FLUKE
Calibration

1523, 1524

Thermometer Readout

Users Guide

PN 4427817
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1 Before You Start

1.1 Introduction

The Reference Thermometer Readouts (1523, 1524) are designed to be reliable, stable, temperature measuring instruments that can be used in the field or laboratory. They offer accuracy, portability, and speed for nearly every field calibration application. The instruments have been designed with the field user in mind and are easy to use while maintaining stability, uniformity, and accuracy comparable to some laboratory instruments. Your Fluke 1523 and 1524 thermometer readout is a handheld, battery operated instrument that measures temperature using Platinum resistance Thermometers (PRT), Thermistors, and Thermocouples (TC).

1.2 Standard Equipment

Unpack the instrument carefully and inspect it for any damage that may have occurred during shipment. If there is shipping damage, notify the carrier immediately.

Verify that the following components are present:

- 1523/1524 Reference Thermometer Readout with 3 AA batteries
- AC Adapter, with power cord
- RS-232 Cable
- User's Guide
- Documentation CD
- Report of Calibration and calibration label
- Clamp-on ferrite(s)

If all items are not present, contact an Authorized Service Center. (See Section 1.8, Authorized Service Centers on page 7.)

1.3 Safety Information

The Reference Thermometer is designed in accordance with EN 61010-1 {2nd Edition}, and CAN/CSA 22.2 No 61010.1-04. Use this instrument only as specified in this manual, otherwise the protection provided by the instrument may be impaired.

A **Warning** identifies conditions and actions that pose hazard(s) to the user; a **Caution** identifies conditions and actions that may damage the instrument being used.

International symbols used on the reference thermometer and in this manual are explained in Table 1 on page 4.

1.3.1 ⚠ Warning

To avoid possible electric shock or personal injury:

- Do not use the reference thermometer in environments other than those listed in the user's guide.
- Do not use the reference thermometer for any application other than that which is specified. The instrument was designed for temperature measurement and calibration. Any other use of the instrument may cause unknown hazards to the user.
- If the reference thermometer is used in a manner not in accordance with the equipment design, the operation and the protection provided by the instrument may be impaired. In addition, safety hazards may arise.
- Do not apply more than the rated voltage, as marked on the reference thermometer, between the inputs, or between any input and earth ground (30 V, 24 mA max all terminals).
- Follow all equipment safety procedures.
- Calibration equipment should only be used by trained personnel.
- The reference thermometer is intended for indoor use only.
- Before you use the instrument, inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors. Do not use the reference thermometer if it

appears damaged or operates abnormally. Protection may be impaired. When in doubt, have the instrument serviced.

- Always use an isolated RTD or PRT (metal sheath isolated from lead wires).
- Make sure the battery door is closed and latched before you operate the reference thermometer.
- Do not operate the reference thermometer around explosive gas, vapor, or dust.
- For battery operation use only 3 AA batteries, properly installed in the reference thermometer case.
- 1524 model, thermocouples can only be used on channel 1.

1.3.2 Cautions

To avoid possible damage to the reference thermometer or to equipment under test:

- Do not apply more than the rated voltage, as marked on the reference thermometer, between the inputs, or between any input and earth ground (30 V 24 mA max all terminals).
- Unless recalibrating the instrument DO NOT change the values of the calibration constants from the factory set values. The correct setting of these parameters is important to the safety and proper operation of the instrument.
- The instrument and any thermometer probes used with it are sensitive instruments that can be easily damaged. Always handle these devices with care. DO NOT allow them to be dropped, struck, stressed, or overheated.
- DO NOT operate this instrument in an excessively wet, oily, dusty, or dirty environment.
- Use the proper probes, function and range for your measurement.
- Ensure probe coefficients are downloaded.

Table 1 *International Symbols*

Symbol	Description	Symbol	Description
	AC (Alternating Current)		PE Ground
	AC-DC		Hot Surface (Burn Hazard)
	Battery		Read the User's Guide (Important Information)
	Complies with European Union directives		Off
	DC		On
	Double Insulated		Canadian Standards Association
	Electric Shock		C-TICK Australian EMC mark
	Fuse		The European Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) mark.

