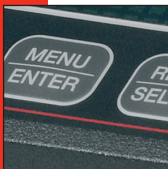


User Manual
Compact Signal Calibrator
CSC201



Ametek JOFRA CSC201 Reference Manual

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1. Introduction

The AMETEK CSC201 Compact Signal Calibrator is a handheld, battery-operated instrument that measures and simulates physical and electrical parameters. The calibrator has the following features and functions:

- A large easy to read display used to display all supported physical and electrical parameters.
- Temperature measurement and simulation using resistance temperature detectors (RTDs), thermocouples (TCs) and thermistors.
- Signal measurement and sourcing capabilities for resistance and voltage (millivolts) in the RTD and TC mode.
- Extended and comprehensive pressure measurement capabilities with JOFRA APM
- A thermocouple (TC) input/output terminal with automatic reference-junction temperature compensation.
- An interactive menu
- Complete RS232 interface for remote control

1.1 Contacting Ametek

US, Canada, Latin America
Europe, Africa, Middle East

Asia

AMETEK TCI at **1-800-527-9999**
AMETEK Denmark A/S at
+ 45 4816 8000
AMETEK Singapore Pte. Ltd. at
+ 65 (64) 842 388

1.2 Standard Equipment

Check to see if your calibrator is complete. It should include:
CSC201 Calibrator
Instruction Manual
Test Leads

1.3 Safety information

Symbols Used

The following table lists the International Electrical Symbols. Some or all of these symbols may be used on the instrument or in this manual.

Symbol	Description
	AC (Alternating Current)
	AC-DC
	Battery
	CE Complies with European Union Directives
	DC
	Double Insulated
	Electric Shock
	Fuse
	PE Ground
	Hot Surface (Burn Hazard)
	Read the User's Manual (Important Information)
	Off
	On
	Canadian Standards Association
	This calibrator must be recycled or disposed of properly (2002/96/EC).

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.

Use the calibrator only as specified in this manual, otherwise injury and damage to the calibrator may occur.



The CSC201 is designed to calibrate and measure low voltage process signals. To ensure the safety of the operator, DO NOT connect the CSC201 to inputs greater than 30 Volts.



To avoid possible electric shock or personal injury:

- Do not apply more than the rated voltage. See specifications for supported ranges.
- Follow all equipment safety procedures.
- Never touch the probe to a voltage source when the test leads are plugged into the current terminals.
- Do not use the calibrator if it is damaged. Before you use the calibrator, inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.
- Select the proper function and range for your measurement.
- Make sure the battery cover is closed and latched before you operate the calibrator.
- Remove test leads from the calibrator before you open the battery door.
- Inspect the test leads for damaged insulation or exposed metal. Check test leads continuity. Replace damaged test leads before you use the calibrator.
- When using the probes, keep your fingers away from the probe contacts. Keep your fingers behind the finger guards on the probes.
- Connect the common test lead before you connect the live test lead. When you disconnect test leads, disconnect the live test lead first.
- Do not use the calibrator if it operates abnormally. Protection may be impaired. When in doubt, have the calibrator serviced.
- Do not operate the calibrator around explosive gas, vapor, or dust.

- When using a pressure module, make sure the process pressure line is shut off and depressurized before you connect it or disconnect it from the pressure module.
- Disconnect test leads before changing to another measure or source function.
- When servicing the calibrator, use only specified replacement parts.
- To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator appears.
- To avoid a violent release of pressure in a pressurized system, shut off the valve and slowly bleed off the pressure before you attach the pressure module to the pressure line.
- To avoid personal injury or damage to the calibrator, use only the specified replacement parts and do not allow water into the case.



Caution

To avoid possible damage to calibrator or to equipment under test:

- Disconnect the power and discharge all high-voltage capacitors before testing resistance or continuity.
- Use the proper jacks, function, and range for your measurement or sourcing application.
- If the message changes to "OL" the range limit is exceeded and the pressure source must immediately be removed from the APM to prevent damage to the pressure transducer inside.
- Maximum torque allowed is 13.5 Nm/10 ftlbs. NEVER exceed the torque allowed.
- To avoid damaging the plastic lens and case, do not use solvents or abrasive cleansers.

Clean the calibrator with a soft cloth dampened with water or water and mild soap.

2. Calibrator Interface

Figure 1 shows the location of the input and output connections on the calibrator, while Table 1 describes their use.

