User's Guide

CE

OMEGA
An OMEGA Technologies Company

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CCT-20, CCT-90, CCT-95

RTD, Potentiometer and Resistance Signal Conditioners

M2217/1201

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It is the policy of OMEGA 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 Engineering, Inc. 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, patient connected applications.

TABLE OF CONTENTS

OPEN THE HOUSING

PROCEDURE

1. Insert a screwdriver or similar tool in the points marked ①.
2. Turn the screwdriver until the case walls begin to separate towards **A** and **B**, so the two side lugs ③, are free.
3. Grab the Signal Conditioner body, at the points marked ②, and pull it towards **C**, until the two side lugs ③ are out of their housing and the internal circuits are visible. See the sketch below for the disassembly of the circuit boards.
4. Before reinserting the Signal Conditioner body into the case, the following must be checked :

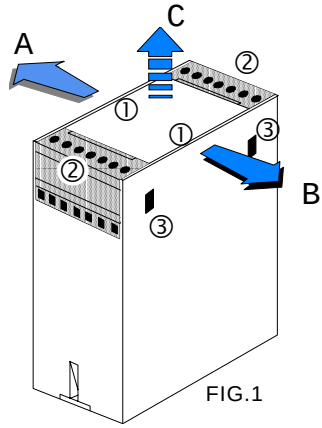


FIG.1

-The front label (blue color) must be in its correct position, with terminals 1 and 7 (power supply) separated from the other terminals.

-The three internal modules must be inserted correctly in their internal case guides.

INTERNAL OVERVIEW

A. "ME" Input module.
B. "MS" Output module.
C. "MA" Power supply module.
D. "MP" Input Board.

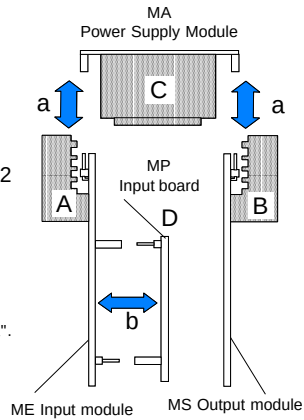


FIG.2

PROCEDURE FOR DISASSEMBLY

1. Pull out the "ME" input module towards "a".
2. Pull out the "MS" output module towards "a".
3. Pull out the "MP" input board towards "b".
4. To assemble reverse the procedure.

POWER SUPPLY

RECOMENDED WIRING

The power supply must be connected to terminals 1 and 7. The characteristics of the power supply are shown on the side label.

WARNING.- If the power supply is dc voltage, be careful with the polarity indicated for each terminal.

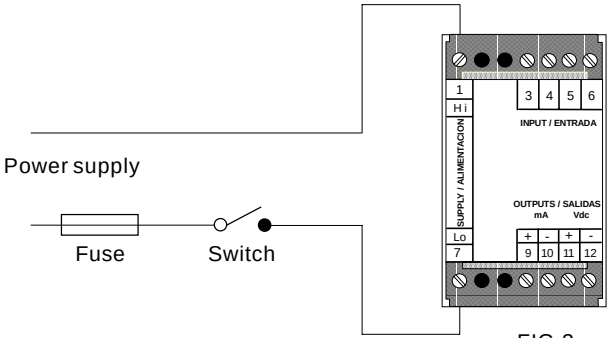


FIG.3

PRECAUTIONS

The installation must incorporate safety devices to protect the operator and the process when using the Transmitter to control a machine or process where injury to personnel or damage to equipment or process, may occur as a result of failure of the Transmitter.

PROTECTIONS

See on table 1 the recommended value of the fuse for the different power supply availables.

Power supply	Fuse value
230 Vac	50 mA
115 Vac	100 mA
48 Vac	150 mA
24 Vac	300 mA
24 Vdc	300 mA

TABLE 1

CHANGING THE POWER SUPPLY

The unit is not provided with a system to change the power supply. Therefore if the power supply must be modified to other value, please replace the module MA for another one appropriate to the new characteristics. Contact your local distributor for instructions.

SIGNAL OUTPUT module MS

The signal conditioner provides two different analog output signals, both proportional to the signal input.