1.4 CE Comments

1.4.1 EMC Directive

Fluke's equipment has been tested to meet the European Electromagnetic Compatibility Directive (EMC Directive, 2004/108/EC). The Declaration of Conformity for your instrument lists the specific stan-dards to which the unit was tested.

The instrument was designed specifically as a test and measuring device. Compliance to the EMC direc-tive is through EN 61326-1:2006 Electrical equipment for measurement, control and laboratory use – EMC requirements

As noted in the EN 61326-1, the instrument can have varying configurations. The instrument was tested in a typical configuration with shielded RS-232 cables.

1.4.2 Immunity Testing

The instrument was tested to the requirements for laboratory locations.

1.5 Using Clamp-On Ferrites

Clamp-on ferrites are provided for use in improving the instrument's electromagnetic (EM) immunity in envi-ronments of excessive EM interference, like areas of heavy industrial equipment. We recommend placing the ferrites on the cables of probes attached to the instrument.

To attach a ferrite to a probe cable, make a loop in the cable near the connector and clamp the ferrite around half of the loop as shown in the diagram. The ferrite can be easily detached and moved to a new probe when needed. (See Figure 1 on next page.)

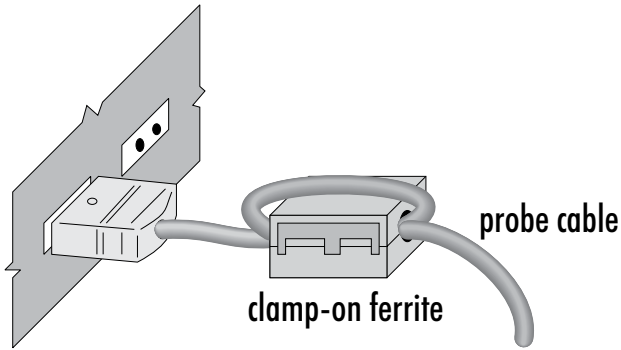

Figure 1 *Clamp-On Ferrite*

1.6 Emissions Testing

The instrument fulfills the limit requirements for Class B.

1.7 Low Voltage Directive (Safety)

In order to comply with the European Low Voltage Directive (2006/95/EC), Fluke equipment has been designed to meet the EN 61010-1.

2 Quick Start

2.1 Setup

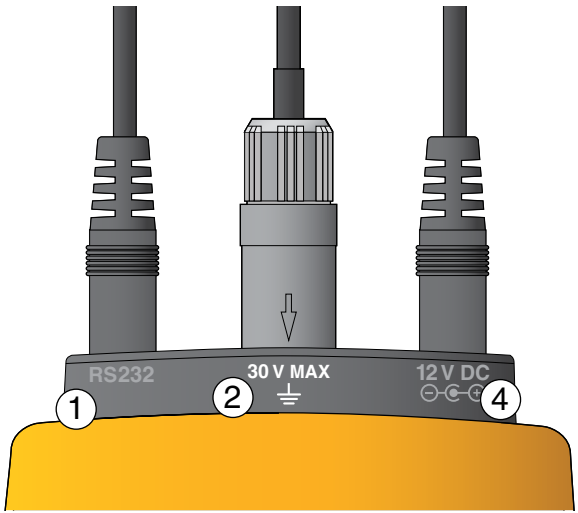

Figure 2 *Input/Output Connections - 1523*

Table 2 *1523 Input/Output Connections*

No.	Name	Description
1	Serial	Serial interface connector
2	Connector, T1	Sensor Connector, Channel 1
4	Power	External Power adapter connection

