OMEGA
ENGINEERING, INC.
*An OMEGA Technologies Company*

# MODEL
# CN2081 High Limit
# CN2091 Low Limit
# CONTROLLER

## Operator's Manual

FM
APPROVED

## WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service 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 our customers receive maximum coverage on each product. If the unit should malfunction, it must be returned to the factory for evaluation. Our 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. However, 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 or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

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OMEGA ENGINEERING, INC.
An OMEGA Technologies Company

One Omega Drive, Box 4047
Stamford, Connecticut 06907-0047

Call OMEGA Toll Free*

Sales: 1-800-82-66342 / 1-800-TC-OMEGA
Customer Service: 1-800-622-2378 / 1-800-622-BEST
Engineering Assistance: 1-800-872-9436 / 1-800-USA-WHEN

*In CT: (203) 359-1660 And International
CABLE: OMEGA TELEX: 996404
EASYLINK: 62968934 FAX: (203) 359-7700


### Return Requests/Inquiries

**Direct all warranty and repair requests/inquiries to OMEGA Customer Service Department, telephone number (203) 359-1660. BEFORE RETURNING ANY INSTRUMENT, PLEASE CONTACT THE OMEGA CUSTOMER SERVICE DEPARTMENT TO OBTAIN AN AUTHORIZED RETURN (AR) NUMBER. The designated AR number should then be marked on the outside of the return package.**

**To avoid processing delays, also please be sure to include:**

1. **Returnee's name, address, and phone number.**
2. **Model and Serial numbers.**
3. **Repair instructions.**

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

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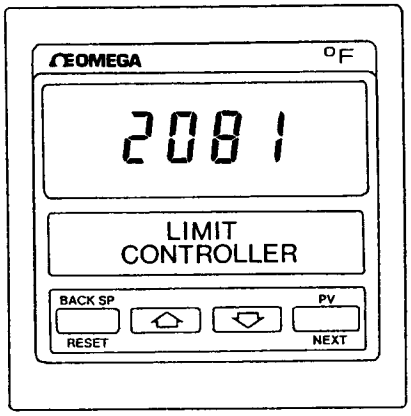
M1153/0290

PLEASE NOTE

This instrument has a self test start-up sequence. For the first 20 seconds after power on, the display will flash "SELF tEST", the front keypad will be locked out and the relay will be in the limit condition. Normal operation commences after 20 seconds.



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## SECTION 1 INTRODUCTION

### 1.1 GENERAL DESCRIPTION

The OMEGA® CN2081 HIGH LIMIT and CN2091 LOW LIMIT CONTROLLER is a microprocessor-based instrument with special design features for extra safety and reliability. The instrument provides one 5 ampere electromechanical relay (EMR) to alarm or shut down the system when the temperature exceeds the setpoint.

Two backup circuits, one totally independent analog circuit and one digital "Watch-dog" circuit ensure reliable Limit Control at all times.

The analog backup looks at the input signal independently from the main microprocessor circuitry, compares the input to its own setpoint (set outside the digital primary limit setpoint) and will trip the limit relay at alarm state if the digital circuit fails to do so.

The digital "Watch-dog" circuit monitors key functions of the microprocessor circuitry and automatically resets the processor if noise or unusually large power spikes should upset any of the digital operations.

All programming and configuring are accomplished through the front keypad with fixed sequences of displays used to ensure complete and proper configuration, calibration and operation.

