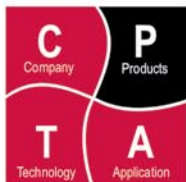


# TTC Family

## Global Hot Runner Control Solutions



**Synventive**  
molding solutions

# Redefining Temperature Control

## The next step in the evolution of hot runner temperature control systems.

The best temperature controller on the market is now more flexible, compact and affordable than ever before. Introducing the new TTC family of temperature control systems – combining proven Synventive performance and value with innovative new features to help you perfect your process. In each new TTC system, you'll find the qualities that set Synventive apart – Triangulated Control Technology™ and industry leading diagnostics – as well as enhancements that deliver:

### Superior reliability

Synventive products lead the market in reliability. And now, the TTC provides even more reasons to depend on Synventive; for example, a new, selectable “hot start” feature that maintains the set point in the event of a temporary loss of input power.

### Ease of use

Wherever you operate in the world, the new TTC family of systems is designed for global use, with expanded language conversion options, universally accepted icons, improved global input power flexibility, and security levels that increase or decrease operator options and complexity.

Startup is easy: just enter set points and turn the power on. Standard features such as wet heater bakeout and slaved power-up (selectable) go into action automatically.

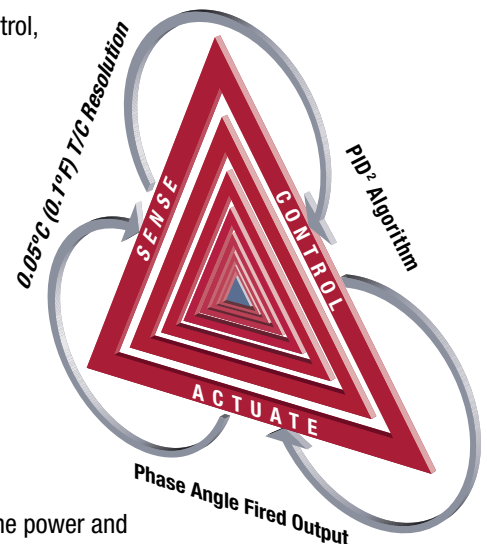
### Triangulated Control Technology®

All Synventive hot runner temperature controllers feature Triangulated Control Technology®. Using this unique technology, our controllers:

- 1) **Sense** – 20 times per second, Synventive controllers precisely measure the thermocouple;
- 2) **Control** – the proprietary self-optimizing Synventive PID<sup>2</sup> control algorithm adjusts if the actual temperature deviates 0.1° F (0.05° C) from setpoint. The second derivative (PID<sup>2</sup>) monitors the actual temperature rate of change. As a result, the TTC module regulates the output to the heater in advance of achieving setpoint to limit or eliminate over or undershoot.
- 3) **Actuate** – using phase angle fired output, the Synventive controller delivers smooth and exact power to each heater in 0.24 VAC increments for the ultimate in temperature control.

Triangulating your process with a Synventive controller means achieving better temperature control, that could result in:

- enhanced part quality
- reduced scrap
- improved part weight consistency
- material savings
- higher profit margins



### Power Priority®

“Low mass”, or extremely small hot runner nozzles are a unique challenge to control. To smooth the power and ultimately the melt heat history, Synventive has created Power Priority®. Power Priority® smoothes the power output to individual zones. Users have the option to manually apply a Power Priority® set point from 1 (light) to 4 (heavy) output, providing unparalleled control for applications where it is most needed.

### Protection

Closed loop wet heater bakeout – 120 times per second (at 60 Hz), the TTC module checks the heater for a short, steadily ramping up the voltage for the fastest possible time to set point. If the heater is wet or shorted, the output is adjusted within 8.3 milliseconds to protect the heater, cables and controller.

 **5 YEAR WARRANTY\***

Every TTC controller comes with a full 5-year warranty and is backed by the industry-leading worldwide service and support that our customers expect from Synventive.

\* Excludes touchscreen interface (2-year warranty on touchscreen interface)





TTC 2100-1



TTC 2100-2 (left),  
TTC 2100-1 (right),  
both shown with an optional  
480 to 240 Delta/Delta three phase  
2:1 45 kva step down transformer.  
Integrated transformer pods  
available up to 112 kva.

**The flexibility to deliver smooth,  
accurate control – globally**

Unlike most hot runner temperature controllers, the TTC system offers true global input power flexibility. So whether your operations are in the U.S. or halfway around the world, you can confidently put the best in temperature control to work.



