the 12-Channel records that have been logged or stored in memory (= CLEAR - STORE).

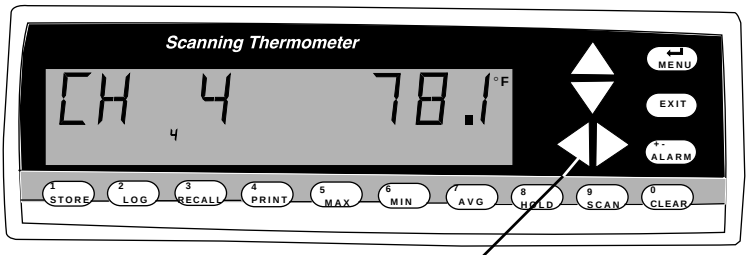


MENU button
Push to scroll through the menu to enter or change setup parameters. The word “SCALE” appears in the display and the current scale setting (for example °F) flashes.
To scroll backwards through the menu choices push and hold MENU then press the Left arrow key.

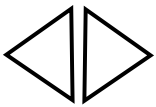
See MENU, starting on page 26, for a complete selection of MENU choices and how to set up parameters.

Up-Down Arrow keys
Active within the MENU. Used to scroll through menu options.

Front panel displays and controls continued
Left-Right Arrow keys

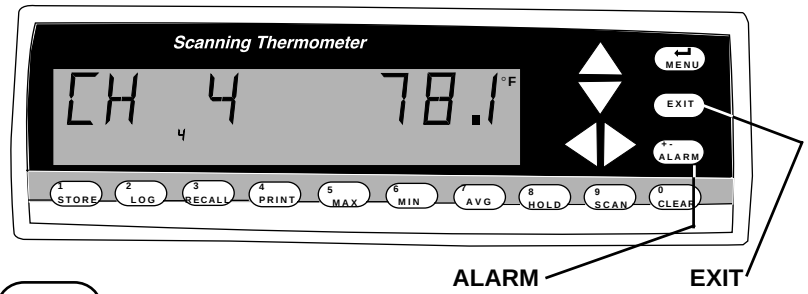


Left-Right Arrow Keys



Left-Right Arrow keys
Active within the MENU. Used to scroll through menu options.

- Manually select a channel.



EXIT button
During MENU, push to EXIT the MENU and save any menu choices that have been made. SAVING SETUP is displayed for two seconds, then the instrument returns to scanning.

During STORE, RECALL, MAX, MIN, AVG, CLEAR or HOLD displays, push to EXIT the display and return to scanning.

ALARM button
Push to turn off the alarm beeper. The flashing alarm icon and other alarm displays remain.
When a numerical function is required and the NUM icon is on, push to toggle between + and -.

Temperature Alarms
When an alarm occurs the alarm beeper will beep (if ALARM BEEPER is set to ON in the menu) the printer will print the alarm record (if ALARM PRINT ON is set in the menu), the alarmed channel **1** and the alarm icon **2** will flash.

(continued on next page)

Front panel displays and controls continued
ALARM button continued

Temperature Alarms continued

- **HI temperature alarm**: When a thermocouple detects a temperature above the HI limit setting in the menu, ALARM is displayed, the alarm icon and the channel number **3** flash. HI will flash when that channel is displayed.
- **LO temperature alarm**: When a thermocouple detects a temperature below the LO limit setting in the menu, ALARM is displayed, the alarm icon, and the channel number **3** flash. LO will flash when that channel is displayed.

To turn off the alarm displays: push the Left-Right arrow keys to display the out of range channel, then push ALARM. Repeat for all alarmed channels.

To clear all alarm conditions at once: push CLEAR then push ALARM.

Other Alarms

- **OPEN thermocouple:** A thermocouple channel that is OPEN (no thermocouple connected) will cause an OPEN alarm.

  OPEN will be displayed instead of a temperature when that channel is displayed.

  Check thermocouple connection, wiring to the thermocouple, or replace the thermocouple.

  If the channel is not used, disable the channel (see How to Enable/ Disable channels, page 30).

- **UNDER alarm:** If the instrument detects a reading indicating a temperature below the operating range of the thermocouple type an UNDER alarm occurs.

  UNDER will be displayed instead of a temperature when that channel is displayed.

- **OVER alarm:** If the instrument detects a reading indicating a temperature above the operating range of the thermocouple type an OVER alarm occurs.

  OVER will be displayed instead of a temperature when that channel is displayed.

- **LOG FULL alarm:** 4,680 12-Channel records can be stored in memory. A record is stored in memory manually by pushing STORE, or automatically according to the log rate setting in the menu.

  During a LOG FULL alarm LOG and FULL alternate in the display. During a LOG FULL alarm you can:

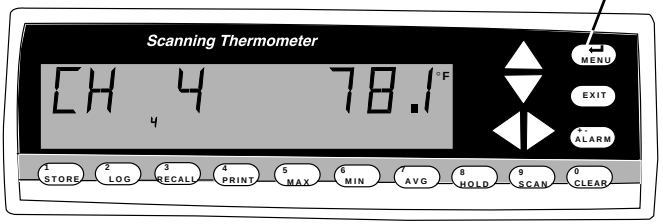
  - RECALL - scroll through the logged readings.
  - PRINT - print the logged readings.

  To clear (erase) **the memory**: push CLEAR then push LOG.

- **Instrument errors:** Various hardware errors can also cause an alarm such as an A/D error, EEPROM verify error, flash write error, etc. The entire display will flash the alarm message. See Error Messages, page 62.

  Normal display updates stop until the alarm is acknowledged. Other updates (scanning, printing, other alarms, logging) continue without interruption.

Front panel displays and controls continued
About the MENU



MENU

About the Menu

Push the MENU button **1** to scroll through the menu to enter or change setup parameters.

The word “SCALE” appears in the display and the current scale setting (for example °F) flashes.

To scroll backwards through the menu choices push and hold MENU then press the Left arrow key.

MENU lets you adjust the following:

display		**see page**
SCALE	temperature scale displayed	28
RESOLUTION	the resolution of the displayed temperature	29
¦¦¦¦¦¦¦¦¦¦	choose which channels are scanned	30
KKKKKK...	thermocouple type	31
CONTRAST	the contrast of the display	32
TRIGGER OFF	trigger off/on	33
TRIGGER PULSE	trigger mode	34
SCAN	scan time interval	35
RATE	PRINT rate	36
RATE	LOG rate	37
ALARM	alarm off, or on	39
PRINT ON	alarm print on or off	40
If alarm is set to ON		
¦¦¦¦¦¦¦¦¦¦	choose channel to set HI alarm	41
¦¦¦¦¦¦¦¦¦¦	choose channel to set LO alarm	42
HYST	set alarm hysteresis	43
SETPT	set HI alarm setpoints	44
SETPT	set LO alarm setpoints	45
BEEPER	beeper on or off	46
DATE MM/DD	date format	47
DATE 042599	set date	48
TIME 10:13	set time	49
CALPT 1 32.0	field calibration	50
REPORT	calibration report	53

About the Menu continued

- **Quick access -** Push MENU then SCAN, PRINT, LOG, or ALARM to jump to that point in the menu.
- When done with a menu setup either push EXIT to save the setup and return to scanning or push MENU to continue to the next menu setup.
- If a numeric entry is required in a menu setup, a flashing NUM icon is displayed and the number and ± keys are active.
- To erase a single digit while entering a number push the Down arrow key.

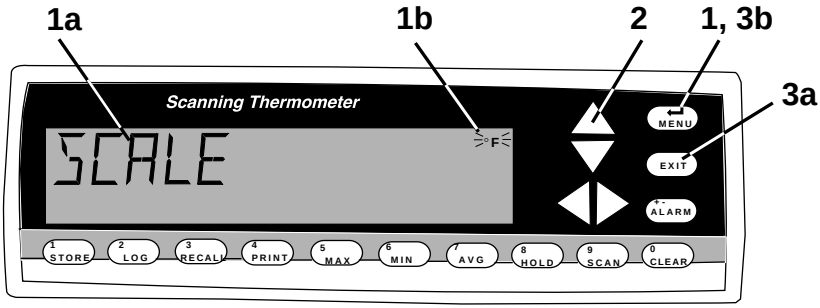
Front panel displays and controls continued
How to set the scale

How to set the scale

The instrument can record, display and print at the following scales:

°F	Degrees Fahrenheit
°C	Degrees Centigrade
°R	Degrees Rankin
K	Kelvin

The default scale is °F.



To set or change the scale:

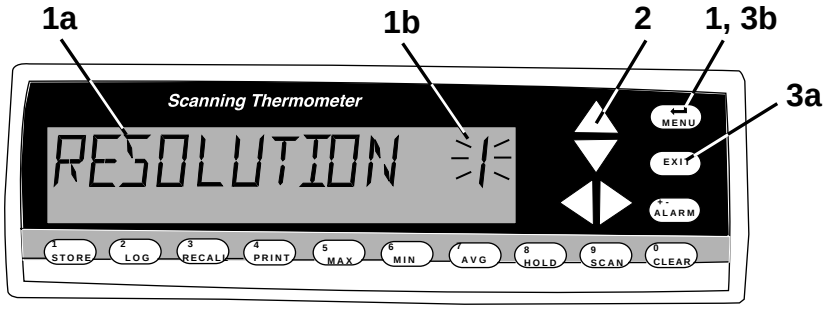
1. Push MENU, SCALE **1a** is displayed and the current scale setting **1b** flashes.
2. Push the Up or Down arrow keys until the desired scale is flashing.