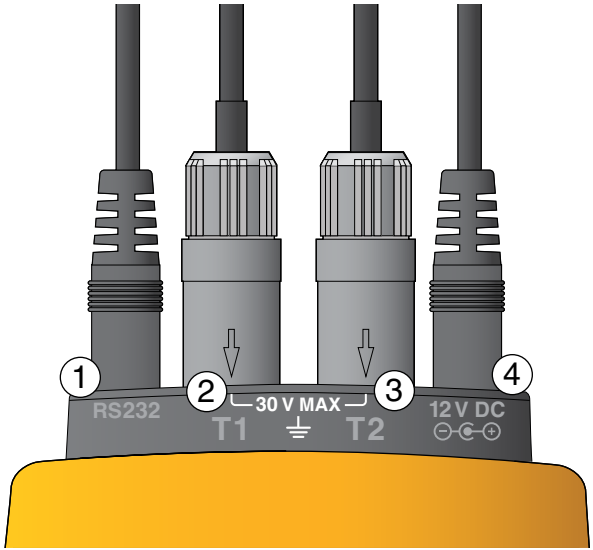

Figure 3 *Input/Output Connections - 1524*

Table 3 *1524 Input/Output Connections*

No	Name	Description
1	Serial	Serial interface connector
2	Connector, T1	Sensor Connector, Channel 1
3	Connector, T2	Sensor Connector, Channel 2
4	Power	External Power adapter connection

Figure 4 *Keys*

Table 4 *1523 Key Functions*

No	Key	Description
1		Power on or off
2		Yellow Second or Special Function Key
3		Turns the backlight on or off
4		1st Press: MAX, 2nd Press: MIn, 3rd Press: AVE, 4th Press: STD DEV
5		Units, °C/°F
6		1st press - Holds value on screen "-- HOLD --" across bottom of screen. 2nd press - Releases Screen hold.
7		Enters setup menu, see menu structure
8		Saves measurement as a logged data point
9		Arrows increment or decrement selections in an active field. In Graph Mode, Arrows change the scale of the graph.
10		Selects highlighted selection, Saves a new selection.

No	Key	Description
11		1st Press - Enters Recall menu, 2nd Press - Exits Recall Menu
12		Moves down to next option on screen.
13		“RESET” - Resets Stats Data
14		“Ω mV” - Toggles from °C to Ω or Ω to °C (PRT, thermistor), °C to mV or mV to °C (TC)
15		“TREND” - Starts Graphing data
16		“HOME” Returns user to main screen

