INTERNATIONAL TEMPERATURE CONTROL, INC.

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TROUBLE SHOOTING GUIDE
TC-2000 Modular Hot Runner Mold Control Systems

For ITC Modules & Main Frames Only

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

Normally problems have two basic forms:
First: relates 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 or display error code messages.
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 more difficult to identify and repair & not covered in this document.

NOTE:
Never replace fuses or failed modules without first identifying the cause of the failure. Dangerous voltages exist inside the control enclosure, in the mold wiring and at all connection points. *(ONLY Trained Electrical personnel should perform all service.)*

ELECTRICAL HAZARD:
High Voltage electrical current is present in the main frame: *(ONLY Trained Electrical personnel should perform all service.)*
CAUTION: Never operate the system without a Module or Main Frame Blank Plate covering every slot.
CAUTION: Never operate the system if the main frame back panel is not securely in place.
CAUTION: Never operate the system with connectors which are damaged, removed or if any wiring is exposed.

BEFORE POWER IS CONNECTED TO SYSTEM:
1st Use an Ohm meter to check each heater power lead to ground. Resistance to ground should be greater than 20,000 Ohms
2nd Check resistance (Ohms) between heater power leads:
3rd Check connections of Red & White Thermocouple leads to insure proper connections at all terminals.
4th Use Ohm meter to measure resistance between Red & White leads. Resistance reading should be low.
5th Measure resistance between Heater & Thermocouple leads. Resistance should be greater than 20,000 Ohms.

PROBLEM	PROBABLE CAUSE & REMEDY
Main Frame will not power up:	1 System may not be plugged in. 2 Input power fuse(s) or circuit breaker may be blown. 3 Input power cord incorrectly wired or damaged.
Main Frame breaker switch trips to "OFF": **Only On Start-Up:** Heaters usually draw the most current on initial start-up after Soft Start	1 Current draw of the heaters exceed the rating of the breaker switch. 2 Sequentially turn on zones, allowing them to come up to set point temperature before additional zones are turned on. 3 Short in power circuit.
Main Frame breaker switch trips to "OFF": **During Normal Operation:**	1 Current draw of the heaters exceed the rating of the breaker switch. 2 Short in power circuit.
Module will not turn on:	1 Check that main frame breaker switch is on. 2 Check module fuses. If blown, check for a short in the wiring. 3 Return module to *International Temperature Control, Inc.* for repair.
Lights on modules are dim:	1 Is input voltage to main frame equal to rating of the module? Normally 240vac.
Display Temperature reads low and not rising: Controller: "LOW TEMP" LED is lit & "LOAD" LED is not lit (no current draw)	1 Power cable is defective. 2 Blown fuse(s) in module. 3 Defective heater. 4 Triac or Triac driver failed open. 5 (for the S20 series module only) Mechanical set point may be defective. 6 Try module in known good heater zone.
Display Temperature reads low and not rising: Controller: "LOW TEMP" LED lit and "LOAD" LED is lit (there is current draw)	1 Wrong thermocouple zone. Look for another zone to read high. 2 Heater may be too small for application. 3 Check for open heater. 4 Check for open wire on connector. 5 Low input voltage condition (Power to module is not @ 240vac) 6 Open Triac or Triac driver. 7 Try module in known good heater zone.