3a. Push EXIT to save the setup and return to scanning, or

3b. Push MENU to switch to the next setup topic (adjust the resolution).

How to change the resolution
The instrument can display and print temperatures at either 0.1° or 1° resolution.

The default resolution is 0.1°.



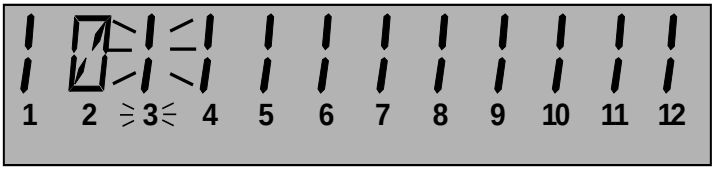
To set or change the resolution:

1. Push MENU until RESOLUTION is displayed. RESOLUTION **1a** is displayed and the current resolution setting **1b** flashes.
2. Push the Up or Down arrow keys until the desired resolution is flashing.

3a. Push EXIT to save the setup and return to scanning, or

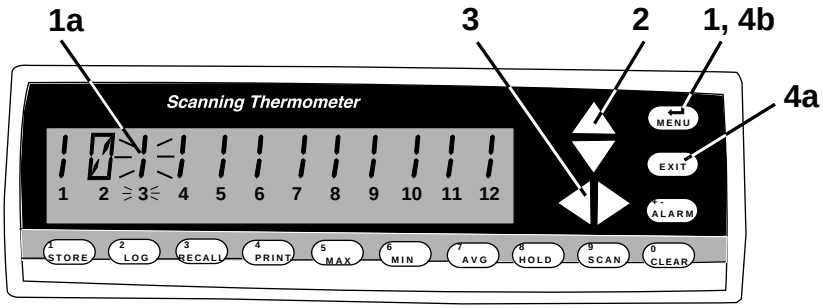
3b. Push MENU to switch to the next setup topic (Enable/Disable channels).

Front panel displays and controls continued
How to Enable/Disable channels



How to Enable/Disable channels
A thermocouple channel can be turned off if that channel is not used or not desired. A channel that is turned off will be skipped in a scan and listed as OFF in a printout.

The default setting is all channels ON.

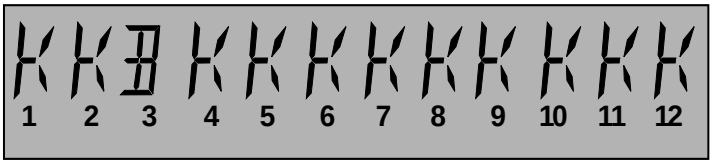


To set or change scan channels:

1. Push MENU until 1's and 0's are displayed and the current channel **1a** flashes. (1 is scan channel on, 0 is scan channel off.)
2. Push the Up or Down arrow keys as the channel flashes to toggle between 1 and 0.
3. Push Left or Right arrow keys to switch channels.
   Repeat steps 2 and 3 for all channels you want to change.

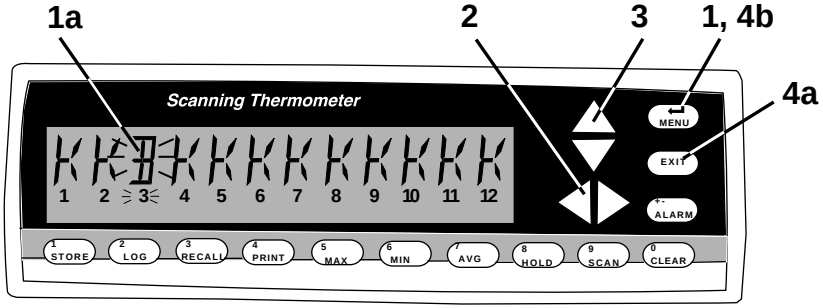
4a. Push EXIT to save the setup and return to scanning, or

4b. Push MENU to switch to the next setup topic (setup thermocouple types).



How to setup thermocouple types
Thermocouples of types K, J, B, N, S, R, E or T can be used with this instrument. Any combination of thermocouple types can be used.
See Appendix B for thermocouple specifications.

The default setting for all channels is type K.



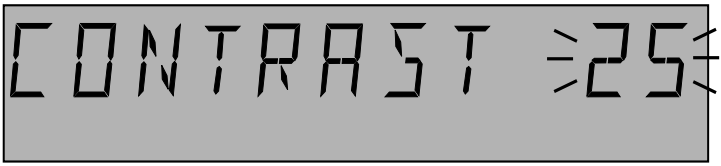
To set or change thermocouple type:

1. Push MENU until K's (or other types) are displayed and the current channel **1a** flashes (disabled channels are blank).
2. Push Left or Right arrow keys to switch channels.
3. Push the Up or Down arrow keys as the channel flashes to scroll through thermocouple types.
   Repeat steps 2 and 3 for all thermocouple type changes.

4a. Push EXIT to save the setup and return to scanning, or

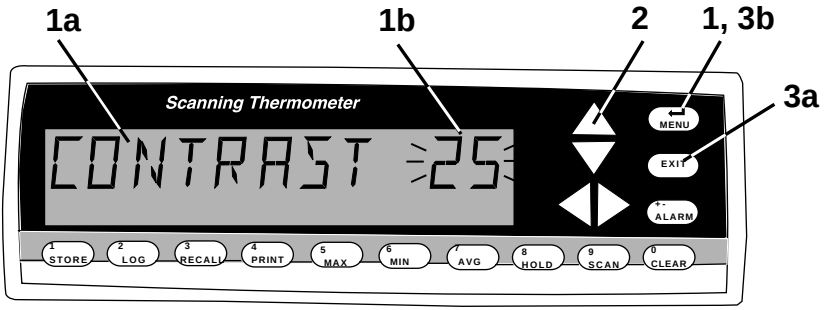
4b. Push MENU to switch to the next setup topic (adjust the display contrast).

Front panel displays and controls continued
How to adjust the display contrast



How to adjust the display contrast
The display contrast can be adjusted from 1 (very dark - the background interferes with the display) to 50 (very light - display letters and numbers are dim). This setting adjusts the contrast for varying viewing angles.

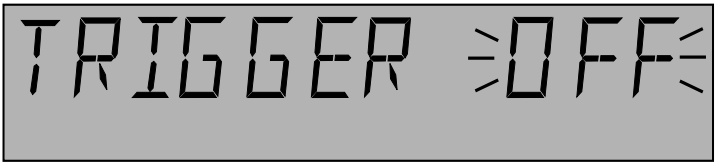
The default setting is 25.



To set or adjust the display contrast:

1. Push MENU until CONTRAST **1a** is displayed and the current contrast value **1b** flashes.
2. Push and hold the Up or Down arrow keys to adjust the contrast value quickly. Push an Up or Down arrow key to change contrast one digit at a time.
   The contrast changes as the value is adjusted.

3a. Push EXIT to save the adjustment and return to scanning, or
3b. Push MENU to switch to the next setup topic (set trigger type).

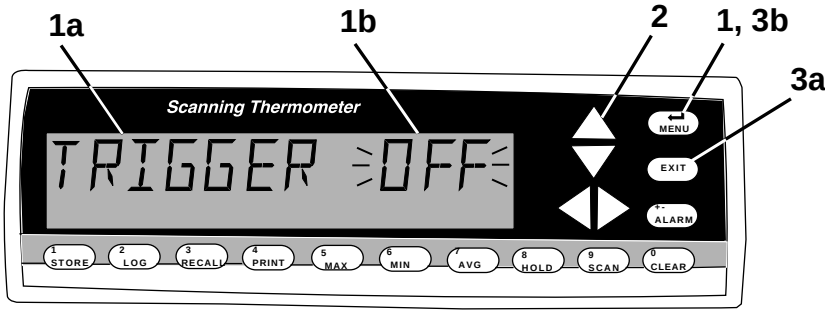


How to set trigger type

A trigger (contact between pins 1 and 2 of the trigger) can be set to:

- pulse print (print one record when trigger contact is closed).
- S/S (start/stop) PRINT (equivalent to toggling PRINT on while trigger contact is closed).
- pulse STORE (equivalent to pushing STORE to log one record).
- S/S (start/stop) STORE (equivalent to pushing LOG to continuously log records while trigger contact is closed).

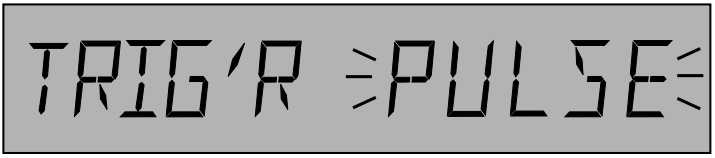
The default setting is OFF.



To set or adjust the trigger type:

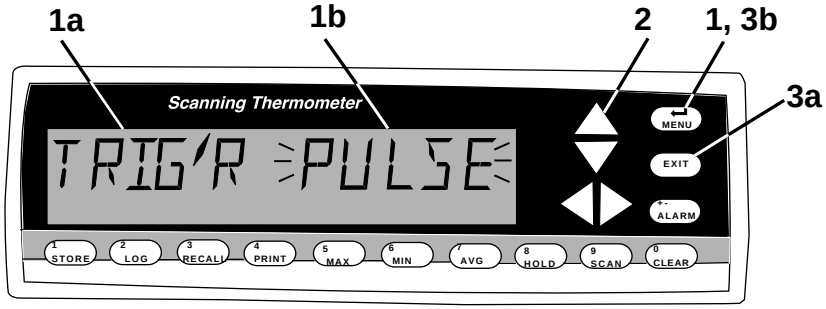
1. Push MENU until TRIGGER **1a** is displayed and the current setting **1b** (OFF, STORE or PRINT) flashes.
2. Push the Up or Down arrow keys to scroll between OFF, STORE and PRINT.
3a. Push EXIT to save the setting and return to scanning, or
3b. Push MENU to switch to the next setup topic (set trigger mode).

