1 YEAR WARRANTY

MADE IN USA

User's Guide

CN100 Series
Temperature Monitors for Thermocouples and RTDs

omega.com®
OMEGA®

OMEGAnet® Online Service www.omega.com	Internet e-mail info@omega.com

Servicing North America:

USA:
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
Tel: (514) 856-6928 FAX: (514) 856-6886
e-mail: info@omega.ca

For immediate technical or application assistance:

USA 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®
TELEX: 996404 EASYLINK: 62968934 CABLE: OMEGA

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

Servicing Europe:

Benelux:
Postbus 8034, 1180 LA Amstelveen, The Netherlands
Tel: +31 (0)20 3472121 FAX: +31 (0)20 6434643
Toll Free in Benelux: 0800 0993344
e-mail: sales@omegaeng.nl

Czech Republic:
Rudé armády 1868, 733 01 Karviná 8
Tel: +420 (0)69 6311899 FAX: +420 (0)69 6311114
Toll Free: 0800-1-66342 e-mail: czech@omega.com

France:
9, rue Denis Papin, 78190 Trappes
Tel: +33 (0)130 621 400 FAX: +33 (0)130 699 120
Toll Free in France: 0800-4-06342
e-mail: sales@omega.fr

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.dl

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 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.

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

TABLE OF CONTENTS
CNIOO SERIES TEMPERATURE MONITORS

SECTION 1 INTRODUCTION

1.1 GENERAL DESCRIPTION

The OMEGA® CN100 Series temperature monitor is a temperature indicator with either high or low alarms. The six input channels accept independent thermocouple inputs, and there is an individual setpoint for each channel. In operation, the CN100 will scan each channel for 4 to 12 seconds (via side adjustment), and the display will indicate the temperature measured by the individual thermocouples. A red LED indicates an alarm condition; in the event of an alarm, scanning is halted and the relay de-energizes, until the manual reset button is depressed. The CN101 models are high temperature alarms, while the CN102 units will alarm on low temperatures.

The CN102 models also feature a built-in cold start alarm suppression. When the "START UP" LED is lit, the alarm action is suspended until the temperatures of each input reach their respective setpoints. Power failures for less than 30 minutes do not affect the start-up operation.

1.2 AVAILABLE MODELS

CN101(*)-(**) HIGH ALARM

TEMP T/C RANGE	J	K	T	E
0-250°F	CN101J-250F	–	CN101T-250F	CN101E-250F
0-250°C	CN101J-250C	–	CN101T-250C	CN101E-250C
0-500°F	CN101J-500F	CN101K-500F	CN101T-500F	CN101E-500F
0-500°C	CN101J-500C	CN101K-500C	–	CN101E-500C
0-1000°F	CN101J-1000F	CN101K-1000F	–	CN101E-1000F
0-1000°C	–	CN101K-1000C	–	–
0-2000°F	–	CN101K-2000F	–	–
TEMP RANGE	S	C		
0-3000°F	CN101S-3000F			
0-4000°F	–	CN101C-4000F		

CN102(*)-(**) LOW ALARM

TEMP T/C RANGE	J	K	T	E
0-250°F	CN102J-250F	–	CN102T-250F	CN102E-250F
0-250°C	CN102J-250C	–	CN102T-250C	CN102E-250C
0-500°F	CN102J-500F	CN102K-500F	CN102T-500F	CN102E-500F
0-500°C	CN102J-500C	CN102K-500C	–	CN102E-500C
0-1000°F	CN102J-1000F	CN102K-1000F	–	CN102E-1000F
0-1000°C	–	CN102K-1000C	–	–
0-2000°F	–	CN102K-2000F	–	–
TEMP RANGE	S	C		
0-3000°F	CN102S-3000F			
0-4000°F	–	CN102C-4000F		

RTD#

RANGE	HIGH ALARM	LOW ALARM
0-250°C	CN101RTD-250C	CN102RTD-250C
0-250°F	CN101RTD-250F	CN102RTD-250F
0-500°C	CN101RTD-500C	CN102RTD-500C
0-500°F	CN101RTD-500F	CN102RTD-500F
0-1000°F	CN101RTD-1000F	CN102RTD-1000F

SECTION 2 INSTALLATION

2.1 UNPACKING

Remove the packing list and verify that all equipment has been received. If there are any questions about the shipment, please call OMEGA Customer Service Department.

Upon receipt of shipment, Inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

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

2.2 CONTROLLER LOCATION

Select a location for the controller that is free from excessive shock, vibration, dirt, moisture, and oil. The ambient temperature should be between 30° and 130°F(-1° and 54°C).

2.3 MOUNTING

Mount the controller into a 3 5/8" (92mm) square cutout. Refer to Figure 2-1 for the cutout and case dimensions. The plug-in controller does not have to be removed from its housing for mounting.