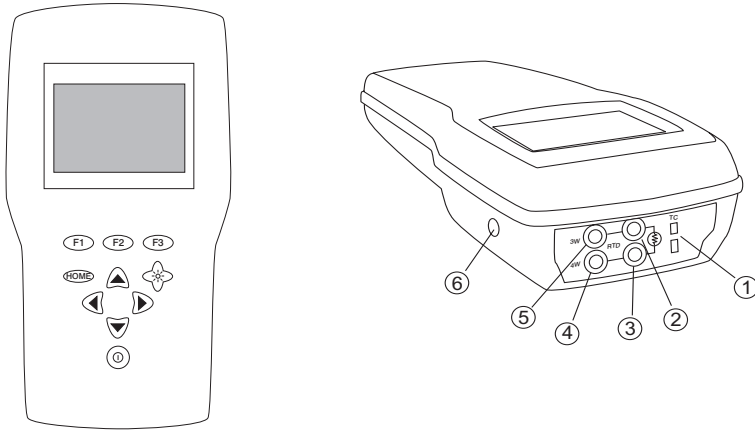


Figure 1. Input/Output Terminals

Table 1: Input and Output Terminals

No.	Name	Description
1	TC input/output	Terminal for measuring, or simulating thermocouples. Accepts miniature polarized thermocouple plugs with flat in-line blades spaced 7.9 mm (0.312 in) center to center.
2,3	Source/Measure RTD 2W	Terminals for sourcing and measuring 2W RTDs and resistance. Sense terminals for 4W RTD and resistance measurement
4,5	Measure RTD 3W 4W	Terminals for performing RTD measurements with 3-wire or 4-wire setups.
6	Pressure module connector/Serial port	Connects calibrator to a pressure module for pressure measurements or connects calibrator to a PC for remote control.

Figure 2 shows the location of the keys on the calibrator. Table 2 lists the functions of each key.

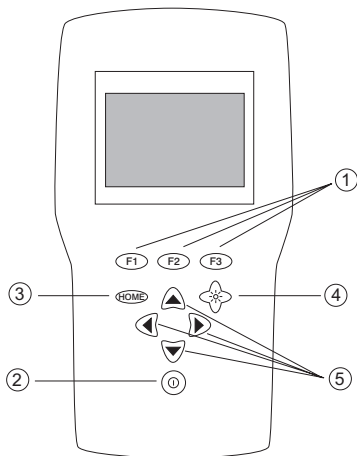


Figure 2. Keypad

Table 2. Key Functions

No.	Name	Function
1	Function Keys	These keys are used in various ways, primarily to configure the calibrator
2	ON/OFF Key	This key is used to turn the calibrator on and off
3	Home	Returns to home menu on the menu bar.
4	Backlight Key	This key is used to turn the backlight on and off
5	Cursor Keys	These keys are used for setting user input values

2.1 Main Display

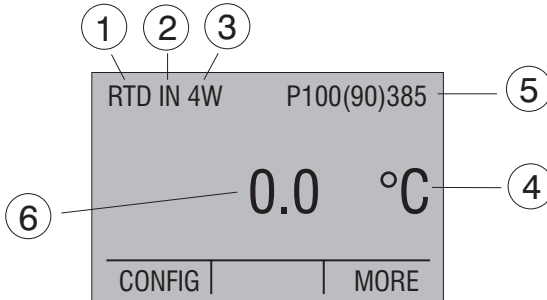


Figure 3. Display

The display of the calibrator, shown in Figure 3, is divided into two sections: the main display and the menu bar.

The main display is used for both measuring and sourcing.

The menu bar is used to setup the display to perform the desired function.

Table 3 explains the different parts of the display:

Table 3: Display Functions

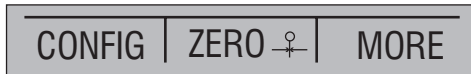
No.	Name	Description
1	Primary Parameters	Determines what parameter is going to be measured or sourced. The available options are TC (thermocouple), RTD, and PRESSURE.
2	Input/Output control	Switches the display between input mode (read), and output mode (source).
3	Additional Settings	Available only for TC (thermocouple), and RTD measurements. For TC this setting turns the CJC (Cold Junction Connection) on and off. For RTD measure [RTD IN], this setting sets the number of wires used in the measurement (2-wire, 3-wire, or 4-wire)
4	Units	Shows what unit the measurement or source value is in. Available options are °C, °F and K for RTD and TC.
5	Sensor Types	Allow for measurements to be made for different types of RTDs and TCs. All types are shown in the Specifications.
6	Numeric Displays	Display the numeric values of the signal being measured, or sourced. An "OL" reading indicates an out of range or overload condition.

2.2 Menu Bar

The parameters on the display are controlled by the menu bar, which is located at the bottom of the LCD. The function keys (F1, F2, and F3) are used to navigate through all the levels and choices of the menu bar. Refer to the menu tree for a clarification on the layout of all the levels.

