# TYPE CM-2201

## NELSON SINGLE POINT CIRCUIT MANAGEMENT SYSTEM

**SPECIFICATION & APPLICATION INFORMATION**

**2 Line, 16 Characters/row**
LCD Display

**Temperature Input Range**
-50°C to +500°C
-58°F to + 932°F

**Enclosure**
NEMA Type 4X

**Current Rating**
30A max (resistive load only)

**Ambient Temperature**
-40°C to + 40°C
-40°F to +104°F
Start up at -20°C

**Current Monitoring**
0.1 to 40A

**Ground Fault Monitoring**
10mA to 500mA

**Voltage Range**
100Vac to 277Vac


### 1.1 Description of Circuit Management System

Nelson's Single Point Circuit Management System (referenced to as "CM-2201") is a microprocessor based digital control and monitoring system that has been specifically designed for stand-alone or networked electric heat tracing applications. This system provides temperature control and heater cable monitoring while communicating additional information to operations personnel such as temperature alarms, voltage and current alarms, ground fault leakage, sensor failures and communications failures.

### 1.2 Description of System Components

The circuit management system is housed in a NEMA 4X durable molded fiberglass polyester enclosure that can be wall or rack mounted. The system is provided with dual pole solid-state heater switching and is environmentally hardened for use in various plant locations.The standard versions of the CM-2201 can be installed in Class 1, Division 2 hazardous locations without special requirements. Up to 256 individual systems can be connected to a single RS-485 data highway allowing communications to a host device. The CM-2201 is fully compatible with PC based communications software via ModBUS® RTU protocol. All alarm and control functions can be accessed from the central location.

### 1.3 Description of Key Features

- **Easy to Use Interface**
  The 2 line, 16 characters/row, alphanumeric LCD display enables the use of English language prompts for setpoint entry and operation. There are no cryptic codes or key press combinations to remember.

- **On/Off or Proportional Control**
  The desired control mode can be easily selected via the front panel user interface.

- **Ground Fault Alarm and Trip Settings**
  Separate alarm and trip settings for ground fault interrupt allow alarming of developing faults prior to circuit interruption.

- **Dual RTD Input**
  The optional second RTD can easily be configured in a variety of ways, including working with one RTD / two RTDs and High Temperature Cutout.

- **Programmable Auto Test Cycle**
  The user can select an interval from 1 to 24 hours to have the unit automatically check the heater operating current and ground fault conditions. This allows problems to be detected and fixed before the heating system is actually needed.

- **Host Communications**
  The RS-485 ModBUS® RTU communications capability is included as a standard feature. There are no expensive "daughter boards" or firmware updates required.

## SPECIFICATIONS

### Temperature Input

| | |
|---|---|
| **Range:** | -50 to +500°C (-58 to 932°F) |
| **Accuracy:** | ±2°C |
| **Repeatability:** | ±1°C |
| **RTD:** | 100 ohm platinum, 3-wire RTD, (lead compensated up to 20 ohms) |
| **RTD Configuration:** | Single, Backup, Highest, Lowest, Average or High Temperature Cutout |
| **RTD Fail-safe:** | Heater ON or OFF |

### Heater Switching

| | |
|---|---|
| **Configuration:** | Two-pole, dual SSR per phase, 800 amp, 1 cycle inrush |
| **Ratings:** | 100-277VAC, 30A continuous |
| **Line Frequency:** | 50 or 60Hz |
| **Current Measurement:** | 0.1 to 40A 3%±0.1A |
| **GF Measurement:** | 10 to 500mA 5%±2mA |
| **Voltage Measurement:** | 0 to 300Vac 3%±2V |

### Control Power

| | |
|---|---|
| **Power Requirement:** | Control power from heater voltage, 110-277Vac, 12VA max |

### Communications

| | |
|---|---|
| **Port:** | (1) RS-485 |
| **Protocol:** | MODBUS® RTU |
| **Transmission Rate:** | up to 115Kbps |
| **Wiring:** | 2-wire, shielded, twisted pair |
| **Max. Wiring Run:** | 4,000 feet without repeater |
| **Modules per Network:** | Up to 256 |

### Measured Values

| | |
|---|---|
| **Temperature:** | -50 to 500°C (-58 to 932°F) |
| **Minimum Temperature:** | -50 to 500°C (-58 to 932°F) |
| **Maximum Temperature:** | -50 to 500°C (-58 to 932°F) |
| **Heater Current:** | 0.1 to 30A |
| **Ground Fault Current:** | 10 to 500mA |
| **Min. Heater Voltage:** | 90Vac |
| **Max. Heater Voltage:** | 300Vac |
| **Weight:** | 4.0kg (8.9lb) |

### User Interface

| | |
|---|---|
| **Display:** | 16-character x 2-line LCD Alphanumeric display |

