

VC-M-1

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## Installation, Operation & Maintenance Manual

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# VC-M-1 *TEMPERATURE CONTROLLER*

# OPERATING INSTRUCTIONS

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**\*\*Please read these instructions thoroughly before using this instrument.\*\***

*IMPORTANT: Make sure the control module power switch is “OFF” and the main frame circuit breaker is “OFF” before inserting or removing control modules.*

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### ELECTRICAL LOCKOUT:

**THE ELECTRICAL POWER SOURCE MUST BE LOCKED OUT WHENEVER ANYONE IS WORKING ON THE EQUIPMENT.**

Each maintenance person should have a personal padlock, with only one key. When working on any equipment this person should use the padlock to lock out the electrical controls. It is most important that the only available key for the lock be in the pocket of the person who is working on the temperature control equipment. If other persons work on the same equipment, each should use their own different lock at a separate lockout station for the controls of the equipment. Accidental startup of the equipment may have tragic results.

In no case should the removal of, or work be performed on, the temperature control modules or main frames without following proper electrical lockout procedures.

### LIFTING APPARATUS:

Temperature control equipment, like any other type of equipment, requires normal periodic maintenance or relocation if the user is to get the most for the investment in the equipment. One of the most flagrant of safety violations is the use of inadequate and unsafe lifting equipment. The temperature control equipment or parts thereof should be assembled, disassembled, and moved with lifting facilities that have the capability of gently and slowly lifting and lowering the equipment or various parts.

**WHEN USING A CRANE OR FORKLIFT, OPERATE WITHIN ITS RATED CAPACITY, THE SAFE RATED CAPACITY INCLUDES WEIGHT OF HOOKS, BLOCKS, AND ANY OTHER HANDLING DEVICES, SUCH AS CABLES, SLINGS, SPREADER BARS, ETC. CONSIDER THE WEIGHT OF ALL THESE AS PART OF THE LOAD TO BE LIFTED.**

#### WARNING:

When inserting or removing control modules from the main frame, power must be turned off on both the module and main frame. If the module is inserted or removed while under a load, severe damage will result to both the control module and the main frame. Before replacing the module, the main frame must be inspected for damage by a qualified technician. Damage caused to control module and main frame as a result of improper insertion or removal, will not be covered under warranty.

#### PLANT SAFETY:

The safety procedures mentioned here do not eliminate all safety hazards found in the area of operation. However, they do highlight some procedures that have been found through long experience to improve safety conditions around temperature control systems. International Temperature Control Inc. welcomes inquiries about other suggested safety procedures for use around their equipment.

#### OUT OF SERVICE:

When the system is out of service, both the control module and main frame must be turned off.

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### ANTI-ARCING FEATURE

The VC-M-1 temperature control module is equipped with our innovative **Anti-arcing** feature that will help prevent damage to the control module and main frame in the event the module is inadvertently removed under load. This feature should not be considered a substitute for proper handling procedures, but rather a supplemental protection mechanism.

If this control module is inserted into a main frame not equipped for **Anti-arcing**, the instrument will not provide power to the heater and a “tOh” error code will be displayed. If this condition occurs, the **Anti-arcing** jumper can be moved from the #2 & #3 enabled position to the #1 & #2 disabled position. By repositioning the jumper in the **Anti-arcing** disabled position, the module will function in main frames not equipped with the **Anti-arcing** feature.

**Disabling the anti-arcing feature can void your two-year warranty in the event the module is removed from main frame under load, as a resulting in damage to printed circuit board traces.**

**NOTE:** This feature will only work with updated main frames and should not be considered a substitute for proper handling procedures. Disabling the anti-arcing feature could void your two-year warranty if damage occurs.

**NOTE:** The **Anti-arcing** feature will not prevent damage if the jumper is not in the enabled position.

**NOTE:** The **Anti-arcing** feature of this module will not prevent damage if the module is used in a main frame not properly equipped for **Anti-arcing**.

Older mainframes may not be equipped with the **Anti-Arcing** feature.

They can be upgraded with **Anti-Arcing** by installing Contact (R144-017) in position #3 of Card Edge Connector (CKF-312-G). Please contact PCS for further instructions.

