FLUKE®
Calibration

4180, 4181

Precision Infrared Calibrator

Users Guide

March 2013

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1 Before You Start

1.1 Introduction

The Model 4180/4181 Portable IR Calibrator may be used as a portable instrument or bench top temperature calibrator for calibrating point IR thermometers. The 4180/4181 is small enough to use in the field, and accurate enough to use in the lab.

The instruments feature:

- Rapid heating and cooling
- RS-232 interface capability

Built in programmable features include:

- Temperature scan rate control
- Eight set-point memory
- Adjustable readout in °C or °F
- Adjustable Emissivity

The temperature is accurately controlled by Hart's digital controller. The controller uses a precision platinum RTD as a sensor and controls the surface temperature with a solid state relay (triac) driven heater (4181) and FET driven Peltier modules (4180).

The LCD display continuously shows the current temperature. The temperature may be easily set with the control buttons to any desired temperature within the specified range. The instrument's multiple fault protection devices insure user and instrument safety and protection.

The 4180/4181 calibrators are designed for portability and ease of operation. Through proper use the instrument will provide continued accurate calibration of IR temperature measurement devices. The user should be familiar with the safety guidelines and operating procedures of the calibrator as described in this User's Guide.

Unique patent pending safety features make the instruments the safest IR calibrators available. The Block Temperature Indicator (Patent Pending) shows the user when the target temperature is above 50°C letting the user know when it is safe to place the target cover on the instrument and/or move it to a different location. The indicator remains illuminated when the instrument is energized and above 50°C, but with mains power removed, it will flash until the target temperature drops below 50°C.

1.2 Unpacking

Unpack the calibrator 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:

4180

- 4180 IR Calibrator
- Report of Calibration
- Power Cord
- User's Guide
- Documentation CD
- Target Cover
- Serial Cable

4181

- 4181 IR Calibrator
- Report of Calibration
- Power Cord
- User's Guide
- Documentation CD
- Serial Cable

If all items are not present, contact an Authorized Service Center (see Section 1.6 Authorized Service Centers on page 7).

1.3 Symbols Used

Table 1 lists the International Electrical Symbols. Some or all of these symbols may be used on the instrument or in this guide.

Table 1 *Symbols used*

Symbol	Description
	AC (Alternating Current)
	AC-DC
	Battery
	Complies with European Union directives
	DC

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

1.4 Safety Information

The Portable IR Calibrators are designed in accordance with IEC 61010-1, IEC 61010-2-010 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.

The following definitions apply to the terms "Warning" and "Caution".

- "Warning" identifies conditions and actions that may pose hazards to the user.
- "Caution" identifies conditions and actions that may damage the instrument being used.

1.4.1 Warnings

To avoid personal injury, follow these guidelines.

General

DO NOT use this instrument for any application other than calibration work. The instrument was designed for temperature calibration. Any other use of the instrument may cause unknown hazards to the user.

This instrument is intended for indoor use only.

Follow all safety guidelines listed in the User's Guide.

Calibration Equipment should only be used by Trained Personnel.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Before initial use, or after transport, or after storage in humid or semi-humid environments, or anytime the instrument has not been energized for more than 10 days, the instrument needs to be energized for a "dry-out" period of 2 hours before it can be assumed to meet all of the safety requirements of the IEC 61010-1. If the product is wet or has been in a wet environment, take necessary measures to remove moisture prior to applying power such as storage in a low humidity temperature chamber operating at 50°C for 4 hours or more.

Overhead clearance is required for the 4181. At least 1 meter (39 inches) overhead clearance is recommended. DO NOT place the instrument under a cabinet or other structure. Allow at least 15 cm (6 inches) of clearance around the instrument.

DO NOT face the target towards a wall or other object. The target emits high amounts of heat and will cause objects to heat up or catch fire.

DO NOT use this instrument in environments other than those listed in the User's Guide.

DO NOT operate near flammable materials.

Use of this instrument at **HIGH TEMPERATURES** for extended periods of time requires caution.

Completely unattended high temperature operation is not recommended due to safety hazards that can arise.

Do not use the instrument if it operates abnormally. Protection may be impaired. When in doubt, have the instrument serviced.

Burn Hazard

DO NOT touch the IR target surface or areas surrounding the target of the instrument. If the instrument is set at 100°C, the display reads 100°C, the target surface may be 100°C or greater. The sheet metal of the instrument may exhibit extreme temperatures for areas close to the IR target surface.

This instrument is equipped with a Block Temperature Indicator (front panel LED HOT indicator – Patent Pending). When the indicator is flashing, the instrument is disconnected from mains power and the temperature of the block is above 50°C. When the indicator is illuminated, always on, the instrument is powered and the block temperature is above 50°C.

Temperatures above 70°C (158°F) are considered hazardous. Use extreme care when working with these temperatures. Observe all warnings and cautions given in this manual.

DO NOT turn off the instrument at temperatures higher than 100°C. This could create a hazardous situation. Select a set-point less than 100°C and allow the instrument to cool before turning it off.

DO NOT operate instrument in any orientation other than vertical (target face perpendicular to installation surface). Risk of fire or burn hazard may result due to excessive heat buildup.

The instrument can generate extreme temperatures. Precautions must be taken to prevent personal injury or damage to objects.

The air around the instrument can reach temperatures greater that 100°C.

