

TABLE OF CONTENTS

| | |
|--|----|
| I. FEATURES | 3 |
| <i>Control & Monitoring</i> | 3 |
| <i>Heater Cable Monitoring Option - CM-2/1</i> | 4 |
| <i>Ground Fault Monitoring Option - CM-2/GF</i> | 5 |
| II. INSTALLATION | 6 |
| III. OPERATION | 7 |
| <i>Channel Select</i> | 8 |
| <i>Set Points</i> | 8 |
| <i>CM-2/GF Settings</i> | 9 |
| <i>Actual Temperature</i> | 10 |
| <i>Program Select</i> | 11 |
| <i>System</i> | 11 |
| <i>Setting Security Codes</i> | 14 |
| <i>Alarm Acknowledge</i> | 15 |
| <i>Alarm Display</i> | 15 |
| <i>Function</i> | 19 |
| <i>Master Mode</i> | 20 |
| IV. START-UP..... | 23 |
| <i>Turning The System On</i> | 23 |
| <i>Programming Individual Channels (Circuits)</i> | 23 |
| <i>Group (Block) Programming of Channels</i> | 23 |
| <i>De-activation of Unused Channels</i> | 24 |
| <i>Checking Alarms</i> | 24 |
| <i>Description of Setpoint Command Display Prompts</i> | 24 |
| V. TROUBLESHOOTING | 26 |
| VI. SPECIFICATIONS | 31 |
| <i>Performance</i> | 31 |
| <i>Inputs</i> | 31 |
| <i>Output</i> | 31 |
| <i>Communications</i> | 31 |
| <i>Displays</i> | 32 |
| <i>Keyboard</i> | 32 |

I. FEATURES

CONTROL & MONITORING

The CM-2 is a scanning microprocessor based distributive digital control and monitor system that has been specially designed for use with electric heat tracing systems. Its features are designed to optimize performance while minimizing interface complexities for operations personnel.

The system is available in up to 40 circuit configurations that are environmentally hardened so they can be sited at various locations in your plant. The units can be installed in Division 2 hazardous locations with the use of purged enclosures.

Units can be individually mounted or grouped together in larger cabinets for use in specific locations. The individual systems can be connected to a master unit that has the ability to monitor, program and control the individual systems. Data and alarm information is completely duplicated at the central and local levels for easy maintenance at the local level.

Can Be Factory Programmed - non-volatile memory allows the unit to be programmed at the factory with circuit control and alarm set points. This eliminates the need for initializing of the system when it is received in the field yet allows responsible field adjustment and alteration.

Programmable Set Points -

- Each circuit can be programmed for the following features:
- Temperature Control Set Point
- High Temperature Alarm Set Point
- Low Temperature Alarm Set Point
- Controller Dead Band

Actual Pipe Temperature Read-out - actual pipe temperature is displayed as the unit scans each circuit. Individual circuits can also be selected for temporary or continuous monitoring

Multiple Set-Point Memory - multiple set points can be assigned to each circuit, stored as a separate program. This allows for multiple product piping to easily be changed from one set of temperatures to another without extensive reprogramming.

Can Monitor Heater Cable Electrical Functions - unit is designed to integrate optional heater (CM-2/1) monitoring for continuity, current flow and circuit breaker fault of parallel and series heater cables. The CM-2/GF option will monitor heaters for ground fault leakage, current levels, supply voltage.

Smart Remote Functions Independent of Master - each unit operates independently, even if it is linked with a master unit. This allows the system to function even if the master unit should go down. All programming alarm and control functions can be input and monitored at the remote unit as well as the master.

Security Codes - allows only authorized personnel to change set point in the system.

All Critical Alarms Available - the unit monitors all parts of the system and provides alarm indication that provides quick and easy identification of the problem.

High and Low Temperature Alarms - will be initiated when the actual pipe temperature exceeds the upper or lower alarm set points for each circuit.

Circuit Fault Alarm - will be initiated when a failure is detected in the heater cable. This feature is operational when either the CM-2/1 or CM-2/GF monitoring options are included in the system.

Power Failure Alarm - will be initiated if the power supply to the microprocessor goes down.

Sensor Failure Alarm - will activate in the event of a short circuit or open circuit developing in the sensor wiring. Each circuit can be programmed to have the heater cable turn on or off in the event of a sensor failure. This allows you to customize your systems to the particular needs of the fluids you are heat tracing.

Memory Failure Alarm - will be initiated if a failure is detected in the data stored in the microprocessor's memory.

Communications Failure Alarm - will activate if communication between a master and remote CM-2 unit fails.

Manual Override - a manual override switch is available to control the heat tracing in the event of a CPU failure.

Large, Easy to Read Display - makes data highly visible. A 2 line, 20 character fluorescent display is visible in sunlight or at night for easy reading in difficult lighting situations.

Separate Text Communications Display - is provided on the second 20 character fluorescent display. This provides a plain English explanation and prompts to assist in both programming and data display situations.

No Cryptic Alarm Codes - are required in the CM-2 system. All alarms are explain in plain English due to the expanded display capability of the unit.

Group Programming - allows you to program a block of circuits with the same parameters with one input. You no longer have to put in the data for each circuit separately.

Self-Calibrating System - eliminates the need for periodic manual calibration of the system. The system rechecks its calibration each time it cycles through a scan cycle.

Second Re-flash Capability - allows the system to output a second alarm after the first one has been acknowledged.

Rugged Unit Goes Anywhere - the unit is constructed so that is may be installed anywhere in your plant, including Division 2 hazardous locations when used with purged enclosures. Available in NEMA 12, 4, and 4X enclosures.

Industrial Grade Electronics - provides a wide ambient operating range of -40°F to +130°F for the unit. Internal components are rated for -40°F to +185°F.

Conformal Coated Circuit Boards - for all electronics reduces the possibility of corrosion on printed circuit boards.

Special Connector Pins - provide corrosion resistant connections for all electrical plugs.

Anti-Condensation Space Heater - prevents internal condensation on the unit.

No Problems with Extended Power Outages - all instructions and data are stored in non-volatile memory. This eliminates the need to reload control and alarm set points after extended power outages. The system is immediately operable. It will also allow the system to be initialized at the factory, eliminating the need to field load the system as part of the start-up procedures.

HEATER CABLE MONITORING OPTION - CM-2/1

The Nelson CM-1 heater cable monitoring system will automatically monitor all electrical functions of a heating cable. This system is available as an optional integrated part of Nelson's CM-2 Temperature Control System. It is programmed and monitored by the CM-2 unit, so all signals are fed through the CM-2 control console.

Works With all Types of Heaters - will monitor self-limiting, constant wattage (zone) and series styles of electric heating cables.

Monitor Continuity - of parallel and series heating cables. Will verify that the heater circuit has not been severed or broken to its farthest point.

Monitor Current Flow - for each circuit. A sensitive (2% of scale) adjustable trip device allows you to select a low current alarm level for each circuit.

Monitor Voltage Supply - to check for circuit breaker trips (cable faults) or accidentally de-energized circuit breakers. Alarm occurs if voltage is not available when the heater is supposed to be energized.

No Monitor Wire - is required to monitor continuity of self-limiting and constant wattage heater cables.

Noise and Transient Immunity - eliminates false alarms. Software filters and time delays get rid of nuisance alarms so common to many systems.

System is Totally Passive - there are no injected electrical signals, such as are common to power line carrier systems to cause electrical noise in your plant. This eliminates problems with interference from plant communications systems.

GROUND FAULT MONITORING OPTION - CM-2/GF

Ground Fault Leakage Alarm and Read out - can be set for each circuit to give an alarm at any value from 1 to 250 ma. Alarm is separate function from ground fault interruption feature. The alarm value is normally set below the interruption level, providing a maintenance indication that heater insulation resistance is deteriorating before it reaches a level that requires it to be taken off line. Actual leakage current can be read from display.

Ground Fault Interruption - this feature eliminates the need for special ground fault interrupter branch circuit breakers. Each circuit can be programmed to interrupt electrical service to the heater at any value from 1 to 250 ma. The control relay for the heater circuit is locked out until manually reset. The heater circuit must be protected by standard breaker to provide bolted fault protection/ interruption capability.

Current Read Out - read out load currents for each heater circuit.

Voltage Alarm - loss of current alarm gives indication of loss of voltage due to either breaker trip or breaker turned off when circuit is calling for heat.

Low Current Alarm - provides indication of loss of a heater cable segment.

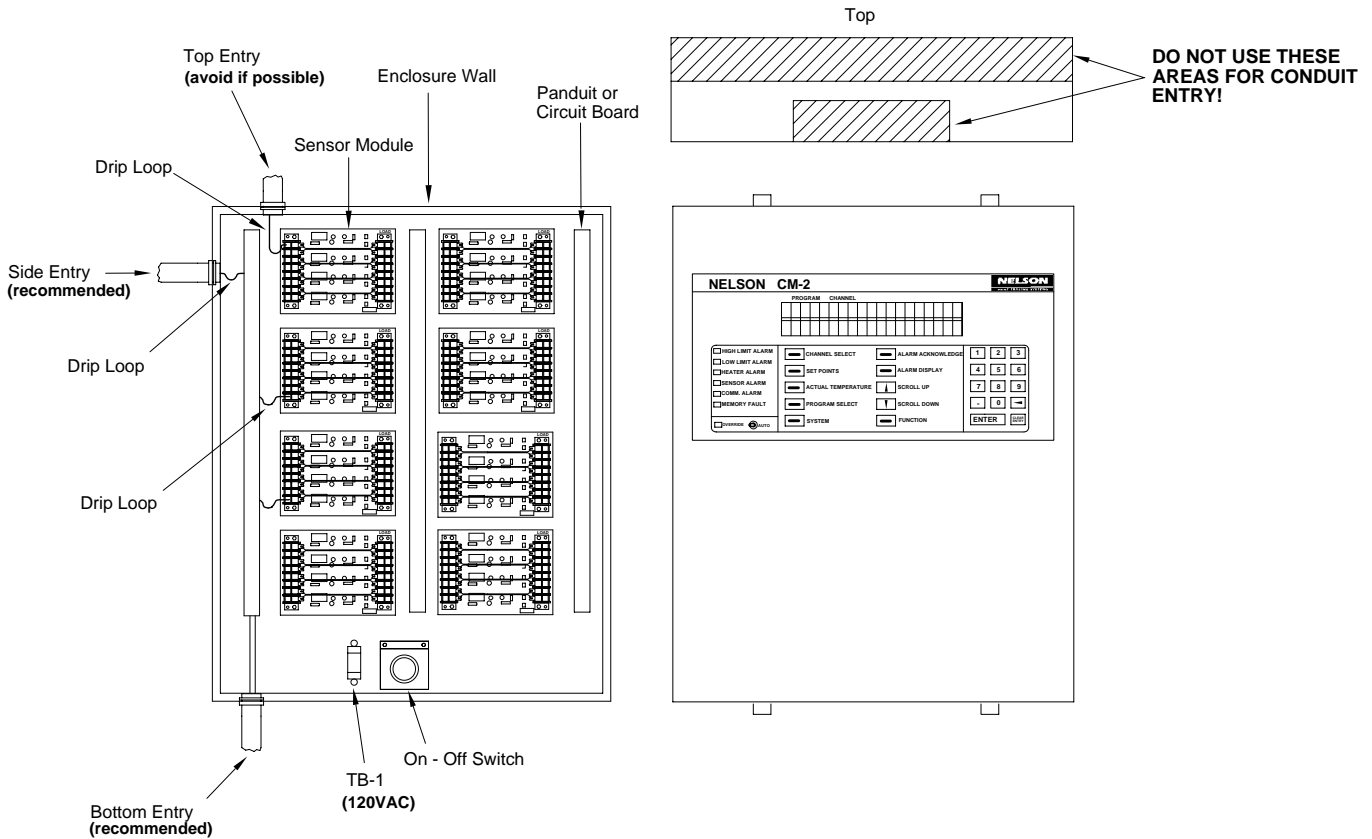
High Current Alarm - provides indication of developing short circuit situations. A time delay is provided to compensate for self regulating heater inrush currents.

