User Manual for
MTS Console
with HRC-X Controller

KEEP THIS SHEET SOMEWHERE SAFE

(Some areas of the controller software
are password protected.)

Every machine leaves our factory with two levels
of password protection. We recommend that you
change these as soon as possible to establish your
own security.

System Password - LINUX
User Password - UNIX

User Manual for MTS Console

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This manual is intended for use with the MTS Console and HRC-X Controller
(Serial No...................) with which it was supplied.
(Where fitted, this controller is supplied with Alarm Key Switch Number.............)

This manual is written and prepared for Software Version – 5th September 2007

Publications

Issue	Date	Changes	Author	Authorised
1.0	15/7/97	First formal Issue	BNM	AR
2.0	7/11/97	Revised to incorporate software developments	BNM	AR
2.1	15/3/99	Revised to incorporate software developments	DH	AR
3.0	11/6/99	Manual Revision. Includes recent minor software changes.	DH	AR
3.1	12/8/99	Switching On/Off and disconnecting console details added.	DH	AR
3.2	19/8/99	Error messages updated.	DH	AR
3.3	20/9/99	Changes to Chilled Water control and SPI devices added.	DH	AR
3.4	05/01/00	Special Limits - RTD & Water are made pro-active.	DH	AR
3.5	06/09/00	Changes to troubleshooting section because surface-mount control cards now have T/C input fuses.	DH	AR
3.6	21/09/00	Introduction of QwikFix Appendix	DH	AR
4.0	23/01/01	Introduction of EasyView Page to Touchscreen Console and separation of TS and TSi manuals	DH	AR
4.1	13/02/01	Graph page selection increased from six to twenty zones.	DH	AR
4.2	21/01/02	Configure Controller Options changed for Boost Command and Display Option.	DH	AR
4.3	11/02/02	Cable mis-wiring disclaimer added.	DH	AR
4.4	15/02/02	Extra instructions for using Setup page to make group settings.	DH	AWR
5.0	March 2002	- C and K manuals merged - Run controls moved to main page - main page has 40 -160 zone display options - EasyView mini-panel display controls changed . Boost & Standby controls moved from Global to autonomous zones. - New Master Only Startup mode introduced - New remote option for Boost or Standby - Utilities-Mode sub page removed. - New Other Help in Troubleshooting - Network facility Introduced	DH	AWR
5.1	July 2002	Password "timer-override" introduced	DH	SK
5.2	Aug 2002	Zero Power note added	DH	AWR
6.0	Jan 2003	New Setup page and Setting up procedure	DH	SK
6.1	Jan 2003	Communication Speed added	DH	SK
6.2	Feb 2003	Export Data has Zone Min-Max feature added	DH	SK
6.3	Mar 2003	Qwikfix repair no longer required - Append D removed	DH	SK
6.4	April 2003	KTS Console Function explained	DH	SK
6.5	April 2003	TC Offset and Zone-Grouping introduced	DH	AW
6.6	May 2003	Individual Zone Boost	DH	SK
6.7	Sept 2003	Extra Boost Information	DH	SK
6.8	Dec 2003	Input Network Screens Introduced.	DH	SK
7.0	Feb 2004	Stage Startup introduced and Configure Controller changed substantially for new Systems Options	DH	SK
8.0	Jun 2004	- Introduction of Standby Delay facility - Introduction of Shut-down timer - Introduction of Spear Standby - Zoom page and Calibrate Touch function added to	DH	SK

		MTS - Introduction of T/C Fail option in Setup page and changes to "Master Zone Selection" - Introduction of extra Display Data page on MTS console and withdrawal of Set, Actual and Power columns from Setup page - SPI Interface control added to MTS Console		
8.1	Mar 2005	Extra connection information added to IO cards in Appendix B	DH	ARW
8.2	Apr 2005	New Appendix items AI8 (Analog Input Card) and WM0x (Water Manifolds) added to K-Series Appendix.	DH	ARW
8.3	Apr 2005	New information added regarding the KM series case for Water Manifolds	DH	PK
8.4	May 2005	Extra information about "Allow ToolLoad" option greying out [Load] button on ToolStore Page	DH	AWR
8.5	July 2005	- Printer Utility allows connection to networked printers. - Extra instructions for upgrading via network connection	DH	SK
8.6	Aug 2005	Autostandby function replaces Spear Standby Function in Setup page configuration	DH	IE
8.7	Aug 2005	Shutdown Stages are introduced so that Staged Shutdown may switch off in a different order to Staged Startup.	DH	IE
8.8	Sep 2005	More information about updating an MTS console without USB, along with instructions for using a simple FTP program.	DH	SK
8.9	Oct 2005	ToolStore increased to 5 banks of 20 slots (100 tools) with extra selection controls.	DH	IE
9.0	Oct 2005	"Demo" facility added for training or demonstration use.	DH	SK
9.1	Sep 2006	Facility to Save "All Tools" added to ToolStore	DH	IE
9.2	Dec 2006	C-Series option removed from Manual	DH	DH
9.3	Mar 2007	Auto Detect removed from Utilities page to Tool Page (New Tool)	DH	IE
9.4	Apr 2007	Pages changed to align with KTS manual where there are similar functions Appendix A Wiring standard includes Dual Supply option	DH	IE
9.5	June 2007	Individual Setup information added to Setup and Config pages.	DH	DH
9.6	Sept 2007	Configure IO board has new interface on Utils page	DH	IE

Contents

Introduction

Specification

The following are general specifications. The actual controller/console supplied may have contractual variations and differ in some specified options.

Supply Voltage	415 Volts 3 -phase 50/60 Hz with neutral. Other available include 240/380/400 and 480 volts in Star or Delta configuration.
Voltage Bandwidth	Stable within (20% supply voltage swing
Supply earth-leakage trip	300mA (note: this is for tool protection)
Overload protection	Miniature Circuit Breaker
Mains Voltage output pattern	Burst-fired with zero voltage crossover
Low Voltage output pattern	Typically 24 volts AC. User configurable between burst-fired or phase-angle.
Low voltage transformer	1.2 kW with optional upgrade to 2 kW
Output overload protection	High-speed semiconductor fuse links
Temperature control method	Closed-loop (Auto) or open-loop (Manual) with HR Software
Control range	0 - 472 Centigrade (Celsius), 32-881 Fahrenheit
Temperature Scale	Centigrade (Celsius) or Fahrenheit
Printer Output Connector	USB Port
Data Communications	RS-232 serial, DB9 male connector
Alarm Output	Closing Contact Relay 5 Amp max
T/C Tool Connector	Harting type Han A or equivalent
Heater Tool Connector	Harting type Han E or equivalent

Safety Instructions

DO NOT enter the cabinet without first ISOLATING the supplies -there are unguarded terminals inside the cabinet which may have a dangerous potential across them.

Where a three-phase supply is used then this potential may be at 415 volts or higher.

Safety Notices - an explanation

Within this manual, safety instructions are marked as follows:

A WARNING symbol and message, shown here, identifies where there may be a hazardous situation which, if not avoided, may result in death or injury to personnel.

Most warnings pertain to electrical aspects and you must comply with them to minimise any personal danger.

A CAUTION warning identifies where there may be a hazardous situation which, if not avoided, may result in damage to property.

Caution warnings present no personal danger, but may cause the equipment to fail or lose its memory.

Welcome

PMS welcomes you to their HRC range of temperature controllers for hot runner injection moulding tools. This particular member of the proven family of Hot Runner Controllers is user friendly and retains the standard control facilities associated with other PMS controllers.

About the controller...

The display console and controller cabinet together are designed for use in the plastic injection moulding industry as temperature controllers for third party hot runner systems as commonly used in mould tools. They must not be used in residential, commercial or light-industrial environments. Furthermore, they must not be used in an explosive atmosphere, or where there is a possibility of such an atmosphere developing.

About the manual...

The following table describes the various user-sections.

Section	Description
Introduction	The first part of this manual contains a brief technical description of the console and the cabinet followed by Safety Instructions and Installation notes. The Introduction pages introduce the various interface screens that are found within the Console and then describe the operating philosophy that facilitates precision temperature control
Setting up your controller	This section describes how to set up the controller from basic steps, as if it were to be used in a new environment. Normally all new controllers are supplied with all the Set-up details ready configured to your needs. However it would be necessary to consult these pages should you ever need to reconfigure a controller to a new tool or environment.
Running your controller	This section is for operators - it describes how to Start, Stop and Pause the heating load. It deals with making temperature changes and describes how to interrogate the controller about past performance. The final pages of this section describe the various alarms that may be displayed on the controller.
Customising your controller	This section describes how to use the ToolStore to save permanent changes to tool settings. These may be required either to use the controller on different moulding tools or to save and recall other settings.
Maintaining your controller	Maintaining your controller is mostly concerned with keeping it in order, checking records and settings and running self-diagnostic checks. As there are no user serviceable parts inside the Touch Screen controller then electro-mechanical maintenance comprises mainly of keeping the unit clean and changing air filters.
Trouble-shooting	This final section lists the various Error messages that may be displayed along with possible causes and actions. It also has guidance for some possible faults and details about fuses and replacing them.

Where to use this equipment

The display console and controller cabinet together are designed for use in the plastic injection moulding industry as temperature controllers for third party hot runner systems as commonly used in mould tools. They must not be used in residential, commercial or light-industrial environments. Furthermore, they must not be used in an explosive atmosphere, or where there is a possibility of such an atmosphere developing.

The HRC cabinet and Touch Screen console should be installed in a clean dry environment where the ambient conditions do not exceed the following limits: -

- Temperature   0 to +35°C.
- Relative Humidity   90% (non-condensing)

When in use this equipment does not emit audible noise in excess of 10dbA.

Controller - Tool Connections

If the main power switch for the controller has a red handle on a yellow plate, then the controller should be connected to an independent supply that stays live when the main moulding tool is switched off.

If the controller has a black handle on a silver/grey background then you should connect it to a sub-circuit of the main tool, so that the controller is isolated when the main tool is switched off.

The various connections, between the controller cabinet and your system, using the cables supplied with the equipment, are shown in the looms, or cable data sheet, and Appendix A.

Equipment failure through mis-wiring

Before you energise the system, pay special attention to how the supply to your controller is wired and how it is connected to the mould.

Lack of attention to detail causes errors such as:

* incorrect wiring of mains supply phases into the controller

* crossing heater supply feeds with thermocouple detection (although this error can be eliminated by the adoption of PMS Standard connections)

In such cases wiring errors have caused equipment failure.

PMS Systems Ltd cannot be responsible for damage caused to the controller by customer wiring and/or connection errors.

Controller Power Supplies

The control cabinet can be manufactured to accept a wide range of supplies and sequence of phases. Refer to the serial plate in the controller cabinet for confirmation of the supply requirements. If the local supply is outside the specified range please contact PMS Systems Ltd for advice.

Tel:+44 (0)1432 265768   Fax.: +44 (0)1432 263782.

Isolating the Controller

The main Power Switch is sufficiently rated to disconnect the total load current during switch On and switch Off. To prevent its operation, during maintenance, you can use a suitably- sized padlock, or similar device, to lock the switch in the Off position.

Although the main switch has the capacity to switch the whole system Off, we recommend that you only do this in an emergency situation. Your console and cabinet uses computer technology and you should normally switch the system off in stages, as detailed below. A sequenced method, for switching On and Off, protects the console and keeps the switched load to a minimum to extend the life of the main Isolator.

0° C/F or 0% Power is NOT Switched Off

The heat of a nozzle is proportional to the applied current. Setting any zone to zero degrees temperature, or 0% power, means that only the current is reduced to zero. However, the current-control is not a breaking-contact switch but a semi-conductor device known as a Triac. This means that, at zero current, there may still be some voltage at the nozzles.

On a single phase, or 3-phase star supply with a neutral, the triac is on the live side of the supply - this keeps residual voltage to a low value. However, on a 3-phase delta wired supply there will be phase voltage on the nozzle while the controller's main isolator is On, even when the heating is set to zero degrees, 0% or Off.

ALWAYS isolate the controller before you open up a controller to examine any wiring or change fuses. Remember that, with respect to the mains supply, 0% power is NOT Off.

Switching On and Off

Switching On

Switching ON the Main Isolator for the controller may, or may not, start to heat up the zones; it depends on how the Console-Startup option is configured. (see page 48).

If Console startup is set to "Stop" then the tool remains at zero power and at room temperature. If it set to any of the other three options (Startup, Standby, or Run) the controller applies power to the zones so that they heat up.

Switching Off (or Shutting Down)

We recommend that you use the console to shut down the heating load, and only use the main isolator to switch off a dormant controller.

1. Shut down the heating.

On the main page, select the [**Stop**] mode and reduce the heating to zero.

2. Shut down the Console

On the Utils page, touch the [**Exit**] button and this will shut down the Console Computer.

3. Shut down the Controller

Finally, use the main power switch to isolate all the power to the whole system.

The Touch Screen Family

There are several variations of our leading Touch Screen Consoles and while they share the same user interface there are one or two operating differences, of which you need to be aware.

Differing Storage media

The TS, KTS and MTS consoles use different media for backing up and restoring tool settings. The TS variety uses a standard 3½" floppy disk, and the KTS uses compact flash (CF) cards via a PCMCIA adapter, while the MTS can use a USB Flash Memory stick for exporting and upgrading.

Differing drive bay access

Different Consoles also have different locations for their drive bays, some of which are immediately apparent and some a little less so.

KTS – drive bay is accessed through an opening door at the top of the case and immediately behind the handle.

TSA – drive bay is open and visible at the left hand side (viewed from the front)

MTS - Uses USB Flash Memory Stick into USB Socket on the underside of the console.

X-Series Controller Cabinets

The power supply to the control cabinet is via a bulkhead mounted 3-pole plug wired in star or delta configuration. (Please check your specification for details of which configuration has been supplied.) Connections to the tool are by looms terminating in Harting type Han A or E female connectors or their equivalents. There are normally two types of looms supplied; a thermocouple loom using type HA and a heater supply loom, using type HE and typical connector and wiring details are show in Appendix A.

An alarm output option is available for extending the alarm or, perhaps, inhibiting the injection process.

A USB printer port may be provided for producing hard copies of certain screens. Again, please check with the system specification for details.

Controller Cards

There are two boards mounted inside the HRCX cabinet. The larger main output control board, with the triacs, heatsinks and current measure coils, controls the output power and hence, the zone temperatures. Then there is a smaller input board which accepts the thermocouple inputs and uses its single CPU to control the main output sections. The two cards together have four main components:

- thermocouple amplifier,
- CPU,
- multi-voltage output triac.
- current measuring coils that read zone output current.

Thermocouple Amplifiers

All our cards are provided with one of two possible thermocouple amplifiers. One is designed to handle type J thermocouple inputs and the other, type K inputs.

Central Processor Unit (CPU)

The CPU provides the following facilities: -

- closed and open loop control of the zones,
- communicates settings and thermocouple readings over the data link to the display micro-processor
- checks for alarm conditions, including blown output fuse(s), incorrect thermocouple wiring, zone over temperature condition, heater not responding to controller output and generates alarm information for the display screen and alarm relay (if fitted),
- controls the output power to both the on-board and off-board triacs using a number of self-tuning algorithms,
- continuous monitoring of a reference voltage signal on the bus and adjusts the on-board or off-board triac output to compensate for fluctuations in the supply voltage. the system can accommodate up to 30% swings in the supply

Burst firing is normally used in systems operating at mains voltage and phase angle firing in low voltage systems.

The card requires no analogue calibration and is ready for use once set up from the display console.

Output Triacs

The HRC-X is built as either a 6 or 12-zone controller. All the output triacs are mounted directly to a single main heatsink which ensures that each zone is capable of controlling a full 15 Amps.

Power Supply Units (PSUs)

The main low voltage power supply unit in the HRX is located on the main output board. It has two accessible input fuses to protect the supply. In the event of a ruptured supply fuse then the controller should be turned OFF and isolated from the mains supply before they are replaced. Replacement fuses should be of the same type with the characteristics.

How the Controller Works

PMS controllers are designed to perform in closed and open loop configurations. However, we consider that the normal operating mode is closed loop.

Whenever the controller is set to start, the system goes into the following self-calibration routine.
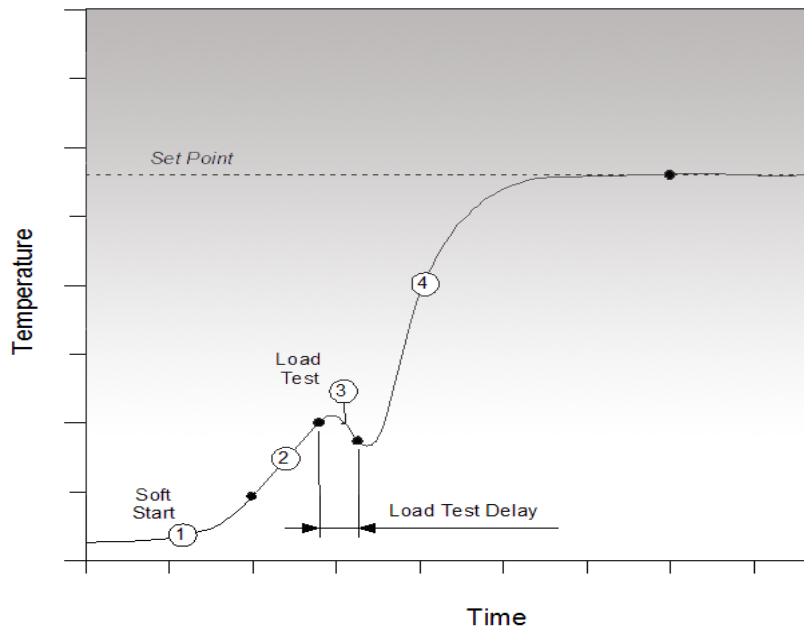
1. The zone controller slowly ramps up the heater power and simultaneously looks for a positive temperature change at the thermocouple input. The controller verifies the actual rate of rise against a predetermined value. Power is slowly increased until the correct rate of rise is achieved.

2. The controller now increases the zone temperature at a constant rate of rise until the temperature reaches about 110°C (230°F).

3. At 110°C the controller performs a Load Test on the zone heater to check its thermal characteristics. The output power is reduced to zero for a test period and the temperature monitored for a response. From all this information, the controller has built a mathematical model of the heater characteristics and so it can automatically select a Fast, Medium or Slow response heating program that suits the tool. This allows more efficient control of the zones.

4. The controller continues to ramp up the temperature to the set point, which should be achieved with minimum over-shoot.

5. Having built a virtual model to map the tool and heater characteristics, the controller can maintain the temperature at an accurate point with virtually no deviation.

Watchdog feature

The controller card CPU has a watchdog timer that must be reset by the system every 3 milliseconds. If for any reason the software fails to reset the timer, the zone power is set to zero to protect the tool against over-heating. The controlling card resets to the auto-tune procedure and power is increased in progressive steps until correct temperature control is re-established.

Screen Layout and Navigation

The main page has a [**Menu**] button at the bottom of the side buttons that activates the navigation screen.

From this screen you can access the other screens which are:

Toolstore – to select other tool options

Diagnose – for self-diagnostic testing

Utilities – to set up essential global parameters

Setup – to configure specific tool parameters

Help – to access the online manual

Back – to return to the Main page

On the right hand edge of each page are the various buttons which access the many functions. While most buttons do change between pages, some are common such as [**Print**] and [**Help**].

At the bottom of the every page there is a status line, which indicates the current Working Mode and the Alarm Status of the controller. Between the two is a Message bar, which will be used to display other relative information such as:

- Display Group information
- Password Prompts
- Toolbank information

Most of the functions can be operated by using your finger-tip to touch particular areas of the screen. However, some functions, for instance the keyboard and key pads, and on-line help, have areas which may be difficult to select unless you use a suitable touch-screen stylus.

Mode and Status Windows

The Mode window flashes whenever the system is in an abnormal state such as Stop, Standby, Startup, Shutdown, Boost or Testing. Only Run Mode shows as continuous.

The Status window shows whether the system is a Normal healthy condition. If not, it shows a Warning, or Alarm Status.

The Main Page

The main page shows a presentation of 20 zones at a time. If you have more than 20 zones then you can use the [**PgUp**] and [**PgDn**] to scroll the display to other zones, or the [**Display**] button to see more zones on the screen, but with reduced information.

The control buttons at the side can change according to your immediate needs.
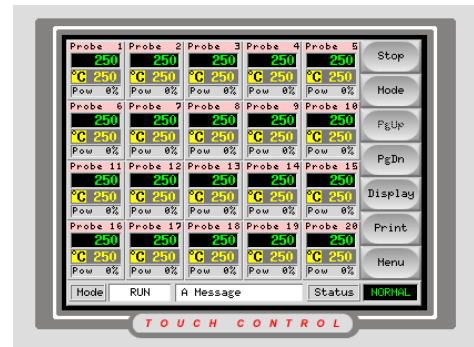
- While the page is idle (no zones selected), you can use the top two buttons to select the operating mode of the controller.
- You can use the [**Display**] button to alter the number of zones seen on the main page.
- If you touch any zone, in readiness to change values, then the control buttons change to [**Set**], [**Zoom**], [**Graph**] and [**Cancel**].
- If you touch the [**Menu**] button then a Menu list appears from which you can select other pages or an On-Line help facility.