TTC 2200-1 (Panel Mount),  
for seamless integration into any  
molding machine's control panel.

**An expandable architecture  
allows custom configurations**

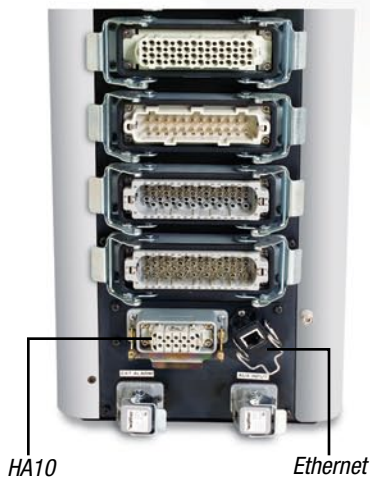
The TTC's expandable architecture lets you customize the system to your specific operation and applications. For example, the back plate of the TTC enclosure can accommodate most connectors you specify. A wide array of options are available – call or e-mail Synventive for a complete list.



TTC 2100-4

**A completely modular design for  
easy maintenance**

The new TTC has a modular design for quick control card addition and replacement. Plus, the system is easy to troubleshoot by telephone, reducing downtime and field maintenance visits.



HA10

Ethernet

**Mold ID**

Automatically identify up to 63 different molds. Attach a cable to the mold or plug a "mold key" into the HA10 connector on the rear of the enclosure. The Ethernet cable transmits the information to our Touch Screen interface and the user pre-programs which menu to load when the wiring pattern is detected. The Mold ID feature can be added to any existing TTC with a Touch Screen interface.

# Interface Selection

## International Interface



## Touch Screen Interface (RPC 4, 12.1" display)



- Windows XP® Operating System
- Flash Drive

Core Description	Inter-national	Touch Screen RPC 4
Maximum zones	128	640
2 year warranty	X	X
Modular design	X	X
Automatic/manual control	X	X
Adaptive PID <sup>2</sup> control algorithm	X	X
Algorithm is executed 20 times per second	X	X
Extended tuning ranges (fast/slow)	X	X
Phase angle firing	X	X
Wet heater bakeout	X	X
Power compensation in manual mode	X	X
T/C resolution 0.1 degrees F over full scale	X	X
Setpoints in Tenths		X
Zone "on", "off", and "locked off"	X	X
Delta/wye convertible option	X	X
Degree F/C	X	X
Thermocouple J/K	X	X

Operational Features	Inter-national	Touch Screen RPC 4
Menu storage	10	1000
Programmable groups	4	20
Instant grouping	X	X
Boost (selectable time/amount)	X	X
Trim	X	X
Slaved power up (enable/disable)	X	X
Automatic set point limit	X	X
Manual set point limit	X	X
Security levels	X	X
On power up "on" or "off" ("ask" touchscreen only)	X	X
Auto load manual remembered % output		X
Operation identification		X
Tool graphics with real time data overlay		X
Thermocouple "rewire"		X
On-line help		X

Actual Values	Inter-national	Touch Screen RPC 4
Actual temperature	X	X
% output	X	X
Deviation from set point	X	X
Amps	X	X
Volts		X
Watts		X
Ohms		X

Software Features	Inter-national	Touch Screen RPC 4
Gammavision (SPC data/graphing)		X
Instant data reporting (up to 24 hours)		X
Data report storage (up to 1 year)		X
Mold Doctor (advanced troubleshooting)		X
Field Calibrator		X
On screen or hard copy printing		X
Networking		X
Remote troubleshooting		X

Alarms	Inter-national	Touch Screen RPC 4
High temperature (adjustable)	X	X
Low temperature (adjustable)	X	X
Thermocouple pinched (adjustable time)	X	X
Thermocouple open (remembered % output)	X	X
Thermocouple reversed	X	X
Open fuse	X	X
Shorted heater	X	X
Open Heater	X	X
Uncontrolled output (relay power cut off)	X	X
Critical over temperature alarm (adjustable)	X	X
Heater resistance monitoring (predict heater failure)		X
Heater wattage monitoring (predict leaks)		X
Alarm history		X

Cable Connections on Enclosure/Tool End	Inter-national	Touch Screen RPC 4
HBE 16/24/48 or DME® standard	X	X
Custom connectors	X	X

Inputs	Inter-national	Touch Screen RPC 4
Standby (selectable group) (also manually activated)	X	X
Control inhibit (voltage to activate)	X	X
Control inhibit (voltage to deactivate)	X	X
Material protection	X	X
Sequenced power up (also manually activated)		X
Remote boost		X
Mold ID (auto mold recognition)		X

Outputs	Inter-national	Touch Screen RPC 4
Resettable alarm output	X	X
Non-resettable alarm output	X	X
OK to run output	X	X

Misc.	Inter-national	Touch Screen RPC 4
Find this module LED	X	X
Daisy chain enclosures	X	X

Selectable by zone

Interfaces are interchangeable. Touchscreen software is included free of charge with the International Interface. Users can load the complimentary software on any computer with Windows 98®, 2000®, NT® or XP® operating systems.

