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FLUKE®

— Calibration

9118A

Calibration Furnace

Getting Started

PN 4176584

September 2012 Rev. 1, 3/14

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Fluke Corporation
P.O. Box 9090
Everett, WA 98206-9090
U.S.A.

Fluke Europe B.V.
P.O. Box 1186
5602 BD Eindhoven
The Netherlands

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Introduction

Warning

To prevent possible electrical shock, fire, or personal injury, read all safety information before you use the Product.

The Product is used to calibrate Platinum Resistance Thermometers (PRTs), fiber optic sensors, and thermocouples to a maximum temperature of 1200 °C.

This manual includes information on how to turn on the Product, understand the controls, and basic maintenance. For instruction on how to operate the Product, refer to the *9118A Users Manual* on the CD-ROM.

How to Contact Fluke

To contact Fluke Calibration, call one of these telephone numbers:

- Technical Support USA: 1-877-355-3225
- Calibration/Repair USA: 1-877-355-3225
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31-40-2675-200
- Japan: +81-3-6714-3114
- Singapore: +65-6799-5566
- China: +86-400-810-3435
- Brazil: +55-11-3759-7600
- Anywhere in the world: +1-425-446-6110

To see product information and download the latest manual supplements, visit Fluke Calibration's website at <http://www.flukecal.com>.

To register your product, visit <http://flukecal.com/register-product>.

Safety Information

A **Warning** identifies conditions and procedures that are dangerous to the user. A **Caution** identifies conditions and procedures that can cause damage to the Product or the equipment under test.

Warning

To prevent possible electrical shock, fire, or personal injury:

- Read all safety information before you use the Product.
- Carefully read all instructions.
- Use the Product only as specified, or the protection supplied by the Product can be compromised.
- Do not use the Product around explosive gas, vapor, or in damp or wet environments.
- Use this Product indoors only.
- Use only the mains power cord and connector approved for the voltage and plug configuration in your country and rated for the Product.
- Replace the mains power cord if the insulation is damaged or if the insulation shows signs of wear.
- Connect one end of the supplied ground wire to the protective earth ground terminal on the rear panel and the other end to an earth ground.
- Make sure the ground conductor in the mains power cord is connected to a protective earth ground. Disruption of the protective earth could put voltage on the chassis that could cause death.
- Do not put the Product where access to the mains power cord is blocked.
- Make sure that the Product is grounded before use.
- Do not use an extension cord or adapter plug.
- Do not use the Product if it operates incorrectly.
- Do not use the Product if it is damaged.
- Disable the Product if it is damaged.
- Make sure the power cord does not touch with hot parts of the Product.
- Make sure that the space around the Product meets minimum requirements.

- Do not keep the Product in operation and unattended at high temperatures.
- Use caution when you install and remove probes and inserts from the Product. They can be hot.
- Do not put the Product on a flammable surface and keep a fire extinguisher nearby.
- Do not set anything on top of the Product. Very high temperatures can cause the ignition of flammable materials.
- Do not remove the isothermal block and rear plug at high temperatures. The isothermal block and rear plug are the same temperature as shown on the display.
- Do not lift or move the Product with the isothermal block in place. The isothermal block and rear plug may fall out of the instrument.
- Applicable personal protective equipment must be worn when you move hot temperature probes or do work near the furnace apertures.
- Do not use the Product for applications other than calibration work.
- The Product must only be used by approved personnel.
- Do not touch surfaces near the well access port. They can be very hot.
- Do not touch the insulation material in the Product. The insulation material can cause mild mechanical irritation with skin, eyes, and upper respiratory system. If it gets on your skin, flush area and wash gently. Do not rub or scratch exposed skin. If it gets into your eyes, flush abundantly with water. Do not rub eyes. If the nose and throat become irritated, move to a dust-free area and blow nose. If symptoms continue, get medical advice.

⚠ Caution

To prevent damage to the Product:

- Operate the Product at room temperature. See specifications.
- Keep a minimum of 45 cm clearance from the front, left, and right sides. Keep 150 cm from the top of the Product.
- Do not put the Product in a corner or cause a blockage behind the Product.
- Do not use fluids to clean out the well. Fluids in the Product can cause damage.
- Do not put unwanted material into the probe protection tube or hole of the insert. Fluids in the Product can cause damage.
- Only change calibration constant values from the factory set values when you calibrate the Product. These values are important in the safe operation of the Product.
- Read and understand the operation before you turn on the Product.
- Do not operate the Product in wet, oily, dusty, or dirty environments.
- Make sure the probe handle temperature does not go above its limit.
- Be careful with thermometer probes. Do not drop, stress, or let them become too hot.
- Do not operate the Product without the control probes correctly connected and put into the furnace. The furnace does not operate correctly without the control probes.
- Make sure the main probe and zone probe are connected to the correct connector.
- Turn off the furnace when a mains supply power fluctuation occurs. Turn on the furnace only when the mains power is stable.
- Make sure that all reference sensors used with the furnace are specified for the temperature range of the furnace.
- Do not disconnect the Product from the mains while the furnace temperature is above 80 °C.