Zone Status Information

At maximum resolution each zone displays a full control-panel that carries four pieces of information:

1. **Zone Header** - this carries the name, or alias name, of the zone against a colour coded background.

2. **Actual temperature** - which changes colour to show status:
   Green on Black – Healthy
   Black on Yellow- Warning (1st stage temperature deviation)
   White on Red - Alarm (2nd stage deviation or Fault message)

3. **Temperature scale** (C – Celsius or F – Fahrenheit) and Set Temperature. The only other value that may be seen here is L which is a water flow zone with flow in Litres per minute.

4. **Power Level** - this shows the percentage power that is being applied to the zone. Note that, in normal Burst Fire mode, power is a function of time as opposed to current. So, a power rating of 50% means that full load current is being applied for 50% of the time, and that the rest of the time it is running at zero power. The actual time period for on and off is very brief and, at 50% power, it would be switched on and off for approximately 0.15 seconds at a time.
   For a spear/tip probe, the displayed power is different again. During the pre-heat (gate closed) period, the power displayed refers to the power in the main body of the nozzle (still on a time function, as above). When a Boost signal is received it then indicates the power in the tip of the nozzle. At a similar time, the Status indicator at the bottom of the page switches from RUN to BOOST. Although there may be some apparent discrepancy between the actual boost period and the displayed boost period in the Status window, the Boost Display is explained in detail on page 77.


If a zone is switched off then an Off Switch is shown below the Zone Name.

Main Page Options

If you want to see more than 20 zones at any one time then you can change the main page to show more zones with less information. The sixth Function button has a dual function and, while no zone is selected (no blue highlight showing), touching the [**Display**] button will cause the main page to cycle through 20, 35 and 60 zone display s shown below.

20 Zones - each zone shows Zone name, Set and Actual temperature and Power setting

35 Zones - each zone shows Title and Actual

60 Zones - each zone shows Actual Temperature

After 60 zones, the next touch on the [**Display**] button reveals a Data page which shows the setup data for all the console zones. As well as Set and Actual temperature values, it also shows the power used on each zone and, if current coils are fitted, the main and leakage current in each zone.

Main Page Options - Zone Grouping Display

If you use a controller for a multi-part tool, it may be more convenient to show the display page with zones grouped as in the tool. To show this option here are some typical screen shots from a two-colour 16+16 zone tool. This would normally show the first 20 zones (all of colour 1 and some of colour 2) on the first page as shown below. Scrolling down would show the rest of colour 2 on the second page.

Page 1 – both colours
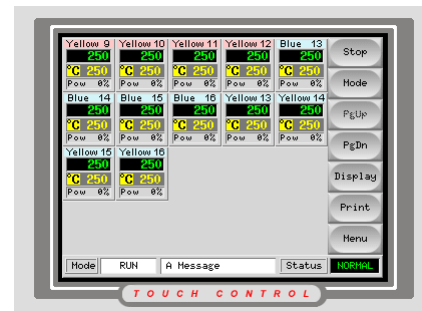
Page 2 – rest of second colour

By using the Zone Grouping feature, that is described on page **Error! Bookmark not defined.**, the new display would be as shown below.
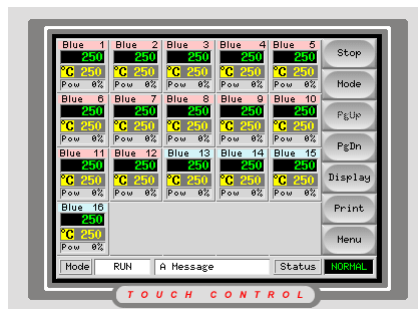
Group 1 – First Colour

Group 2 – Second Colour

Note that this display option cannot be switched between Grouped and Ungrouped on the main page. Once it has been configured on the Setup Page then it remains as the preferred display option. However, the [**Display**] button on the main page still functions in its own right and so the number of zones, and the amount of displayed information, still alters to accommodate more zones on each touch of the button.

Main Page Options — Coloured Headers

Where required, you can change the preset zone header colours. A facility within the Setup Configuration allows you to pick from any of 16 different preset colours that you can use for any zone type.

Main Page — Other functions

Once you select any zone within the main page the buttons at the side change to offer more functions:

a) Set

Touch [**Set**] to bring up the keyboard ready to set the working temperature or mode.

b) Zoom Page

Touch [**Zoom**] for this page which shows:

* live data for the Actual, Set and Power levels for the selected zone in the upper half

* a table with the zone data from the setup page in the lower half.

c) The Graph page

Touch [**Graph**] to see a page with graphs, showing temperature against time, for up to six zones at a time.
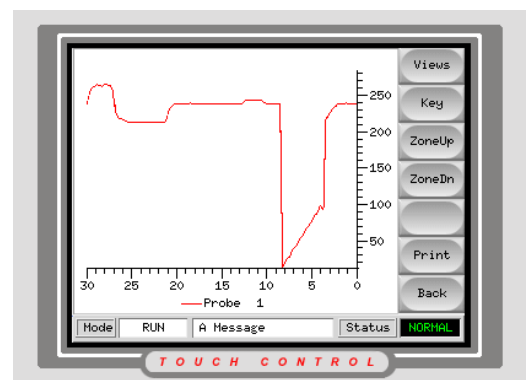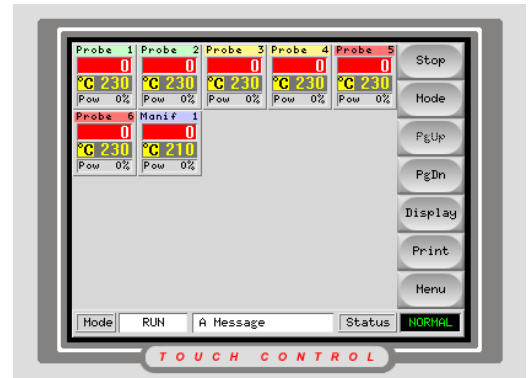
Other pages accessible from the Navigation Screen

The ToolStore page

ToolStore is a tool bank in which you can store up to 100 tool configurations. It also enables you to backup tool settings to storage media and restore them to the controller, whenever they are needed again.

The status of the displayed tool configuration is colour coded to indicate:

Black   The store has a name but holds no data.

Blue   There are settings saved in this tool bank.

Purple   A tool that is currently being used with saved data.

Red   This indicates a tool that is currently being used but whose data has been modified and so, is different to that held in the store.
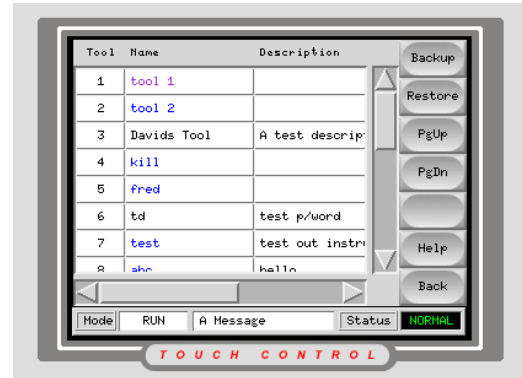
The Utilities page

The Utilities page contains:

* Access to inspect and configure all the System Parameters such as Language and Passwords.

* An [**Export**] facility that can export recent zone temperature data as a CSV (Comma Separated Value) file which can be displayed in a spreadsheet.

* An [**Exit**] button that is the correct means of shutting down the console prior to switching off the main Isolator.

The Diagnose page

This utility allows you to carry out a series of defined tests to check zone performance, interaction, heater wiring and thermocouple integrity. This is a perfect tool for checking the condition of any mould tool after initial commissioning or any major maintenance.
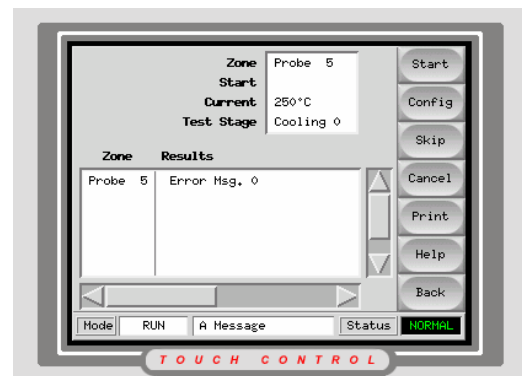
The Set-up page

The Set-up page is concerned, mainly, with setting up your system. It displays all the tool setting information on a single scrollable screen that may be printed out to provide maintenance and installation records.
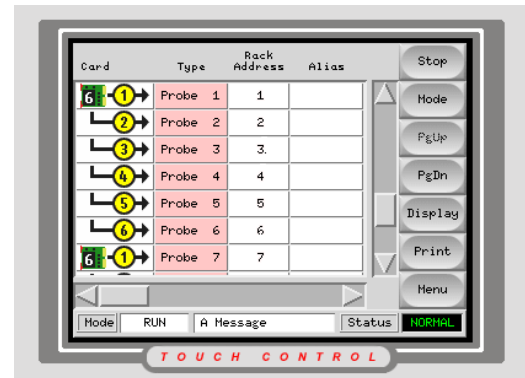
The Help Pages

The touch console has a full help section that offers help on all aspects of the console, the controller and all its functions.

The general Help menu can be reached from the Help menu button on the main page. Other pages have help buttons that link into the relevant sections.
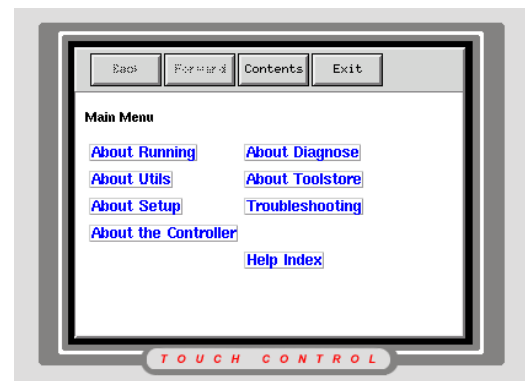
The User Interface

There are many places within the setting up and operating procedures where the system needs your input. It may require either alphabetic entry for Passwords or tool names or numeric entry for temperature settings or various limits. Whenever such an input is needed then the controller will bring up either the Keyboard or the Keypad as an interface for your input.

The Keyboard

It is a standard QWERTY layout with touch-activated keys. Touching the keys enters the particular character into the display line: the [**back space**] button deletes them, starting from the last entry.

To use the Shift key you may:

- Touch it once - which initialises the next letter and then returns to lower case, such as in "Names"
- Touch it twice - which causes it to "LOCK-ON TO UPPER CASE"
- Touch it once more to reset all letters to continuous lower case

When you have finished typing then touch either:

- [**Enter**] to enter your typed text, or
- [**Esc**] to leave the keyboard without saving or entering text

The Keypad

The Controller automatically displays the keypad whenever it needs a numeric input. The keypad may be seen with differing variations, according to the required input.

Numeric Input

The Numeric keypad is offered whenever the system needs figures only. It has the numerical touch pads that allow you to input numbers and a display line at the top to show your input. There are also three function buttons:


Delete - removes the last numbers typed in

Enter - inputs the displayed figures into the controller

Esc - closes the keypad and does not enter any input to the controller.

Temperature Value Input

Two further rows of buttons are the Value and Mode buttons. This version of the keypad is displayed wherever the controller may require more information such as controlling zones on the main page.
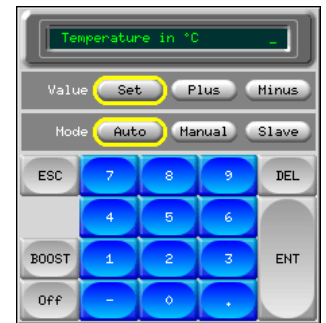
Value Input

The three buttons on the Value row are:

Set - enters the value to be a set point

Add - adds the value that you enter to the existing set point.

Subtract - subtracts the value that you enter from the existing set point

Mode Input

The operating mode of any zone can also be set from the keypad. The three buttons are:

Auto -   this is the default mode for the controller, i.e. closed loop, where the controller output is determined as a set temperature and which rely on feedback from the thermal sensor. In this mode inputs are (as shown in the prompt) entered in degrees temperature.

Manual -this is an optional mode, i.e. open loop where the controller output is fixed at a set power level, which is determined by you the operator. In this mode, input shall be a percentage power level.

Slave -   this is a fallback mode, which can be successfully used if a thermal sensor has failed. Rather than switching to manual, you have the option to slave the faulty zone to a working one. The temperature on the faulty zone then mimics the good zone that is working in auto (or closed loop).

Provided the Value box is at Set, the prompt asks for the identity of a target zone, which should be operating at a similar temperature.

Note: you cannot nominate another zone that is already slaved to another.

Slaving Guidelines

Although Slaving seems a straightforward technique there are several points that you should bear in mind when using this option.

1. **You can only slave like zones for like zones**. - You cannot slave a probe zone to a manifold zone - the system will not permit such a selection.

2. **You cannot nominate another zone that is already slaved to another.** - If, for example, zone 2 is currently slaved to zone 3, you cannot slave zone 1 to zone 2. The leading zone must already be a healthy zone.

3. **You cannot nominate a zone that creates a loop.** - If, for example, zone 2 is slaved to zone 3, then you cannot slave zone 3 back to zone 2.

4. **When selecting a lead zone to slave to you should find a similar zone type that is currently operating at the same temperature and at the same power level.** - If you nominate a lead zone that is working at the same temperature but outputting a noticeably different power level then the slaved zone may not regulate efficiently.

Cycle Synch Input

Some controllers may be associated with Cycle Snych spears that have Body and Tip heaters.

Where you need to set up the tip values this keyboard will be displayed. The display at the top prompts you for one specific parameter and after each is entered, it automatically moves on to the next, until all four parameters have been entered.

If you enter any value incorrectly, touching [**Esc**] steps you back through the entries so that you may correct the error. Alternatively, you can call up the keypad again and touch [**Enter**] to step past the good entries, without changing them, until you return to the bad entry to correct it.

Full instruction on setting up these zone types are given on page 52.
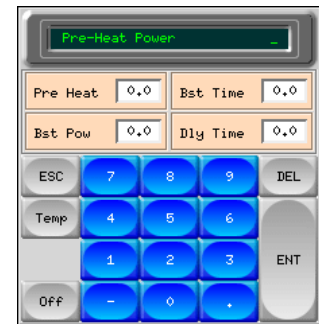
Setting up your controller

New Touch Screen consoles and controllers are provisionally configured at the factory and you may not need this section for a new system. However, you should always check through any new controller to see that its settings are correct for the tool with which is about to be used. Also, if you a reconfiguring your Touch Screen console to a new tool or environment then you may well need this chapter of the manual.

There are three distinct areas involved in setting up a controller. According to your needs you may need a combination of any of the following...

Utilities Parameters

The Utilities page contains a number of global parameters that determine how the console functions.

Some are concerned with the overall operating environment such as passwords, time and date settings and printer connections. While others, such as Display options and ToolLoad options, directly affect the console and tool operation.

Tool parameters

Tool parameters are configured on the Setup page must be configured to suit the particular tool; this includes delegating zones to act as probes or manifolds, setting temperature monitoring, cooling and coolant flow monitoring. Operation limits also come under tool variables for instance warning and alarm levels, and maximum power limits.

Once this section has been completed then all the relevant settings may be saved to a slot in the Toolstore for easy recall.

Operating parameters

Once a tool has been configured then you can enter the nominal operating parameters. This includes such values as zone temperatures, coolant temperatures and flow levels.

Setting up - System Utilities

The Utilities screen gives you access to several user-configurable parameters. The only exception, however, is the first piece of information which shows the current Software version. This is always shown as the version date and it is automatically reconfigured if ever the software is upgraded. It is vital that you make a note of the Software version date should you ever need to contact your supplier with a technical query. This helps to identify which version of the software you are currently using.

Generally the method for setting any parameter on this page is as follows.

- Open the page
- Scroll up or down to find the required parameter
- Touch the parameter setting on the right-hand side
- Touch [**Set**] at the top of the sidebar buttons.
  If required enter your password into the keyboard
  (If this is the first time you have set a parameter on this page then the system will ask you for your password to verify your authority. If you alter subsequent parameters during this visit, it will not ask for password a second time. However, if your subsequent settings come much later, then the password timer may expire and you will need to enter your password again.)

All the following parameters are found within the Utilities page, although not necessarily in the following order…

Software Version

This shows which version of the software is installed – it is not user-configurable.

If you need to contact PMS Systems Ltd, regarding any technical issues, then it is often helpful to have the software date to hand.

Setting the System Time and Date:

We recommend that you set the correct time and date, so that any hard copies of Tool Test. or Export Data will be correctly marked up when printed out

To adjust the Time, touch [**Set**] and, if asked, enter your Password. In the keyboard that appears set the current time and then [**Enter**].

You can set the Date similarly.

Language

You may select a preferred language for the screen and online help.

This option offers a drop-down selection for different screen language options; select any language and then touch [**OK**].

NOTE - after selecting a different language, the console will temporarily shut down as it restarts in the new selected language. If the system is in RUN mode then the Control cards will maintain the working temperatures during this brief change over.

Controlled access though passwords

When you first use your Touchscreen controller you find, as you go through some pages, that some functions are protected by password access. Wherever a password is required then a prompt in the message window at the bottom of the screen indicates whether the particular function requires a User or a System password.

Three levels of control

If the User Password option is set to [**Enabled**] then there are three levels of control…

1) Open Level - includes various functions that need no password such as Start and Stop.

2) User is a Level 1 password which gives low level access to:

- switch the tool on and off,
- alter temperatures,
- select different tools

3) System is a Level 2 password which gives high-level access to:

- all user-level functions,
- set the user password,
- re-configure the settings for a new tool,
- store and load new tool settings to/from the disc

Two Levels of Control

If the User Password option is set to [**Disabled**] then all those functions that would normally need a User (Level 1) Password become Open Level and no longer require any Password to access. Only those higher functions that require a System (Level 2) password retain their Password protection.

Password Application Table

Here is a detailed list of what level of password is required for various functions on the different pages.

Page/Screen	No Password required to	Level 1 (User) password required to:	Level 2 (System) password required to:
Main	Run/Stop/Change Modes. Change Display options. Go to Zoom or Graph page	Set (Alter temperatures or modes)	
Zoom		Set (Alter temperatures or modes)	
Graph	View/Keys/Print		
Tools	Export/ Exit (shut down console)	Load, Save, Backup Restore, Delete	New (Create new tools)
Utils	Set/Change Time		Change any Utility Values
Diagnose		Start Test	Configure Test, Select zones to be tested
Setup			Set, Config (Change any values)

Setting Password Security

Every machine leaves our factory with two levels of password protection (these are provided on a detachable page at the front of the Manual). We recommend that you change these, as soon as possible, to establish your own security.

Edit System Password

1. Touch [**Menu**] and open the Utils page.
2. Scroll down to view Edit System Password.
3. Touch the adjacent right-hand box.
4. Touch [**Set**].
5. The keyboard appears with the prompt PASSWORD. and a scrolling message in the lower bar prompts you to enter the existing System password to establish your authority.
6. Once you have given the current System Password the next prompt changes to NEW SYSTEM PASSWORD where you can type in a new System Password and then [**Enter**].
7. Re-type in the new System Password for confirmation and touch [**Enter**].
8. Touch [**Back**] twice to return to the Main Screen.

Edit User Password

1. Touch [**Menu**] and open the Utilities screen.
2. Scroll down to view Edit User Password.
3. Touch the adjacent right-hand box.
4. Touch [**Set**].
5. The keyboard appears with the prompt PASSWORD. Touch-type your existing System password to establish your authority. (If you have just set a new System Password at previous screen, then this step will not apply.)
6. In the keyboard that appears when the prompt reads NEW USER PASSWORD touch-type your new User Password and then [**Enter**].
7. Re-type in the new User Password for confirmation and touch [**Enter**].
8. Touch [**Back**] twice to return to the main page.

About password active times

There is a password timer function in used to limit System or User access time.

Once you have entered a User (level 1) password then it remains active until the password-timer expires, in which case you must re-submit the password to make further changes. If, however, you make more changes within the configured time-out period it resets the timer. This allows you to continue setting up parameters beyond the timer period and not until your last use does it eventually time out to render the password inactive.

When you have entered a System (Level 2), then it remains active on that particular page, where it was given, or for any other page where any password (System or User) is required. As with the User password, the password-timer does not start to time out until you stop making any changes that require the password.