The high temperatures present in instruments designed to operate at 300°C and higher may result in fires and severe burns if safety precautions are not observed.

Electrical Hazard

These guidelines must be followed to ensure that the safety mechanisms in this instrument will operate properly. This instrument must be plugged into an AC only outlet according to Section 2.1 Specifications on page 9. The power cord of the instrument is equipped with a three-pronged grounding plug for your protection against electrical shock hazards. It must be plugged directly into a properly grounded three-prong receptacle. The receptacle must be installed in accordance with local codes and ordinances. Consult a qualified electrician.

DO NOT use an extension cord or adapter plug.

DO NOT operate this instrument without a properly grounded, properly polarized power cord.

DO NOT connect the instrument to a non-grounded outlet.

For installations with polarized outlets, insure that the polarity of the connection is correct.

HIGH VOLTAGE is used in the operation of this equipment. Contact an Authorized Service Center (see Section 1.6 Authorized Service Centers on page 7) for obtaining service from a qualified technician. No user serviceable parts.

If supplied with user accessible fuses, always replace the fuse with one of the same rating, voltage, and type.

Always replace the power cord with an approved cord of the correct rating and type.

1.4.2 Cautions

Protect the target against dirt and damage – scrapes and scratches. A well kept target surface, free from dirt and damage, produces better measurements. Use the target cover whenever the instrument is not in use to protect the target. Always use the target cover when transporting the instrument, but remember to never transport the instrument when the target temperature is above 50°C.

DO NOT touch the target. Oils and salts from the skin will permanently damage the target surface at high temperatures.

When ice forms on the target, change the instrument set-point higher than 50°C to melt the excess ice. **DO NOT** wipe the front plate (target). Change the set-point to 100°C or higher to evaporate the excess water.

DO NOT use fluids to clean the target surface.

DO NOT use shop air to clean the target surface. Oil and contaminants in the shop air could contaminate the surface.

DO NOT use canned, compressed air (used to clean a computer) to clean the target surface. Chemicals in the air could contaminate the target surface.

DO NOT force cool the surface. The surface should not be cooled by any method other than natural convection. Forced air can often have oil or water in it. Even water can leave mineral deposits on the surface. Trying to cool the surface too quickly can also cause thermal shock to the emissive surface.

DO NOT use liquid nitrogen (LN2) to quick cool the target.

DO NOT plug the instrument into 230V if the fuse holder reads 115V. This action will cause the fuses to blow and may damage the instrument.

Component lifetime can be shortened by continuous high temperature operation.

DO NOT change the values of the calibration constants from the factory set values. Calibration constants shall only be changed by qualified and authorized personnel. The correct setting of these parameters is important to the safety and proper operation of the calibrator.

DO use a ground fault interrupt device.

Always operate this instrument at room temperatures as stated in Section 2.2 Environmental Conditions on page 10.

The instrument is a precision instrument. Although is has been designed for optimum durability and trouble free operation, it must be handled with care. It is important to keep the calibration well and the IR target surface clean and clear of any foreign matter.

Always carry the instrument in an upright position. The convenient pull-up handle allows one hand carrying.

DO NOT operate the instrument in excessively wet, oily, dusty, or dirty environments.

DO NOT operate near flammable materials.

If a main supply power fluctuation occurs, immediately turn off the instrument. Wait until the power has stabilized before re-energizing the instrument.

Use the target cover at temperatures below ambient (25°C). If ice or liquid water forms on the target, IR thermometers will not indicate the correct temperature.

1.5 CE Comments

1.5.1 EMC Directive

Hart's equipment has been tested to meet the European Electromagnetic Compatibility Directive (EMC Directive, 89/336/EEC). The Declaration of Conformity for your instrument lists the specific standards to which the instrument was tested.

The instrument was designed specifically as a test and measuring device. Compliance to the EMC directive is through IEC 61326-1 Electrical equipment for measurement, control and laboratory use.

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

1.5.2 Emission Testing

The instrument fulfills the limit requirements for Class A equipment. The instrument was not designed to be used in domestic establishments.

1.5.3 Low Voltage Directive (Safety)

In order to comply with the European Low Voltage Directive (2006/95/EC), Hart's equipment has been designed to meet the EN 61010-1 and EN 61010-2-010 standards.

1.6 Authorized Service Centers

Please contact one of the following Authorized Service Centers to coordinate service on your Hart product:

Fluke Corporation
Hart Scientific Division

799 E. Utah Valley Drive
American Fork, UT 84003-9775
USA

Phone: +1.801.763.1600
Telefax: +1.801.763.1010
E-mail: support@hartscientific.com

Fluke Nederland B.V.

Customer Support Services
Science Park Eindhoven 5108
5692 EC Son
NETHERLANDS

Phone: +31-402-675300
Telefax: +31-402-675321
E-mail: ServiceDesk@fluke.nl

Fluke Int'l Corporation

Service Center - Instrimpex
Room 2301 Sciteck Tower
22 Jianguomenwai Dajie
Chao Yang District
Beijing 100004, PRC
CHINA

Phone: +86-10-6-512-3436
Telefax: +86-10-6-512-3437
E-mail: xingye.han@fluke.com.cn

Fluke South East Asia Pte Ltd.