Front panel displays and controls continued
How to set trigger mode



How to set trigger mode
If a trigger type is set to PRINT or STORE, the trigger mode can be set. (See How to set trigger type on preceding page.)
The modes are PULSE (momentary action, as in pushing and releasing a button), and S/S (start/stop, toggle action as in switching on or off).

The default setting is PULSE.



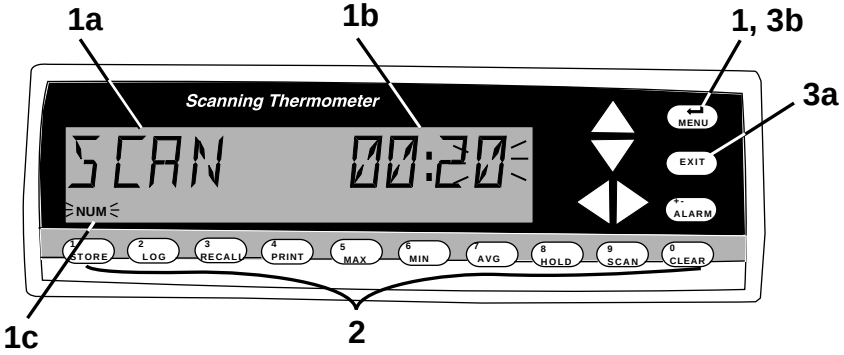
To set or adjust the trigger mode:

1. Push MENU until TRIG'R **1a** is displayed and the current setting **1b** (PULSE or S/S) flashes.
2. Push the Up or Down arrow keys to switch between PULSE and S/S.

3a. Push EXIT to save the setting and return to scanning, or
3b. Push MENU to switch to the next setup topic (adjust the scan rate).

How to adjust the scan rate
The scan rate is the interval between the start of individual scans of all twelve channels.

The default setting is 00:04 (4 seconds).
It takes 4 seconds to do one 12 channel scan, so a scan rate of 00:04 results in continuous scanning.
With the scan rate at 00:20 there will be 3 scans per minute.
The maximum scan rate that can be set is one hour (60:00).



To adjust the scan rate:

1. Push MENU until SCAN is displayed or push MENU at least once, then push SCAN.
   SCAN **1a** is displayed and the current setting **1b** flashes.
   NUM **1c** appears and flashes indicating number keys **2** are active.
2. Push number keys **2** to enter the scan rate. (For example, 36:12 is entered by pushing 3 - 6 - 1 - 2.)

3a. Push EXIT to save the setting and return to scanning, or

3b. Push MENU to switch to the next setup topic (adjust the print rate).

Front panel displays and controls continued
How to adjust the print rate

How to adjust the print rate

The print rate is the time the instrument waits between printing temperature scans on the attached printer.

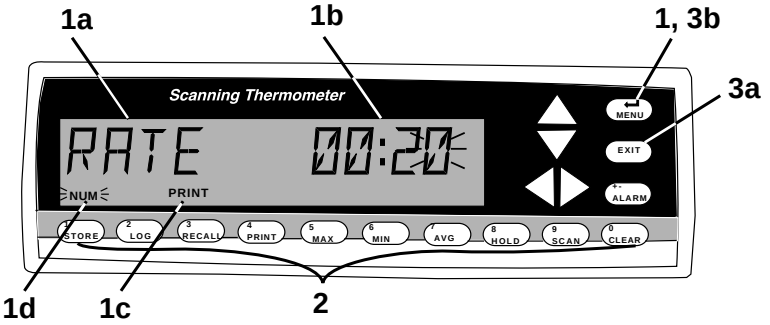
A printer must be attached and turned on. The instrument only sends the data, there is no alarm or storage of print information if the printer is disconnected or turned off.

The PRINT button must be pushed and PRINT displayed.

The default setting is 00:20 (20 seconds).

It takes 4 seconds to do one 12 channel scan so a print rate of 00:04 is the maximum obtainable.

Note: If the print rate is set more often than the scan rate (lower time setting) the instrument will scan and print at the print rate.



To adjust the print rate:

1. Push MENU until the PRINT RATE displays or push MENU at least once, then push PRINT.
   RATE **1a** is displayed and the current setting **1b** flashes.
   PRINT **1c** is displayed.
   NUM **1d** appears and flashes indicating number keys are active.
2. Push number keys **2** to enter the print rate. (For example, 36:12 is entered by pushing 3 - 6 - 1 - 2.)

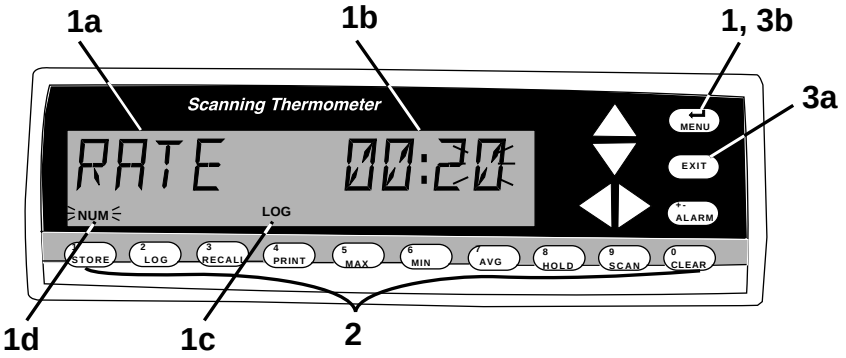
3a. Push EXIT to save the setting and return to scanning, or

3b. Push MENU to switch to the next setup topic (adjust the log rate).

How to adjust the log rate
The log rate is the time the instrument waits between logging temperature scans in memory.
4,680 12 channel scans can be logged in memory, then LOG FULL is displayed. When LOG FULL is displayed you can RECALL – scroll through the logged readings, and you can PRINT – print the entire list of 4,680 logged entries. To clear (erase) memory: push CLEAR, then push LOG.
The default setting is 00:20 (20 seconds).
It takes 4 seconds to do one 12 channel scan so a log rate of 00:04 is the maximum obtainable. The longest interval that can be set is 1 hour, 60:00.
Examples: At a setting of (00:20) the log is full in 26 hours. At the minimum setting (00:04) the log is full in 5.2 hours. For 8 hours use a setting of 00:09. At the maximum setting (60:00) the log is full in 4,680 hours (195 days).
Manually pushing STORE adds one scan to the same memory as LOG.

(continued on next page)

Front panel displays and controls continued
How to adjust the log rate continued



To adjust the log rate continued:

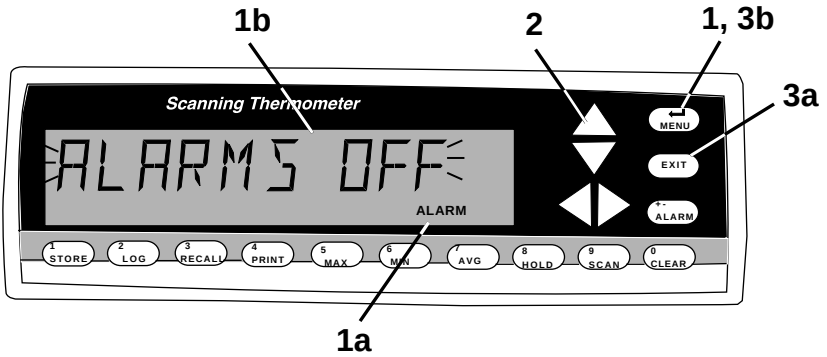
1. Push MENU until the LOG RATE displays or push MENU at least once, then push LOG. RATE **1a** is displayed and the current setting **1b** flashes. LOG **1c** is displayed. NUM **1d** appears and flashes indicating number keys **2** are active.
2. Push number keys to enter the log rate. (For example, 36:12 is entered by pushing 3 - 6 - 1 - 2.)

3a. Push EXIT to save the setting and return to scanning, or

3b. Push MENU to switch to the next setup topic (set the alarm mode).

How to set the alarm mode
The alarm mode can be ALARMS OFF, or ALARMS ON.
The default setting is ALARMS OFF.
In ALARMS OFF the instrument does not react to temperature extremes with an alarm.
In ALARMS ON a HI or LO temperature alarm remains until manually reset.

To set the alarm mode:



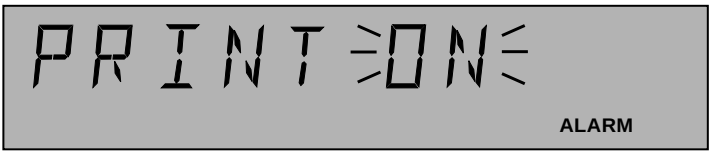
1. Push MENU until ALARMS is displayed or push MENU at least once then push ALARM.
   ALARM **1a** is displayed and the current setting **1b** ALARMS OFF, or ALARMS ON flashes.
2. Push Up/Down arrow keys to switch mode.