### 1.2 AVAILABLE MODELS

| HIGH LIMIT | LOW LIMIT | INPUT TYPE | RANGE |
|---|---|---|---|
| CN2081JF | CN2091JF | Iron/Constantan | -299 to 1400°F |
| CN2081JC | CN2091JC | Iron/Constantan | -184 to 760°C |
| CN2081KF | CN2091KF | Chromel/Alumel | -181 to 2500°F |
| CN2081KC | CN2091KC | Chromel/Alumel | -118 to 1371°C |
| CN2081TF | CN2091TF | Copper/Constantan | -300 to 741°F |
| CN2081TC | CN2091TC | Copper/Constantan | -184 to 394°C |
| CN2081EF | CN2091EF | Chromel/Constantan | -179 to 1832°F |
| CN2081EC | CN2091EC | Chromel/Constantan | -117 to 1000°C |
| CN2081RF | CN2091RF | Pt13%Rh/Pt | +32 to 3199°F |
| CN2081RC | CN2091RC | Pt13%Rh/Pt | 0 to 1789°C |
| CN2081SF | CN2091SF | Pt10%Rh/Pt | +32 to 3181°F |
| CN2081SC | CN2091SC | Pt10%Rh/Pt | 0 to 1749°C |
| CN2081BF | CN2091BF | Pt30%Rh/Pt6%Rh | 800 to 3259°F |
| CN2081BC | CN2091BC | Pt30%Rh/Pt6%Rh | 427 to 1793°C |
| CN2081P1F | CN2091P1F | 100Ω Pt RTD ($\alpha$=0.00385) | -300 to 1400°F |
| CN2081P1C | CN2091P1C | 100Ω Pt RTD ($\alpha$=0.00385) | -184 to 760°C |

See Specification Section for wider ranges on some input types.

## SECTION 2 UNPACKING

Remove the packing list and verify that all equipment has been received. If there are any questions about the shipment, please call the OMEGA Customer Service Department at 1-800-622-2378.

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 material is saved for their examination. After examining and removing contents, save the packing material and carton in the event reshipment is necessary.

## SECTION 3 MOUNTING

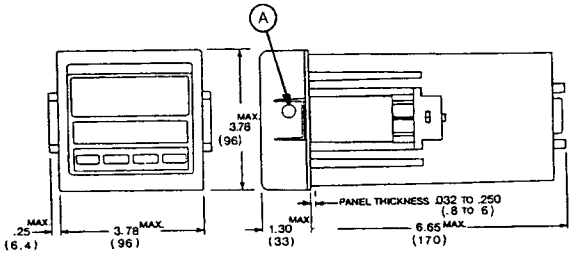
**HAZARD**

**INSURE THAT ALL POWER AND MEASURING CIRCUITS ARE DISCONNECTED BEFORE INSTALLATION IS ATTEMPTED.**

In the normal course of installation and operation, there is no reason to remove the electronic assembly from the case. If the electronic assembly is removed, SPECIAL PRECAUTIONS MUST BE TAKEN IN HANDLING THE CMOS INTEGRATED CIRCUITS TO PREVENT STATIC DISCHARGE DAMAGE TO THE DEVICES.

The entire electronic assembly may be removed from the case for servicing without disturbing the rear terminal wiring by pressing the tabs on the side of the bezel and carefully pulling the assembly out of the case.

The Model CN2081/CN2091 controller is intended to be mounted in a control cabinet or rack panel with natural convection cooling where access to the rear terminals is enclosed and where supply and load wiring can be properly terminated and enclosed. Prepare a panel cutout of 3.620 X 3.620 in. (92x92 mm). Use the two clamps which hook in to the case slots on the two sides of the case to secure the housing to the panel. Tighten the clamping screws to insure a snug fit. Do not overtighten. Allow adequate clearance around the instrument case for proper air circulation.



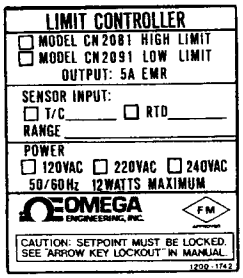

Ⓐ Access hole is for the analog backup setpoint potentiometer. Leave adaquate clearance to access this potentiometer.

Figure 1 - Case Dimensions

## SECTION 4 IDENTIFICATION

### 4.1 REAR LABELS

Refer to case mounted label on each unit for proper identification of supply voltage and sensor type before proceeding with the wiring.