When you stop making changes and the timer renders the password inactive you must re-enter the System password to make further changes.

If, while the System password is active, you visit a lower level page that only requires User (Level 1) password level (eg Display main) or none at all (eg Graph) then the System password will expire after 20 seconds but, on doing so, it becomes a User (Level 1) password which would allow you to continue setting lower level parameters.

Setting your password timer

1. Touch [**Menu**] and open the Utils page.
2. Scroll down to view Password Timer.
3. Touch the right-hand box adjacent to Password Timer.
4. Touch [**Set**].
5. If required, type in your System password at the next prompt.
6. In the following keypad touch-type your required password active time (in minutes) and then [**Enter**].
7. Touch [**Back**] twice to return to the main page.

Password Override

To override the User and System Password control, set the Password Timer to "99". This setting negates the need to enter a Password at any of the usual checkpoints such as Load Tool or Temperature Change. Under this condition, the only function that still needs a Password input is the Change Password action.

Configuring a printer

Before you can obtain a hard copy of any records or details, you must connect a compatible printer via the printer port and then select an appropriate printer driver.

If the console has a USB port then it will be possible to connect to a local printer. Alternatively, without a USB port, you must configure the Console to work to a networked printer.

1. Touch [**Menu**] and open the Utils page.
2. Scroll down to show 'Printer.
3. Touch the right-hand box adjacent to Printer.
4. Touch [**Set**].
5. In the panel that appears scroll down to find a suitable printer driver (A brief description of the printers catered for by that selection is displayed in the adjacent window) and touch that printer name.
6. If the console has a USB port then you can select [**Local**] or [**Network**] for your printer connection. If there is no USB then you must opt for a [**Network**] printer.
7. Touch [**OK**].
8. If you have selected a Network printer you must supply the IP address for that printer. While on the Utilities page select the "Printer Address" option and touch [**Set**].
9. Touch type in the IP address for the networked printer that you intend to use. (If you haven't got an IP address for a printer then consult your local IT department). Touch [**Enter**].
10. While on the Utilities page select the appropriate Paper Size.
11. Touch [**Set**] to see the Paper-size selection panel.
12. Select [**A4**] or [**Letter**] to accommodate your preferred paper size.
13. Touch [**OK**] to accept the chosen Paper-size or [**Cancel**] to leave the page without making any change.
14. Touch [**Back**] twice to return to the main page.

Should you have any difficulties then contact your supplier for further help.

OPERATION NOTE: if need to cancel a print queue then touch the [**Clear Print Queue**] button on this page. It cancels any print requests that are in the current queue.
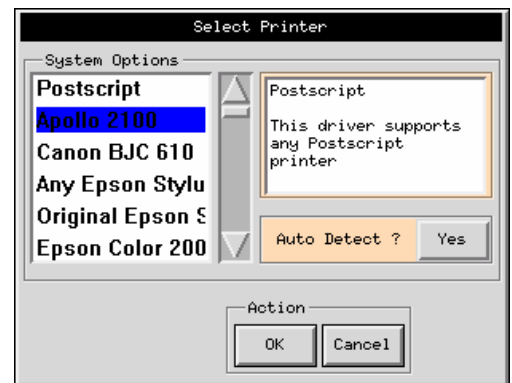
Configuring a Quad Input /Output card

If the detect sequence finds an IO card during the initial stages then the [**QuadIO**] button on the Utilities screen becomes active – touching this button opens the setup screen for the card where its default I/O options may be seen as:
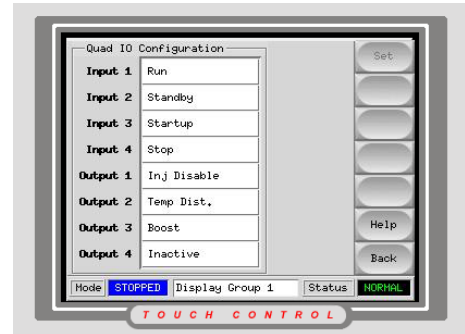**Inputs 1 – 4:** Run, Standby, Startup, Boost
Outputs 1-4: Injection Disable, Temperature Disturbance, Boost, Inactive

You can configure the Input/Output options on this screen.

To Configure the Input/Output options

1. Go to the Utilities page and select the [**QuadIO**] tab.
2. Select the desired Input or Output and touch [**Set**].
3. Select your preference for that I/O channel. Note that once any option has been selected, it is not available for any other channel.

Inputs

There are eight input options, from which you may select any four. These are:

Input Option	Effect
1 - Inactive	This allows you to set the input as inactive and is available for any spare or unwanted channels.
2-7 - Run, Standby, Startup, Stop, Boost or Shutdown	The input sets the operating mode into any one of the six running modes.
8 - Passkey	This is reserved for future use with a physical pass swipe card or key.

Outputs

There are eight output options, from which you may select any four. These are:

Output Option	Effect
Inactive	This allows you to set the relay as inactive and is available for any spare or unwanted channels.
Inj(ection) Disable/Enable	The relay closes when all the zones are up to working temperature and the Status window shows Normal (green on black).
Temp. Dist (Temperature Disturbance)	The relay closes if any zone raises a Fatal Alarm such as T/C error or FUSE failed.
Boost	The relay closes if the console goes into Boost Mode (which may be initiated Manually or Automatically).
Hot Runner	The relay closes if any Probe or Manifold zone sees a 2nd stage Alarm or a Fatal Error.
Cavity Alarm	The relay closes if any Cavity (RTD) zone sees a 2nd stage Alarm or a Fatal Error.
Water Flow	The relay closes if any Water-Flow zone sees a 2nd stage Alarm or a Fatal Error.
Stopped	The relay closes to confirm that the console has been stopped by one or more external sources.

Other Utilities Parameters

There are a number of controller parameters that are also setup within this page.

Limit Exceeded

Setting

1. Touch [**Menu**] and open the Utils page.
2. Scroll down to view Limit Exceeded.
3. Select the parameter by touching in the adjacent right-hand box.
4. Touch [**Set**].
5. If required, type in your System password at the next prompt.
6. Select [**Disable**] or [**Enable**] as required.
7. In the "Limit Exceeded" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.
8. Touch [**Back**] to return to the main page.

Description

This option sets the response of the console when an operator tries to set a zone temperature that exceeds the preset limit.

DISABLED – means that an attempt to set the temperature above the limit is non-effective and the set temperature remains unaltered after touching the Enter button.

ENABLED – means that if an operator attempts to raise a current temperature from 350 to 450 when the reset limit is 400 then the set temperature will rise to the 400 degree limit value and no more.

Blanking Delay

Setting

1. Touch [**Menu**] and open the Utils page.
2. Scroll down to view Blanking Delay.
3. Select the parameter by touching in the adjacent right-hand box.
4. Touch [**Set**].
5. If required, type in your System password at the next prompt.
6. In the following keypad touch-type your required delay time (in minutes) and then [**Enter**].
7. Touch [**Back**] to return to the main page.

Limits

The maximum period for Blanking Delay is 98 minutes.

Overiding

You can override the Blanking Delay so that it remains permanently visible by setting this time to "99 minutes".

Description

In order to optimise screen life, the screen saver blanks the monitor screen after it has been idle for a preset time. You can set this preset time so that the screen stays visible for more or less time by using the Screen Blanking Delay option.

Allow ToolLoad

Setting

1. Touch [**Menu**] and open the Utils page.
2. Scroll down to view Allow Toolload.
3. Select the parameter by touching in the adjacent right-hand box.
4. Touch [**Set**].
5. If required, type in your System password at the next prompt.
6. Select [**Disable**] or [**Enable**] as required.
7. In the "Allow Toolload" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.
8. Touch [**Back**] to return to the main page.

Description

This option determines whether tools may be changed while the system is in Run mode.

Select [**Enabled**] if you wish to be able to switch on-the-fly. In Run mode, or [**Disabled**] if you wish to prevent such changes and force the operator to shut down to swap tools.

How you use this option will depend on local circumstances and the following may be helpful.

If your ToolStore contains variations of the same basic tool, each with the same number of zones and all configured similarly except that there may be temperature variations between the different tools. If so then you may well want to swap tools on-the-fly as this gives you the ability to make preset temperature changes to suit special conditions.

Alternatively, a console may have a collection of very different tools within the ToolStore because it may be physically moved from one controller to another and used on different presses. With different zone counts and operating conditions then it is more likely that you may want to bar operators from switching tools on-the-fly in Run mode.

Finally, a console may be configured to several controllers via a local network in which each controller may have similar, or dissimilar, tools and settings. In this situation, the ToolStore [**Load**] button is the only way in which the console may be switched to communicate with different controllers. Consequently, an operator may need to select different tools while the current tool remains in Run mode and so, the console would have Allow ToolLoad set to Enable.

NOTE: If ToolLoad is disabled then the [**Load**] button on the ToolStore page is greyed-out while the system is in RUN mode.

Baud Rate (Communication Speed)

Setting

1.   Touch [**Menu**] and open the Utils page.
2.   Scroll down to view Baud Rate.
3.   Select the parameter by touching in the adjacent right-hand box.
4.   Touch [**Set**].
5.   If required, type in your System password at the next prompt.
6.   Select [**Low**] or [**High**] as required.
7.   In the "Baud Rate" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.
8.   Touch [**Back**] to return to the main page.

Description

Modern electronics enabled newer control cards to use a higher communication speed (or baud rate) to communicate with the console, although they are capable of working at low speed as well. Older cards, however, were only capable of communicating with the console at slow speed.

Normally new Touch Screen consoles are supplied with new Cabinets in which case there is no problem with communication between the two. However, if you are using a new console with an older cabinet there may be a mismatch between their communication speeds.

How to check the Communications

To check that the console and cabinet are communicating, observe the Scan LEDs on the control cards. In a normal condition, you can see the Scan LEDs flashing sequentially through the cards - this shows that the console can talk to the control cards. If no Scan LEDS light up then the communication has failed. Check first that the data lead is correctly fitted and, if all seems normal, then change the Baud rate to Low as shown below.

You may observe an in-between situation where some of the Scan LEDS light up while others do not. This may happen if some of the cards in the older cabinet have, at some time in the past, been changed for newer ones. In this case the few newer cards will communicate at the higher speed (and light their Scan LEDs) while the older original cards will remain unlit.

Console Startup

Setting

1.   Touch [**Menu**] and open the Utils page.
2.   Scroll down to view Console Startup.
3.   Select the parameter by touching in the adjacent right-hand box.
4.   Touch [**Set**].
5.   If required, type in your System password at the next prompt.
6.   Select [**Stop**], [**Startup**], [**Standby**] or [**Run**] as required.
7.   In the "Console Startup" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.
8.   Touch [**Back**] to return to the main page.

Description

This option allows you to select a particular Startup Mode for the console to adopt after initial switch-on or console re-booting. It is not part of the ToolStore settings.

The Startup choices are

- **Stop** – the system powers up with all the zones set to zero degrees
- **Startup** – the system starts up in a preset homogenous or staged pattern.
- **Standby** – the system starts up such that any zones that have Standby temperatures configured will rise to those standby temperatures. Zones that have no standby configured will rise to their normal operating temperature.
- **Run** - all zones will rise up to their normally designated operating temperature.

Machine Name, Domain Name, IP Address, Net Mask and Obtain Address

For any of these Networking parameters

Setting

1. Touch [**Menu**] and open the Utils page.
2. Scroll down to view Console Startup.
3. Select the parameter by touching in the adjacent right-hand box of one of the above parameters.
4. Touch [**Set**].
5. If required, type in your System password at the next prompt.
6. Set the particular parameters either by Key pad or option select as required.
7. In the "parameter" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.
8. Touch [**Back**] to return to the main page.

Description

For details about configuring the networking parameters see the section "Networking to your Controller" on page 93.

Calibrate Touch

Allows you to re-calibrate how the screen response physically aligns with where you touch it. For details about how to calibrate the touch screen, refer to "Checking Touch Screen Alignment" on page 98 in the Maintenance section.

SPI Interface

Setting

1. Touch [**Menu**] and open the Utils page.
2. Scroll down to view SPI Interface.
3. Select the parameter by touching in the adjacent right-hand box.
4. Touch [**Set**].
5. If required, type in your System password at the next prompt.
6. At the numeric keypad enter an address between 1 and 224 (your IT department should be able to provide the appropriate address number for the command machine).
7. Touch [**ENT**] to accept the new address or [**ESC**] to leave without making any changes
8. The parameter now shows the SPI Address and <Active> provided it sees the remote machine is connected and running. Alternatively it shows the SPI Address and <Inactive> if the console does not detect any SPI messages for a period of 30 seconds.

Description

You can configure the MTS console to communicate through the serial port to a remote machine using SPI protocol. Once the SPI Interface parameter has been set to an appropriate address, the console announces itself to the remote machine as a "Self-tuning General Purpose Temperature Control". The remote operator is then able to send commands, such as adjust zone temperature(s), and the MTS console will respond accordingly.

To Disable the SPI Interface

Repeat the above procedure but use the address 0 (zero). The parameter now shows "SPI not running" to confirm your new setting.

Creating a new tool slot

When setting up a new tool then your next step in the configuration sequence is to create a named tool slot.
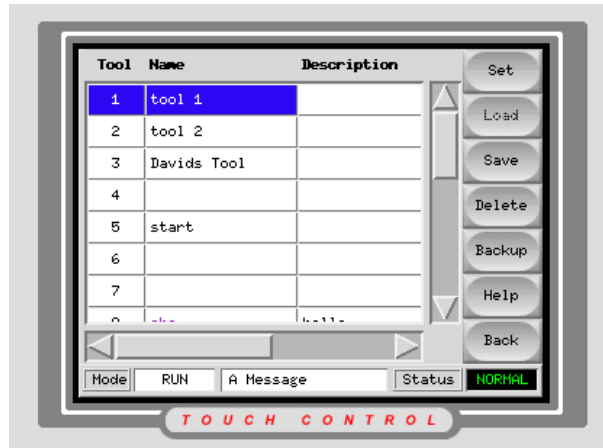
1. Touch [**Menu**] and open the Tool page.
2. Select a blank tool slot and touch [**Detect**].
3. Enter your System password to gain access.
4. Type in a new name for the proposed tool and press [**Enter**] to continue.
5. If the tool is connected, via a Network, to any other cabinet, the next step presents an option to select the local controller (labelled "Serial Port") or a remote controller (labelled hrcnetx).
    If no network-connected controllers are detected, then it automatically passes this option and goes straight on to step 6.
6. The console runs an automatic "Card Detect" routine to find out what type and how many cards are fitted in the selected controller. Once it has gathered this information then the console opens the Setup page for you to start configuring the various Controller Parameters for this new tool.
    If the system has any problem running the detect sequence it may report an "Auto Detect Failed" and ask if you want to repeat the Detect routine. If the reason for failure is obvious, such as a loose network cable, or a mains glitch, during the Detect routine, then you may touch [**OK**] to re-try card detection.
    If the detection routine continues to fail then contact PMS Systems Ltd for advice.
7. After all the parameters have been correctly set up then you may return to this Toolstore page later and add any appropriate "Tool Notes".

Setup page – Console Parameters

Many Console parameters may be thought of as global because they affect either

a) how the console behaves for all tools (eg temperature scale is Centigrade or Fahrenheit) or

b) how all the zones behave within a single tool setting (eg Boost time is set as one period of time for all zones that have any Boost temperature set)

There are two ways in which you may reach the "Configure Controller" options that lie behind the [**Config**] button.

Automatically

This occurs whenever you create a new tool setting. (See the previous page for a full description.) Once the Console has completed the Card Detect routine for a new tool then it automatically switches you to the Configure Controller menu in the Setup page in order to configure the Console Parameters.

Manually

In order to view or change a Global parameter-

1. Check that no zones are currently selected and that the [**Set**] button is greyed out while the [**Config**] button is active.

2. If any zones are currently selected then touch [**Cancel**] – this makes the [**Config**] button active.
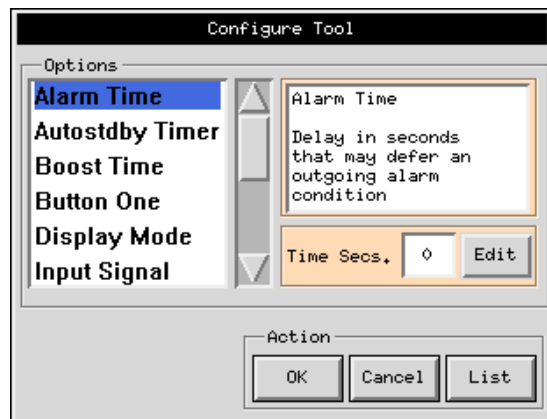
To select or modify Global parameters

This contains a number of options for the system that you need to configure for the console to run correctly.

The Configure Controller box has a panel on the left which lists the various global parameters. On the right is a second panel that has a brief description of the selected parameters. In between these is a scroll bar that you can use to scroll up or down to the required parameter.

As you select any parameter then the buttons below the descriptive panel change to accommodate that parameter as follows:

1. For parameters that need a quantitative input such as Timers then it offers an edit button alongside the current setting. Touching [**Edit**] brings up a simple keypad where you make numeric entries.

2. For parameters with a two-way choice (eg "high/low" or "enable/disable") then it offers two labelled button so tat you may select either choice.

3. For parameters where there are three or more options (eg language) then it offers the multiple choice in the left-hand "System Options" window. Make you selection and then touch [**OK**] to return to the main selection of parameters.

4. Finally, touch [**OK**] at the bottom of the panel to accept your parameter values; alternatively, touch [**Cancel**] to leave this screen without changing any existing settings.

For an overview of all these parameters, and how they are currently set, touch the [**View**] button.

Option	Current Setting
Alarm Time	0 Secs.
Boost Time	0 Secs.
Display Mode	Sorted
Input Signal	Standby
Master Only	Disable
Power Mode	Amperes
Startup Mode	Master
Standby Delay	0 Mins.

Configure Tool — Action: Print / Back
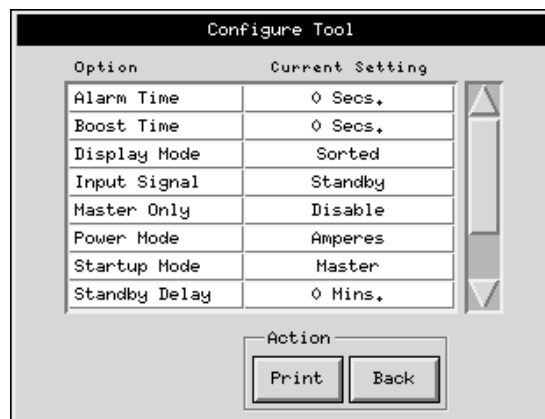
Alarm Time (seconds)

Setting

1. Open the Setup page – touch [**Config**] and, if required, enter your system password.
2. In the Configure Controller box select "Alarm Time" and touch [**Edit**]
3. In the Keypad enter the required Alarm time and touch [**Enter**]
4. In the "Configure Controller" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.

Limits

The maximum setting for Alarm Time is 999 seconds.

Description

Use this to configure a brief delay between an alarm condition being detected, and an external alarm being sent. This allows you to prevent fleeting deviations causing nuisance alarms or to compensate for slow reacting systems.

Autostandby Timer (minutes)

This option is dependant on selecting "AutoStandby" as an Input Signal option.

Setting

1. Open the Setup page – touch [**Config**] and, if required, enter your system password.
2. In the Configure Controller box select "Autostandby Timer" and touch [**Edit**].
3. In the Keypad enter the required Standby time and touch [**Enter**]
4. In the "Configure Controller" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.

Limits

The maximum period for Auto Standby is 25 minutes.

Description

This option is dependant on selecting Auto-Standby as an Input Signal option.

Autostandby works together with the remote Input Signal so that, if a cycling input is not detected within a pre-configured period, then the console assumes a Standby mode. All zones that have any standby setting will respond to the condition by reducing their temperature to prevent unnecessary material degradation.

If the controller is running spear-tip probes then Autostandby also switches the tips to Off.

Boost Time (seconds)

Setting

1. Open the Setup page – touch [**Config**] and, if required, enter your system password.
2. In the Configure Controller box select "Boost Time" and touch [**Edit**].
3. In the Keypad enter the required Boost time and touch [**Enter**]
4. In the "Configure Controller" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.

Limits

The maximum period for Boost Time is 9999 seconds.

Description

This option allows you to set how many seconds the zone temperature is boosted for, whenever Boost Mode is selected. To set the boost time period, touch the [**Edit**] button to show the keypad and key in your required setting.

Button One Mode

Setting

1. Open the Setup page – touch [**Config**] and, if required, enter your system password.
2. In the Configure Controller Options select "Button One Mode".
3. Select [**Run**] or [**Startup**] as required.
4. In the "Configure Controller" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.