3a. Push EXIT to save the setting and return to scanning, or

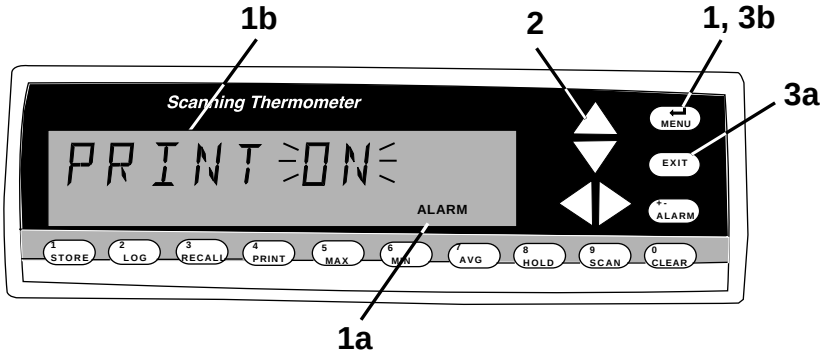
3b. Push MENU to switch to the next setup topic (set alarm print).

How to set HI alarm(s)
The alarm mode must be ALARMS ON. If the alarm mode is ALARMS

Front panel displays and controls continued
How to set the alarm print



How to set the alarm print
Alarm print can be PRINT ON or PRINT OFF.
The default setting is PRINT ON.
When set to PRINT ON a record is printed on your attached printer when an alarm event occurs.

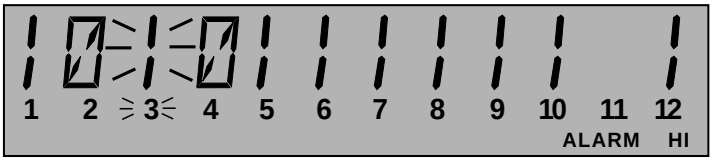


To set the alarm print:

1. Push MENU until ALARM **1a** and PRINT **1b** are displayed and the current setting **1b** (ON or OFF) flashes.
2. Push the Up/Down arrow keys to toggle between ON and OFF.

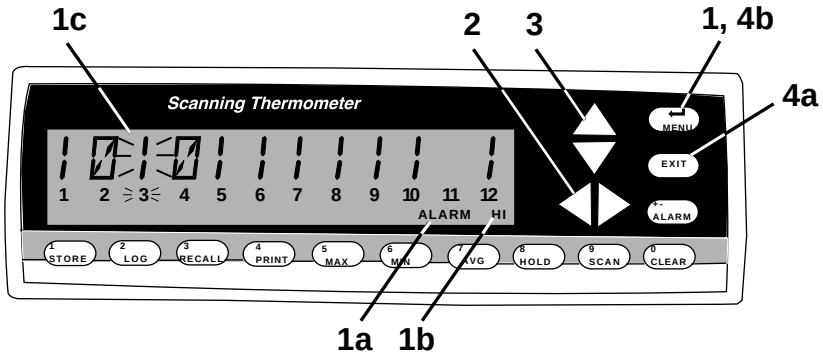
3a. Push EXIT to save the setting and return to scanning, or

3b. Push MENU to switch to the next topic (set HI alarm(s), if the alarm mode is ALARMS OFF the next setup topic is Enable/Disable the alarm beeper).



OFF this setting is skipped in the MENU.
The default settings are all 0's (HI alarm off).

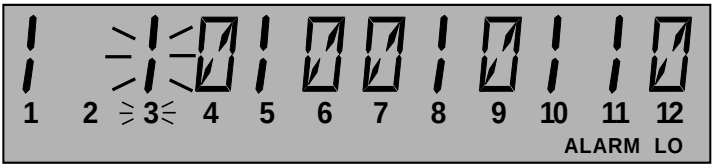
To set HI alarm(s):



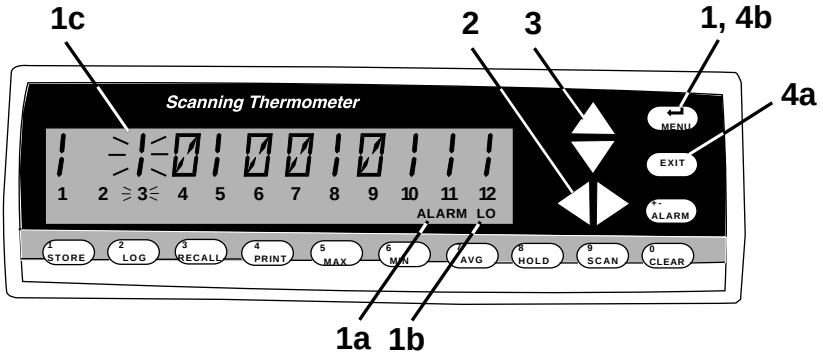
1. Push MENU until ALARM **1a** and HI **1b** are displayed and the current channel settings are indicated by 0's – HI alarm off, 1's – HI alarm on, or blank if that channel is disabled.
   The currently selected channel is flashing **1c**.
2. Push Left/Right arrow keys to select the channel.
3. Push Up/Down arrow keys to switch between 0 and 1.
   Repeat steps 2 and 3 for all HI alarms you wish to change.

4a. Push EXIT to save the settings and return to scanning, or
4b. Push MENU to switch to the next setup topic (set LO alarm(s)).

Front panel displays and controls continued
How to set LO alarm(s)



How to set LO alarm(s)
The alarm mode must be ALARMS ON. If the alarm mode is ALARMS OFF this setting is skipped in the MENU.
The default settings are all 0's (LO alarm off).



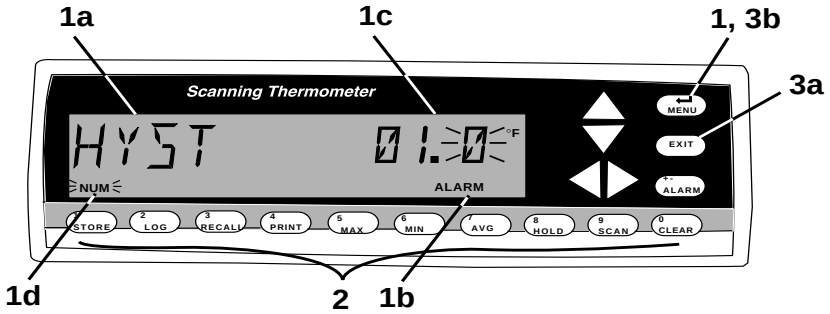
To set LO alarm(s):

1. Push MENU until ALARM **1a** and LO **1b** are displayed and the current channel settings are indicated by 0's – LO alarm off, 1's – LO alarm on, or blank if that channel is disabled.
   The currently selected channel is flashing **1c**.
2. Push Left/Right arrow keys to select the channel.
3. Push Up/Down arrow keys to switch between 0 and 1.
   Repeat steps 2 and 3 for all LO alarms you wish to change.

4a. Push EXIT to save the settings and return to scanning, or
4b. Push MENU to switch to the next setup topic (set hysteresis).

How to set alarm hysteresis
The alarm mode must be ALARMS ON. If the alarm mode is ALARMS OFF this setting is skipped in the MENU.
Note: Defaults /settings are described in °F, the actual scale used is the scale that was previously selected.
The default setting is 1.0°F.
Hysteresis can be any value from 0.0°F to 99.9°F.
Hysteresis is the ± temperature range before an alarm is out of range.

For example, if a HI alarm is set at 100° and hysteresis is set at 1°, that channel's temperature exceeds 100°, and alarms are set to ON, the alarm will come on. The alarm will be automatically reset when the channel's temperature goes below 99°. If hysteresis was set at 5° the alarm would be automatically reset when the channel's temperature goes below 95°.

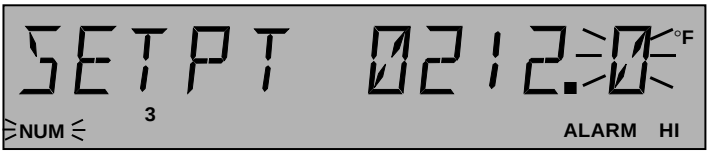


To set alarm hysteresis:

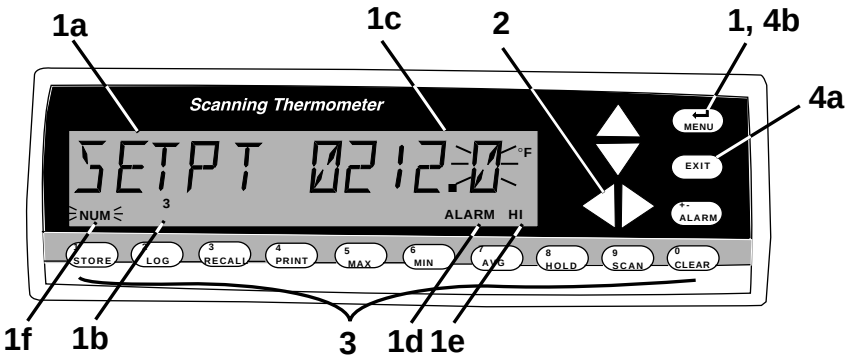
1. Push MENU until HYST **1a**, ALARM **1b** and current hysteresis value **1c** (flashing) are displayed.
   NUM **1d** appears and flashes indicating number keys are active.
2. Push number keys to set hysteresis.
   (For example, 02.3 is entered by pushing 0 - 2 - 3.)

3a. Push EXIT to save the setting and return to scanning, or
3b. Push MENU to switch to the next setup topic (adjust HI alarm setpoints).