### 4.2 SOFTWARE PART NUMBER

| E | P | - | ① | ① | ② | ② | - | ③ | ③ | ④ | ④ |
|---|---|---|---|---|---|---|---|---|---|---|---|

**① Output**

| | |
|---|---|
| 10 | 5 AMP EMR Hi Limit |
| 20 | 5 AMP EMR Lo Limit |

**② Input**

| | |
|---|---|
| 00 | Type J Thermocouple |
| 01 | Type K Thermocouple |
| 02 | Type R Thermocouple |
| 03 | Type S Thermocouple |
| 04 | Type T Thermocouple |
| 05 | Type E Thermocouple |
| 06 | Type B Thermocouple |
| 20 | 100 Ω Pt RTD |

**③ Display Range**

| | |
|---|---|
| XX | The factory will assign a unique part number for each range ordered. |

**④ Voltage**

| | |
|---|---|
| 03 | 120 VAC |
| 04 | 220 VAC |
| 05 | 240 VAC |

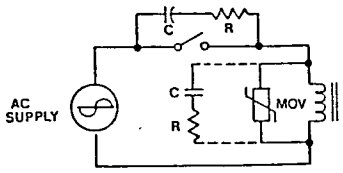
## SECTION 5 WIRING

Successful operation begins with proper installation. Good installation requires not only that good wiring practices be followed but also that reasonable protection be provided against external electrical influences that may interfere with the controller operation. In addition, all wiring should conform to applicable local and national codes. The controller should be wired with an external power disconnect and fuse.

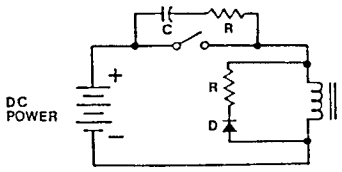
### 5.1 NOISE SUPPRESSION

The primary sources of electrical interference (noise) that can impact any digital device are inductors most commonly found as coils and windings in solenoids, relays and transformers. It is important to suppress any potential for electrical noise at its source to ensure reliable controller operation. Specifically this means putting noise suppression devices across the terminals of all inductors in your system.

**AC NOISE SUPPRESSOR**




**DC NOISE SUPPRESSOR**



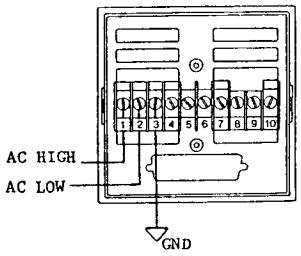
If you do not have the necessary components available, they may be purchased locally or in kit form from OMEGA (Kit 1821-101).

| ITEM | MAX. AC | RATING | KIT |
|---|---|---|---|
| RC | 240 VAC | 0.1uF/220Ω | 1821-101 |
| MOV | 130 VAC | 35 Joules | 1821-101 |

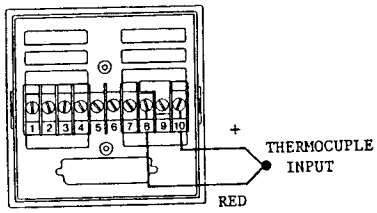
When wiring to the controller, twisted pair with insulated shield is recommended for all signal leads. Make sure the shield is grounded ONLY at terminal 8 of the controller. Be sure to protect against ground loops in signal leads, shields and all other input and output wiring. Low level signal leads and high level power cables must not be run in the same conduit or cable trays. Care when wiring means better system reliability.

## 5.2 AC SUPPLY WIRING

Connect the AC line power to the rear terminals as shown in this diagram. The unit is normally wired for 120 VAC opera-tion. Refer to the case label for the proper AC supply voltage rating. Maximum input current at 120 VAC, 50/60 Hz is 115 mA. Other voltages are available. Check and be sure.



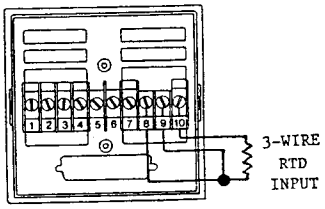

## 5.3 THERMOCOUPLE INPUT WIRING




Connect the RED (-) thermocouple wire to terminal 8. Connect the remaining (+) thermocouple wire differing in color to terminal 10. No connection is made to terminal 9. It is important that all connections be clean and tight. Maximum loop resistance of the thermocouple circuit must not exceed 100Ω. Use shielded thermocouple extension wire between the thermocouple and the controller.

