Diagnostic Functions
VISIONS 3000 w/Linux rev.5.12 Software:

The VISIONS 3000 incorporates a suite of functions specifically designed to troubleshoot the mold both at start-up and during normal operations.

Tool Validation:

A suite of functions which allows a tool to be completely tested prior to placing it in a molding press. Once placed in operation the Validation process proceeds automatically without operator intervention. Once all zones have been tested, the user has the option of saving the results on the controller. This file can later be viewed on the controller, or exported and viewed on a PC to be used as a baseline for future reference.

For Tool Validation to function properly, all zones must be under 212° F and in a settled condition. Once the controller has been configured for the tool, the validation process can be done on a test bench, on the floor beside the machine or anywhere convenient.

The Validation process works by applying a small set amount of power to each zone, one at a time and measuring the response during the time power is applied, thus it is able to detect cross-wired zones as well as being able to determine how the zone responds to power.

The following characteristics are checked: Cross wired zones - No load to heater - Open Thermocouple - Reversed Thermocouple - Heater Resistance (this determines the maximum current drawn by the heater when it is at 100% power)

The major difference between the VISIONS 3000 and others is that we control power. It is realized that all hot runner controllers control power to some extent, but in the VISIONS 3000 the primary emphasis is on power. It is power that produces heat and any temperature rise in the tool is a result of the application of power. Only with the proper control of power can temperature be properly controlled. With our competitors, the emphasis is on temperature with their flashy PID terms and statements of accuracy, with power being relegated to second place. In terms of understanding what is going on within the tool, we need to know the circumstances of power usage.

For example; in the Tool Validation Function, as well as the expected functions of Thermocouple Open, Swapped, Reversed and Reversed/Swapped detection, the VISIONS 3000 applies a measured amount of power to each zone in turn for a period of 1 minute. Within this time frame the response is measured and the results are shown on the screen. NOTE; the level of power applied to manifold zones is greater due to their larger thermal mass.

Given a group of, typical cavity zones with the same specifications, the application of the same amount of power should result in the same increase in temperature, in the same time frame, on all the zones. Any deviance will be the result of a fault within the heater, its installation (or perhaps, a misplaced thermocouple). This added insight into the functioning of the tool is invaluable to a toolmaker for determining operational characteristics and faults prior to installing the tool within the machine.

A complete tool diagnosis report can be printed for customer certification and a benchmark for future troubleshooting. The printout includes the following: Zone Number, Zone Name, Thermocouple Status, Heater Load Status (which includes Wattage, Current, Resistance, Test Temperature increase and Time to Perform the increase), thus providing an overall zone by zone tool status.

Toolset Database:
All set-up parameter values are stored in a toolset database. With no practical limit to the number of toolsets that can be stored on the VISIONS 3000 You can even assign more than one toolset to each tool if required, meaning that set-up procedures for different materials in the same tool can be easily stored and recalled.

Alarms:
The VISIONS 3000 controller can take various actions when an alarm condition is triggered:

During set-up, Alarms can be turned "on" or "off"; limits can be set, as well as the configuration of alarm actions

- **Alarm Actions:**
  o **Ignore** – No action is taken
  o **Alarm** – The controller set to trigger an external alarm relay which (if connected) will activate an external alarm, start the indicator light and stop the machine. In this mode the VISIONS 3000 will continue to maintain temperature with an Alarm Warning on the screen.
  o **Standby** – All zones placed in standby mode, the Alarm Relay is triggered and an Alarm Warning is displayed on the screen.
  o **Shutdown** – The VISIONS 3000 turns off all zones, the alarm relay is triggered and the alarm warning appears on the screen.
- **Types of Alarms:**
  o **Open Thermocouple** – controller cannot read temperature.
  o **Reversed Thermocouple** – temperature reading in not correct.
  o **Cold Thermocouple** – this unique feature has the ability to detect zones that, while they appear to control & respond normally, fail to increase in temperature when power is applied to the heating element. This fault is commonly caused by a thermocouple cable that has been damaged, causing a secondary junction. This secondary junction measures a temperature that overrides the reading of the correct primary sensor. With this feature active, the VISIONS 3000 can automatically detect this fault and switch off the power to