DME® is a registered trademark of D-M-E Company.

# Gammavision®

## On-line analysis

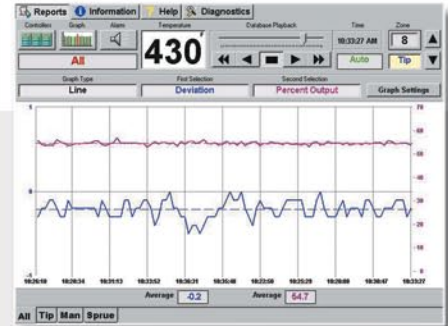
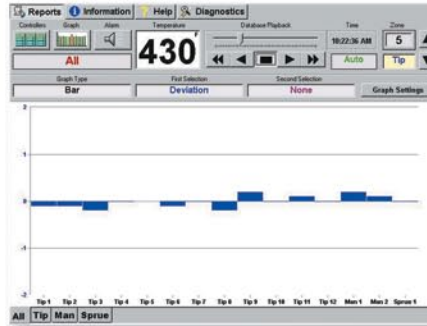
Gammavision® chart recorder and statistical analysis software allows the user to record the performance of the hot runner tool. Print to the screen for instant reporting or watch the action on-line with our “playback” mode.

### Bar graph

Playback selected group display one or two variables

### Line graph

Playback selected zone display one or two variables



### Data summary report

Statistical analysis of control by zone.

- Temperature average
- Standard deviation
- Temperature range
- Temperature minimum
- Temperature maximum
- Deviation alarms
- Average percent output
- Average current (amps)
- Average watts
- Average resistance (ohms)

Name	Temp Average	Std Dev	Temp Range	Temp Min	Temp Max	Dev High	Dev Low	Avg Percent	Avg Current	Avg Watts	Avg Resist
Tip 1	399.8	0.08	0.4	399.6	400.0	0	0	52.84	0.22	52.8	1090
Tip 2	399.8	0.05	0.3	399.7	400.0	0	0	38.58	0.19	45.6	1263
Tip 3	399.8	0.08	0.4	399.6	400.0	0	0	42.39	0.21	50.4	1142
Tip 4	399.8	0.05	0.3	399.7	400.0	0	0	45.49	0.20	48.0	1200
Tip 5	399.8	0.11	0.4	399.7	400.1	0	0	57.40	0.23	55.2	1043
Tip 6	399.8	0.13	0.4	399.6	400.0	0	0	43.68	0.21	50.4	1142
Tip 7	399.8	0.09	0.4	399.7	400.1	0	0	49.67	0.23	55.2	1043
Tip 8	399.8	0.10	0.4	399.6	400.0	0	0	49.38	0.21	50.4	1142
Tip 9	400.0	0.11	0.4	399.8	400.2	0	0	60.08	0.24	57.6	1000
Tip 10	400.0	0.07	0.4	399.8	400.2	0	0	42.74	0.25	60.0	960
Tip 11	400.0	0.09	0.4	399.8	400.2	0	0	50.47	0.21	50.4	1142
Tip 12	400.0	0.10	0.4	399.8	400.2	0	0	63.47	0.25	60.0	960
Man 1	400.0	0.07	0.4	399.8	400.2	0	0	68.01	0.27	64.8	888
Man 2	400.0	0.09	0.4	399.8	400.2	0	0	73.87	0.27	64.8	888
Sprue 1	400.0	0.34	1.6	399.3	400.9	0	0	90.75	0.12	28.8	2000

### Zone setpoint report

Displays critical zone set up information

### Zone setpoint change report

Displays zone changes with a time stamp

### Alarm summary report

Display zone alarms with a time stamp

### SPC report

Display average temperature and standard deviations by zone in 15 minute intervals

# Mold Monitor

## Preventive Diagnostics

Mold Monitor is a set of on-line (in production) advanced software routines consisting of three preventative diagnostic tools; material protection, heater resistance and heater wattage monitoring.