Output in Current: 4 to 20 mA, terminals 9 - 10
Output in Voltage: 0 to 10 Vdc, terminals 11 - 12

Do not use both outputs simultaneously. Only one selection can be made.
The side label shows which one is selected.

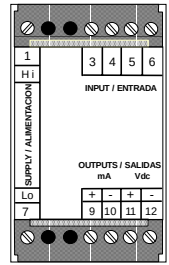


FIG.5

CHANGING THE SIGNAL OUTPUT

All signal conditioners are delivered as a standard version, with the analog output selected as 4 to 20 mA, unless specified otherwise. To select a 0 to 10 V output, remove jumpers E and F as shown in Figure 6. Other non-standard output voltage and current ranges may be obtained by adding and/or replacing resistors given in Tables 2 and 3.

NON STANDARD OUTPUT VOLTAGES

TABLE 2

Output in V.	Value in KΩ for : R29	R30	R31	R32
±10	49.9	-----	200	----
0 to 1	-----	-----	11	100
0 to 5	-----	-----	100	100
1 to 5	-----	100	66.5	100

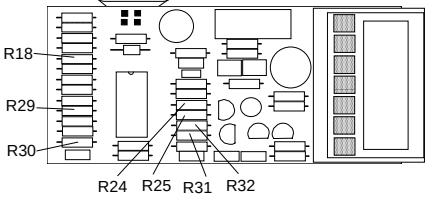
NON STANDARD OUTPUT CURRENTS

TABLE 3

Output in mA.	Value in Ω for : R18	R24	R25
0 to 5	-----	100	-----
0 to 10	-----	49.9	-----
1 to 5	100 K	124	-----
0 to 20	-----	-------	24.9

"-----" means "Resistor must not be installed"

Jumpers E and F : Closed only if the output is 4 to 20 mA.



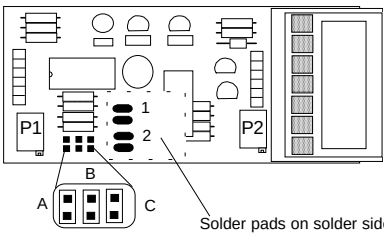
Replace or add the indicated resistors with the values shown in Tables 2 and 3 for the desired output.

FIG.6

SIGNAL INPUT, module ME
OVERVIEW

This module together with the "MP" input board, performs all the input signal conditioning (see Fig. 2). This module contains the trimmers and jumpers for the amplifier gain and the low level output (offset).
The signal input connections are made at Terminals 3, 4, 5 and 6.
See the wiring instructions in the Connections Section for more details.

FIG.7



P1 : Output zero adjustment.
P2 : Gain amplifier adjustment.

OFFSET ADJUST

Solder pad 1 if closed : Adjust the low range level of the output (Offset positive coarse).
Solder pad 2 if closed : Adjust the low range level of the output (Offset negative coarse).
Jumper A if closed : Adjust the low range level of the output (Offset negative fine).

AMPLIFIER GAIN

Jumper B if closed : Gain at maximum level
Jumper C if closed : Gain at medium level.
Jumpers B and C opened : Gain at minimum level.

CCT-20, ELECTRICAL FEATURES

INPUT

Table 4 indicates all the standard available ranges for the CCT-20 using RTD sensors (Pt100, 100 Ω at 0°C) in accordance with DIN 43760. The position of the jumpers are indicated in Table 5.
The CCT-20 uses the 3-wire measurement, which compensates for lead wire resistance. However 2-wire sensors can be used too. See wiring connections.
The signal conditioner also has circuitry to linearize the sensor signal. The signal output is proportional to the measured temperature in °C.
The maximum excitation current is 1 mA.
For different signal ranges, contact the engineering department.

TABLE 4

Reference	A	B	C	D	E	F
RANGE °C	0 to 100	0 to 200	0 to 300	0 to 400	0 to 500	0 to 600
Min. input Span*	50°C					

* The Minimum Input Span is the minimum difference between the maximum and minimum input signal for a full scale output (4 to 20 mA or 0 to 10 Vdc) .