- **Do not attempt to push the block into the furnace. The isothermal block expands as the furnace heats due to thermal expansion. It will extend beyond the front of the furnace at high temperatures. This is normal.**
- **Remove the isothermal block and rear plug prior to transporting the furnace. The ceramic furnace tube is fragile and can be damaged by the block.**
- **To prevent the probe under test from getting stuck in the isothermal block due to different rates of thermal expansion, allow a clearance of at least 0.4 mm between the outer diameter of the probe and the hole of the isothermal block.**
- **Never introduce any foreign material into the probe hole of the isothermal block. Fluids, etc. can leak into the Product and cause damage.**
- **Minimize vibration in the calibration environment.**
- **The furnace can be used with or without an isothermal block installed. Unique calibration parameters are necessary for each mode of operation.**
- **Before operating the furnace, select the appropriate mode of operation in the calibration menu (see Furnace Setup Menu). If necessary, a calibration for the new mode of operation may be required.**

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The symbols on the Product and in this manual are shown in Table 1.

Table 1. Symbols

Symbol	Description	Symbol	Description
	Risk of Danger. Important information. See Manual.		Hazardous voltage. Risk of electric shock.
	Caution. Hot surface.		Protective Earth Ground
	USB connection		Conforms to European Union directives.
	Conforms to relevant North American Safety Standards.		Conforms to relevant Australian EMC standards.
	This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste. Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as category 9 "Monitoring and Control Instrumentation" product. Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.		

Installation

Unpack and Inspection

Carefully unpack the Product and check for all parts. If there is damage, tell the shipper immediately and make a claim. The parts included are:

- 9118A Calibration Furnace
- Type-S Thermocouple, Long
- Type-S Thermocouple, Short
- Protection Tube, Long
- Protection Tube, Short
- TC Support Bracket
- L-Key, Hex 3 mm
- Button Head Screw, M5X12 (2 each)
- Getting Started Manual
- Users Manual CD-ROM
- Ground Wire
- Serial Cable
- USB Cable
- Super Wool Insulator
- Calibration Certificate
- Isothermal Block
- Rear Plug
- Rear Plug for backup

The last 3 items are only for the thermocouple calibration furnace with isothermal block.

Placement

For best results, choose a location to setup the Product where room temperature changes are minimum. To safely remove heat, put the Product in a position with a minimum of 45 cm of free air space around it.

Fluke Calibration recommends that you do a test for axial uniformity and adjust if necessary after the Product is installed. Temperature uniformity of the Product could be affected by the environment where the Product operates or by equipment or material placed inside or at the ends of the central tube. Refer to the Calibration section of the Users Manual.

Dry-Out Period

Before initial use, after transport, or the Product has not been energized for more than 10 days, turn on the Product for a minimum of 2 hours.

If the Product is wet or was in a wet environment, remove moisture before you turn on the Product.

How to Move the Product

⚠️⚠️ Warning

To prevent personal injury, use proper techniques to lift the Product.

When you lift the Product, bend your knees and lift with your legs. Before you move the Product, let it cool to ambient temperatures and remove the control and cutout thermocouples and all objects in the furnace well. To safely move the Product, two people are necessary. Put one person in the front and one person at the rear of the Product. Carefully put your hands under the Product and lift in unison.

⚠️ Caution

To prevent damage to the Product, remove the isothermal block and rear plug prior to transporting the furnace. The ceramic furnace tube is fragile and can be damaged by the block.

Product Components

As shown in Figure 1, the two major components of the Product are the furnace and the controller.