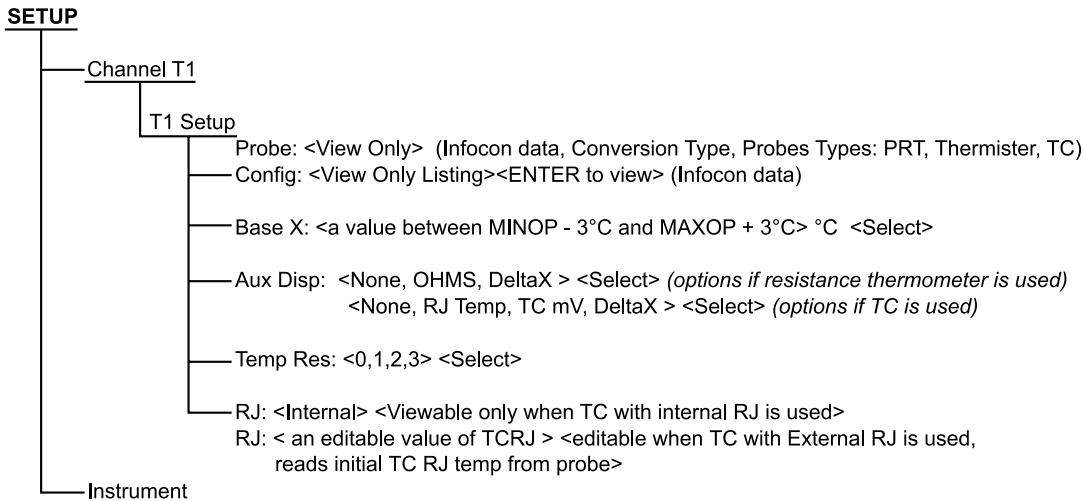

Figure 5 *1523 Menu*

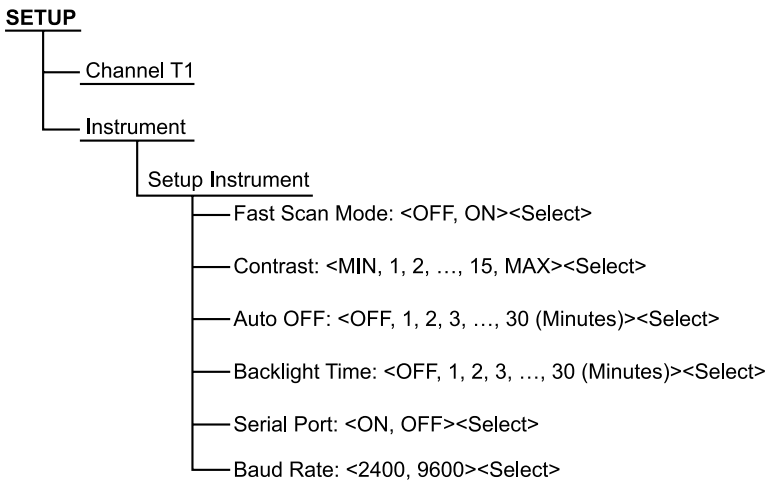

Figure 6 *1523 Menu (cont)*

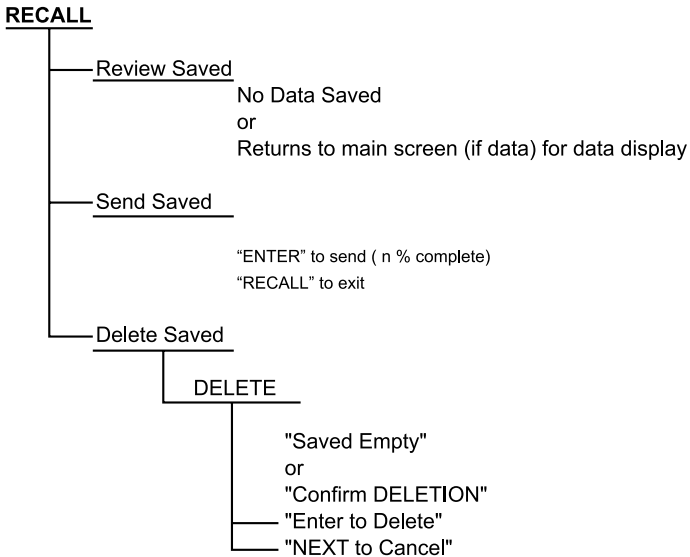

Figure 7 *1523 Menu (cont)*

Table 5 *1524 Key Functions*

No	Key	Description
1		Power on or off
2		Yellow Second or Special Function Key
3		Turns the backlight on or off
4		1st Press: Max, 2nd Press: Min, 3rd Press: Ave, 4th Press: STD DEV
5		Units, °C/°F
6		1st press - Holds value on screen "-- HOLD --" across bottom of screen. 2nd press - Releases Screen hold.
7		Enters setup menu, see menu structure
8		Saves measurement as a logged data point
9		Arrows increment or decrement selections in an active field. In Graph Mode, Arrows change the scale of the graph.

No	Key	Description
10		Selects highlighted selection, Saves a new selection.
11		1st press - Enters Recall Menu, 2nd press - Exits Recall Menu
12		Moves down to next option on screen.
13		“RESET” - Resets Stats Data
14		“Ω mV” - Toggles from °C to Ω or Ω to °C (PRT, thermistor), °C to mV or mV to °C (TC)
15		“TREND” - Starts Graphing data
16		“LOG” - Log a series of measurements, see Auto Log in menu structure
17		“HOME” Returns user to main screen