Auto Test Cycle - unit can be programmed to switch heaters on periodically and check for insulation resistance, developing ground faults, and loss of voltage conditions.

Retrofit Existing CM2/1 Systems - these new features can be installed in existing CM2/1 systems. Existing sense cards are replaced with the current transformer cards and terminal blocks (in the same foot print), and multiplexer is mounted below the CM2 control head.

II. INSTALLATION

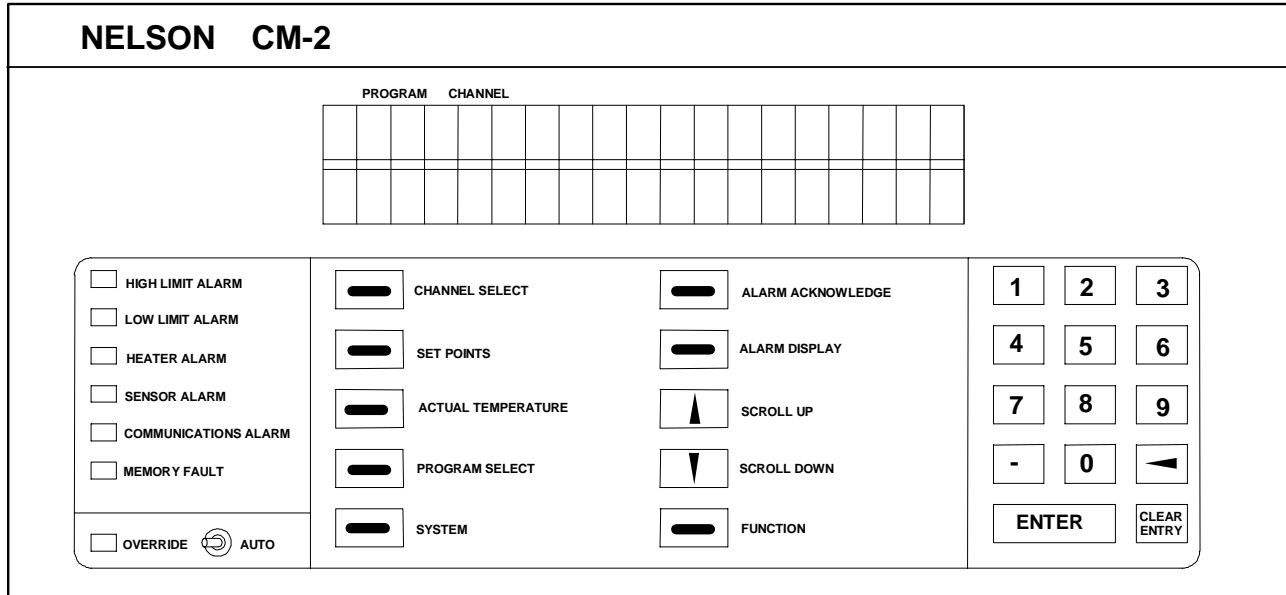
When routing conduit to the panel, avoid top entry into the CM-2 enclosure. Top conduit provides a potential moisture path to the electronic circuit boards. Bottom conduit entry is recommended. If top entry cannot be avoided, avoid the area directly over the circuit boards. Drip loops as shown are recommended for side and top entry when they cannot be avoided. A drip loop is a dip or bend in the circuit wire to block or shed moisture that may follow a wire to the circuit boards. *See Figure 1 below.*



Conduit / Wiring Entry for CM-2 Enclosure

Figure 1

III. OPERATION



CM-2 Face

Figure 2

HIGH LIMIT ALARM

Pipe temperature above alarm values.

LOW LIMIT ALARM

Pipe temperature below alarm values.

HEATER ALARM

Output driver failure or heater alarm.

SENSOR ALARM

Thermocouple or RTD open or shorted.

COMMUNICATION ALARM

Loss of communications between master and remote units.

MEMORY FAULT

Error in computer data memory. Stored data may be in jeopardy.

OVERRIDE

System manual override - turns on all circuits in event of computer control problem.

CHANNEL SELECT

Allows selection of a specific channel for viewing ACTUAL TEMPERATURE or programming SET POINTS.

SET POINTS

Allows access for viewing channel control parameters (alarm and control temperatures, deadband, etc.). Level 1 security code required to change parameters.

ACTUAL TEMPERATURE

Continuously displays temperature of selected heater channel on second line of data display.

PROGRAM SELECT

Allows change of all SET POINTS in the system from one set to another. Requires Level 2 security code.

SYSTEM

Allows change of controller configuration parameters. Requires Level 2 security code.

ALARM ACKNOWLEDGE

For acknowledging alarms when viewing alarms in data display.

ALARM DISPLAY

Displays channels in ALARM.

SCROLL UP

Advances channel data currently in the display to the next higher channel data.

SCROLL DOWN

Advances channel data currently in the display to the next lower channel data.

FUNCTION

Permits access for entering Level 1 and Level 2 security codes.

ENTER

For entering data into memory.

ARROW

Backspace

CLEAR ENTRY

Erase display and / or clear entry.

CHANNEL SELECT

This key allows selection of a channel to be displayed for ACUTAL TEMPERATURE or for SET POINTS. Use of this function does not require using a security code. To select a channel, press the <CHANNEL SELECT> key. The display will show:

| PROGRAM | | CHANNEL | | | | | | | | | | DATA | | | | | | |
|---------|---|---------|---|---|---|---|--|--|--|--|---|------|--|--|--|--|--|--|
| C | H | A | N | N | E | L | | | | | 1 | | | | | | | |
| | | | | | | | | | | | | | | | | | | |

For example, to select channel 9, press <9> on the keypad. The display will show:

| PROGRAM | | CHANNEL | | | | | | | | | | DATA | | | | | | |
|---------|---|---------|---|---|---|---|--|--|--|--|---|------|--|--|--|---|--|--|
| C | H | A | N | N | E | L | | | | | 1 | | | | | 9 | | |
| | | | | | | | | | | | | | | | | | | |

Press <ENTER>. The 1 will be replaced by the 9 and the display will revert to the normal scrolling mode. Then choose either <ACTUAL TEMPERATURE> or <SET POINT> to be displayed for channel 9.

SET POINTS

This key allows viewing of the setpoints of a channel. If the setpoints are to be changed, the proper LEVEL 1 security code may be entered through the <FUNCTION> key. To proceed with changing set points on channel 9, enter the LEVEL 1 security code, then press <SET POINTS>. The display will show:

| PROGRAM | | CHANNEL | | | | | | | | | | DATA | | | | | | |
|---------|---|---------|---|---|---|---|--|--|--|--|--|------|--|--|--|---|---|---|
| 1 | | | | | | | | | | | | | | | | 2 | 0 | 0 |
| H | I | L | I | M | I | T | | | | | | | | | | | | |

To change the HI LIMIT from 200 to 205 degrees, press <205> on the keypad. The display will show:

| PROGRAM | | CHANNEL | | | | | | | | | | DATA | | | | | | |
|---------|---|---------|---|---|---|---|--|--|--|--|--|------|--|--|--|---|---|---|
| 1 | | | | | | | | | | | | | | | | 2 | 0 | 0 |
| H | I | L | I | M | I | T | | | | | | | | | | 2 | 0 | 5 |

Press <ENTER>, the 200 will be replaced by 205 in memory. The display will now show:

| PROGRAM | | CHANNEL | | | | | | | | | | DATA | | | | | | |
|---------|---|---------|---|---|---|---|---|--|--|--|--|------|--|--|--|---|---|---|
| 1 | | | | | | | | | | | | | | | | 1 | 7 | 5 |
| S | E | T | P | O | I | N | T | | | | | | | | | 1 | 8 | 0 |

To leave the SET POINT at 175, press <ENTER>. To change the value to 180, press <180> on the keypad then press <ENTER>. The new SET POINT of 180 will now be held in memory even through loss of power. The display will now show:

| PROGRAM | | CHANNEL | | | | | | | | | | DATA | | | | | | |
|---------|---|---------|---|---|---|---|--|--|--|--|--|------|--|--|--|---|---|---|
| 1 | | | | | | | | | | | | | | | | 1 | 0 | 0 |
| L | O | L | I | M | I | T | | | | | | | | | | 1 | 2 | 5 |

To leave the LO LIMIT at 100, press <ENTER>. To change the value to 125, press <125> on the keypad then press <ENTER>. The new LO LIMIT will now be held in memory. The display will show:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | | | | | |
|---------|---|---|---|---------|---|---|---|------|--|--|--|--|--|--|--|---|--|--|--|
| 1 | | | | 9 | | | | | | | | | | | | 2 | | | |
| D | E | A | D | B | A | N | D | | | | | | | | | 3 | | | |

To leave the DEADBAND at 2, press <ENTER>. To change the value to 3, press <3> on the keypad then press <ENTER>. The new DEADBAND will be held in memory. The display will show:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | | | | | |
|---------|---|---|---|---------|---|---|--|------|---|---|---|---|--|--|---|---|---|---|--|
| 1 | | | | 9 | | | | 0 | | | | | | | | 1 | | | |
| A | C | T | I | V | E | ? | | 1 | = | Y | E | S | | | 0 | = | N | O | |

To leave the channel inactive, press <ENTER>. To activate channel 9, press <1> then press <ENTER>. The display will show:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | | | | | | | |
|---------|---|---|---|---------|---|---|---|------|---|---|---|--|--|---|---|---|---|---|--|--|--|
| 1 | | | | 9 | | | | 0 | | | | | | | | 1 | | | | | |
| F | A | I | L | M | O | D | E | 1 | = | O | N | | | 0 | = | O | F | F | | | |

In the event of a temperature sensor failure, each channel can be selected to turn ON or OFF, whichever is best. To leave in the OFF mode, press <ENTER>. To change to the ON mode, in case of sensor failure, press <1> then <ENTER>. The display will show:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | | | | | | |
|---------|---|---|---|---------|---|---|--|------|---|---|--|--|---|---|---|--|---|---|---|---|
| 1 | | | | 9 | | | | 1 | | | | | | | | | | | | |
| M | O | N | I | T | O | R | | 2 | = | P | | | 1 | = | S | | 0 | = | N | O |

For CM-2 (temperature control and temperature alarm only) and CM-2/GF (+ ground fault and current alarms) press <0> and <ENTER> for this prompt. For CM-2/1 (+ continuity / low current / voltage alarms) press <1> if you monitoring MI (series) heater or <2> for a self regulating or constant wattage (parallel) heater. Then press <ENTER>.