Description

You can use Button One Mode to set the preferred starting option. It offers a choice between RUN and STARTUP on the first or top button, on the main page. Whichever starting mode is selected here, other modes can still be accessed via the MODE button.

Display Mode

Setting

1. Open the Setup page – touch [**Config**] and, if required, enter your system password.
2. In the Configure Controller System Options select "Display Mode".
3. Select [**Sorted**] or [**Mixed**] as required.
4. In the "Configure Controller" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.

Description

This option allows you to choose how the main page and set-up page group the zones.

- **Sorted** mode separates all the zone types into a pre-determined order, which is Spear zones first followed by Probes, then Manifolds, then Specials.
- **Mixed** mode groups the probe and manifold zones as they are positioned within the card rack, so that manifolds may appear out of sequence order, but grouped with their corresponding probe zones.

Input Signal

Setting

1. Open the Setup page – touch [**Cancel**] and, if required, enter your system password.
2. In the Configure Controller System Options select "Input Signal".
3. Select [**Standby**], [**Auto-Standby**] or [**Boost**] as required.
4. In the "Configure Controller" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.

Description

Your console may have a remote input (normally open pair) that can be closed to switch the operation mode of the controller. The available options are:

STANDBY - this switches the controller into Standby mode while the remote line is closed and returns to its previous state when the signal is removed. If this option is selected then you can also use the Standby Delay option to defer the Standby condition for a preset time.

AUTO-STANDBY – rather than switch to an immediate Standby condition, this option enables the Autostandby Timer. It is used where you need to monitor a cycling condition which, while running will reset the timer each cycle to keep the temperature at normal. If the cycling stops (eg the mould stops opening and closing, then a short time later the Autostandby Timer will time out and set the temperature down to its Standby level.

BOOST - this switches the controller into boost mode.

NOTE:

1. The remote input is only effective when the system is in RUN mode.
2. This function defaults to BOOST when the controller has Spear zones.
3. Only those zones that have Boost or Standby temperatures configured in their SetUp will respond to the remote input signal.

Power Mode

Setting

1. Open the Setup page – touch [**Cancel**] then [**Config**] and, if required, enter your system password.
2. In the Configure Controller System Options select "Power Mode".
3. Select [**Percent**] or [**Amperes**] as required.
4. In the "Configure Controller" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.

Description

(on controllers with normal probes)

If you have control cards with current measuring coils fitted to your system then this option enables the main page to show either Current or Percentage Power in the zone boxes on the main page. If there are no current measuring coils then the option should be set to [**Percent**] otherwise the Power/Current display will show Zero.

(on controllers with Spear Probes)

If your tool is using Spear and Tip Probes then this option decides whether you will see amps or percentage power while a boost signal is received.

Selecting [**Percent**] will allow you to display the percentage power level that is being applied to the Tips during the Boost part of the mould cycle. During the non-boost period the zone displays the percentage power that is being applied to the body only.

Selecting [**Amps**] allows see the pre-heat and boost current in the Tips. During the non-boost period the zone display returns again to the percentage power that is being applied to the body only.

Startup Mode

Setting

1. Open the Setup page – touch [**Cancel**] then [**Config**] and, if required, enter your system password.
2. In the Configure Controller System Options select "Second Startup".
3. Select [**Master-Follow**], [**Master Only**] or [**Stage**] as required.
4. In the "Configure Controller" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.

Description

This option allows you to switch between three different starting modes which are:

MASTER-FOLLOW - a default option that ties the faster-acting nozzles set temperature to slower manifold's actual temperature. This results in a homogenous rise with all zone temperatures coming up together.

MASTER-ONLY –heats only the nominated Master zones first - it does not apply any power to the subordinate nozzles until the Master zones have reached their set temperature.
(see page 58 for information about configuring Master Zones)

STAGE - is similar to the Master Follow option but rather than just the two stages it allows you to nominate up to eight stage groups that will heat up in successive stages.
When Staged Startup is selected then the shutdown automatically follows a Staged Shutdown. Note, however, that there is a separate allocation for shutdown groups – so a shutdown pattern need not be the same as the startup sequence.
Selecting Staged Startup also enables the Shutdown Timer and Shutdown Temperature options. If both options are set to a preferred value then stage switching will occur at whichever parameter is reached first (time or temperature).
(see page 66 for more detailed information about the interaction between Shutdown Time and Shutdown Temperature.)

A more complete description of these modes is detailed in the "Startup" section on page 74.

Standby Delay

This option is dependant on selecting "Standby" as an Input Signal option.

Setting

1. Open the Setup page – touch [**Cancel**] then [**Config**] and, if required, enter your system password.
2. In the Configure Controller box select "Standby Delay" and touch [**Edit**].
3. In the Keypad enter the required Delay time and touch [**Enter**]
4. In the "Configure Controller" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.

Limits

The Standby Delay defaults to 0 which means that there is normally no delay in responding to a Standby request. If a delay is required, then you can configure the delay period from 0 to 99 minutes in 1 minute steps.

Description

This function allows you to delay the controller from going to Standby when it is selected via the remote input; it is only configurable if you set the Input Signal option to Standby.

This delay is used to hold the mould at its normal working temperature for a short period after receiving a go to Standby input from the moulding tool. If the Standby request exceeds the Standby Delay-timer, then the controller will reduce the appropriate zone temperatures to their Standby level. If, however, the Standby request is removed before the Delay-timer times out, then it resets its time count, and the zone temperatures will have been maintained at their normal working point.

Note: Selecting Standby Delay does not effect any manual switching into Standby that may be selected on the touch screen console.

Shutdown Timer

This option is dependant on selecting "Stage" as a Startup Mode option.

Setting

1. Open the Setup page – touch [**Cancel**] then [**Config**] and, if required, enter your system password.
2. In the Configure Controller box select "Shutdown Timer" and touch [**Edit**].
3. In the Keypad enter the required Delay time and touch [**Enter**]
4. In the "Configure Controller" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.

Limits

The maximum period for Shutdown Timer is 99 minutes.

Description

This sets a delay period that is used to hold on successive groups during a Staged Shutdown. It sets, in minutes, the time that successive zone groups must wait before each switches off.

Setting this option to zero makes the timer in effective so that Staged shutdown is reliable solely on temperature.

Shutdown Temperature

This option is dependant on selecting "Stage" as a Startup Mode option.

Setting

1. Open the Setup page – touch [**Cancel**] then [**Config**] and, if required, enter your system password.
2. In the Configure Controller box select "Shutdown Temp" and touch [**Edit**].
3. In the Keypad enter the required temperature and touch [**Enter**]
4. In the "Configure Controller" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.

Limits

The Shutdown Temperature setting defaults to "0" which represents an extremely long shutdown interval.

The highest shutdown temperature permitted is 260° C or 500°F and if this set value is equal to, or higher than, the normal temperature, then it has no effect and the shutdown interval becomes dependant on the Shutdown timer.

Description

During a Staged shutdown, each stage must cool down to a preset value before other zones can be switched off to cool down. This function allows you to configure this shutdown temperature to speed up or slow down the shutdown process.

Raising the shutdown Temperature means that zones do not have to cool down so much until subsequent stages are switched off which shortens the overall shutdown time. Lowering the Shutdown Temperature has the opposite effect and lengthens the shutdown time.

Temperature Scale

Setting

1. Open the Setup page – touch [**Cancel**] then [**Config**] and, if required, enter your system password.
2. In the Configure Controller box select "Temp Scale".
3. Select [**Deg. C**] or [**Deg. F**] as required.
4. In the "Configure Controller" box touch [**OK**] to accept the new setting or [**Cancel**] to reject it and return to the original setting.

Description

The temperature window allows you to select your preferred display temperature. The system has an automatic selector, which changes the display according to the mains supply frequency. Where a 60 Hz supply is detected then the system displays temperatures in Fahrenheit and where a 50 Hz supply is detected the system displays in centigrade. If this automatic display does not suit your own requirements then this Temperature Scale window may be used override the automatic display.

Finished Configuration?

Once you have completed all the necessary configuration boxes, and want to save them, as they have been set, touch the [**OK**] button.

If you do not wish to accept the changes made, touch [**Cancel**]. The configure menu disappears, and the system reverts back to any previous selections that may have been made.

SetUp Page - cards that may be detected

The SetUp page displays a grid array that you can reveal by using the scroll bars at the right and bottom of the screen. Cards that are initially detected by the New-Tool process are shown in the left-hand column, while the rest of the grid remains blank.

The following is a list and description of the cards that may be detected by your console...

Symbol	Card and Description
	6-zone card at 5 Amp rating for Probes

Using the SetUp page to set up the Zones

How to select zones (single or multiple)

Before you start to set up the various zones, it helps to pause and see how this page works. To set up a tool you need to select the various groups of zones and then configure the various parameters.

Select the zones by touching the white boxes in the Type column. Touch the boxes that are next to the particular cards that you intend to configure. Touching one box selects that channel which then turns to blue with white text. Touching the box again deselects the zone.

Touching more subsequent boxes adds them to the initial selection. Any configuration that is subsequently selected is applied to all the highlighted zones.

Touching non-adjacent boxes and then the [**Range**] button on the right-hand side extends your selection to include all the zones in between the first two zones selected.
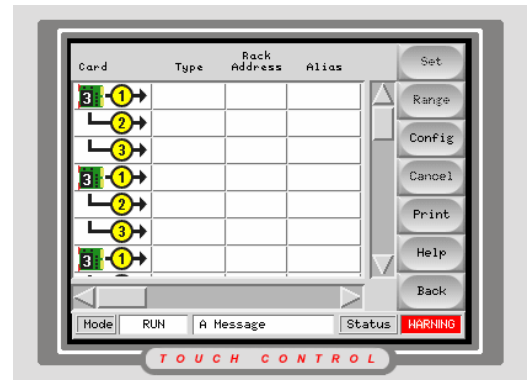
Zone Type Options

Probe, Manifold (or Not Used)

The different control cards, 1MOD, 2 MOD, 3MOD and 6MOD can be used for a variety on heater zones – however these fall into two main types which may be either Probes (or Nozzles) and Manifolds (of different sizes).

The Configure Card slot allows you to set the zones to either Probe or Manifold so that the control card can match its load.

A third option is "Not Used" which is available to switch off any excess zones that are not connected to a load. This may occur where 3 6MOD cards give 18 zones but only 16 are required for a particular tool; in such case the last two "spare" zones can be configured as "not used".

Once a type has been selected then the Setup page is populated with pre-configured parameters. These values may easily be modified to suit your own circumstances.

How to set the Zone Types

As seen earlier, the Setup Grid displays various Icons in the first column to show what cards have been detected.

However, none of the cards know their function. At this stage, any typical temperature control card may be used for either a Probe zone or a Manifold.

Your must now allocate roles to the cards and, to do this, it helps to start with one type of zones such as the probes.

1. In the Type column, select the first and last cards within that group and then touch [**Range**] to include all those in between.

2. With all the desired zones highlighted touch [**Set**] to bring up the Configure Box and touch [**Probe**] to configure those selected zones.

3. You can also select the preferred header colour by touching any of the 16 preset colours available in the Panel Colour Picker – if none is chosen then it defaults to the Type colour.

4. This last step returns you to the main SetUp page where you will see that most of the Tool parameter boxes have been given pre-configured values. Some of those values may be correct for your immediate needs; others may need to be tailored to your particular circumstances to match your tool mould.

Complete setting up the zone types for all other zones before you set up the various parameters.
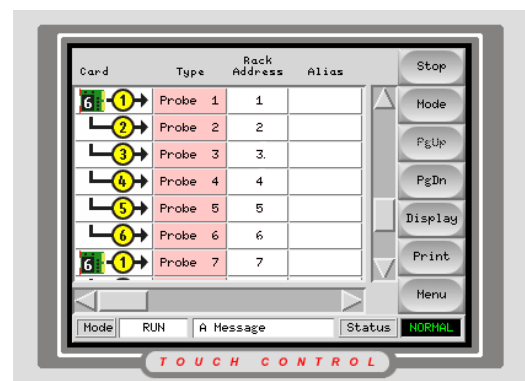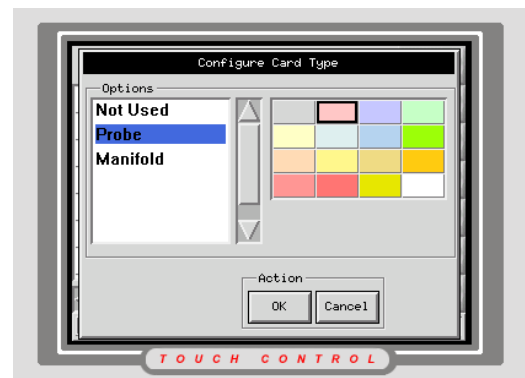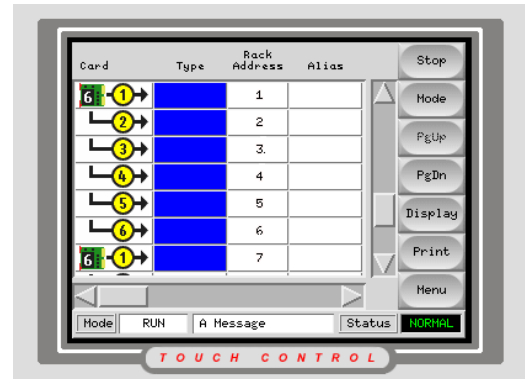
Pre-configured Set-Up values

The diagram below shows the whole SetUp chart and the differing values that are given to both Probe and manifold zones following type- configuration.

Different zones types are pre-configured to set values as seen in the table below:

Parameter	Probe and Manifold Cards	Other Monitoring Cards	Synchro/ Spear
Rack Position	slot address*	slot address*	slot address*
Alias	blank	blank	blank
Standby & Boost	0ºC or 0ºF	blank	0ºC or 0ºF
Master Zone	blank	blank	blank
Warn Hi & Lo	5ºC or 9ºF	blank	5ºC or 9ºF
Alarm Hi & Lo	25ºC or 45ºF	25ºC or 45ºF	25ºC or 45ºF
Max Temp Setting	350ºC or 662ºF	350ºC or 662ºF	350ºC or 662ºF
Max Power Setting	80%	blank	80%
T/C Offset Value	0ºC or 0ºF	blank	0ºC or 0ºF
Speed	Auto	blank	Auto
Triac	On-Board	blank	Both
Sensor	J-Type	blank	J-Type
Display Group	1	blank	1
Startup Stage	off	off	off
Shutdown Stage	off	off	off
Analog Input	blank	20 lit/min Flow	blank

If these preset figures are not suitable for the tool in question then you can simply change them to your preferred values by following the next pages.

Using the SetUp page to set up the parameters

Setting each parameter follows a similar pattern that is explained below:

1) Select the zones

In order to set up any tool parameters you first need to select the zones.
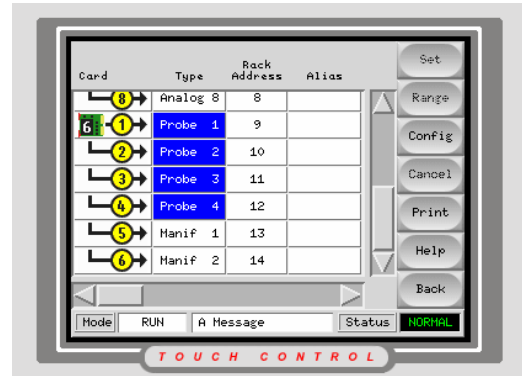
2) Select the parameter

To select any one value, you may touch the associated column, at any point in the column, including the header. This highlights the parameters against the selected zones.

Touching in another column deselects the first parameter and accepts the second selection.
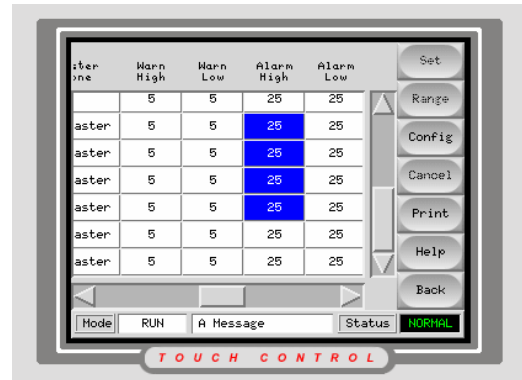
3) Set the Value

The next step is to program in the Standby value by touching [**Set**] on the Function bar.

If this is your first visit to the Setup procedure then you are first asked for a password to establish your authority. Subsequent visits from the same screen do not require repeated authorisation.

After entering the password either a keypad or a related SetUp box appears on the screen where you can input new preferred values.
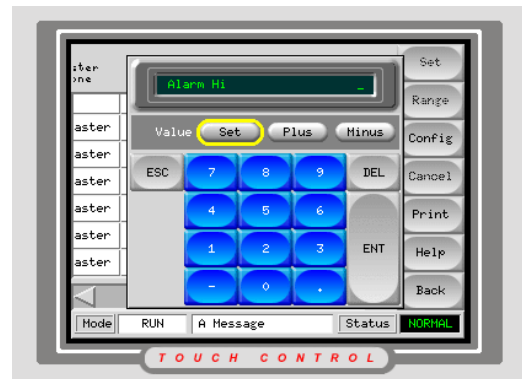
Setting the Tool Parameters

There are numerous parameters that are associated with each card type and most of them are automatically configured after zone detecting and allocating. These values may be accepted or reconfigured to your own preferred values and an explanation of each parameter is given in the following pages.

Rack Position

Setting

There is no Setting option for Rack Position on the Touchscreen Console.

Description

This indicates where, on the rack, the particular card, or zone, is located. This reading does not refer to a physical position but is determined by a miniature logic-switch on the back-plane board.

Alias

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the "Alias" column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the Keyboard at the "Alias Name" prompt touch-type the new name (back-space deletes characters).
4. When finished touch [**Enter**] to accept the new entry, or [**Esc**] to reject it and return to the Setup page.

Description

If no Alias is given then the system shows zone types on the main page with their inherent type name, i.e. Probe 1, 2, 3 etc or Manifold 1, 2 etc. However, setting up Alias enables it to show the zones with a more meaningful name. On a two colour machine, for instance, it may be more useful to name one bank as "Red 1, 2, 3 etc." and the second bank as "Blue 1, 2, 3 etc."

To use the Alias function, select all the zones within a named group and touch the Alias column.

Touch [**Edit**] to display the keyboard and key in a new name - you can remove any existing name by touching the [**Back Space**] key.

Alias is an auto-numbering function so if you number the first zone in a group "Red 1", subsequent zones in the same selected group bear the following numbers i.e. "Red 2", "Red 3" etc.

T/C Open Mode

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the "T/C Open Mode" column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the "Select Zone or Option" panel choose a recovery option or nominate a specific zone or select [**Cancel**] to leave it unchanged.

Description

This column allows you to preselect the console response should it detect a failed thermocouple while the system is running. To select the preferred response touch one or more zones then touch anywhere in the Auto T/C column to bring up a Select Item list which has the following options.

Normal (default setting) - If the zone's T/C fails then the console does not instigate any action - the zone power sets down to 0% and it shows a T/C fatal alarm.

Auto Manual - The console collects data over a period of time and after 10 minutes of steady running it has sufficient information about the power levels required to maintain the current set temperatures. If the T/C fails with this option selected then the console will run the particular zone in open-circuit mode and use the average power levels that have been derived from historical performance.

Auto Slave - In a similar way to auto manual, the console has sufficient data and is able to match zone performance such that, if a T/C failure is detected, it will automatically switch the failed zone into Slave mode and automatically select the most appropriate zone to master the failed zone.

The main problem with Auto Manual and AutoSlave is that the console needs to collect a reasonable amount of performance data upon which it can make a manual or slave match; this is normally achieved after 10 minutes of running at a steady temperature. If the T/C failure occurs before sufficient run data has been collated then the zone will default to 0% power and show a T/C fatal alarm. There is a fourth alternative which you may select and this does not need to pre-collect any performance data but does rely on your prior knowledge about zone performance.

Nominated Zone Slaving - in this option, if you have previous knowledge of zone behaviour then you may nominate any zone to master a failed zone. Using this option may mean that you select one zone at a time and nominate a master zone for each in turn. For instance you could slave Zone 1 to Zone 2, Zone 2 to Zone 3, Zone 3 to 4 etc. If the system sees a multiple T/C failure then it will cascade the slave pattern. In the above pattern if Zone 1 T/C fails then it will slave to Zone 2. If Zone 2 subsequently fails then Zones 1 and 2 will both slave to Zone 3.
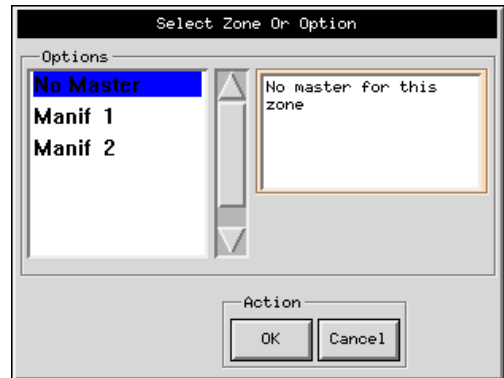
Standby (temperature)

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the "Standby" column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the Keypad that appears, touch-type the Standby value (ie the amount by which you want to reduce the running temperature)
4. When finished touch [**Enter**] to accept the new entry, or [**Esc**] to reject it and return to the Setup page.