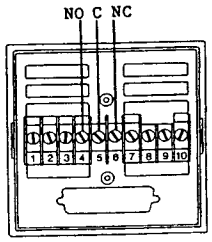
## 5.4 RTD INPUT WIRING (100Ω Pt - 0.00385 Ω/Ω/°C)

Connect the RTD sensor per this diagram for a 3-wire RTD. For a two wire RTD, short terminals 8 to 9 and connect the RTD between terminals 9 and 10. The RTD leads may be extended using shielded copper wire not to exceed 10Ω per lead.




## 5.5 LOAD WIRING - 5A ELECTROMECHANICAL RELAY

Wire the load relay as shown in the diagram. The contacts are rated for 5 amperes at 240 VAC maximum. Note that the relay is energized during normal operation and drops out under alarm conditions. The relay is shown here in de-energized state.

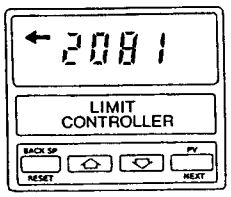


NOTE

Relay terminal designations refer to the de-energized state, i.e., with no power to the controller. To provide reliable alarm action, the relay in this controller is energized during normal operation of the controller. When wiring to the relay, be sure to keep this in mind. Before power is applied to the controller and when the alarm is ON, the relay terminal designation is as shown above. During normal operation with no alarm ON, the relay designations are the reverse of that shown above.

## SECTION 6 OPERATION

### 6.1 DISPLAY/KEYPAD




Four front panel keys are the operator interface. Key functions are clearly marked. Four blue "seven-segment" characters in the display show setpoints and measurement up to ±9999 units and symbols to inform and prompt the operator. An "ARROW" segment flashes when an alarm condition exists. On power up, the arrow will flash for 20 seconds. If no alarm condition exists, the relay will reset and the arrow will extinguish automatically. If an alarm condition exists before a power down, the unit will remain in the alarm condition on power up.

### 6.2 OPERATOR PROGRAM

During the normal operation, the user has ready access to three displays. The principle display is the digitally set LIMIT setpoint. This display is continuous unless another display is called. The **UP** and **DOWN** arrow keys are used to change the setpoint value. Any setpoint value is acceptable to the controller within the range of the selected input. The unit automatically restricts the primary setpoint from being set within the tolerance range of the analog backup setpoint (see Section 8). If on change of the primary setpoint, this limit is restrictive, readjust the analog setpoint as necessary to get the desired primary setpoint.

Press and hold the **PV** key to display the actual temperature.

Press and hold the **BACK SP** key to display the analog backup setpoint.

If the setpoint limit has been exceeded, the limit relay will trip and the annunciator "ARROW" will flash. Press the **RESET** key to reset the relay and turn OFF the indicator. If the setpoint is still exceeded, both the relay and the indicator will remain ON.

## 6.3 SELF DIAGNOSTICS

If any of the following hardware or system failures are detected, an error code will appear on the display.

| DISPLAY | FAILURE | CORRECTIVE ACTION |
|---|---|---|
| E0 | Analog setpoint out of range | Check and adjust backup set-point range. |
| E1 | Power | Check AC supply voltage. |
| E2 | Memory | Remove and restore AC supply. |
| E3 | AC Supply Sync. | Check AC supply voltage. |
| E4 | Calibration Lost | Recalibrate (See Section 8). |
| E5 | Input Out of Range | Check input range. |
| E6 | Data Lost | Remove and restore AC supply. |
| E7 | HI/LO Setup Error | Remove and restore AC supply. |
| E8 | HI/LO Conversion Error | Go to configuration loop and confirm HI/LO selection. |
| E9 | Analog Setpoint Error | Set analog setpoint further away from digital setpoint. |

During any error condition except "E9", the limit relay and alarm indicator are turned ON. If the above corrective actions do not correct the failure, return the unit for service. (See Section 13.)