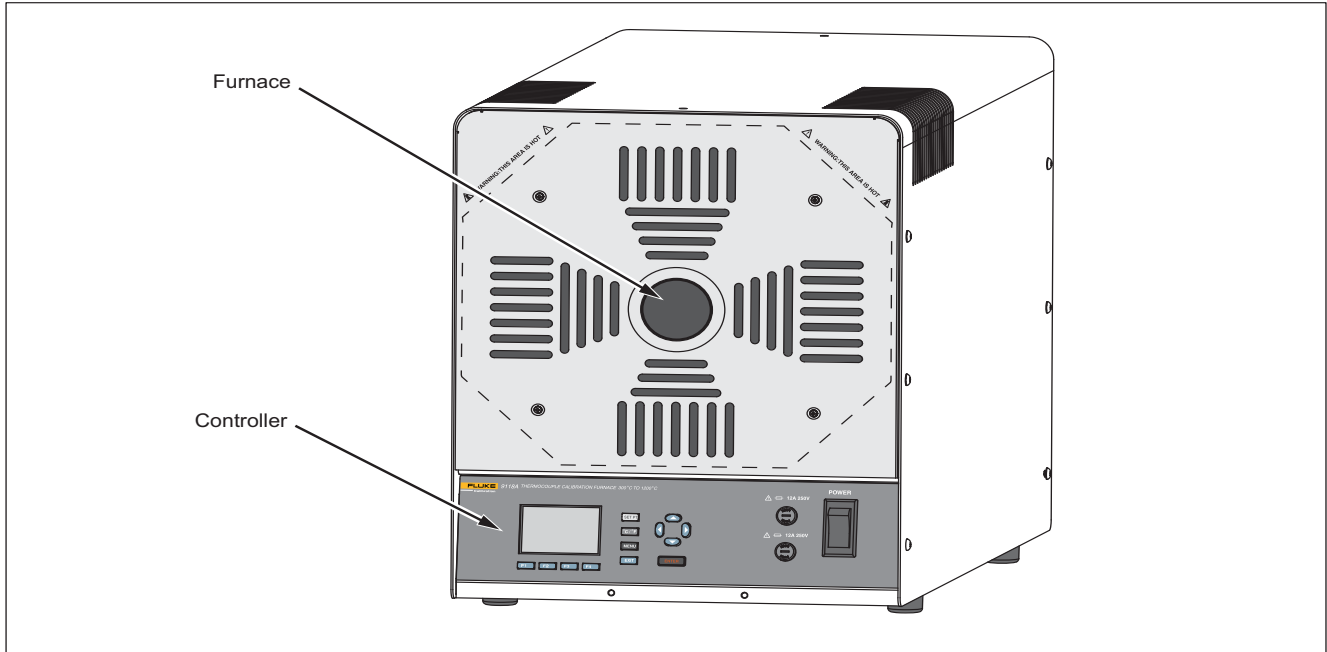


Figure 1. Calibration Tube Furnace

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Front-Panel Controls

Figure shows the front-panel controls of the Product and Table 2 is a list of control descriptions.