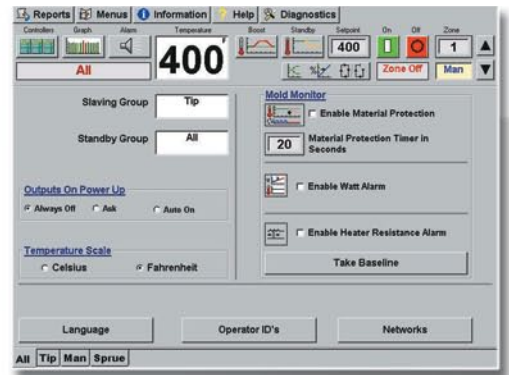
**Material Protection** – establish a signal between the molding machine and the Synventive TTC controller. Each time the signal is received a timer starts counting down. If the programmable timer counts down to zero the software puts the TTC controller into standby. Guards against material degradation and prevents unnecessary scrap.

**Heater Resistance Monitoring** – twice an hour the heater resistance monitor compiles the last 30 minutes of heater resistance information by zone after a baseline has been established. The most recent heater resistance information is compared against the recorded baseline. The heater resistance alarm watches the life of the heater and helps the user predict in advance when a heater is about to fail. Predict downtime and maximize press time by avoiding unexpected heater failures.

**Heater Wattage Monitoring** – create upper and lower wattage alarm limits by zone to help see inside your mold. The heater wattage monitor activates the alarm after ten consecutive watt readings exceed the user defined watt band.

Many times heaters are grouped together in a system to save control dollars. Wiring these heaters in parallel prevents the open heater diagnostic from alerting the user that one of a group of heaters has failed. The watt band however, can be set to alarm if the watt reading falls below a certain limit. Prevent hard to diagnose processing problems caused by a cold spot in your process.

Diagnosing that material has leaked into your hot runner manifold system is very difficult and often occurs too late with the appearance of degraded material in your part. Prevent this problem by monitoring the watt consumption by zone. If the wattage consumption rises it may be caused by material that has leaked into the manifold system which is now transferring the heat to the mold steel or is encasing the thermocouple.



# Mold Doctor®

## Troubleshoot Your Mold

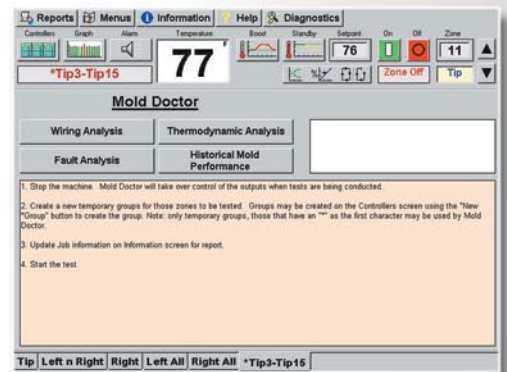
Mold Doctor® is an off-line (tool room) advanced troubleshooting tool consisting of four diagnostic tests; wiring analysis, fault analysis, thermodynamic analysis and historical mold performance.

**Wiring analysis** – checks the wiring of the tool. The software clearly tells the user of miswired zones and how to fix them.

**Fault analysis** – quickly identifies the following problems: thermocouple open, thermocouple reversed, thermocouple pinched, open fuse, heater open, heater wet and heater short.

**Thermodynamic analysis** – this test automatically heats all selected zones to 200° F (93° C) then to 400° F (204° C) and finally cools to 300° F (149° C). During the heating and cooling process Mold Doctor® records critical information and reports to the user. Compare like zones against one another, major differences in the four key areas (resistance, power consumption, heating and cooling rates) will point you toward the solution. Once the tool is qualified, save a thermodynamic analysis as your known “good parts” baseline. Future problems will be easy to diagnose using the historical mold performance tool.

**Historical mold performance** – allows the user to easily compare a known “good” thermodynamic analysis baseline to the current “suspect” thermodynamic analysis. Intuitively troubleshoot your mold with hard data.



# Field Calibrator

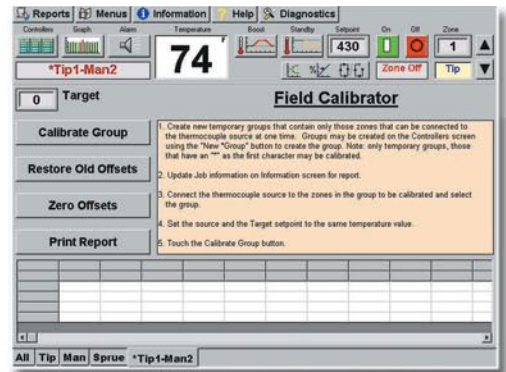
## Calibrate your Synventive controllers in house

QS or ISO audits? No Problem. Calibrate your controllers in house quickly, easily and without a calibration technician.

