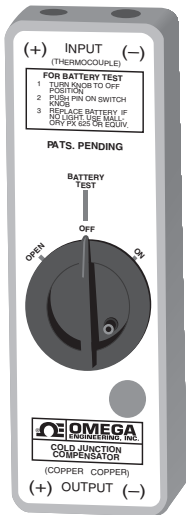


.1 YEAR
WARRANTY



User's Guide



Shop online at

omega.com[®]

Ω OMEGA[®]

omega.com

e-mail: info@omega.com

*For latest product manuals:
omgamanual.info*

ISO 9001
CERTIFIED
CORPORATE QUALITY

STAMFORD, CT

ISO 9001
CERTIFIED
CORPORATE QUALITY

MANCHESTER, UK

MCJ SERIES Miniature Cold Junction Compensator



OMEGAnet[®] On-Line Service
omega.com

Internet e-mail
info@omega.com

Servicing North America:

U.S.A.: ISO 9001 Certified
One Omega Drive, Box 4047
Stamford, CT 06907-0047
Tel: (203) 359-1660
FAX: (203) 359-7700
e-mail: info@omega.com

Canada:
976 Bergar
Laval (Quebec) H7L 5A1, Canada
Tel: (514) 856-6928
FAX: (514) 856-6886
e-mail: info@omega.ca

For immediate technical or application assistance:

U.S.A. and Canada:
Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA[®]
Customer Service: 1-800-622-2378 / 1-800-622-BEST[®]
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN[®]

Mexico:
En Español: (001) 203-359-7803
FAX: (001) 203-359-7807
e-mail: espanol@omega.com
info@omega.com.mx

Servicing Europe:

Czech Republic:
Frystatska 184, 733 01 Karviná, Czech Republic
Tel: +420 (0)59 6311899
FAX: +420 (0)59 6311114
Toll Free: 0800-1-66342
e-mail: info@omegashop.cz

Germany/Austria:
Daimlerstrasse 26, D-75392
Deckenpfronn, Germany
Tel: +49 (0)7056 9398-0
FAX: +49 (0)7056 9398-29
Toll Free in Germany: 0800 639 7678
e-mail: info@omega.de

United Kingdom:
ISO 9002 Certified
One Omega Drive
River Bend Technology Centre
Northbank, Irlam
Manchester M44 5BD
United Kingdom
Tel: +44 (0)161 777 6611
FAX: +44 (0)161 777 6622
Toll Free in United Kingdom:
0800-488-488
e-mail: sales@omega.co.uk

It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, human applications.

Unpacking Instructions



Remove the Packing List and verify that you have received all equipment, including the following (quantities in parentheses):

- MCJ Cold Junction Compensator (1)
- Mating male OST thermocouple connector (1)
- Thermocouple male pins (2)
- Battery (1)
- Operator's manual (1)

If you have any questions about the shipment, please call the Customer Service Department at **1-800-622-2378** or **203-359-1660**. We can also be reached on the Internet at **www.omega.com**

e-mail: cservice@omega.com

When you receive the shipment, inspect the container and equipment for signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor damage claims unless all shipping material is saved for inspection. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

MCJ Series Miniature Cold Junction Compensator



TABLE OF CONTENTS

Section	Page
Section 1 Introduction	1-1
1.1 Description	1-1
1.2 Theory of Operation	1-3
Section 2 Operating Instructions	2-1
2.1 Battery Installation	2-1
2.2 To Test the Battery	2-2
2.3 To Measure Temperature	2-2
2.4 To Calibrate Thermocouple Instruments ...	2-6
Section 3 Troubleshooting and Calibration ..	3-1
3.1 Troubleshooting the MCJ	3-1
3.2 Calibration	3-2
Section 4 Specifications	4-1
Section 5 Retrofit Kit	5-1

1.1 Description

The MCJ Miniature Cold Junction Electronic Ice Point is an automatic cold junction compensator that is necessary to utilize when using a thermocouple (T/C) probe together with a voltmeter (or millivolt recorder) to measure temperature. It is also necessary to utilize when a precision millivolt source is used to calibrate a thermocouple meter. The MCJ should be used with instrumentation that has an impedance of 50K ohms or greater.