Front panel displays and controls continued
How to adjust HI alarm setpoints



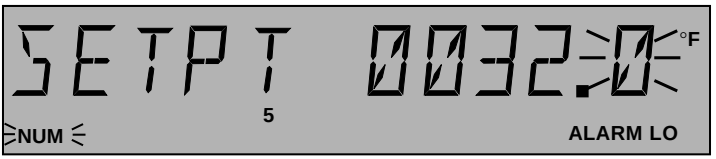
How to adjust HI alarm setpoints
The alarm mode must be ALARMS ON. If the alarm mode is ALARMS OFF this setting is skipped in the MENU.
Only channels whose HI alarms are set to 1 (on) can have their setpoints changed.



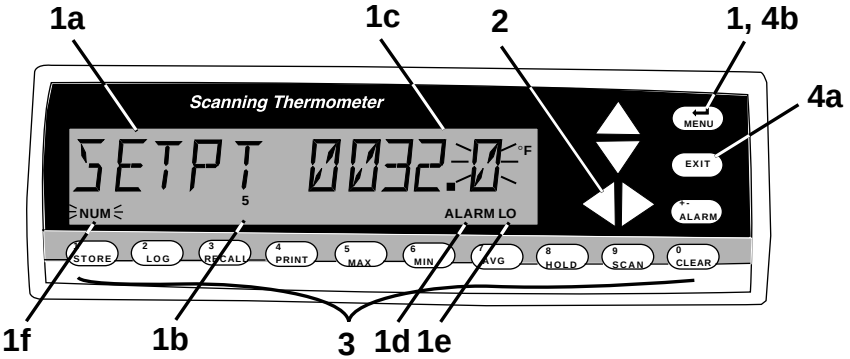
To adjust a HI alarm setpoint:

1. Push MENU until SETPT **1a**, the channel number **1b**, the setpoint value **1c,** ALARM **1d**, and HI **1e** are displayed. NUM **1f** appears and flashes indicating number keys **3** are active.
2. Push Left/Right arrow keys to select channel(s).
3. Push number keys to set the HI alarm temperature. (For example, 156.8 is entered by pushing 1 - 5 - 6 - 8.) Repeat steps 2 and 3 for all HI alarm set points you wish to adjust.

4a. Push EXIT to save the setting and return to scanning, or
4b. Push MENU to switch to the next setup topic (adjust LO alarm setpoints).



How to adjust LO alarm setpoints
The alarm mode must be ALARMS ON. If the alarm mode is ALARMS OFF this setting is skipped in the MENU.
Only channels whose LO alarms are set to 1 (on) can have their setpoints changed.

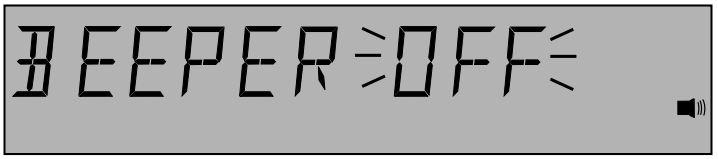


To adjust a LO alarm setpoint:

1. Push MENU until SETPT **1a**, the channel number **1b**, the setpoint value **1c,** ALARM **1d**, and LO **1e** are displayed. NUM **1f** appears and flashes indicating number keys **3** are active.
2. Push Left/Right arrow keys to select channel(s).
3. Push number keys to set the LO alarm temperature. (For example, -0.8 is entered by pushing 0 - 8 - 0 ±.) Repeat steps 2 and 3 for all LO alarm setpoints you wish to adjust.

4a. Push EXIT to save the setting and return to scanning, or
4b. Push MENU to switch to the next setup topic (Enable/Disable the alarm beeper).

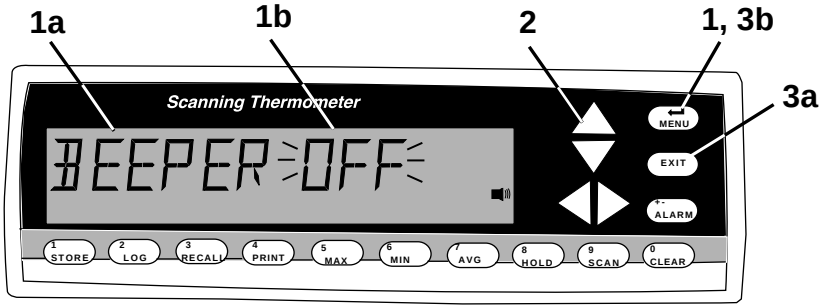
Front panel displays and controls continued
How to Enable/Disable the alarm beeper



How to Enable/Disable the alarm beeper
Beeper on allows audible warning of alarm condition. Beeper off prevents audible warning. In either case, the icon will flash.
This turns the audible beeper on or off. When off and an alarm occurs, only the flashing alarm icon is displayed.

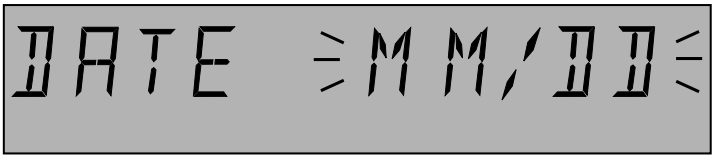
The following will cause an alarm:

- Channel temperature higher than a HI alarm setpoint.
- Channel temperature lower than a LO alarm setpoint.
- Open thermocouple.
- Disconnected thermocouple (= open thermocouple).
- Log full.
- Hardware errors (error message will appear).

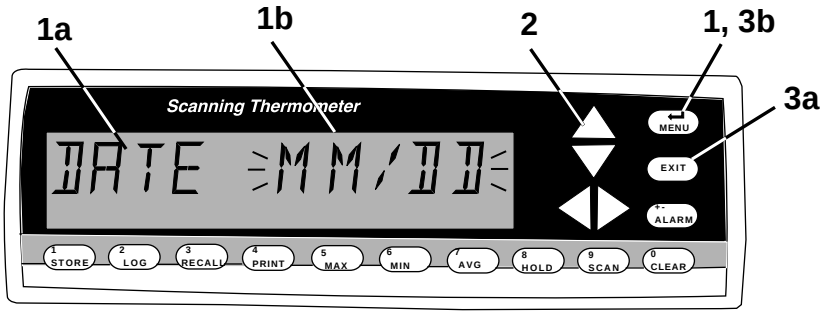


To Enable/Disable the alarm beeper:

1. Push and release MENU until BEEPER **1a**, and ON or OFF **1b**, are displayed with ON or OFF flashing.
2. Push the Up/Down arrow keys to switch between ON and OFF.
3a. Push EXIT to save the setting and return to scanning, or
3b. Push MENU to switch to the next setup topic (set date format).



How to set the date format
The date can be displayed MM/DD or DD/MM.

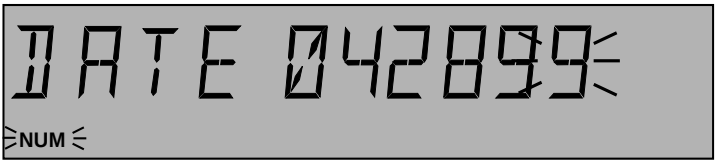


To set the date format:

1. Push MENU until the word DATE **1a** is displayed and the current setting **1b** flashes.
2. Push the Up or Down arrow keys to toggle between MM/DD and DD/MM.

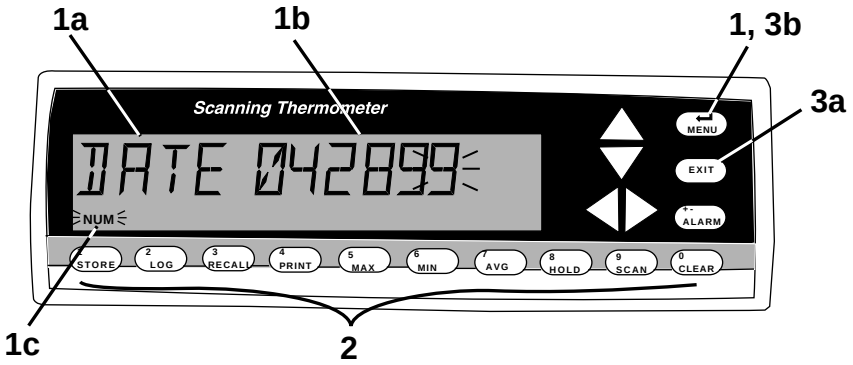
3a. Push EXIT to save the setting and return to scanning, or
3b. Push MENU to switch to the next setup topic (set the date).

Front panel displays and controls continued
How to set the date



How to set the date
The date can be displayed MM/DD/YY or DD/MM/YY. Check the date format (previous page) before setting the date.

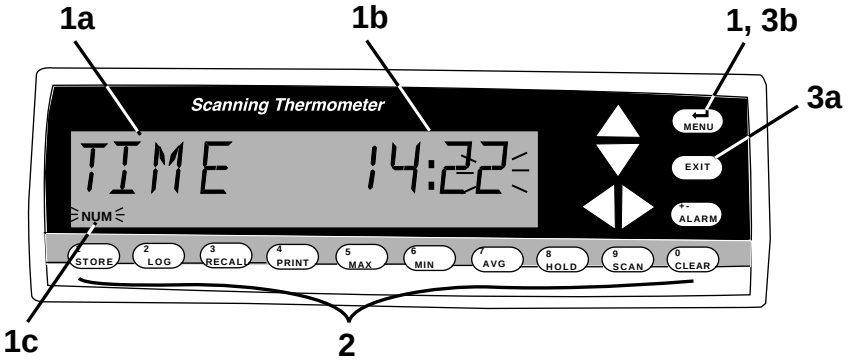
The internal calendar is ‘smart’. It automatically adjusts for months with 28, 30 and 31 days, and even compensates for leap year.