Remove the two screws that hold the mounting slides; then remove the slides. Insert the case into the cutout from the front side of the panel and reinstall the two slides and two screws. The length of the slides must be reduced if the controller is to be mounted in an extra thick panel. If the controller has been unplugged from its housing, the top of the housing can be determined by the serial tag.

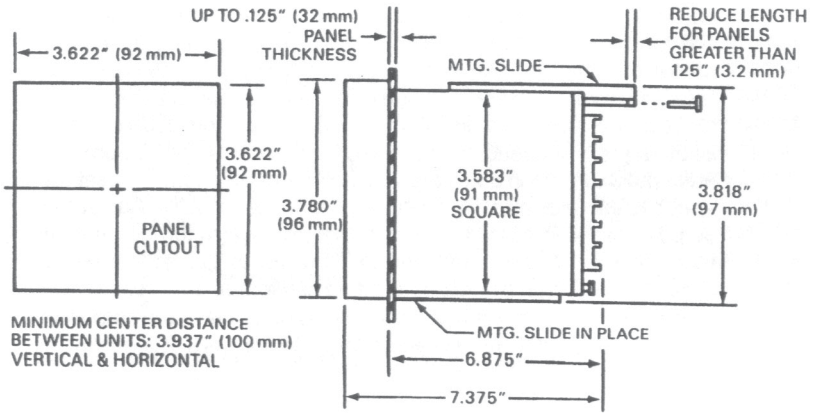


Figure 2-1. Outline Dimensions

2.4 WIRING POWER CIRCUIT

The controller operates on either 120 or 240 VAC, 50 to 60Hz line voltage when connected to the proper terminals. Incoming power lines should be properly fused. Refer to Figure 2-2.

NOTE

Fuse incoming high side of line with fast blow fuse of appropriate rating. Shorted heater or wiring will destroy the relay or output Triac.

2.5 SENSOR PLACEMENT

Proper sensor placement is essential. It can eliminate many problems in the total system. The probe should be placed so that it can detect any temperature change with little thermal lag. In a process that requires fairly constant heat output, the probe should be placed close to the heater. In processes where the heat demand is variable, the probe should be close to the work area. Experimenting with probe location can often provide optimum results.

In an ice bath process, the addition of a stirrer will help to eliminate lags. Some RTD's are shock sensitive and require care in handling and installation.

2.2 SET UP PROCEDURE

Wire the instrument as shown in Figure 2-2. Observe polarity (on the thermocouples red is always negative, on RTDs black is negative) and short all the unused zone inputs (do not short the analog output). Turn all the setpoints fully CW on CN101 models and CCW on the CN102 models. Power up the instrument. If any zone alarms, check for open thermocouples or setpoints turned the opposite way. Correct the problem and push the RESET button. Observe the scanning rate and readjust if needed at the side of the instrument. Push the SET button and release. The green light should appear for about 10 seconds and the display indicates the setpoint Adjust the setpoint of the indicated zone to the desired alarm temperature. If more time Is needed, push the SET button to get an additional 10 seconds. Wait for the green light to disappear and repeat the procedure for all used zones. For unused zones, leave the setpoints fully CW for CN101 models and

