

**S20-D2C**  
**TEMPERATURE CONTROL MODULE**  
**Installation, Operation, & Maintenance Manual**

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**S20-D2C**  
***TEMPERATURE CONTROL***  
***MODULE***

**OPERATING**  
**INSTRUCTIONS**

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

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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 start up 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 FORK LIFT, 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 a control module 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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#### INSTALLATION OF MODULE INTO MAIN FRAME:

1. Lockout and tag out power to main frame. Module must be turned off. If module is installed or removed under load, damage to both the main frame and module can result.
2. Slide module into housing zone slot. Make sure it slides into card guides and seats properly into edge card connector on the back of the main frame..

#### MODULE DESCRIPTION:

- The S20-D2C Temperature Control Module utilizes solid-state circuitry. It has been designed to function in either our standard 15 amp or high power 30 amp main frames.
- Working in conjunction with type-J or type-K thermocouples, in either the Fahrenheit or Centigrade ranges, the module automatically controls temperature within the mold zone, by comparing actual temperature with power usage and regulating power to maintain a set-point temperature.
- The S20-D2C module has a digital LED readout which allows the operator to monitor temperatures. The module is also equipped with individual LED displays which indicate current mold operating functions.
- The module can be used as a fully automatic closed loop temperature controller, or as a manual power controller.
- The S20-D2C is equipped with amperage readout circuitry
- The S20-D2C module incorporates a wide of diagnostic and protective features.
- The S20-D2C module is noted for its ease of operation and reliable features.
- The S20-D2C is compatible with "G" series main frames.

#### AUTOMATIC OPERATION:

When used with type-J or type-K thermocouple feedback the S20-D2C module is a fully automatic temperature control instrument. You need only to enter the desired zone operating temperature and turn the power switch on. When power is switched on the module will:

- Automatically switch to the soft start cycle if the zone temperature is below 200 degrees Fahrenheit.
- After approximately 5 minutes, or when the mold zone temperature reaches 200 degrees Fahrenheit, or when the set point is reached, whichever occurs first, the unit will automatically switch to normal operation and begin to bring the temperature to the selected set point temperature.

#### AUTOMATIC MODE OPERATING PROCEDURES:

- Module must be properly installed in the housing. Heater and thermocouple must be properly connected. **(NOTE: NEVER REMOVE A MODULE WHILE THE MAIN FRAME IS UNDER POWER.)**
- Turn on the main frame power switch.
- Push the **"OUTPUT % KNOB"** to the "IN" position for automatic operation.

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- Turn on the “**POWER ON/OFF**” switch located at the bottom of the module.
- If the zone temperature is below 200° F and below set point, the module will automatically go into “**SOFT START**” mode for approximately 5 minutes or until the mold zone temperature, as determined by the thermocouple, reaches 200 degrees Fahrenheit or the set point temperature is reached. (**Soft Start** can be deactivated by pulling the manual knob and pushing in back in within 1 to 1-1/2 seconds)
- When the Soft Start conditions are met, the Soft Start mode ends and the instrument goes into normal operation. Power is applied at a full rate while the temperature is well below set-point. As the temperature nears the set point temperature, the control module will automatically begin to adjust the output power to the heater to smoothly bring the zone temperature to the set point temperature. Once the set-point temperature is reached, the control module will continue to automatically adjust the output power to constantly maintain the set point temperature. The yellow load light on the front of the control module the operator to monitor power as it is being applied to the heater. When the light is lit, it indicates power is being applied to the heater. A blinking light indicates a modulating of power to the heater.
- To turn off the module, simply switch off the “**POWER ON/OFF**” switch.

#### **MANUAL OPERATION:**

If thermocouple feedback is not available, the S20-D2C may be operated as a manual power controller.