Figure 1-1. MCJ

This extremely versatile, battery-powered device provides the electrical equivalent of an ice bath reference at 32° F (0°C). It is factory calibrated and available in one of nine thermocouple calibrations:

T/C TYPE	METALS
J	Iron/Constantan
K	Chromega®/Alomega®
T	Copper/Constantan
E	Chromega®/Constantan
R	Pt-13% Rh/Pt*
S	Pt-10% Rh/Pt*
G	W/W-26% Re*
C	W-5% Re/W-26% Re*
D	W-3% Re/W-25% Re*

*Where: Pt = Platinum, Rh = Rhodium,
W = Tungsten, Re = Rhenium

MCJ's manufactured before 1996 use a different battery and battery compartment. See Section 5 about kit for retrofitting pre-1996 units.

1.2 Theory of Operation

The MCJ contains a self-compensating voltage generator that is built into a small housing. The input side consists of the standard “OST” female pins that are integral to the MCJ case (see Figure 1-2). On the output side are two screw terminals that are connected to the compensating voltage circuitry.

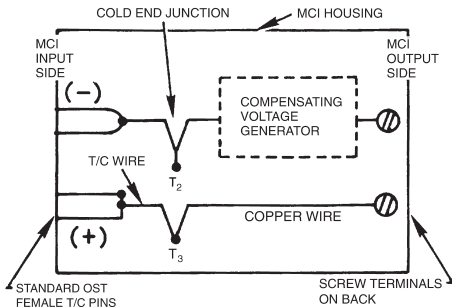


Figure 1-2. Inside the MCJ

This design incorporates a temperature sensitive element that is thermally integrated with the “cold end” junctions T2 and T3 (located inside the MCJ). In theory, as the ambient temperature surrounding T2 and T3 varies, a change in thermal emf is generated.

The thermal emf induced by this change in ambient temperature will create an error in the output signal, unless it is compensated for. To correct the error, an equal and opposite voltage is automatically injected into the circuit by the compensating voltage generator circuitry of the MCJ. This, in turn, cancels out the emf error.

By integrating copper leads at the cold end junctions T2 and T3, the thermocouple material itself is not directly connected to the voltmeter, thereby eliminating induced errors. This also eliminates the need to run thermocouple lead wires from the output of the MCJ to the measuring device.

The compensating voltage generator in the MCJ is temperature sensitive and produces a compensating emf that tracks the error signal over a wide ambient temperature range with a high degree of accuracy.

2.1 Battery Installation

The MCJ is provided with a 1.5 volt silver oxide battery (part number MCJ-BATT-B). To install the battery, rotate the black “OPEN-OFF-ON” switch counterclockwise (CCW) to the position labeled OPEN. Carefully lift the switch from the housing (see Figure 2-1).

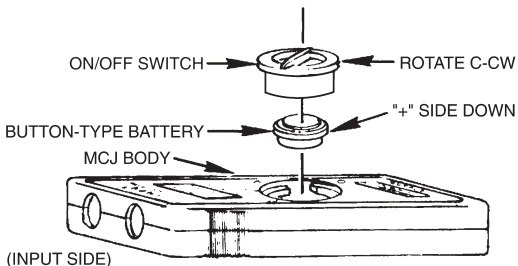


Figure 2-1. Installing the Battery

Install the battery into the MCJ body with the “+” side of the battery facing downward. (Notice the “+” mark scribed onto the silverplated battery contact spring inside the MCJ.) After the battery is installed, re-assemble by placing the black switch onto the MCJ body, being sure to line up the switch arrow with the “OPEN” position. Finally, rotate the switch clockwise to the OFF position.

2.2 To Test the Battery

With the battery installed, move the switch to the OFF/BATTERY TEST position. Firmly depress the metal pin on the switch and note the battery test indication light. When lit, it indicates that the battery is good. If it does not light up, replace the battery.

2.3 To Measure Temperature

The MCJ can be used in conjunction with a voltmeter to accurately measure temperature. It will take the signal from a thermocouple sensor and cancel out the error introduced by the use of the copper wires leading to the voltmeter.