Fluke ASEAN Regional Office
Service Center
60 Alexandra Terrace #03-16
The Comtech (Lobby D)
118502
SINGAPORE

Phone: +65-6799-5588
Telefax: +65-6799-5589
E-mail: anthony.ng@fluke.com

When contacting a Service Centers for support, please have the following information available:

- Model Number
- Serial Number
- Voltage
- Complete description of the problem

2 Specifications and Environmental Conditions

2.1 Specifications

Table 2 *Specifications*

	4180	4181
Temperature range (@ 23 °C ambient, 0.95 emissivity)	–15 °C to 120 °C	35 °C to 500 °C
Display accuracy[1]	± 0.40 °C at –15 °C ± 0.40 °C at 0 °C ± 0.50 °C at 50 °C ± 0.50 °C at 100 °C ± 0.55 °C at 120 °C	± 0.35 °C at 35 °C ± 0.50 °C at 100 °C ± 0.70 °C at 200 °C ± 1.20 °C at 350 °C ± 1.60 °C at 500 °C
Stability	± 0.10 °C at –15 °C ± 0.05 °C at 0 °C ± 0.10 °C at 120 °C	± 0.05 °C at 35 °C ± 0.20 °C at 200 °C ± 0.40 °C at 500 °C
Uniformity[3] (5.0 in dia of center of target)	± 0.15 °C at –15 °C ± 0.10 °C at 0 °C ± 0.25 °C at 120 °C	± 0.10 °C at 35 °C ± 0.50 °C at 200 °C ± 1.00 °C at 500 °C
Uniformity[3] (2.0 in dia of center of target)	± 0.10 °C at -15 °C ± 0.10 °C at 0 °C ± 0.20 °C at 120 °C	± 0.10 °C at 35 °C ± 0.25 °C at 200 °C ± 0.50 °C at 500 °C
Heating time	15 min: –15 °C to 120 °C 14 min: 23 °C to 120 °C	20 min: 35 °C to 500 °C
Cooling time	15 min: 120 °C to 23 °C 20 min: 23 °C to –15 °C	100 min: 500 °C to 35 °C 40 min: 500 °C to 100 °C
Stabilization time	10 minutes	10 minutes
Nominal emissivity[3]	0.95	0.95
Thermometer emissivity compensation	0.9 to 1.0	
Target diameter	152.4 mm (6 in)	
Computer interface	RS-232	
Power	115 V ac (± 10%), 6.3 A, 50/60 Hz, 630 W 230 V ac (± 10%), 3.15 A, 50/60 Hz, 630 W	115 V ac (± 10%), 10 A, 50/60 Hz, 1000 W 230 V a (± 10%), 5 A, 50/60 Hz, 1000 W
Fuse(s)	115 V ac 6.3 A, 250 V, slow blow 230 V ac 3.15 A, 250 V, T	115 V ac 10 A, 250 V, fast blow 230 V ac 5 A, 250 V, F
Size (HxWxD)	356 mm x 241 mm x 216 mm (14 in x 9.5 in x 8.5 in)	356 mm x 241 mm x 216 mm (14 in x 9.5 in x 8.5 in)
Weight	9.1 kg (20 lb)	9.5 kg (21 lb)
Safety	EN 61010-1:2001, CAN/CSA C22.2 No. 61010.1-04	

[1]For 8 µm to 14 µm spectral band thermometers with emissivity set between 0.9 and 1.0

[2]The uniformity specification refers to how IR thermometers with different spot sizes both focused at the center of the target will measure the same temperature.

[3]The target has a nominal emissivity of 0.95, however it is radiometrically calibrated to minimize emissivity related uncertainties.

2.2 Environmental Conditions

Although the instrument has been designed for optimum durability and trouble-free operation, it must be handled with care. The instrument should not be operated in an excessively dusty or dirty environment. Maintenance and cleaning recommendations can be found in the Maintenance section of this manual.

The instrument operates safely under the following conditions:

- ambient temperature range: 5-35°C (41-95°F)
- ambient relative humidity: maximum 80% for temperature <31°C, decreasing linearly to 50% at 40°C
- mains voltage within ±10% of nominal
- vibrations in the calibration environment should be minimized
- altitudes less than 2,000 meters
- indoor use only

3 Quick Start

3.1 Setup

Note: *The instrument will not heat, cool, or control until the "SET PT." parameter is "Enabled".*

Place the instrument on a flat surface with at least 15 cm (6 inches) of free space around the instrument. Overhead clearance is required. DO NOT place under a cabinet or structure.

Plug the power cord of the instrument into a mains outlet of the proper voltage, frequency, and current capability (see Section 2.1 Specifications on page 9 for power details). Observe that the nominal voltage corresponds to that indicated on the power entry model at the back of the calibrator.

Turn on the power to the calibrator by toggling the switch on the power entry module. After a brief self-test, the controller should begin normal operation. The main screen will appear within 30 seconds. If the instrument fails to operate, please check the power connection. The display will show the well temperature, and wait for user input before further operation.

Press “SET PT.” and use the arrow keys to set the desired set-point temperature. Press “ENTER” to save the desire set-point and enable the IR Calibrator. After five (5) seconds the instrument should start to operate normally and heat or cool to the designated set-point.

3.2 Parts and Controls

This section describes the exterior features of the IR Calibrator. All interface buttons are found on the front of the IR Calibrator (Figure 1 on next page). Power connection and serial connections are found on the back of the instrument (see Figure 3 on page 15).