The top level of the menu is the home menu. It can be accessed anytime by pressing the HOME key. There are two variations of the home menu: the input home menu and the output home menu.

There are up to three options for the input home menu. They are [CONFIG], [ZERO] and [MORE]. [CONFIG] is used to enter the parameter selection menu. [ZERO] is only available when the pressure mode is selected. [MORE] allows access to further menus.



In the output home menu there are three active options, [CONFIG], [STEP] or [RAMP] and [MORE]. [CONFIG] and [MORE] serve the same purpose as



in the input home menu. STEP or RAMP either steps or ramps the output.

The contrast menu is usually the next menu level. Its options are [CONTRAST], [NEXT], and [DONE]. The [CONTRAST] option is used to



adjust contrast. [NEXT] proceeds to the auto off main menu, and [DONE] returns to home menu. Contrast is adjusted using the cursor keys.

The auto off main menu contains the options [AUTO OFF], [NEXT], and [DONE].



The [AUTO OFF] option is used to turn the automatic shutoff on and off and set the amount of time the unit needs to stay dormant to shut off. [NEXT] and [DONE] return to the home menu.

AUTO FUNC	NEXT	DONE
-----------	------	------

When the calibrator is in any source mode, the auto output main menu is added. The options available on this menu are [AUTO FUNC], [NEXT] and [DONE]. The [AUTO FUNC] option allows you to turn the RAMP/STEP functions on or off. [NEXT] is used to access the contrast main menu and done returns to the home menu.

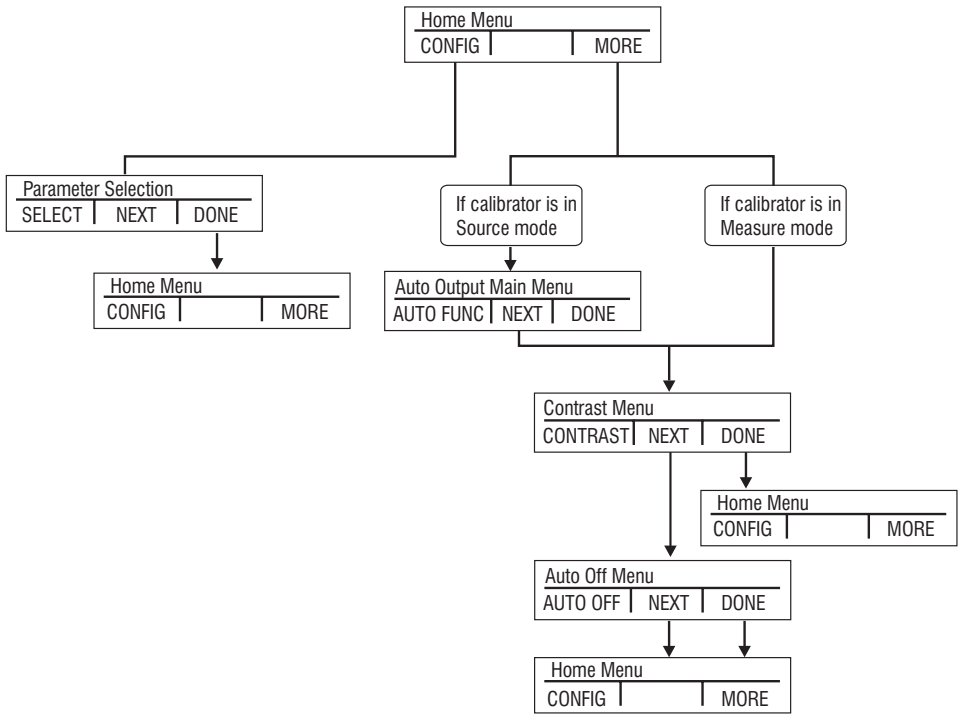


Figure 4. Simplified Menu Tree

3. Using Measure Modes

3.1 Measuring Temperature

3.1-1 Using Thermocouples

The calibrator supports the following thermocouple types: B, C, E, J, K, L, N, R, S, T, U, BP, and XK. The characteristics of all the types are described in the Specifications section. The calibrator also has a Cold Junction Compensation (CJC) function. Normally this function should be ON and the actual temperature of the thermocouple will be measured. With CJC OFF, the calibrator will measure the difference between the thermocouple at the junction and at its TC input terminal.

Note: CJC off mode should only be used when calibration is being done using an external ice bath.