Limits

The maximum Standby value that you can set is 250°C or 450°F

Description

A Standby command allows you to temporarily reduce the temperatures of selected zones until a Run command restores the zones to their normal operating temperature.

The value entered here allows you to individually set that temperature depression on a zone-by-zone basis. Any zones are left at zero, will not respond

to a standby request but stay at their normal operating temperature. The [**Add**] and [**Subtract**] buttons allow you to trim the temperature.

Boost (temperature)

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the "Boost" column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the Keypad that appears, touch-type the Boost value (ie the amount by which you want to increase the running temperature)
4. When finished touch [**Enter**] to accept the new entry, or [**Esc**] to reject it and return to the Setup page.

Limits

The maximum Boost value that you can set is 250°C or 450°F

Description

A Boost command allows you to temporarily raise the temperatures of selected zones for a set period. (see page 45 to read about Boost Time).

The value entered here allows you to individually set that temperature increase on a zone-by-zone basis. Any zones are left at zero, will not respond to a Boost request but stay at their normal operating temperature.

If the associated zone is a Spear zone then the Boost is applied to the Tip and not the Body.

Please note that, during a boost command, the Boost Time is the main determining factor. If, on a slow responding manifold, you set a high boost temperature while the boost time is set short, then the zone is unlikely to reach your set Boost temperature before the Boost Time limit expires.

Finally, the Status window will display a Boost indicator for as long as the external Boost signal is applied - even if the Boost Timer (for normal or spear nozzles) has expired and the current has returned to its normal level.

Master Zone

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the "Master Zone" column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the "Select Zone or Option" panel you can either:
   a) nominate that there is no master zone
   b) select a Master zone from one of the existing Manifolds zones or
   c) touch [**Cancel**] to leave this screen and return without making any changes.

Description

Setting a Master zone for any group of zones is an option that must be left until all the zones have been initially configured. Once you have allocated the Probes and Manifolds, then you can select groups of dependent zones and use this option to set their master zone.

Usually, you select a group of Probes in order to designate a common Manifold as a Master Zone. However, on larger tools you may also select a group of smaller, or sub, manifold zones to designate a larger main distribution Manifold as their Master zone. Both of these options are equally catered for using this option.

Warning and Alarm Levels

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in one of the four Alarm or Warning columns.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the Keypad that appears, touch-type the required value for the particular value (Note that Warning levels should be less than Alarm Levels).
4. When finished each value touch [**Enter**] to accept the new entry or [**Esc**] to reject it and return to the Setup page.
5. Repeat the above steps for the remaining High and Low settings.

Limits

The maximum Warning or Alarm value that you can set for any of this group is 99°C or 178°F.

Description

These four columns set the first and second stage (Warning and Alarm) levels that monitor the zone temperatures. These generate visual warnings should the Actual temperatures deviate too far from the nominal Set temperature.

If no other values are chosen, these parameters are automatically set to ±5° C for Warning and ±25° C for Alarm levels. However all these may be reset to a preferred value by touching in the relevant column and then setting new levels on the keypad.

If any temperatures deviate by an amount that exceeds the first stage limits constitutes a warning. This displays a Warning message in the lower Status box and the offending zone has its Actual Temperature window changed to Black text against yellow background. If any temperature then deviates further and exceeds the second stage limits it raises the situation to Alarm.

This occurrence displays an Alarm message in the lower Status box, changes the Actual temperature window to show White text against a Red background and actuates an Alarm relay that may be used to set of a Beacon, Siren of other remote device.

These Warning and Alarm limits are a common feature on all zones, whether they control or monitor.

Using an Alarm Delay can accommodate fleeting alarms, that become a nuisance, - this holds off the outgoing alarm until the limits have been exceeded for a certain configurable time. (See page 45.)

Maximum Setpoint Setting

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the Maximum Setpoint column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the Keypad that appears, touch-type the Maximum Setpoint value for the selected zones.
4. When finished touch [**Enter**] to accept the new entry, or [**Esc**] to reject it and return to the Setup page.

Limits

The highest Maximum Setpoint temperature that you can set is 450°C or 850°F.

Description

This column allows you to set the maximum setpoint value for any zone, or group of zones. This parameter may be set to inhibit any changes up to excessively high probe temperatures that may cause material degradation or tool damage.

If you try to raise the zone setpoint to any value which is above the Maximum Setting then the final setpoint depends on how the Limit Exceeded option (see page 37) has been configured. For instance if the current zone temperature is 350 and the Maximum setting is 400, if you try to set a new temperature of 450 then:

- with Limit Exceeded option set to Enabled the new set temperature would rise to 400 which is the highest allowable temperature setting.
- with the Limit Exceeded option set to Disabled the set temperature would not rise at all but will remain at 350.

Minimum Setpoint Setting

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the Minimum Setpoint column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the Keypad that appears, touch-type the Minimum Setpoint value for the selected zones.
4. When finished touch [**Enter**] to accept the new entry, or [**Esc**] to reject it and return to the Setup page.

Limits

The lowest Minimum Setpoint temperature that you can set is 0°C or 0°F.

Description

This column allows you to set the minimum setpoint value for any zone, or group of zones. This parameter may be set to inhibit any changes up to excessively low probe temperatures that may cause moulding problems.

If you try to set a new low temperature which is below the Minimum Setting then the final temperature depends on how the Limit Exceeded option (see page

37) has been configured. For instance if the current zone temperature is 250 and the Minimum setting is 200, if you try to set a new temperature of 150 then:

- with Limit Exceeded option set to Enabled the new set temperature would lower to 200 which is the lowest allowable temperature setting.
- with the Limit Exceeded option set to Disabled the set temperature would not alter at all but will remain at 250.

NOTE: If, on any zone, the Maximum and Minimum Setpoints are set to the same value then the operator cannot make any setpoint changes to that particular zone.

Maximum Power Setting

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the Maximum Power column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the Keypad that appears, touch-type the Maximum Power value for the selected zones.
4. When finished touch [**Enter**] to accept the new entry, or [**Esc**] to reject it and return to the Setup page.

Limits

The highest Maximum Power Setting that you can set is 100% power.

Description

This column allows you to set the maximum power permitted for Manual/Open Loop working for any zone, or group of zones. This parameter may be set to inhibit any changes up to excessively high probe temperatures that may cause material degradation or tool damage.

T/C Offset Value

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the TC Offset column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the Keypad that appears, touch-type the Offset temp for the selected zones.
4. When finished touch [**Enter**] to accept the new entry, or [**Esc**] to reject it and return to the Setup page.

Limits

The highest T/C Offset temperature that you can set is ±75°C or ±135°F.

Description

Some manufacturers make probes where the T/C sensor is closer to the rear band heater than the tip. For such a type, the displayed T/C temperature could be noticeably different to the temperature of the plastic material at the tip. In such a situation it helps if the operator can set some offset so that temperature on the main page reflects the working temperature at the tip rather than the actual T/C temperature somewhere else within the probe. The T/C Offset Value allows you to achieve such temperature display compensation.

While using a set Temperature of, say, 250°C on the main page and then putting (plus) 20 degrees into the T/C Offset column on the Setup page, the zone will then control the temperature to 270°C. However the main page will still show 250°C. Also, the offset is a constant value, so that increasing the zone set temperature to 290°C on main page means that the zone is then controlled to 310°C at the T/C point. Using a minus T/C offset has the same effect only working in the opposite direction, i.e. with Set Temperature at 250°C and T/C Offset at minus 30°C the actual controlled temperature at the T/C is 220°C.

However the use of T/C Offset is proportional. This means that if you apply plus 20° offset to a zone whose set temp is normally 250°, while the tool is at its ambient temperature of 21°, then you will not see the display temperature immediately corrected by 20° to show 1°. What happens is that the controller uses only a proportion of the offset while the tool is below its set temperature. This graph shows how a proportion of the offset is used while the tool is below its set temperature.

Note that the need for T/C offset is not exclusive to such probes as first mentioned - this facility could have other uses for different production situations.

Corrected Offset at low temperature
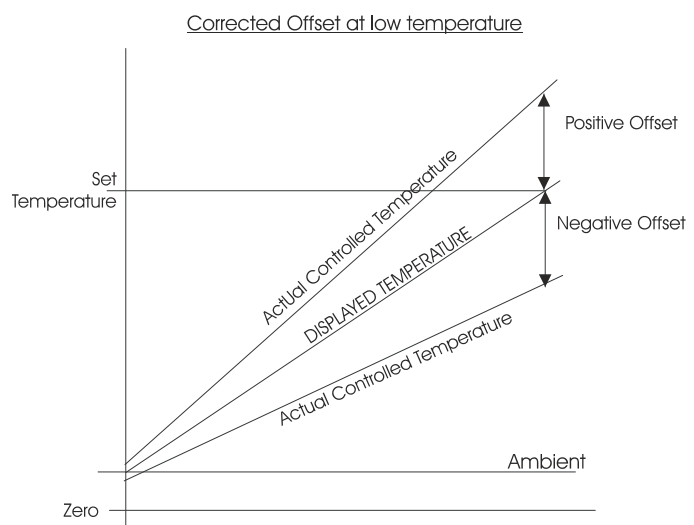
Speed

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the "Speed" column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the "Configure Card Speed" panel choose a preferred control speed for the selected zones.
4. Touch [**OK**] to accept the new speed setting or [**Cancel**] to leave it unchanged.

Description

The Speed parameter determines how fast the zone will respond to or anticipate changes in temperature. While there are manual settings of Slow Medium or Fast, the default setting is auto. This allows the zone to run an auto-load sensor program during its first start and determine which of the three manual settings best suits the load. After a first run, the Zoom page will show the setting as either manual (Slow, Med or Fast) or Auto setting (A-Slow, A-Med, or A-Fast). However, there are some miniature probes on the market that may require a very-fast speed setting and for these products there is an Ultra option.

Triac

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the "Triac" column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the "Configure Card Triac" panel choose either On-Board or Off-Board Triacs for the selected zones.
4. Touch [**OK**] to accept the new speed setting or [**Cancel**] to leave it unchanged.

Description

This column allows you to select the triac to match the load and different cards have different needs.

K-series Controllers with 1, 2, 3 or 6MOD cards, use only On-Board triacs and does not show this column.

X-Series with 6 or 12-zone cards use only On-Board triacs and does not show this column.

Setting any zone type to Spear automatically sets the Triac selection to Both.

Sensor

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the "Sensor" column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the "Select Item" panel choose either J-Type or K-Type Sensor for the selected zones or select [**Cancel**] to leave it unchanged.

Description

All control and monitoring cards need to be correctly matched to the tool temperature sensor.

Select J-Type or K-type as suitable for Closed loop Control, if in doubt check with the tool specification to confirm which type is fitted to the probes.

Select RTD for temperature monitoring circuits on WT cards.

Display Group (allocation)

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the "Display Group" column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the Keypad that appears, touch-type the Display Group number for the selected zones.
   Note that Display Group defaults to Group 1, start by allocating to the second, third, fourth groups etc. by typing "2" on the first setting, then "3", "4", etc. for repeat settings – all remaining zones are then left as Group 1.
4. When finished touch [**Enter**] to accept the new entry, or [**Esc**] to reject it and return to the Setup page.

Limits

There is a limit of 6 Display Groups.

Setting Zones to No Display

If you set any zones to Display Group 0 then those zones will function but not be seen on the Display page. The more common use for this function is to hide the IO3 board which has 4 I/O circuits and a T/C circuit none of which would normally need to be seen but which must remain functional to work. It is possible that other applications may also require such an invisible function and if this option is used then only the Setup Page displays all of the detected cards within the associated controller.

Description

As mentioned earlier in the manual, the Display Group function allows you to configure different zones into groups. Before you embark on this particular exercise it will make grouping easier if you first read all of the following:

a. Before you start grouping zones then all the zones, by default, are in Group1.
b. Before you allocate the zones into groups, then it is worth noting how many zones you are starting with, and plan which zones will go into which groups. For example, a tool with 140 zones (say 128 probes and 12 manifolds) may need to be set up as four groups, each with 32 zones and 3 manifolds.
c. As you start to group the zones into these groups you should start by assembling group 2, then 3, then 4. All the zones that are left, after step three, will automatically remain in group 1.
d. As you assemble each group of zones, then the remaining zones will automatically re-number themselves. This means that you appear to put zones 1-35 in Group 2, then zones 1-35 in group 3 and finally zones 1-35 into group 4. Although you appear to be selecting the same group each time, it is, in fact, a different group of renumbered zones and you can confirm this by checking the rack addresses.

Following these steps, and working on the given example, then on completion the main page would show the following:

Group	Probes	Manifolds
1	1- 32	1 - 3
2	33 - 65	4 - 6
3	66 - 98	7 - 9
4	99 - 128	10 - 12

When you have completed the zone grouping exercise you can verify the finished results by returning to the main page and scrolling through the different pages. As each group is separately shown the message in the lower status bar tells you which group is currently displayed in the window. Proper use of the Zone Alias naming feature reinforces this facility. If, for instance, each zone is dedicated to a different colour or material then use the Alias feature to name the zones so.

Group	Material colour	Probe "Alias"	Probes	Manifold "Alias"	Manifold
1	Blue	Blue 1 - 32	1- 32	Blue 33 - 35	1 - 3
2	Yellow	Yellow 1- 32	33 - 65	Yellow 33 - 35	4 - 6
3	Red	Red 1 - 32	66 - 98	Red 33 - 35	7 - 9
4	Green	Green 1 - 32	99 - 128	Green 33 - 35	10 - 12

Zone Display Grouping has no effect on the operation of the controller. It exists only to facilitate the operator control interface in situations where a tool might have distinct groups of zones that are more easily monitored as separate groups.

Startup Stage (allocating zones to)

This option is only available if you select "Stage" as a Startup Mode option in the global "Config" settings.

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the "Startup Stage" column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the Keypad that appears, touch-type the Startup Stage Group number for the selected zones.
4. When finished touch [**Enter**] to accept the new entry, or [**Esc**] to reject it and return to the Setup page.
5. Repeat the above steps to configure all the zones into their respective Startup Groups.

Limits

There is a limit of 8 Startup Stages.

Description

In order to use Staged Startup you need to configure different groups of zones into discrete stages. There is no need to set the Startup Stages in any order although it may be a simpler task to start at the first group and then move on to subsequent groups.

Select the zones that you wish to nominate for any one stage in the Startup pattern and then touch anywhere in the Startup Stage column. In the keypad that appears, enter the stage number for that group (Startup Group "1" will be the first to reach their operating temperature, "2" the second group etc). Continue with other groups of zones until all the zones have been configured.

Shutdown Stage (allocating zones to)

This option is only available if you select "Stage" as a Startup Mode option in the global "Config" settings.

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the "Shutdown Stage" column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the Keypad that appears, touch-type the Shutdown Stage Group number for the selected zones.
4. When finished touch [**Enter**] to accept the new entry, or [**Esc**] to reject it and return to the Setup page.
5. Repeat the above steps to configure all the zones into their respective Shutdown Groups.

Limits

There is a limit of 8 Shutdown Stages.

Description

This column allows you to nominate the zone groups for staged shutdown. Zones in Group 1 will be switched Off first followed by subsequent zones that you nominate for groups 2, 3 4 etc. the interval between shutdown stages is determined by the Shutdown Timer and the Shutdown Temperature in the Config panel. Their interaction is shown in the following table.

Shutdown Timer	Shutdown Temp (with Set Temp at 260°)	Shutdown Pattern
0 mins	200°	Each stage must cool down to 200° before it switches off and next stage starts cooling
5 mins	0°	Each stage must cool down for 5 minutes before it switches off and next stage starts cooling
5 mins	200°	Each stage will cool down for 5 minutes or until it cools down to 200° (whichever occurs first) and then it switches off and the next stage starts cooling.
0 mins	260°	The cooling sequence will cascade through the stages with no noticeable delay between them. This combination should be avoided.

Analog Sensor Type

This option is only available if you have any Analog Flow Sensors fitted.

Setting

1. Open the Setup page – select those zones that you wish to configure and touch anywhere in the "Sensor" column.
2. Touch [**Set**] and, if required, enter your system Password.
3. In the "Select Sensor" panel choose a Sensor type that matches the selected zones or select [**Cancel**] to leave it unchanged.

Description

If an Analogue input board is installed then you can use this column to choose from a Select-Item list what type of input the analogue card is reading. Most often it will be related to water flow rate but may include other parameters such as pressure, positioning or any other measurable quantity. The zone information on the main page will then be changed to reflect the analogue input such as L to read litres per minute on a Water Flow input.

Note, however, that the X-Series has no option for using Analog cards.

Setting up the Operating Parameters

Once the Console and Tool parameters have been defined then you can set up the normal running temperatures for that tool.

To set your required zones you need to look at the main page to see all the various zones, with their function colour coded to show probes, manifolds and others.
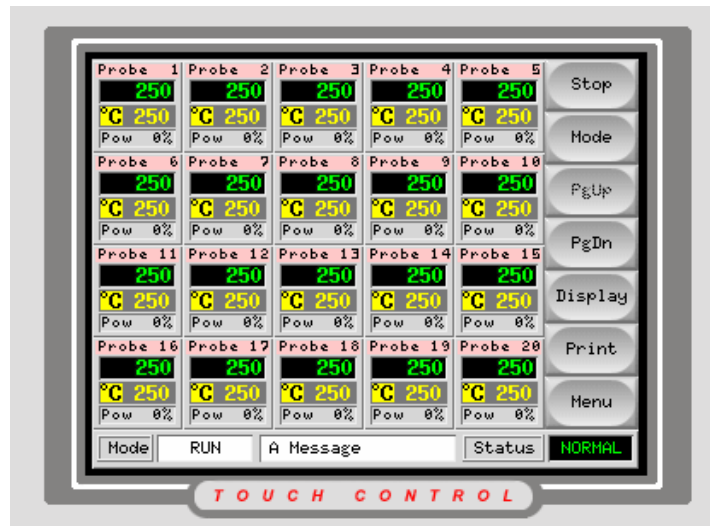
To Select the appropriate zones...

1. Select appropriate zones by simply touching them, your choice is confirmed by the appearance of a blue border. To select groups of zones you may either:

- * repeatedly touch every zone in question until you have sufficient zones selected with their blue borders active, or

- * touch the first and last zones within a range and then select [**Range**], from the side bar, this increases your selection to include all the zones between the specified pair.

(Unselecting is as simple as touching [**Cancel**] on the side bar or, if there are only a couple of zones, touching them a second time to de-select them.)

2. Touch the [**Set**] command button on the upper right of the screen, and enter your System password to display the temperature setting keypad.

3. Check that this is a set point, as opposed to a temperature raise or lower, by selecting [**Set**] in the top Value box.

Setting Probe and Manifold temperatures

1. Chose the operating mode for your zone, or group of zones - Auto (or closed loop) is the normally preferred mode. However, if you select [**Manual**] (open loop) or [**Slave**], notice how the prompt changes, in the top window, to accommodate your preferred mode. Unless you need to be in either of these other modes touch [**Auto**] to return to the Set Temperature prompt.

2. Enter the desired temperature or power setting or target slave zone, according to the mode that you chose in the previous step. To correct a setting during this step [**Delete**] undoes your last entered figure.