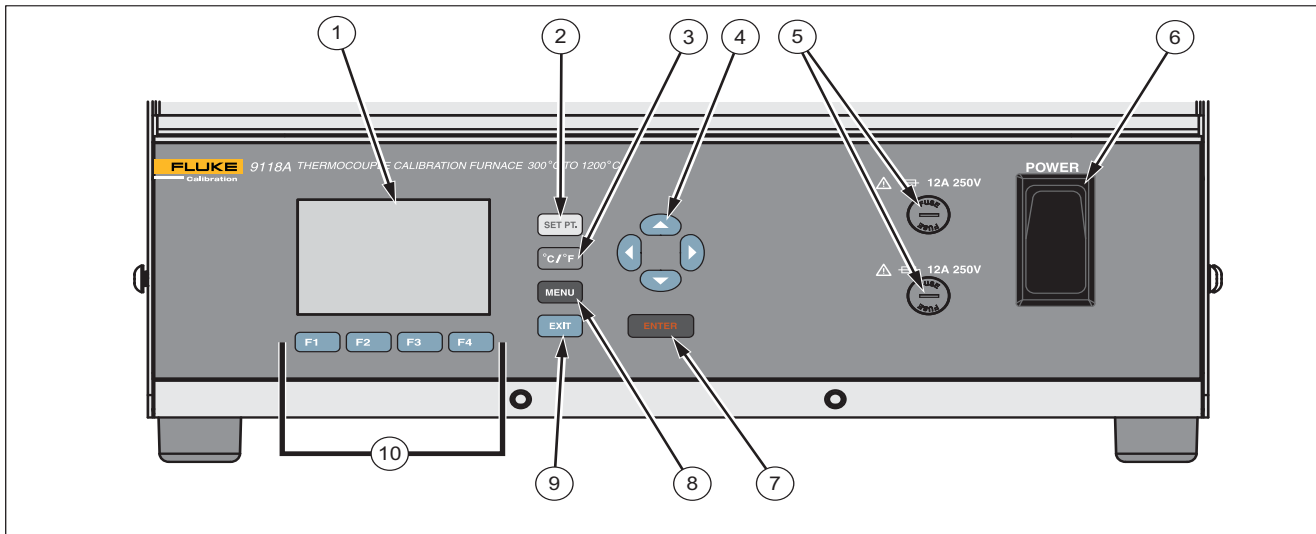


Figure 2. Front-Panel Controls

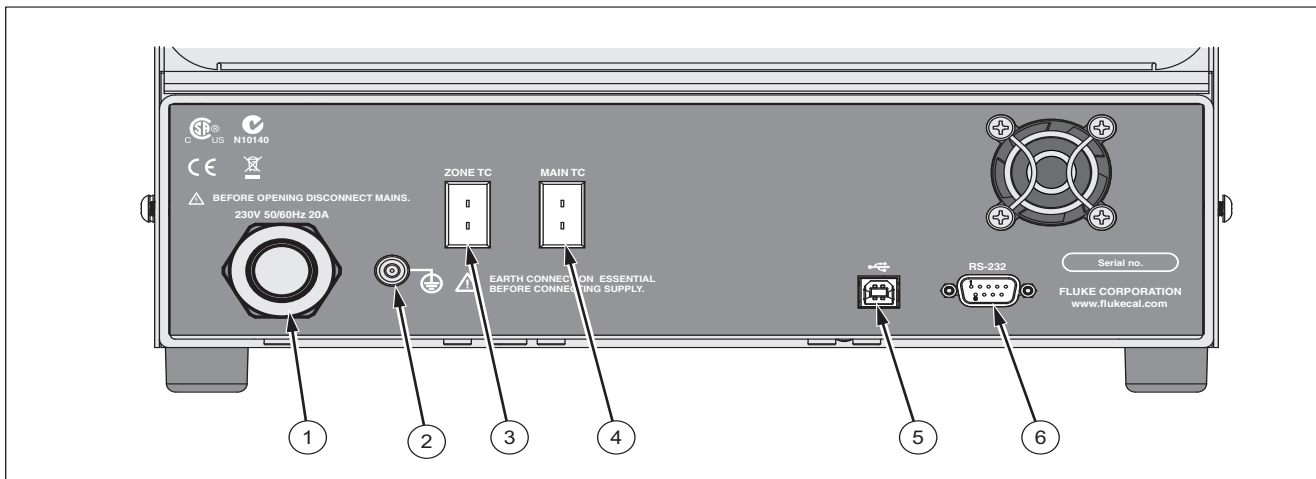
gxs007.eps

Table 2. Front-Panel Controls

Item	Description	Item	Description
①	LCD Display	⑥	Mains power switch
②	Set a temperature setpoint into the Product.	⑦	Used to set a value into the Product and choose a menu.
③	Sets the Product to show temperatures in Celsius or Fahrenheit.	⑧	Menu button shows the main menu in the display.
④	Moves through menus and adjusts numbers.	⑨	Exits the menu shown in the display and moves to the previous menu.
⑤	Furnace fuses	⑩	Softkeys (F1 through F4) are used to select the function that shows in the display above the softkey.

Rear-Panel Connections

Figure 3 shows the rear-panel connections of the Product and Table 3 is a list of connector descriptions.



gxs008.eps

Figure 3. Rear-Panel Connections

Table 3. Rear-Panel Connections

Item	Description	Item	Description
①	Mains power cord	④	Main thermocouple input jack
②	Protective Earth Terminal	⑤	USB connector
③	Zone thermocouple input jack	⑥	RS-232 connector

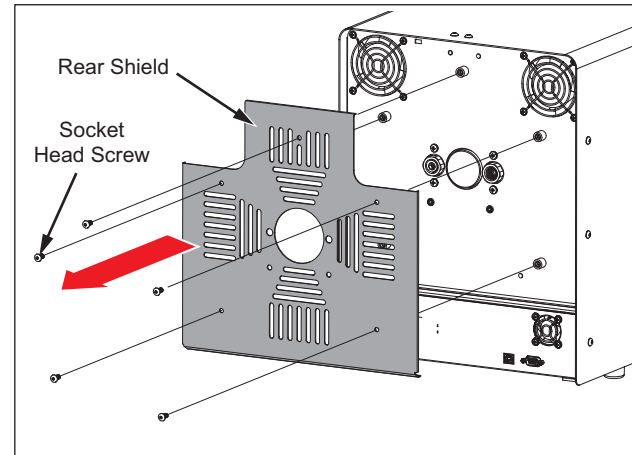
Protection Tube and Support Bracket Installation (and Optional Isothermal Block)

⚠ Warning

To prevent personal injury, disconnect the Product from mains power and when applicable, allow to cool to 80 °C prior to performing any maintenance or installation work on the Product.

To install two protection tubes and a thermocouple (TC) support bracket and optional isothermal block (9118A-ITB):

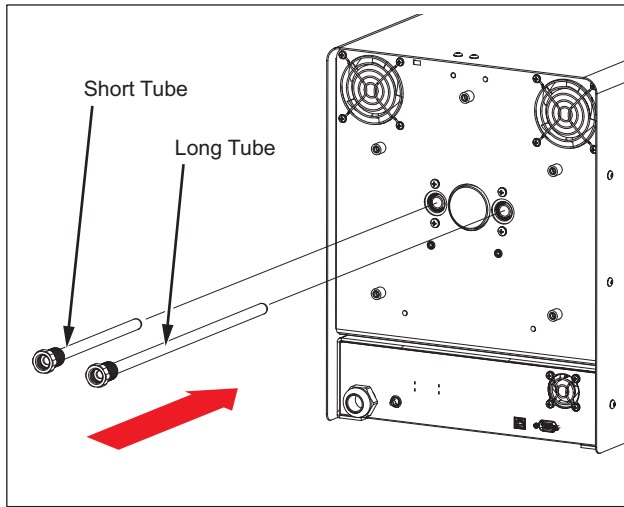
1. Remove the five socket-head screws and take down the rear shield from unit. See Figure 4.



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Figure 4. Rear Shield Removal

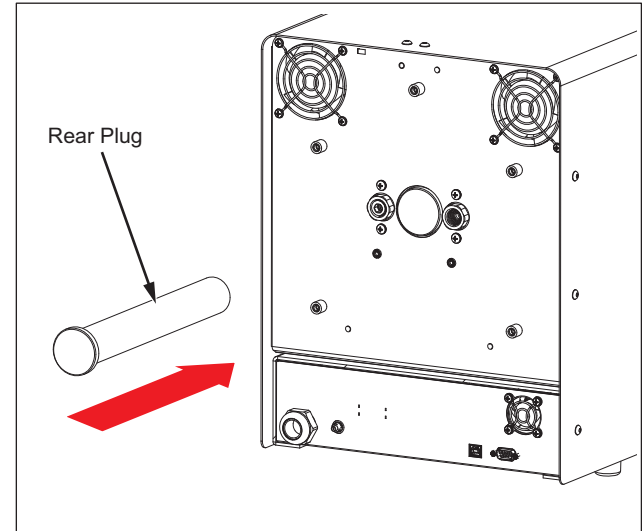
2. Insert the long and short protection tubes into flange nuts and screw them into position.
 - Long tube in the right side.
 - Short tube in the left side. See Figure 5.