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PROBLEM	PROBABLE CAUSE & REMEDY
Display Temperature reads low and rising slowly: Controller: "LOW TEMP" LED is lit	1 Give module more time to settle on the set point. 2 Heater may be too small for application. 3 Mold water cooling temperature may be set too low. 4 Wrong thermocouple zone. Look for another zone to read high. 5 Check for poor connections between heater wires on connectors. 6 Pinched or shorted thermocouple. 7 Low input voltage condition (Power to module is not @ 240vac) 8 Half-open triac or triac driver could cause this problem. 9 Try module in known good heater zone.
Display shows temperature is high and rising: Controller: "HI TEMP" LED is lit	1 Shorted Triac or Triac driver. NOTE: Triac or Triac driver can be half shorted. 2 Try module in known good heater zone. 3 Return module to *International Temperature Control, Inc.* for repairs.
Temperature won't settle on set point:	1 Give module more time to settle on the set point. 2 Does the molding process have a wide temperature variation? Check to see if changes in the display temperature correspond to the cycle of the molding process. 3 Check incoming power for fluctuations in voltage. 4 Injection barrel heat may be set too low 5 Water temperature may be set too low 6 Heaters wattage size may be insufficient to achieve desired results.
Module appears to be operating properly, but no power is being applied to the heater:	1 Main frame not set up for Anti-arcing feature. 2 Move jumper (JP9) on rear of module from lower (enabled) position to upper (disabled) position. 3 Open heater, triac, or cable.
CAUTION: Never remove a module from the main frame while under power. If this is done and the Anti-Arcing feature is disabled on the module, severe electrical sparking damage can result to both the module and main frame. If an electrical discharge occurs and the contact points on the module are burned off, nothing can be done to repair the module.	
Module blows fuses:	1 Check heater size to make sure it does not exceed module amperage rating. 2 Check mold power cable for a short. 3 Check heater or mold wiring for a short. NOTE: Do not replace fuse(s) until the problem is found and corrected as damage or injury may result.
Temperature Oscillation:	1 This is usually caused by the location of 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 set point temperature. 3 Does the molding process have a wide temperature variation? Check to see if changes in the display temperature corresponds to the opening and closing or injection cycle of the molding process. 4 Check incoming power for fluctuations in voltage. 5 Mold water temperature set too low 6 Heater size may be too small for application 7 Heater may not be loose or contanimation may prevent heater making good contact
Temperature too high:	1 Normally this is caused by heat from adjacent zones. 2 The melt temperature of the plastic is above 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 not connected. 2 Heater too small. 3 Heater defective (burned out). 4 Heater to far from thermocouple. 5 Try module in known good heater zone.

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Soft Start not functioning:	1 Soft Start has been turned "OFF". 2 Mold temperature above 212 deg. F, or time limit has been exceeded. 3 (For UATC Style Modules Only) Time limit may have been set to "0".
Heater Fails Prematurely or Operates Erratically:	1 Improper fit, heater may not be making good contact resulting in the lack of proper heat transfer. 2 Contamination by moisture, oils, dirt, etc. 3 Severe flexing of the heaters leads. 4 Operating temperature in excess of heaters rated capacity. 5 Corrosion prevents proper heater contact.
Process Temperature Seems Way To High or Too Low:	1 Incorrect temperature mode - Verify the module is set to "F" or "C" as desired. 2 Incorrect thermocouple mode - Verify the module is set to "J" or "K" as desired.
One Zone Not Functioning Properly:	1 Swap module to see if problem follows module. 2 Swap Mold Power Cable to see if problem follows cable 3 Swap Mold Thermocouple Cable to see if problem follows cable. 4 If module is set to "AUTO", switch to "MAN" to see if heat is applied in manual operation. If zone heats up fault may be in thermocouple sensor or cable. 5 If soft start functions properly and error occurs after switching out of soft start, thermocouple sensor or cable may be faulty.
"tCO" - Open Thermocouple - Error Code:	1 Break in wiring. Determine if break is in wiring or in thermocouple. Repair wiring or replace thermocouple as necessary. 2 Thermocouple fuses in module may be blown. 3 Machine/Mold may be un-grounded causing blown thermocouple.
"tCr" - Reversed Thermocouple - Error Code: NOTE: Error message will not display until temperature is high enough to provide an adequate voltage differential between the conductors. (usually around 130° F)	1 Thermocouple wiring is reversed (Red should connect to red, not red to white). Re-wire the thermocouple. White is positive (J-Type - Iron) (K-Type - Chromel) Red is negative (J-Type - Constantan) (K-Type is Alumel)
"tCS" - Shorted Thermocouple - Error Code:	1 Short in wiring. Determine if short is in wiring or thermocouple. Repair wiring or replace thermocouple as necessary. 2 Machine/Mold may be un-grounded causing blown thermocouple.
"HiC" - Over Current - Error Code:	1 The heater is drawing current beyond the factory set limit of 16 amps. Replace heater. 2 (On UATC Style Modules Only) Heater is drawing current beyond the selected value. Either replace heater or change module setting to proper value. (range 0 to 16 amps)
"tOh" - Open Triac/Heater - Error Code:	1 Replace heater. 2 Mold power cable is defective. 3 Check mold wiring to see if heater & thermocouple are wired correctly. 4 Replace triac - Return module to ITC for repairs. If system uses solid state relays, the "tOh" feature may activate. In these instances, the module may need to be reprogrammed for the application.
"tSh" - Shorted Triac - Error Code:	1 Replace triac - Return module to ITC for repairs.
"gFd" - Ground Fault Sensitivity - Error Code:	1 (On UATC Style Modules Only) There is leakage to ground in the mold. This is usually caused by moisture in the mold or bare wires. (A dangerous condition which can cause damage or injury) Dry out mold and/or repair defective wiring. (Selectable value of 60 to 180 ma)
F1 or F2 LED Lit:	1 Faulty fuse on module. Turn "OFF" power on module and replace fuse.
High LED Lit:	1 Zone temperature exceeds set point by more than 30 degrees F.
Low LED Lit:	1 Zone temperature is below set point by more than 30 degrees F.