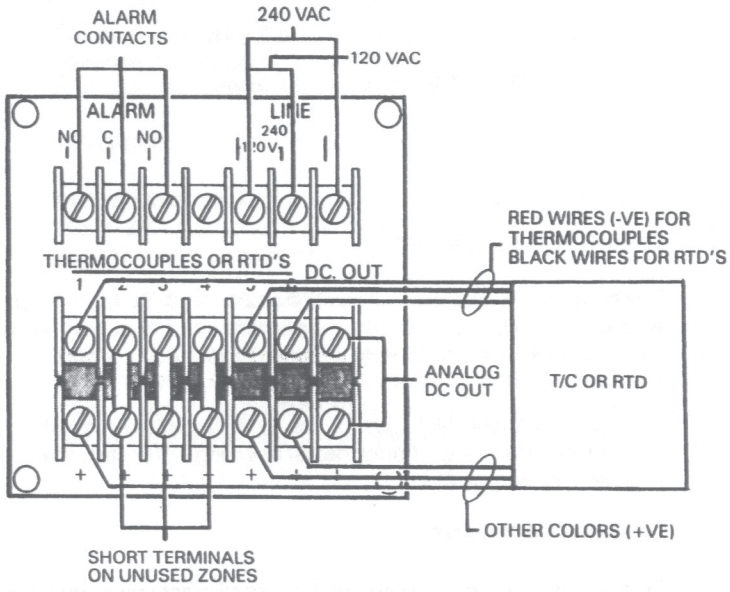


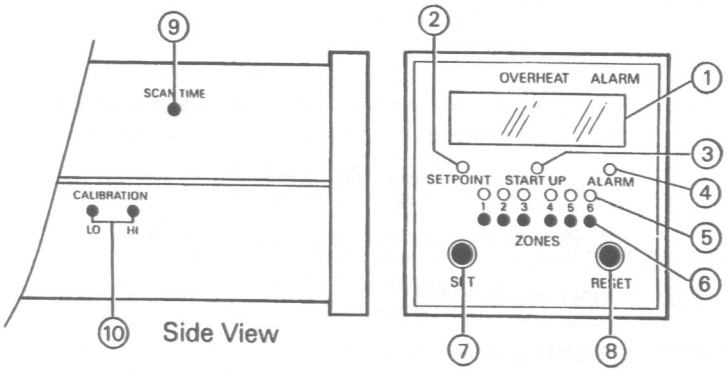
Figure 2-2. Wiring Diagram

SECTION 3 OPERATION

3.1 OPERATION

The typical control system contains the sensor, controller and the process. The thermocouple sensor produces a small voltage change proportional to the measured temperature of the process. An RTD produces a change in resistance proportional to the measured temperature of the process. This is linearized in a unique active circuit, and amplified by the controller, where it is compared with setpoint temperature. If the temperature of the sensor is above setpoint, the output circuitry will be actuated. This is indicated by means of an LED light. The digital meter displays the sensor's process temperature, and when switched, displays the alarm setpoints. Six zones share common amplifier and display.

3.1.1 Controls and Indicators (Refer to Figure 3-1)



1. LED Display (temperature or setpoint)
2. Setpoint (displayed by green LED)
3. Start Up button—cold start (CN102 only)
4. Alarm Light (red LED)
5. Zone Light (yellow LED)
6. Setpoint Control
7. Setpoint Enable
8. Manual Alarm Reset
9. Scan Time Adjust
10. Calibration LO and HI potentiometers

3.1.2 RELAY OUTPUT

The output relay has SPDT contacts rated 5 amps at 120V and 3 amps at 240 VAC. These contacts can be wired to provide power to the alarm. This is a latching relay.

3.2 ADJUSTING SETPOINTS

Six setpoint adjustments are located on the faceplate. These are 15-turn potentiometers with slotted shafts. A small screwdriver is required.

3.3 ADJUSTING SCAN TIME

This adjustment is located on the side of the instrument. It is a 15-tum potentiometer with slotted shaft CW rotation increases the scan time.

SECTION 4 SERVICE INFORMATION

4.1 MAINTENANCE

Some simple preventative maintenance will keep the controller operating properly:

1. Keep the controller clean and protected from dirt, oil and corrosion.
2. Periodically recheck all electrical connections.

4.2 TEST PROCEDURE

4.2.1 Visual Inspection

1. Inspect the instrument for mechanical damage.
2. Make sure that all screws are tight.
3. Make sure all switches and lights are properly installed.
4. Make sure all labels are properly and correctly attached.

4.2.2 Functional Observation

1. Short the thermocouple or RTD inputs to each zone.
2. Attach cord and plug to 120 VAC line terminals.
3. Attach ohmmeter to C and NO relay terminals.
4. Insert the power cord to 120 VAC line outlet.
5. Observe that ohmmeter reads near zero ohms.
6. Observe that digital display is “on” and all the digits are working properly.

7. Observe that only one scan light is on.
8. Observe that digital display reading is more than zero and less than 100^0F (or ^{0}C).
9. Adjust LO calibration potentiometer on the side of the instrument until the display reads 75 ±5^0F (25 ±5^0C). Refer to Figure 4.1.
10. Turn all setpoint controls 10 turns clockwise.
11. If the alarm light (red) is on, push the RESET button and remove the alarm.
12. Observe that zone light scans sequentially from zone to zone without skipping any zones.
13. Turn the scan time control fully CW (about 20 turns) and observe that the scan rate is more than 12 seconds.
14. Turn the scan time control fully CCW and observe that the scan rate is between 2-5 seconds.
15. Set the scan time at 5 seconds ±1 second.
16. When the scan light comes to zone 1, push the set switch and observe that the green setpoint light comes on. Observe that the light stays on for 7-15 seconds and the zone scan light stays on zone 1 as long as green light is on.
17. Push the SET button and turn the setpoint control fully CCW; observe that indication goes to 0000 -0 +2.
18. Observe that the alarm light comes on and ohmmeter resistance measures HI (open).
19. Push the SET button and turn the setpoint control fully CW. Observe that the display rises gradually from 0 to full range of the instrument.
20. Push the RESET button and observe that the RESET light is off and the instrument resumes scanning.
21. Repeat steps 17 through 20 for other channels.
22. Switch the power on and off several times and observe that the unit does not go to alarm condition.
23. Disconnect the thermocouple short from zone 1 and observe that when the scan light comes to zone 1, the instrument indicates alarm, the meter reeds full scale, and the scanning has stopped.