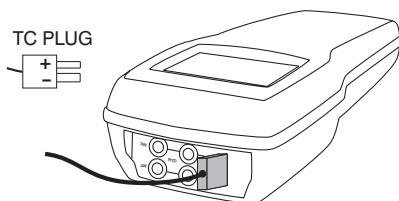
To use the thermocouple to measure temperature, follow these steps:

1. Attach the thermocouple leads to the TC miniplug, and insert the plug into the input/output of the calibrator, as in Figure 5.

Note: For best accuracy wait 2 to 5 minutes for the temperature between the miniplug and the calibrator to stabilize before any measurements are taken.

2. Press [CONFIG] to enter the configuration mode.
3. Select TC from the primary parameters. Choose [IN] in the input/output control, and then the thermocouple type from the sensor types. The temperature unit may also be changed from Celsius to Fahrenheit or Kelvin.

The calibrator can also measure the mV signal from a Thermocouple, which can be used along with a table in case the corresponding TC type is not supported by the calibrator. To do so, proceed as above and choose mV as a sensor type.



Note: The TC wire used must match the thermocouple type being calibrated.

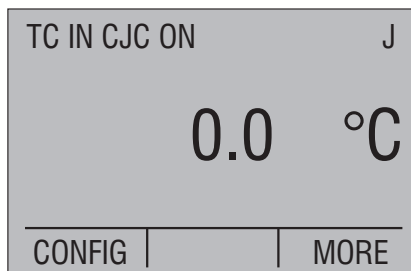


Figure 5. Measuring Temperature Using Thermocouple Terminals

3.1-2 Using Resistance-Temperature-Detectors (RTDs)

The supported types of RTDs are shown in the Specifications section. RTDs are characterized by their 0°C resistance, R0. The calibrator accepts two, three, and four wire inputs, with four wire input being the most accurate.

To use the RTD option, apply the following steps:

1. Press [CONFIG] to enter the configuration mode..
2. Select RTD from the primary parameters. Select [IN] from input/output control.
3. Choose 2, 3, or 4-wire connection [2W, 3W, 4W]. (4-wire allows for the most precise measurement)
4. Select RTD type from the sensor types.
5. Attach RTD leads as shown in Figure 6.

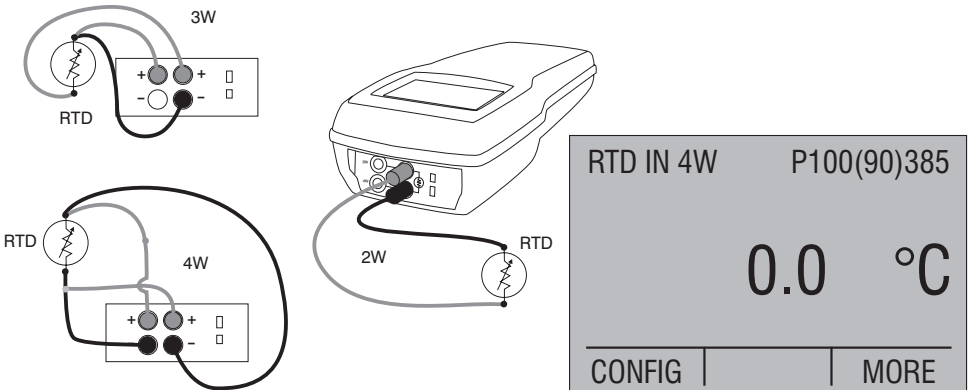


Figure 6. Measuring Temperature with RTD Connection

Resistance can also be measured using this function. To do so, use the above procedure and choose OHMS from the sensor types. This option can be used along with a table to measure an RTD which is not programmed into the calibrator.

3.2 Measuring Pressure



To avoid a violent release of pressure in a pressurized system, shut off the valve and slowly bleed off the pressure before you attach the pressure module to the pressure line.

Caution

To avoid mechanically damaging the pressure module, never apply more than 13.5 Nm/10 ftlbs. of torque between the pressure module fittings, or between the fittings and the body of the module.

To avoid damaging the pressure module from overpressure, never apply pressure above the rated maximum printed on the module.

To avoid damaging the pressure module from corrosion, use it only with specified materials. Refer to the pressure module documentation for material compatibility.

To measure pressure, follow these steps:

1. Connect the pressure module to the calibrator as shown in Figure 7.
2. Press [CONFIG] to enter the configuration mode.
3. Select [PRESSURE] from the primary parameters.
4. Select the desired measuring unit.
5. Zero the pressure module. The zero function on the calibrator can be found in the pressure zeroing menu.