### STANDARD OPERATING FEATURES

#### **NORMAL OPERATIONS: Auto Keys**

When the power switch on the module is turned ON, the control module will look at the existing zone temperature and determine if the “**SOFT START**” cycle is needed. The “**SOFT START**” cycle will be activated any time the zone temperature is below 212° F (100° C) when the module is turned on. Upon completion of the “**SOFT START**” cycle the module will automatically switch to the automatic control mode. At this time the control module will apply the necessary power to bring the process temperature up to the set point temperature and maintain it, if set point temperature is above 212° Fahrenheit (100° Celsius).

#### **SETTING OPERATING TEMPERATURE: Up & Down Key**

The set point temperature is normally preset at 400° Fahrenheit (204° Celsius) at the factory. You can change the set point temperature at any time by pressing the “**UP**” arrow or “**DOWN**” arrow keys. The module will remember the last entered set point temperature when it is shut off.

#### **SOFT START KEY:**

The “**SOFT START**” cycle applies a reduced output power to the heater at start up. The module only activates “**SOFT START**” if the initial process temperature at start up is below 212° F (100° C). The output power is gradually increased while the zone temperature is below 212° F (100° C). The “**SOFT START**” cycle time is factory set at 5 minutes. The time duration may be changed by scrolling through the **MENU** for the “**SSt**” parameter. (range 0 to 30 minutes)

#### **MANUAL OPERATION KEY:**

To operate the µATC-20 control module manually, push the “**MAN**” key. The percentage of output power will be displayed in the set point window. Push the “**UP**” or “**DOWN**” keys to change the output percentage. If thermocouple feedback is not available, the process temperature window will show the error code “**tCO**” or “**tCr**”. When switching from “**AUTO**” to “**MAN**” mode, there is a bump less transfer of power.

**NOTE:** Other Alarms will not operate in the manual mode.

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### AMPS KEY:

When the “AMPS” key is pressed the process temperature (upper) window will display the average amperage draw of the heater circuit. To return the display to process temperature press the “AMPS” key again.

### BOOST KEY:

Boost is applied for those applications where additional heat is needed for a period of time. Boost mode is selectable both for time and temperature.

Boost Time Duration is selectable from 0 to 30 minutes in the “bdu” MENU OPTION.

Boost Temperature Setting is selectable from 0° to 100° F (0° to 30° C) in the “btp” MENU OPTION.

**NOTE:** The “BOOST” feature is disabled during the “SOFT START” cycle.

### STAND-BY KEY:

When the “STBY” key is pressed the control module will automatically lower the set point to 212° F (100° C). in automatic mode only. To return to the previous set point press the “AUTO” key.

**NOTE:** Pressing “STBY” immediately sets a new set point at 212° F (100° C). which may activate the high or low temperature alarm. This is normal and the alarm will deactivate when the temperature nears 212° F (100° C). per normal alarm function.

## ERROR CODES & ALARMS INDICATORS:

### ERROR CODES - Displayed in process temperature (upper) window:

Error Code	Description
tCO	An open thermocouple condition. There is a break within the thermocouple circuit which prevents a complete circuit from being made. Module switches to “APO” mode if selected, otherwise “OFF”.
tCr	Thermocouple wires are reversed. The module has detected that the thermocouple is wired backwards. Module will disable power to the heater.
tCs	The thermocouple is shorted. There is a condition within the thermocouple, or thermocouple wiring which is causing a short. Module switches to “APO” mode if selected, otherwise “OFF”.
tOh	The module triac or the heater circuit is open. Module will disable power to the heater.
tSh	Main triac is shorted. An over temperature condition has occurred, and current flow is detected. The module will disable power to the heater.
HiC	High Current overrun. The module detects current greater than the value set in the MENU “HcL” parameter and will disable power to the heater.
gFd	When current leakage to ground in heater circuit is in excess of the value set in the MENU “gFS” parameter. Module will disable power to the heater.

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### ERRORS & ALARMS INDICATOR DESCRIPTION:

#### **OPEN THERMOCOUPLE PROTECTION:**

In the event a thermocouple fails in the open condition after reaching set point temperature, the module will automatically control temperature with stored APO (Average Power Output) information if the **MENU** feature “**tCO**” is set to “**APO**”, otherwise power is disabled. This feature only operates at set point temperature.

#### **REVERSED THERMOCOUPLE PROTECTION**

The VC-M-1 will scrutinize actual voltage through the thermocouple. In the event a negative voltage is detected, the “**tCr**” error code will be displayed, and power will not be applied to the heater.