While in engineer level security, locate the Field Calibrator button under the diagnostics tab.

- Create a temporary group of zones to be calibrated
- Enter job information, for your internal records
- Establish a thermocouple source equivalent to the zones
- Enter the calibration target temperature
- Press the calibrate group button

The software automatically determines the calibration offset changes needed to correct the zones reading. Field Calibrator has an accuracy of  $\pm 0.2^{\circ}$  F or  $\pm 0.1^{\circ}$  C.



## Features

**Boost** – temporarily raises a zone or group of zones temperature (typically tips) to clear a cold slug on start up. User selectable or automatic with a remote input.

**Standby** – lowers a group of zones to the standby temperature while the process is idle. User selectable or automatic with a remote input.

**Trim** – permanent, automatic set point change for the zone or zones selected. Temperatures set at different levels will change the same amount.

### Operator Identification

Create an authorized user list with individual user codes. The user must enter their operator identification number prior to any change to the control system. View/print changes by operator on demand.

### Security Levels/Operating Limits

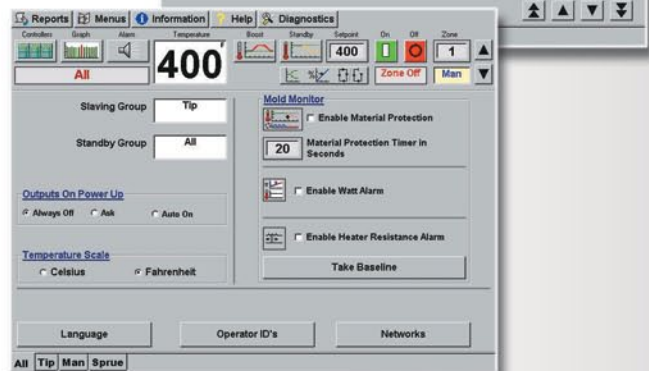
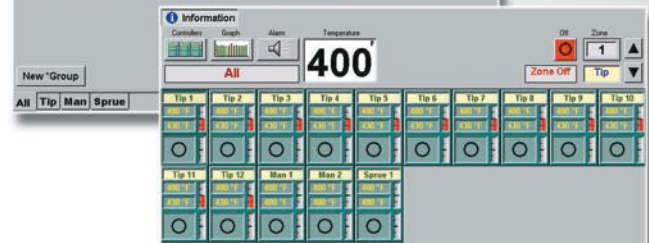
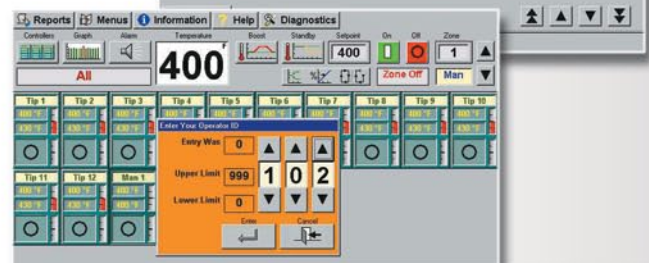
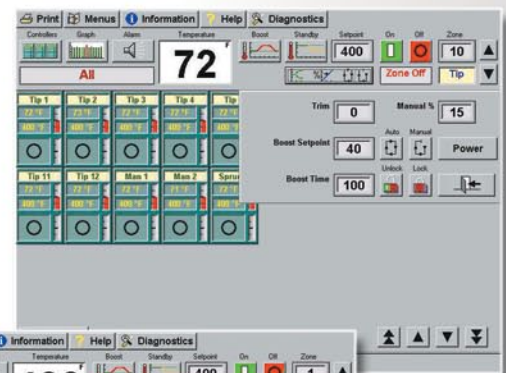
The TTC controller has four security levels; monitor (shown), operator, supervisor and engineer. For simplicity, only the functions allowed in each level are displayed. Customize your system by setting up zone groups and establish operating limits.

### Languages

Chinese (中文), Czech (Czech), Danish (Dansk), Dutch (Nederlands), English (English), French (Français), German (Deutsch), Italian (Italiano), Japanese (日本語), Polish (Polski), Portuguese (Português), Russian (Russian), Spanish (Español), Swedish (Swedish).