## 6.4 SETTING THE ANALOG BACKUP SETPOINT

A separate backup setpoint is provided in the limit controller to ensure load protection in case of digital circuit failure. To set the BACKUP setpoint, first remove the plastic plug on the outside right edge of the bezel. A small screwdriver is required. While pressing the **BACK SP** key to display the backup setpoint value, adjust the displayed value using a small instrument screwdriver until the desired backup setpoint is displayed.

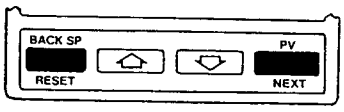
To ensure proper limit control operation, the backup setpoint must be set at a value of at least 50 PV units higher (for a high limit) or 50 units lower (for a low limit) than the primary digitally set setpoint. If the backup setpoint is set too close to the primary setpoint, an "E9" error message will appear on the display when the **BACK SP** key is pressed. If the "E9" display is not cleared by changing the backup setpoint value before the **BACK SP** key is released, the analog backup circuit may trip the LIMIT relay before the primary digital circuit does. This is not recommended.

Replace the plastic plug before returning the controller to normal operation.

## 6.5 MONITOR PROGRAM

A special monitor program is included in this controller to allow system fault analysis after a limit condition has been experienced.

A special key code is required to address the monitor program. To access the monitor program, press the **BACK SP** and **PV** keys simultaneously.



6.5.1 Arrow Key Lockout

The first display in the monitor program is an arrow key lockout feature. This feature can be enabled to prevent unauthorized or casual change of the digitally set setpoint from the front keypad. The display will show "LOC" followed by an "ON" or "OFF". The **UP ARROW** key turns the lockout feature ON. The **DOWN ARROW** key shuts the lockout feature OFF. Press the **NEXT** key to enable the selected action.

```
SINCE THE MODEL CN2081 OR CN2091 IS USED TO PROVIDE  SAFETY
SHUTDOWN WHEN A LIMIT IS EXCEEDED, IT IS HIGHLY RECOMMENDED
THAT THE  ARROW KEY LOCKOUT  FEATURE BE ENABLED TO  PREVENT
UNAUTHORIZED TAMPERING WITH THE LIMIT SETTING.
```

6.5.2 Min/Max Measurement

The next display will be a momentary "HI P" for a high limit controller or "LO P" for a low limit controller. The maximum ("HI P") or minimum ("LO P") process value since the last reset will then appear on the display immediately after the "HI P" or "LO P" display.

No action is required. This is an information only display. Press the **RESET** key to clear the stored value. A power down condition will also clear the stored value. Press the **NEXT** key to proceed with the monitor program.

6.5.3 Limit Duration

The next display "DUR" stands for duration or time that the process variable has been outside of the digital setpoint limit, i.e., the time that the limit has been exceeded.

The time display is in hours Xh and minutes YY and appears on the display as "XhYY".

A colon flashes on the left side of the display when the timer is running. The timer stops when the process variable returns within the digital setpoint limit even though the limit relay remains latched.

"DUR" is an information only display. The timer display will operate for durations up to 4 hours and 51 minutes. Times exceeding this value will cause the timer display to flash.

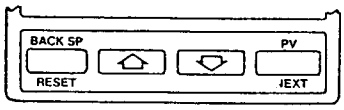
Press the **RESET** key to clear the stored time. A power down condition will also clear the stored value. Press the **NEXT** key to return to the normal operation display. This ends the monitor program.

## SECTION 7 CONFIGURATION PROGRAM

7.1 ACCESS TO CONFIGURATION

The controller can be reconfigured within specified limits by following the sequence of displays in the configuration program. When in the configuration program, the controller is in the limit condition, i.e., the arrow indicator is ON and the limit relay is tripped.

A special key code sequence is required to address the configuration program that prevents unauthorized changes to the configuration. To access the configuration program:




1. While pressing the **NEXT** key while you:
2. press the **DOWN** key,
3. press the **UP** key,
4. press the **DOWN** key,
5. While continuing to hold both the **NEXT** and **DOWN** keys, press the **UP** key.