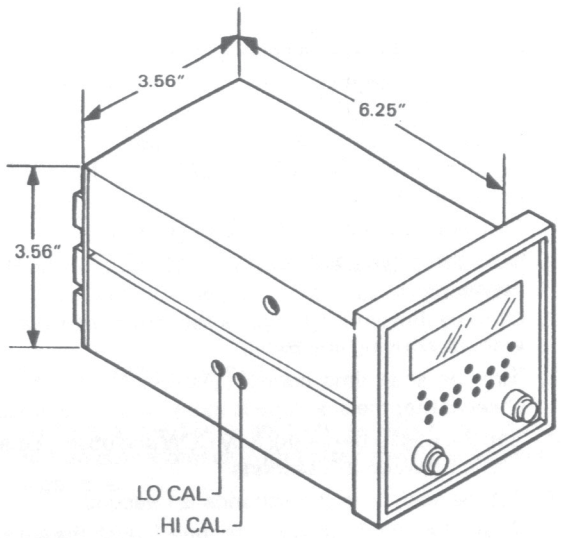


Figure 4-1. Calibration Adjustments

4.2.3 Ca

5

minutes,
attach proper thermocouple or RTD wire to zone 1.

2. Connect the other end of the wire to the thermocouple signal generator. Select proper cold junction compensation. Refer to Figure 4-2. For RTD version use precision decade resistance box.
3. Bring the instrument to alarm condition by setting the millivolt or resistance signal higher than the range of the instrument. This will stop the scanning and keep the instrument latched to the zone being calibrated.
4. Set the millivolt source or decade resistance box to low calibration point as indicated on the calibration tables.
5. Adjust the LO calibration potentiometer on the side of the instrument to read the proper typical value ±1^{0}F or ±1^{0}C.
6. Set the millivolt source or decade resistance box to high calibration point as indicated on the calibration tables.
7. Adjust the Hi calibration potentiometer on the side of the instrument to read the proper typical value ±1 ^{0}F or ±1^{0}C.
8. If large adjustments are made on HI calibration potentiometer, repeat steps 4 through 7 until all errors are eliminated.
9. Check all calibration points on the table to be within ±.25% of the typical calibration.
10. Measure that the DC voltage output corresponds to the calibration table. For RTD version, check resistance output.

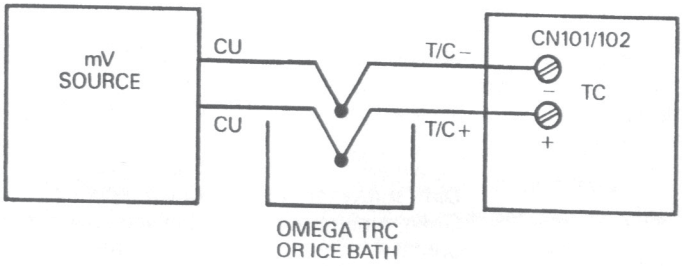


Figure 4-2. Thermocouple Calibration

4.2.4 Calibration Alarm

1. Push the SET button and adjust zone 1 setpoint to mid-range.
2. Set the temperature input to .25% of range below the setpoint.
3. Push the RESET button and allow the scan light to go to zone2.
4. Set the input to zone 1 to .25% of range above the setpoint.
5. Observe that when the zone light comes to zone 1, the unit goes into alarm condition within 4 seconds.

4.2.5 Zone Crosstalk

1. Set zone 1 setpoint to full range.
2. Set zone 1 temperature to 90% of its range.
3. Set zone 2 setpoint to .25% of range above its shorted thermocouple temperature.
4. Reset alarm if necessary and allow the unit to scan.
5. Observe that zone 2 does not alarm.

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
1. instrument is inactive	No line voltage	Check line voltage
	Blown fuse	Replace fuse
	Dirty screw terminal	Clean terminal
	Open transformer primary	Replace power transformer.
2. Display reads full range unit in alarm no scanning	Open thermocouple probe or RTD probe	Check probe
	Burned input I.C.	Replace
3. No output, unit in alarm	Relay contacts or relay coil	Check relay. Clean or replace
4. Reading is zero	Reversed thermocouple leads	Check and correct.
5. Reads ambient	Shorted thermocouple	Check and correct.
6. Alarm does not reset	Broken or jammed reset switch	Check and replace.
7. Does not read setpoints	Broken or loose switch	Tighten or replace.
8. Erratic indication	Loose ribbon cable.	Check cable.
	Power supply faulty	Check ±12V regulators.
9. Cannot reach range	5V Reference	Check 5.03V ±.02; adjust if necessary.
10. Cannot adjust scan rate	Broken potentiometer	Replace potentiometer