3. Touch [**Enter**] to confirm your settings or [**Esc**] to return to the main page without accepting the new choice and values.
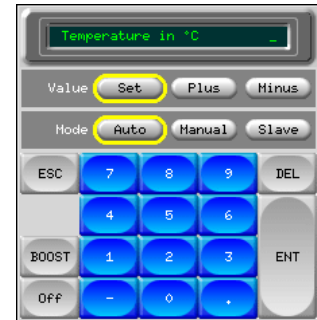
Saving everything to a Tool Bank

Once you have configured all the initial settings, transfer all the settings into the tool bank slot, which you named in Stage 1, so that they may be re-used at any time.
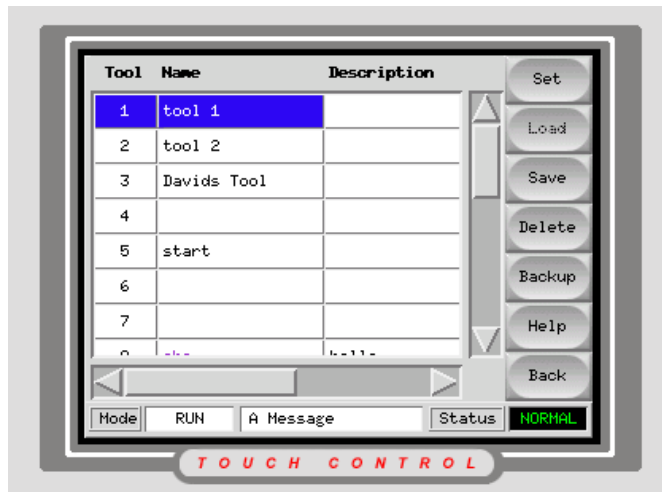
Saving your tool configuration

1. Select the Tool store tab to display the tool store window.

2. If your new tool is not selected then touch it now to open that memory slot.

3. Touch [**Save**] to save all your new configurations settings into this new slot.

Running your controller

This section of the manual is divided into four main areas that are concerned with:

- the basic Starting and Stopping along with Boost and Pause controls.
- changing settings while the controller is running. This allows you to make changes while the controller is running, so that you can adjust temperatures and change any parameters to cope with varying operating conditions.
- inspecting historical graphs that can display how any zone has behaved over the last 5 or 30 minutes, or even the last 24 hours. With such information being so easily available, it makes problem solving easier to pinpoint.
- recognising what alarms may be generated and what they mean and what to do about them.

What is included in this section

Starting

Stopping

Pausing - how to put the heaters on hold for a short time

Looking at Startup and Shutdown methods

Boost - how to apply a brief raise in temperature

Using the main page to control and monitor temperatures

Using Slave Mode to compensate for a failed thermocouple

Looking at temperature history for the last 5 or 60 minutes

Alarms - what alarms may be seen on the controller.

Starting and Stopping and Pausing

Other than simple power-on (Run) or Power-off (Stop), your controller offers more options to Start, Stop and Pause your moulding tool heaters. Touching [**Mode**] reveals these extra functions which are all described in the following pages.

You can use the main page to control both the global operating of the system such as Run and Stop as well as the individual zone operations such as temperature and mode changes. In order to accommodate this range of functions, the top-most function buttons have different functions that change according to need.
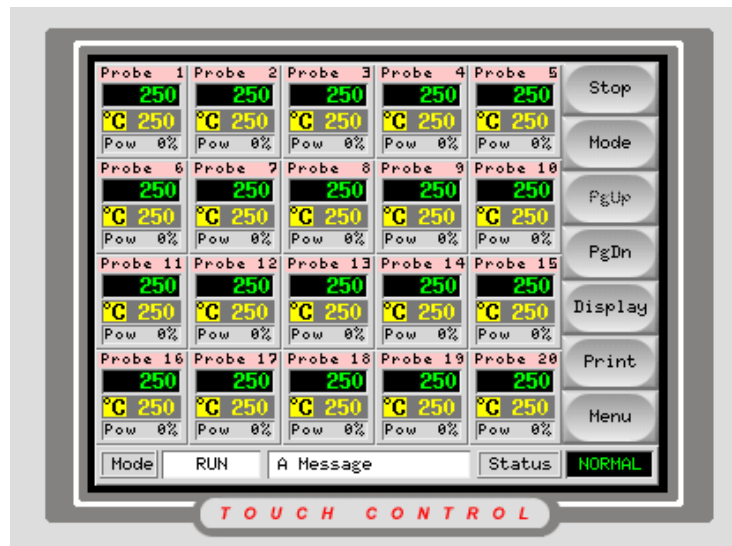
While no zone is selected (with its borders highlighted in blue) then the upper function buttons provide [**Stop**], or [**Start**] and [**Mode**] selection. When you want to alter the temperature or operating mode of any zone, or inspect a zone on the graph page then your first step is to select that particular zone. Doing so automatically change the top three function buttons over to [**Set**], [**Zoom**] and [**Range**] in readiness for your next command.

Note that it possible to open the main page expecting to find the Start/Stop buttons but find the [**Set/Zoom**] buttons active with apparently no zone selected. In such a case you will have a warning that reads "ZONE selection active" in the lower message bar and that, by scrolling further down the pages, you find a selected zone at the end of the list that is keeping the [**Set**] button active. Touch [**Cancel**] to deselect all zones and the [**Start/Stop**] buttons will reappear on the screen.

Run

Run command switches all the heaters on, so that they independently rise up to their set temperature.

To switch all the heaters on and prepare the tool for moulding:

1.   Open the main page.
2.   Touch [**Run**].
3.   At the confirmation prompt touch [**OK**] to confirm your request or [**Cancel**] to defer the action.

(Notice that the [**Run**] button now reads [**Stop**])

Stop

To switch all the heaters off, so that the tool can cool down:

1.   Open the main page.
2.   Touch [**Stop**].
3.   At the confirmation prompt [**OK**] to confirm your request or [**Cancel**] to defer the action.

(Notice that the [**Stop**] button now reads [**Run**])

Selecting Stop does not remove voltage from the heaters; it switches off by setting all the target temperatures to Zero. Do NOT try to change fuses or disconnect units while in this mode.

Stopping individual zones

To switch individual zones to off:

1.   Open the main page.
2.   Touch the zone or zones that you wish to switch off
3.   Touch [**Set**]
4.   At the following keyboard enter the User password to confirm your authority.
5.   At the keypad touch [**Off**] and [**OK**] to confirm the action.
6.   On return to the main page the stopped zones display the Off symbol.
7.   To reset the zone(s), repeat these steps and touch [**On**] - the temperature setting will be restored from memory.

WARNING: Selecting [**Off**] does not remove voltage from the heaters; it switches off by setting the target temperatures (or current flow) to Zero. Do NOT try to change fuses or disconnect units while in this mode.
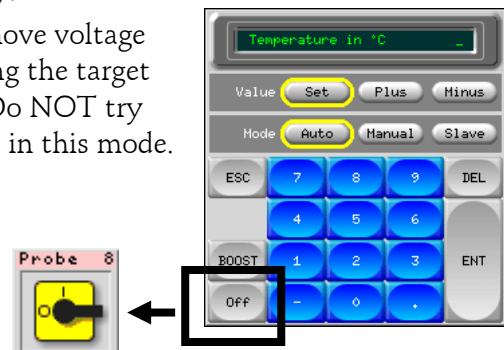
Standby Mode

This mode is available for times when the mould-tool needs to be paused. Under this command, any zones that have some Standby temperature configured are reduced in temperature to prevent degradation on certain materials while standing in the tool. (Read about setting up Standby temperature on page 57.)

1. Open the main page.
2. Touch [**Mode**] to activate the Mode menu.
3. Touch [**Standby**].
4. At the confirmation prompt touch [**OK**] to confirm your request or [**Cancel**] to defer the action.

The controller is now placed into the Standby mode.

Start-up

Start-up mode applies heat to the zones in a predetermined pattern rather than switching on all the zones at once.

Normal Startup Mode

With Master Only Startup disabled, then the tool will achieve a homogenous rise for all zones that have a declared Master zone. In this mode, the controller modifies the Set Temperature, of any probes or sub-manifolds that have a Master zone, to follow the Master zone's Actual temperature. As the Master zone's temperature rises then so will its sub-zones rise at the same rate rather than rush away at their own speed. All other zones, that have no declared Master zone, remain set at zero. When any Master zone reaches its Set Temperature all the zones, in the tool, are then switched over to Run. Zones, which have previously been held at zero, are then allowed to reach their normal working temperature.

Master Only Startup Mode

In certain moulds (such as Manner Gate Valve tools) you must start up in two stages to protect the gating valves and seals from stress caused by thermal expansion. Configuring the tool to enable Master Only Startup ensures that only those zones that are set as Master (usually one or more manifold zones) are initially switched on: all other zones are set to Zero. Once the Master Zones reach their set working temperature then the remaining zones are switched on for the complete tool to reach working temperature.

Staged Group Startup

This option is similar to the Master Only startup detailed above, but it offers more stages in the startup pattern for complex stack moulds. In Stage Startup, each nominated group of zones is switched on in sequence which allows the first group of zones to be energised and allowed to reach their nominal operating temperature before subsequent groups are heated up. Allocating zones into discrete startup stages is detailed in the Setting up procedures on page 66.

Enabling Staged Startup is switched within the Configure Controller options which may be accessed via the Setup Page and Configure option and is detailed on page 44.

To use Startup Made

1. On the Display page touch [**Startup**] if it is immediately available otherwise touch [**Mode**] and then [**Startup**] in the Mode menu.
2. At the confirmation prompt touch [**OK**] to confirm your request or [**Cancel**] to defer the action.
3. The system initiates the pre-configured Start up pattern while the top button changes to "Shutdown". The Mode window shows STARTUP as a flashing sign.
4. When normal temperatures are reached then the system automatically assumes a Run mode and confirms this by displaying a steady RUN sign in the Mode window.

NOTE: Start-up mode cannot run without a Master Zone selected. If Start-up is chosen with no Master Zone selected then the system automatically switches over to Run Mode.

Shutdown

This Shutdown mode is dependent on, and is an opposite complement to, the Startup mode.

With the Startup Mode set to Master

Shutdown switches off the nominated manifold zones and all the probe zones have their Set temperatures adjusted to follow the manifold Actual temperature as it gradually reduces. This allows the whole tool to cool in a homogeneous manner and so reduce thermal differences and stress.

On some tools however, this may be an extremely slow process because the heat, which is applied to the probes to keep them at the same temperature as the associated Master manifold, conducts through to the manifold. This can considerably extend the manifold's normal cooling time and consequently the whole shutdown process may take a long time.

Individual zones that have no Master Zone configured will simply switch off and cool down at their own rate. Depending on tool design, and zone location, then the rate of cooling for masterless zones may, or may not, depend upon thermal conductivity from adjacent zones that are still being heated.

Note: If Shutdown is chosen with no Master Zone selected then the system automatically switches over to Stop Mode.

With the Startup Mode set to Staged

Shutdown consecutively switches off the zone groups in timed intervals and in the order as nominated by Shutdown Stage configuration. The Shutdown Timer within the Configure Controller section sets the time delay for between each group being switched off and therefore determines how long it takes for the complete tool to cool down.

Note: If the Shutdown timer is set to Zero then the system will still attempt to carry out a Staged shutdown but will use a fixed temperature of 100°C as a shutdown trigger level rather than a fixed time period. Accordingly, the first group is switched off and once it has cooled down to 100°C then the second group is switched off and so on until all groups are switched off. However, in some tools, the thermal conduction between heated and cooling groups could considerably extend the time that it takes for any group to cool down to the set level. As a result, the Shutdown process would again be very slow.

To select Shutdown Mode proceed as follows: -

1. Open the main page.
2. Touch [**Mode**] to activate the Mode menu.
3. Touch [**Shutdown**].
4. At the confirmation prompt touch [**OK**] to confirm your request or [**Cancel**] to defer the action.

Once the Master manifold reaches zero (or room) temperature then the system automatically assumes a Stop mode.

Manual Boost

There are two methods of applying manual boost which are described below. However, the use of zone temperature Boost is dependant on the following:

- There are two quantities that determine boost, the boost temperature (described on page 58) and it's time (described on page 46)
- It is this period of time that takes precedence within a boost command. Once the boost period expires then the extra heating power is removed regardless of whether the zones actually reached the temperature that may be called for by the zone SetUp parameter.
- Boost only raises the temperatures of zones that have a boost value configured (see Console parameters on page 58) .
- for Spear tip nozzles, only the Tip temperatures are raised (see page **Error! Bookmark not defined.**).
- Boost mode is only available while the system is in Run mode

Boost Mode (all configured zones)

Boost Mode provides a means of temporarily raising zone temperatures - the feature may be used on its own or as a means to recover from Standby Mode.

1. Open the main page
2. Touch [**Mode**] to activate the Mode menu.
3. Touch [**Boost**].
4. At the confirmation prompt touch [**OK**] to confirm your request or [**Cancel**] to defer the action.

Boosting selected zones

If you need to boost just some of the configured zones in order to clear one or more zones then you have a Single Zone Boost facility. This is available from the main page and it allows you to boost a single zone's temperature.

The Boost command is used as follows:

1. Open the main page.
2. Select the zone, or zones, that you wish to boost.
3. Touch [**Set**] to display the Keypad as seen here.
4. Touch [**Boost**].
5. Touch [**Enter**] to boost the temperature of the selected zone, or zones.

The Zone temperatures return to normal after the Boost time expires.

Remote Boost

Remote boost tends to occur as one of two entirely different functions.

1. For spear tip zones, a cycling input is used to initiate the tip boost condition to open the probe gates. The period and settings for this remote boost are configured on the setup page as a Spear-Tip group and are not related to the normal Boost Time and Boost Value settings mentioned above.

2. On machines using either the remote console input (see appendix A) or a 4-way I/O card (see Appendix B) an operator has the ability to initiate a Manual boost by remote connection. This remote boost uses the same settings as Manual boost and it operation falls under the same constraints as for Manual Boost as are mentioned above.

How Boost is displayed in the Status Window

The Status bar at the bottom of the screen has a mode window which changes to display BOOST whenever a boost command has been initiated. The period of time that the BOOST message is displayed may vary according to how the boost is applied and what system it applies to.

Manual Boost command for simple single element nozzles

If a Boost condition is manually initiated for all, or individual zones, then the message bar shows "BOOST" in black letters on a yellow background. The BOOST message persists for the same Boost-Time period that has been preset in the Configure Controller Setup. When that preset time expires the nozzle returns to normal running temperature and the Status Bar returns to showing RUN.

Remote Boost command for simple single element nozzles

If a boost Command is received from an external source via the I/O board then the message-bar shows M/C BOOST as black letters on a white background. The time that the message displays for is dependant on the external signal.

If the external signal is brief for example, it lasts 1 second, and the Boost Time is set to something longer, perhaps 3 seconds, then the nozzles are boosted for 3 seconds after which they return to normal level. The M/C BOOST signal is also displayed for 3 seconds after which it returns to RUN.

If the Boost Time is set to 3 seconds and the external signal lasts for 4 seconds, then the nozzles are still boosted for 3 seconds and then return to their nominal value. However the M/C BOOST message in the Status bar is displayed for the longer 4 seconds (while the external signal is present) even though no boost current is being applied for the last second.

Remote Boost command for Spear/Tip nozzles.

When an external signal is used to trigger a Spear Tip nozzle then the Mode indicator on the status bar switches from RUN to BOOST and the Power indicator in each zone switches from Body power, or current, to Tip power. What is seen on the touch screen depends on various factors as explained below.

The Mode Window Indicator

The Mode indicator switches to BOOST and should only be used to confirm that an external Boost signal has been received. It remains at BOOST for a period that is equal to that of the incoming remote signal PLUS one second - it is no indication of the actual Tip boost period.

Individual Zone Power Indicators

The power-indicator on individual zones changes from Body to Tip display. You may, or may not, see the Tip Pre-Heat power level for a brief period. This depends on the length of the Boost delay and the number of cards in the system. If the controller has many cards, the total scan time may exceed the Boost Delay period, in which case the Pre-heat power will not be seen so the Power Indicator shows the Boost Power only. If the Boost Delay is set to 2 seconds or more, the console has enough time to scan all the cards and you will initially see the Pre-Heat power and then the Boost Power levels.

Once the Boost Period has expired then the zone power indicator returns to show main body power, regardless of the condition of the external Boost signal.

The following graph shows examples of how the Boost Display may vary:
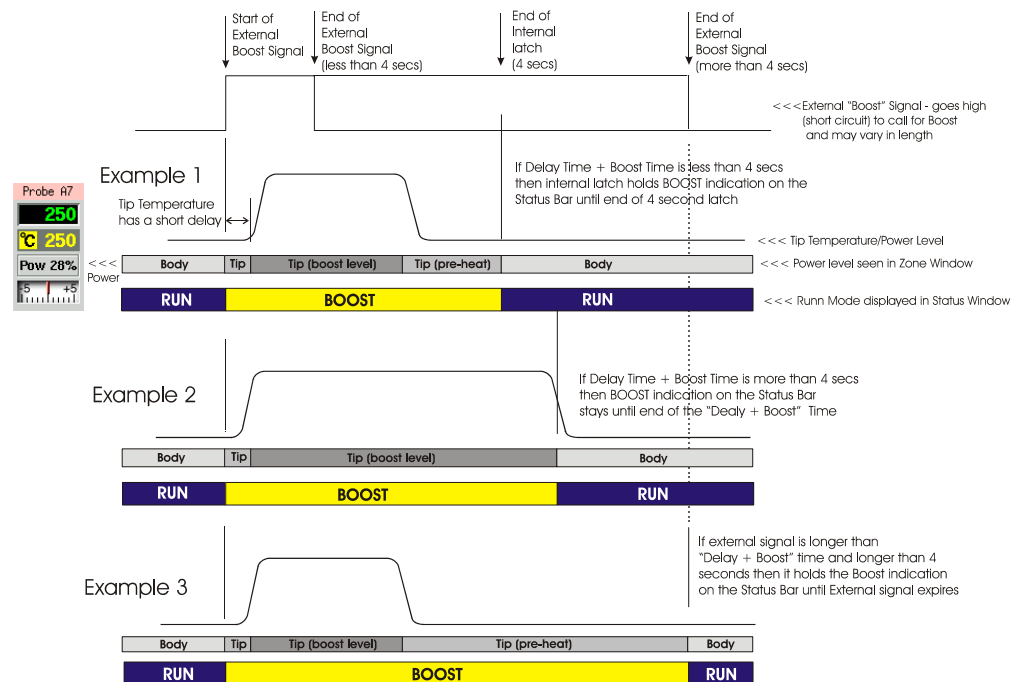
Changing Temperatures

If any conditions change such that you need to change any settings whilst your mould is running then there are many features on the main page that enable you to fine tune your controller.

Use the "Value" keys to enter temperature commands
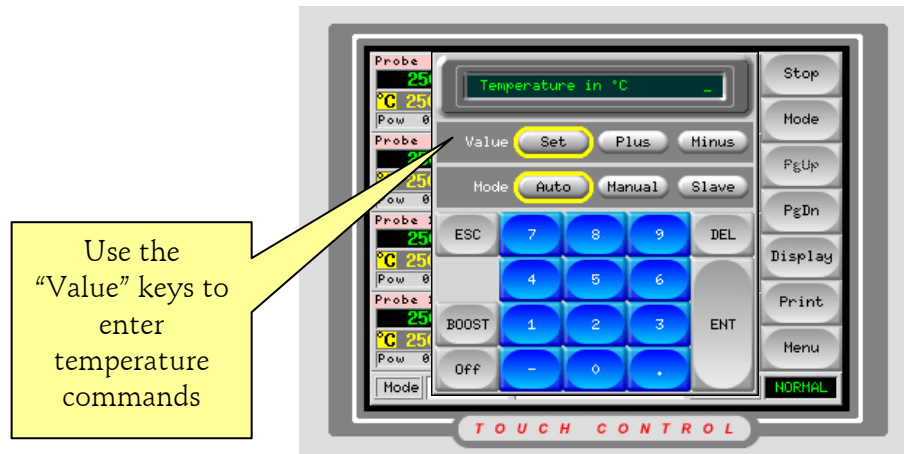
To change the working temperature
1. Open the main page.
2. Select the desired zones, (this automatically changes the function keys from Global to Zone).
3. Touch [**Set**] to display the keyboard.
4. Enter the password to display the keypad

and either

Configure a new set temperature
5. Touch [**Set**].
6. Enter the new Temperature.
7. Touch [**Enter**] to confirm your request or [**Esc**] to defer the action.

Raise the overall temperature
5. Touch [**Plus**].
6. Enter the amount you wish to raise it by.
7. Touch [**Enter**] to confirm your request or [**Esc**] to defer the action.

Lower the overall temperature
5. Touch [**Minus**].
6. Enter the amount you wish to lower it by.
7. Touch [**Enter**] to confirm your request or [**Esc**] to defer the action.

Changing Modes

Use the "Mode" keys to enter working- mode commands
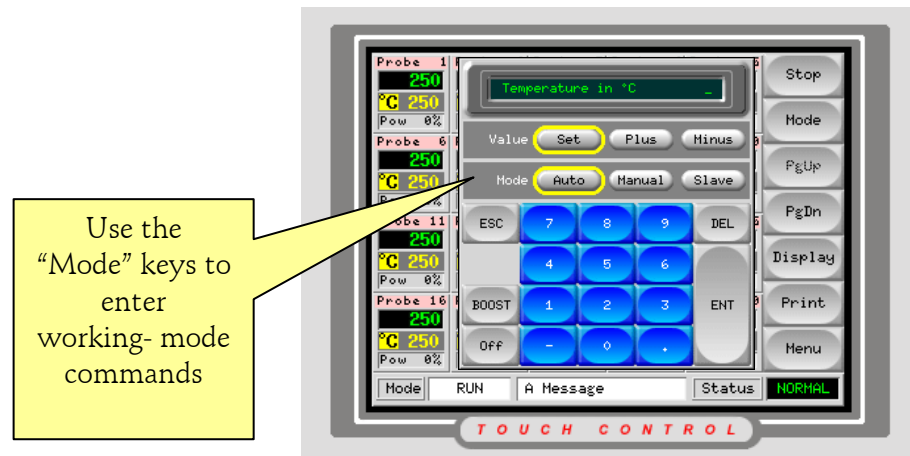
To change the Working Mode

1. Open the main page.
2. Select the desired zones, (this automatically changes the function keys from Global to Zone).
3. Touch [**Set**] to display the keyboard.
4. Enter the password to display the keypad.

and either

Select Auto Mode

5. Touch [**Auto**].
6. Set the required Temperature.
7. Touch [**Enter**] to confirm your request or [**Esc**] to defer the action.