3.2.1 Display Panel

Display (1)

The display is a 240 x 160 pixel monochrome graphics LCD device with a bright LED backlight. The display is used to show current control temperature, measurements, status information, operating parameters, and soft key functions.

SET PT. (2)

The Set Pt. Key allows you to enable the instrument to heat or cool to a desired set-point. Until this key is enabled, the instrument will not heat or cool. It is in a “sleep” state for safety of the operator and instrument.

°C/°F Key (3)

The °C/°F Key allows you to change the displayed temperature units from °C to °F and vice versa.

Menu Key (4)

The Menu Key allows the user to access all parameter and settings menus. From the main menu, the user can use the soft keys to access submenus and functions.

Exit Key (5)

The Exit Key allows you to exit menus and cancel newly entered values.

Arrow Keys (6)

The Arrow Keys allow you to move the cursor on the display, change the display lay-out, and adjust the contrast of the display.

Enter Key (7)

The Enter Key allows you to select menus and accept new values.

Soft Keys (8)

The Soft Keys are the four buttons immediately below the display (labeled F1 to F4). The functions of the soft keys are indicated on the display above the buttons. The function of the keys may change depending on the menu or function that is selected.

Block Temperature Indicator (9) [Patent Pending]

The block temperature indicator allows users to know when it is safe (50°C to 60°C) to install the target cover. The indicator illuminates when the target exceeds approxi-mately 50°C. The indicator illuminates until the target cools to less than approximately 50°C. If the instrument is disconnected from mains power, the indicator ashes until the target temperature is less than approximately 50°C.

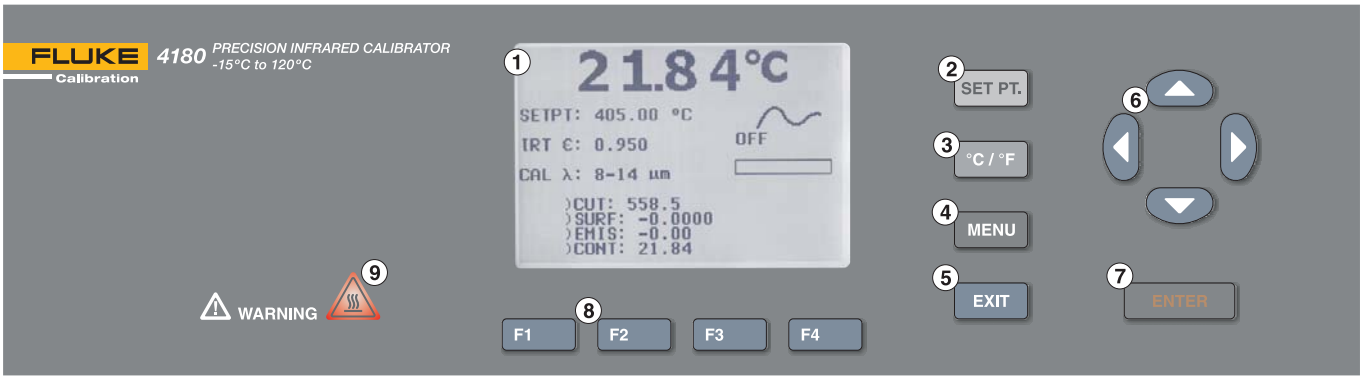


Figure 1 Display panel

3.2.2 Display

The front panel display is shown in detail in Figure 2 on next page.

Process Temperature (1)

The most recent block temperature measurement is shown in large digits in the box at the top of the screen.

Set-Point Temperature (2)

The current set-point temperature is displayed just below the Process Temperature.

Emissivity Setting (IRT ε) (3)

The current infrared thermometer emissivity setting is displayed below the current set-point temperature.

Calibration Wavelength (CAL λ) (4)

The current calibration wavelength selected. The wavelength band at which the instrument was calibrated.

Stability Status (5)

On the right hand side of the screen, a graph displays the current status of the stability of the IR Calibrator.

Heating/Cooling Status (6)

Just below the stability graph, a bar graph indicates HEATING, COOLING, or CUT-OUT. This status graph indicates the current level of heating or cooling if the instrument is not in cutout mode.

Soft Key Functions (7) (not shown)

The four sets of text at the bottom of the display indicate the functions of the soft keys (F1–F4). These functions change with each menu.

Editing Windows

While setting up and operating the instrument, you are often required to enter or select parameters. Editing windows appear on the screen when necessary to show the values of parameters and allow edits.