SECTION 5 SPECIFICATIONS

5.1 THERMOCOUPLE

ALARM TYPE	CN1O1 models-high alarm; CN1O2 models-low alarm
ACCURACY:	±1% of range
INPUTS:	6, thermocouple
NO. OF SETPOINTS:	6, independent for each input
SCANNING RATE:	4 to 12 seconds per channel, side adjustment
RELAY:	SPDT Mechanical, rated 5A at 120 VAC, 3A at 240 VAC latching
ANALOG OUTPUT:	0 to 5 VDC, scans sequentially from zone to zone (non-isolated)
ALARM OPERATION:	Relay de-energized. ALARM ON LED indicator on, scan hold until reset
RESET:	Manual, front pushbutton
MAX. VOLTAGE BETWEEN INPUTS:	10 VDC or 6 VRMS
POWER:	120/240 VAC, 50/60 Hz
POWER LOSS:	Unit returns to ready state
DISPLAY:	4-digit LED, 0.6”
AMBIENT OPERATING RANGE:	32 to 135^{0}F
DIMENSIONS:	3.56”H x 3.56”W x 6.25”D
PANEL CUTOUT:	1/4 DIN, 3.622” x 3.622”
DEPTH BEHIND PANEL:	6.25”
TERMINALS:	Type 6-32 screws

5.2 RTD

ACCURACY:	Greater than 0.5% range ±1
INPUTS:	RTD 100 ohm Platinum (European) —2 wire "Top" input connector— common to all 6 channels (negative wire). "Bottom" input connector— single inputs to each channel (positive wire)
NO. OF SETPOINTS:	6, independent for each input
OPEN SENSOR INDICATION:	Treated as alarm
SCANNING RATE:	4 to 12s per channel, side adjustment
RELAY:	Mechanical, rate 5A @ 120 Vac (24 Vdc), 3A @ 240 Vac (48 Vdc); SPDT type
ANALOG OUTPUT:	0 to 5 Vdc, non-isolated
ALARM OPERATION:	Relay de-energized, ALARM ON LED indicator on, scan hold until reset
RESET:	Manual, front pushbutton
MAX. VOLTAGE BETWEEN INPUTS:	10 Vdc or 6Vrms
POWER:	120/240 Vac, 50/60 Hz
POWER LOSS:	Unit returns to ready state after power resumption
RESOLUTION:	10
DISPLAY:	4-digit LED, 0.6"
AMBIENT OPERATING RANGE:	32 to 135^{0}F
DIMENSIONS:	3.56" H x 3.56"W x 7" D
PANEL CUTOUT:	¼ DIN, 3.622" x 3.622"
DEPTH BEHIND PANEL:	6.25"
TERMINALS:	Type 6-32 screws

5.3 PARTS LIST

P.C. Board-A

RESISTORS 1/4 WATT

1 - 220 ohm (R26)
2 - 1K (R6, R22)
4 - 1.5K (R9, R10, R11, R12)
1 - 2.2K (R17)
1 - 2.7K (R16)
6 - 4.7K (R4, R7, R8, R24, R29, R30)
7 - 10K (R2, R3, R5, R13.2, R14. R15, R23)
1 - 8.2K (R27)
1 - 18K (R28)
1 - 33K(R1)
1 - 66K (R19)
1 - lOOK (R20)
1 - 470K (R25)

PRECISION RESISTORS:

1 ‘ 400K(R18)

POTS:

1 - 2K (P3) **(89PR)**
2 - **1OOK** (P1, P2) **(89PR)**

CAPACITORS:

1 - 68pF **(C3)**
1 - 220pF **(C2)**
1 - 4700 pF(C4)
3 - 0.01uF (Mylar) (C5, C8, near Q14)
1 - 2.2/50V (C7)
1 - 10/25V(C6)
2 - 10/50V (C9. C10)
1 - 100/25V (C1)
2 - 100/50V (C13. C141
1 - 1000/16V (C12)

DiODES:

9 - 1N4148 (D1, D2, D3, D4, D5, D6, D7, D8, D9)
4 - 1N4004 (D0, D11, D1Z, D13, D14)

TRANSISTORS:

7 **-** 2N4424(Q2,Q3, Q4, **Q5, Q7, Q23, Q24)**

CRYSTAL:

1 ‘ 3.5795

INTEGRATED CIRCUITS:

1 - 741 (Q19)
1 - 311 (Q18)
3 - 4518(Q 8,Q12, Q13)
2 - 4028 (Q1, Q16)
2 - 4040(Q11, Qi4)
2 - 4052(Q9, Q10)
1 - 4066(Q17)
1 - 4011 (Q6)

VOLTAGE REGULATORS:

1 . 317LZ (Q22)
1 - 7812(Q20)
1 - 7819(Q21)