the heating element, preventing overheating and material degradation.
- o **No Load** – Should the heater fail, the VISIONS 3000 would normally detect this fault due to lack of current being drawn by the zone and indicate No Load on the screen. Where excessive current has been taken, it is common for the output fuse on the Power Card to fail. This is clearly indicated by the green fuse LED for that zone not being lit. Replacing the fuse will restore output and the green LED will light.
- o **Temperature Tolerance** – Tolerances can be set for individual zones to prevent the triggering global alarms. Each zone has its own trigger points and values assigned independently.
- o **Power Tolerance** (cavities only) – Individual heaters are constantly monitored for power consumption to determine if a heater is drawing more/less power than a set amount or average by similar cavities.
    - ▪ Any increase in demand is the first indication of a developing heater fault. This early detection is vital in preventing avoidable scrap.
    - ▪ Over power is also an indication of "tool bleed" for individual zones or the whole tool. Early detection can save significant tool repair cost & time.
    - ▪ Under power is an indication of the loss of water supply to the mold.
- o **Tool Motion** – If VISIONS 3000 is equipped with a machine interface, this unique feature can detect the cessation of production and automatically place the tool in standby mode, when it detects the tool stops moving. Can also be set to trigger if a minimum number of movements is not detected.
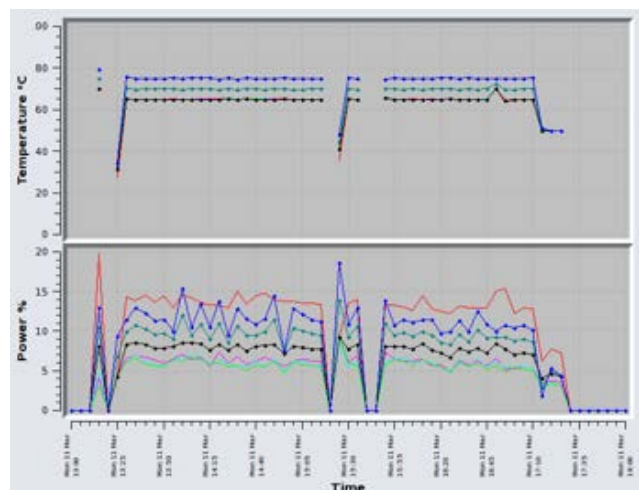
Graphs:

The written word can provide all necessary data (and more) to make intelligent decisions. But it takes time to review data. With graphs the information is visual allowing almost instantaneous identifications of potential problem areas, which than can be more thoroughly dealt with.

- • **Live Graph:**

    The live graph visually identifying poorly performing zones and review the effects of your zone tuning efforts. The VISIONS 3000 controller stores zone graph data for one year. The data stored is the minute-average data for each zone.

    - o The live graph shows the last minutes data (temperature & data) for up to 8 zones.
    - o You can pick the individual zones to be displayed.
    - o This information is updated once a second.
    - o Last hours data is updated once a minute.
    - o Upper graph show temperature
   - o Lower graph show current

- **Surface Graph**

This visualisation tool allows you to view the cavity zones as a 3-dimensional surface. It is useful for quickly comparing the performance of all of the cavities in one graph. All the cavities are visible as pyramids set against a baseline level which is the average.

You can view instantaneous view data which is updated live every second and you can rotate and zoom the view so that relevant zones are visible.