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PROBLEM	PROBABLE CAUSE & REMEDY
Cannot Adjust Module Temperature:	1 (On UATC Style Modules Only) Front panel "LOCK" is "ON" - In options menu, turn-off "LOCK" option
Out of Calibration:	1 Return to *International Temperature Control, Inc.* for calibrating. Modules are not calibrated below 200° F consequently temperature readings will vary at ambient temperature. Thermocouple operating range: J-type 200° to 1400° - K-type 200° to 2300° F
ITC Module will not operate in a DME mainframe:	In a few instances the top set of contacts in the DME mainframe may be wired. The top contacts on ITC modules are used to program the module and if the corresponding connectors on the DME mainframe are wired, it is likely that feedback into the programmable chip will cause the module to function improperly or not at all. 1 Permanent fix - Disconnect the wires to the top connector on the DME mainframe. 2 Temporary fix - Place scotch tape over the top contacts on the ITC control module.

How to Determine if a problem is with a Module, Cables or the Mold:

Simple Method

1st. Move module to known good zone. If problem follows module, problem is probably with module. If not:
2nd. Move Cable to known good zone. If problem follows cable, problem is probably with the cable. If not:
3rd. Problem is in the mold.

Comprehensive Method

Step #1

Disconnect cable from the mold. Check resistance from Pin to Pin at the mold connector. The Thermocouple should read 3 to 50 ohms at room temperature. Heaters should read greater than 8 ohms. If no continuity is detected, that is an indicates of an open or broken connection or wire.

Step #2

At the mold, check resistance from each pin to ground. For heaters only - if no continuity is detected it indicates an open condition, or no connection to ground. If any resistance is found that indicates a short to ground.

Step #3

Reattach the cable to the mold connector and detach it from the control. Check resistance from pin to pin on the frame end of the cable. Like in Step #1 the Thermocouple pins should read between 3 an 50 ohms at normal room temperature. The heater should read greater than 8 ohms. If no continuity is detected it indicates an open heater or open thermocouple. The connection is broken in the cable or the pins are not making contact.

A much faster & simpler method of checking cables can be accomplished by using ITC's Power Cable & Thermocouple Cable Test Boxes.
Please consult ITC for information on our Cable Test Boxes.

Step #4

At the frame end of the cable, check the resistance from each pin to ground on the cable. For heaters only - continuity indicates an open condition in the cable to ground. If any resistance is found it indicates the wires are shorted in the cable or the connectors are shorting to ground.

Step #5

At this point if everything checks OK, the problem is in the controller or main frame.

1st. - turn "OFF" the main disconnect,
2nd. - locate the problem zone (module),
3rd. - Check the fuses on the card (module). If fuse is bad, replace fuse. If fuses check OK then;
4th. - Swap the suspect module into a known good zone,
5th. - Turn "ON" the main disconnect,
6th. - If the problem follows the card (module), the problem is with the card (module). If the problem does not move, it is inside of the enclosure between the module and connector located on the side of the enclosure.