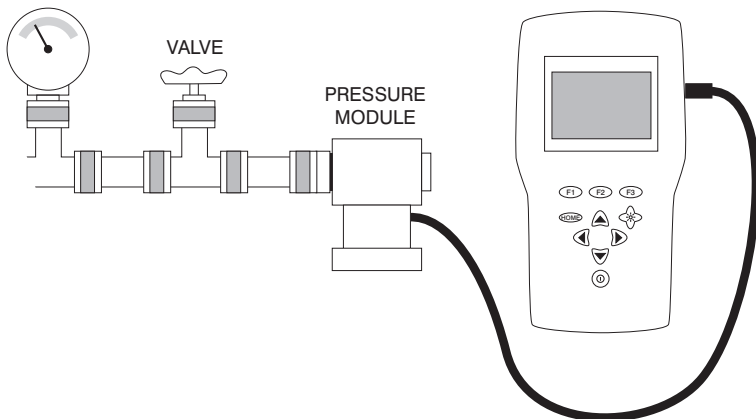


Figure 7. Connections for Measuring Pressure

3.2-1 Zeroing with Absolute Pressure Modules.

To zero, adjust the calibrator to read a known pressure, such as barometric pressure.

To adjust the calibrator, follow these steps:

1. Select [ZERO $\frac{\circ}{+}$]. [SET REFERENCE ABOVE] will appear. Enter the pressure using the cursor keys.
2. The calibrator stores the Barometric zero offset in non-volatile memory. The zero offset is stored for one absolute pressure module at a time. If a new absolute module is connected this process must be repeated.

4. Using Source Modes

The calibrator can generate calibrated signals for testing and calibrating. It can simulate the electrical output of RTD and thermocouple temperature sensors.

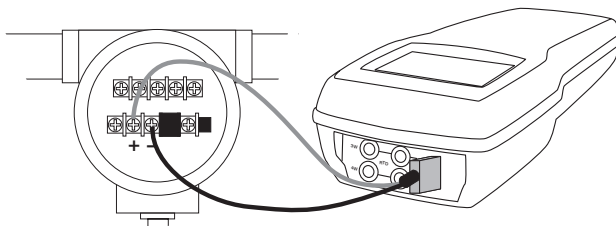
4.1 Setting 0% and 100% Output Parameters

To set the 0% and 100% points, use the following steps:

1. Use [CONFIG] to enter the configuration mode and choose the desired primary parameter.
2. Select output [OUT] from the input/output control, and enter the desired value. For example select [RTD OUT].
3. Press the right arrow key to bring up alternate functions for the function keys. Use the arrow keys to adjust the value to the desired 0% value. Press and hold the 0% key until "Set 0%" flashes on the screen.
4. Press the right arrow key to bring up alternate functions for the function keys. Use the arrow keys to adjust the value to the desired 100% value. Press and hold the 100% key until "Set 100%" flashes on the screen.
5. Use the F2 key to cycle from 0% to 100% in either 10% or 25% increments, depending on which is selected.

4.2 Using Auto Output Functions

There are two Auto Output functions; [STEP] and [RAMP]. When the [STEP] function is selected the calibrator steps from the 0% set source value to the 100% set source value in 10% or 25% increments. The word [STEP] turns to [STEPPING] when the [STEP] function is active. The [RAMP] function ramps the calibrator output from the 0% to 100% set source values. When the [RAMP] function is active the word [RAMP] turns to [RAMPING]. Both the [STEP] and [RAMP] functions will continue from 0% to 100% and back again until a key is pressed.



Note: TC wire used must match the thermocouple type being calibrated.

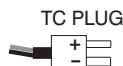


Figure 8. Connections for Outputting Thermocouples

4.3 Sourcing Thermocouples

To source a thermocouple use the following steps:

1. Connect the thermocouple leads to the appropriate polarized TC miniplug, and insert the plug into the TC terminals on the calibrator, as shown in Figure 8.
2. Press [CONFIG] and choose thermocouple [TC] from the primary parameters.
3. Choose output [OUT] from the input/output control.
4. Select the desired thermocouple type from the sensor types.
5. Enter the temperature using the cursor keys.