#### **SHORTED THERMOCOUPLE INDICATION:**

In the event a thermocouple fails to detect a rise in temperature while power is being applied to the heater, the module will activate an alarm, and the “**tCS**” error code will be displayed. The module activates “**APO**” if selected, otherwise “**OFF**”.

#### **OPEN TRIAC/OPEN HEATER:**

The module will alert the operator in the event of an open triac or heater, by displaying a “**toH**” error message in the upper window. This condition is detected if the heater fails to maintain or rise to set point temperature and there is an absence of current flowing to the heater. Module will disable power to heater.

#### **SHORTED TRIAC PROTECTION:**

Within the circuitry of the  $\mu$ ATC-20 module are relays which disable power to the heater in the event the main triac is shorted. In a situation when power to the heater is detected when the temperature is well above the set point, the module will disable power to the heater. A “**tSH**” error code will then be displayed in the upper window so damage to the mold or heater can be averted.

#### **HIGH CURRENT WARNING:**

To help protect valuable molds and other related equipment, a safety device will alarm if a heater is drawing current above its rated capacity. To set a current value, scroll through the **MENU** for the “**HiC**” feature, using the “up” or “down” keys set a value just above the heaters maximum current draw. The module will trigger an alarm and disable power to the heater if current exceeds the set value. Utilizing this feature can save time and expense by calling attention to a problem before damage occurs. In **MENU** the range may be set between 1.0 and 16.0 amps.

#### **GROUND FAULT SENSITIVITY:**

The control module is equipped with a ground fault detection circuit. When the “**SOFT START**” cycle terminates, the control module will check for current leakage to ground in the heater circuit. If leakage is detected in excess of the value entered in “**gFS**” **MENU** parameter, the control module will alarm and “**gFd**” will be displayed in the process temperature window. The ground fault sensitivity is factory set at 120mA. Sensitivity may be adjusted or turned off in **MENU** option “**gFS**”. To disable ground fault, first set the option to “**OFF**” then turn the module off and then back on. (range 60 to 180 mA) Power will be disabled to heater.

#### **HIGH AND LOW TEMPERATURE ALARM:**

The high and low temperature alarms have been factory set at +/- 30° F (16° C). If the zone temperature drops 30° (16° C) below the set point or if the temperature exceeds 30° (16° C) above the set point, the alarm will activate, and the “**HIGH**” or “**LOW**” LED will activate.

#### **BLOWN FUSE INDICATION:**

In the event that one or both of the module power fuses blow, the red LED's labeled “**F1**” or “**F2**” will come on indicating which fuse has blown. **CAUTION:** only the proper fuses must be used in order to prevent module damage and void the warranty. Fuses are available from PCS.

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### MENU MODE

#### MENU MODE OPERATING PROCEDURE:

1. To enter the “MENU” mode, press the “MENU” key to scroll through menu until the desired option appears in the process temperature (upper) window. As you scroll through the menu, the current setting of each option will be displayed in the set point (lower) window.
2. To scroll through the menu, continue to press the MENU key until the desired feature code appears in the upper window.
3. To change the setting of a parameter displayed in the upper window, press the “UP” or “DOWN” arrow key.
4. To set the parameter and exit the “MENU” mode, continue to press the “MENU” key until you reach the end of the menu of features. The controller will restart after storing the new values.

**CAUTION:** While in the “MENU” mode, the module will not control temperature. Therefore, it is recommended that any changes be made at start up.

### VC-M-1 “MENU” Parameter Chart

CODE	FUNCTION	SETTINGS
C-F	Temperature display mode	(°F) or °C
AL	Audible Alarm	(On) or OFF
tCb	T/C break option	(APO) – Average Power Output or OFF
Out	Output Type	(F2y) or Pid
SSt	Soft Start Time	0-30 minutes (5)
gFS	Ground Fault Sensitivity	60-180 mA or “OFF” (120)
HcL	Maximum Current	1.0 – 16.0 Amps (16.0)
btp	Boost Temperature Setting	0° - 100° (30 °)
bdu	Boost Temperature Duration Setting	0-30 minutes (5)
J-K	Thermocouple Type	(J) or K
SSL	Soft Start Lock	(ON) or OFF
FPL	Front Panel Lockout	ON or (OFF)

**\*\*Factory settings in parenthesis.\*\***

### “MENU” - PARAMETER SETTINGS:

#### **C-F CELSIUS OR FAHRENHEIT SETTING:**

This parameter allows selection of either “C” or “F” temperature ranges – select “C” or “F”.