- Turn on the main frame power switch.
- Pull the “**OUTPUT % KNOB**” to the “**OUT**” position. This will switch the instrument into the manual control mode.
- The green “**MANUAL**” LED light will be illuminated to indicate the control module is in manual operating mode.
- The percentage of power to be applied can be set by simply rotating the knob “clockwise” to increase the output power and “counterclockwise” to reduce the output power.
- The output power works on a basis of “**ON**” times versus “**OFF**” time. The yellow “**LOAD**” indicator LED will give you an indication of the amount of time power is being applied to the mold heater. The more the LED is on the more power the module is putting out.
- If you wish to resume automatic mode, simply push “In” the “**OUTPUT % KNOB**”.
- To turn off the module, simply switch off the “**POWER ON/OFF**” switch.

### **GENERAL OPERATING FEATURES**

#### **SOFT START:**

The automatic “**SOFT START**” function of the S20-D2C is designed to eliminate the adverse affect of full power being applied to a cold heater, by slowly baking out moisture. If the zone temperature is below 200 degrees Fahrenheit and or below the set point temperature when the control module is turned on, the “**SOFT START**” function will automatically be activated. If the zone temperature is above 200 degrees Fahrenheit when the module is turned on, it will automatically switch to the normal operation mode. When the “**SOFT START**” cycle is active, the instruments output power is limited to approximately 25% of full power. The “**SOFT START**” cycle has been set to last for a time period of about 5 minutes, or until the mold zone temperature reaches 200 degrees Fahrenheit, or the set point temperature is reached, whichever occurs first. The “**SOFT START**” function can be disabled by pulling the manual knob out and pushing it back in within 1 to 1-1/2 seconds.

If thermocouple feedback is not available, the “**SOFT START**” function will not be activated when the control module is turned “**ON**” The module will go into thermocouple error mode.

**NOTE:** When the “**SOFT START**” cycle is active, the yellow “**SOFT START**” light is lit.

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#### ANTI-ARCHING FEATURE:

The S20-D2C module is equipped with our innovative **Anti-Arching** feature, which will help prevent damage to the control module and/or main frame in the event the module is inadvertently removed or inserted while under load. The **Anti-Arching** feature must 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-Arching**, the instrument will not provide power to the heater. If this condition occurs, the Anti-Arching Jumper can be moved from the "bottom" enabled position to the "top" disabled position. By moving the jumper to the Anti-Arching disabled position, the module will function in main frames not equipped with the Anti-Arching feature.

**NOTE:** The **Anti-Arching** feature will only work with ITC's updated TC-2000 main frames.

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

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

**NOTE:** Older ITC main frames can be upgraded with the **Anti-Arching** feature by the installation of Contact (MF-ECC) in position #3 of the main frame Card Edge Connector (MF-EC) . Please consult factory.

\*\*Reference enclosed Anti-Arching sheet for more information.\*\*

#### FAHRENHEIT OR CENTIGRADE:

"F" or "C" ranges are field selectable by repositioning the appropriate dipswitch on the circuit board. A decimal point after the third digit in the upper display window indicates if the module is operating in "F" or "C" range. Factory default setting "F" range.

#### THERMOCOUPLE TYPE – J or K:

The S20-D2C module is engineered to operate with either type-J or Type-K thermocouples. The thermocouple type is field selectable by repositioning the thermocouple dip switch on the circuit board. The factory default setting is for "J" type thermocouple. If the thermocouple type setting is changed, the module will need to be recalibrated with the correct thermocouple output.

#### CONTROL METHOD:

The S20-D2C temperature control module utilizes a highly efficient PID Power Output program to control temperature. This time proven process reliably holds temperature to a very close tolerance.

#### AMPERAGE READOUT DISPLAY:

The S20-D2C control module has been equipped with the ability to read full amperage draw of the heater. This valuable diagnostics tool allows you to monitor conditions within the heating system of the mold.

### WARNING INDICATORS

#### SHORTED TRIAC OR HEATER INDICATOR:

The S20-D2C control module can detect a shorted triac or heater condition. This condition will be detected when power is still being applied to the heater when the temperature is will above the set point. The following alarm will be displayed **'tSH'** and all LED's will start flashing.