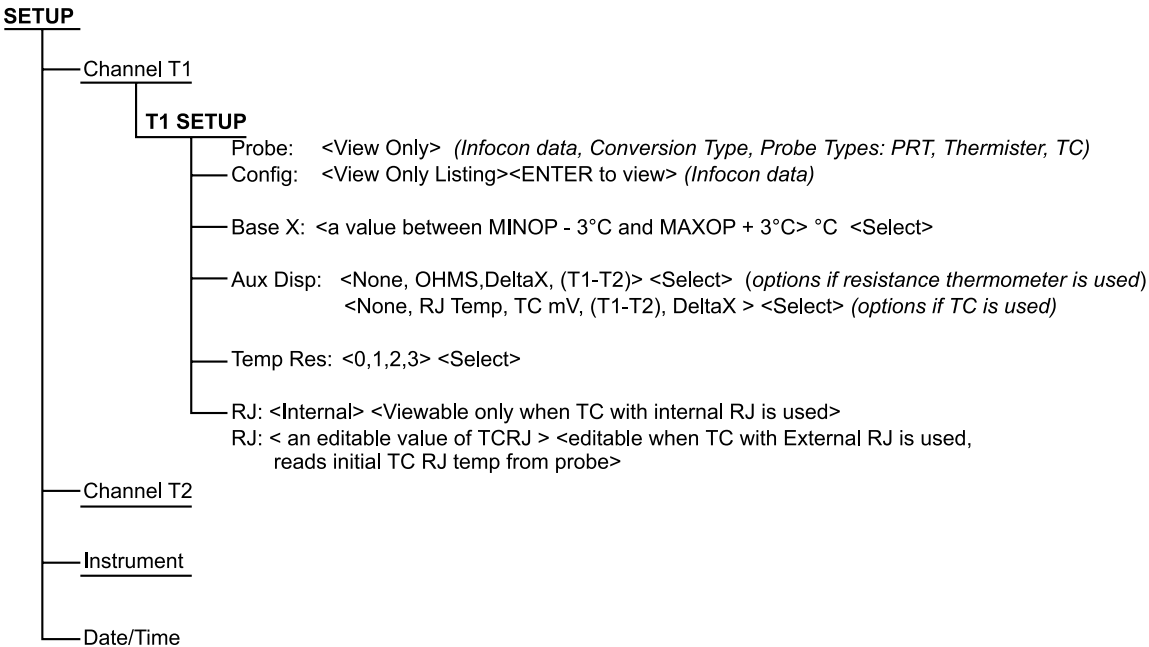

Figure 8 *1524 Menu*

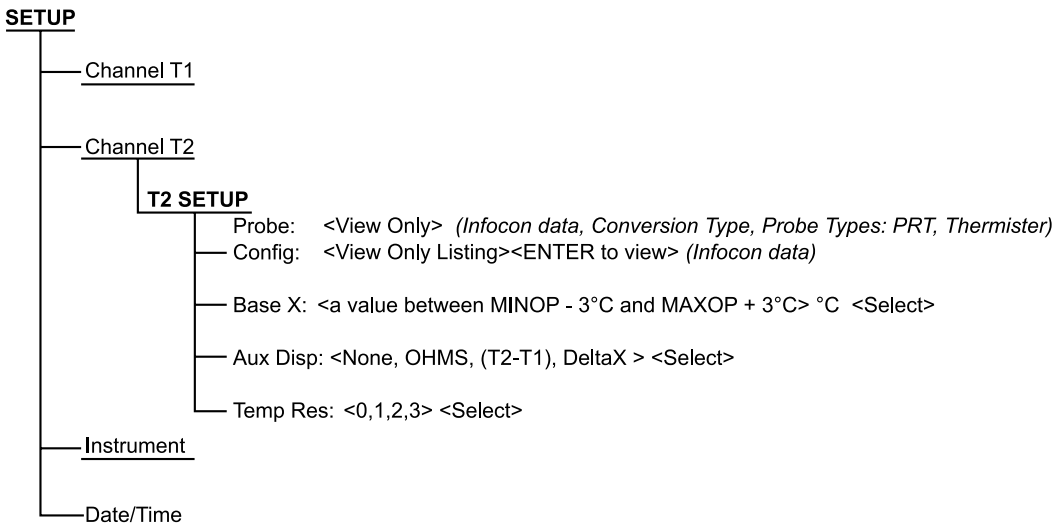

Figure 9 *1524 Menu (cont)*

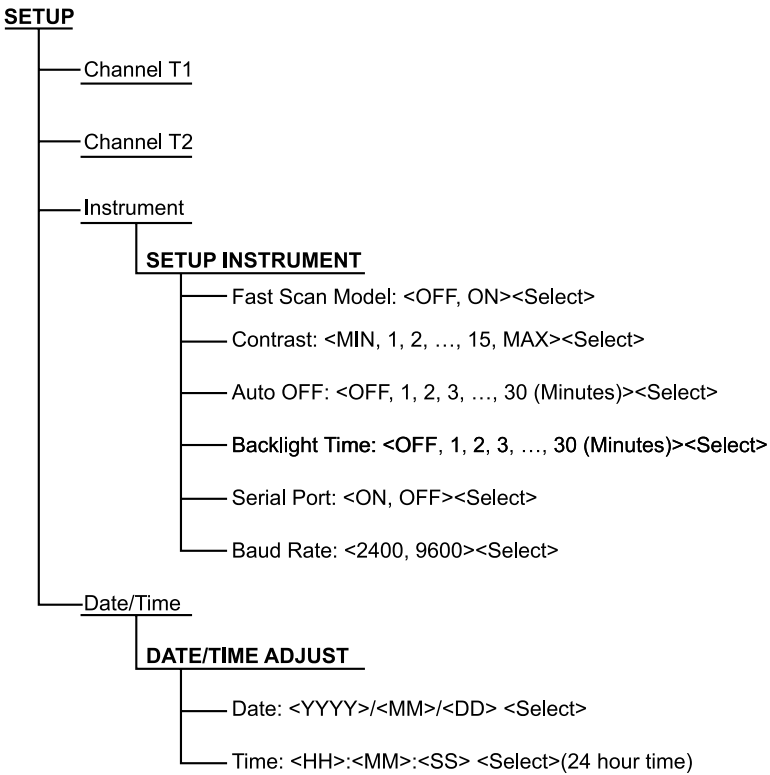

Figure 10 *1524 Menu (cont)*