OUTPUT

0 to 20 mA or 4 to 20 mA	R_L < 600 Ω max. 22 mA ±3%
0 to 10 Vdc	R_L > 1000 Ω max. 11 V ±3%
ACCURACY	≤ 0.2 % FS
RESPONSE TIME	≤ 250 mS
GALVANIC ISOLATION	Input, Output and Power Supply are all isolated to 2 kVeff 50 Hz/1 m.

GENERAL SPECIFICATIONS

RIPPLE	≤ 0.5 %
BAND PASS	1.5 Hz (-3 dB)
STORAGE TEMPERATURE	-30° to +80°C
OPERATING TEMPERATURE	-10° to +60°C
TEMPERATURE COEFFICIENT	≤ 0.015 %/°C
STANDARD POWER SUPPLY	115 Vac (±10%) 50/60 Hz
POWER CONSUMPTION	≤ 1.5 VA
TEST VOLTAGE	4 kVeff. 50 Hz/1m.

SIGNAL INPUT RANGE SELECTION

Set the jumpers to the position indicated in Table 5, for each range. The jumpers are located on the "ME" input module. See Fig. 8.
If the signal input range is modified, follow the adjustment and calibration procedure.

RANGE °C	CLOSE JUMPER
0 to 100	B
0 to 200	C
0 to 300	C
0 to 400	both opened
0 to 500	both opened
0 to 600	both opened

TABLE 5

"ME" Input module, components view.

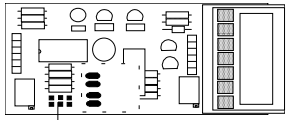


FIG.8

ADJUSTMENT AND CALIBRATION PROCEDURE

A decade box is recommended as an input signal source.

1. When input and output signal values are determined, remove the conditioner case. (Fig. 2).
2. Check on the "MA" module, if the selected power supply is correct. (Table 1).
3. Select on the "ME" input board the desired temperature range, using jumpers "B" and "C" as indicated in Table 5.
   Select the desired output on "MS" output module (voltage or current), using jumpers "E" and "F". (Fig. 6).
4. Connect the decade box or calibrator to the correct converter terminals.
5. Connect digital multimeter, to the signal output terminals to be used.
6. Power up the signal conditioner with the appropriate power supply.
7. Adjust the decade box until it generates the low signal level. (For example: 0°C)
8. Turn the "ZERO" trimmer (P1), located on the "ME" input module, until the multimeter shows the desired low level signal output. (For example: 0 Vdc).
9. Adjust the decade box until it generates the high signal level. (For example: 100°C).
10. Turn the "GAIN" trimmer (P2), located on the "ME" input module, until the multimeter shows the desired high level signal output. (For example: 10 Vdc).
11. Repeat steps 7 to 10, until the two values are correct.

SENSOR BREAK DETECTION

For open circuit protection, the signal output goes down scale (<4 mA).

CCT-90, ELECTRICAL FEATURES

INPUT

The CCT-90 works with potentiometers or resistance based transducers.
It may be used potentiometers with a resistance value between 100 Ω minimum and 1 MΩ maximum.

To adjust the output signal to the input resistance, see the Adjustment and Calibration Procedure paragraph on the following page.

OUTPUT

0 to 20 mA or 4 to 20 mA	R_L < 600 Ω max. 22 mA ±3%
0 to 10 Vdc	R_L > 1000 Ω max. 11 V ±3%
ACCURACY	≤ 0.2 % FS
RESPONSE TIME	≤ 250 mS
GALVANIC ISOLATION	Input, Output and Power Supply are all isolated to 2 kVeff 50 Hz/1 m.

GENERAL SPECIFICATIONS

RIPPLE	≤ 0.5 %
BAND PASS	1.5 Hz (-3 dB)
STORAGE TEMPERATURE	-30° to +80°C
OPERATING TEMPERATURE	-10° to +60°C
TEMPERATURE COEFFICIENT	≤ 0.015 %/°C
STANDARD POWER SUPPLY	115 Vac (±10%) 50/60 Hz
POWER CONSUMPTION	≤ 1.5 VA
TEST VOLTAGE	4 kVeff. 50 Hz/1m.