Contact International Temperature Control Inc. for repairs.

Erratic Display:

It is possible that 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 filtering within the power supply of the module can accommodate.
A random occurrence is not a 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.

Improper grounding of the Mold or Control System can also cause erratic operation of the control system.

Low Input Voltage Condition:

A mold designed & built to run at 240vac may not function properly if the plant voltage is at 208vac. This reduced voltage effectively removes approximately 25% of the available power to the heaters. Example, a 1,000 Watt heater designed to operate at 240vac, will only produce about 750 Watts at 208vac. Typically you want the controller to reach a steady state at 15% to 85% Power Output, at the desired control temperature.

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In other words a plant with 208 vac input power may cause a slow temperature rise and have a hard time maintaining temperature.

MAIN POWER - 480 vac between phases - approx.
272 vac to ground - approx.
CONTROL SYSTEM POWER - 240 vac between phases - approx.
120 vac to ground - approx.
120 vac to neutral in a grounded system - approx.

Thermal Lag:

This is the response of the heater to the time the sensor starts seeing a change in temperature. Heater design, heater contact to the heated surface, placement of the sensor in relation to the heater and contact of the thermal sensor to the heated surface are critical. A good rule of thumb would be to have the thermal sensor no more than 1/2" from the heater, thus providing a response of approximately 2 seconds from power "ON" till the thermal sensor starts seeing an increase in temperature. Any greater time could cause oscillation.

Intent of Alarm Diagnostics:

To prevent expensive mold repairs, defective products and costly down time. In this regard, ITC provides an extensive array of error and diagnostic messages which catch problems before they cause damage.

Cross Wired Zones:

Obviously, this is when one zone's thermocouple is wired to an incorrect heater (one from another zone). This is easy to find; Turn on one zone at a time and determine if only that zone heats up. If another zone heats up, that zone is suspect.

Shorted Thermocouple:

This is when the thermocouple make contact with a surface at a point other than where it was designed to sense temperature. Typically this happens when a pinched or frayed wire is shorted to ground, usually near a sharp edge or at a junction point or pinched within the mold. Usually you can just measure the thermocouple for an OPEN condition. The Thermocouple junction is a very low voltage battery in the mini-volt range (0.000 to 20,000milli-Volts) and looks like a typical short circuit on a ohm meter.

A mold or machine which is not properly grounded can cause a thermocouple to short out.

Fuses:

Never replace any fuses with out first determining the reason that the fuse had blown, for damage or injury may result.

Main Frame Total Amperage & Wattage Capacity:

3-Phase Power Supply

Input power is 240 vac 3-Phase, with Heaters being 240 vac Single Phase.

Main Frame Breaker Switch	=	Total System Heater Capacity
50		20,784 Watts or 86.6 Amps
70		29,080 Watts or 121.2 Amps
100		41,568 Watts or 173.2 Amps

a. Breaker size x 1.732 = the total system heater amperage capability
b. Total system amp draw x 240 = total system watts

Single-Phase Power Supply

Input power is 240 vac Single-Phase, with Heaters being 240 vac Single Phase.

Main Frame Breaker Switch	=	Total System Heater Capacity
50		12,000 Watts or 50 Amps
70		16,800 Watts or 70 Amps
100		24,000 Watts or 100 Amps

Anti-Arcing Feature:

Anti-arcing has been a standard feature on all ITC main frames & modules since June of 2000. Our modules have the capability of operating with main frames which both have and don't have this feature, by simply moving the jumper at the back of the module from the enabled to disabled position. It is important that the jumper remain in the enabled position on main frames equipped anti-arching, to prevent damage caused by electrical sparking if the module is removed from the main frame while under power.

Main frames which are not equipped with the Anti-arcing feature can be up-grade very easily. Please consult ITC for information..

Proper Grounding:

Equipment (Machine, Mold, Etc.) not properly grounded can cause erratic operation of the controller or worse yet, severe damage to the control/module, blown fuses, wires, thermocouples, etc.

NOTE: ALWAYS DISCONNECT POWER BEFORE SERVICING ANY ELECTRICAL APPARATUS