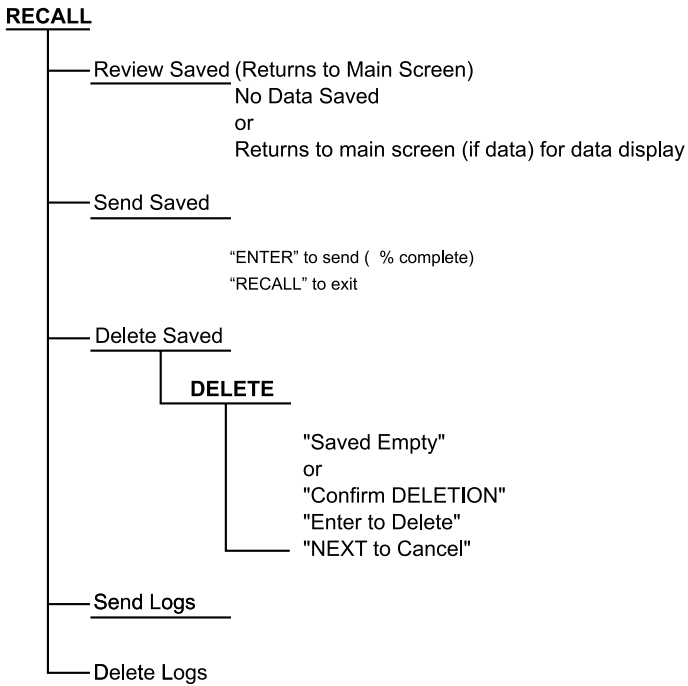

Figure 11 *1524 Menu (cont)*

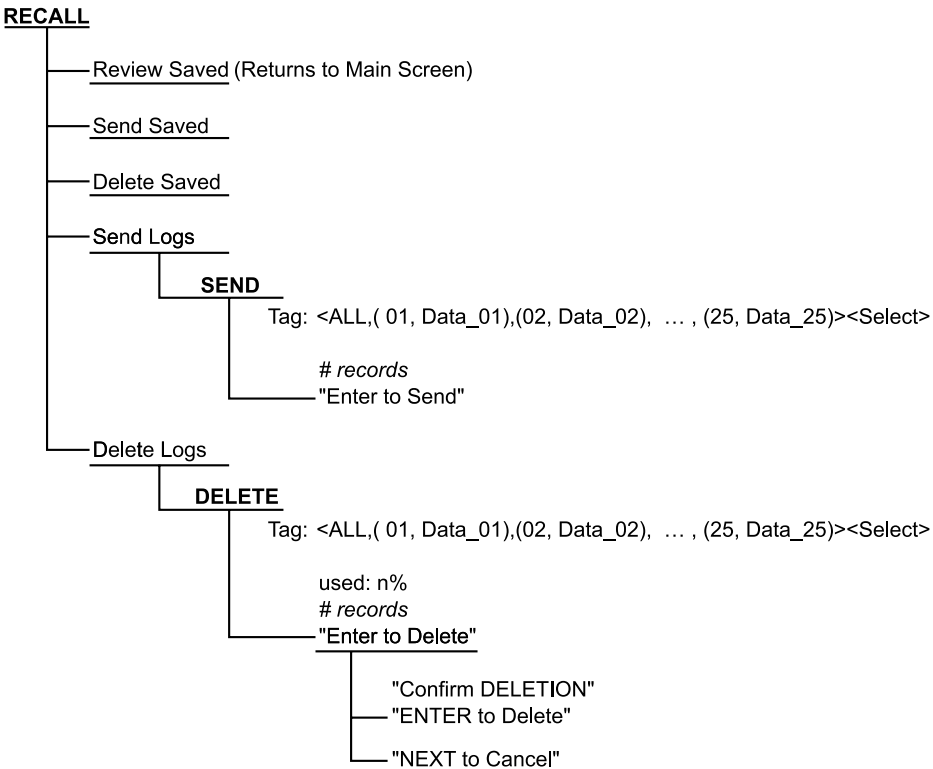

Figure 12 *1524 Menu (cont)*

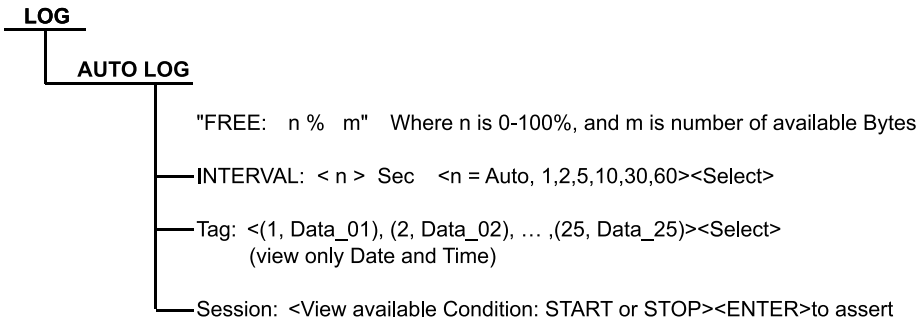

Figure 13 *1524 Menu (cont)*

2.2 Specifications

Specifications are based on a one year calibration cycle and apply from 13 °C to 33 °C unless stated otherwise. All specifications assume a five minute warm up period.