#### **AL AUDIBLE ALARM SETTING:**

Build in alarm – Select “ON” or “OFF”.

#### **tCb THERMOCOUPLE OPEN PARAMETER SETTING:**

(APO – Average Power Output). If this option is set to “APO” and the thermocouple input is lost during operation, the control module will alarm and indicate that the thermocouple input is open. However, instead of disabling power to the heater, the instrument will continue to apply the same average power to the heater as applied just prior to losing the thermocouple signal. Factory set to “APO” but may be turned “OFF”.

#### **Out OUTPUT POWER CONTROL METHOD:**

“F2y” (fuzzy) or “Pid” (Adaptive-Auto-Tuning). “F2y” will control the zone temperature by adjusting the power to the heater, providing a ripple free effect, and improving heater life. “Pid” will control the temperature by turning the heater on and off proportionately. Typically, either method will control as well as the other. However, the “Pid” control method must be used when the module is operating solid state

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relays. This control method is usually factory set to “F2y” unless solid state relays are being used to switch output power.

**gFS GROUND FAULT SENSITIVITY SETTING:**

Select 60 – 180mA or “OFF”. Factory set at 120 mA. To disable ground fault, first set the option to “OFF”, then turn the module off and then back on.

**HCL HIGH CURRENT LIMIT SETTING:**

Select 1 – 16 amps. Factory set at 16 amps. If the module detects a current draw that exceeds the set value, it will cut power to the heater and display an “HiC” warning. This option allows for setting a current warning level just above the maximum draw of the heater. When the instrument detects a current greater than the set value, it will alarm and shut off power to the heater.

**btp BOOST TEMPERATURE SETTING:**

This feature allows for the input of a temperature value by which the set point can be increased when Boost is activated. Factory set at 30° F (16° C). Boost has a selectable temperature range of 0° to 100° F (30° C).

**bdu BOOST TEMPERATURE DURATION SETTING:**

This parameter allows user to set the duration time the temperature boost is to remain on at the desired boost temperature. Range 0 to 30 minutes. Factory set at 30 minutes.

**J-K THERMOCOUPLE TYPE:**

This parameter allows the operator to select either “J” to “K” type thermocouple, depending on the requirements. Factory set to “J”.

**SSt SOFT START SETTING:**

Select 0 to 30 minutes. Factory set at 5 minutes.

**SSL SOFT START LOCK:**

This parameter prevents the Soft Start parameter from being overridden from the front panel. The Soft Start cycle must be completed prior to entering either manual or automatic control mode. Factory set to “ON” or select “OFF”.

**FPL FRONT PANEL LOCK SETTING:**

This parameter locks the front panel keys with the exception of “AMPS” & “MENU”. This lockout prevents accidental changing of temperature settings, etc. Select “ON” for lock or “OFF” for un-lock. Factory set to “OFF”.

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### TROUBLE SHOOTING

#### **NOTE:**

It is assumed that the system has been installed in accordance with the proper instructions, that all wiring is correct and that power to the system is as specified on the controller.

Normally problems have two basic forms:

First, relate to the Controller, Wiring, Heaters or Thermocouples. These problems usually present themselves as abnormal indications on the control module, i.e., absence of or blinking lights & displays and error codes.

Second, revolve around the design and/or manufacturing of the mold, the hot runner system (manifold), or the actual processing conditions. These problems are often difficult to identify and repair.

#### **PROBLEMS:**

#### **SOLUTIONS:**

The module will not turn on:

1. Check input power.
2. Ensure input power is in proper phase.
3. Check power cord connections.
4. Check that main frame is turned on.
5. Check fuses (Bussman ABC-15), if blown check for wiring short.
6. Swap module with known good module.
7. Return defective module for repairs.

Temperature won't settle on set point:

1. Give module more time to settle on set point.
2. Molding process may have a wide variation in temperature. Check to see if changes in display temperature are in the same cycle as molding process.

Lights dim:

1. Check actual input voltage, should be same as module rating.

Module appears to operate properly, but no power is being applied to the heater:

1. Main frame is not set up for Anti-arcing.
2. Move jumper from pin position #2 & #3 (Enabled) to pin position #1 & #2 (Disabled).

Mold is unusually cold:

1. Allow tool to warm up in Soft Start mode.
2. Check mold thermocouple/heater wiring.
3. Thermocouple/Heater not wired to proper zone.
4. Thermocouple/Heater defective.
5. Make sure input power voltage is correct.
6. Return defective module for repairs.