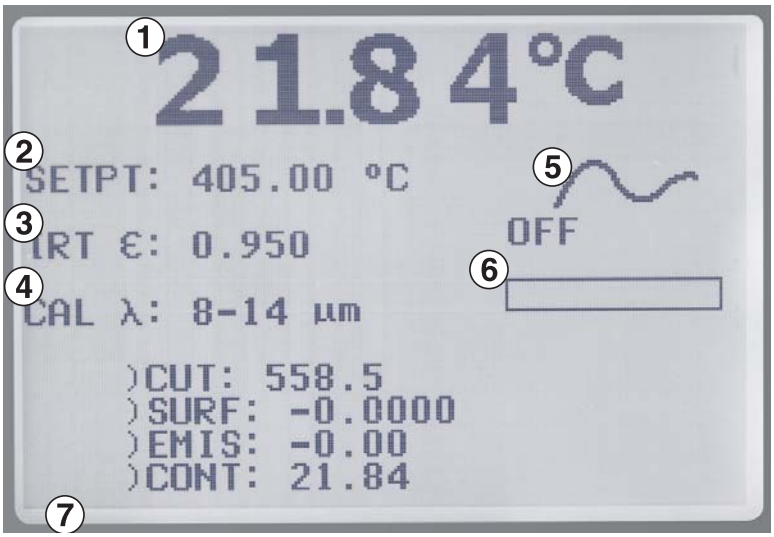


Figure 2 *Main screen*

3.2.3 Back Panel

The following are found on the back panel of the IR Calibrator (see Figure 3 on opposite page).

Fan (1)

The fan is located high in the center of the back of the instrument. Do not obstruct the airflow of the fan. Leave at least 6 inches of air flow around the instrument.

Power Entry Module (2)

The power supply cord attaches to the power entry module. Plug the cord into an AC mains supply appropriate for the voltage displayed on the power entry module and as specified in Section 2.1 Specifications on page 9.

Power Cord

The power entry module contains the attachment for the power supply cord to the right hand side back panel. Plug the cord into an AC mains supply appropriate for the voltage range as specified in the specifications tables.

Power Switch

The power switch is located on the power entry module of the instrument.

Fuses

The 418X fuses are located inside the power entry module of the instrument (Figure 3 on opposite page).

If necessary, fuses must be replaced according to Section 2.1 Specifications on page 9.

Serial Connector (3)

The serial (RS-232) interface can be used to transmit measurements and control the operation of the IR Calibrator.

Figure 3 *418X back panel*

3.3 Languages

The display on the instrument can be set to different languages depending on the configuration.

- European: English, French, Spanish, Itialian, German, Chinese, Japanese
- Russian: Russian, English

3.3.1 Language Selection

The languages are located in the Menu system under the System Menu/Display Setup. Select the language to be displayed by using the left and right arrow keys (see Section 4.3 System Menu on page 21).

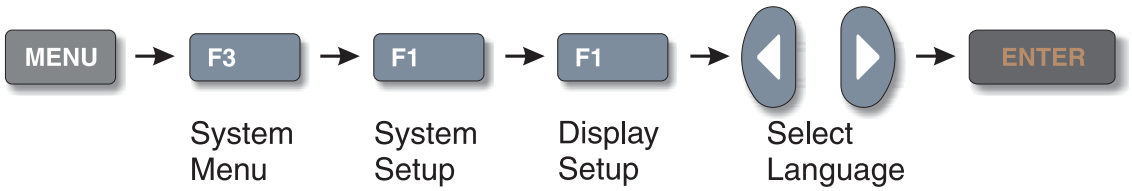


Figure 4 *Steps to language selection*

3.3.1.1 Reset to English Language

F1 + F4 temporarily displays English, or returns to the selected language. The selected language will resume after the power is switched off and on again. To permanently select English, follow the instructions listed in Section 3.3.1 Language Selection.

3.4 Ice Buildup and Purge Procedure (4180 Only)

3.4.1 Icing Warning

At the factory, the instrument calibration is done with the target free of any ice or moisture. Ice or moisture on the target changes the target's emissivity and apparent temperature. If there is any ice or moisture (even though it is a slight amount) on the target, the display temperature accuracy is invalid. In addition, ice buildup can damage the surface coating causing the radiometric calibration to drift.

The user of the IR Precision Calibrator should always avoid ice buildup. To facilitate this, a cover with a purge inlet is provided with the 4180. It is recommended that the target cover be used at any set-point below the dew point. Depending on the ambient humidity of the environment where the target is used, the dew point can be as high as the ambient temperature of that environment.

3.4.2 Purge Procedure

Use of the cover allows the target to be used at temperatures below the dew point. The target is less likely to form ice while the target is covered. The target cover is provided with a purge inlet to further prevent ice buildup. To use the purge, the user will need a 6mm (0.25 in) outside diameter tube. Connect tubing to the purge inlet on the target

cover. You must use a dry gas for the purge. This means the gas should have a dew point below -15°C. We recommend nitrogen or dried air. If the gas contains any water vapor, ice or moisture will form on the target. A relatively low flow rate of 2.4 – 4.8 liters/min (5 – 10 CFH) is recommended for the purge.

Do not leave the target uncovered for more than 5 seconds, since it can cause ice to form on the target. To make measurements below the dew point, do the following:

1. Put the target cover in place.
2. Adjust the set-point to the desired temperature and allow the instrument to stabilize at that temperature.
3. Remove the target cover when the target stabilizes.
4. Take a sample
5. Replace the target cover.

3.4.3 Removing Ice Buildup on the Target

If a small amount of ice has formed, you can place the cover back on the target and allow the purge gas to sublime the ice. If there is more ice or you don't have a purge available, change the instrument set-point to a temperature equal to or greater than 50°C with the target uncovered. Allow all ice to melt and all water to dry before returning target to use. ***DO NOT*** wipe the target.