The data which can be visualised live are:
- o Power as a percentage of full power per zone,
- o Power in Watts
- o Temperature

The images below show an 8 cavity tool which has stabilised at setpoint. The data being graphed is the %-power average. You can see from the first image that 2 zones require more power than the others while the second image, which has been rotated, reveals that one zone requires considerably less power.
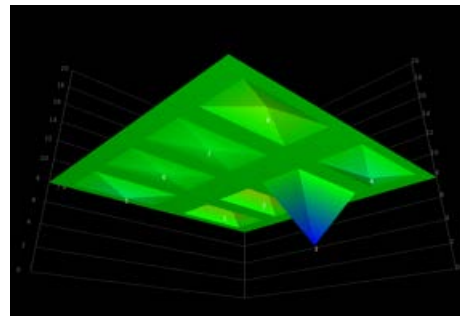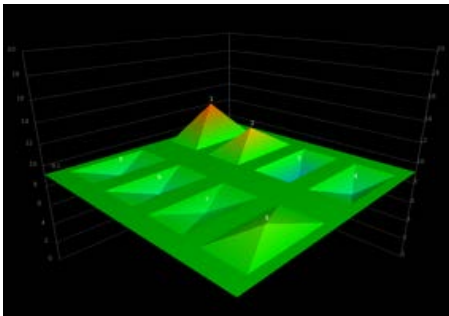
Data Log:

The VISIONS 3000 can save within its data base a full 12 months of production history; this includes virtually every keystroke for set-up and parameter changes, graphs, Alarms, etc.

- **Event Log:**

  The event log is a record of changes to the controller status over time, up to one year of history for the following events:
    - o System events, such as when controller was started
    - o Controller events, such as boost
    - o Set-up changes
    - o Alarms
    - o File Access
    - o User events, such as when a user logs in

  When an event occurs, the VISIONS 3000

Event Log (all events) 2013-05-01

Wed May 1 2013 08:28:50 : Default User logged on: 'Supervisor'
Wed May 1 2013 08:28:52 : Initialising Controller Hardware
Wed May 1 2013 08:28:52 : Initialising Relay Interface (Relay Open)
Wed May 1 2013 08:28:53 : Hotrunner controller found. Communications are up.
Wed May 1 2013 10:08:31 : Entering Monitor-Mode - starting controller. User:'Sup
Wed May 1 2013 10:08:31 : Sending setup 'test.efi' to controller.
Wed May 1 2013 10:08:32 : Entering Run-Mode (No Manifold Preheat). Starting co
Wed May 1 2013 10:09:27 : Leaving Run-Mode - entering Monitor-Mode. User:'Sup
Wed May 1 2013 10:09:29 : Leaving Monitor-Mode - stopping controller. User:'Sup
Wed May 1 2013 10:10:05 : Setup file 'Settings/8Cavities0Manifolds.efi' saved.
Wed May 1 2013 10:10:12 : Setup Changed: 'Number Of Manifolds: 0'
Wed May 1 2013 10:10:14 : Setup file '*8Cavities0Manifolds.efi*' saved.
Wed May 1 2013 10:10:17 : Setup Changed: 'Number Of Cavities: 8'
Wed May 1 2013 10:10:19 : Setup file '*8Cavities0Manifolds.efi*' saved.
Wed May 1 2013 10:10:40 : Setup file 'Settings/8Cavities0Manifolds.efi' saved.
Wed May 1 2013 10:10:44 : Entering Monitor-Mode - starting controller. User:'Sup

places a time-stamped message in the log. The history of all previous messages can be

recalled from the archive, so if you know the date of a particular problem, you can look it up in the log. The log can be exported to a USB drive.

- **System Log:**
  These are messages about software versions, when the controller was started and various communications and serious hardware error messages.

  System Event Log 2013-05-01
  ****
  Wed May 1 2013 08:28:48 : System Started. Version 2.11a.
  Wed May 1 2013 08:28:48 : Loading Settings from file 'test.efi'
  Wed May 1 2013 08:28:52 : Initialising Controller Hardware
  Wed May 1 2013 08:28:52 : Initialising Relay Interface (Relay Open)

- **Controller Log:**
  Whenever the controller is put into monitor mode, soft start, diagnostics, etc., a message of this type is entered into the log. Serious communications errors are logged here.