Temperature above set-point:

1. Thermocouple shorted or not wired correctly.
2. Triac shorted.

Tool overheats:

1. Is temperature display set to F°?
2. Check thermocouple.
3. Replace triac.
4. Return defective module for repairs.

Open thermocouple:

1. Check thermocouple & mold wiring.

Reversed thermocouple:

1. Correct thermocouple mold wiring.



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Ground Fault:

1. Heater/Wiring is wet – if so, dry out.
2. Replace heater.
3. Repair heater wiring.

Module blows fuses:

1. Make sure heater size does not exceed module rating.
  2. Make sure this is not the result of a shorted heater or a short in the tool wiring. Do not replace module until problem is corrected as damage may result.
- NOTE: Blown fuses are not caused by the module, they are caused by an outside factor.

Temperature Oscillation:

1. This is usually caused by the location, or the thermocouple being too far from the heater it is controlling. Proper procedures dictate that the heater & thermocouple should be within 1/2" of each other.
2. Oscillation can also be caused when the melt temperature is significantly above or below the setpoint.

Temperature too high:

1. Normally this is caused by heat from adjacent zones.
2. The melt temperature of the plastic is hotter than the set point for the zone.
3. Thermocouple may not be wired to the same control module as the heater.

No heat indication:

1. Heater is not connected.
2. Heater is too small.
3. Heater is burned out.
4. Heater is too far from thermocouple.

It is also possible something has occurred electrically to upset the microprocessor in the control module. It indicates that there is more interference in the power line to the control system than the filtering in the power supply can accommodate. A random occurrence is not cause for concern. The solution usually is to connect the controller as close to the electrical service supply as possible, and not to the molding machine, where motors, solenoids, etc. can cause interference.

### OTHER FALSE ALARMS

- You may experience false alarms due to the time settings of certain options. The factory settings may not be the proper setting for your particular zone characteristics.
- Zones that heat slowly may need extended time for open heater and shorted thermocouple detection (**tOh**). Conversely you may want to decrease the time for zones that heat too rapidly.
- If you are in a situation where mold changes are frequent and you do not want to take the time to adjust these settings to the mold characteristics, you can set all the settings to the highest level or in some cases turn them off. However, this will substantially reduce the control module's many diagnostic benefits and its ability to prevent heater runaway and mold damage.

If an instrument is not functioning properly or needs calibration, we highly recommend that you return it to PCS for service. In most cases your module will not be correctly repaired at other facilities.

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### OPTIONS

#### EXTERNAL ALARM OPTION:

This option feature allows the user to connect an audible or visual alarm apparatus located externally from the Mainframe.

NOTE: To function, the Optional External Alarm Feature must also be present in the Mainframe.,

The alarm will activate if any of the properly optioned VC-M-1 modules in the mainframe go to an error condition (regardless of the audible ALARM feature setting in the Options Menu).

#### Error Conditions:

- Open Heater/Triac (tOh)
- Shorted Heater/Triac (tSh)
- Over current Condition (HiC)
- Open Thermocouple (tCO)
- Shorted Thermocouple (tCS)
- Reversed Thermocouple (tCr)
- Ground Fault (gFd)
- Internal Configuration Error (CAL, cFg, CFg)
- Over or Under temperature condition ( $\pm 30^{\circ}$  from setpoint)

#### High/Low Temperature Alarm Notes:

- First power up: When the module is first powered up, the Process Temperature will be below the setpoint and have a low temperature condition, however, the module will not close the alarm contacts, since this is considered to be normal operation. Once the Process Temperature enters the normal range of  $\pm 30^{\circ}$  ( $16^{\circ}$  C) from setpoint, the alarm contact closure procedure will be enabled for any future high or low temperature conditions.
- Standby mode: Placing the module into Standby Mode creates a temporary target temperature of  $212^{\circ}\text{F}$ . ( $100^{\circ}$  C) If the Process Temperature at that time is  $\pm 30^{\circ}$  from  $212^{\circ}$  F ( $100^{\circ}$  C), the alarm contacts will close.
- Boost Mode: Placing the VC-M-1 into Boost Mode creates a temporary target temperature greater than the current setpoint (the temperature and time are set in the Options Menu). If the Process temperature at that time is  $\pm 30^{\circ}$  from the temporary Boost target temperature, the alarm contacts will close activating the external alarm.
- Operator Intervention: If an operator changes the setpoint, causing it to be  $\pm 30^{\circ}$  from the Process Temperature, the alarm contacts will close activating the external alarm.
- Manual Mode: The alarm contacts will not close for High/Low Temperature conditions if the module is in Manual Mode.