If the code is entered correctly, the first display in the configuration program will indicate either a high limit "HI L" or a low limit "LO L" configuration. No selection is necessary or possible at this display (the high or low configuration is done in hardware). A change in the control action requires returning the controller to the OMEGA factory.

Press the **NEXT** key to proceed with the configuration program. In this instrument, the **ARROW** keys are used to display the desired parameter (units, TC type, etc.) and the **NEXT** key is used to enable the selected parameter and to advance the program.

## 7.2 INPUT SELECTION

Depending upon which input selection is made, a dedicated display will appear as follows:

### 7.2.1 Thermocouple Input

The unit is preprogrammed for 7 different thermocouple types (J=0, K=1, R=2, S=3, T=4, E=5 and B=6). Use the **ARROW** keys until the desired number appears on the display. Then press the **NEXT** key to select the displayed thermocouple type.

Due to the design of the cold junction compensation circuit, certain thermocouple changes also require a hardware change. Thermocouples J, K, E and T use the same hardware. Type R and S share other circuitry, and Type B is a separate unit. Make sure that the hardware provided agrees with the thermocouple type selected.

### 7.2.2 RTD Input

No special displays. The controller automatically proceeds to the next display.

## 7.3 UNITS SELECTION

The next display in the configuration program shows the units as F or C. No selection is possible at this display. A change in units requires returning the controller to the OMEGA factory. Press the **NEXT** key to proceed with the configuration program.

7.4 SPAN SELECTION

Span selection automatically follows the units selection above. Two displays are used for each span limit.

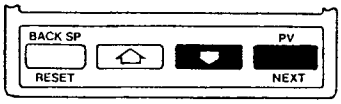
| | | | |
|---|---|---|---|
| "HI S" | Then | "XXXX" | Use the **ARROW** keys to set the desired HI SPAN. Press the **NEXT** key to proceed. |
| "LO S" | Then | "XXXX" | Use the **ARROW** keys to set the desired LO SPAN. |

To return to normal operation, press the **NEXT** key.

## SECTION 8 CALIBRATION PROGRAM

8.1 ACCESS TO CALIBRATION

Calibration of the limit controller to an external reference source is accomplished with a special calibration program. Wait at least 20 minutes for the controller to warm up before calibration is performed. A special key code is required to address the calibration program. To access calibration, first enter the configuration program (see Section 10) and advance the display to low span ("LO S"). While the "LO S" value is displayed, press and hold the **NEXT** key then press the **DOWN** key.




NOTE: During calibration, the limit relay is put in an alarm condition and the indicator arrow is ON. The system cannot operate while the controller is being calibrated.

Different dedicated displays are provided for each input type.

8.2 THERMOCOUPLE INPUT

All thermocouple reference calibrations require a precision calibrator that can provide 50.000 ± .005 mV and 0.000 ± .005 mV when connected to the input terminals. Thermocouple input limit controllers require a four point calibration in the following sequence as indicated on the display. A jumper is required between terminals 8 and 9 for part of the calibration.

| | DISPLAY | REFERENCE | JUMPER |
|---|---|---|---|
| 1. | "HI C" | apply 50.000 mV | with jumper (8 to 9) |
| 2. | "LO C" | apply 0.000 mV | with jumper (8 to 9) |
| 3. | "0 C" | apply 0.000 mV | without jumper |
| 4. | " ICE" | J TC in ice bath | without jumper |

For each calibration input, wait at least 3 minutes after the input is applied for the input to stabilize and then press the **NEXT** key. When thermocouple calibration is complete, the controller will automatically return to the normal operator display.

8.3 RTD INPUT

All RTD reference calibrations require a precision resistance reference of 300.00±.05Ω and 100.00±.05Ω. RTD input controllers require a two point calibration in the following sequence as indicated on the display.

1. "HI C" apply 300.00Ω reference
2. "LO C" apply 100.00Ω reference.

For each calibration point, wait at least 3 minutes after the input is applied for the input circuit to stabilize and then press the **NEXT** key. When RTD calibration is complete, the controller will automatically return to the normal operator display.