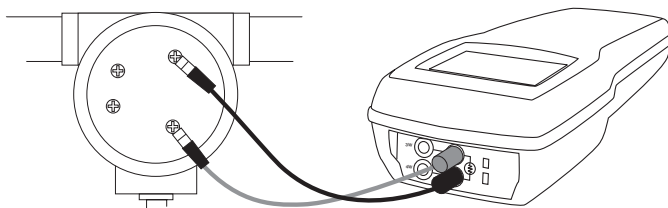
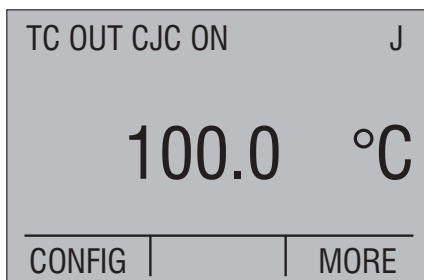


Figure 9. Connections for Outputting RTDs

4.4 Sourcing Ohms/RTDs

To source an RTD, follow these steps:

1. Press [CONFIG] and choose [RTD] from the primary parameters.
2. Choose output [OUT] from the input/output control, and select RTD type from the sensor types.
3. Connect the calibrator to the instrument being tested, as in Figure 19.
4. Enter the temperature or resistance using the cursor keys.

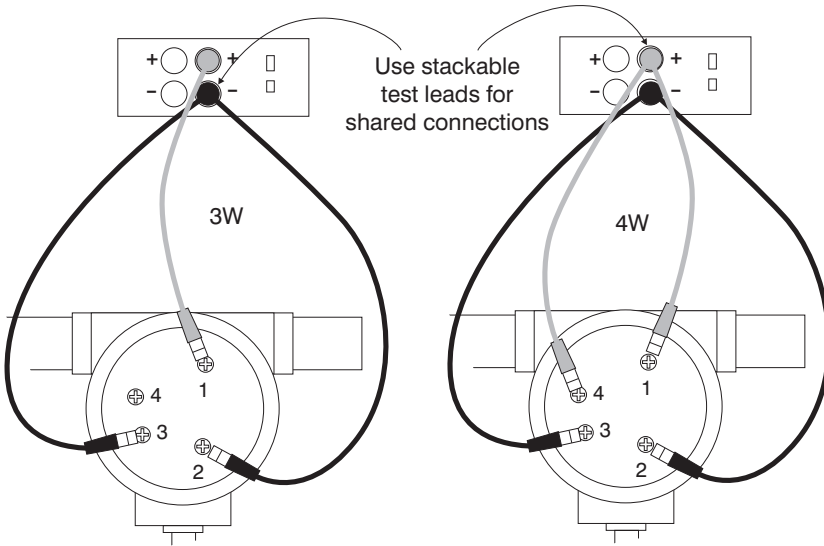
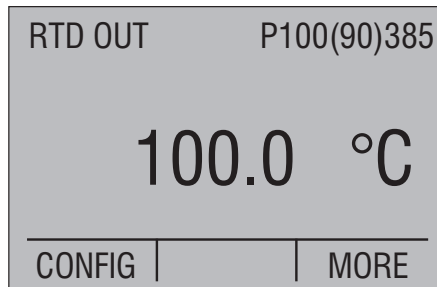


Figure 10. Using a 3- or 4-wire Connection for RTDs



Note: The calibrator simulates a 2-wire RTD. To connect 3- or 4-wire transmitter, use stacking cables, as shown in Figure 10.

4.4-1 Custom RTD

A custom curve-fit PRT may be entered into the calibrator for sourcing and measuring. To do so follow these steps:

1. Switch to lower display. Select RTD and set sensor type to CUSTOM.
2. Custom Coefficients can only be entered through the serial port.

The custom function uses the Calendar-Van Dusen equation for outputting and measuring custom RTDs. The coefficient C is only used for temperatures below 0°C. Only A and B coefficients are needed for the range above 0°C, so coefficient C should be set to 0. The R0 is the resistance of the probe at 0°C. The ITS 90 coefficients for PT385, PT3926, and PT3616 are shown in Table 4.

Table 4. RTD Coefficients

RTD	Range(°C)	R0	Coefficient A	Coefficient B	Coefficient C
PT385	-260 - 0	100	3.9083x10-3	-5.775x10-7	-4.183x10-12
PT385	0 - 630	100	3.9083x10-3	-5.775x10-7	---
PT3926	Below 0	100	3.9848x10-3	-5.87x10-7	-4x10-12
PT3926	Above 0	100	3.9848x10-3	-5.87x10-7	---
PT3916	Below 0	100	3.9692x10-3	-5.8495x10-7	-4.2325x10-12
PT3916	Above 0	100	3.9692x10-3	-5.8495x10-7	---

5. Remote Operation

The calibrator can be remotely controlled using a PC terminal, or by a computer program running the calibrator in an automated system. It uses an RS232 serial port connection for remote operation. With this connection the user can write programs on the PC, with Windows languages like Visual Basic to operate the calibrator, or use a Windows terminal, such as Hyper Terminal, to enter single commands. Typical RS232 remote configurations are shown in Figure 11.

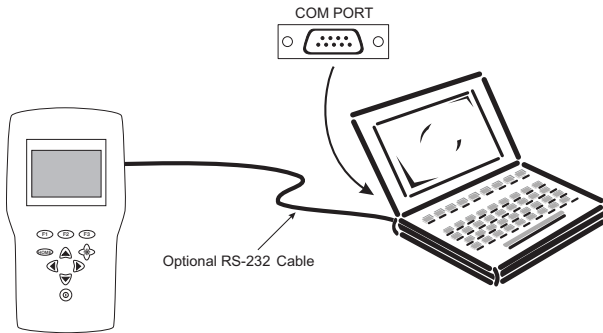


Figure 11. Calibrator-to-Computer Connection

6. Specifications

One year at 23°C ± 5°C, unless specified otherwise. Outside of this range the stability of the measurements is ± 0.003% of FS/°C.

Table 5: General Specifications

Operating Temperature	-10°C to 50°C
Storage Temperature	-20°C to 60°C
Power	4 X AA batteries; Alkaline or optional rechargeable
Battery Life	Approximately 20 hours
Serial Communications	ASCII; RS232
CE - EMC	EN61326: 2006, ANNEX A
Safety	EN/IEC 61010-1:2010 3rd Edition (Low Voltage Directive)
Size	9.3" x 3.8" x 2.3" (23.5cm x 9.7cm x 5.7cm)
Weight	Approximately 21oz. (0.6kg)

Table 6: Resistance Measurement

	Range	Accuracy (% of reading ± floor)
Ohms low	0.00Ω - 400.0Ω	0.015% ± 0.03Ω
Ohms high	401.0Ω - 4000.0Ω	0.015% ± 0.3Ω

Table 7: Resistance Source

Range	Excitation Current	Accuracy (% of reading ± floor)
Ohms low 5.0Ω - 400.0Ω	0.1mA - 0.5mA	0.015% ± 0.1Ω
5.0Ω - 400.0Ω	0.5mA - 3mA	0.015% ± 0.03Ω
Ohms high 400Ω - 1500Ω	0.05mA - 0.8mA	0.015% ± 0.3Ω
1500Ω - 4000Ω	0.05mA - 0.4mA	0.015% ± 0.3Ω

Note: Unit is compatible with smart transmitters and PLCs. Frequency response is ≤ 5ms.

Table 8: Thermocouple Measurement/Source

	Range	Accuracy (% of reading ± floor)
Read (mV)	-10.000mV - 75.000mV	0.015% ± 10μV
Source (mV)	-10.000mV - 75.000mV	0.015% ± 10μV

Maximum current output in voltage ranges is 1mA with an output impedance of ≤ 1Ω

Table 9: Thermocouple Read and Source (errors in °C)

TC Type	Range (°C)		Accuracy (°C)	
	Minimum	Maximum	CJC OFF	CJC ON
J	-210.0	-150.0	0.4	0.6
	-150.0	1200.0	0.2	0.4
K	-200.0	-100.0	0.5	0.7
	-100.0	600.0	0.2	0.4
	600.0	1000.0	0.3	0.5
T	1000.0	1372.0	0.4	0.6
	-250.0	-200.0	1.5	1.7
	-200.0	0.0	0.5	0.7
E	0.0	400.0	0.2	0.4
	-250.0	-200.0	1.0	1.2
	-200.0	-100.0	0.3	0.5
R	-100.0	1000.0	0.2	0.4
	0.0	200.0	1.7	1.9
	200.0	1767.0	1.0	1.2
S	0.0	200.0	1.7	1.9
	200.0	1767.0	1.1	1.3
B	600.0	800.0	1.5	1.7
	800.0	1000.0	1.2	1.4
	1000.0	1820.0	1.0	1.2
C	0.0	1000.0	0.5	0.7
	1000.0	2316.0	1.5	1.7
XK	-200.0	800.0	0.2	0.4
BP	0.0	800.0	1.9	2.1
	800.0	2500.0	0.6	0.8
L	-200.0	900.0	0.2	0.4
U	-200.0	0.0	0.4	0.6
	0.0	600.0	0.2	0.4
N	-200.0	-100.0	0.8	1.0
	-100.0	1300.0	0.3	0.5

CJC error outside of $23 \pm 5^\circ\text{C}$ is $0.05^\circ\text{C}/^\circ\text{C}$

Table 10: RTD Read and Source

RTD Type	Range (°C)		Accuracy (°C) 1 year	
	Minimum	Maximum	Measure 4W/Source	Measure 3W
P10(90)385	-200	100	0.85	2.20
	100	400	1.00	2.50
	400	800	1.20	2.80
P50(90)385	-200	100	0.20	0.50
	100	400	0.30	0.60
	400	800	0.40	0.70
P100(90)385	-200	100	0.15	0.25
	100	400	0.20	0.35
	400	800	0.30	0.45
P200(90)385	-200	100	0.40	0.50
	100	630	0.50	0.60
P400(90)385	-200	100	0.20	0.25
	100	630	0.25	0.30
P500(90)385	-200	100	0.20	0.25
	100	630	0.30	0.35
P1K(90)385	-200	100	0.15	0.20
	100	630	0.20	0.25
P50(90)391	-200	100	0.20	0.50
	100	400	0.30	0.60
	400	800	0.40	0.70
P100(90)391	-200	100	0.15	0.25
	100	400	0.20	0.35
	400	800	0.30	0.45
P100(90)392	-200	100	0.10	0.25
	100	630	0.20	0.35
M10(90)427	-100	260	0.75	2.00
M50(90)428	-180	200	0.15	0.40
M100(90)428	-180	200	0.10	0.20
H120(90)672	-80	260	0.10	0.15
P100(90)JIS	-200	100	0.10	0.25
	100	630	0.20	0.35
YSI(90)400	15	50	0.10	0.15

Table 11: Pressure Measurement

Units	Engineering Unit Factor
Psi	1
bar	0.06894757
mbar	68.94757
kPa	6.894757
MPa	0.00689476
kg/cm2	0.07030697
cmH2O @ 4°C	70.3089
cmH2O @ 20°C	70.4336
mmH2O @ 4 °C	703.089
mmH2O @ 20°C	704.336
inH2O @ 4°C	27.68067
inH2O @ 20°C	27.72977
inH2O @ 60°F	27.70759
mmHg @ 0°C	51.71508
inHg @ 0°C	2.03602

Ranges, Resolution and Accuracy are determined by the module

7. Maintenance

7.1 Replacing Batteries

Replace batteries as soon as the battery indicator turns on to avoid false measurements. If the batteries discharge too deeply the calibrator will automatically shut down to avoid battery leakage.

Note: Use only AA size alkaline batteries.

7.2 Cleaning the Unit



To avoid personal injury or damage to the calibrator, use only the specified replacement parts and do not allow water into the case.



Caution

To avoid damaging the plastic lens and case, do not use solvents or abrasive cleansers.

Clean the calibrator with a soft cloth dampened with water or water and mild soap.

7.3 Service Center Calibration or Repair

Only qualified service personnel should perform calibration, repairs, or servicing not covered in this manual. If the calibrator fails, check the batteries first, and replace them if needed.

Verify that the calibrator is being operated as explained in this manual. If the calibrator is faulty, send a description of the failure with the calibrator. Be sure to pack the calibrator securely, using the original shipping container if it is available.

7.4 Replacement Parts & Accessories

SPK-CSC-003	Operating Manual
2206011	Wire adapter kit - Type K thermocouple
2206012	Wire adapter kit - Type T thermocouple
104203	Test lead set
127403	RS232 to 6-pol LEMO
121985	Extension Cable for Pt 100 Sensor - 5 m
121983	Extension Cable for Type K - 5 m
122523	Extension Cable for Type N - 5 m
120519	Thermocouple Male Plug - Type Cu-Cu - White
120518	Thermocouple Male Plug - Type R / S - Green
120517	Thermocouple Male Plug - Type K - Yellow
120516	Thermocouple Male Plug - Type J - Black
120515	Thermocouple Male Plug - Type T - Blue
120514	Thermocouple Male Plug - Type N - Orange

AMETEK Calibration Instruments

is one of the world's leading manufacturers and developers of calibration instruments for temperature, pressure and process signals as well as for temperature sensors both from a commercial and a technological point of view.

JOFRA Temperature Instruments

Portable precision thermometers. Dry-block and liquid bath calibrators: 5 series, with more than 25 models and temperature ranges from -90° to 1205°C / -130° to 2200°F. All featuring speed, portability, accuracy and advanced documenting functions with JOFRACAL calibration software.

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Process signal measurement and simulation for easy control loop calibration and measurement tasks - from handheld field instruments to laboratory reference level bench top instruments.

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A complete range of calibration equipment for temperature, pressure and signal, approved for marine use.

FP Temperature Sensors

A complete range of temperature sensors for industrial and marine use.

M&G Pressure Testers

Pneumatic floating-ball or hydraulic piston dead weight testers with accuracies to 0.015% of reading.

M&G Pumps

Pressure generators from small pneumatic "bicycle" style pumps to hydraulic pumps generating up to 1,000 bar (15,000 psi).



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