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CL542-PLUS
Automated Thermocouple Calibrator

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Product Description

- **Easy to use**
  With the CL542-PLUS you can check & calibrate all your thermocouple instruments and measure thermocouple sensors.

- **Take it without into the shop, plant or field**
  Carry it without worry - it comes protected with a rubber boot and rugged, low profile switch. Easy to operate even in the dark areas of the plant with the backlit display.

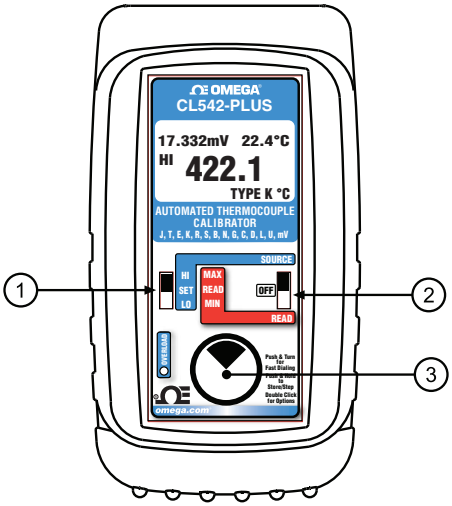
- **Calibrate directly in temperature (°C & °F)**
  Stop carrying around a millivolt source and thermocouple tables. The CL542-PLUS works with the thermocouples you use including types J, T, E, K, R, S, B, N, G, C, D, L (J-DIN), U (T-DIN) and Platinel II. Easily set any value quickly to within 0.1° with the adjustable digital potentiometer "**DIAL**" plus store any three temperatures for instant recall with the OMEGA switch.

- **Calibrate quickly with automatic output stepping**
  Choose between 2, 3, 5, 11 and 21 steps to automatically increment the output in 100%, 50%, 25%, 10% or 5% of span. Select the step time to match your system from 5, 6, 7, 8, 10, 15, 20, 25, 30 and 60 seconds.

- **Compatible with all process instruments**
  Connect directly to the thermocouple inputs of smart transmitters, PLCs, DCS and multichannel recorders and verify their outputs or displays.

- **Measure Thermocouple Sensors**
  Trouble shoot sensor connections and find broken wires. The CL542-PLUS measures the thermocouple in degrees C or F. Secondary display shows the millivolt value corresponding to the thermocouple temperature as well as the cold junction temperature measured by the calibrator.

Basic Operation



① **OMEGA SWITCH**

SOURCE: Instantly output two preset thermocouple temperatures by moving the Omega switch to the **"LO"** position or **"HI"** position. For fast three point checks select the **"DIAL"** position. The CL542-PLUS will remember the last **"DIAL"** value, even with the power off.

These values can easily be changed to suit the calibration requirements. The temperatures stored in the HI and LO positions are also used for Auto Stepping.

READ: Slide the switch to the DIAL position. The CL542-PLUS will display the current temperature from the thermocouple sensor. Slide the switch to HI and the highest temperature measured since turn-on or reset will be displayed; slide the switch to LO and the lowest temperature measured since turn-on or reset will be displayed.

② **SOURCE/OFF/READ Switch**

Select "**SOURCE**" to output in °C, °F, or millivolts. Select "**READ**" to read a thermocouple sensor or millivolts.

③ **PUSH-BUTTON KNOB**

SOURCE: Turn the knob to adjust the output level. Turn clockwise to increase the output, counter clockwise to decrease the output in 0.1° steps at a time. Push down and turn the PUSH-BUTTON knob for faster dialing.

Press and hold the knob for two seconds to store desired OMEGA HI/LO points in SOURCE mode. Continue to press and hold the knob for two more seconds to start the automatic ramping.

READ: Press and hold to transfer the current temperature into the OMEGA HI/LO points. This clears the HI/LO temperature readings which will update as the temperature changes.

Double click the knob to get into the CL542-PLUS Configuration Mode. Use configuration to select °C or °F, T/C Type, Backlight On/Off, Step Size, Step Time and Auto Off On/Off.

CHANGING BATTERIES

Low battery is indicated by **"BAT"** on the display. Approximately one to four hours of typical operation remain before the CL542-PLUS will automatically turn off. To change the batteries; remove the rubber boot, remove the battery door from the back of the unit by sliding the door downward. This allows access to the battery compartment. Replace with four (4) "AA" 1.5V batteries being careful to check the polarity. Replace the battery door and replace the boot. All stored configuration options (T/C Type, OMEGA Memories, etc., are reset to factory settings when the batteries are removed.

Note: Alkaline batteries are supplied and recommended for maximum battery life and performance.

Connections

Simulating or reading thermocouples requires the use of thermocouple or extension grade thermocouple wire.

Plug thermocouple wires into the female miniature thermocouple connector mounted in the top end of the housing.

The CL542-PLUS has two banana jacks mounted in the top end of the housing. These are not temperature compensated and are to be used only for millivolt signals.

Configuration

Configure the Calibrator

Move ② POWER SWITCH to **"SOURCE"** or **"READ"**.

MODEL CL542-PLUS
DOUBLE CLICK
PUSH-BUTTON KNOB
FOR CONFIGURATION

Setup

Double click the ③ PUSH-BUTTON knob at any time the unit is on and the following displays will appear for 15 seconds:

>	EXIT	15
	TEMP UNITS	°C
	T/C	K
	CJC	ON
	BACKLIGHT	ON

>	EXIT	15
	STEPS	3
	STEP TIME	8
	AUTO OFF	ON

>	EXIT	15
	SHOW mV	ON
	SHOW CJ	ON

Turn the ③ PUSH-BUTTON knob to move through the menu. Press the ③ PUSH-BUTTON knob to toggle between OFF and ON or to scroll through the settings.

EXIT MENU - exits this menu immediately and saves any changes. Menu will automatically exit after 15 seconds of inactivity (countdown timer is displayed).

TEMP UNITS - pressing the knob will toggle between °C and °F.

T/C - pressing the knob will cycle through T/C types J, T, E, K, R, S, B, N, G, C, D, L (J-DIN), U (T-DIN) and Platinel II.

CJC - Automatic CJC (Cold Junction Compensation) may be turned on or off. It is recommended that CJC be left on (default). CJC should only be turned off if an external cold junction compensator or ice bath is used with the CL542-PLUS.

BACKLIGHT - If BACKLIGHT is ON the backlight will light all the time the unit is powered up. For maximum battery life turn the backlight off when using the calibrator in areas with enough ambient light to read the display.

STEPS - pressing the knob will cycle through 2, 3, 5, 11 and 21 steps. The endpoints of the steps are based on the values stored in the **HI** and **LO** OMEGA outputs.

STEP TIME - pressing the knob will cycle through 5, 6, 7, 8, 9, 10, 15, 20, 25, 30 and 60 seconds.

AUTO OFF - If AUTO OFF is ON, the unit will turn off after 30 minutes of inactivity to save battery life. If AUTO OFF is OFF the unit will stay on until the POWER SWITCH is moved to the off position.

SHOW mV - If SHOW mV is ON the mV value corresponding to the sourced or measured temperature is displayed.

SHOW CJ - If SHOW CJ is ON the cold junction temperature measured by the CL542-PLUS will be displayed.

Note: All settings are remembered even with the power off. Removing the batteries resets the values to factory defaults.

Sourcing Thermocouple

SOURCE

Choose this function to provide a simulated thermocouple signal into controllers, temperature transmitters, indicators or any input devices that measure thermocouple sensors..

1) Disconnect the thermocouple sensor from the device to be calibrated.
2) Select "**SOURCE**" with slide switch ②.
3) Connect a thermocouple wire (matching the type of wire to sensor being simulated) with miniature male T/C connector to the inputs of the device being calibrated, making sure to check polarity. Millivolt outputs (without cold junction) may be connected with a copper (white) miniature T/C connector or the banana jacks with copper wire.

The output is adjusted in 0.1° (or 0.001 mV) increments by turning the knob ③ while the OMEGA switch ① is in the "HI", "LO" or "SET" position. Press and turn the knob for faster dialing with 10° (or 0.100) increments.

The OVERLOAD indicator will light if excessive voltage or current is detected by the calibrator.

Reading Thermocouple Sensors

READ

Choose this function to measure temperatures with a thermocouple probe or sensor.

1) Disconnect the thermocouple sensor from any other device.
2) Select "**READ**" with slide switch ③.
3) Place the OMEGA switch into the **READ** position.
4) Connect a thermocouple probe (matching the type of wire to sensor being measured) with miniature male T/C connector to the sensor. Millivolt outputs (without cold junction) are connected with a copper (white) miniature thermocouple connector or to the banana jacks with cooper wire.

The CL-542-PLUS measures the temperature signal and constantly updates the display with the current temperature reading. Move the OMEGA switch to MAX to see the highest temperature reading and to MIN to see the lowest temperature reading. Press and hold the knob ④ to clear the MAX and MIN readings.

The OVERLOAD indicator will light if excessive voltage or current is detected by the calibrator.

Storing OMEGA Outputs

STORING HI and LO OMEGA Outputs

Choose this function to provide a simulated thermocouple signal into controllers, temperature transmitters, indicators or any other input device that measure thermocouple sensors..

1) Store your high (SPAN) output temperature by moving the OMEGA switch to the **HI** position and turn the ③ PUSH-BUTTON knob until the desired temperature is on the display. Press and hold the knob until **STORED** appears to store the value. Release the PUSH-BUTTON knob.
2) Store your low (ZERO) output temperature by moving the OMEGA switch to the **LO** position and turn the ③ PUSH-BUTTON knob until the desired temperature is on the display. Press and hold the PUSH-BUTTON knob until **STORED** appears to store the value. Release the PUSH-BUTTON knob.
3) Instantly output your SPAN and ZERO temperature outputs by moving the OMEGA switch between HI and LO. You may also select any third temperature output (such as mid-range) using the SET position on the OMEGA switch.

Automatic Stepping

To change the Automatic Stepping settings

Double click the ③ PUSH-BUTTON knob at any time the unit is on and the following display will appear for 30 seconds:

Turn the ③ PUSH-BUTTON knob to move through the menu. Press the ③ PUSH-BUTTON knob to toggle between OFF and ON or to change the STEPS and the STEP TIME settings. These settings are remembered even with the power off.

	EXIT	**15**
>	**STEPS**	**3**
	STEP TIME	**8**
	AUTO OFF	**ON**

EXIT MENU - exits this menu immediately and saves any changes. Menu will automatically exit after 30 seconds of inactivity.

STEPS - pressing the knob will cycle through 2, 3, 5, 11 and 21 steps then reverse dircetion. The endpoints of the steps are based on the values stored in the **HI** and **LO** OMEGA outputs.

2 steps will automatically switch between the values stored in the HI & LO OMEGA (0 & 100%).

3 steps between the HI, Midpoint and LO OMEGA (0, 50 & 100%).

5 steps between the HI and LO OMEGA in 25% increments (0, 25, 50, 75 & 100%).

11 steps between the HI and LO OMEGA in 10% increments (0, 10, 20...80, 90 &100%).

21 steps between the HI and LO OMEGA in 5% increments (0, 5, 10... 90, 95 & 100%).

STEP TIME - pressing the knob will cycle through 5, 6, 7, 8, 9, 10, 15, 20, 25, 30 and 60 seconds.

To start the Automatic Stepping

Start automatic stepping or ramping by placing the OMEGA Switch into the HI or LO position then press and hold the ③ PUSH-BUTTON knob for 6 seconds (the word STORE will appear on the display after 3 seconds and continue to press the PUSH-BUTTON knob) until the word STEPPING appears on the display. The word STEPPING will appear on the display anytime the selected automatic function is running. Stop the stepping by again pressing and holding the ③ PUSH-BUTTON knob for 3 seconds.

Ranges & Accuracies

T/C Type	Degrees C Range	Accuracy	Degrees F Range	Accuracy	T/C Material	ISA/ANSI Color
J	-200.0 to -180.0	±0.3°	-346.0 to -292.0	±0.5°	+Iron -Connstantan Jacket	White Red Black
	-180.0 to -50.0	±0.2°	-292.0 to -58.0	±0.4°		
	-50.0 to 500.0	±0.1°	-58.0 to 932.0	±0.2°		
	500.0 to 1200,0	±0.2°	932.0 to 2192.0	±0.4°		
K	-230.0 to -100.0	±0.6°	-382.0 to -148.0	±1.1°	+ Chromel® -Alumel® Jacket	Yellow Red Yellow
	-100.0 to 1050.0	±0.2°	-148.0 to 1922.0	±0.4°		
	1050.0 to 1371.1	±0.3°	1922.0 to 2500.0	±0.5°		
T	-260.0 to -200.0	±1.0°	-436.0 to -328.0	±1.8°	+Copper -Constantan Jacket	Blue Red Blue
	-200.0 to -50.0	±0.5°	-328.0 to -58.0	±0.9°		
	-50.0 to 0.0	±0.2°	-58.0 to 32.0	±0.4°		
	0.0 to 400.0	±0.1°	32.0 to 752.0	±0.2°		
E	-240.0 to -200.0	±0.4°	-400.0 to -328.0	±0.7°	+Chromel -Constantan Jacket	Purple Red Purple
	-200.0 to -100.0	±0.2°	-328.0 to -148.0	±0.4°		
	-100.0 to 850.0	±0.1°	-148.0 to 1562.0	±0.2°		
	850.0 to 1000.0	±0.2°	1562.0 to 1832.0	±0.4°		
R	-13.3 to 250.0	±1.2°	-1.0 to 482.0	±2.2°	+Pt/13Rh -Platinum Jacket	Black Red Green
	250.0 to 750.0	±0.6°	482.0 to 1382.0	±1.1°		
	750.0 to 1600.0	±0.5°	1382.0 to 2192.0	±0.9°		
	1600.0 to 1767.8	±0.6°	2192.0 to 3214.0	±1.1°		
S	-18.3 to 100.0	±1.2°	-1.0 to 212.0	±2.1°	+Pt/10Rh -Platinum Jacket	Black Red Green
	100.0 to 400.0	±0.8°	212.0 to 752.0	±1.4°		
	400.0 to 1700.0	±0.6°	752.0 to 3092.0	±1.1°		
	1700.0 to 1767.8	±0.7°	3092.0 to 3214.0	±1.3°		
B	315.6 to 550.0	±1.8°	600 to 1022.0	±3.2°	+Pt/30Rh -Pt/6Rh Jacket	Grey Red Grey
	550.0 to 900.0	±1.1°	1022.0 to 1652.0	±2.0°		
	900.0 to 1150.0	±0.7°	1652.0 to 2102.0	±1.3°		
	1150.0 to 1820.0	±0.6°	2102.0 to 3308.0	±1.1°		

Ranges & Accuracies

T/C Type	Degrees C Range	Accuracy	Degrees F Range	Accuracy	T/C Material	ISA/ANSI Color
N	-230.0 to -180.0	±1.0°	-382.0 to -292.0	±1.8°	+Nicrosil -Nisil Jacket	Orange Red Orange
	-180.0 to -50.0	±0.5°	-292.0 to -58.0	±0.9°		
	-50.0 to 1100.0	±0.2°	-58.0 to 2012.0	±0.4°		
	1100.0 to 1300.0	±0.3°	2012.0 to 2372.0	±0.5°		
G (W)	100.0 to 150.0	±1.2°	212.0 to 302.0	±2.2°	+Tungsten -W26/Re Jacket	White Red White/Blue
	150.0 to 400.0	±0.8°	302.0 to 752.0	±1.4°		
	400.0 to 1700.0	±0.4°	752.0 to 3092.0	±0.7°		
	1700.0 to 2320.0	±0.7°	3092.0 to 4208.0	±1.3°		
C (W5)	-1.1 to 1500	±0.5°	30.0 to 2372.0	±0.9°	+W5/Re -W26/Re Jacket	White Red White/Red
	1500 to 1900	±0.6°	2372.0 to 3452.0	±101°		
	1900.0 to 2100.0	±0.7°	3452.0 to 3812.0	±1.3°		
	2100.0 to 2320.0	±0.9°	3812.0 to 4208.0	±1.6°		
D	-1.0 to 50.0	±0.6°	30.0 to 122.0	±1.1°	+W3/Re -W25/Re Jacket	White Red White/Yellow
	50.0 to 1400.0	±0.4°	122.0 to 2552.0	±0.7°		
	1400.0 to 1800.0	±0.5°	2552.0 to 3272.0	±0.9°		
	1800.0 to 2320.0	±0.9°	3272.0 to 4208.0	±1.6°		
P Platinel®	-217.8 to -150.0	±0.6°	-360.0 to -238.0	±1.1°	+Pd55/Pt31/Au14 -Au65/Pd35 Jacket	Yellow Red Black
	-150.0 to -50.0	±0.4°	-238.0 to -58.0	±0.7°		
	-50.0 to 1000.0	±0.2°	-58.0 to 1832.0	±0.4°		
	1000.0 to 1395.0	±0.3°	1832.0 to 2543.0	±0.5°		
						DIN Colors
L J-DIN	-200.0 to -50.0	±0.2°	-328.0 to -58.0	±0.4°	+Iron -Connstantan Jacket	Red Blue Blue
	-50.0 to 500.0	±0.1°	-58.0 to 932.0	±0.2°		
	500.0 to 750.0	±0.2°	932.0 to 1382.0	±0.4°		
U T-DIN	-200.0 to -75.0	±0.3°	-328.0 to -103.0	±0.5°	+Copper -Constantan Jacket	Red Brown Brown
	-75.0 to 100.0	±0.2°	-103.0 to 212.0	±0.4°		
	100.0 to 600.0	±0.1°	212.0 to 1112.0	±0.2°		

CL-542-PLUS Specifications

(Unless otherwise indicated all specifications are rated from a nominal 23°C, 70% RH for 1 year from calibration)

General	
Accuracy	±(0.008% of Reading + 0.006 mV)
Cold Junction Compensation	± 0.16°F (±0.1°C)
Millivolt Range	-13.000 to 80.000 mV
Operating Temperature Range	-25 to 60°C (-10 to 140°F)
Relative Humidity Range	10% ≤RH ≤90% (0 to 35°C), Non-condensing
	10% ≤RH ≤70% (35 to 60°C), Non-condensing
Size	L=5.63 x W=3.00 x H=1.60 inches
Weight	12.1 ounces (including boot & batteries)
Batteries	Four "AA" Alkaline 1.5V (LR6)
Battery Life	50 Hours
Low Battery	Low battery indication with nominal 1 hour of life left
Protection against misconnection	Over-voltage protection to 60 Vdc (rated for 30 seconds)
Display	High contrast graphic liquid crystal display. LED backlighting for use in low lit areas.

Read	
Input Impedance	>10 Megohms
Open Thermocouple Threshold Pulse	 10,000 Ohms nominal <10 microamp pulse for 300 milliseconds
Normal Mode Rejection	50/60 Hz, 50 dB
Common Mode Rejection	50/60 Hz, 120 dB

Source	
Output Impedance	<0.3 Ohms
Source Current	>20 mA (drives 80 mV into 10 Ohms)
Noise	≤4 microvolts p-p for frequencies of 10 Hz or below

Accessories

Standard Test Leads (Included with calibrator)

Three feet (1 meter) of wire with an alligator clip on one end and a spring loaded protected banana plug on the other end.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **37 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **three (3) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of theproduct, and
3. Repair instructions and/or specific problems relative to the product.

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M4838/0210