RELAYS:

1 - 5 AMP Relay MS64-932

TRANSFORMER:

1 - 830957

HEADERS:

1 - 4161-14-03-P1 (Straight)
1 - 4162-22-06-P1

SOCKETS:

2 - 16 Pin MEGA 16MP

CONNECTOR:

1 - 4002-14-00-P5

P.C. Board-B

PRECISION RESISTOR 1%:

1 1K (R52)
1 - 250K (R53)
1 - 174K(NearP10)

POTS:

1 - 200 ohm (P10) 89PR
7 - 10K (P4, P5, P6, P7, P8, P9, P11) 89PR

CAPACITORS:

1 - 2.2/50 (C25)
1 - 4.7/50V (C22)
4 - 22/50 (C15, C16, C19, C23)

RESISTORS 1/4 WATT

6 - 100 ohm (R76, R77, R78, R79, R80, R81)
7 - 1K (R29, R49, R56, R57, R58, R62, R63)
1 - 1.5K (R72)
1 - 2.2K (R64)
2 - 4.7 (R74, R83)
5 - 10K (R27, R51, R59, R67, R69)
17 - 33K (R32, R33, R34, R37, R38, R39, R40, R45, R47, R48, R50, R54, R55, R60, R61, R68, R70)
3 - 100K (R28, R46, R91)
1 - 220K(R35)
- 330K (R30)
2 - 1 Meg. (R36, R41)
1 - 1.5 Meg. (R42)
2 - 10 Meg. (R65, R66)

DIODES:

6 - 1N4148 (D15, D16, D18, D19, D20, D23)
6 - 1N751, 1N753 or 1N754 (Z2, Z3, Z4, Z5, Z6, Z7)

TRANSISTORS:

1 - 2N4424 (Q29)

INTEGRATED CIRCUITS:

3 - 4051(Q24,Q30,Q31)
2 - uA339 (Q25,Q26)
1 - 4066(Q27)
I - 0P20 (Q28)

HEADERS:

1 - 14 PIn #4161-14-03-Pi (Straight)

SWITCHES:

2 - C&K8168(S1,S2)
2 - BlackCaps8025
2 - Metal Guards G-12A
2 - Washers

BARRIER CONNECTOR:

1 - A204207NLR50
1 - A20720NLR53

CONNECTOR:

1	**-**	4002-14-00-P5
1		Cable #455-240-14

PC Board-C

RESISTOR 1/4 W:

7	-	47ohm

LED's:

1	-	Red (MV5754)
1	-	Green (MV5454)
6	-	Yellow(MV5354)

DISPLAY MODULE:

2	-	MAN6740

HARDWARE:

1	-	Case
1	-	Backplate
1	-	Bezel
1	-	Face Plate (Metal)
1	-	Face Plate (Plastic)
1	-	Sprlng
4	-	3/8" x 5/32" F/HD Screws
4	-	3/8" x 5/32" R/MD Screws
2	-	5/32 Nuts
1	-	Red Lens

5.4 CALIBRATION CHARTS

The following charts are sample calibration charts for the ranges 0-500^{0}FJ, and 0-2000^{0}FK. For models other than these ranges,it is advisable to calibrate the units at 10% and 90% FS.

5.4.1 CALIBRATION TABLE 0-2000°F-TYPE-K

CN101(*)-(**)

TYPICAL CAL.			
mV	°F	ANALOG Vo DC	TEMPERATURE-ACTUAL
0.000	34	.085	32
3.819	201	.50	200
8.314	400	1.00	400* LO CAL. POINT
12.854	600	1.50	600
17.523	800	2.00	800
22.251	1000	2.50	1000
26.975	1201	3.00	1200
31.629	1400	3.50	1400
36.166	1601	4.00	1600 *HI CAL. POINT
40.575	1800	4.50	1800
44.856	1995	4.99	2000

RANGE COMPONENTS

R13.4 - 10K
R18 - 400K 1%
R62 - 1.5K
R63 - 2.2K
R64 - 1.3K
R73 - 43K
R84 - 13.3K
R85 - 27K
R86 - 110K 1%

5.4.3 CALIBRATION TABLE 0-500°F-TYPE J

TYPICAL CAL.			
mV	°F	ANALOG Vo DC	TEMPERATURE-ACTUAL
0.000	34	.03	32
0.507	50	.50	50 *LO CAL. POINT
1.942	100	1.00	100
3.411	150	1.50	150
4.906	200	2.00	200
6.420	251	2.51	250
7.947	301	3.01	300
9.483	350	3.50	350
11.023	400	4.00	400
12.566	450	4.50	450 *HI CAL. POINT
14.108	501	5.01	500