To set the date:

1. Push MENU until the word DATE **1a** is displayed and the current setting **1b** flashes.
NUM **1c** is flashing to indicate that number keys **2** are active.
2. Use number keys to enter the correct date.
(To enter 04-28-99 push 0 - 4 - 2 - 8 - 9 - 9.)
3a. Push EXIT to save the setting and return to scanning, or
3b. Push MENU to switch to the next setup topic (set the time).

How to set the time
The time must be set as 24-hour time. For times after 12:59 p.m. add 12 to the hours. Thus, 2:22 p.m. is 14:22, and 5:00 p.m. is 17:00.



To set the time:

1. Push MENU until TIME **1a** is displayed and the current setting **1b** flashes.
   NUM **1c** is flashing to indicate that number keys **2** are active.
2. Use number keys to enter the correct time.
   (To enter 18:21 push 1 - 8 - 2 - 1.)

3a. Push EXIT to save the setting and return to scanning, or
3b. Push MENU to switch to the next setup topic (field calibration).

How to do a field calibration

Factory calibration is stored in protected, non-volatile memory. Field calibration is usually used to reduce probe errors over a specified range. All field calibration values may be cleared (returning the instrument to factory calibration) by pushing and holding CLEAR during the power up display test.

An individual channel's field calibration may be cleared. When CALPT1 is displayed, press and hold CLEAR until CALPT1 CLR is displayed. This also clears CALPT2 for this same channel. The CAL icon will also go off for this channel.

There are no restrictions on what values may be entered for field calibration.

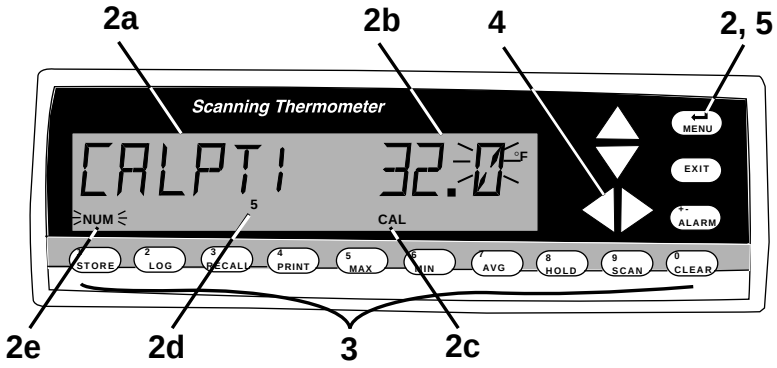
Two calibration points may be entered for each channel. After CALPT1 is entered the prompt for CALPT2 appears.

If only CALPT1 is entered the offset is affected.

If both CALPT1 and CALPT2 are entered, both slope and offset are affected.

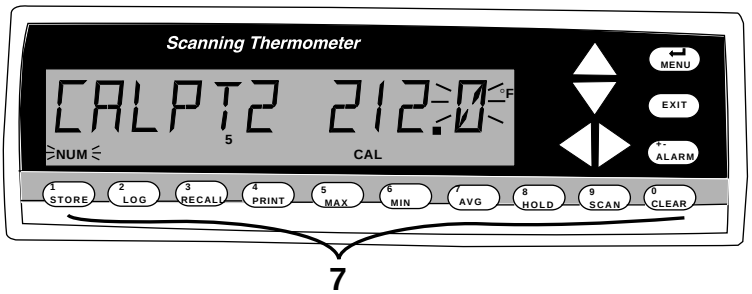
(See calibrating to the freezing/boiling points of water on page 53, for an example.)

(continued on next page)



To do a field calibration continued:

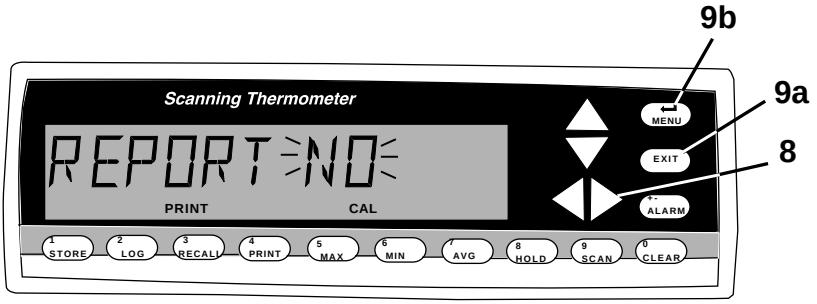
1. Place the probe(s) at the desired temperature.
2. Push and release MENU until the display reads CALPT1, **2a**.
   The entry point **2b** flashes.
   CAL **2c** is displayed. The channel number **2d** is displayed.
   NUM **2e** appears and flashes indicating number keys **3** are active.
3. Push number keys to enter the temperature of the first calibration point. (For example, 32.0 is entered by pushing 3 - 2 - 0.)
4. Use Left/Right keys to select next channel. Do all CALPT1's first.
5. Push MENU to switch to CALPT2.
   CALPT 2 is skipped if no changes are made in CALPT1.



6. Place the probe(s) at the desired temperature.
7. Push and release number keys **7** to enter the temperature of the second calibration point. (For example, 212.0 is entered by pushing 2 - 1 - 2 - 0.)

(continued on next page)

Front panel displays and controls continued
How to do a field calibration continued



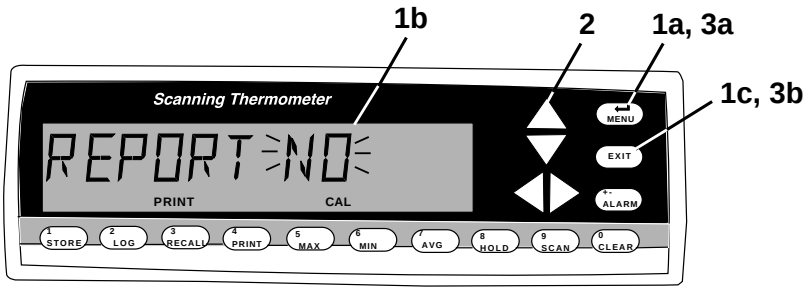
To do a field calibration continued:

8. Push Left or Right arrow keys to switch channels and enter their CALPT2, or if desired,

9a. Push EXIT to save the setting and return to scanning, or

9b. Push MENU to switch to the next setup topic (cal report).

Note: This is only valid if an optional parallel printer is attached to the DB-25 (M) input connection. Alternately, this report may be obtained through "ScanLink".



To print a calibration report:

1. If MENU **1a** is pushed the display REPORT NO with NO **1b** flashing appears. Push MENU **1a** or EXIT **1c** to skip printing a calibration report, or
2. Push either of the Up or Down arrow keys **2** to choose to print a calibration report.
3. Push MENU **3a** or EXIT **3b** to save the setup (all setup changes since MENU was first pushed), print the calibration report (if YES was chosen) and return to scanning.

Example field calibration report °C:
Note: Service field calibration can only be performed by an authorized service facility. Contact your authorized dealer for information.

```
Service calibration performed on 04/09/98 at 13:28:47

Field calibration status as of 04/09/98 14:11:50, scale  = C

Ch   CalPt.1   Change  CalPt.2   Change     Date      Time
     -------   ------  -------   ------   --------  --------
 1      None      0.0     None      0.0   04/09/98  14:01:45
 2     -16.7      0.0    482.3      0.0   04/09/98  13:58:51
 3     -16.1      0.0    482.4      0.4   04/09/98  13:58:51

 4     -15.5      0.1    482.5      0.2   04/09/98  13:58:51
 5     -15.0      0.1    482.5      0.2   04/09/98  13:58:51
 6     -14.4      0.1    482.6      0.4   04/09/98  13:58:51

 7     -13.9      0.1    482.6      0.3   04/09/98  13:58:51
 8     -13.3     -0.1    482.7      0.6   04/09/98  13:58:51
 9     -12.8      0.0    482.7      0.5   04/09/98  13:58:51

10     -12.2      0.0    482.8      0.5   04/09/98  13:58:51
11     -11.7      0.0    482.8      0.6   04/09/98  13:58:51
12     -11.1      0.0    482.9      0.7   04/09/98  13:58:51
```

To print a calibration report continued:
Example field calibration report °F:

Service calibration performed on 04/09/98 at 13:28:47

Field calibration status as of 04/09/98 14:12:41, scale = F

Ch	CalPt.1	Change	CalPt.2	Change	Date	Time
1	None	0.0	None	0.0	04/09/98	14:01:45
2	2.0	0.0	900.2	0.1	04/09/98	13:58:51
3	3.0	0.0	900.3	0.7	04/09/98	13:58:51
4	4.0	0.2	900.4	0.4	04/09/98	13:58:51
5	5.0	0.1	900.5	0.4	04/09/98	13:58:51
6	6.0	0.1	900.6	0.6	04/09/98	13:58:51
7	7.0	0.1	900.7	0.6	04/09/98	13:58:51
8	8.0	-0.2	900.8	1.0	04/09/98	13:58:51
9	9.0	0.0	900.9	1.0	04/09/98	13:58:51
10	10.0	0.0	901.0	0.9	04/09/98	13:58:51
11	11.0	0.0	901.1	1.1	04/09/98	13:58:51
12	12.0	0.0	901.2	1.2	04/09/98	13:58:51

How to calibrate to water

Ice Point
Calibrate CALPT1 to the freezing point of water (0°C or 32°F) by using crushed ice made of distilled water. Immerse the probe in a flask (insulated) filled with crushed ice and topped off with distilled water. Add crushed ice to keep the flask full of crushed ice and water during calibration.