## SPECIFICATIONS

### User Interface (continued)

| | |
|---|---|
| **Panel Indicators:** | Power On<br>Heater On<br>Serial Communication Active<br>System Failure<br>Process Alarm |
| **Keypad:** | 9 touch keys, polyester faceplate<br>• Actual, Alarm, Program, Reset<br>• Select Up, Select Down, Select Right, Select Left<br>• Enter |
| **Security:** | Controller parameters password protected |

### Environment

| | |
|---|---|
| **Approvals:** | cCSAus<br>Class I, Div. 2, Groups A, B, C, D<br>Class I, Zone 2, Groups IIC<br>Temp Code T4, 135°C |
| **Operating Temperature:** | -40°C to +40°C Starting at -20°C |
| **Conformal Coating:** | Boards conformal coated for hostile environments |

### Enclosure

| | |
|---|---|
| **Type:** | NEMA Type 4X Molded Fiberglass Polyester enclosure |
| **Size:** | 12”H x10”W x 6”D |
| **Features:** | Quick release latches to open door. |

### Alarm Output

| | |
|---|---|
| **Alarm:** | **Normally Open contacts**<br>One DC opto-isolated contact<br>One AC opto-isolated contact |
| **Alarm Rating:** | DC contact: 30Vdc/100mA max<br>AC contact: 24-277Vac @ 0.5A max |
| **Alarm Output:** | LED Indication |

### Alarm Function

| | |
|---|---|
| **Temperature:** | High Temperature Alarm / Low Temperature Alarm |
| **Current:** | Low Current Alarm / High Current Alarm |
| **Ground Fault Current:** | Ground Fault Current Alarm / Ground Fault Current Trip |
| **Voltage:** | High Voltage Alarm / Low Voltage Alarm |
| **Hardware:** | Self-Check Failure / Switch Fail / RTD Failure / Power Failure |

## SPECIFICATIONS

### User-Definable Options

| | |
|---|---|
| **Heater Name or Tag:** | 16 Character Alphanumeric |
| **Temperature Units:** | °C or °F |
| **Control Method:** | ON/OFF with Deadband or Proportional |
| **Deadband:** | 1 to 5°C (1 to 10°F) |
| **PowerLimit:** | 20% to 100% in 10% steps, off |
| **SoftStart:** | 10 to 999s, off |
| **Auto Check:** | 1 to 720hrs, off |
| **Temperature Setpoint:** | -50 to 500°C (-58 to 932°F), off, none |
| **High Temp. Alarm:** | -50 to 500°C (-58 to 932°F), off |
| **Low Temp. Alarm:** | -50 to 500°C (-58 to 932°F), off |
| **High Current Alarm:** | 0.1 to 30A, off |
| **Low Current Alarm:** | 0.1 to 29A, off |
| **Ground Fault Alarm:** | 10 to 495mA, off |
| **Ground Fault Trip:** | 15 to 500mA, off |
| **High Voltage Alarm:** | 95V to 280V, off |
| **Low Voltage Alarm:** | 85V to 270V, off |
| **Override:** | ON/OFF |
| **Alarm Contacts:** | Solid State – Normally Opened |

*For custom configurations or modifications of CM2201, consult Nelson Heat Trace.*

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## TROUBLESHOOTING

### Low Voltage Warning/Alarm

This warning/alarms voltage levels are less than the LOW VOLTAGE WARNING/ALARM setting.

Cause of Warning/Alarm:
- Warning/Alarm setting too close to normal operating voltage
- Damaged power cable
- Incorrect VOLTAGE TURNS RATIO
- "Brown-out" conditions
- Loss of power to the circuit

### Overcurrent Trip

If the controller is unable to start the cable due to high current or after attempting to soft start it, the controller will trip its output switch off.

Cause of Alarm:
- Excessive in-rush current
- Incorrect CM-2201 settings
- Incorrect wiring
- Damaged cable

### Switch Failure

This alarm indicates that the controller senses current flow when the output switch should be off.

Cause of Alarm
- Some other device energized heat trace
- Output switch has failed "closed"

### Power Limiting (Current Limiting)

This alarm indicates that the controller senses current flow when the output switch should be off.

Cause of Alarm
- Some other device energized heat trace
- Output switch has failed "closed"

### EEPROM Data Failure

This alarm indicates that the controller has detected a failure in its non-volatile memory (this is where all of the controller's configuration and calibration settings are stored). This indicates an internal problem and the CM2201 should be replaced and returned to the factory for repair.

Cause of Alarm:
- The CM-2201 cannot bypass the failed area of its memory and has loaded factory defaults into this failed area.

### Power Failure

When display is off and alarm contacts are tripped, this is an indication of a power failure.