Select Manual Working

5. Touch [**Manual**].
6. Set the required power Setting.
7. Touch [**Enter**] to confirm your request or [**Esc**] to defer the action.

Select Slave Working

5. Touch [**Slave**].
6. Select the zone that you wish to Slave to.
7. Touch [**Enter**] to confirm your request or [**Esc**] to defer the action.

Checking Zone Settings

There is a Zoom facility that allows you inspect individual zones to see their individual configurations. More importantly, it is the only place where you can see what response speeds the controller has automatically selected for each zone. Referring to "How the Controller Works", on page 19, that section describes how the control card initially ramps up the temperature to decide whether to use a fast, medium or slow response curve for each zone. Once the initial run has been done then the Zoom page shows the resultant speed selection. Very occasionally, on intermediate sized nozzles or manifolds, the selection may not be the best match for optimum performance. In which case you can check which Auto speed is associated the zones and, on the Setup page, chose to manually override the computer's choice and select a preferred response speed.

Touching any one zone on the main page causes the second button down to change from [**Mode**] to [**Zoom**]. Touch [**Zoom**] and it reveals the zoom page.

The top of the page shows the zone name or alias in its appropriate colour background, along with live temperature information which is relayed from the main page. The lower half shows the current setup configuration which can be scrolled to see all the information. Meanwhile the [**ZoneUp**] and [**ZoneDn**] buttons allow you to browse other zones without having to return to the main page and reselect.

If the selected zone is a spear type then the extra Tip information is shown at the upper right hand side of the screen as seen here.

Checking zone past performance (graph)

Your controller can record and display the temperature history for any zone over a period of time. It has the option to view the historical graph for the last 5 to 30 minutes depending on the selected range.

Inspecting the last 5 to 30 minutes

To view a temperature trace history, select one or more zones and then touch [**Graph**].

The graph page then displays a live trace of current temperature against a 30 minute time trace. If more than one zone was selected, then up to six may be seen at any one time and a colour key at the bottom of the page to shows which trace represents which zone. To see other zone traces then simply touch [**ZoneUp**] or [**ZoneDown**] to alter the zones currently on display.

There is also a means to magnify the scale; however, once this magnification is selected the screen freezes its traces at that point in time. No further live updating occurs but scales can be expanded to see closer detail on the historic trace.
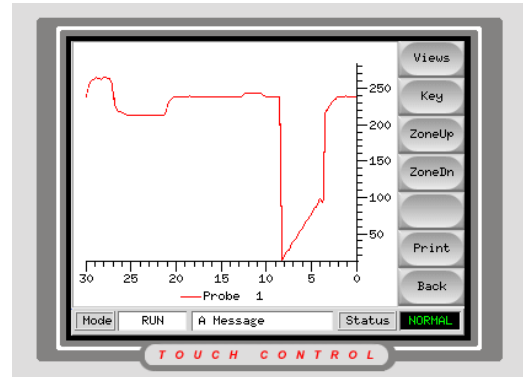
Magnifying Views

After touching [**View**] the graph trace is static and no longer updates in real time. However, you now have [**ZoomX+**] and [**ZoomX-**] which zoom the time scale from 30 minutes down to 5 minutes full scale. Similarly you have the two buttons marked [**ZoomY+**] and [**ZoomY-**] which zoom the temperature scale from 250 degrees down to 7.5 degrees full scale.

While using the Zoom feature small arrows appear on the scale graticules. If, while zooming in, the trace moves out of the window you can drag the appropriate scale to move the graph into the main viewing area. Also, when you reach the end of either scale the small arrows will disappear to show that you cannot traverse any further in that particular direction.
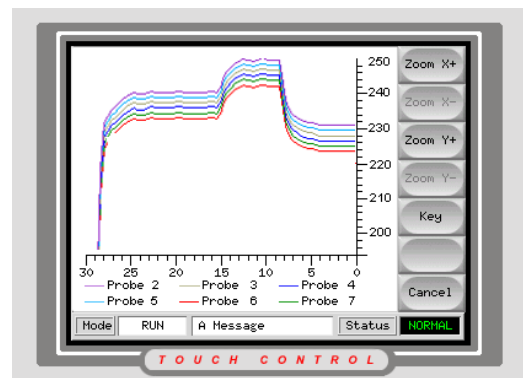
Alarms

Whichever page may be active, there is a common Mode and Status window at the bottom of the page.

| Mode | **WAITING** | Messages appear here... | Status | **NORMAL** |
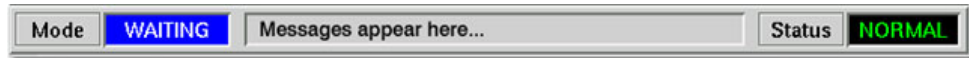
If your controller is switched on and running normally then the left hand Mode window will show RUN (written as black text on white background) and the opposite Status window will show NORMAL (written in green text on black background).

If the controller is manually switched out of RUN mode then the Mode window will change. Any of the following may be displayed, according to what function has been selected, and all, apart from RUN, will be seen flashing, on and off, to draw your attention to a possible abnormal condition.

The table below lists the different displays and their meaning:

RUN	All control zones are working normally
STOP	The System has been shut down and the heaters are at room temperature.
STANDBY	All zones with any Standby setting are reduced by that setting.
STARTUP	The system has been started in a homogenous or staged heat -rise. It will switch to RUN when working temperature has been reached.
SHUTDOWN	The system has been shut down in a homogenous or staged heat fall. It will switch to STOP when room temperature has been reached.
BOOST	All zones, with any Boost setting, are being temporarily raised to allow material to flow. (manual request)
M/C BOOST	The zones are being temporarily raised to allow material to flow. (machine request)

The right hand Status window shows NORMAL if all the zones are at their set temperature and no faults have been detected. If a fault is detected then it will change its display and colour as detailed below:

NORMAL	Controller is running normally
WARNING	A zone's Temperature exceeds the warning limits
ALARM	This shows either a Fatal Error or a zone's temperature exceeds alarm limits

Most zones will have preset first and second stage temperature alarm limits. If any zone's temperature deviates past the first stage limit then a WARNING will be generated. If any zone's temperature deviates further, past the second stage limit, then an ALARM will be generated.

There are also various conditions that are under constant supervision and if any of these arise then an ALARM which is known as a Fatal Error, is shown in the same way.

Identifying Zone alarms

To identify which zone is raising a Status alarm, you need to switch to the main page to check zone information. The EasyView page will also show zone and Alarm information, however, if the fault is not on a probe zone, the EasyView page may not show the guilty sector.

Normal Zone
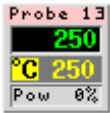
This shows a healthy zone: a state that is identified by the second temperature window showing Green text on black background.
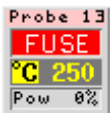
Warning Zone
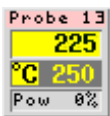
This shows a zone with a first stage warning - the actual temperature window has changed to black text on yellow background. This indicates that the temperature of this zone has deviated from the set temperature by a preset level. (see zone limits for exact details).

Alarm Zone

Here, the set temperature display is seen as white numbers on a red background. Since it is displaying the actual temperature, then it must be a second stage temperature alarm, in which a zone temperature has now deviated from the set point by an even larger margin.

The Status Warning may also be derived from zone with a Fatal Error (as shown here) in which case, the actual temperature is replaced by an abbreviated Error message.

(for a full list of al the possible Error messages and their meanings consult the Trouble shooting table on page 110)

Beacon and Sounder extension

If your controller is fitted with a Beacon and Sounder, it acts in a supervisory capacity only. Any incidence of a 2nd stage temperature alarm or fatal error alarm (such as Fuse or T/C) is extended to the beacon/sounder module. Curing the alarm condition will extinguish the beacon/sounder.

A key switch is also provided to mute the sounder at any time. Note however, that no reminder is given to show that the sounder is muted when the system is healthy. Re-occurrence of subsequent alarm conditions will cause the beacon to light but not create an accompanying audible alarm.

Using On-Screen Help

The micro-touch console has a limited on-screen help section that is text-based only. The Menu has a [**Help**] button that takes you into a help section with information on the following topics:

- Start, Stop & other universal run modes
- Individual zone Boost & Stop modes
- Temperature adjustments
- Closed, Open loop or Slaving
- Main page display options
- Graphical Temperature History
- Graph Zoom operation
- Lower Status Bar & Alarms
- Card indicators & alarms

Training and Demonstration Mode

Your controller has a "Demo Mode" that can be used for training or demonstration purposes.

While this mode is engaged the controller will not communicate with the associated Controller Cabinet therefore we recommend that you ensure that the system is idle before using the Demo Mode Facility.

About Demo Mode

While in Demo Mode, the console behaves as normal and all the usual facilities are available. The main difference is that Demo mode feeds every zone, within the selected tool, with a stream of pre-recorded temperature data. The Console appears to be working and it gives a real trace when Graph page is selected. While in this mode you can train users how to set and modify temperatures, alarms and other parameters and see the changes on the screen.

Selecting Demo Mode

1.   Select the Tool Page

2.   Select and load any tool.

3.   Select the required tool; make a note of the current Connection value.

4.   Touch [**Connection**] and then [**Set**]

5.   In the Select-Item option touch [**Demo Mode**].

6.   Accept the warning that this option will disable the Console.
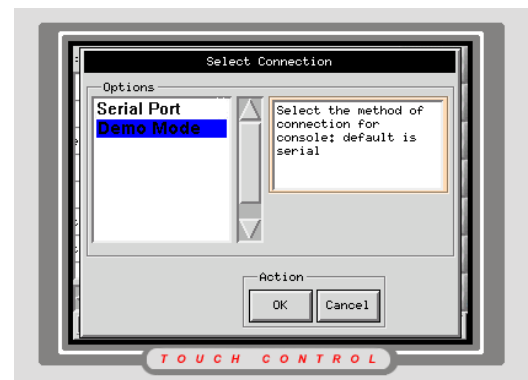
While in Demo Mode you can select and load other tools. By making sure that the next tool is connected to Demo Mode, you can see the same pre-recorded temperature data applied to your new tool.

De-selecting Demo Mode

Taking the console out of Demo mode is a simple reverse of the Selection routine.

1.   Select the tool page.

2.   Select the current tool being used.

3.   Touch [**Connection**] and [**Set**].

4.   In the Select-Item option, select the original setting that was noted at Step 3 while selecting Demo Mode above).

5.   Restore the console and controller back to production if required.

Customising your controller

Your controller has a dedicated Tool Bank which enables you adapt it quickly to different circumstances. It has twenty available positions that can be individually configured, named, saved and recalled whenever the tool or job changes.

What is included in this section

Inspecting the tool store - looking at what has been saved

Naming a tool - creating a new tool position

Saving tool settings - putting settings into a new tool position

Recalling tool settings - reusing past tool settings that have been saved

Changing tool settings - altering existing tool settings

Deleting a tool - how to clear a tool position

Networking to your Controller

Using the tool store page

Opening the Tool page allows you to see what different tool settings are saved away for immediate use.

The initial window shows the first twenty tool slots alongside the [**PgUp**] and [**PgDn**] buttons. There are 5 different pages (or banks) of tools giving a total capacity of 100 ToolSlots.

To use any one tool, first find the appropriate page by using [**PgUp**] and [**PgDn**]. Once you have opened the required page, touch and select any one tool - the tool is highlighted with a blue background and the buttons on the left side change to allow you to use the selected tool.

The [**Backup**] and [**Restore**] buttons at the top of the page can be used to make a complete backup or restoration of all the tools and their settings. This is particularly useful for copying multiple tool settings from an old machine to a new one.

Tool Page information

The main window has four columns containing the following information:

Tool - the allocated tool number

Name - a user configurable text field, of xx characters, that may be used to hold an identifying name for the tool.

The colour of the name is a key that shows the state of tool:

black - shows a tool store that has been named (using the [**Edit**] button, but which holds no settings.

blue - shows a tool that has been named, it may or may not have stored settings and it is not in current use.

purple - shows the tool that is currently in use and that has no changes to any settings that it may have in its store.

red - shows a tool that is in current use but which has been changed from its stored settings during use.

Description - a user-configurable text field that may be used to hold an expanded description of the tool.

Connection - this normally defaults to Local Serial which indicates that the tool settings are stored locally within the console memory. However, if the console is networked, this may show the name of a remote console. If so, then it is not a local tool that may be used. If that tool is loaded then the console is, in effect, disconnected from the local controller and connected to a remote hot runner controller and will monitor and control that controller. During this period the local controller is left running at its last set temperature without any local monitoring.
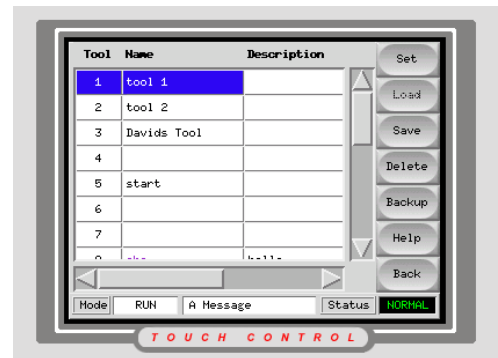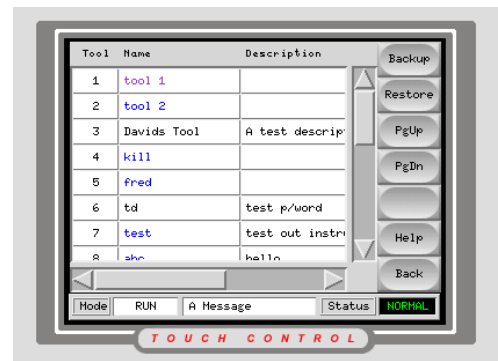
Naming a new tool

It is essential that whenever you need to generate and create new tool settings then you must first create a named slot for the new tool. If you configure all the new settings and then try to name and empty slot then all your new settings may be lost as you complete this sequence and you may have to start again.

To give a new name to a blank tool position:

1. Open the ToolStore page and select an empty tool store.
2. Touch [**New**].
3. At the keypad enter your System Password.
4. At the Tool Name prompt enter the new name for tool position and press [**Enter**].
5. The next pop-up window is the Connection option. If you are using the console and controller as a single stand-alone unit then the only available option is Local Serial. If, however, you are programming a console that is connected to a number of different control cabinets over a network then you must select the appropriate cabinet address for the intended new tool.
6. Use the Description section to add any relevant notes to the Tool. Touch the Description column and then [**Set**] to bring up the keyboard to add the descriptive text.

Renaming an existing tool

If you need to edit the name of an existing tool this can simply be done. It does not matter whether that tool is in current use, or not.

1. Open the ToolStore page.
2. Touch the relevant tool tab.
3. Touch in the Name column against the relevant tool, then touch [**Set**].
4. At the keyboard enter the System password.
5. At the name prompt, edit the existing name and then touch the enter button.

Loading tool settings

Once a tool setting has been saved into memory then it may be recalled at any time.

However, you should remember that the operating mode for the controller cabinet remains unchanged by loading another tool. So, if your controller is in Run mode and another tool setting with different temperatures is selected, and loaded, then the tool will immediately change to run at the new incoming temperature settings.

To use the Load tool function

1. Open the ToolStore page.
2. Select the tab for the desired tool.
3. Touch [**Load**].
4. At the "Load and USE Tool (name)" prompt, confirm your decision by pressing [**load Tool**] to confirm or [**Cancel**] to exit without saving the new settings.

NOTE: If the "Allow ToolLoad" option has been set to Disable then, if the system is in RUN mode, the [**Load**] button is greyed out because swapping Tools on-the-fly is not permitted. For information about setting "Allow ToolLoad" see page 38.

Saving tool settings

Tool settings can be saved at any time back into memory. But there may be two variations to saving changes.

Over-writing the last settings with new saved settings

If you have changed tool settings and know that they are satisfactory, then you can save them back into the same tool store.

1. Open ToolStore.
2. See that the current tool is displayed in red, which indicates that settings have been changed.
3. Touch [**Save**] to overwrite the old ToolStore settings.

Saving modified settings, without losing existing ones

If you have changed some tool settings and want to keep them but at the same time you wish to retain the old unmodified settings then it becomes necessary to create a new store to save them into. The following method allows you to do this without losing either the old or the new settings:

1. Open the ToolStore page.
2. Select a spare blank tool tab.
3. Touch [**Save**]
4. At the keypad enter your System password.
5. At the "Save to Tool (name)"prompt, confirm your decision by pressing [**OK**] to confirm or [**Cancel**] to exit without saving the new settings.

Deleting a tool

Once you have deleted a tool there is no way to recover its previous settings. Take care that you are deleting the correct tool.

To remove a tool and all its settings from any position:

1. Open the ToolStore page.
2. Select the unwanted tool tab.
3. Touch [**Delete**].
4. At the "Delete Tool" (name) prompt, touch [**delete Tool**] to confirm your decision or [**Cancel**] to exit without deleting.

Backing up tool settings

There is an option within this sequence to back up either the one selected tool or a complete tool bank (20 tools). This latter option is designed to help restore a batch of tool settings when setting up a new or replacement MTS console.

Whichever option is chosen, the MTS console uses a USB connected Memory Stick for backing up and restoring tool settings.

To save (backup) one selected tool setting:

1. Open the ToolStore page.
2. Insert a memory stick into the USB socket.
3. Select the tool that you wish to backup.
4. Touch [**Backup**] and enter a user password, if required, to the on-screen keyboard.

When the backup has been completed remove the memory stick from the USB socket and write the tool name onto the label.

To save (backup) all the tool bank:

1. Open the ToolStore page.
2. Insert a memory stick into the USB socket.
3. Select the required tool bank page, touch [**Backup**] on the opening page and enter a user password, if required, to the on-screen keyboard.

When the backup has been completed remove the memory stick from the USB socket and write the tool name onto the label.

Restoring tool settings

⚠️ Caution

If there is any information stored in the selected tool bank slot then this process over-writes new information into that memory slot.

There is an option within this sequence to restore either all of the stored tools or just one selected tool.

To Restore a single Tool

To restore a saved tool setting from a USB memory stick back into the tool bank.

1. Open the ToolStore page.
2. Insert the memory stick with the data, into the USB socket.
3. Select the tool tab where you intend to restore the incoming tool data.
4. Touch [**Restore**] on the opening page, and enter the password, if required, to the on-screen keyboard.
5. The tool setting data is read back into the tool bank slot and over-writes any information that is in that memory slot.
6. Remove the memory stick.

To Restore a Tool bank page

To restore a saved tool setting from a USB memory stick back into the tool bank.

1. Open the ToolStore page.
2. Insert the memory stick with the data, into the USB socket.
3. Select and empty ToolBank page, touch [**Restore**], and enter the password, if required, to the on-screen keyboard.
4. The tool setting data is read back into the tool bank slots and over-writes all of the previous tool bank data.
5. Remove the memory stick.

Networking to your Controller

Touch Screen consoles can communicate over an Ethernet network in order to pass information both to and from the console. You can set up your network connection within the Utilities page by touching the [**Network**] tab to see this screen.

What facilities Networking offers

Provided your remote terminal has an X-Win server, you can easily communicate with the Console to return an emulation of the working program. This means that you can monitor the Touch Screen Console and you also have the facility for remote control. If you have network connections to multiple consoles then you can transfer files such as tool settings between the different machines.
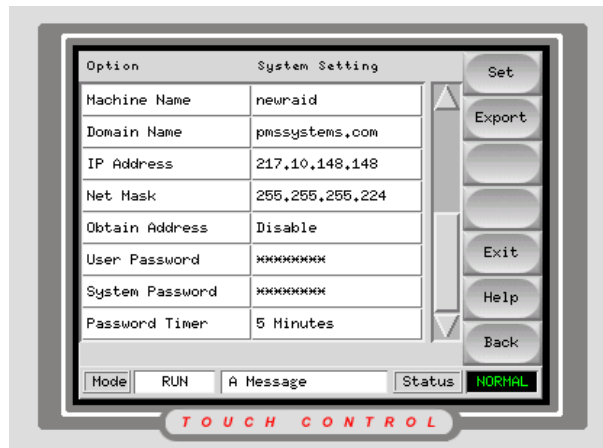
How to make the connection

In order to use this facility, connect your console to an active network using a T-base lead to the socket on the Touch Screen computer.