**(WARNING; IF THIS CONDITION OCCURS, SHUT THE MODULE OFF IMMEDIATELY AS DAMAGE TO THE HEATER CAN RESULT)**

#### OPEN TRIAC / OPEN HEATER INDICATOR:

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.

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**HIGH TEMPERATURE WARNING INDICATOR:**

The red “**HIGH TEMPERATURE** “ warning light is factory set to illuminate when the process temperature is more than 30 degrees Fahrenheit above the set-point temperature.

**LOW TEMPERATURE WARNING INDICATOR;**

The red “**LOW TEMPERATURE** “ warning light is factory set to illuminate when the process temperature is more than 30 degrees Fahrenheit below the set-point temperature.

**OPEN THERMOCOUPLE WARNING INDICATOR:**

If thermocouple feedback is not available when the unit is turned on or if it is lost during operation, the red “**OPEN**” thermocouple light will illuminate and the temperature display will be blank. To prevent an uncontrolled temperature rise, the output power to the heater will be automatically disabled if the unit is in the “**AUTOMATIC**” control mode.

**REVERSED THERMOCOUPLE WARNING INDICATOR:**

If the thermocouple wiring to the instrument is reversed, the control module will detect the problem shortly after the zone temperature begins to increase. When a reversed thermocouple polarity is detected, the “**REV**” thermocouple LED will be illuminated and the output to the heater will be disabled if the unit is in “**AUTOMATIC**” control mode.

#### WARNING CODES

Warning Code	Description
tSH	Shorted Triac or Heater
toH	Open Triac or Heater
tCo	Open Thermocouple
tCr	Reversed Thermocouple

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#### TROUBLESHOOTING GUIDE

Module will not turn on:	<ol style="list-style-type: none"><li>1. Check input power.</li><li>2. Check power cord connection.</li><li>3. Check that main frame power is on.</li><li>4. Check module fuses. If blown, check for a short in the wiring</li></ol>
Three backward "c's" Displayed HI TEMP light on	<ol style="list-style-type: none"><li>1. Check Thermocouple connections and leads</li><li>2. Check continuity of leads and cables</li></ol>
Temperature won't settle on set point:	<ol style="list-style-type: none"><li>1. Give module more time to settle on the set point</li><li>2. Does molding process have a wide temperature variation? Check to see if changes in display temperature are in the same cycle as the molding process.</li></ol>
Lights dim:	<ol style="list-style-type: none"><li>1. Is actual voltage input into housing equal to rating of module?</li></ol>
Display shows temp is low and not rising: LOW TEMP light on.	<ol style="list-style-type: none"><li>1. Give module more time to settle on the set point.</li><li>2. Set point may not be functioning properly.</li></ol>
Display shows temp is low and rising slowly: LOW TEMP light on	<ol style="list-style-type: none"><li>1. Check for poor connections between heater and heater wires and connectors.</li><li>2. Half-open triac or triac driver could cause this problem.</li><li>3. Try module in a known good heater zone.</li></ol>
Display shows temp is low and not rising: LO TEMP light on & LOAD light on	<ol style="list-style-type: none"><li>1. Check for open heater.</li><li>2. Check for open wire or connector.</li><li>3. Open triac or triac driver.</li><li>4. Try module in a known good heater zone.</li><li>5. If no current, triac or triac driver failure.</li></ol>
Display erratic: LO TEMP light on tCr Error Code	<ol style="list-style-type: none"><li>1. Thermocouple wires may be reversed. White (iron) is positive Red (constantan) is negative</li></ol>
Display shows temperature is high and rising: HI TEMP light on LOAD light on	<ol style="list-style-type: none"><li>1. Shorted triac or triac driver.</li></ol> <p>NOTE: Triac or triac driver can be half shorted.</p>
Module appears to operate properly, but no power is being applied to the heater:	<ol style="list-style-type: none"><li>1. Main frame is not set up for Anti-Arching.</li><li>2. Move Jumper from lower (enabled) to upper (disabled) position.</li></ol>
Erratic or intermittent reading on display:	<ol style="list-style-type: none"><li>1. Check for an intermittent thermocouple or heater.. Check for loose wires.</li><li>2. Try module in known good heater zone.</li></ol>

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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 fuses until problem is corrected as damage may result.