SIGNAL INPUT RANGE SELECTION

For this model it is not necessary to change or set any jumpers position.
To change the signal input range, follow the adjustment and calibration procedure.

ADJUSTMENT AND CALIBRATION PROCEDURE

A potentiometer is recommended as an input signal source

1. When input and output signal values are determined, remove the conditioner case. (Fig. 2).
2. Check on the "MA" module, if the selected power supply is correct. (Table 1).
3. Check that the jumpers "A", "B" and "C" located in the "ME" input module are opened. Select on the "MS" output module the desired output (voltage or current), using jumpers "E" and "F". (Fig. 6).
4. Connect the potentiometer to the conditioner input terminals 3 - 4 - 5. The slide terminal of the potentiometer must be connected to terminal 4.
5. Connect a digital multimeter, to the signal output terminals to be used.
6. Power up the conditioner with the appropriate power supply.
7. Turn the potentiometer slide to one end, until a low level signal input is achieved.
8. Turn the "ZERO" trimmer (P1), located on the "ME" input module, until the multimeter shows the desired low level signal output. (For example: 0 Vdc).
9. Turn the potentiometer slide to the other end, until a high level signal input is achieved.
10. Turn the "GAIN" trimmer (P2), located on the "ME" input module, until the multimeter shows the desired high level signal output. (For example: 10 Vdc).
11. Repeat steps 7 to 10, until the two values are correct.

CCT-95, ELECTRICAL FEATURES

INPUT

Table 6 indicates all the standard available ranges for CCT-95 and its electrical specifications. The position of the jumpers are given in Fig. 8.
This model uses a 2-wire measurement technique and therefore, it does not compensate for errors due to the lead resistance.
The maximum input resistance allowed is 1 MΩ.
For different signal ranges, contact the engineering department for more instructions.
The open circuit burnout protection is >20 mA up-scale.

TABLE 6

Reference	A	B	C	D
Input range	0 to 200 Ω	0 to 2 KΩ	0 to 20 KΩ	0 to 200 KΩ
Min. input Span *	10 % of full range selected			

* The Minimum Input Span is the minimum difference between the maximum and minimum input signal for a full scale output (4 to 20 mA or 0 to 10 Vdc).

OUTPUT

0 to 20 mA or 4 to 20 mA	R_L < 600 Ω max. 22 mA ±3%
0 to 10 Vdc	R_L > 1000 Ω max. 11 V ±3%
ACCURACY	≤ 0.2 % FS
RESPONSE TIME	≤ 250 mS
GALVANIC ISOLATION	Input, Output and Power Supply are all isolated to 2 kVeff 50 Hz/1 m.

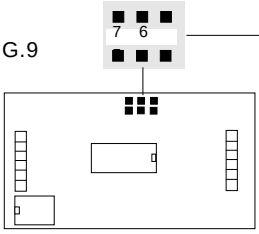
GENERAL SPECIFICATIONS

RIPPLE	≤ 0.5 %
BAND PASS	1.5 Hz (-3 dB)
STORAGE TEMPERATURE	-30° to +80°C
OPERATING TEMPERATURE	-10° to +60°C
TEMPERATURE COEFFICIENT	≤ 0.015 %/°C
STANDARD POWER SUPPLY	115 Vac (±10%) 50/60 Hz
POWER CONSUMPTION	≤ 1.5 VA
TEST VOLTAGE	4 kVeff. 50 Hz/1m.

SIGNAL INPUT RANGE SELECTION

Set the jumper to the position indicated in Table 7 for each range. The jumpers are located on the "MP" input board. See Fig. 9.
If the signal input range is modified, follow the adjustment and calibration procedure.

FIG.9



Input board components view.