RANGE COMPONENTS

R13.2 - 10K
R18 - 400K 1%
R62 - 1K
R63 - 1K
R64 - 2.2K
R73 - 33K
R84 - OUT
R85 - 10K
R86 - 350K 1%

5.4.3 CALIBRATION TABLE 0-250°C-RTD

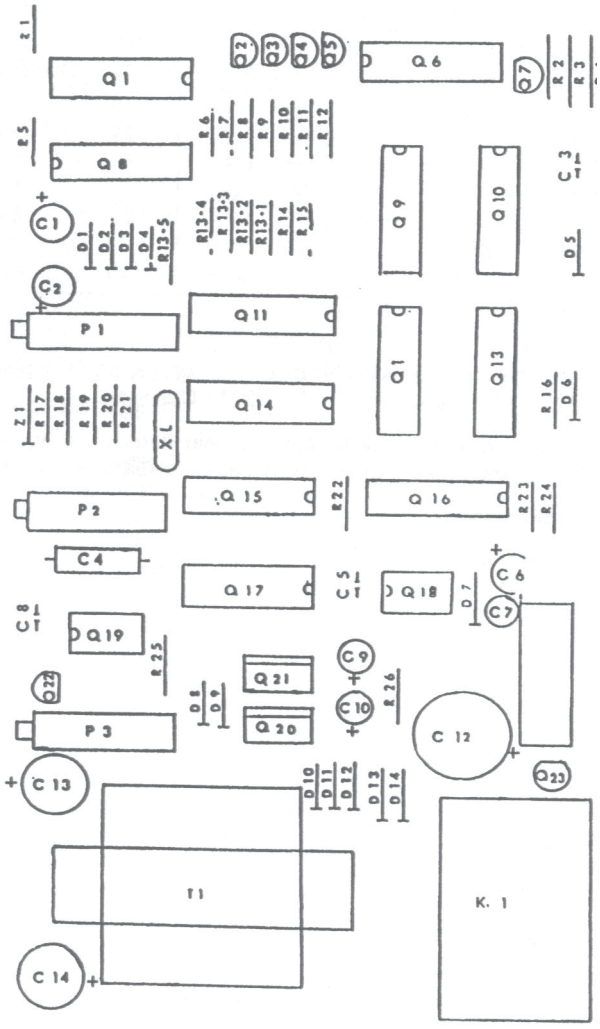
CALIBRATION TABLE			ACTUAL	
RESISTANCE ohms	TEMP. °C	ANALOG OUTPUT VDC	TEMP. °C	ANALOG OUTPUT VDC
100.94	2.4	0.05	2	0.05
110.85	27.4	0.55	27	0.56
122.72	57.6	1.15	58	1.17
136.49	94.7	1.90	94	1.89
147.36	123.5	2.47	123	2.47
167.36	177.0	3.54	178	3.55
188.88	235.7	4.70	236	4.70

NOTES

Actual temperature rounded off to whole digit (no decimal point). Accuracy better than 0.5% of 25^0C-225^0C range. Recommended lead wire distances to obtain stated accuracy with proper calibration. Use copper wire. Based on ambient temperature.