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

1. Main frame is not set up of Anti-Arching.
2. Move Dip Switch from lower (enabled) to upper (disabled) position.

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 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. Heaters not connected.
2. Heaters too small.
3. Heaters burned out.
4. Heaters 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.



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#### SPECIFICATIONS:

Voltage .....	208 to 240 VAC, single phase
Current .....	15 amps
Frequency .....	50/60 Hz
Wattage .....	3600
Module Power Usage .....	Less than 3 watts, excluding load
Thermocouple Isolation .....	Isolated from ground and supply voltage
Control Method .....	True PID with zero crossfire
Physical Configuration .....	Plugs in for easy interchangeability
Compatibility .....	Compatible with any "G" Series housing
Size .....	2" wide, 7" high, 7 1/2 " deep
Weight .....	1 1/2 pounds
Temperature Range .....	Fahrenheit or Centigrade
Set point .....	0 - 999° F
Control Accuracy .....	+/- 1° F (in 200° to 800° F range)
Calibration Accuracy .....	Better than 0.2% of full scale
Thermocouple .....	Type- J or K grounded or ungrounded
Display .....	Single LED display, 3-digit, 7 segments
Output Switch .....	Internal solid state Triac, triggered by AC zero crossing pulses
Overload Protection .....	Triac and load use high speed fuses Both sides of AC line are fused
Soft Start Duration .....	5 Minutes
Soft Start Override Temperature .....	200° F
Set point Control .....	Precision 3 digit push-button switch direct reading resolution 1° F
Manual Power Control .....	Single turn push/pull potentiometer calibrated scale range: 0-100%
Anti-Arching Setting Method .....	Jumper
Low Temperature Indicator .....	Red " <b>LOW</b> " temperature light
High Temperature Indicator .....	Red " <b>HIGH</b> " temperature light
Thermocouple Reversed Indicator .....	Red ' <b>REV</b> ' thermocouple light and display ' <b>tCr</b> '
Thermocouple Open Indicator .....	Red ' <b>OPEN</b> ' thermocouple light and display ' <b>tCo</b> '
Manual Mode Indicator .....	Green " <b>MANUAL</b> " light
Soft Start Indicator .....	Yellow " <b>SOFT START</b> " light
Heater Load Indicator .....	Yellow " <b>LOAD</b> " light
Shorted Triac Indicator .....	Display ' <b>tsh</b> ' and all LED's Blink
Open Heater or Triac Indicator .....	Display ' <b>toH</b> '
Automatic/Manual Select .....	Push/Pull potentiometer
Cold Junction Compensation .....	Automatic better then 1.12° F/F (0.01° C/C)

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INTERNATIONAL TEMPERATURE CONTROL, Inc.

**This temperature control system incorporates a special "Anti-Arcing" feature**

The control modules that were shipped with this unit have a special "Anti-Arcing" circuit that will help to prevent damage to the module and main frame in the event that the module is removed under load. This feature should not be considered a substitute for proper handling procedures, but rather as a suplimental protection device. If you wish to use these control modules in an older main frame, i.e. one that is not set up for this option, the anti-arcing feature must be disabled on the control module. This is very easily done by moving the illustrated jumper from the lower position to the upper position (see below). If this module is installed in a main frame that is not equipped for this feature, no damage will be caused as a result. The module will appear to operate normally, but no power will be put out to the heater.

This main frame will operate with all standard control modules regardless of the availability of this feature.