gxs125.eps

Figure 5. Short Tube and Long Tube Insertion

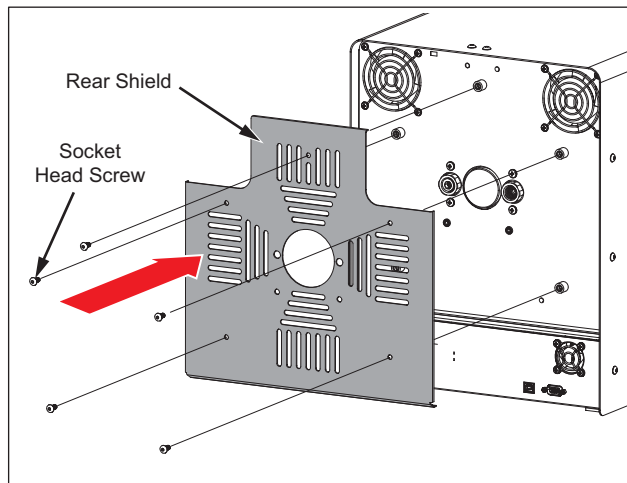
3. This step is only for the optional isothermal block (9118A-ITB). Insert the rear plug carefully into position. See Figure 6.



gxs126.eps

Figure 6. Rear Plug Insertion

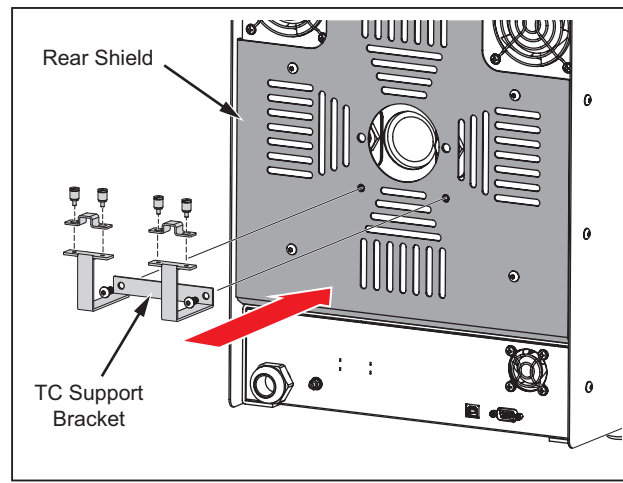
4. Attach the rear shield with the five socket-head screws. See Figure 7.



gxs127.eps

Figure 7. Attach the Rear Shield

5. Install the thermocouple support bracket on the rear shield. See Figure 8.



gxs128.eps

Figure 8. Attach the Support Bracket

6. This step is only for the optional isothermal block (9118A-ITB). Insert the isothermal block into the ceramic tube from the front side of the Product. Make sure that the front plug is in contact with the side of the ceramic tube. The position of block must be as shown in Figure 9.