## SECTION 9 SPECIFICATIONS

The OMEGA Model CN2081 and CN2091 Limit Controller meets Factory Mutual Research Corporation Approval Standard - Temperature Limit Switch per FM Class No. 3545 - and has been approved by FM as meeting this standard.

**Performance**

**Accuracy:** See table I (Digital)
**Repeatability:** ±1°F.
**Temperature Stability:** Offset ±0.01%FS/°C, Gain ±100 ppm/°C.
**Input:** User can select desired span.
**Input Impedance:** 22 MΩ min. (TC input)
**THERMOCOUPLES:** Max. span shown.
**Temperature Rating:**
Operating 5 to 55°C (41 to131°F)
Storage -20 to +71°C (-4 to 60°F)
**Noise Rejection:**
Common Mode 120 db min., 140 db typ. @ 60 Hz.
Normal Mode 60 db min, 65 db typ. @ 60 Hz.

**Output:** SPDT form C electromechanical relay rated 5 amperes @ 250 Vac, 50/60 Hz
**Control Action:** HI or LO Limit
**Humidity:** 0 to 90% RH non-condensing
**Sensor Break Protection:** Display indicates error message and relay trips.

TABLE I

| INPUT TYPE | SPAN°F | ACCURACY °F | SPAN °C | ACCURACY °C |
|---|---|---|---|---|
| J | -299/+1400 | * | -184/+760 | ** |
| K | -341/-300 | -150/+50 | -207/-184 | -83/+28 |
| | -300/-181 | -100/+35 | -184/-118 | -56/+19 |
| | -181/+2500 | * | -118/+1371 | ** |
| R | +32/+3199 | * | 0/+1759 | ** |
| S | +32/+3181 | * | 0/+1749 | ** |
| T | -380/-300 | -75/+75 | -229/-184 | -42/+42 |
| | -300/+741 | * | -184/+394 | ** |
| E | -179/+1832 | * | -117/+1000 | ** |
| B | +32/+800 | -100/+100 | 0/+427 | -56/+56 |
| | +800/+3259 | * | +427/+1793 | ** |
| 100Ω Pt | -300/+1400 | * | -184/+760 | ** |

* = 1% OF FULL SPAN OR 10°F WHICHEVER IS LARGER
** = 1% OF FULL SPAN OR 6°C WHICHEVER IS LARGER

**Input Power:** 10 watts typically @ 117 Vac, 13.5 watts maximum, 50/60 Hz ±2 Hz, 220 or 240 Vac available.
**Self Diagnostics:** Display indicates error message and trips relay.
**Display:** Sealed vacuum flourescent with 4 blue seven-segment characters.

## SECTION 10 SERVICING

CAUTION To maintain the FM approval, no modification to a Model CN2081 or CN2091 Limit Controller may be made in the field.

Unit should be returned to OMEGA. See Warranty Instructions.

# OMEGA® ... Your Source for Process Measurement and Control

## TEMPERATURE

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

## PRESSURE/STRAIN

- ☐ Transducers & Strain Gauges
- ☐ Load Cells & Pressure Gauges
- ☐ Instrumentation

## FLOW

- ☐ Rotameters & Flowmeter Systems
- ☐ Air Velocity Indicators
- ☐ Turbine/Paddlewheel Systems
- ☐ Vortex Meters and Flow Computers

## pH

- ☐ Electrodes & Transmitters
- ☐ Benchtop/Laboratory Meters
- ☐ Controllers, Calibrators & Simulators

## DATA ACQUISITION

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

## HEATERS

- ☐ Heating Cable
- ☐ Strip Heaters
- ☐ Cartridge Heaters
- ☐ Immersion Heaters
- ☐ Tubular & Band Heaters


®OMEGA ENGINEERING, INC.
*An OMEGA Technologies Company*
One Omega Drive, Box 4047
Stamford, CT 06907-0047
(203) 359-1660 Telex: 996404 Cable: OMEGA FAX: (203) 359-7700