Table 6 *General Specifications*

Operating Temperature†	–10 °C to 60 °C
Storage Temperature	–20 °C to 70 °C
Operating altitude	10,000 meters above mean sea level
Relative Humidity (% RH operating without condensation)	0 % to 90 % (non condensing)
Vibration	Random, 2g, 5–500 Hz

Power requirements	3 AA alkaline batteries 12 V dc universal power supply
Size	96 x 200 x 47 mm (3.75 x 7.9 x 1.86 inches)
Weight	0.65 kg (1.4 lb)
Safety	EN 61010-1:2001, CAN/CSA C22.2 No. 61010.1-04
†Environmental conditions for all specifications: 13 °C to 33 °C	

Table 7 *Millivolt Measurement*

Range	**Resolution**	**Accuracy**
–10 mV to 75 mV	0.001 mV	± (0.005 % + 5 µV)
Temperature Coefficient (–10 °C to 13 °C, +33 °C to 60 °C):		
± (0.001 %/°C + 1 µV/°C)		

Table 8 *Ohms Measurement, RTDs*

Ohms Range	**Accuracy ± Ω 4 Wire**
0 Ω to 400 Ω	± (0.004 % + 0.002 Ω)
Temperature Coefficient (–10 °C to 13 °C, +33 °C to 60 °C):	
0.0008 %/°C + 0.0004 Ω	
Excitation Current: 1 mA	

Table 9 *Ohms Measurement, Thermistor*

Ohms Range	**Accuracy ± Ω, 4 Wire**
200 Ω to 50 kΩ	± (0.01 % + 0.5 Ω)
50 kΩ to 500 kΩ	± (0.03 %)
Temperature Coefficient (–10 °C to 13 °C , +33 °C to 60 °C):	
0.002 %/°C + 0.1 Ω (0 Ω to 50 kΩ)	
0.06 %/°C + 0.1 Ω (50 kΩ to 500 kΩ)	
Excitation Current:	10 μA (0 Ω to 50 kΩ) 2 μA (50 kΩ to 500 kΩ)

Equivalent temperature accuracies derived from primary specifications (Ω, mV)

Table 10 *Temperature, Thermocouples*

Type	Range	Measure Accuracies (ITS-90)
B	600 °C to 800 °C 800 °C to 1000 °C 1000 °C to 1800 °C	0.85 °C 0.68 °C 0.57 °C
C	100 °C to 550 °C 550 °C to 2300 °C	0.32 °C 0.71 °C
E	–200 °C to 0 °C 0 °C to 950 °C	0.52 °C 0.22 °C
J	–200 °C to 0 °C 0 °C to 1200 °C	0.52 °C 0.23 °C
K	–200 °C to 0 °C 0 °C to 1370 °C	0.61 °C 0.24 °C

Type	Range	Measure Accuracies (ITS-90)
L	–200 °C to 0 °C 0 °C to 900 °C	0.36 °C 0.23 °C
M	–20 °C to 0 °C 0 °C to 400 °C 400 °C to 1400 °C	0.26 °C 0.25 °C 0.22 °C
N	–200 °C to 0 °C 0 °C to 1300 °C	0.72 °C 0.28 °C
R	–20 °C to 0 °C 0 °C to 500 °C 500 °C to 1750 °C	1.09 °C 0.97 °C 0.49 °C
S	–20 °C to 0 °C 0 °C to 500 °C 500 °C to 1750 °C	1.05 °C 0.95 °C 0.56 °C
T	–200 °C to 0 °C 0 °C to 400 °C	0.60 °C 0.25 °C
U	–200 °C to 0 °C 0 °C to 400 °C	0.54 °C 0.24 °C
Resolution: 0.01 °		
Note 1: Accuracies are based on internal Reference Junction Compensation. Refer to Technical manual for equivalent external reference accuracies.		

Table 11 *Temperature, RTD Ranges, and Accuracies (ITS-90)*

Accuracy ± °C 4 Wire Probe
± 0.011 at –100 °C
± 0.015 at 0 °C
± 0.019 at 100 °C
± 0.023 at 200 °C
± 0.031 at 400 °C
± 0.039 at 600 °C
Resolution: 0.001°C (0.001°F)

Table 12 *Temperature, Thermistor*

Accuracy ± °C
± 0.002 at 0 °C
± 0.003 at 25 °C
± 0.006 at 50 °C
± 0.014 at 75 °C
± 0.030 at 100 °C
Resolution: 0.001 °C (0.001 °F)
Based on a 10 kΩ (at 25 °C) thermister with a beta value of 4000 Ω. See technical manual for details.