3.5 Emissivity Setting of the IR Thermometer

The 4180 and 4181 Precision IR Calibrators are calibrated with a radiometric calibration. This calibration is done with a highly accurate IR thermometer. This IR thermometer has an emissivity setting of 0.950 during the 4180 or 4181 calibration. Therefore, when calibrating IR thermometers using the 4180 or 4181, it is best practice to use an IR thermometer emissivity setting of 0.950. Some IR thermometers do not have an adjustable emissivity setting. Most of these will have emissivity set as 0.95. In either of these cases, the apparent emissivity setting of the instrument should also be set to 0.95.

If the IR thermometer being used does not have an emissivity setting of 0.95, the 4180 and 4181 allows adjustment of emissivity (IRT ε, from 0.90 to 1.00). Refer to Section 4 Menu Structure on page 19 for information on how to access IRT ε in the controller menu.

If you are not certain of the emissivity setting of the IR thermometer you are calibrating, consult your IR thermometer's User's Guide or your IR thermometer's manufacturer.

3.5.1 Apparent Temperature Setting Limits

The IR calibrator is calibrated with an emissivity setting of 0.95. The instruments have a variable emissivity adjustment that allows the user to vary their apparent emissivity from 0.90 to 1.00. This setting should match the IR thermometer's emissivity setting. It is best to use the emissivity setting of 0.95. However, some IR thermometers do not allow for an emissivity setting of 0.95. For these instruments, the calibrator's emissivity setting should be set to the IR thermometer's emissivity setting. Due to safety issues

and the physical limits of the instrument, the temperature range of the instrument may be limited from the specified range when using an emissivity setting other than 0.95. A table of this limitation is shown in Table 3.

Table 3 *Apparent temperature limits*

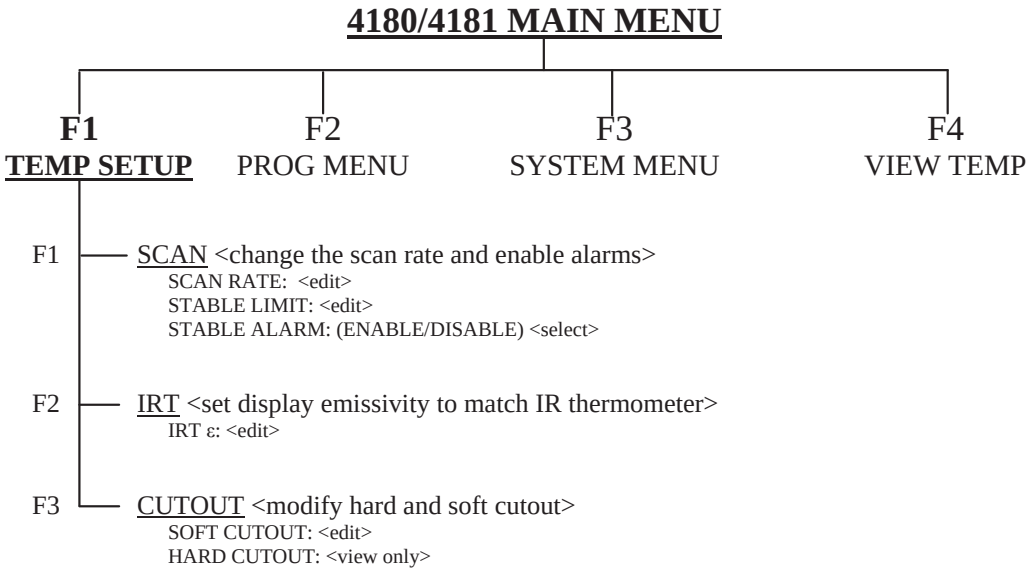
	4180		4181	
ε	HI (°C)	LO (°C)	HI (°C)	LO (°C)
0.90	120.0	–15.0	500.0	35.0
0.91	120.0	–15.0	500.0	35.0
0.92	120.0	–15.0	500.0	35.0
0.93	120.0	–15.0	500.0	35.0
0.94	120.0	–15.0	500.0	35.0
0.95	120.0	–15.0	500.0	35.0
0.96	119.2	–14.5	496.6	35.0
0.97	118.4	–14.0	493.2	35.0
0.98	117.6	–13.5	489.8	35.0
0.99	116.8	–13.0	486.4	35.0
1.00	116.0	–12.5	483.0	35.0

3.6 Forced Air and Convection

Since the 4180 and 4181 have a large surface area, a major component of the temperature uncertainty is caused by changes in convection. Because of this, the user should keep the instrument away from areas with large amounts of air flow or drafts.

4 Menu Structure

4.1 Temperature Setup Menu



Hot Keys

SETPoinT Key - SET TEMPERATURE SETPOINT
SETPOINT: <set point temperature> <edit>
ENTER <enable control of the instrument>
F1 – SELECT PRESET <1-8> <select>
F1 – EDIT PRESET <1-8> <edit>
F4 – SAVE/DISABLE <disables control of the instrument>

ºC / ºF Key - Units: <°C, °F>

Up/ Down Arrow Keys <contrast adjust> <toggle>
Up Key: Lighter
Down Key: Darker

F1 & F4 Keys (same time) <reset to English language>

F1 & F3 Keys (same time) <turn off key press beep>

Figure 5 *Temperature setup menu*

4.2 Program Menu

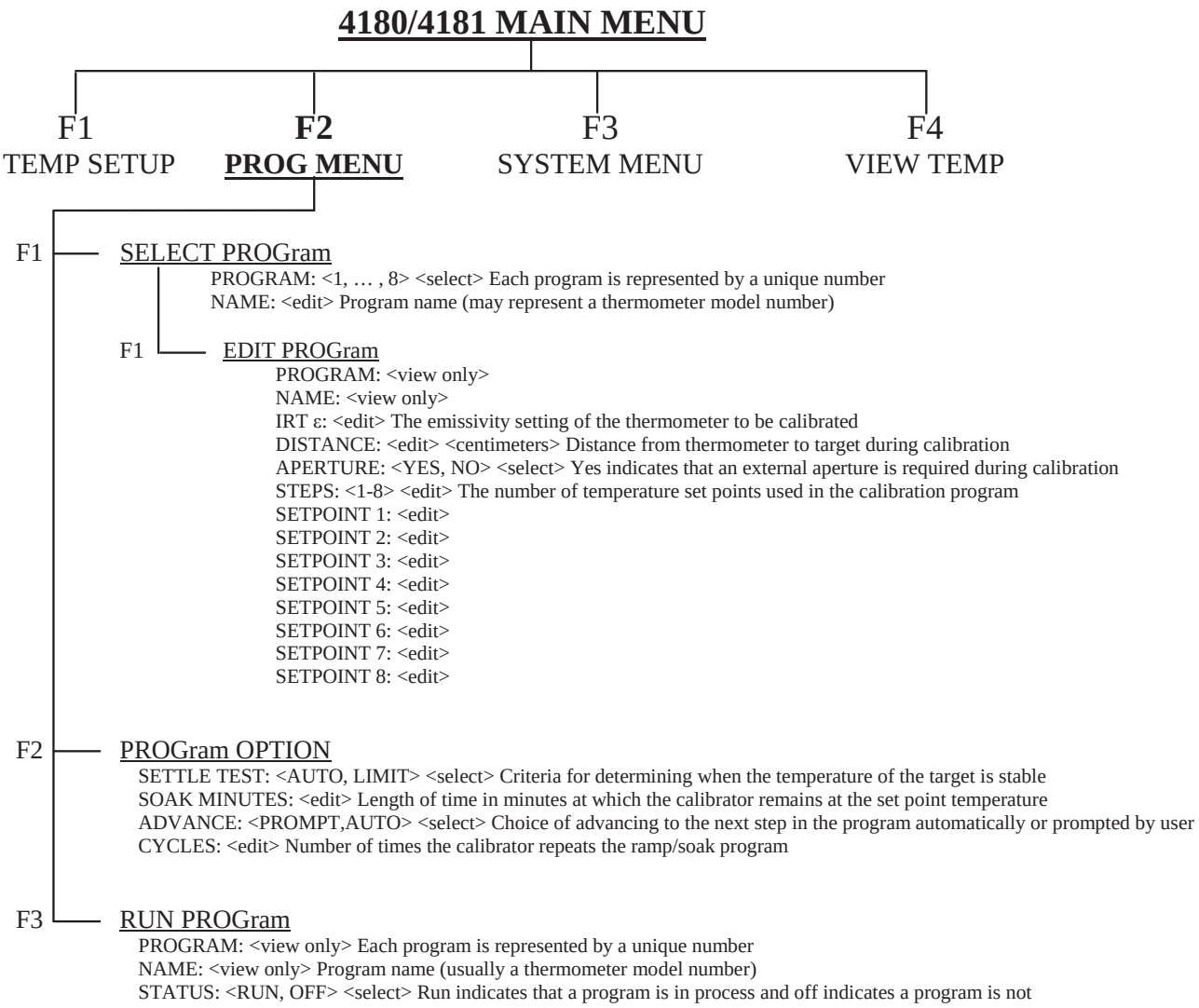


Figure 6 *Program menu*

4.3 System Menu

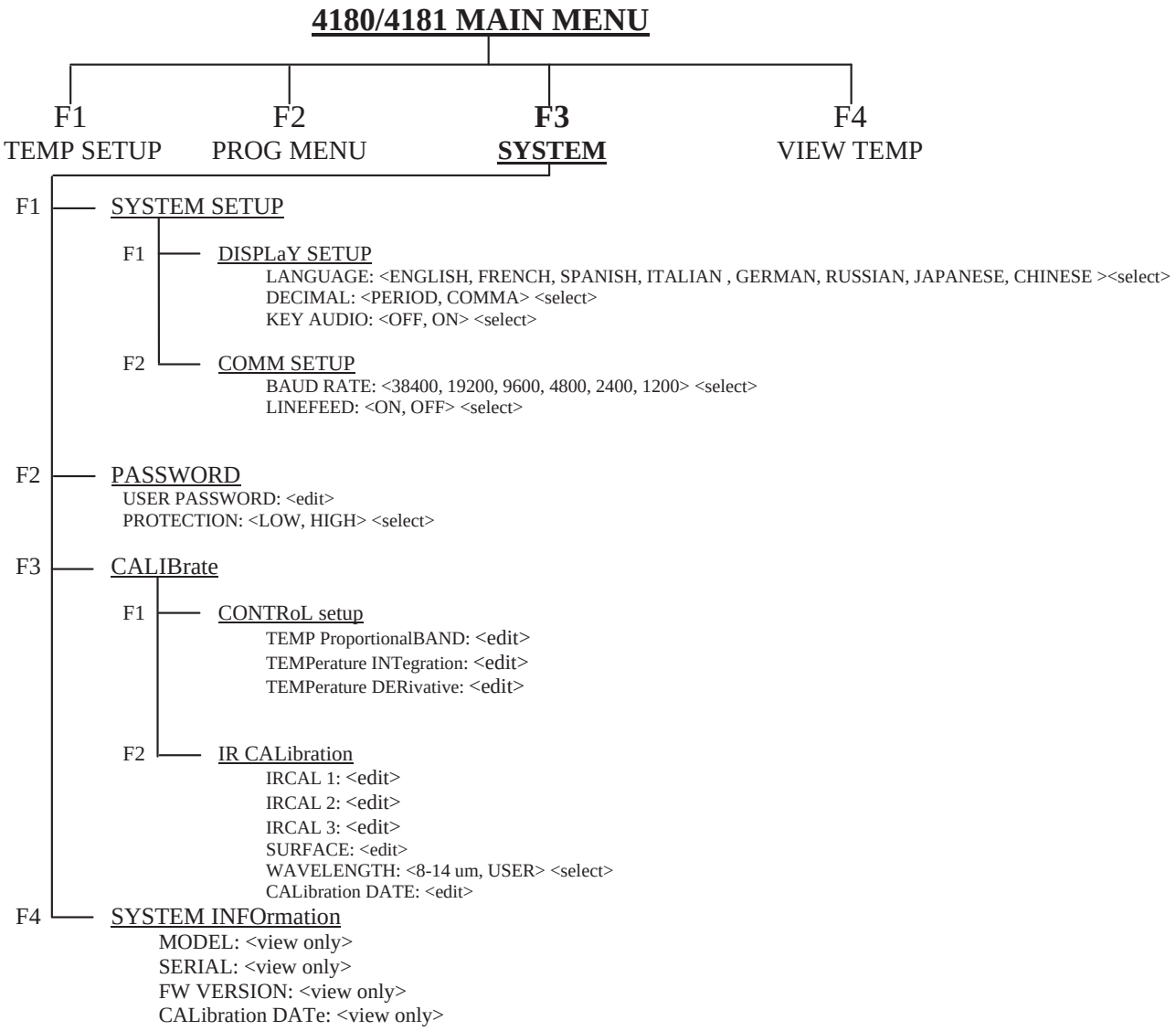


Figure 7 *System menu*

4.4 View Temperature Menu

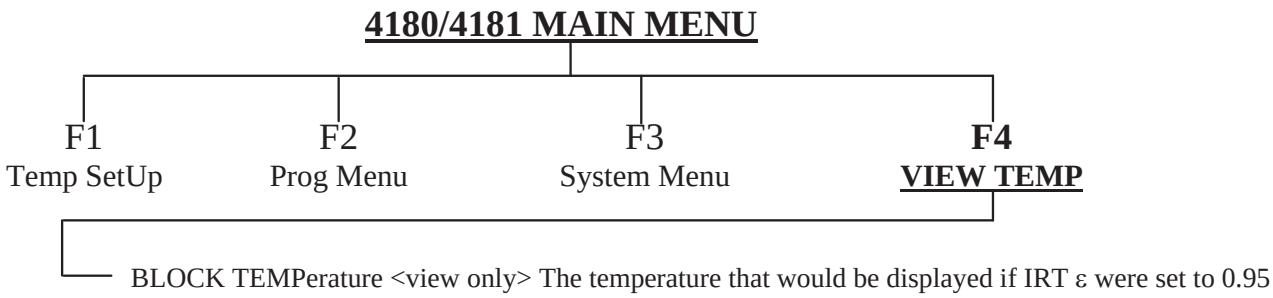


Figure 8 *View temp menu*

5 Maintenance

The instrument has been designed with the utmost care. Ease of operation and simplicity of maintenance have been a central theme in the product development. Therefore, with proper care the instrument should require very little maintenance. Avoid operating the instrument in an oily, wet, dirty, or dusty environment.

Ice will build up on the target surface over a period of time, see see Section 3.4.3 Removing Ice Buildup on the Target on page 17.

If the outside of the instrument becomes soiled, it may be wiped clean with a damp cloth and mild detergent. **DO NOT** use harsh chemicals to clean the instrument, which may damage the paint. **DO NOT** wipe the front plate (target).

It is important to keep the target surface of the instrument clean and clear of any foreign matter. Always utilize the target cover when the instrument is not in use and during transport.

The instrument should be handled with care. Avoid knocking or dropping the instrument.

If a hazardous material is spilled on or inside the instrument, the user is responsible for taking the appropriate decontamination steps as outlined by the National Safety Council with respect to the material.

If the mains supply cord becomes damaged, replace it with a cord with the appropriate gauge wire for the current of the instrument. If there are any questions, contact an Authorized Service Center (see Section 1.6 Authorized Service Centers on page 7) for more information.

Before using any cleaning or decontamination method except those recommended by Hart, users should check with an Authorized Service Center (see Section 1.6 Authorized Service Centers on page 7) to be sure that the proposed method does not damage the equipment.

If the instrument is used in a manner not in accordance with the equipment design, the operation of the instrument may be impaired or safety hazards may arise.