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### VC-M-1 PRODUCT SPECIFICATIONS:

Voltage .....	208 to 240vac, single phase
Current .....	15 amps
Frequency .....	50/60 Hz
Wattage .....	3600
On/Off Key .....	Auto Latching (stays on last setting if power is lost)
Physical Configuration .....	Plugs in for easy interchangeability
Compatibility .....	Compatible with "G" Series housings
Size .....	2" Wide, 7" High, 7-1/2" Deep,
Weight .....	1-1/2 #
DC Power Supply .....	Internally generated regulated and compensated
Module Power Usage .....	Less than 5 watts, excluding load
Set point Range .....	0° to 999° F (537° C)
Control Accuracy .....	+/- 1° F (0.5° C) dependent on total thermal system
Calibration Accuracy .....	Better than 0.2% of full range
Operating Temperature Range .....	32 to 120 degrees F (0 to 48° C)
Thermocouple .....	Type J, or Type K grounded or ungrounded
External Thermocouple Resistance .....	High impedance potentiometer input allows long distance T/C wiring
Output Drive .....	Internal solid-state triac, zero crossing AC pulses
Ground Fault Sensitivity .....	60 to 180 mA, default 120 mv.
High/Low Temperature Alarm .....	Factory set @ +/- 30 degrees F (16° C)
Overload Protection .....	Fuses on both sides of AC line
Transient Protection .....	dv/dt and transient pulse suppression
Shorted Triac Heater Protection .....	Highly sensitive, fast acting relays cut power to load
Power Line Isolation .....	Optically and transformer isolated from AC lines. Isolation voltage greater than 2500 volts
Display .....	Dual LED displays, 3-digit, 7-segment
Manual Mode .....	Maintains constant output power to within 1% of manual set power. Adjustable from 0 to 100%
Soft Start .....	Variable stepped voltage, phase fired
Soft Start Duration .....	5 Minutes (Adjustable - 0 to 20) up to 212 degrees F (100° C)
Soft Start Override Temperature .....	212° F (100° C)
Operational Modes .....	Soft Start precedes Auto Mode. Thermocouple break overrides Soft Start and Auto Mode. Reversed or shorted thermocouple overrides Soft Start and Auto Mode. Manual Mode overrides thermocouple break, reversed, shorted thermocouple and Auto Mode. Output is disabled during all fault conditions.
Cold Junction Compensation .....	Automatic, better than 0.02° F/F° (0.01° C/C)
Open Thermocouple Protection .....	Automatically disables power to heater or Average Power Output (APO). Selectable
Reversed Thermocouple Protection .....	Automatically disables power to heater.
Shorted Thermocouple Protection .....	Automatically disables power to heater or Average Power Output (APO). Selectable
Warranty .....	2-Years

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## Addendum

(Firmware version 5.20 and later)

### VC-M-1 “Menu” Parameter Chart

CODE	FUNCTION	SETTINGS
Out	Output Type	(trc) or rLy

\*\* Factory setting in parenthesis \*\*

### “MENU” – PARAMETER SETTINGS

#### Out

#### **OUTPUT POWER CONTROL METHOD:**

“**trc**” (TRIAC) or “**rLy**” (RELAY). “**trc**” indicates that the external load/heater is directly controlled by the on-board triac. “**rLy**” indicates that the external load/heater is controlled by an EXTERNAL RELAY, typically used in high current (30A) mainframes.

When set to “**trc**”, the module is capable of directly measuring and displaying the current draw on the load/heater and has the ability to detect a shorted or open load/heater.

When set to “**rLy**”, the module is not capable of measuring or displaying the current draw of the load/heater and CANNOT detect a shorted or open load/heater. The detection of an open or shorted load/heater is disabled when set to “**rLy**” mode. High current PCS mainframes, which contain external relays, display the current draw on the mainframe front panel.

The Output Power is always controlled using PID (Adaptive-Auto-Tuning) algorithm and “Zero Cross” power control. The module cannot be set to “Phase Angle” control since this method has the potential to generate power line noise and interfere with other devices



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