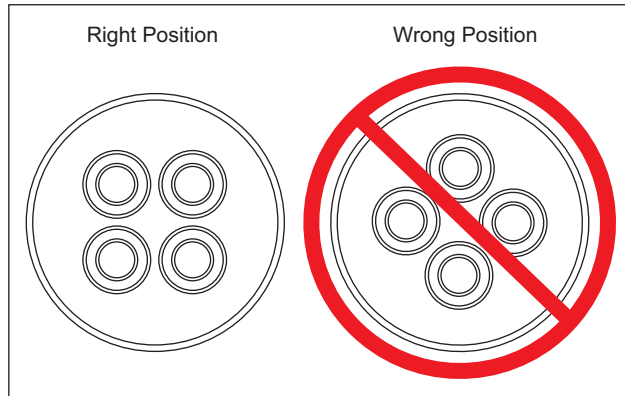


Figure 9. Front Plug Insertion

Probe Installation

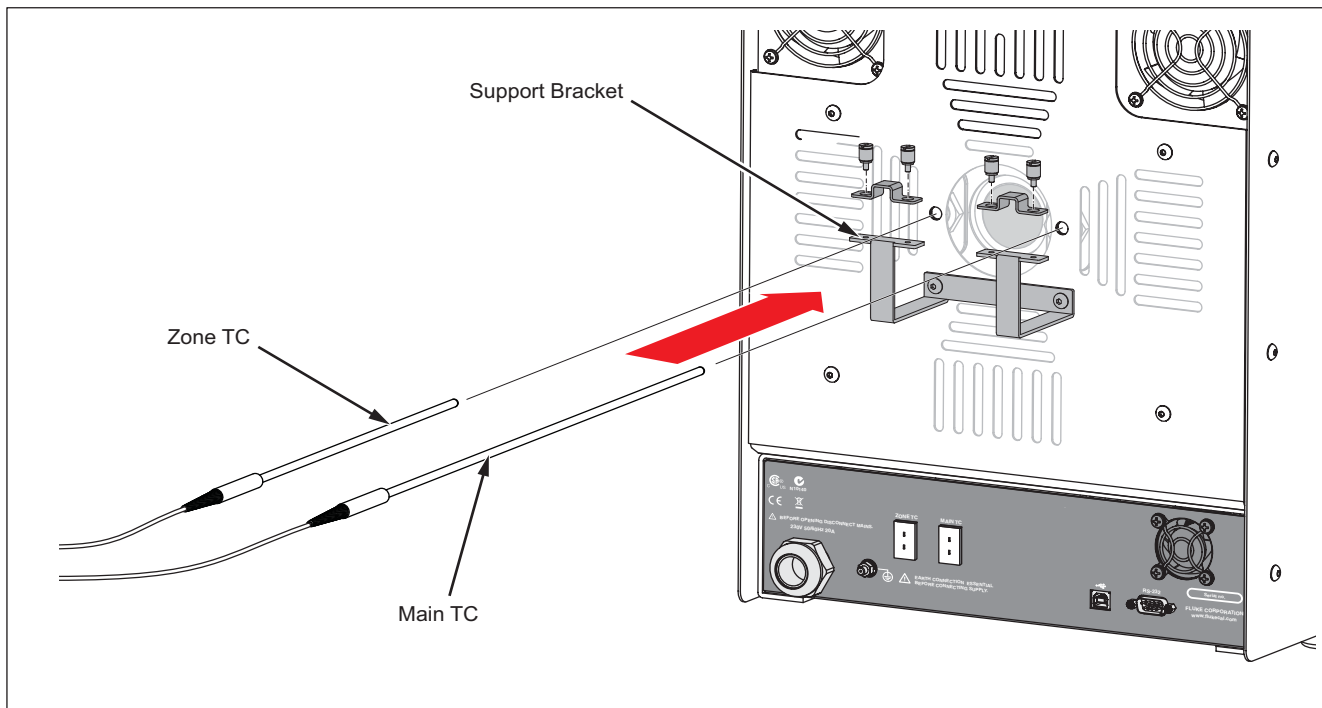
Note

When you put the temperature control probes into their applicable protection tube (see steps 2 and 6 below), make sure the end surface of the probe handle is aligned with the edge of the TC support bracket. Failure to do so may cause the Product to be out of calibration.

Two thermocouples are used as temperature control probes. These probes are put into the rear of the furnace and held in position with the TC support bracket.

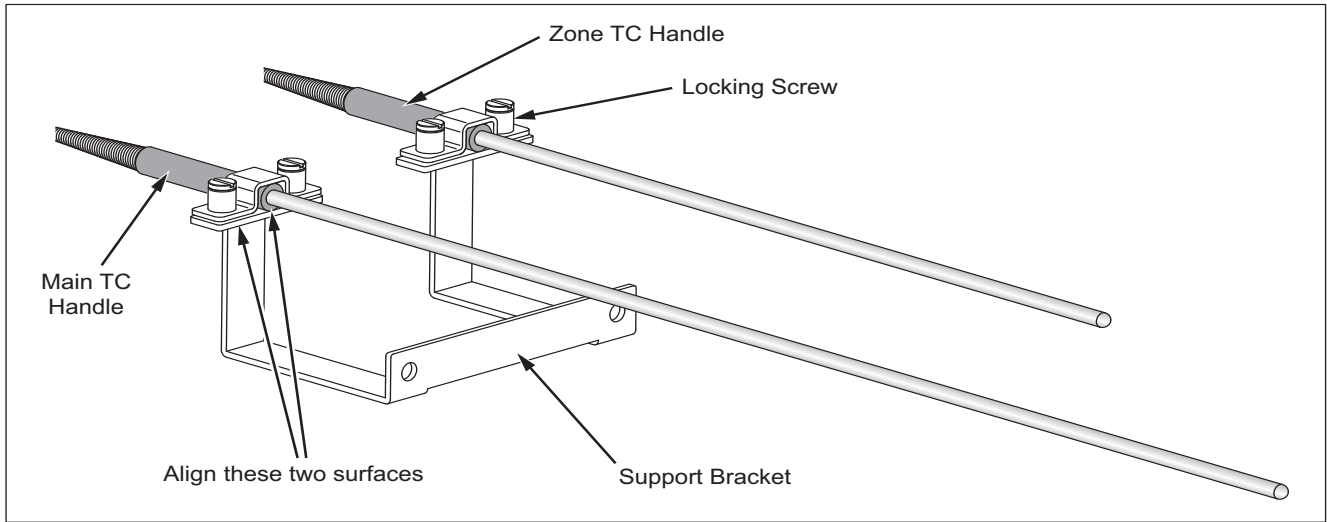
To install the control probes:

1. Put the long probe into the **MAIN TC** tube on the rear panel of the furnace.
2. Align the end surface of the thermocouple handle with the front edge of the bracket. See Figures 10 and 11.
3. Tighten the bracket screw to hold the thermocouple in position.
4. Connect the cable of the long probe to the **MAIN TC** connector on the rear panel.



gxs131.eps

Figure 10. Probe Installation A



gxs132.eps

Figure 11. Probe Installation B

⚠ Caution

To prevent damage to the thermocouple, do not over tighten the screw.

To prevent contamination of the thermocouple, always wear clean gloves when you handle the thermocouples.

5. Put the short probe into the **ZONE TC** tube on the rear panel of the furnace.
6. Align the end surface of the thermocouple handle with the front edge of the bracket. See Figures 11 and 10.
7. Tighten the bracket screw to hold the thermocouple in position.
8. Connect the cable of the short probe to the **ZONE TC** connector on the rear panel.