Other languages easily available using the Windows XP® operating system based language translator and character sets.

Windows 98®, 2000®, NT® and XP® are registered trademarks of Microsoft Corporation.



# TTC 2100 & 2200

## Performance Specifications

Thermocouple Calibration Accuracy:	0.2°F (0.1°C)
Control Accuracy (steady state):	+ 0.1°F (+ 0.05°C)
Power Response Time:	8.3 msec. or one half line cycle at 60 Hz
Process Sampling:	50 msec. or 20 times per second
Control Algorithm:	Proprietary PID <sup>2</sup> with added autotuning features
Degrees F or C:	Field Selectable
Operating Range:	0-999°F (0-500°C)
Output Voltage:	0-240 VAC, phase angle fired, 1000 steps
Standby Temperature:	User Selectable (0-999°F, 0-500°C)
Interlocking Features:	22 - 132 VAC/VDC Input to Activate

## Input Specifications

Thermocouple:	Type J standard; Type K selectable (grounded thermocouples only)
Cold Junction Compensation:	Internal to enclosure
External Resistance:	10 Meg. Ohms
Temp. Variation Due To T/C Length:	None

## Electrical

Input Voltage:	160-265 VAC Delta, 160-265 VAC Wye
Frequency:	47-53 Hz, 57-63 Hz
Ambient Temperature Range:	32-115°F (0-45°C)
Humidity Range:	10-95% non-condensing
Output Module Rating:	240V: 4 zone - 3 Amps/zone 720 Watts/zone 2 zone - 15 Amps/zone 3600 Watts/zone 1 zone - 30 Amps/zone 7200 Watts/zone
Communications Electrical Standard:	RS-485, networkable

## Performance Standards

U.S., Canadian and International:	CE Mark I.E.C. 801-1, 801-2, 801-3, 801-4 *Safety UL-508, UL-873 and CSA
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\*Designed to meet

Physical Specifications	Height		Width		Depth		*Weight	
	(inches)	(millimeters)	(inches)	(millimeters)	(inches)	(millimeters)	(pounds)	(kilograms)
Single heat sink	35	889	9.3	237	20	508	85	39
Dual heat sink	40	1016	19	483	20	508	150	68
Quad heat sink	54	1372	30	762	30	762	200	91
Panel mount single heat sink	32	813	19	482	7	178	75	34

\*Single excludes coasters. All exclude screen.  
Specifications subject to change without notice



### Synventive Molding Solutions

✉ 10 Centennial Drive  
Peabody, MA 01960  
USA  
☎ +1 800.367.5662  
☎ +1 978.750.8065  
☎ +1 978.646.3600  
✉ info@synventive.com

### Synventive Molding Solutions GmbH

✉ Heimrodstraße 10 64625 Bensheim  
P.O. Box 3123 64615 Bensheim  
Germany  
☎ +49 (0)6251 9332 0  
☎ +49 (0)6251 9332 90  
✉ infohrde@synventive.com

### Synventive Molding Solutions (Suzhou) Co., Ltd.

✉ 12B Gang Tian Industrial Square  
Suzhou Industrial Park, 215021  
China  
☎ + 86 512 62838870  
☎ + 86 512 62838890  
✉ infohrcn@synventive.com

### Your Local Representative

# TTC 2100 Highlights



## Reliability

- Improved global input power flexibility
- Optional "hot start" feature, maintains set point if input power is lost temporarily

## Ease of Use

- Inclusion of Asian character sets for expanded language conversion
- Expanded use of universally accepted icons
- Security levels increase or decrease operator options and complexity (monitor, operator, supervisor and engineer levels)

## Control

- Triangulated Control Technology™
- Power Priority™
- Setpoints in Tenths

## Features

- Expandable architecture
- Flexible packaging (panel mount design for in machine control)
- Relay power cut off to prevent runaway zones and operator tickle
- Expanded software features
  - On screen printing
  - Instant data collection for up to the last 24 hours, including summary reporting and long term report storage
- Group tab creation - view all zones or only the zones in each group
- Instant grouping
- Tool graphics with real time zone data overlay
- "Find this module" LED
- Expanded input and output options
  - Inputs
    - Machine cycle/material protection
    - Safe to run from machine
    - Sequenced power up
    - Auto boost
    - Mold ID
  - Outputs
    - Safe to run from controller
- Standard current measurement

## Value

- Smaller footprint
- Attractive Price