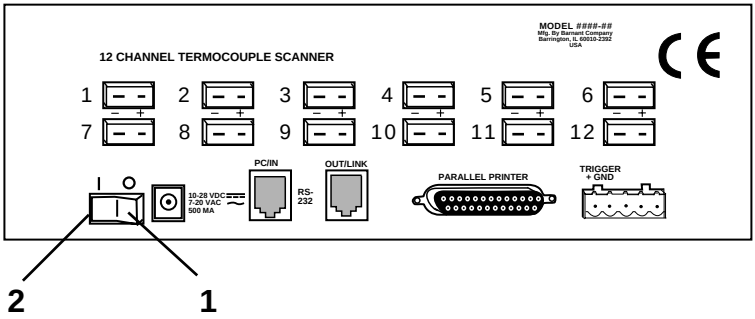
Boiling Point
Calibrate CALPT2 to the boiling point of water (100°C or 212°F) by using distilled water and correcting for altitude and barometric pressure. As a rule of thumb the boiling point of water decreases 1°C or 1.8°F for every 1000 feet above sea level. Correction for barometric pressure is usually required only in the case of severe high or low pressure weather conditions.

Note: This method is less accurate than using a dry block calibrator or a thermocouple calibration furnace. Boiling point calibration is only recommended when this equipment is not available and two point calibration is required.

Power up modes

Power up modes are special ways to clear memory or defaults during power up.

To activate a power up mode:



1. Turn off the power using the power switch on the back of the instrument (O).

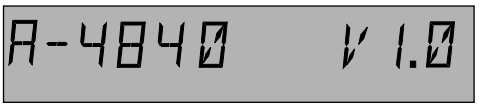
2. Turn power back on (I) and before the instrument completes the display check,

2a. (before the small 12 turns off).

Push and hold: **CLEAR & MENU** to clear a service calibration and revert to factory calibration, or

Push and hold: **MIN & MAX** to restore factory MENU defaults, or

Push and hold: **MENU** to display the firmware version.



Push EXIT or CLEAR to switch to the scanning display.

Care and Cleaning
Clean the case by using a mild detergent. Avoid immersion and excess liquid.

Maintenance
Battery

Battery
A lithium battery retains the date and time when power is off or the instrument is disconnected from its power source.

At room temperature and with a new battery, memory will be retained for over a year.

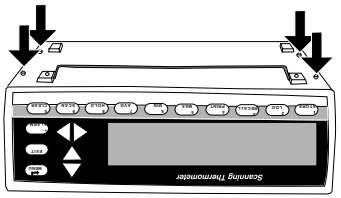
A BAD BATTERY error message is displayed if the battery voltage is low and the battery needs replacement.

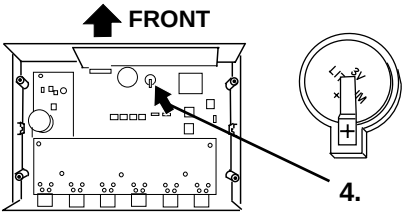
Battery: Lithium button battery RAYOVAC® or PANASONIC® type BR1225, only.

To replace the battery:

WARNING: Turn power off and completely disconnect instrument. Disconnect power source, thermocouples, computer, links, and printer.

2.





1. Use anti-static discharge procedures as in computer repair.
2. Remove four screws from bottom of unit.
3. Turn instrument right side up and lift top cover off.
4. Remove the battery by slipping it forward from under its contact clip.
5. Replace the battery.
6. Replace the top cover.
7. Turn instrument upside down and replace the screws.

WARRANTY

The Manufacturer warrants this product to be free from significant deviations from published specifications. If repair or adjustment is necessary within the warranty period, the problem will be corrected at no charge if it is not due to misuse or abuse on your part, as determined by the Manufacturer. Repair costs outside the warranty period, or those resulting from product misuse or abuse, may be invoiced to you.
The warranty period for this product is noted on the Warranty Card.

PRODUCT RETURN

To limit charges and delays, contact the seller or Manufacturer for authorization and shipping instructions before returning the product, either within or outside of the warranty period. When returning the product, please state the reason for the return. For your protection, pack the product carefully and insure it against possible damage or loss. Any damages resulting from improper packaging are your responsibility.

TECHNICAL ASSISTANCE

If you have any questions about the use of this product, contact the Manufacturer or authorized dealer.

We reserve the right to make improvements in design, construction and appearance of our products without notice.

Specifications

Operating Temperature
(for stated accuracy) ..... 18°C to 28°C (64°F to 82°F)

Operating Temperature
(useful range) ..... 0°C to 40°C (32°F to 104°F)
Storage temperature ..... –40°C to 60°C (–40°F to 110°F)

Humidity (non-condensing) ..... 10 to 90%
Altitude ..... Less than 2000 m

Accuracy
Thermocouple types E,J,K,N,T
>–150°C ..... ±(0.1% of reading ±0.5°C)
±(0.1% of reading ±0.8°F)
<–150°C ..... ±(0.25% of reading ±1°C)
±(0.25% of reading ±2°F)
Thermocouple types B,R,S ..... ±(0.1% of reading ±2°C)
±(0.1% of reading ±4°F)

Resolution ..... 0.1° or 1°
(1° above 999.9°)
(1° below –150°C, –238°F)

Scales ..... °C / °F / K / °R

Isolation
thermocouple to thermocouple ..... 250 VRMS
thermocouple to rear panel ..... 250 VRMS

Thermocouple connections ..... Two-blade female mini-ANSI

Display update rate ..... 3 seconds

Thermocouple read time ..... 4 seconds to 60 minutes

Print time ..... 4 seconds to 60 minutes

Battery ..... Lithium BR1225, RAYOVAC® or PANASONIC® only

Display ..... LCD
12 0.7 in variable characters
30 fixed word/icons

Alarm level ..... 50 dBa

Power source
Line voltage ..... 10–28V DC (non-polarized)
@ ~ 300 mA
9–20V AC 50–400 Hz
@ ~ 500 mA

(continued on next page)

Typical power usage	10–28V DC (non-polarized)
Enclosure	molded ABS case UL-94V0
chemical resistance	withstands standard cleaning solvents
Pollution Degree	Pollution Degree 2/ IEC664 (Indoor use—lab, office)
ingress rating	IP-32 per IEC 529
Printer	
connector	DB25 male
Trigger input	internal pull-up 5K ohms/5V DC contact closure to ground
PC IN	RJ-11, RS-232 19,200 baud, 7-bit odd parity
OUT LINK	RJ-11, RS-232 19,200 baud, 7-bit odd parity
Dimensions	
L × W × H	8.5 × 10.4 × 3.6 in
weight	~ 3 lbs.
Compliance (For CE Mark):	EN61010-1/A2: 1995 (EU Low Voltage Directive) and EN61326-1/A1: 1998 (EMC Directive) Use of external agency-listed power converter reduces voltages to non-hazardous levels. Regulatory agency specifications, therefore, are not applicable to the balance of the unit.

Appendix A
Error messages

Error messages are listed in alphabetical order, followed by a brief description of the error condition, followed by what action the user can take to correct the error (if possible).

A/D TIMEOUT
Return for service if error persists.

BAD BATTERY
Low battery voltage. Affects the clock and calendar. Replace the lithium battery inside the instrument. See pg. 58.

BAD FLD CAL
Bad field calibration checksum. All field calibration values are erased. Repeat field calibration if needed.

BAD SRVC CAL
Bad service calibration checksum. Usually requires service or repair to correct. Until then defaults to last factory calibration.

CHKSUM ERROR
Bad program checksum. Usually requires service or repair to correct.

CONFIG ERR
Power down to clear error. Return for service if error persists.

ERASE ERROR
Internal memory error. Usually requires service or repair to correct.

NO CAL
Bad factory calibration checksum. This information is stored in the microprocessor's EEPROM and has been partially erased. Pressing the "ALARM" button will clear the error message and allow the unit to function ***without calibration****: The unit will not meet published accuracy, but it will operate.*

OPEN
The channel is detecting a missing or open (defective) probe.

OVER
The channel is detecting a temperature that is above the maximum for the selected thermocouple type.

SETUP ERROR
MENU setup items are invalid. Factory defaults are used. Repeat MENU setup if needed.

UNDER
The channel is detecting a temperature that is below the minimum for the selected thermocouple type.

VERIFY ERROR
Internal memory error. Usually requires service or repair to correct.

WRITE ERROR
Internal memory error. Usually requires service or repair to correct.