The Isothermal Block

The Isothermal Block consists of:

- Front ceramic plug
- Four ceramic guide tubes
- Ceramic block
- Rear ceramic plug

Items 1-3 are fixed together by high temperature cement. The isothermal block is intended to stabilize temperature fluctuations and improve heat conduction between the furnace and the sensor under test. The “block” is made of aluminum-oxide and provides a relatively constant and accurate temperature environment for the sensor under test. Four 6.7 mm diameter wells are provided.

To install the insert:

1. Carefully remove the isothermal block from the packaging.

The well must be clear of any foreign objects such as dirt or grit before the isothermal block is installed.

2. Carefully insert the isothermal block into the well from the front of the furnace until the front plug contacts the well.
3. Rotate the insert to the correct position, as shown in Figure 9.
4. Insert the rear plug into the well from the rear of the furnace until it contacts the tube.

The fit between the block and the tube is typically loose in order to accommodate thermal expansion.

Connect to Mains Power

⚠⚠ Warning

For safe operation and maintenance of the product, remove moisture from the Product before you connect to mains power. Fluke Calibration recommends the Product be put in a low humidity temperature chamber at 50 °C for 4 hours or more.

To prevent possible electrical shock or personal injury, connect mains power cord correctly and make sure the product is grounded.

Be sure the power cord to the mains supply is wired correctly. The power cord wires are color-coded as follows:

- Black: Line
- White: Neutral
- Green: Ground

Attach a separate safety ground wire between the Protective Earth Terminal on the rear panel of the Product and an earth ground conductor.

Connect the supplied ground wire between the protective earth terminal on the rear panel and earth ground. Use the 2.5 meter power cord to connect the Product to a 230 V ac outlet rated for 20 amps.

How to Turn on the Product

Push the “I” side of the power switch, on the front panel of the Product. The screen shown in Figure shows in the display while the Product does a self test.



gxs001.eps

Figure 12. Power-Up Screen

How to Turn Off the Product

⚠ Warning

To avoid personal injury, do not disconnect the product from mains power if the furnace temperature is greater than 80 °C.

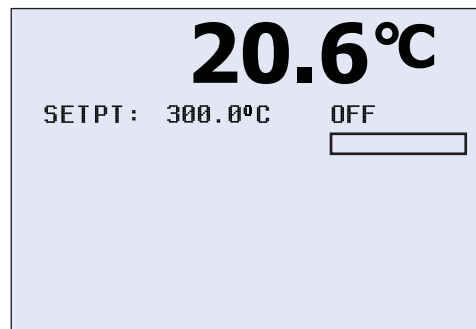
⚠ Caution

To prevent possible damage to the Product, disable the temperature control first and then turn off power.

To turn off the Product:

1. Push **SET PT.**.
2. Push the softkey under SAVE/DISABLE to disable the heaters.
3. Push the “O” side of the power switch, on the front panel of the Product.

When the self test is complete and no errors are sensed, the screen shown in Figure 13 shows in the display. The Product is in a standby mode. You must set a setpoint temperature to start control of the furnace. See the “Adjust Furnace Temperature” section to learn how to start the temperature control of the furnace.



qxs002.bmp

Figure 13. Main Screen

Setup

Set the Language

Text in the LCD display can be set to show in a different language. To set the language:

1. Push **MENU**.
2. Push the softkey below **System Menu**.
3. Push the softkey below **Display Menu**.
4. Push **◀** or **▶** to scroll through the languages.
5. When your language is shown in the display, push **ENTER**.

To toggle between the set language and English, push **F1** and **F2** at the same time.

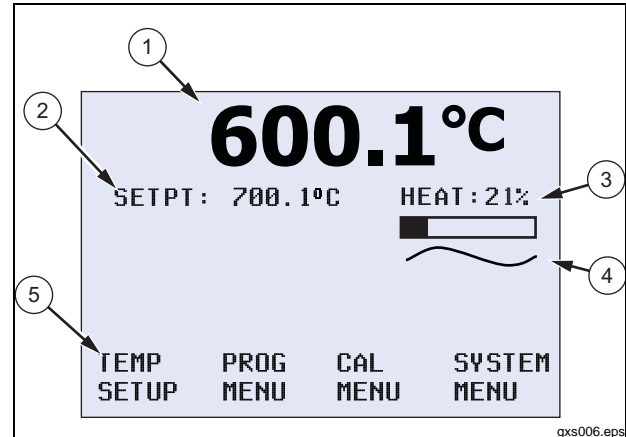
Set Display Contrast

With the main screen shown in the display, push **☰** to decrease display contrast. Push **☷** to increase display contrast.

Display

Table is a list of display elements with descriptions.

Table 4. Display Elements



gxs006.eps

Item	Description
①	Furnace temperature
②	Setpoint temperature
③	Heat/Cool Status
④	Stability Indicator (— = stable, ~ = unstable)
⑤	Softkey functions

Operation

⚠️⚠️ Warning

For safe operation and maintenance of the product:

- **Energize the Product for a 2 hour dry-out period before use, if the Product was:**
 - In transport
 - In a humid or semi-humid storage environment
 - Not energized for more than 10 days
- **Remove moisture from the Product before you connect to mains power. Fluke Calibration recommends the Product be put in a low humidity temperature chamber at 50 °C for 4 hours or more. While the Product dries, do not assume the Product complies with all safety standards.**
- **Put temperature probes you remove from the Product on a heat resistant rack or surface until they are safe to touch.**
- **Keep a minimum of 45 cm clearance from the front, left, and right sides. Keep 150 cm from the top of the Product.**

Notes

In order for the Product to perform within specification, the open ends of the furnace tube (both front and rear) must be filled with a temperature-resistant fiber ceramic insulating material such as a Superwool Plus Blanket.