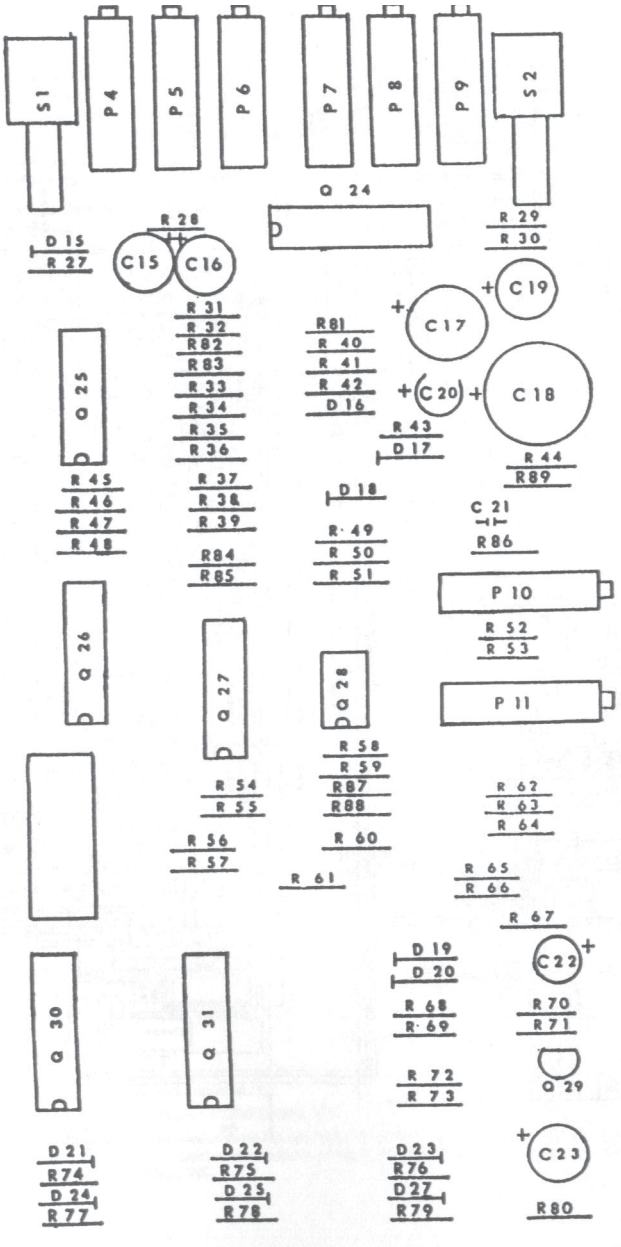
AWG	Distance
14	150ft
20	50ft
24	25ft

5.5 COMPONENT LAYOUT-P.C. Board A

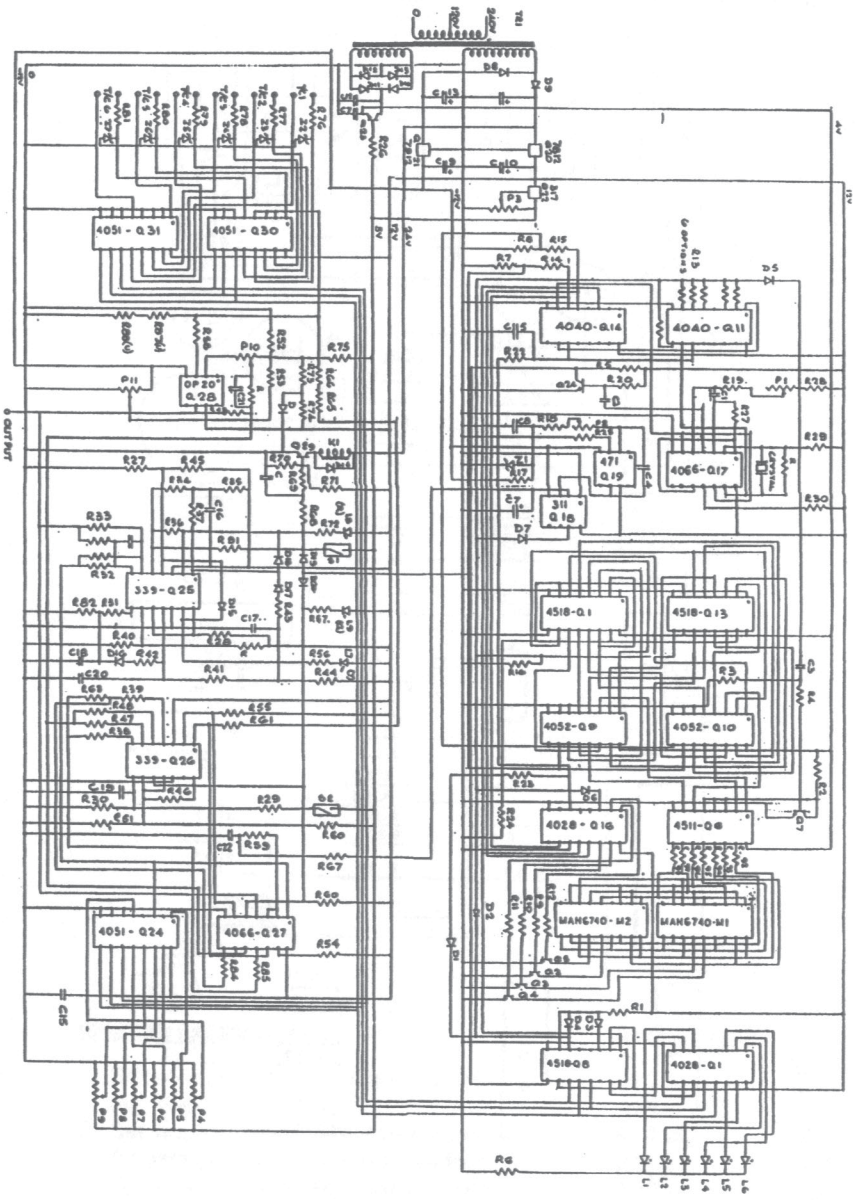


1. Select nearest standard range resistor (e.g. 800° = R13.3).
2. Set setpoint pot full CW (maximum).
3. Adjust P2 for required range readout.
4. Reduce R18 If range cannot be reached.

5.5 COMPONENT LAYOUT-P.C. Board B



5.6 SCHEMATIC



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 which wear are not warranted, including but 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 it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS 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.

Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course!

Shop online at www.omega.com

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
- 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

M0666/0702