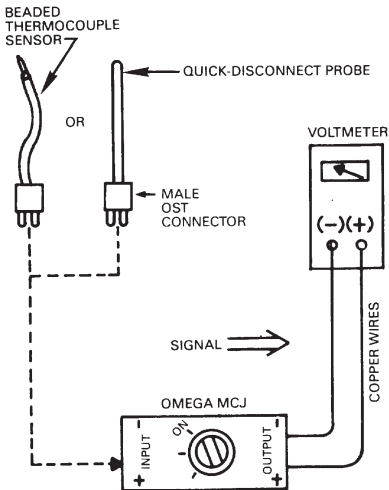


Figure 2-2. Operating with a Voltmeter

Assemble the battery into the MCJ and test for power (see Section 2.2). Connect a thermocouple sensor to the INPUT side of the MCJ as described in this section. Make sure the thermocouple sensor is the same calibration as the MCJ (i.e. a type-K thermocouple sensor must be used with the MCJ-K).

Refer to Figure 2-2. To attach a sensor to the MCJ, simply plug in a Quick-Disconnect thermocouple probe assembly directly into the INPUT side of the MCJ. Or, you can wire a beaded thermocouple sensor to the male OST connector that is supplied with the unit. (When wiring your own sensor, be sure to attach the RED wire of the thermocouple to the “-” terminal of the OST connector.) Then plug the OST male connector assembly into the INPUT side of the MCJ, as shown in Figure 2-2.

Next, connect COPPER wire from the OUTPUT screw terminals of the MCJ to the voltmeter. The screw terminals are located on the back of the MCJ, behind the cap. Wire the negative terminal on the MCJ to the negative terminal on the voltmeter.

Turn ON the MCJ and the voltmeter. The voltmeter will display a millivolt value that represents the compensated millivolt signal produced by the thermocouple probe. That value must then be translated into a temperature reading.

To translate a millivolt signal into a temperature value, locate the “correct” Thermocouple Reference Table for that particular thermocouple type. When using a type-K probe, use the type-K Thermocouple Reference Table.* Using the millivolt value given by the voltmeter display, read the equivalent temperature value from the Table.

*See OMEGA Temperature Measurement Handbook and Encyclopedia®, Technical Section.

For example, if the voltmeter displays “1.520 mV”, you need to translate that value into a temperature. If you are using a type-K thermocouple, and want to know what that is in degrees Fahrenheit, find the type-K Thermocouple Reference Table (in Fahrenheit). Look through the millivolt values until you find 1.520 mV. Look to find that it is the equivalent to 100°F.

2.4 To Calibrate Thermocouple Instruments

The MCJ can also be used in conjunction with a precision Millivolt Source in order to check and calibrate Thermocouple Thermometers and other thermocouple-ready instruments.

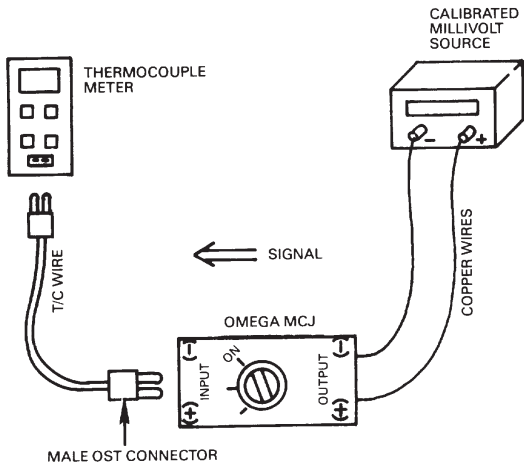


Figure 2-3. Operating with a Millivolt Source

Assemble the battery into the MCJ and test for power (see Section 2.2). Connect the MCJ to the Millivolt Source and the Meter to be calibrated (as shown in Figure 2-3). Be sure to use thermocouple wire from the Thermocouple Meter to the input terminals of the MCJ. Use copper wires from the Millivolt Source to the MCJ. Observe correct polarity when wiring.

Simulate a temperature value by “dialing-in” the correct millivolt signal on the Millivolt Source. To do this, use the correct Temperature vs. Millivolt Thermocouple Table for that particular thermocouple type, and find the millivolt signal that represents the temperature that you wish to simulate.

The thermocouple meter display should be reading the temperature equivalent to the millivolt signal that the source is generating (within the accuracy of the equipment being used).