Fiber ceramic insulation contains a binding material that will off-gas when first exposed to high temperatures producing a harmless odor. Once the binding material has off-gassed completely, the odor will no longer persist with subsequent uses of the furnace.

⚠️ Warning

To avoid personal injury or skin irritation, wear disposable latex gloves (or equivalent) when handling fiber ceramic material.

Refer to the *9118A Users Manual* for instructions on how to operate the Product.

Maintenance

⚠️⚠️ Warning

To prevent possible electrical shock, fire, or personal injury:

- Do not operate the Product with covers removed or the case open. Hazardous voltage exposure is possible.
- Use only specified replacement parts.
- Have an approved technician repair the Product.

⚠️ Caution

To prevent possible damage to the Product:

- Do not use fluids to clean the well.
- Do not use harsh chemicals on the Product surfaces.
- Do an over-temperature cutout test a minimum of one time in a 6 month period.
- Make sure the well is clean and clear of unwanted material.
- Use the National Safety Council decontamination steps when hazardous material is spilt on or in the Product.

- Never introduce any foreign material into the probe hole of the Isothermal Block. Fluids, and can leak into the instrument and cause damage.
- Do not lift or move this instrument with the isothermal block in place. The isothermal block and rear plug can fall out of the Product.

Fluke Calibration recommends that you do an axial uniformity test when you receive the Product and at 6 month intervals. See the Furnace Calibration section in the *9118A Users Manual*.

Cutout Test

Fluke Calibration recommends you do a minimum of one cutout test in 6 months. To do a cutout test:

1. Push **SET PT.**.
2. Set the setpoint temperature to 400 °C and let the furnace temperature become stable.
3. Push **ENTER**.
4. Push **MENU**.
5. Push the softkey below **TEMP SETUP**.
6. Push the softkey below **CUTOUT**.
7. Set the soft cutout to 300 °C.

The cutout indicator on the front panel illuminates and the furnace stops the heat cycle. If the cutout does not stop the heat cycle, the Product must be repaired.

8. Set the soft cutout temperature to 1240 °C.

How to Clean the Product

Clean the Product surfaces with a damp cloth and mild detergent. Make sure liquids do not go into the Product.

Note

Before you clean or decontaminate the Product with a procedure not recommended by Fluke Calibration, speak with a service center associate for more information.

Specifications for 9118A and 9118A-ITB

General Specifications

Operating Conditions

Operating Temperature.....	5 °C to 40 °C
Storage Temperature	-20 °C to 70 °C
Humidity	80 % maximum for temperatures <31 °C, decreasing linearly to 50 % at 40 °C
Altitude	<2000 m
Power Requirements.....	230 V ac (± 10 %), 50/60 Hz, 20 A
Heater Power	4000 watts at 230 V ac

Over-current Protection

System	20 A, 250 V resettable circuit breaker
Main Heater Fuse.....	F 12 A, 250 V
Zone Heater Fuse	F 12 A, 250 V
Computer Interface.....	RS-232 and USB
Display.....	Monochrome LCD, °C or °F user-selectable
Display Resolution.....	0.1 °C or °F
Size (H x W x L)	400 mm x 337 mm x 700 mm
Net Weight.....	29 kg (without isothermal block)

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Isothermal Block (optional)

Isothermal Block Construction	Alumina
Block Outer Diameter.....	37 mm
Block Length	380 mm
Well Diameter (four wells total).....	6.7 mm
Well Depth	365 mm
Net Weight	0.84 kg (isothermal block only)

Accuracy Specifications

All accuracy specifications except temperature are for a period of 1 year after calibration, at 13 °C to 33 °C.

Note

The furnace can be used with or without an isothermal block installed. Unique calibration parameters are necessary for each configuration. Calibration does NOT come standard from the factory for each configuration. Ensure that the furnace has been properly calibrated for the desired mode of operation.

Furnace Temperature Range..... 300 °C to 1200 °C

Set-Point Accuracy

±5 °C

Radial Uniformity

Temperature	9118A (14 mm from geometry central point)	9118A-ITB (hole to hole)
300 °C	±0.5 °C	±0.1 °C
700 °C		±0.20 °C
1200 °C		±0.25 °C

Axial Uniformity

Temperature	9118A (±30 mm axial length from geometry central point)	9118A-ITB (at 60 mm from full immersion)
Full Range	±0.25 °C	±0.2 °C

Temperature Stability

Specification	9118A	9118A-ITB
Stability	±0.2 °C	±0.1 °C
Stabilization Time	2 hours, full range	3 hours at or below 700 °C 2 hours above 700 °C
Note: Temperature stability measured as 2-sigma over 30 minutes		

Heating Time (23 °C to 1200 °C)

9118A 40 minutes
9118A-ITB 45 minutes

Cooling Time (1200 °C to 300 °C)

9118A 180 minutes
9118A-ITB 200 minutes