  Controller Event Log 2013-05-01
  Wed May 1 2013 13:36:56 : Ending Soft-Start. Stopping Controller
  Wed May 1 2013 13:36:57 : Entering Monitor-Mode - starting controller. User:'Sup
  Wed May 1 2013 13:37:00 : Entering Run-Mode (No Manifold Preheat). Starting cc
  Wed May 1 2013 13:37:24 : Fatal: Communications with hotrunner controller are
  Wed May 1 2013 13:37:42 : Hotrunner controller found. Communications are up.

- **Set-up Log:**
  Changes to the current set-up are logged with these messages. This includes most of the changes possible in the set-up dialog as well as setpoint or mode changes.

  Setup Event Log 2013-05-01
  Wed May 1 2013 10:11:14 : Zones 1 to 8 renamed.
  Wed May 1 2013 10:11:26 : Zones 1 to 8 renamed (indexed).
  Wed May 1 2013 10:11:55 : Setpoint Changed: 'Temperature: 65°C for Zones: 1-8
  Wed May 1 2013 10:20:32 : Setpoint Changed: 'Temperature: 40°C for Zone: 3'
  Wed May 1 2013 11:26:06 : Setpoint Changed: 'Temperature: 65°C for Zone: 3'
  Wed May 1 2013 13:52:38 : Setup Changed: 'Cavity Power Limit: 70%'
  Wed May 1 2013 13:52:54 : Setup Changed: 'Alarm Action (Power Tolerance): Igno

- **Alarm Log:**
  Alarm conditions are logged when they are triggered and when they are dismissed, either by the user or naturally (e.g.: the temperature-tolerance alarm). The state of the alarm relay is also logged.

  Alarm Event Log 2013-05-01
  Wed May 1 2013 13:40:33 : User Cleared Alarms.
  Wed May 1 2013 13:40:41 : *** ALARM *** Zones 1-4,7,8 are out of temperature-tolerance. Action: Alarm
  Wed May 1 2013 13:40:49 : *** ALARM *** Zones 1-8 are out of temperature-tolerance. Action: Alarm
  Wed May 1 2013 13:40:57 : *** ALARM *** Zones 3-8 are out of temperature-tolerance. Action: Alarm
  Wed May 1 2013 13:41:13 : *** ALARM *** Zones 1-8 are out of temperature-tolerance. Action: Alarm
  Wed May 1 2013 13:41:13 : *** ALARM *** Zone 2 is out of power-tolerance. Action: Alarm
  Wed May 1 2013 13:41:21 : *** ALARM *** Zones 1-3,5-7 are out of temperature-tolerance. Action: Alarm
  Wed May 1 2013 13:41:21 : *** ALARM *** Zones 1,2 are out of power-tolerance. Action: Alarm
  Wed May 1 2013 13:41:29 : *** ALARM *** Zones 1-2,5,6 are out of temperature-tolerance. Action: Alarm
  Wed May 1 2013 13:41:45 : *** ALARM CLEARED *** All Cavities are within power-tolerance.
  Wed May 1 2013 13:41:45 : *** ALARM *** Zones 1-2,5 are out of temperature-tolerance. Action: Alarm
  Wed May 1 2013 13:41:53 : *** ALARM *** Zones 1,2 are out of temperature-tolerance. Action: Alarm
  Wed May 1 2013 13:41:56 : *** ALARM CLEARED *** All Zones are within temperature-tolerance.
  Wed May 1 2013 11:26:26 : Alarm conditions cleared (Relay Closed)

- **File Log:**
  These messages log any file operations, including exporting or importing files. Messages here referring to setup files with asterisks (*) in their name are automatic backups of the current setup file. These occur when a user makes a setup change.

  File Event Log 2013-05-01
  Wed May 1 2013 14:12:46 : Setup file '128Zone.efi' loaded.
  Wed May 1 2013 14:13:02 : Setup file '150Zone.efi' loaded.
  Wed May 1 2013 14:13:38 : Setup file '*150Zone.efi*' saved.
  Wed May 1 2013 14:13:48 : Setup file 'Settings/150Zone.efi' saved.
  Wed May 1 2013 14:14:08 : Setup file 'Settings/150Zone4Water.efi' saved.
  Wed May 1 2013 14:14:27 : File '150Zone4Water.efi' exported to USB device and
  Wed May 1 2013 14:15:58 : History File exported to USB device and saved as 'EFI
  Wed May 1 2013 14:16:47 : Setup file '150Zone.efi' deleted.
  Wed May 1 2013 14:17:01 : Diagnostics report 'test1.txt' deleted.

- **User Log:**
  When users log on and off, a message is entered into the log.

User Event Log 2013-05-01

Wed May 1 2013 08:28:50 : Default User logged on: 'Supervisor'
Wed May 1 2013 12:36:54 : User Changed to 'Operator'
Wed May 1 2013 12:48:08 : User Changed to 'Supervisor'
Wed May 1 2013 14:28:25 : Setup Changed: 'Default User: Setter'
Wed May 1 2013 14:29:42 : Screensaver timeout; changing user to 'Setter' (Def

Water Flow Monitor Option:

The VISIONS 3000 can be fitted with optional apparatus with will allow the system to monitor the flow rate and temperature of cooling water through each cooling zone in the mold. Often overlooked by many molders, the efficiency of mold cooling is critical to a stable molding environment. The VISIONS 3000 when outfitted with the Water Flow Monitoring option can protect the mold and improve production by quickly identifying cooling impediments and alerting the user to common cooling circuit problems, such as:

- No water flow from the water source
- Blocked water channels
- Scale or rust build up
- Incorrect piping

Data Log:

Just as with our hot runner control zones, the VISIONS 3000 can store and retrieve all operational water temperature and flow data for a period of one year.

The VISIONS 3000 Water Flow Monitoring System is compact, simple and to install, consisting of:

- A Smart Manifold which contains sensors for temperature and flow rate monitoring. The Smart Manifold can be mounted directly on mold or platen. Smart Manifolds come in 4, 8 & 12 zone configurations. For more zones, the Smart Manifolds can be electrically daisy chained together.
- There is a single cable which is hard wired to the manifold that runs to the VISIONS 3000 System
- The VISIONS 3000 will have interface circuitry installed which will interpret data for display on the VISIONS 3000 screen.

Alarms - The VISIONS 3000 controller can take same alarm actions as with hot runner controlled zones:

- **Ignore**
- **Alarm**
- **Standby**
- **Shutdown**

Alarm Actions - Just as with our hot runner temperature controlled zones, the VISIONS 3000 can be configured to take action when one of the water-zone limits is exceeded:

- **Open Thermocouple -** The controller cannot read a water-zone's temperature.
- **Reversed Thermocouple -** The temperature readings from the water-zone are incorrect.
- **Temperature Over-Limit and Under-Limit -** The water-zone's temperature is out of limit.

- **Open Flow-Sensor -** There is a problem with the sensor, or the cable connecting it to the controller.
- **Flow-rate Over-Limit and Under-Limit -** The water-zone's flow-rate is out of limit.

Zone Configurations - You are able to configure each water zone to meet the requirements of the particular mold:

- **Zone Type** – You can configure to monitor just Temperature or just Flow rate, or most commonly to monitor both temperature and flow.
- **Flow Sensor (Maximum and Minimum** – These settings should match the full-scale value of the sensors used.
- **Flow Sensor Offset & Calibration** – These settings are performed by ITC and should not be changed except by ITC.
- **Flow Limit (Maximum & Minimum) –** These are alarm levels. If the flow-rate exceeds the maximum or falls below the minimum, an alarm condition is triggered. This condition can be configured for the controller to take selected action when the alarm conditions are met. A good use of the minimum level alarm is to ensure that the tool is not heated without the water turned on.
- **Temperature Limit (Maximum & Minimum) –** These alarm levels refer to the zone's water temperature.