Appendix B Guidelines to Thermocouple Selection

Type E

Temperature range	-250°C to 871°C
Environmental tolerance	oxidizing, inert atmospheres.
Color	violet, + lead violet, - lead red

Type J

Temperature range	0°C to 760°C
Environmental tolerance	vacuum, oxidizing, reducing or inert atmospheres.
Color	black, + lead white, - lead red

Type K

Temperature range	-250°C to 1260°C
Environmental tolerance	continuous use in oxidizing or inert atmospheres.
Color	yellow, + lead yellow, - lead red

Type N

Temperature range	0°C to 1250°C
Environmental tolerance	continuous use in oxidizing or inert atmospheres.
Color	orange, + lead orange, - lead red

Type T

Temperature range	-184°C to 371°C
Environmental tolerance	vacuum, oxidizing reducing or inert atmospheres.
Color	blue, + lead blue, - lead red

Type B

Temperature range	870°C to 1700°C
Environmental tolerance	oxidizing or inert atmospheres.
Color	grey, + lead grey, - lead red

Type R

Temperature range	0°C to 1480°C
Environmental tolerance	oxidizing or inert atmospheres.
Color	green, + lead black, - lead red

Type S

Temperature range	0°C to 1480°C
Environmental tolerance	oxidizing or inert atmospheres.
Color	green, + lead black, - lead red

Appendix C Temperature Conversion

Fahrenheit - Centigrade

One Fahrenheit degree is 5/9 of a Centigrade degree so the following formulas apply:

°F = (9/5)°C + 32

°C = (°F - 32)(5/9)

Centigrade - Kelvin

K = °C - 273.18

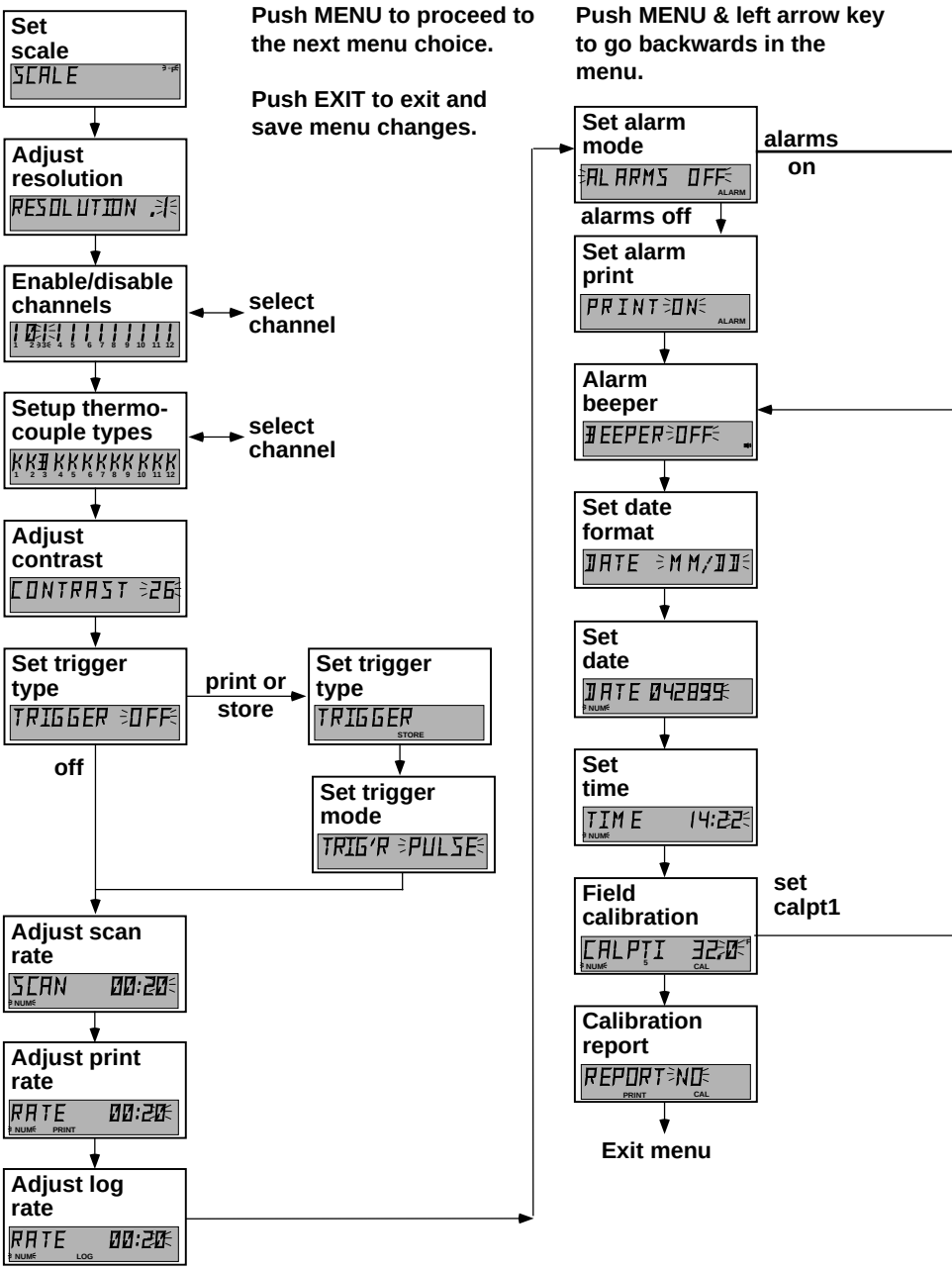
°C = K + 273.18

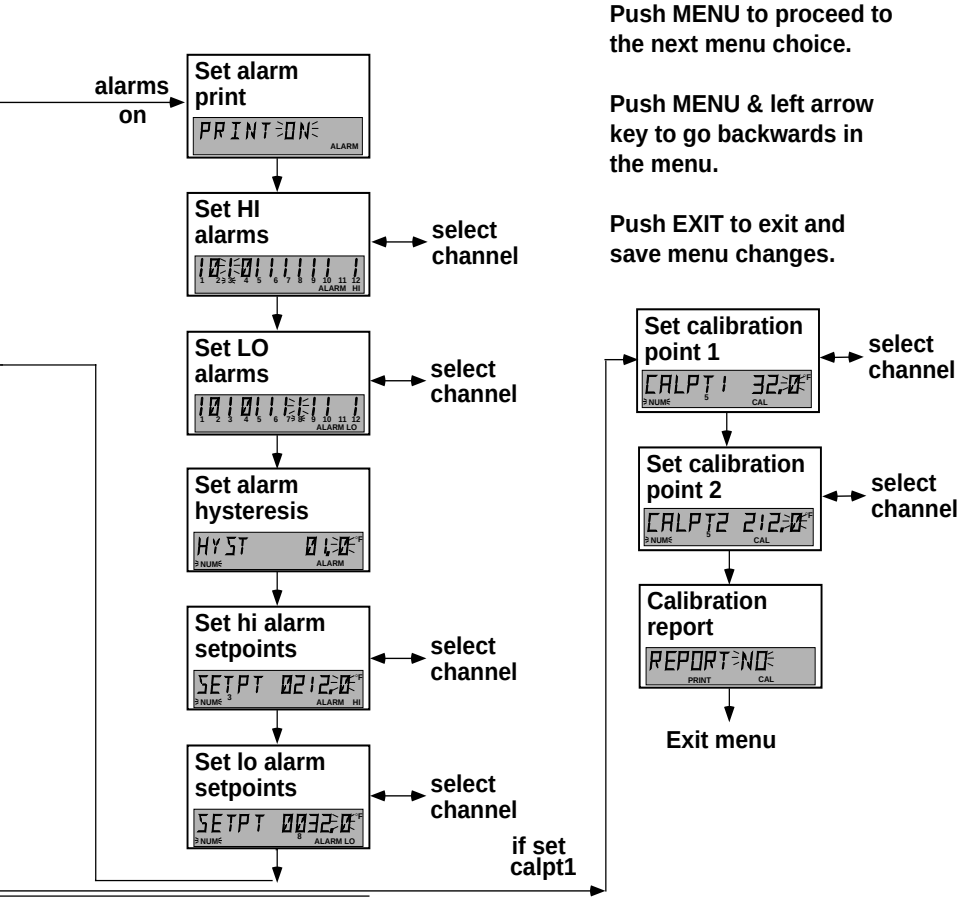
Fahrenheit - Rankin

°R = °F + 459.67

°F = °R - 459.67

Appendix D
Menu flow chart




Push MENU to proceed to the next menu choice.
Push MENU & left arrow key to go backwards in the menu.
Push EXIT to exit and save menu changes.
alarms on
Set alarm print
PRINT ON
ALARM
Set HI alarms
select channel
ALARM HI
Set LO alarms
select channel
ALARM LO
Set alarm hysteresis
HYST 01.0
NUM
ALARM
Set hi alarm setpoints
SETPT 0212.0
NUM
ALARM HI
Set lo alarm setpoints
SETPT 0032.0
NUM
ALARM LO
select channel
if set calpt1
Set calibration point 1
CALPT1 32.0
NUM
CAL
select channel
Set calibration point 2
CALPT2 212.0
NUM
CAL
select channel
Calibration report
REPORT NO
PRINT
CAL
Exit menu

Appendix E
Factory Default settings

A variety of parameters are user set-able using the MENU.
Your menu settings are retained in memory even when the instrument is turned off or disconnected from a power source.
When the unit is first turned on, the memory contains the factory default menu settings. To erase all the menu settings and reset the instrument to factory default menu settings:

1. Turn off the power using the power switch on the back of the instrument.
2. Turn power back on, and before the instrument completes the display check (before the small 12 turns off).
3. Push and hold MIN and MAX.

Menu function	**Setting**
Scale	°F
Resolution	0.1°
Scan channels	all on
Thermocouple types	K
Display contrast	25
Trigger mode	S/S
Trigger type	off
Scan rate	00:04
Print rate	00:20
Log rate	00:20
Alarm	
Alarm mode	off
Alarm print	on
HI alarm channel select	1 (on)
LO alarm channel select	1 (on)
Alarm hysteresis	1.0°F
HI alarm setpoint (on/off)	off
HI alarm setpoint	212.0°F
LO alarm setpoint (on/off)	off
LO alarm setpoint	32.0°F
Alarm beeper	off
Date format	mm/dd
Date	factory*
Time	factory*
*Date and time are set at factory, USA central time.	
Field Calibration	
CALPT 1	input**
CALPT 2	input**
**Instrument display shows current input reading.	
Calibration report	no