Note: The parallel style heaters require a passive continuity monitoring device (NCMD series) connected to both bus wires at the end of the heater being monitored.

CM-2/GF SETTINGS

Units with the ground fault option will display the following setup windows:

Amperage values for the high and low current alarms are entered in tenths of an amp. For example, to set the low current alarm at 2 amps enter 20 on the key pad and press enter.

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | | | | | | |
|---------|---|---|--|---------|---|--|--|------|---|---|--|--|---|---|---|---|---|---|--|--|
| 1 | | | | 1 | | | | | | | | | | | | 0 | . | 0 | | |
| E | N | T | | L | O | | | A | M | P | | | X | 1 | 0 | | | | | |

PROGRAM SELECT

This key allows the entire group of SET POINTS to be changed. There are 5 programs allowed; 0 - 4. To change PROGRAMS, a LEVEL 2 security code is required. Once the security code has been entered, press <PROGRAM SELECT>. The display will show:

| PROGRAM | CHANNEL | DATA | | | | | | | | | | | | | | | | | | |
|---------|---------|------|---|---|---|---|--|--|--|--|--|--|---|--|--|--|--|--|--|--|
| O | P | E | R | A | T | E | | | | | | | 0 | | | | | | | |
| P | R | O | G | R | A | M | | | | | | | | | | | | | | |

To leave in PROGRAM 0, press <ENTER>. To change to another program, press the number, then <ENTER>. The CM-2 will now control to the new group of SET POINTS chosen. The display will show:

| PROGRAM | CHANNEL | DATA | | | | | | | | | | | | | | | | | | |
|---------|---------|------|---|---|---|---|--|--|--|--|--|--|---|--|--|--|--|--|--|--|
| S | E | T | T | I | N | G | | | | | | | 0 | | | | | | | |
| P | R | O | G | R | A | M | | | | | | | | | | | | | | |

Press <ENTER> to return to normal scanning. The SETPOINTS in another program can be changed while the CM-2 is controlling temperatures in the OPERATE PROGRAM. To leave in SETTING PROGRAM 0, press <ENTER>. To change to another program to modify SET POINTS press program number <1 - 4>, then <ENTER>. The display will revert to the normal scanning mode. Press <SET POINTS>. The display will show:

| PROGRAM | CHANNEL | DATA | | | | | | | | | | | | | | | | | | |
|---------|---------|------|---|---|---|---|--|--|--|--|--|--|---|---|---|--|--|--|--|--|
| 1 | | | | 1 | | | | | | | | | 1 | 0 | 0 | | | | | |
| | I | L | I | M | I | T | | | | | | | | | | | | | | |

The SET POINTS in Program 1 can be changed for each channel as desired. The CM-2 is controlling temperatures from the SET POINTS in OPERATING PROGRAM. The <SCROLL UP> and <SCROLL DOWN> keys can be used for changing channels. To clear the display for normal scanning, press <CLEAR ENTRY>.

SYSTEM

The system configuration mode can be accessed only by a LEVEL 2 security code. To configure the system is simple and initiated by pushing the <SYSTEM> key after entering the security code. The operator may examine the system modes without entering a security code.

Temperature Mode - °F or °C

After pushing the <SYSTEM> key the display will show:

| PROGRAM | CHANNEL | DATA | | | | | | | | | | | | | | | | | | |
|---------|---------|------|---|--|--|---|---|---|---|--|--|--|---|---|---|---|---|--|--|--|
| T | E | M | P | | | | | | | | | | 0 | | | | | | | |
| M | O | D | E | | | 1 | = | ° | C | | | | | 0 | = | ° | F | | | |

To leave the TEMP MODE in °F, simply press <ENTER>. To change to °C press <1> on the keypad, then press <ENTER>. the 0 on the top line will be replaced by a 1.

Reset Mode, Manual or Auto

The display will show:

| PROGRAM | | | | | CHANNEL | | | | | DATA | | | | | | | | | | | | | | |
|---------|---|---|---|---|---------|--|--|--|---|------|---|---|---|---|--|--|--|--|---|---|---|---|---|---|
| R | E | S | E | T | | | | | 1 | | | | | | | | | | | | | | | |
| M | O | D | E | | | | | | 1 | = | A | U | T | O | | | | | 0 | = | M | A | N | . |

To leave the RESET MODE in AUTO, press <ENTER>. To change to MANUAL, press <0> on the keypad then press <ENTER>. The 1 on the display will be replaced by 0.

After an alarm condition clears in the AUTO MODE, the alarm display gives a CLEAR message for that channel. When all the alarms are CLEAR, the alarm relay resets.

Probe Type, RTD or T / C

The display will show:

| PROGRAM | | | | | CHANNEL | | | | | DATA | | | | | | | | | | | | |
|---------|---|---|---|---|---------|--|--|--|---|------|---|---|---|--|--|--|--|---|---|---|---|---|
| P | R | O | B | E | | | | | 1 | | | | | | | | | | | | | |
| T | Y | P | E | | | | | | 1 | = | R | T | D | | | | | 0 | = | T | / | C |

To leave the PROBE TYPE in RTD, press <ENTER>. To change to thermocouple (T / C), type J, press <0> on the keypad, then press <ENTER>. The 1 on the top line will be replaced by a 0.

Note: The CM-2 only accepts 3 wire 100 Ohm RTD's and type J thermocouples.

Monitor Mode

The display will now show:

| PROGRAM | | | | | CHANNEL | | | | | DATA | | | | | | | | | | | | | |
|---------|---|---|---|---|---------|---|--|--|--|------|---|---|---|---|--|--|--|--|---|---|---|---|---|
| M | O | N | I | T | O | R | | | | | 1 | | | | | | | | | | | | |
| M | O | D | E | | | | | | | 1 | = | I | N | T | | | | | 0 | = | E | X | T |

To leave the MONITOR MODE in internal, press <ENTER>. To change to external monitoring, press <0> on the keypad, then press <ENTER>. The 1 on the top line will be replaced by a 0.

The MONITOR MODE is used with the CM-2/1 system. The CM-2/1 system controls temperature and monitors each channel for voltage, current and continuity. The MONITOR MODE will almost always be internal (1). The only time it will be external (0) is with a voltage input card (GB-115). If in doubt, contact the factory.

Monitor Time-out, CM-2/1 & CM-2/GF Systems

The display will show:

| PROGRAM | | | | | CHANNEL | | | | | DATA | | | | | | | | | | | | | | | |
|---------|---|---|---|---|---------|---|--|--|--|------|---|---|---|---|---|--|--|--|--|---|---|---|---|---|---|
| M | O | N | I | T | O | R | | | | | 0 | | | | | | | | | | | | | | |
| T | I | M | E | O | U | T | | | | | 1 | = | S | L | O | | | | | 0 | = | F | A | S | T |

To leave the MONITOR TIMEOUT in FAST, press <ENTER>. To change to SLOW, press <1> on the keypad then press <ENTER>.

The 0 on the display will be replaced by a 1. This applies only to a CM-2/1. During systems field commissioning, the FAST MODE (0) is used. During normal operation, the SLOW (1) is preferred to prevent false alarms. The SLOW MODE gives a five minute delay while the FAST MODE gives a one minute delay.

Channel Offset

The display will show:

| PROGRAM | | CHANNEL | | | | | | | | | | DATA | | | | | | |
|---------|---|---------|---|---|---|---|---|--|--|--|--|------|--|---|--|--|--|--|
| C | H | A | N | N | E | L | # | | | | | | | 0 | | | | |
| O | F | F | S | E | T | | | | | | | | | | | | | |

On Unit 01, leave the OFFSET at 0 by pushing <ENTER>. For unit 02, the OFFSET will be 40 for CM-2-40 or 24 for a CM-2-24. Likewise the OFFSET will be 80 or 48 for Unit 03. Press the desired <OFFSET> for the unit, then press <ENTER>. The CM-2 then increments all displayed information by the OFFSET. The maximum value for the OFFSET is 975.

Ground Fault Adapter

The display will show:

| PROGRAM | | CHANNEL | | | | | | | | | | DATA | | | | | | |
|---------|---|---------|---|---|---|---|--|---|---|---|---|------|--|---|---|---|---|--|
| G | - | F | A | U | L | T | | | 1 | | | | | | | | | |
| A | D | A | P | T | E | R | | 1 | = | Y | E | S | | 0 | = | N | O | |

To activate the ground fault sensors on units equipped with the ground fault option press <1> and <ENTER>. For all other units press <0> and <ENTER>. The display will show:

| PROGRAM | | CHANNEL | | | | | | | | | | DATA | | | | | | |
|---------|---|---------|---|---|---|---|---|---|---|--|--|------|--|---|---|--|--|--|
| A | U | T | O | - | T | E | S | T | | | | | | 0 | 0 | | | |
| R | A | T | E | | H | O | U | R | S | | | | | | | | | |

The unit can be programmed to periodically switch on all heater circuits and check all monitor function alarms. The interval in hours determines the frequency of Auto-Testing. Entering 24 will cycle the Auto-Test once every 24 hours. To eliminate all Auto-Testing press <0> and <ENTER>. The display will show:

| PROGRAM | | CHANNEL | | | | | | | | | | DATA | | | | | | |
|---------|---|---------|---|---|---|---|---|---|---|---|---|------|--|---|--|--|--|--|
| A | U | T | O | - | T | E | S | T | | | | | | 0 | | | | |
| D | U | R | A | T | I | O | N | | M | I | N | S | | | | | | |

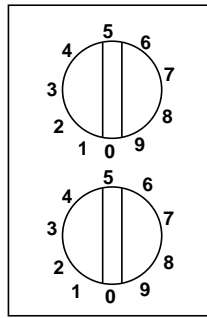
The duration of the Auto-Test is determined by entering the number of minutes (0-15). A minimum of 6 minutes is recommended. To bypass Auto-Testing press <0> and <ENTER>.

Unit Address

The display will show:

| PROGRAM | | CHANNEL | | | | | | | | | | DATA | | | | | | |
|---------|---|---------|---|---|---|---|---|---|---|---|---|------|--|---|--|--|--|--|
| U | N | I | T | | A | D | D | R | E | S | S | | | 1 | | | | |
| V | E | R | S | I | O | N | | 1 | - | 6 | 1 | | | | | | | |

The UNIT ADDRESS is not changeable from the keypad. To change the UNIT ADDRESS, go to the back side of the CM-2 to the UNIT ADDRESS opening. There are 2 selector switches as shown in Figure 3:



Selector Switch

Figure 3

To set the UNIT ADDRESS to 1, set the top switch pointer to 0 and the bottom switch to 1 to give an address of 1. Similarly, for an address of 8, set the top switch to 0 and the bottom switch to 8. UNIT ADDRESS CAN RANGE FROM 01 TO 99. To set a MASTER UNIT in a communications network, set both switches to 9. A MASTER will act only as remote display panel and will not accept inputs from probes or output to power relays.

The lower line of the display gives the version of software currently in EEPROM.

SETTING SECURITY CODES

Press <FUNCTION>, the display will show:

| PROGRAM | | CHANNEL | | DATA | | | | | | | | | | | | | | | | | | | |
|---------|---|---------|---|------|---|--|--|---|---|---|---|---|---|--|---|---|---|---|---|---|--|--|--|
| S | Y | S | T | E | M | | | 0 | | | | | | | | | | | | | | | |
| A | C | C | E | S | S | | | 1 | = | O | P | E | N | | 0 | = | L | O | C | K | | | |

Press <2> on the keypad, then press <ENTER>. The display will show:

| PROGRAM | | CHANNEL | | DATA | | | | | | | | | | | | | | | | | | | |
|---------|---|---------|---|------|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| L | E | V | E | L | | | 2 | | | | | | | | | | | | | | | | |
| C | O | D | E | ? | | | | | | | | | | | | | | | | | | | |

Press <1234> then press <ENTER>. This will unlock the LEVEL 1 and 2 codes to be changed for the First time only. The display will show:

| PROGRAM | | CHANNEL | | DATA | | | | | | | | | | | | | | | | | | | |
|---------|---|---------|---|------|--|--|---|---|---|--|--|--|--|--|---|---|---|---|--|--|--|--|--|
| E | N | T | E | R | | | N | E | W | | | | | | 1 | 2 | 3 | 4 | | | | | |
| L | E | V | E | L | | | 1 | | | | | | | | X | X | X | X | | | | | |

The old value of the Level 1 security code is shown on the top line. Press the new 4 digit security code <XXXX> which will then appear, then press <ENTER>. The display will show:

| PROGRAM | | CHANNEL | | DATA | | | | | | | | | | | | | | | | | | | |
|---------|---|---------|---|------|--|--|---|---|---|--|--|--|--|--|---|---|---|---|--|--|--|--|--|
| E | N | T | E | R | | | N | E | W | | | | | | 1 | 2 | 3 | 4 | | | | | |
| L | E | V | E | L | | | 2 | | | | | | | | Y | Y | Y | Y | | | | | |

The old value of LEVEL 2 security code is shown on the top line. Press the new 4 digit security code (YYYY) which will then appear, then press <ENTER>. The system will re-lock automatically in five minutes after the last keyboard entry. **BE ABSOLUTELY SURE TO RECORD AND STORE THE LEVEL 1 AND 2 SECURITY CODE IN A SAFE PLACE.** To change the codes later requires the value of the current LEVEL 2 code.

ALARM ACKNOWLEDGE

This key is used to acknowledge alarms when viewing ALARM DISPLAY.

ALARM DISPLAY

This key allows the operator to view the ALARM stack and to acknowledge alarms. A security code is not required to access or acknowledge alarms. As the CM-2 scans the channels, any alarms are added sequentially to the ALARM stack. The ALARM stack enables the operator to examine the alarms in the order of occurrence. The types of alarms in the stack are displayed by the LED display. There may be several LED's lit simultaneously. As the stack is SCROLLED, the LED indicating the particular alarm for that channel only is lit. To scroll through the stack use the <SCROLL UP> and <SCROLL DOWN>keys. Repeatedly pushing the <SCROLLING DOWN> will always return to the start of the ALARM STACK. The HIGH and LOW LIMIT, SENSOR, and HEATER ALARM will alarm during a scan cycle. MEMORY FAULT will alarm at the end of a scan cycle. When exiting the ALARM stack by using the <CLEAR ENTRY> key, the RESET display will show:

| PROGRAM | | CHANNEL | | DATA | | | | | | | | | | | | | | | | | |
|---------|---|---------|---|------|---|---|---|---|--|---|---|---|---|---|--|---|---|---|---|--|--|
| R | E | S | E | T | | A | L | L | | | | | | | | | | | 0 | | |
| A | L | A | R | M | S | ? | | | | 1 | = | Y | E | S | | 0 | = | N | O | | |

To not reset press <ENTER>. The CM-2 will be in the normal scanning mode. To reset the alarms, press <1> then <ENTER>. This causes all internal alarm flags to be erased and the CM-2 begins scanning for alarms. Any alarms remaining will be displayed again after the time-out period. The alarms with CLEAR should disappear.

CM-2 Alarms

Typical alarms and their meanings are as follows:

Low Limit Alarm

LOW LIMIT ALARM

| PROGRAM | | CHANNEL | | DATA | | | | | | | | | | | | | | | | |
|---------|---|---------|---|------|--|---|---|---|---|---|---|--|--|--|---|---|---|---|---|---|
| C | H | . | 3 | | | N | O | A | C | K | | | | | 2 | 7 | . | 8 | ° | F |
| L | | | 3 | 0 | | S | | | | 5 | 0 | | | | H | | 2 | 0 | 0 | |

The top line of display gives the value of the current pipe temperature for that channel, also the acknowledgment status, (ack, noack). The bottom line of the display gives alarm limits and set point for that channel. The LOW LIMIT ALARM LED lights. To acknowledge the alarm, press <ALARM ACKNOWLEDGE>. The NOACK will be replaced by ACK.

LOW LIMIT ALARM

| PROGRAM | | CHANNEL | | DATA | | | | | | | | | | | | | | | | |
|---------|---|---------|---|------|--|---|--|---|---|---|---|--|--|--|---|---|---|---|---|---|
| C | H | . | 3 | | | | | A | C | K | | | | | 2 | 7 | . | 8 | ° | F |
| L | | | 3 | 0 | | S | | | | 5 | 0 | | | | H | | 2 | 0 | 0 | |

The LOW LIMIT ALARM LED stays lit as long as the channel is in the alarm condition whether acknowledge or not.

High Limit Alarm

The alarm display will show:

HIGH LIMIT ALARM

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | | | | | |
|---------|---|---------|---|---|---|------|---|---|---|---|---|--|--|---|---|---|---|---|---|---|
| C | H | . | 4 | | N | O | A | C | K | | | | | 4 | 1 | 1 | . | 9 | ° | F |
| L | | | 3 | 0 | | | S | | | 5 | 0 | | | | | H | | 2 | 0 | 0 |

To acknowledge, press <ALARM ACKNOWLEDGE>, the NOACK will be replaced with ACK. The HIGH LIMIT LED will remain lit until the alarm clears.

Heater Alarm

The alarm display will show:

HEATER ALARM

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | | | | | |
|---------|---|---------|---|--|---|------|---|---|---|---|--|--|--|---|---|---|---|---|---|---|
| C | H | . | 2 | | N | O | A | C | K | | | | | 1 | 6 | 1 | . | 8 | ° | F |
| | | | | | O | U | T | P | U | T | | | | | | | | | | |

For the CM-2 only system, the HEATER ALARM indicates a failed 24VDC output driver for the power relay, and open load on the output driver, or blown fuse on the CONTACTOR POWER.

Sensor Alarm

The display will show:

HIGH LIMIT ALARM

SENSOR ALARM

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | | | | | |
|---------|---|---------|---|---|--|------|---|---|---|---|---|---|--|---|---|---|---|---|---|---|
| C | H | . | 1 | 4 | | N | O | A | C | K | | | | 1 | 6 | 8 | 0 | . | ° | F |
| L | | | 3 | 0 | | | S | | | 1 | 5 | 0 | | | H | | 4 | 0 | 0 | |

An open RTD or thermocouple will give a SENSOR ALARM. An abnormally high temperature will be displayed on the top line. The SENSOR ALARM and HIGH LIMIT ALARM LEDs will light. To acknowledge, press, ALARM ACKNOWLEDGE>. The led DISPLAY WILL REMAIN LIGHTED UNTIL THE ALARM CLEARS.

Alternatively the display could show:

LOW LIMIT ALARM

SENSOR ALARM

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | | | | |
|---------|---|---------|---|---|--|------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | H | . | 2 | 2 | | N | O | A | C | K | | - | 4 | 1 | 2 | . | 0 | ° | F |
| L | | | 5 | 0 | | | S | | | 2 | 0 | 0 | | | H | | 3 | 0 | 0 |

A shorted RTD will give a SENSOR ALARM. An abnormally low temperature will be displayed on the top line. the SENSOR ALARM and LOW LIMIT ALARM will light. To acknowledge, press <ALARM ACKNOWLEDGE>. The LED display will remain lighted until the alarm clears.

Note: The CM-2 does not detect shorted thermocouples.

Communications Alarm

This alarm does not exist on a CM-2 remote unit, only on MASTER UNITS (Address 99). The display will show on the MASTER UNIT.

COMMUNICATIONS ALARM

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | | | | | |
|---------|---|---------|---|---|---|------|---|---|---|---|---|---|--|---|---|---|---|---|--|--|
| M | A | S | T | E | R | | S | Y | S | T | E | M | | A | L | A | R | M | | |
| | | | | | | | N | O | A | C | K | | | | | | | | | |

Loss of communications between the Master and remote CM-2 Unit will give a COMMUNICATIONS ALARM. The Master Unit will try for 5 minutes to communicate with a remote before alarming. To acknowledge, press ALARM ACKNOWLEDGE. The LED display will remain lighted until the alarm is cleared. When communications are restored the alarm can be RESET when exiting the ALARM DISPLAY.

Memory Fault

The alarm display will show:

MEMORY FAULT

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | |
|---------|---|---|---|---------|---|--|--|------|---|---|---|---|--|--|
| S | Y | S | T | E | M | | | A | L | A | R | M | | |
| | N | O | A | C | K | | | | | | | | | |

For a CM-2 OR CM-2/1 remote unit 1. Similarly the alarm display will show:

MEMORY FAULT

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | |
|---------|---|---|---|---------|---|--|--|------|---|---|---|---|---|--|
| U | N | I | T | | 1 | | | S | Y | S | T | E | M | |
| | | | | | | | | N | O | A | C | K | | |

For the Master Unit. The display shows that there is a MEMORY FAULT in Unit 1, which is not acknowledged. To acknowledge, press <ALARM ACKNOWLEDGE>. The MEMORY FAULT LED will remain lit until the alarm clears. MEMORY FAULT will not AUTO CLEAR. To CLEAR MEMORY FAULT, SET POINTS and SYSTEM must be carefully examined to determine what data stored in EEPROM has been altered. The correct data must be re-entered by unlocking the unit and reentering correct values. If no altered data is found in either SET POINTS or SYSTEM for the operating program, then MEMORY FAULT can be cleared by re-entering an existing value to generate a new checksum. A MEMORY FAULT in the operating program is generated when Checksums of memory in EEPROM have changed since the Checksum was generated. A Checksum is changed anytime a SET POINT or SYSTEM parameter is changed from the master or remote units.

Override - Auto

The manual OVERRIDE feature is active only on remote units and not master units. This switch completely bypasses the microprocessor and activates the 24 VDC outputs to the power handling devices, thus all heaters are on continuously. An over temperature condition of either pipe or heater cable sheath can be hazardous, an over temperature protection device must be used. In the AUTO position, the microprocessor is in control.

CM-2/1 Alarms

A CM-2/1 System monitors voltage, current, and continuity in addition to the CM-2 functions. The monitoring utilizes the CM-1 Sensor Card (GB-366). The monitor sequence for each channel is voltage first, current second continuity third. The CM-2/1 has a time delay built in to prevent false alarms. Anytime an alarm condition is detected twice in a time-out period, the CM-2/1 will place that channel in alarm. The time-out period is established in the System configuration. FAST time-out is one minute or less and used for initial system commissioning. SLOW time-out is 5 minutes and is recommended for normal plant operation.

Voltage Alarm

The display will show:

HEATER ALARM

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | |
|---------|---|---|--|---------|--|--|--|------|---|---|---|---|---|--|
| C | H | . | | 2 | | | | N | O | A | C | K | | |
| | | | | | | | | 9 | 4 | . | 3 | ° | F | |

This alarm means the CM-2/1 has detected a loss of voltage. Check the panel board for an OFF or tripped breaker. To acknowledge, press <ALARM ACKNOWLEDGE>. The NOACK will be replaced by ACK. The HEATER ALARM LED will remain lit until the alarm clears.

Current Alarm

The display will show:

HEATER ALARM

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | |
|---------|---|---------|---|---|---|------|---|---|---|---|---|---|---|---|---|---|
| C | H | . | 1 | 7 | N | O | A | C | K | | 8 | 4 | . | 3 | ° | F |
| | | | | | H | T | R | A | M | P | S | | | | | |

This alarm means the CM-2/1 has detected a current below the alarm limit set on the Sensor Card. To acknowledge, press <ALARM ACKNOWLEDGE>, the display will show ACK. The HEATER ALARM LED will remain lit until the alarm clears.

Continuity Alarm

The display will show:

HEATER ALARM

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | | |
|---------|---|---------|---|---|---|------|---|---|---|---|---|---|---|---|---|---|---|
| C | H | . | 3 | 7 | N | O | A | C | K | | 2 | 8 | 4 | . | 3 | ° | F |
| | | | | | H | T | R | C | O | N | T | | | | | | |

This alarm means there is a loss of bus wire continuity on a parallel type cable between the Sensor Card and the CMD. To acknowledge, press <ALARM ACKNOWLEDGE>, the display will show ACK. The HEATER ALARM LED will remain lit until the alarm clears.

CM-2/GF Alarms

The CM-2/GF system monitors circuit load current in amps and Ground Fault current leakage in milliamps as well as CM-2 alarms. The Ground Fault system provides both a current leakage alarm and a circuit interrupt with an alarm. In addition, both high and low currents are monitored and alarms provided.

Current Alarm

The display will show:

HEATER ALARM

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | |
|---------|---|---------|--|---|---|------|---|---|---|---|---|---|---|---|---|---|
| C | H | . | | 1 | N | O | A | C | K | H | T | R | L | O | A | D |
| L | O | W | | 2 | . | 0 | | | | H | I | | 2 | 5 | . | 0 |

This alarm means the CM-2/GF has detected a load current either below the minimum or above the maximum values shown on the bottom line of the display window. To acknowledge, press <ALARM ACKNOWLEDGE>. The NOACK will be replaced by ACK. The HEATER ALARM LED will remain lit until the alarm clears. To display the load current use the <ACTUAL TEMPERATURE> key after exiting the ALARM DISPLAY.

Ground Fault

The display will show:

HEATER ALARM

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | |
|---------|---|---------|---|---|---|------|---|---|---|---|---|---|---|---|---|---|
| C | H | . | | 2 | N | O | A | C | K | G | - | F | A | U | L | T |
| A | L | A | R | M | | 2 | 0 | | | T | R | I | P | | 3 | 0 |

This alarm means the CM-2/GF has detected a current leakage fault. If the current fault has exceeded the TRIP level

indicated on the bottom line of the display window the CM-2/GF has also interrupted the circuit. To acknowledge, press <ALARM ACKNOWLEDGE>. The NOACK will be replaced by ACK. The HEATER ALARM LED will remain lit until the alarm clears. To reset a tripped circuit press the <CLEAR ENTRY> key, the reset display will show:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | |
|---------|---|---|---|---------|---|---|---|------|---|---|---|---|---|---------|
| R | E | S | E | T | | A | L | L | | | | 0 | | |
| A | L | A | R | M | S | ? | | | 1 | = | Y | E | S | 0 = N O |

Scroll Up / Down

These keys allow the operator to advance the channel data displayed to the next higher / lower channel. Scrolling is used when viewing ALARM DISPLAY and ACTUAL TEMPERATURE.

FUNCTION

This key permits unlocking the CM-2 to enter LEVEL 1 and 2 security codes. To unlock, press <FUNCTION>. The display will show:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | |
|---------|---|---|---|---------|---|--|---|------|---|---|---|---|-----|---------|
| S | Y | S | T | E | M | | | 0 | | | | | | |
| A | C | C | E | S | S | | 1 | = | O | P | E | N | 0 = | L O C K |

To open, press <1>, then <ENTER>. The display will show:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | |
|---------|---|---|---|---------|---|---|---|------|--|--|--|---|---|-----|
| S | E | C | U | R | I | T | Y | | | | | | | |
| C | O | D | E | ? | | | | | | | | X | X | X X |

Enter the four digit security code <XXX>, then press <ENTER>. The display will then flash LEVEL 1 or 2 depending on the code entered. LEVEL 1 and 2 codes can be made equal which gives universal access. Level 1 code will only allow changing HIGH and LOW LIMIT, SET POINT AND DEADBAND under the <SET POINT> key. LEVEL 2 is required for ACTIVE and FAIL MODE.

Block Program

The display will show:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | |
|---------|---|---|---|---------|---|---|--|------|---|---|---|---|-----|-----|
| B | L | O | C | K | | | | 0 | | | | | | |
| P | R | O | G | R | A | M | | 1 | = | Y | E | S | 0 = | N O |

To not BLOCK PROGRAM, press <ENTER>. To BLOCK PROGRAM, press <1> then press <ENTER>. The display will now show:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | |
|---------|---|---|---|---------|--|---|---|------|---|---|---|---|--|---|
| B | L | O | C | K | | P | R | O | G | R | A | M | | 1 |
| F | I | R | S | T | | C | H | A | N | N | E | L | | |

The number shown on the display is the first (lowest) channel to be BLOCK PROGRAMMED. To change, press the channel number desired then press <ENTER>. The display will now show the desired first channel and advance to the next display:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | | | | | |
|---------|---|---|---|---------|---|---|---|------|---|---|---|---|--|--|---|--|--|--|--|
| B | L | O | C | K | | P | R | O | G | R | A | M | | | 2 | | | | |
| L | A | S | T | | C | H | A | N | N | E | L | | | | | | | | |

To change from channel 2 to channel 40, press 40 on the keypad then press <ENTER>. You can now program SET POINTS with a LEVEL 2 access code for channels 1 through 40. The display for SET POINTS will show:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | | | | | |
|---------|---|---|---|---------|---|---|---|------|---|---|---|---|--|--|--|--|--|--|--|
| O | | B | L | O | C | K | | | 1 | - | 4 | 0 | | | | | | | |
| H | I | | L | I | M | I | T | | | | | | | | | | | | |

Enter the HIGH LIMIT for channels 1 through 40 in the appropriate units, then press <ENTER>. The display will then advance. Complete the programming of the other SET POINTS.

The parameters in SYSTEMS and PROGRAM SELECT can only be accessed for change by a LEVEL 2 code. For changing codes, see the “System” section of this manual.

MASTER MODE

A CM-2 can be used as a MASTER UNIT to poll remote field mounted units. The Master is connected by a RS-485 link to the communications ports of the remote units. The remote units are connected in a daisy chain sequence. A Master Unit operates in a very similar fashion to a remote. The exceptions are the Master does not accept I/O from sensors or contactors, and the display is different for some keyboard functions. Since multiple remote units communicate with the Master, the display must identify the particular unit.

Operation

To select a channel, press <CHANNEL SELECT> key. The display will show:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | | | | | |
|---------|---|---|---|---------|--|---|--|------|--|--|--|--|--|--|--|--|--|--|--|
| U | N | I | T | | | 1 | | | | | | | | | | | | | |

To select Unit 2, press <2>, then <ENTER>. The 1 will be replaced by a 2 and the display will show:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | | | | | |
|---------|---|---|---|---------|---|---|--|------|---|--|--|--|--|--|--|--|--|--|--|
| C | H | A | N | N | E | L | | | 1 | | | | | | | | | | |

All operators are identical with the previous instructions.

Set Points

In the Master Mode, SET POINT is identical with the previous instructions. The display will show the unit number as follows:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | | | | | |
|---------|---|--|---|---------|---|---|---|------|---|---|--|---|---|---|--|--|--|--|--|
| 1 | | | | 9 | | U | N | I | T | 1 | | 2 | 0 | 0 | | | | | |
| H | I | | L | I | M | I | T | | | | | | | | | | | | |

Similarly for SET POINT, LO LIMIT and DEADBAND. The displays for ACTIVE, FAIL MODE and MONITOR are slightly different as follows:

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | | | | |
|---------|---|---------|---|---|---|------|---|---|--|---|---|---|---|---|--|---|---|---|---|
| 1 | | | 9 | | U | N | I | T | | 1 | | 0 | | | | | | | |
| A | C | T | I | V | E | ? | | | | 1 | = | Y | E | S | | 0 | = | N | O |

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | | | | |
|---------|---|---------|---|--|---|------|---|---|--|---|---|---|---|--|---|---|---|---|---|
| 1 | | | 9 | | U | N | I | T | | 1 | | 0 | | | | | | | |
| F | A | I | L | | M | O | D | E | | 1 | = | O | N | | 0 | = | O | F | F |

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | | | | | |
|---------|---|---------|---|---|---|------|---|---|---|---|---|---|---|---|---|--|---|---|---|---|
| 1 | | | 9 | | U | N | I | T | | 1 | | 0 | | | | | | | | |
| M | O | N | I | T | O | R | | | 2 | = | P | | 1 | = | S | | 0 | = | N | O |

Actual Temperature

The display will be similar to the previous, with the addition of UNIT and PROGRAM number. The display will show:

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | | | | |
|---------|--|---------|---|--|---|------|---|---|--|--|--|---|---|--|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | |
| 0 | | | 3 | | U | N | - | 2 | | | | O | N | | 2 | 6 | 1 | ° | C |

Also, the ON / OFF status and rounded off temperature are displayed.

Program Select

When using the Master Mode, the first display is:

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | | |
|---------|---|---------|---|---|---|------|--|--|--|--|--|--|---|--|--|--|--|
| S | E | L | E | C | T | | | | | | | | 2 | | | | |
| U | N | I | T | | | | | | | | | | | | | | |

To select another Unit, press its number, then <ENTER>. The new Unit number will appear below the 2.

System

Since each remote unit can be configured differently, the only part of SYSTEM that is active from the MASTER is BLOCK PROGRAMMING. The display will show:

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | | |
|---------|---|---------|---|---|---|------|--|--|--|--|--|--|---|--|--|--|--|
| S | E | L | E | C | T | | | | | | | | 2 | | | | |
| U | N | I | T | | | | | | | | | | | | | | |

Select appropriate unit number and <ENTER>. The BLOCK PROGRAM displays are the same. The Master must be given the quantity of remote units. The display will show:

| PROGRAM | | CHANNEL | | | | DATA | | | | | | | | | | | |
|---------|---|---------|---|---|---|------|--|--|--|--|--|--|---|--|--|--|--|
| R | E | M | O | T | E | | | | | | | | 1 | | | | |
| U | N | I | T | S | | | | | | | | | | | | | |

Select the appropriate number and <ENTER>. The remote units must be numbered sequentially, starting with 1. Care should be taken when removing a remote unit from service.

Alarm Acknowledge

This key is used to acknowledge alarms when viewing ALARM DISPLAY. Its functions is the same as previously described.

Alarm Display

The ALARM STACK in the Master behaves the same as in the remote units. Each alarm in the Master’s Alarm Stack has the particular unit number associated with the alarm. Some typical displays are:

LOW LIMIT ALARM

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | |
|---------|---|---|---|---------|---|---|---|------|---|---|---|---|---|---|---|
| C | H | - | 3 | U | N | - | 2 | N | A | | | 2 | 8 | ° | F |
| L | | | 3 | 0 | | | S | | | 5 | 0 | | H | 2 | 0 |
| | | | | | | | | | | | | | | | |

Channel 3 in Unit 2 has a NOT ACKNOWLEDGED, LOW LIMIT alarm and the current temperature is 28°F. Acknowledging the alarm gives a display:

LOW LIMIT ALARM

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | |
|---------|---|---|---|---------|---|---|---|------|--|---|---|---|---|---|---|
| C | H | - | 3 | U | N | - | 2 | A | | | | 2 | 8 | ° | F |
| L | | | 3 | 0 | | | S | | | 5 | 0 | | H | 2 | 0 |
| | | | | | | | | | | | | | | | |

Similar displays are found for all other alarm displays.

When exiting the ALARM STACK each unit must be examined individually whether to RESET. The display will show:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | |
|---------|---|---|---|---------|---|---|---|------|---|---|---|---|---|---|---|
| R | E | S | E | U | N | I | T | | | 1 | ? | | | | |
| | | | | | | | | 1 | = | Y | E | S | 0 | = | N |
| | | | | | | | | | | | | | | | |

Enter the proper value (1 or 0) and proceed to UNIT 2. The final display in the ALARM DISPLAY will be:

| PROGRAM | | | | CHANNEL | | | | DATA | | | | | | | |
|---------|---|---|---|---------|---|---|---|------|---|---|---|---|---|---|---|
| C | L | E | A | R | A | L | A | R | M | | | | | | |
| S | T | A | C | K | ? | | | 1 | = | Y | E | S | 0 | = | N |
| | | | | | | | | | | | | | | | |

Enter the appropriate number (1 or 0).

⚠ WARNING:

Sometimes due to data transmission rates, the remote units whose alarms have been CLEARED will not have received an update and will re-alarm the MASTER. Press <ALARM DISPLAY> and press <1> when you get to the CLEAR ALARM STACK display.

Function

This mode works the same as previously. One item to note: It is possible to have difference LEVEL 1 and 2 security codes for each remote unit and the Master. The Master always has access to the remotes through its security codes.

IV. START-UP

TURNING THE SYSTEM ON

- 1) Using the switch in the CM-2 enclosure, power up the CM-2 head and allow the unit to complete its self-check and cycle into scanning mode. This should take 2-4 minutes.
- 2) After the unit has self-checked and cycled into the scanning mode press the <FUNCTION> key then press the <1> key and <ENTER> to access setup. Now enter the level 2 security code (4321) on the keypad and press <ENTER>.
- 3) When prompted to Block Program press the <0> key, then <ENTER> to exit this command. Now press the <SYSTEM> key to check the system parameters. Scroll through the system parameters by pressing the <ENTER> key and make sure the proper selections for temperature and probe type are selected. Use the keypad and the <ENTER> key to make any necessary changes to system parameters. The controller will switch back to scanning mode when you finish scrolling through all the system parameters.

PROGRAMMING INDIVIDUAL CHANNELS (CIRCUITS)

- 1) While in the setup mode press the <CHANNEL SELECT> key, press the <1> key then <ENTER> to begin programming for each individual circuit. If a group of consecutive channels are operating with the exact same control temperatures you may use the BLOCK PROGRAM command in the next section to save time programming or deactivating a group of consecutive channels.
- 2) Next press the <SETPOINTS> key and program #1, channel #1 will appear in the display with the Hi-Limit temperature prompt. Use the keypad and the <ENTER> key to enter the Hi-Limit temperature for channel 1. Continue to use the keypad and the <ENTER> key to step through the temperature settings and control information as the controller cycles through the command prompts for the channel being programmed. When the MONITOR prompt appears:
 - a. If you are programming the CM-2 or CM-2/GF always press <0> and <ENTER> for this prompt.
 - b. If you are programming the CM-2/1 you must enter #1 for series type heater cables or #2 for parallel (self-regulating) type heater cables. Self-regulating type heater cables require a CMD (Continuity Monitor Device) for continuity monitoring.

For an explanation of the control prompts in the **SET POINTS** command see "Description of Setpoint Command Display Prompts" at the end of this section.

- 3) When you reach the Hi-Limit prompt the second time press the <SCROLL UP> arrow key to begin programming the next channel. Repeat this process until all active channels have been programmed. Press the <CLEAR ENTRY> Key when all programming is completed.

GROUP (BLOCK) PROGRAMMING OF CHANNELS

- 1) To BLOCK PROGRAM a consecutive group of channels:
Press the <FUNCTION> key, then <ENTER> to reach the BLOCK PROGRAM command while still in Level 2 access. (If you are not in Level 2 access you must regain access by repeating step 2 in the "Turning the System On" section).
- 2) When you reach the BLOCK PROGRAM command press the <1> key, then <ENTER>. The controller will default to channel #1 as the first channel to be blocked. You must enter the number of the first channel in your group of consecutive channels or press <ENTER> if channel #1 is the first channel in your group. Next enter the number of the last channel in your group using keypad and <ENTER> key.

- 3) The CM-2 will immediately revert to normal scanning mode. Press the <SETPOINTS> key and the CM-2 will begin accepting temperatures and parameters in the Block Program command. Use the keypad and the <ENTER> key to program temperatures and control data for this channel group. You must complete step # 4 to Exit the Block Program command .
- 4) Upon completion of data entry for the Blocked Channels press <FUNCTION> then <ENTER>, then <0> and <ENTER> to exit the Block Program command and return to normal keyboard operation.

DE-ACTIVATION OF UNUSED CHANNELS

- 1) All unused channels should be de-activated until needed. Individual channels can be de-activated by using the <SETPOINTS> command while in Level 2 security access. Using the <SETPOINTS> command enter a <0> when you reach the ACTIVE ? Prompt. Press the <CLEAR ENTRY> key when all programming is completed.
- 2) You can de-activate a consecutive group of channels using the Block Program command outlined above by entering a <0> when you reach the ACTIVE ? prompt.

Note: To Exit the Block Program command you must use the <FUNCTION> key as outlined in step 4 above.

CHECKING ALARMS

- 1) Alarms are indicated by the Red LED's located to the lower left of the display panel. Press <ALARM DISPLAY> on the keypad and read the information in the window. To let others know that you have checked the alarm you can press <ALARM ACKNOWLEDGE> If you so choose. Use the <SCROLL UP> and <SCROLL DOWN> keys to check for additional alarms.
- 2) To exit out of the ALARM DISPLAY command, press the <CLEAR ENTRY> key. The CM-2 will allow you to RESET ALL ALARMS or LEAVE ALL ALARMS IN MEMORY. To RESET the alarms press <1> and <ENTER>. To leave the alarms in MEMORY press <ENTER>.

Note: For complete references of keyboard commands refer to "OPERATION", Section III.

DESCRIPTION OF SETPOINT COMMAND DISPLAY PROMPTS

Hi Limit - the upper alarm temperature. The CM-2 will initiate an alarm when the equipment being traced is heated up to the temperature programmed as the **Hi Limit** temperature.

Setpoint - the maintain temperature. The CM-2 will keep the heat tracing energized until the equipment being traced reaches the temperature programmed as the Setpoint temperature.

Lo Limit - the lower alarm temperature. The CM-2 will initiate an alarm when the equipment being traced cools down to the temperature programmed as the **Lo Limit** temperature.

Dead Band - the Setpoint temperature tolerance. When the equipment being traced reaches the setpoint temperature the CM-2 shuts off the circuit. If you program the CM-2 to Deadband 4 degrees the equipment being traced must cool down 4 degrees before the CM-2 switches the heat tracing back on. This deadband reduces cycling and extends the life of the electro-mechanical relays in your CM-2 panel.

Active - active channels (circuits) are controlled by the temperatures that have been programmed into the CM-2 controller. The controller ignores inactive channels.

Fail Mode - in the event of a temperature sensor failure each channel can be programmed to turn on or off, whichever is best.

Monitor - used to define the monitoring functions for the unit, if you are programming the CM-2 or CM-2/ GF Always Press <0> AND <ENTER> for this prompt. If you are programming the CM-2/ 1 you must enter #1 for series type heater cables or #2 for parallel (self-regulating) type cables. Self-Regulating type cables require a CMD Device be installed for continuity monitoring.

CM-2/GF Configurations

Lo Load Amps - will alarm when the current in the circuit being scanned drops down to the amperage programmed as the **Lo Load Amps**.

Hi Load Amps - will alarm when the current in the circuit being scanned reaches the amperage programmed as the **Hi Load Amps**.

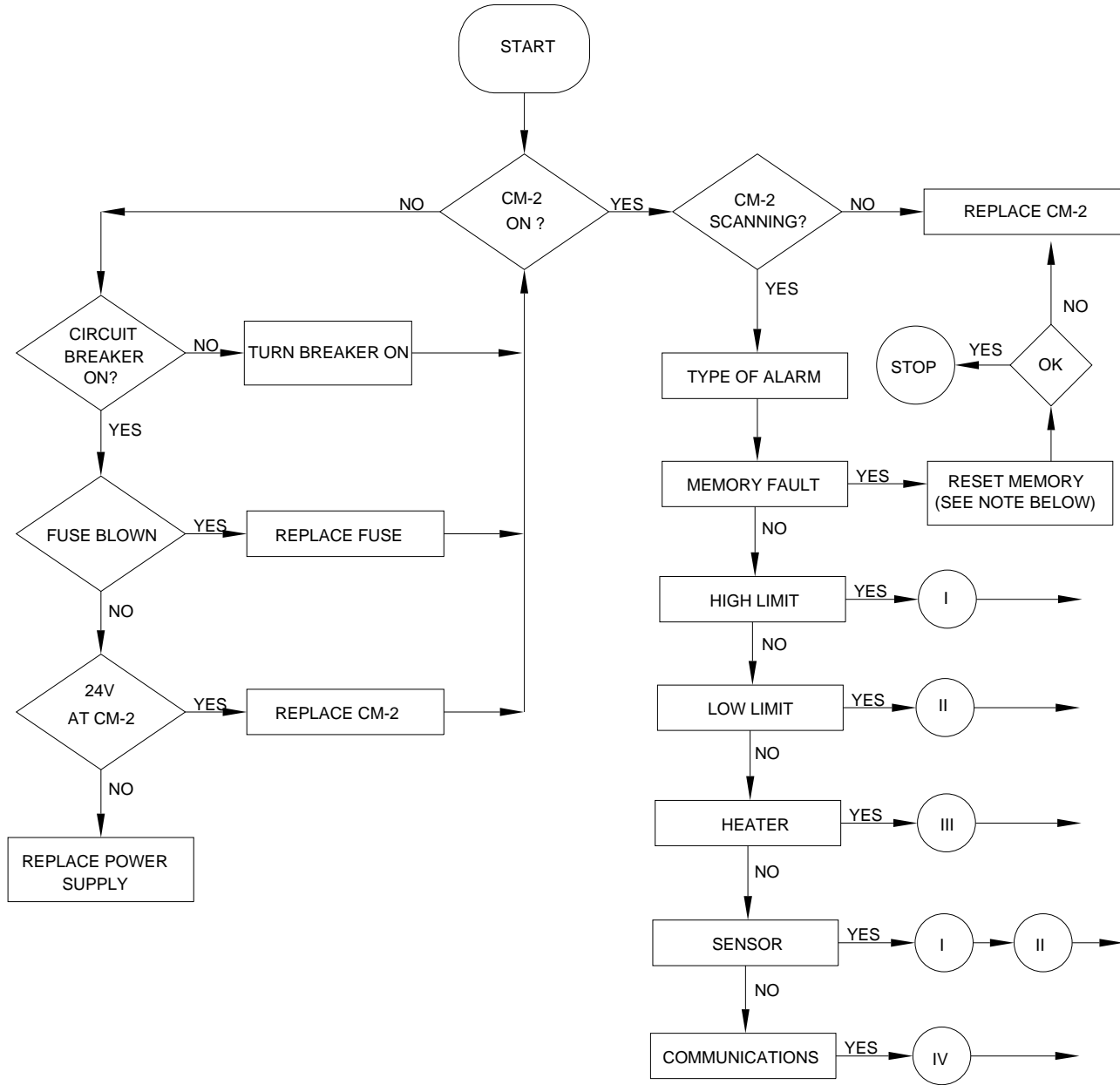
Note: If split process flow will allow part of a self-regulating circuit to see a higher temperature than the portion of the circuit that the probe is monitoring, the current alarms should be set approximately 30% below the nominal load amps to prevent nuisance alarms.

GF Alarm MA - will alarm when the circuit being scanned produces a ground fault condition equivalent in milliamps to the number entered as the **GF Alarm MA**. This value is set lower than the GF Trip level, providing advance notice of a worsening ground fault situation.

GF Trip MA - will initiate a circuit trip when the circuit being scanned produces a ground fault condition equivalent in milliamps to the number entered as the **GF Trip MA**.

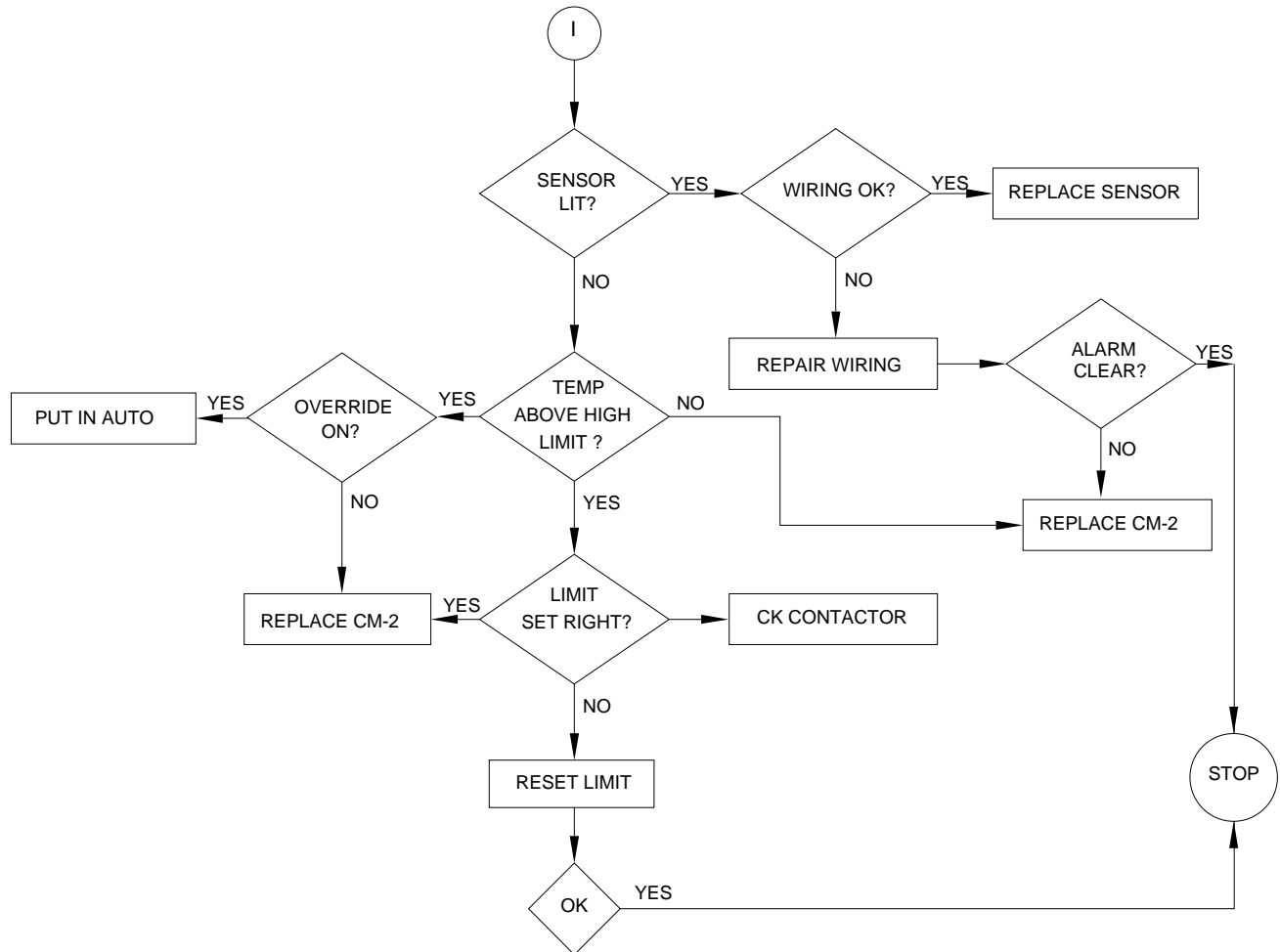
V. TROUBLESHOOTING

CM-2, CM-2/1, CM-2/GF TROUBLESHOOTING PROCEDURES

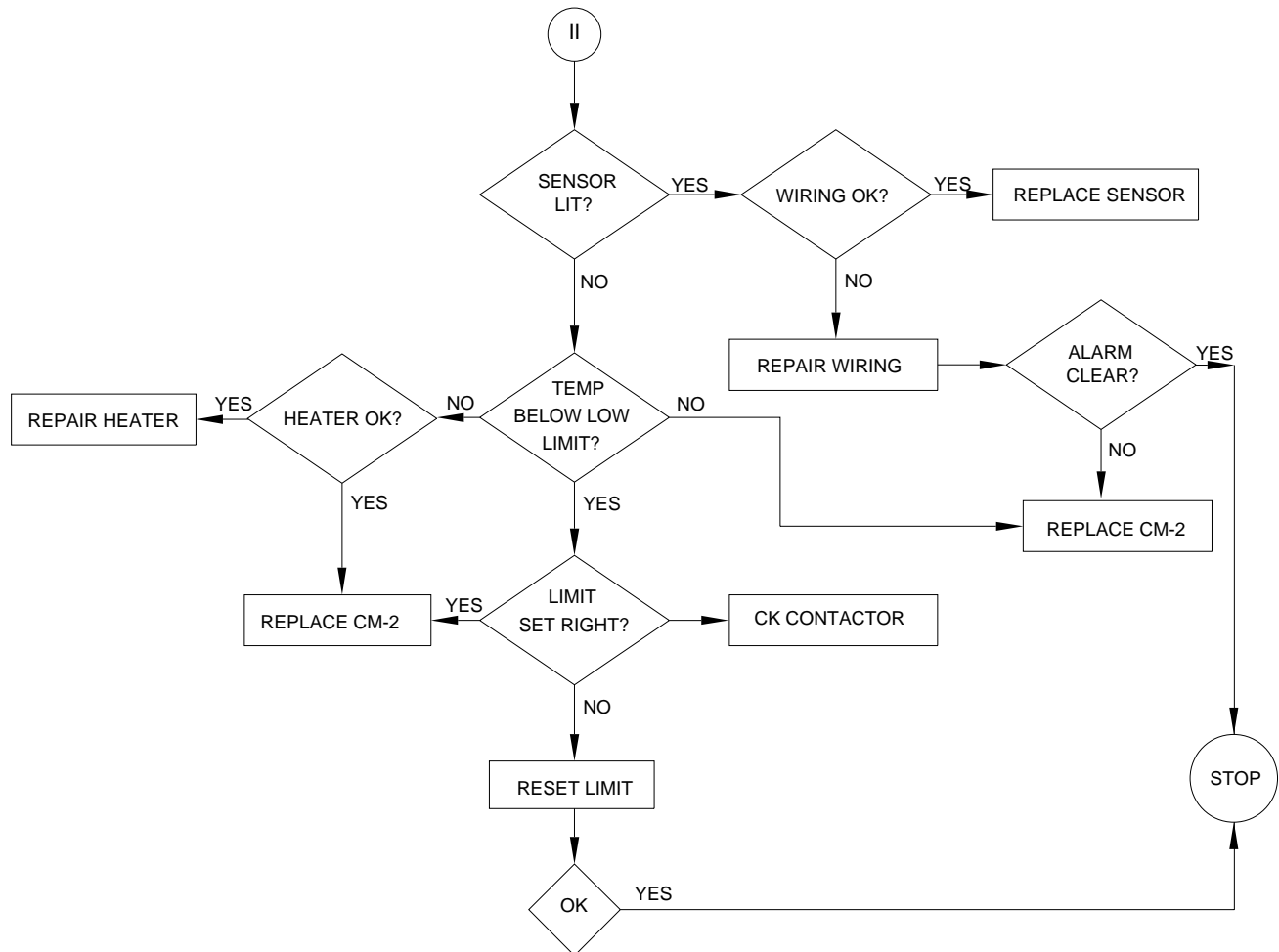


Note: A memory fault will often result in an additional alarm in one or more of the heater circuits due to the loss of information in memory. By using the <ALARM DISPLAY> key to enter the alarm stack and check the information displayed in these alarms you can often locate the cause of the memory fault. After locating the point of memory loss you must reprogram this information back into the CM-2 Head. After reprogramming reset all alarms in the Alarm Display.

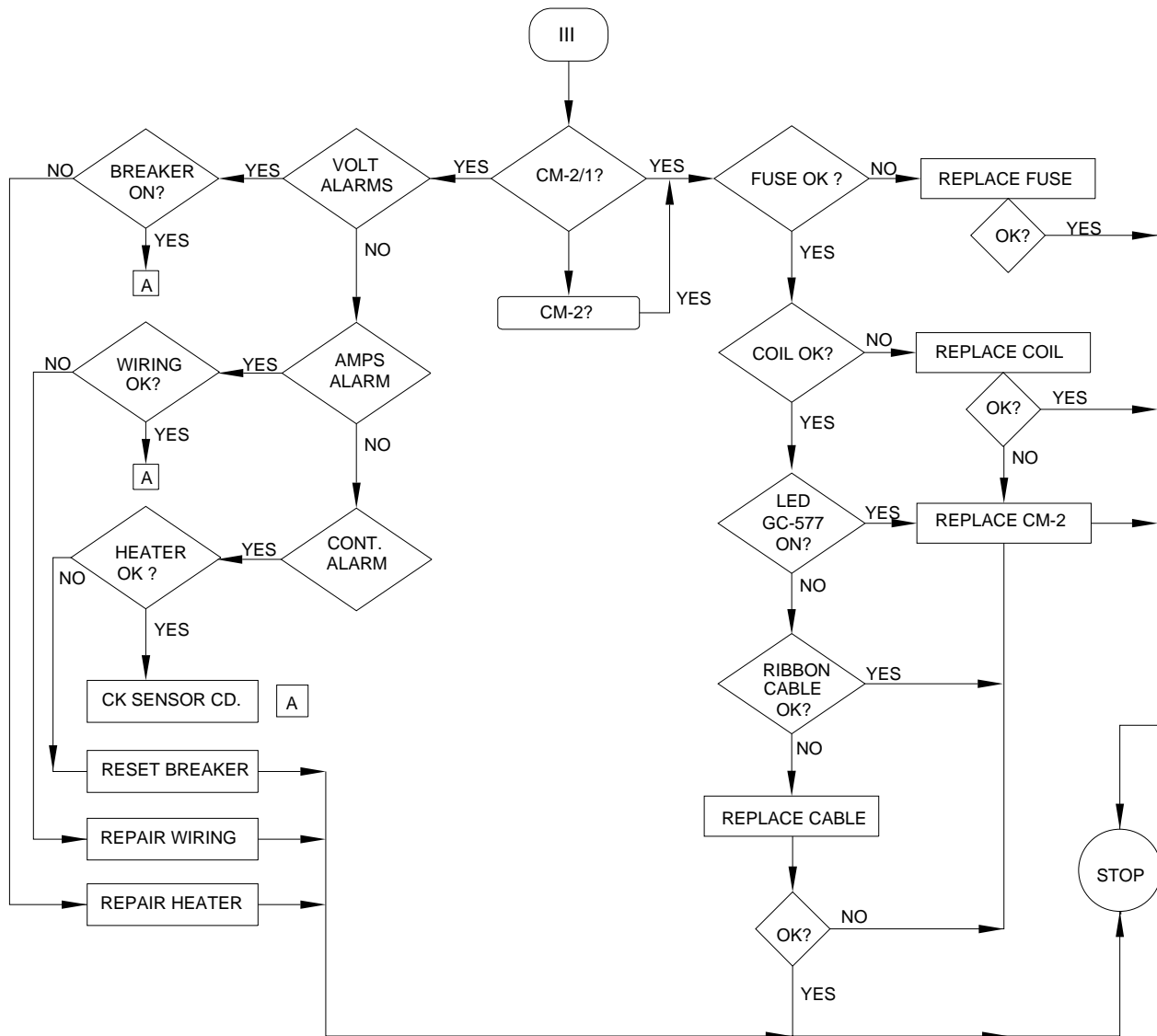
HIGH LIMIT ALARM SENSOR ALARM



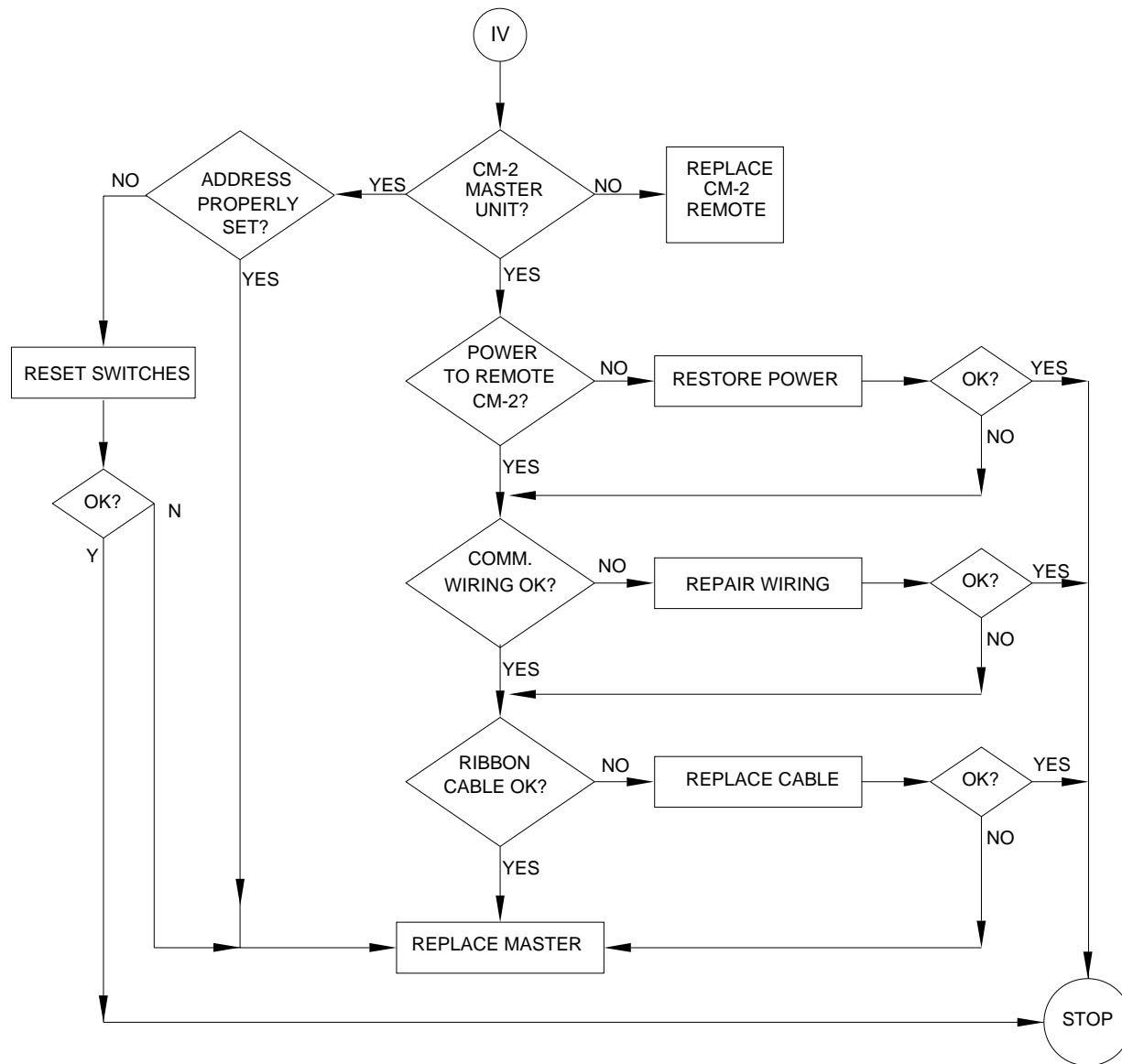
LOW LIMIT ALARM SENSOR ALARM



HEATER ALARM



COMMUNICATIONS ALARM



VI. SPECIFICATIONS

PERFORMANCE

| | |
|----------------------|---|
| Accuracy: | $\pm 1\%$, ± 1 digit; self-calibrating for RTD's or thermocouples |
| Ambient Temperature: | -40°F to 130°F (operation) -40°F to 185°F (storage) |
| Relative Humidity: | 0 - 95% max., non-condensing; boards are conformably coated and special plated connectors are used. |
| Power Input: | 24 VDC output (nom.); 18 VDC - 30 VDC operating; 8 watts for control unit only. |
| Hazardous Locations: | Factory Mutual Approved for Class I, Div. 2, Groups A, B, C, & D; Class II, Groups F & G; Class III, Divisions 1 & 2, and approved for ordinary locations. |
| Capacity: | up to 40 circuit versions; CM-2-40. |
| Memory: | All setpoints, configurations and programs are stored in EEPROMS. This information is stored indefinitely and requires no backup battery. Units can be pre-programmed at factory. |

INPUTS

| | |
|----------------|---|
| Thermocouples: | Type J, standard; Range -100°F (-73°C) to 1400°F (760°C). CM-2 detects open thermocouples. |
| RTD: | 100 ohm Platinum (DIN), 3 wire; Range -117°F (-100°C) to 1562°F (850°C); Max. lead resistance 50 ohms. CM-2 detects open or shorted Reds. Maximum lead length of 2500 feet. |
| Monitoring: | Accepts inputs for voltage, current, and continuity sensing (GB-366 and GD-115 cards). |

OUTPUT

| | |
|--------------|---|
| D C: | 24VDC at 100 ma per channel |
| A C: | 120 through 250 VAC at 300 ma per channel with GC-577-X1 Voltage Driver Card. These outputs are compatible with optional 50A contactors and solid state relays. |
| Alarm Relay: | 2 sets of Form C contacts (C, NC, NO); 3A at 120 VAC or 30 VDC (resistive). Relay is energized during normal operation. |

COMMUNICATIONS

Serial port is selectable between:

| | |
|----------|--|
| RS-232C: | 4800 baud, 25 feet, single drop, full duplex |
| RS-422: | 4800 baud, 4000 feet, single drop, full duplex |
| RS-485: | 4800 baud, 4000 feet, multi drop, half duplex |

DISPLAYS

Data: A two line alphanumeric, 20 character per line vacuum fluorescent display tube with filters and anti-glare coating is provided.

Alarm: LED bar indicators are used. Each LED has four segments to maximize reliability.

KEYBOARD

Sealed membrane, tactile touch feedback.

Nelson Heat Tracing Systems products are supplied with a limited warranty. Complete Terms and Conditions may be found on Nelson's website at www.nelsonheaters.com.

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