TABLE 7

Input range	Close jumper
0 to 200 Ω	5
0 to 2 KΩ	6
0 to 20 KΩ	7
0 to 200 KΩ	------

ADJUSTMENT AND CALIBRATION PROCEDURE

A decade box is required as an input signal source

1. When input and output signal values are determined, remove the conditioner case. (Fig. 2).
2. Check on the "MA" module, if the selected power supply is correct. (Table 1).
3. Select on the input board the desired resistance range, according to Table 7, using jumpers "5", "6" and "7". (Fig. 9).
   Caution : Do not confuse with the jumpers on the "ME" module, all those must be opened.
   Select on the "MS" output module the desired output (voltage or current), using jumpers "E" and "F". (Fig. 6).
4. Connect the decade box to the conditioner terminals 4 - 5.
5. Connect a digital multimeter, to the signal output terminals to be used.
6. Power up the conditioner with the appropriate power supply.
7. Adjust the decade box until it generates the low signal level.
8. Turn the "ZERO" trimmer (P1), located on the "ME" input module, until the multimeter shows the desired low level signal output. (For example: 0 Vdc).
9. Adjust the decade box until it generates the high signal level.
10. Turn the "GAIN" trimmer (P2), located on the "ME" input module, until the multimeter shows the desired high level signal output. (For example: 10 Vdc).
11. Repeat steps 7 to 10, until the two values are correct.

CONNECTIONS

CCT-20

3-wire sensor

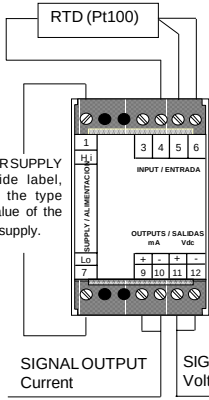


FIG.10

2-wire sensor

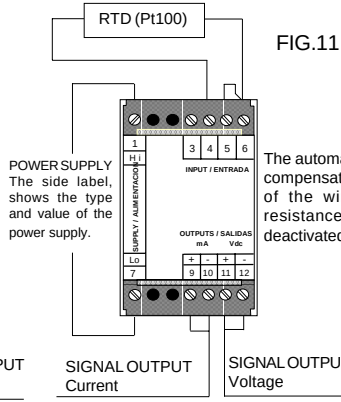


FIG.11

The automatic compensation of the wires resistance is deactivated

CCT-90

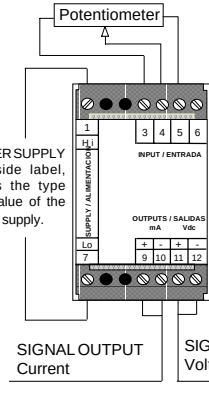


FIG.12

CCT-95

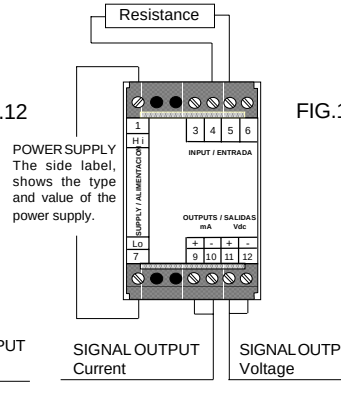
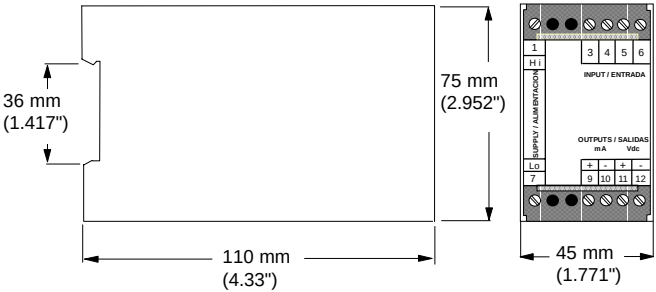


FIG.13

MECHANICAL

DIMENSIONS



TECHNICAL DATA

WEIGHT . . . . . 270 g.
HOUSING BASE . . . . . Polycarbonate, RAL 7032, UL 94 V-1 light grey, IP-40
TERMINAL HOUSING, COVER
AND BLIND PLUGS . . . . . Polycarbonate, UL 94 V-2 dark grey, IP-20
WIRE CROSS SECTION : . . . . . 4 mm^2
Provided with a snap fastener for attaching to DIN 46277 and DIN EN 50022 (35 x 7.5 mm) assembly rails.

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 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 should malfunction, 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 being 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 which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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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. P.O. 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. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

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- Plug-in Cards for Apple, IBM & Compatibles
- Datalogging 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