3.1 Troubleshooting the MCJ

The main sources of incorrect readings are grouped into four categories:

1. Low battery voltage
 2. Incorrect polarity on the MCJ thermocouple input wiring
 3. Incorrect polarity on the MCJ output copper wiring
 4. Wrong thermocouple type used with MCJ
-
1. Check for sufficient battery voltage. See Section 2.2.
 2. Plug in the thermocouple sensor into the MCJ and connect to a voltmeter (Figure 2-2). Warm the thermocouple junction. The voltmeter should go up scale, that is, read more positive. If it goes down scale instead when the probe is warmed, re-check the polarity of the thermocouple wire. Correct it, if necessary. (Remember that the RED thermocouple wire is negative).
 3. Another problem can occur when the MCJ is incorrectly connected in the configuration as seen in

Figure 2-2. If the voltmeter shows a negative millivolt reading, the wiring is wrong. Reverse the polarity of the output wiring from the MCJ to the voltmeter. If erratic readings occur, check for loose or broken wires.

4. If you are sure that you have hooked up the MCJ correctly, but are still getting incorrect readings, check to see that you are using the correct calibration of thermocouple probe, wire and MCJ through-out. A type-J thermocouple probe will not read accurately with a type-K MCJ.

3.2 Calibration

The MCJ is calibrated at the factory and is NOT designed for field calibration. The warranty is void if the label of the unit is tampered with in any way.

Specifications

4

Fixed Reference Temp:	0°C (32°F) standard
Compensation Accuracy: (for standard reference temp. setting)	0.5°C from 15-30°C (59-86°F) ambient
Impedance:	MCJ: less than 200 ohms Use with instrumentation having a source impedance of 50K ohms or greater
Physical Dimensions:	
Length:	75 mm (2.95")
Width:	25 mm (1.0")
Thickness:	12.7 mm (0.5")
Weight (with battery):	Less than 56.7 gr. (2 ozs.)
Battery:	Eveready No. EPX76, 1.5 volts or equivalent, part no. MCJ-BATT-B

4**Specifications**

Battery Life:	2500 hours in continuous operation. Store extra batteries in cool place, 5-10°C (41-50°F)
Storage Temperature:	-25 to 75°C (-13 to 167°F) (without battery)

Pre-1996 MCJ's are powered by a Mallory PX625 1.35 volt battery that is now difficult to obtain. The current models are powered by Eveready No. EPX76 1.5 volt (or equivalent). The two batteries are NOT interchangeable. Pre-1996 MCJ's can be updated by ordering Retrofit Kit Part Number MCJ-BATT-R that includes the 1.5 volt battery and new switch/battery compartment assembly.

NOTES:



WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's Warranty adds an additional one (1) month grace period to the normal **one (1) 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 the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

© Copyright 2009 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of OMEGA ENGINEERING, INC.

Where Do I Find Everything I Need for Process Measurement and Control?

OMEGA...Of Course!

Shop online at omega.comsm

TEMPERATURE

- ☑ Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- ☑ Wire: Thermocouple, RTD & Thermistor
- ☑ Calibrators & Ice Point References
- ☑ Recorders, Controllers & Process Monitors
- ☑ Infrared Pyrometers

PRESSURE, STRAIN AND FORCE

- ☑ Transducers & Strain Gages
- ☑ Load Cells & Pressure Gages
- ☑ Displacement Transducers
- ☑ Instrumentation & Accessories

FLOW/LEVEL

- ☑ Rotameters, Gas Mass Flowmeters & Flow Computers
- ☑ Air Velocity Indicators
- ☑ Turbine/Paddlewheel Systems
- ☑ Totalizers & Batch Controllers

pH/CONDUCTIVITY

- ☑ pH Electrodes, Testers & Accessories
- ☑ Benchtop/Laboratory Meters
- ☑ Controllers, Calibrators, Simulators & Pumps
- ☑ Industrial pH & Conductivity Equipment

DATA ACQUISITION

- ☑ Data Acquisition & Engineering Software
- ☑ Communications-Based Acquisition Systems
- ☑ Plug-in Cards for Apple, IBM & Compatibles
- ☑ Data Logging Systems
- ☑ Recorders, Printers & Plotters

HEATERS

- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments