MFA-0801 & MFA-1201
D-M-E Smart Series®
Low Voltage
Temperature Control System

User's Manual
D-M-E Company

Printed in the United States of America

D-M-E Company
29111 Stephenson Highway
Madison Heights, MI 48071

WARRANTY

D-M-E Company warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, D-M-E Company, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. D-M-E Company shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than D-M-E Company representatives to repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; or c) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

SAFETY

D-M-E Company products have been designed to be safe and simple to operate. As with any electronic equipment, you must observe standard safety procedures to protect both yourself and the equipment.

To Prevent Injuries:

- To avoid electrical shock or fire hazard, do not apply voltage to a terminal that exceeds the range specified for that terminal.
- To avoid mechanical injury, electrical shock or fire hazard, do not operate this product with covers or panels removed.
- To avoid electrical shock or fire hazard, do not operate this product when wet.
- To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

To Prevent Product Damage:

- Do not operate this product from a power source that applies more than the voltages specified.

D-M-E Smart Series®
Low Voltage
Temperature Control System

MFA-0801 & MFA-1201

GENERAL DESCRIPTION

This manual describes the installation, operation, servicing and safety procedures for the D-M-E Smart Series Low Voltage Temperature Control System.

The D-M-E Low Voltage mainframe is designed as a closed-loop power distribution and temperature controlling system. When it is used in conjunction with D-M-E temperature controls, this system provides the user with premier temperature control capabilities. The Low Voltage CSS temperature controllers designed specifically to operate with this system, control low voltage heaters in your injection molding process. This type of temperature control provides the operator with superb operator interface, ease of use, and simplicity.

The mainframe is separated into two different voltage sections: Zones 1 through 4 are **standard high voltage** control zones that can be configured to operate at either 120 VAC or 240 VAC. Zones 5 through 12 in a 12 zone frame, and zones 5 through 8 in an 8 zone frame, are **low voltage** (24 VAC) control zones. Any of D-M-E's **standard** temperature controllers or accessories will function in the high voltage section of the frame. **ONLY CSS-15-24 TEMPERATURE CONTROLLERS WILL OPERATE IN ZONES 5 AND HIGHER.** These controllers are designed specifically to work with 24 VAC heaters.

The power / thermocouple connector, located on the left side of the unit, is designed to maximize the power output capabilities of this temperature control system. It is designed to deliver 15 amps of current, which will support the needs of most situations.

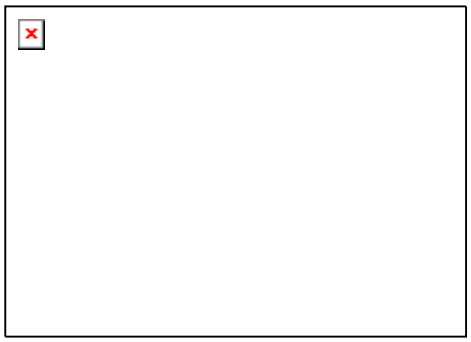

Figure 1 - Power / Thermocouple Connector

This unit also has a built-in cooling fan, a circuit breaker and power input terminal block (see figure 3), making interface easy. Also, neon indicators illuminate advising that power is on (see figure 4).

FEATURES

Each mainframe is constructed with heavy-duty steel framework and includes a built-in cooling fan, connectors for control modules and a multi-pin power / thermocouple connector for interfacing with your mold. Interfacing is accomplished through a power output / thermocouple input cable for each frame. D-M-E can also supply special temperature control systems to meet your special requirements.

Low voltage mainframes are equipped with a communications strip that allow temperature control modules to

communicate with a TAS-05-02 or a CIM-01-02 module. This communication strip employs a serial communications link which is used to receive and transmit data between the temperature control modules and various accessory modules. This communications link can also interface with various host computers for control and monitoring purposes via the CIM-01-02 module. This communication feature is accomplished through a communications motherboard (strip) which is mounted on the mainframe connector mounting plate just above the edge card connectors. Although the features and communications capability will be continually added to and upgraded, the communications scheme and hardware will remain constant. This communications strip is installed at the factory. Notice that each zone in the mainframe has its own discrete address. With the address scheme used, it is possible to have up to 64 discrete addresses. Addressing is accomplished by cutting the solder links in the address lines, located on the rear of the communications strip. When a link is cut, it represents a binary 1; when it is not cut, it represents a binary 0. The standard numbering scheme is as follows: Looking at the back of the motherboard, we start at the extreme right with zone #1 which is coded in binary as "0001". Moving to the left, zone #2 is coded "0010" and zone #3 is "0011". etc., up through binary #63, with the 64th zone being coded binary "0000".

WORLDWIDE WIRING CAPABILITIES

Unless otherwise specified, all Smart Series mainframes will be supplied to accept 240 VAC, 3 phase, 4 wire, input power. Wiring diagrams included in this manual are also located on the back panel of the mainframe. Wiring diagrams illustrate the variety of other voltage, phase and load balancing arrangements possible (such as 380-415 VAC, 3 phase; 208-240 VAC, single phase; and 110-120 VAC, single phase). These wiring adjustments can be performed in the field to suit the requirements of the application. Or, if specified at the time of original order, D-M-E will supply the mainframe configured to suit your input power application requirements.

UNPACKING AND INSPECTION

1. After unpacking, inspect your mainframe and check for any damage that may have occurred during shipment.

2. Check the circuit breaker disconnect and neon phase voltage indicators for damage.

3. Check for proper operation of circuit breaker by flipping breaker on and off with no voltage applied.

4. Check power output / thermocouple input connector for any physical damage.

5. Check AC input power wiring. The power input diagram is located on the back panel of the mainframe. This diagram indicates the input voltage configuration that was prewired at the factory. Make sure it matches what you ordered.

SAFETY

SERVICE AND INSTALLATION OF THIS EQUIPMENT SHOULD ONLY BE ATTEMPTED BY QUALIFIED SERVICE PERSONNEL FAMILIAR WITH HIGH VOLTAGE ELECTRICAL CIRCUITS.

NOTE: ALL NATIONAL AND LOCAL ELECTRICAL CODES MUST BE FOLLOWED WHEN CONNECTING THIS EQUIPMENT.

WARNING: When connecting AC power input cable, it is necessary to remove the mainframe back panel. Do not apply power to this cable or the unit when the back panel is removed.

DANGER: Do not connect AC power input cord to your in-plant power distribution system until mainframe back panel is securely in place.

DANGER: Do not attempt to insert low voltage modules into high voltage zones. Certain catastrophic failure of the module and possible injury to humans in the area may result.

DANGER: Do not attempt to defeat the rejection scheme on low voltage modules as certain catastrophic failure of the module and possible injury to humans in the area may result. Do not remove the rejection rod on the module.

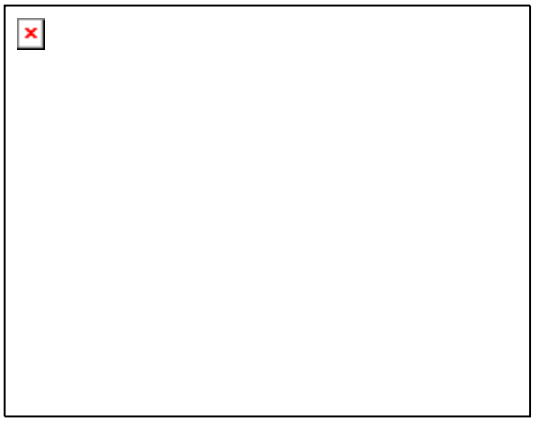

Figure 2 - Rejection Rod on Low Voltage Modules (Do Not Remove)

DANGER - HIGH VOLTAGE

If it becomes necessary to service this equipment after AC input connections are complete, make sure that your in-plant disconnect mechanism is in the "OFF" position and is secured in the "OFF" position by a padlock or other means provided by the manufacturer of the disconnect mechanism. A **"LOCK-OUT"** mechanism is recommended to prevent power from being accidentally turned-on.

INSTALLATION

1. You are installing a piece of electronic equipment which is delicate and should not be subjected to any physical or environmental abuse. Select a cool, dry, well-ventilated, environmentally clean location, away from heat, moisture and liquid carrying lines, i.e.: water cooling hoses, hydraulic hoses, etc.

2. Low Voltage systems are shipped from the factory pre-wired for 240 VAC, 3 phase. Other voltage configurations are available on request (e.g. 240 VAC, single phase; 120 VAC. single phase).

3. Select the supply line input wire size according to national and local electrical codes. Refer to mainframe serial number label for amperage rating of circuit breaker in your mainframe.

   a) Remove mainframe back panel by removing screws around the perimeter of the panel.

   b) Insert input cable through access hole provided on the right side of the mainframe.

4. Connect your AC input cord to the input terminal block as shown on the rear panel for the input voltage configuration you are attaching to.

Figure 3 - Power Input Terminal Block

   a) **WARNING:** Make sure that the chassis has been earth grounded before applying power.

   b) Take up excess slack in cable and secure with strain relief clamp provided on outside of cabinet.

5. If it becomes necessary to change to a voltage configuration other than what the system was prewired for at the factory, it will be necessary to follow the following instructions:

   a) For 208-240 VAC, 3 phase, refer to figure 12.

   b) For 380-415 VAC, 3 phase, refer to figure 13.

c) For 240 VAC, single phase, refer to figure 14.

d) For 120 VAC, signal phase, refer to figure 15.

6. Make sure mainframe back panel is securely in place before connecting power to mainframe

7. Route AC input cable to a branch circuit (service) disconnect switch and attach leads to fused side of switch. Be sure ground lead is attached to a good earth ground.

8. Where required, insert appropriate fuses in fused disconnect box.

9. Connect power / thermocouple cable to mainframe and mold.

10. Refer to Module Specifications sheets supplied with module for front panel controls and module operation for the specific module being used.

WARNING: BEFORE APPLYING POWER, MAKE SURE ALL NATIONAL AND LOCAL ELECTRICAL CODES HAVE BEEN FOLLOWED AND ALL SAFETY PRECAUTIONS ARE TAKEN.

IMPORTANT: For mold wiring and heater connection information, refer to mold connector wiring diagram.

OUTPUT CURRENT LIMITATIONS

Each Low Voltage 8 and 12 zone Smart Series mainframe is equipped with a three-pole, fast-acting 50 amp magnetic circuit breaker, (see figure 4). This circuit breaker limits the maximum input and output current of the mainframe and protects the mainframe internal wiring. The output current limitation for each frame is determined by the size of the circuit breaker in the mainframe.

WARNING: Before inserting or removing any modules from the mainframe, turn the power "OFF" by flipping the circuit breaker handle to the "OFF" position. Otherwise, certain module damage will occur.

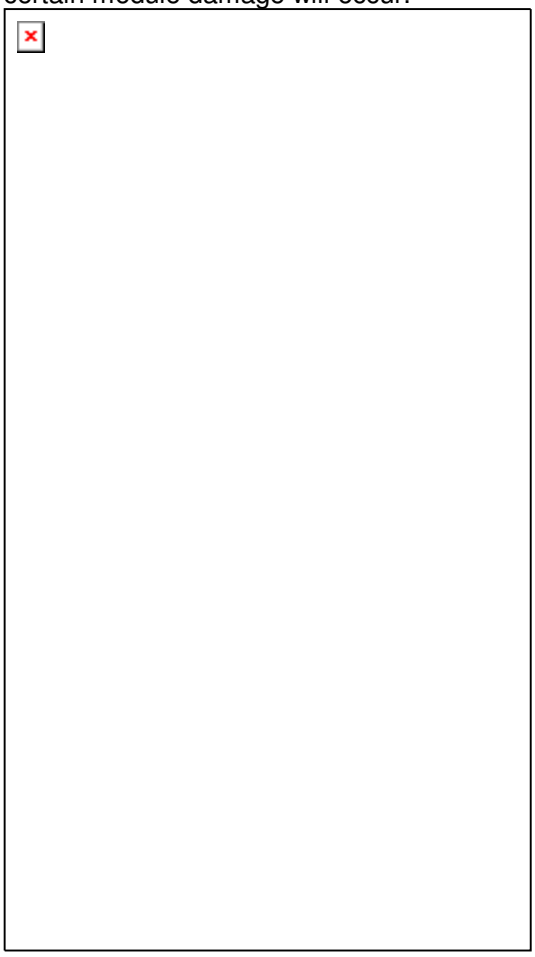

Figure 4 - Circuit Breaker Panel

MAINFRAME WIRING

Provided in this booklet, (figure 17), is a schematic diagram of a standard 12 zone low voltage mainframe. Connectors J1 through J12 (J1 through J8 in an 8 zone mainframe), are the module edge card connectors shown with their respective interconnections. Refer to edge connector for printed circuit board connections (see figure 5). Note that the AC input power contact #6 and #7 on the edge card connector are specifically designated for 240 VAC in zones 1 through 4, and 24 VAC in zones 5 or higher (low voltage zones).

The module output power is connected to the mainframe power / thermocouple connector, located on the left side of the

mainframe, via contact #4 and #5 of the edge card connector.

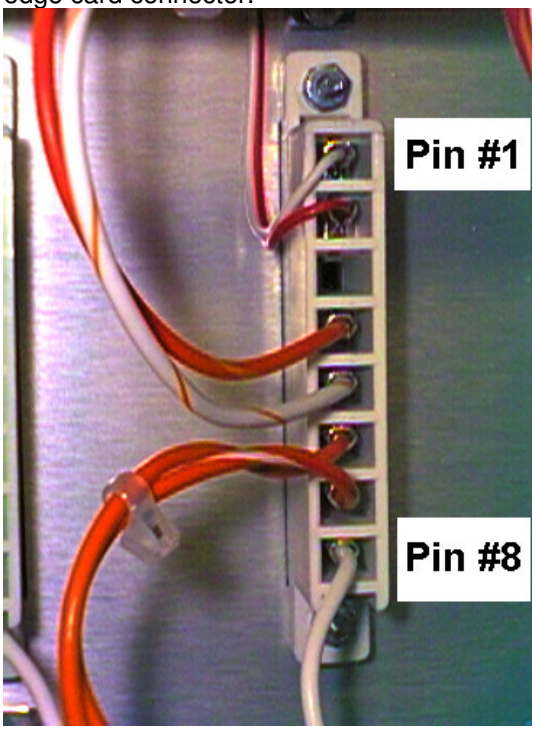

Figure 5 - Rear View of Edge Card Connector

Thermocouple (T/C) input is accomplished by connecting the cable to the power / thermocouple connector located on the left side of the mainframe. The T/C signal is attached to the appropriate module via T/C extension wires connecting the T/C input connector to contacts #1 and #2 on the appropriate module edge card connector. Refer to figure 5, and note that thermocouples are connected to contact #1 which is positive (white wire) and contact #2 which is negative (red wire). A schematic of the mainframe power / thermocouple connector is also provided in this booklet (see figure 17).

Altering the wiring in the rear cabinet to configure the mainframe for a different voltage or phasing situation, is accomplished by using “Push-On” terminals. These terminals provide a fast and easy method for configuring the mainframe for alternate wiring configurations that can be easily adjusted in the field (see figure 6).

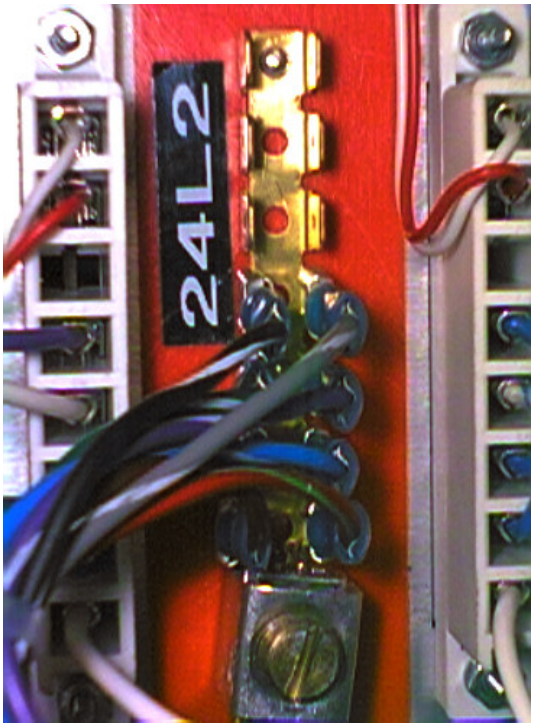

Figure 6 - "Push-On" Terminals

TEMPERATURE CONTROL SYSTEM CONSIDERATIONS:

There are many factors to consider when employing a temperature control system. All power requirements should be examined to make sure that the control system is matched to the heaters that are intended to be controlled:

1. Are the heaters 240 VAC or 120 VAC or 24 VAC?

2. What is the wattage of the heater? Is the module’s output amperage capability adequate for the heater to be controlled?

3. Is the control system sized adequately for all heaters that need to be controlled?

4. Is the input power three phase or single phase?

5. Does the wiring configuration of the mainframe match the power distribution system that is to be used?

TEMPERATURE CONTROL THEORY CONSIDERATIONS:

In any temperature control system, it is important to minimize the lag time between the heat source (heater) and the heat sensor (thermocouple). The lag time is the time it takes for the heat to travel from the heater to the thermocouple. It is very important to keep the physical distance between the heater and the thermocouple at an absolute minimum. Best results are obtained when the heater and thermocouple are in an integral unit, such as D-M-E's "HCTC" series heaters. The greater the distance between heater and sensor (thermocouple), the greater the control error and difficulty.

Make sure that the heater to be used has adequate power (wattage) to elevate the material to be heated to the desired temperature.

If you have any questions or require additional information, contact your local D-M-E representative.

CONNECTORS AND CABLES:

D-M-E inventories a standard mold cable that interfaces with both a 12 zone low voltage mainframe or an 8 zone low voltage mainframe. Though this cable is wired for 12 zones, it is used on both a 12 zone or an 8 zone mainframe. It is available in 10 or 20 foot lengths, or special lengths on request.

Figure 7 - Power / Thermocouple Cable

TERMINAL MOUNTING BOXES:

D-M-E also inventories terminal mounting boxes to provide an easy and economical method of mounting the power / thermocouple connectors on the mold.

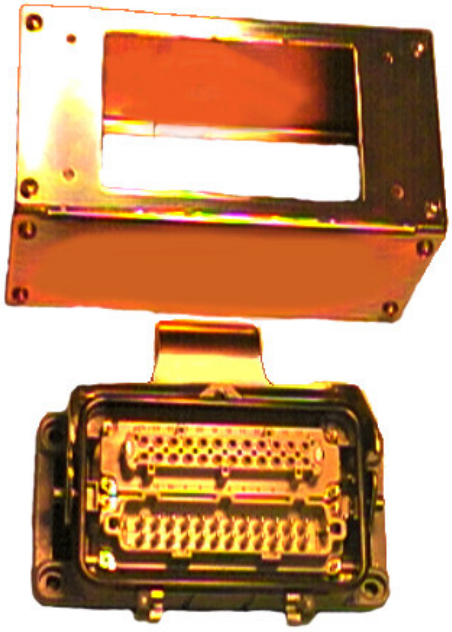

Figure 8 - Terminal Mounting Box (top), and Mold Power / Thermocouple Connector (bottom)

TRANSFORMER KITS:

D-M-E inventories three standard sizes of step-down transformers: 6, 9 and 15 KVA. Each transformer steps voltage down from 480 VAC, 3 phase, to 240 VAC, 3 phase, in 6, 9 and 15 KVA ratings. Other transformer sizes are also available on special request.

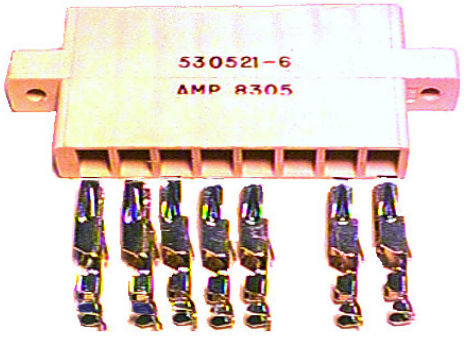

Figure 9 - Edge Connector Kit

To complete your temperature control system, the following accessories are suggested:

- Mold power / thermocouple connector and panel mount base, D-M-E #TPC-0001, (see figure 8).
- Terminal mounting box, D-M-E #PTC-0012, (see figure 8).
- Mold power / thermocouple cable in 10 foot length, D-M-E #CPT-1210 or 20 foot length, D-M-E #CPT-1220, (see figure 7).
- Temperature control modules. **NOTE: Temperature control modules are not included with this low voltage mainframe package, they must be ordered separately.** The D-M-E #CSS-15-24 (24 VAC) module is the only module designed to operate in the low voltage sections of this mainframe. One module is required for each zone of low voltage temperature control. Any of the D-M-E temperature controllers designed to operate at 240 VAC will operate in the high voltage section of the mainframe, however, the D-M-E #CSS-15-02 (240 VAC) module is designed to optimally operate in the high voltage sections of this mainframe. One module is required for each zone of high voltage temperature control.
- For safety considerations, all unused zones must be covered with blank panels. Use one D-M-E #MFBP-10G blank panel for every zone that is not used.

REPLACEMENT PARTS:

Replacement parts listed below:

SSS101	#10-32 Set screw for protective shield
MPS0008	Protective shield 8-zone
MPS0012	Protective shield 12-zone
CBD50	50 amp circuit breaker
CBD75	70 amp circuit breaker
RPM0004	Amber neon light used on breaker panel
RPM0044	Card guide
RPM0046	Pins for edge card connector
RPM0048	Extraction tool for edge card connector pins
CKF312G	Edge card connector kit (connector & 7 pins)

Below is the required mounting pattern for a terminal mounting box D-M-E #PTC-0012 (see figure 8).

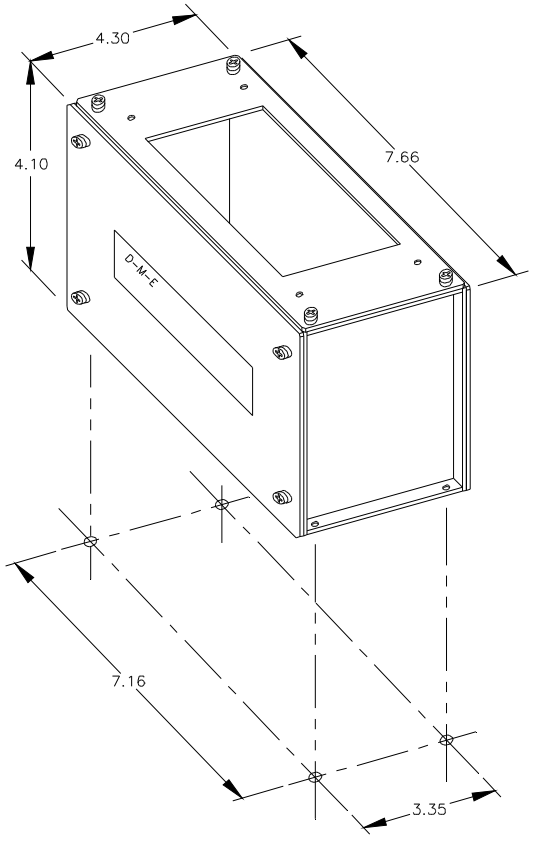

Figure 10 - Terminal Mounting Box Detail

TROUBLESHOOTING:

If the fuses in a module clear upon initial power up, the heater output(s) are probably grounded.

Also, the cleared (blown) fuse indicator for F1 will not illuminate when used with grounded heaters.

For proper operation, the heater output switched by the triac CANNOT be grounded. Only the unswitched leg should be grounded. (See figure 11, below)

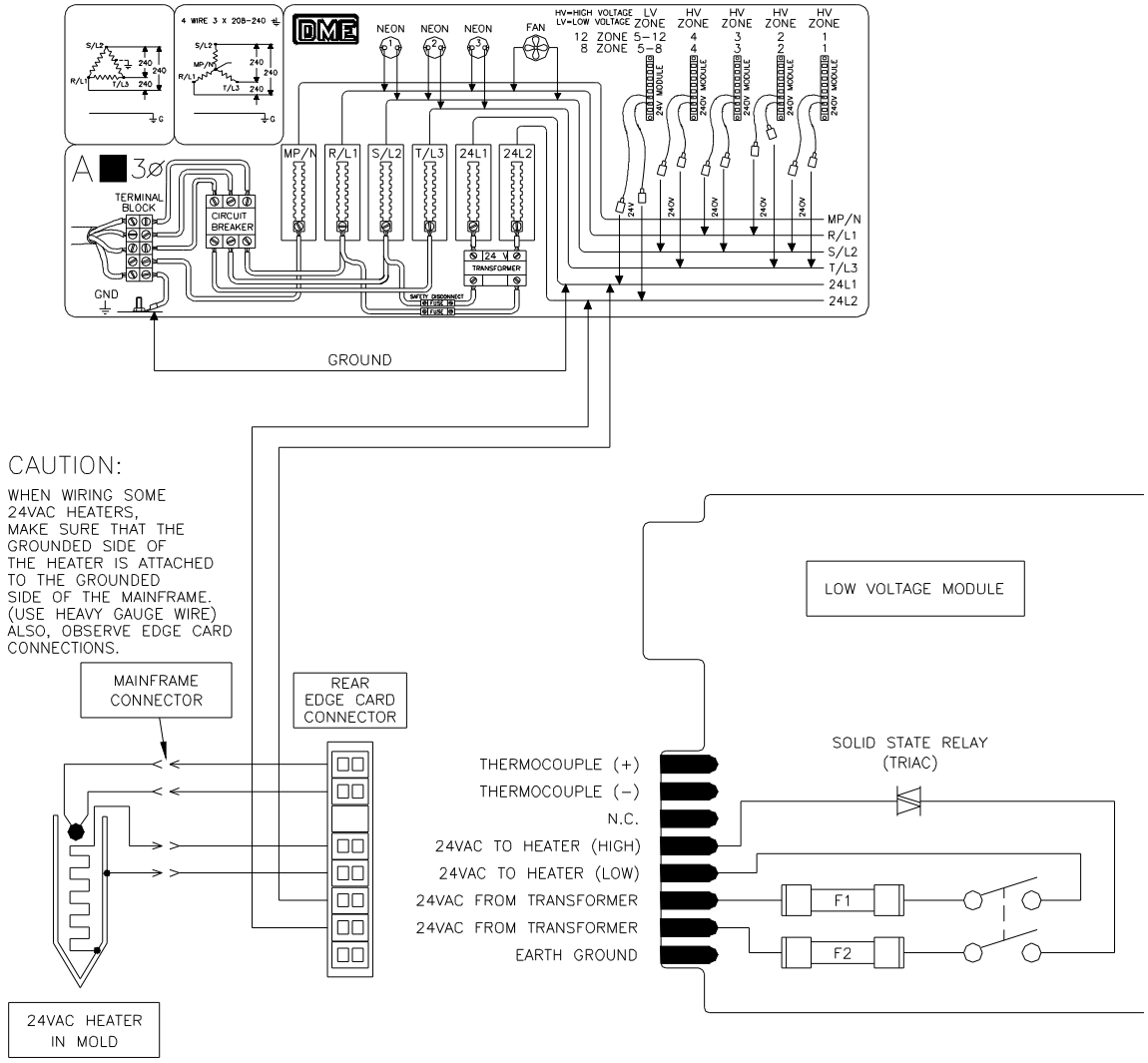

Figure 11 - Mold Wiring / Grounding

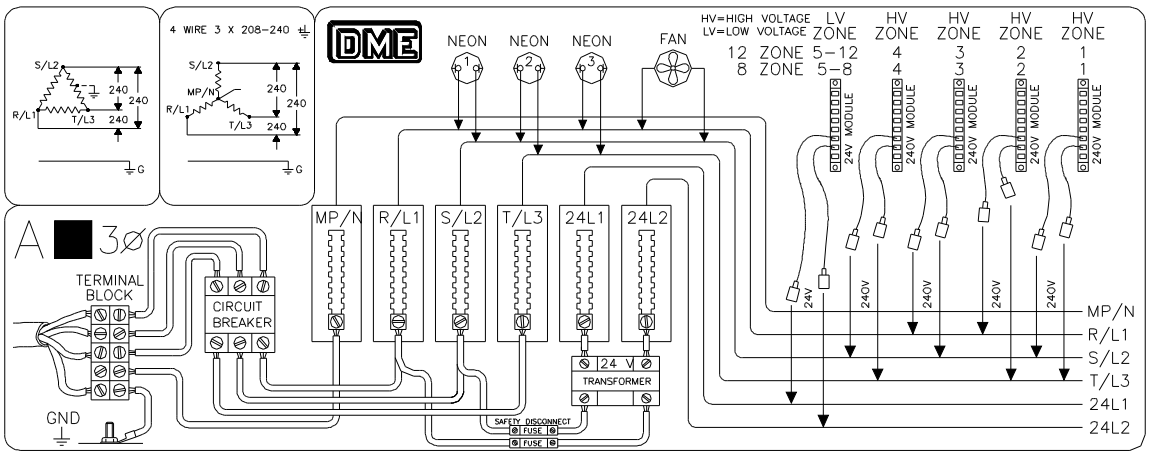

Figure 12 - Back Panel Wiring, Diagram A

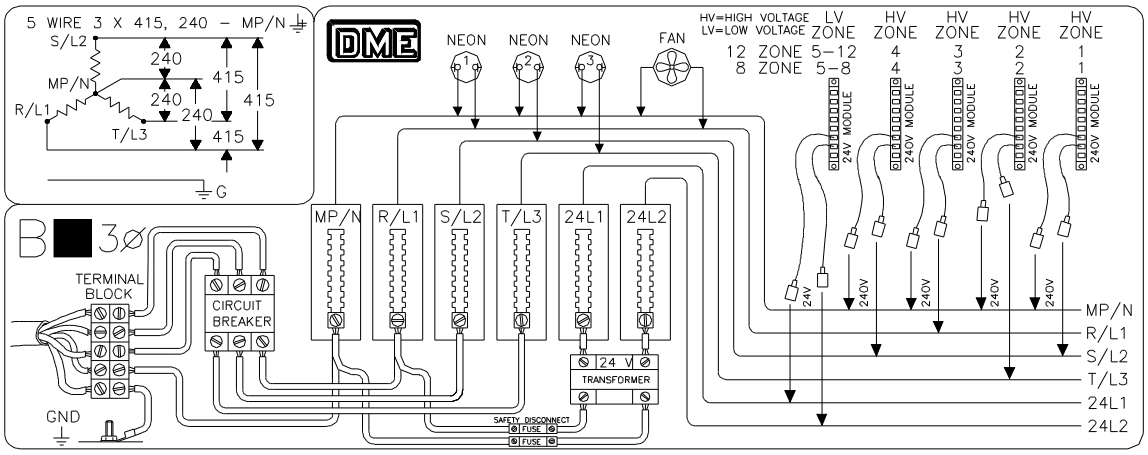

Figure 13 - Back Panel Wiring, Diagram B

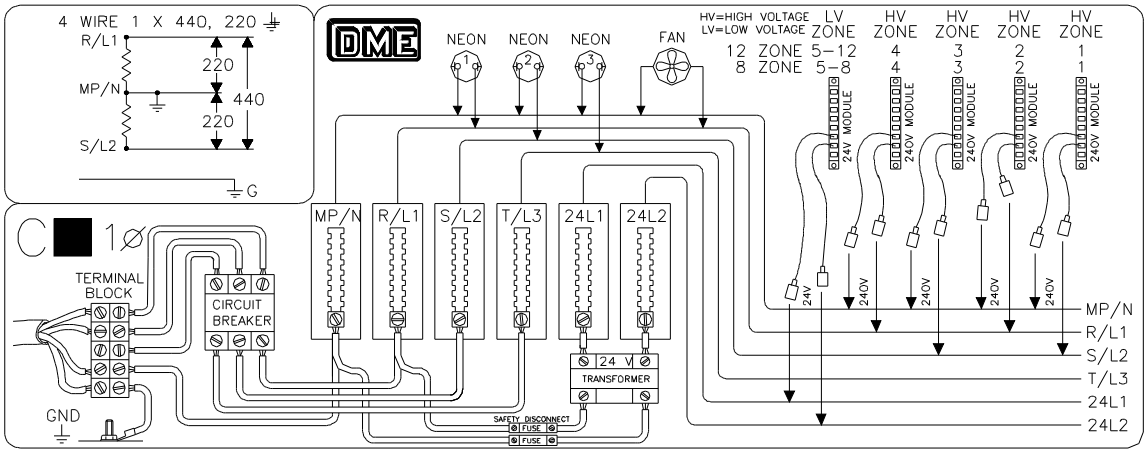

Figure 14 - Back Panel Wiring, Diagram C

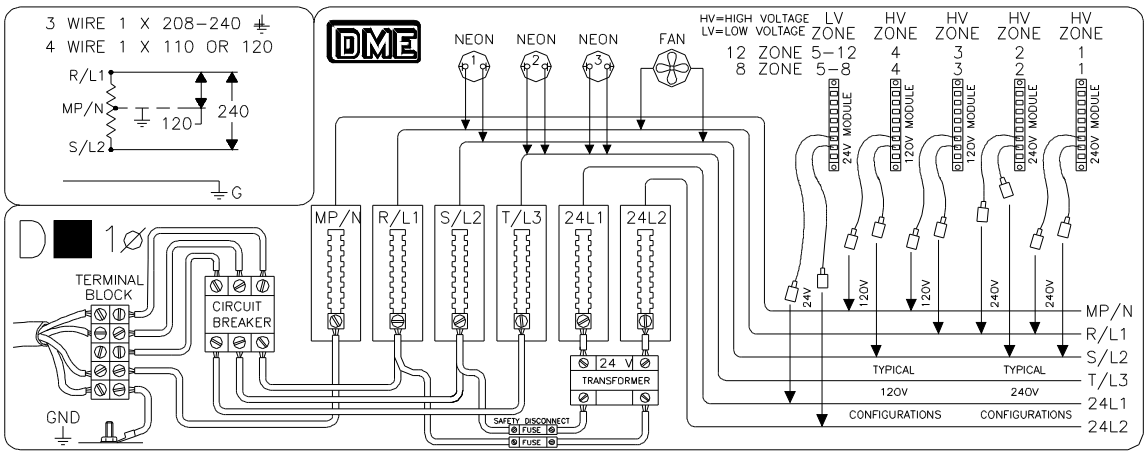

Figure 15 - Back Panel Wiring, Diagram D

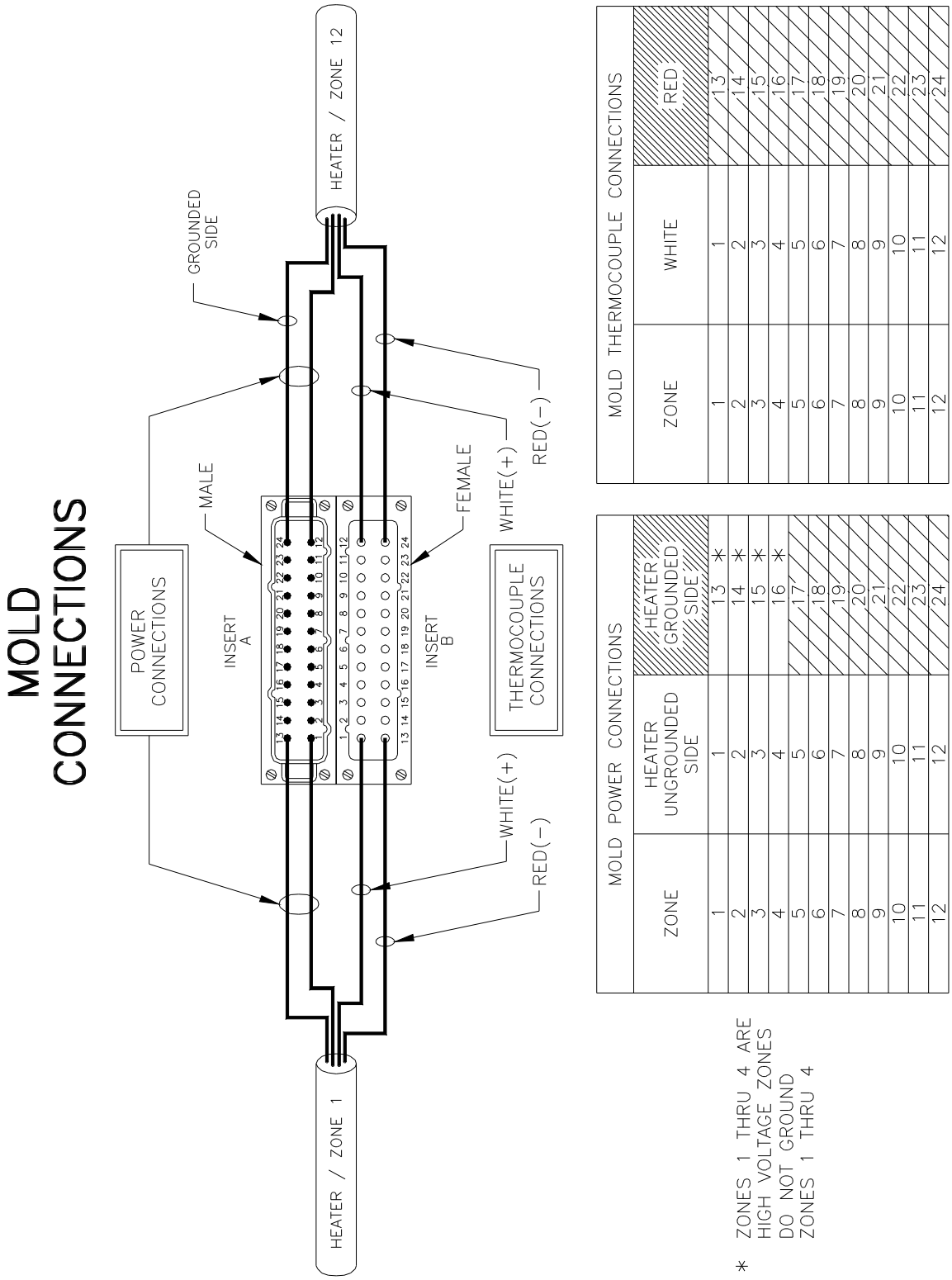

Figure 16 - Mold Connections (Mold Connector)

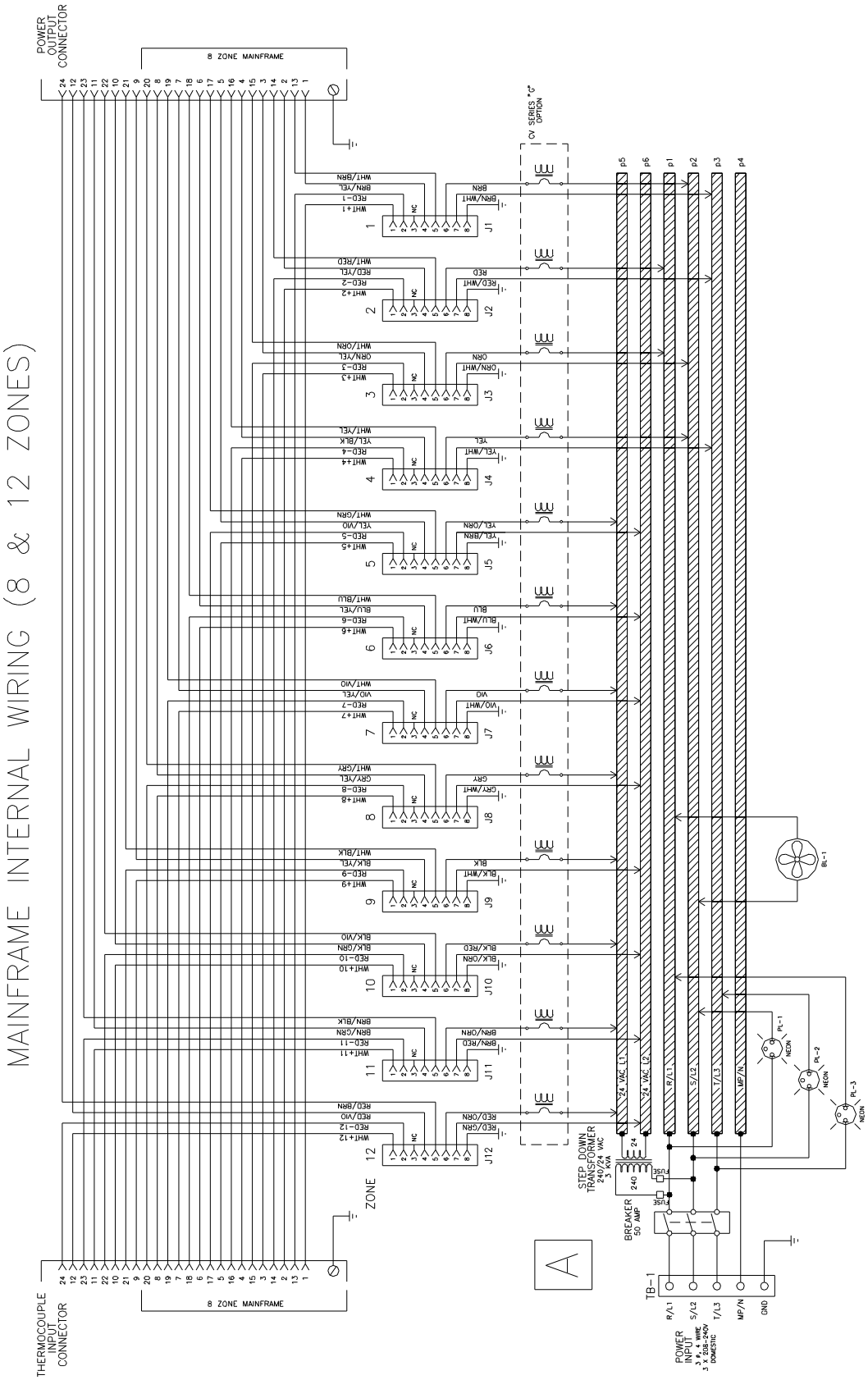

Figure 17 - Power / Thermocouple Connector (Mainframe)

EUROPEAN CONFORMITY (CE) REQUIREMENTS

DME mainframes are shipped with 3MM x 10MM screws that are to be used to secure DME modules to the mainframe for the purpose of statisfying CE requirments. When the modules are screwed down securely, they are considered to be CE certified (compliant). **NEVER REMOVE OR INSERT MODULES WHEN MAINFRAME CIRCUIT BREAKER POWER IS ON.**

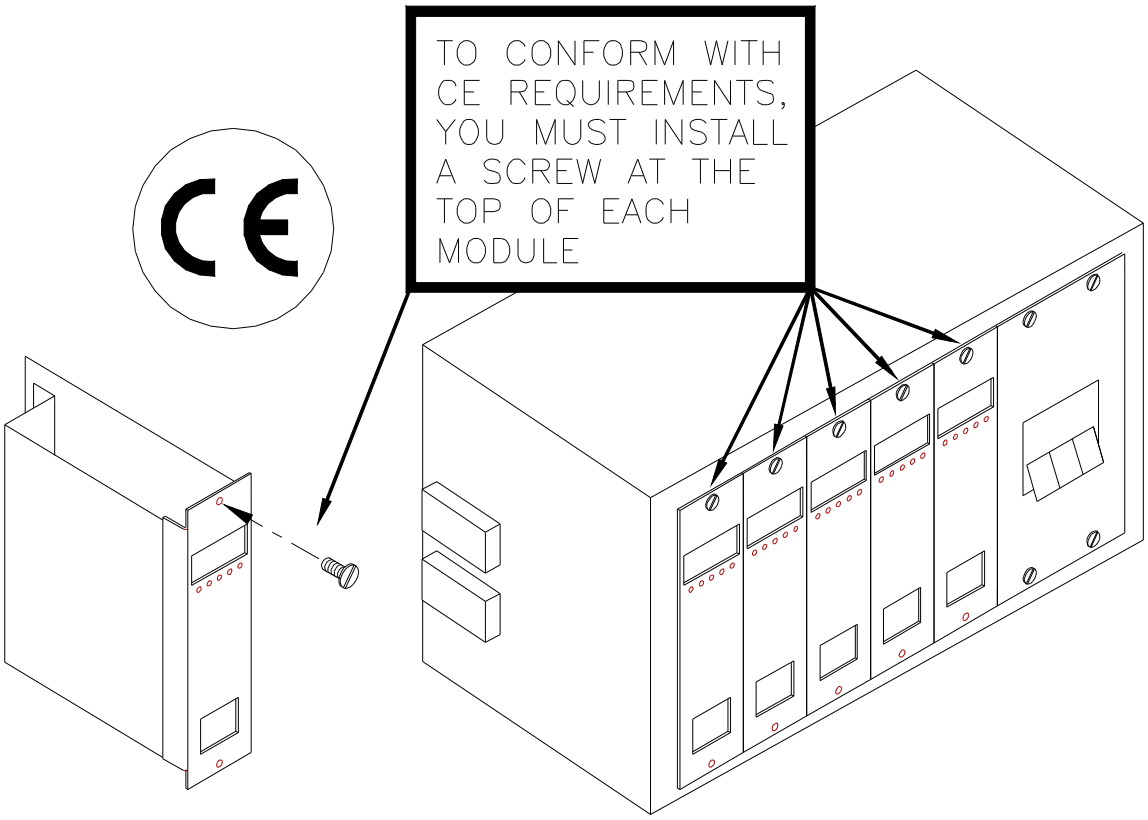

Figure 18 - European Communities Conformity Requirement