The next step is to allocate a unique name to the machine within your factory environment and set the domain name for your own system.

Obtaining an IP address depends on the size of your internal network. For connection to a large network it may be sufficient to enable the Automatic IP facility. On a smaller network you may need to disable the automatic facility and use the [**Edit**] buttons to enter your preferred IP address and Sub-net mask details.

Networking configuration depends a lot your system and should only be carried out by competent IT staff. Should you need further information please contact PMS Systems Ltd.

Maintaining your controller

Maintaining your controller is all about keeping it in order, checking records and settings and running self-diagnostic checks.

There are no user serviceable parts inside the Touch Screen controller and, in the unlikely event of equipment failure, you should return the unit for attention.

What is included in this section

Printing out various pages and tables for your records

Exporting performance data

Checking Touch Screen alignment

Running a self-diagnostic test - check that all is functioning correctly

Viewing and printing test results - saving diagnostic test results

Upgrading your controller

Servicing and Repairing your controller

Print Out Facility

Most of the pages on your controller contain a Print button on the side screen.

This prints tabular data that relates to the particular screen.

MAIN page prints out the Zone Name, Actual and Set Temperatures, and Power level for ALL zones regardless of how the main page display is currently set.

TOOL page Select any tool and print out the tool details, similar to the SETUP printout, without having to load the tool.

DIAGNOSE page prints out the results of a tool test once it has finished.

UTILS page prints out all the current Utility settings for the tool currently loaded.

SETUP page prints out the whole SetUp page with all the current settings for the current tool.

GRAPH Page prints out an image of the graph trace while not in any Close-up View-mode

Export Facility

You can extract the last 24 hours of zone performance data as a zipped spreadsheet. This data is written in a CSV (comma separated value) form, and then compressed into a zip file before exporting.

If the Console has a USB connection then "Export" will write the zipped CSV file onto a memory stick which is plugged into the USB socket. If there is no USB connection then it will write the same file into its "tmp" directory.
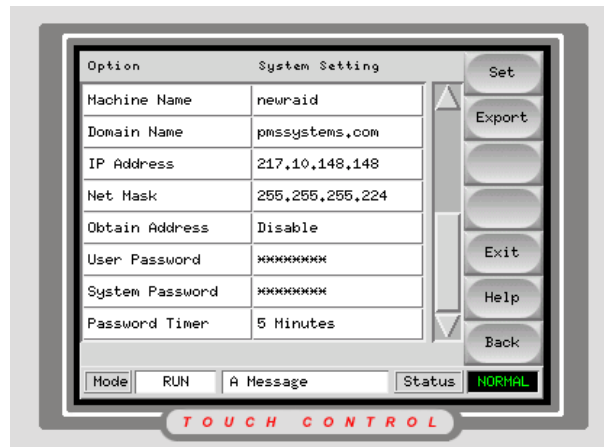
To extract the data using USB port and Memory Stick

1. Insert a USB Flash Memory Stick into the USB port.
2. Select the [**Utils**] page and touch [**Export**]
3. The Export function defaults to exporting all Data for all zones. If this is more than you require then use the zone selection and Temperature selection to modify the export file.
4. If the [**Max Temp**] and [**Min Temp**] options are enabled then the result sheet that is printed out shows the Maximum and Minimum temperatures that have been recorded for the particular zones rather than the current temperature at the time of printing.
5. If the [**Status**] option is enabled then any zones that are currently showing a Fatal Error, such as Fuse, will have that Error condition added to the print-out.
6. Touch Export>[**Yes**] to export the spreadsheet file to the USB Flash Memory if plugged in or the "tmp" directory if not.

To extract the data via the network

You can access the saved files on the "tmp" directory by using a PC which is connected to the console via the Ethernet socket using a crossed Ethernet cable. Alternatively you may access the directory over a network provided the console is connected to the same network. Either way you will first need to know the IP address of the console which you can read on the Utils page as in the above diagram.

Once you have prepared you r access to the console "tmp" directory you can export the required data by following steps 2 – 6 as detailed above. Then continue as described below to view the saved data.

You can use either a standard browser such as Internet Explorer or a graphic FTP program such as CuteFTP. Type in the console IP address to your browser or

FTP agent and then you can navigate to the "tmp" directory and access the CSV data file.

Once the data file has been unzipped it can then be read by any spreadsheet program so that you can examine how the various zones have performed over the last 24 hours that the console has been working. This 24 hours may represent a continuous period over the last day or, if the console has not been in continuous use, it is collated into chunks of time over a number of days or even weeks. If the latter, then the data identifies the time and date for each chunk of information.

Checking Touch Screen Alignment

If at any time you should find that there appears to be a misalignment between where you touch the screen and what part responds then there is a re-alignment facility that can be found on the Utilities page. This runs a brief target and touch calibration routine which can realign touch to response.

While running the calibration function you should use a suitable stylus to make a small point contact are with the screen rather than use your finger which would have a large contact area and lead to possible errors. To maintain accuracy you should touch and hold the stylus in position for a short moment (about 1-2 seconds) so that it can scan the screen several times and take a good average reading. A quick dab at the screen may give rise to reading errors which does not lead to satisfactory calibration.

During the process the cross-hair target will be set to five different positions to cover the whole of the screen area.

How to Calibrate the screen

1. Open the Utils page and scroll to the bottom of the list to find the Calibrate Touch function.
2. Touch [**Recalibrate**] and then [**Set**].
3. If required enter the System password and continue.
4. In the next option touch [**Enable**] to reveal the calibration screen.

5. The screen shows a cross-hair target with an instruction that reads:
6. To calibrate screen, please poke the cross-hairs.
7. Using your stylus touch the centre point of the cross hairs.
8. When you come away from touching the screen, the cross hair target will move to another position.
9. Repeat steps 6) and 7) until all five locations have been tested, after which the screen will return back to the Utilities page.

Self Diagnostic Tests

What is tested during a self-diagnosis check?

The Controller has a diagnostic testing tool, which allows you to check that every zone is functioning correctly. The routine may be used:

- as an acceptance check
- to see that a new tool is wired up correctly
- as a maintenance aid, to check that a working tool is functioning correctly.

This routine allows the controller to step through all the zones, heating one at a time and checking that proper heat rises are detected. The following describes the tests and shows what is deemed as a pass. It also describes some errors that may result in Failures or Warnings.

1. Once a test has been initiated you can choose to stay on the testing page or return to the main page. These give you a different perspective on the test in progress and you can switch between them.

2. Initially the whole tool is cooled, so that it can start from a stable environment, and then starts to run, sequentially, through each zone.

3. On the Testing page, the "Testing Rack Position" box displays information about which zone is under test and that it is in Cooling phase. During the cooling, all zones are checked to see that none experience a significant temperature rise.

4. After a period of time it enters the Heating phase and a quantity of percentage power that is applied to the zone under test. While this is happening, it monitors every other zone to see that only the zone under test experiences a temperature rise. If no temperature rise is detected for the zone under test, it increases the applied power and looks once more for a heat rise. It continues this cycle of raised power and monitoring, until it reaches the Heat Time, stipulated in the Tool Test Parameters.

5. Provided that the zone under test exceeds the Good Rise, that zone is deemed to have passed the test. The message OK is displayed and the controller moves on to the next zone.

6. If, however, the controller fails to detect enough heat rise in the zone under test then it may have detected one of three possible errors:

    - if another zone exceeds the Bad Rise, rather than the one under test, it indicates that there is a cross-over somewhere between a probe and its thermocouple. In this case the test sequence displays a FAIL message in the status line for the zone under test.
    (Note, if there is a crossover then you should expect to see a second FAIL message to show with which other zone the wiring is crossed.)
    - if the zone under test is seen to fall in temperature rather than rise then this is a sign that the T/C polarity is reversed.
    - if the zone under test substantial exceeds the Good rise, but a significant heat rise is also detected in other zones, such that they exceed the Bad Rise, then the controller displays a WARN message. (These other zones are physically close to the zone under test, but not necessarily in numerically sequence.) This fault is usually caused by excessive thermal conduction, which impedes accurate temperature sensing, and so results in imperfect temperature control.

At the end of the Tool Test, the system stores and displays all the results. The particular incidences described above are displayed in further detail. For instance, the two zones, which displayed FAIL because of crossover, both show a full message "Heater/TC Common with Zone NN?". The second fail example would show "Below 0 or Reversed T/C" and the third incident, which detected thermal conduction and showed WARN, displays the full message "T/C Interaction with zone NN?" and points to those zones where excess heat was detected.

There is not room to fully describe the all the potential faults and we trust that you should never see any of them on your own controller. However there is a complete list of error messages (on page 110 that explains their meaning and which helps to identify probable causes.

If no problems are detected, the last message reads "Zones nn to NN tested OK".

Why you may need to change your test parameters

Normally there is no reason to alter the test parameters in your self-diagnostic routine. There are however, two conditions that may require extra attention.

1. If your system is displaying temperatures in Fahrenheit rather than centigrade then, as previously explained, it is necessary to alter the Minimum Rise and Maximum Rise to compensate for temperature scale. (see the previous Caution notice for details).

2. If you are failing to get a satisfactory test because you have an unusually large heating mass such as a heated platen then you may need to compensate for this. However, changing test parameters is a complex matter that is beyond the scope of this operator's manual. Therefore, if you have any doubts or queries please call the PMS service department for advice.

Configuring the test parameters

Normally, there is no reason to alter the test parameters in your self-diagnostic routine. These have been preset at the factory to give correct testing.

However, if you are failing to get a satisfactory test, possibly because you have an unusually large thermal mass, such as a heated platen, then there is a provision for you to adjust the Tool Test parameters. This menu becomes available if you touch the [**Config**] button on the testing page and enter the system password.

Heat Time

For the zone under test, the temperature must rise by at least the temperature shown in the Good Rise box during the specified Heat Time for the zone to pass the test.

Increasing the Heat Time lengthens the period for the test and changing the Heat Time should be limited to small changes - an increase of "1" doubles the overall test time.

The maximum setting for Heat Time is "25" - if you find that this seems to be insufficient heating time for your particular tool then please contact your supplier for further advice. It may happen if a controller is connected to a tool that has a higher thermal mass that the one that the system was originally set up for.

Cool Time

This is the time that the unit is allowed to cool for before the controller applies the Heating Test. Again, you should not exceed 25 in this setting otherwise you may be waiting for a very long time between heating cycles.

Good and Bad Rise

The Good Rise is concerned with the zone under test. It is the temperature rise that the zone must achieve to be a Pass.

The Bad Rise is concerned with other adjacent zones. The test monitors all other zones (not being heated) to see that they do not warm up by more than this preset temperature. If any do warm up more than this "Bad Rise" then it detects "Zone Interaction".

The default values for these two are 6°C for Good Rise and 2°C for Bad Rise.

Setting Test Parameters.
1. For each parameter touch the relevant [**Edit**] button.
2. Using the keypad, enter the parameters for your test.
3. When all four parameters are satisfactory touch [**OK**] to accept your settings or [**Cancel**] to reject them.
4. If, after setting up and testing, the settings have proved to be unsuitable, you can easily reset the factory settings by using the [**Reset**] button.

Reset

Touching [**Reset**] restores the Heat times and Rises back to the original factory setting.

Running a Self Diagnosis test

The diagnostic routine may be performed at any time that the controller is connected to the tool, provided that it is not in use for production.

We have designed this testing page so that you can easily define and conduct self-diagnosis tests to check zone interaction, heater wiring and thermocouple integrity.
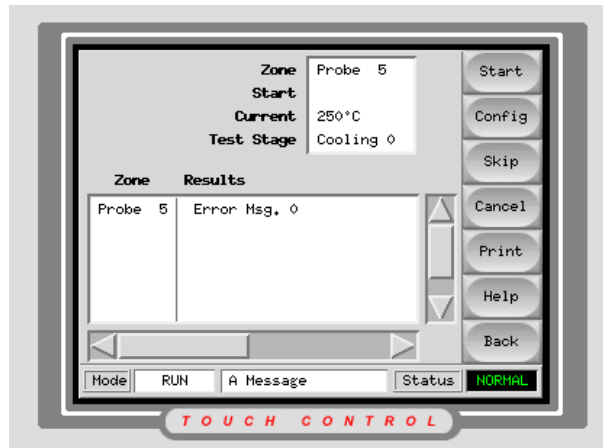
The Information panel at the top right of the screen gives constant feedback about the current zone under test showing whether it is at the cooling or heating stage so that you can observe the test in progress.

To select zones for testing

The normal settings for Tool testing are such that a test will check all zones at the default test settings. If you want to select a specific group of zones for testing, or change the default test values, then touch [**Config**] to display the Configure ToolTest panel.

Touch [**First zone**] to display a full list of available zones, within the current tool, touch the First zone that you wish to include in the Tool Test.

Touch [**Last zone**] to display a list of zones starting with the First zone that you selected in the previous step.

To run the self-diagnosis

Start the test on the selected zones by touching [**Start**] on the side bar.

To pass over or skip zones

To pass by or skip any zones touch the [**Skip**] button while on an unwanted zone. The test report shows "User Skipped test" and moves on to the next zone.

To stop the test prematurely and miss out the remaining zones, touch the [**Cancel**] button. The test report shows "User aborted test" and the controller returns to Stop mode.

System diagnosis results

The Diagnostics page displays information about the testing progress by showing which zone is currently under test and whether it is in cooling or heating phase.

If any error is detected then a suitable error message is shown in the lower area. The results are remembered and displayed in the lower box until a new test is initiated. This means that when you open the Testing page, you can see there are test results already on display - these results have been stored from the last test that was run.

Test Results - hard copies.

Some systems of diagnostic maintenance may require hard copies to be filed away. If you need hard copies of test results then first ensure that a printer is connected and then touch the [**Print**] button at the bottom of the tool bar. This prints out the contents of the lower information box directly to the printer.

Interpreting the test results

Satisfactory Test

If the diagnostic test finds no fault with any zone then the message "Zone Test OK" is displayed.

Unsatisfactory Test

If the test detects any problems then it displays an error messages that is self explanatory. Bellow is a complete list of the various messages along with further detail and possible causes.

User skipped Test - You skipped the test for this zone by pressing [**Skip**] while it was being tested.

User Aborted Test - You aborted out of the test by pressing [**Cancel**] at this point.

Open Circuit T/C - Thermocouple detected as being open circuit. Check thermocouple wiring for displayed zone.

Blown Fuse - Check card fuse. This message is also displayed if the zone was set to use an off board triac that was not installed. N.B. Off board triacs have their own fuse.

No Mains Sync. Pulse - This is probably due to an error in the supply wiring.

No Card Present - No card was detected in the rack at the slot identified with the displayed zone.

Cooling Test Failed - All zone temperatures had to be stable or falling before the heating test begins. If any zones continued to rise with power set to zero within the cooling period, this error is raised.

Heating Test Failed - Temperature did not rise by the set number of degrees within the heating period. This may be caused by an open circuit heater, a pinched, shorted or dislodged thermocouple, or the zone was set to on board triac when the cabinet was wired for off board triacs.

Check for Reversed T/C - Temperature appeared to be decreasing when power was applied.

Below 0 or Reversed T/C - May be caused by a reversed thermocouple. Also, in the unlikely event that the test was carried out at an ambient temperature below 0C, the controller would not work with the resulting negative temperature readings.

Failed to React Correctly - Unexpected results. This message is followed by further error messages.

T/C Interaction with zone NN? - A different zone(s) to the one being tested had an unacceptable rise in temperature (greater than Minimum Rise set in Test Values). Indicates faulty T/C positioning or close zone proximity.

Heater/TC Common with zone NN? - Cross-wiring fault between displayed zones. Could be either Heater or thermocouple wiring at fault.

Message Overflow - There is a limited amount of memory available to store test results. If this message is seen, too many errors have occurred to store them all.

Servicing and repairing your controller

Always isolate your controller at source before you open the unit to inspect it or replace fuses.

When it comes to machine maintenance there is very little that you need to do to look after it.

Replacement parts

We do not expect that you will need to repair any controller parts at board level other than fuses. In the unlikely event of any board failure then we provide an excellent repair and exchange facility for all our customers.

Cleaning and Inspection

Everywhere suffers some degree of contamination and so you need to inspect the fan filters at regular intervals according to your own environment. The filters are removable and a light tapping action removes loose dirt and dust. Failure to do this reduces the flow of cooling air and may incur more expensive repairs if internal components subsequently overheat. If filters do become clogged, they need to be replaced and these can be obtained from your supplier, quoting the serial number of the model.

Any excess dust that has entered into the cabinet may be removed with a light brush and vacuum cleaner.

Any internal cable forms, that flex to accommodate opening doors, should be checked to see that there is no fraying, or damage, to cable insulation.

External cable-looms should be checked to see that there has been no damage to the flexible conduit, plugs or sockets. If the flex has been squashed, if there is visible damage, or if there are any exposed conductors, then, for your own safety, it must be replaced.

If the equipment is subject to vibration then we recommend that you use an insulated screwdriver to check that no terminals have become loose.

Upgrading your controller

Why?

In order to maintain our high quality, our development engineers are making continual improvements to our control system. We also listen to customers who will sometime suggest system changes that may be both useful and achievable. Improvements, which are gained from either of these routes, will be offered to our customers and, should you decide that they would be useful to your own control system, it will be quite straightforward for you to implement the upgrade yourself.

There is usually no need to return your control system for such upgrades. They can, on request, be sent to you in the form of a USB Memory Stick which can be read by your controller.

If you have access to the Internet, they may be downloaded from our site at pms@pmssystems.com. These following instructions will guide you through the upgrade procedure.

How?

We recommend that you always wait until your controller is free before implementing any upgrade. This ensures that, in the event of a mishap such as an error, or a power interruption at a crucial point, and then normal production will not be adversely affected.

If the machine cannot easily be released then ensure that the whole system is operating satisfactorily and disconnect the data cable that connects the touch screen console to the controller, the controller will continue to maintain operating temperatures without the console although you will lose your monitoring for a while.

Procedure for an MTS Console with USB connection.

1. Download the available upgrade from the PMS website and transfer the complete file onto a USB Flash-memory stick.
2. Release the controller from any production working.
3. Plug the Flash Memory into the MTS USB socket.
4. Reboot the console and let the Upgrade self-install.
5. With the upgrade completed, reinstate the controller back to production running.

Procedure for an MTS Console without USB connection

Equipment Required

1. A suitable PC with an Ethernet port.
2. A crossed Ethernet cable suitable for PC-to-PC connection.
3. The upgrade files from PMS Systems Ltd. These will comprise of two or more files, one of which will be named "do_this_code" and the subsequent files will contain the upgrade program which the "do_this_code" program will install.
4. A File transfer program (rcFTP_setup.exe) supplied by PMS Systems Ltd.

Procedure

At the MTS Console

1. Make sure that the MTS console is switched on and open the Utilities page.

2. Make a note of the current software date for later reference.

3. Check the Console IP Address. If there is no current address or if the current address is unsuitable (ie the same as your PC) then touch [**Set**], enter the System password, provide a suitable IP Address (for instance 192.168.1.222) and touch [Enter].

At your PC

4. Install the supplied rcFTP transfer program and reboot the PC.

5. Check that the PC has a unique IP address (one is different to the MTS Console).
   Do this by opening Network Connection within the Control Panel then right click on the LAN icon and select [**Properties**].
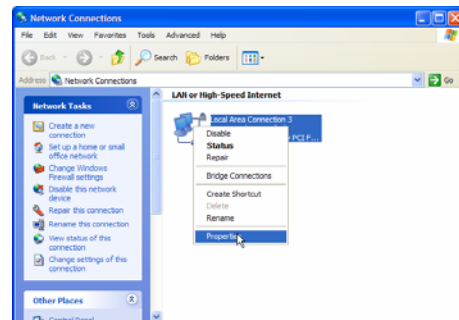
6. At the next properties box select the General tab. Select Internet Protocol (TCP/IP) and click on [Properties].
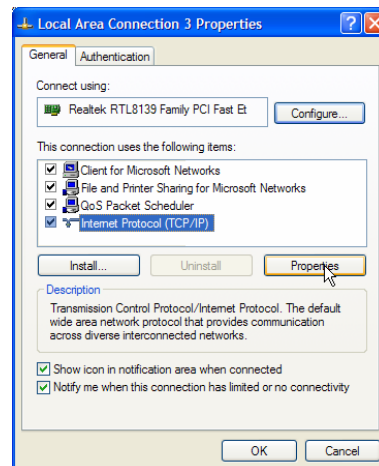
7. At the Internet Properties box check that the computer has an IP address. If 'Obtain an IP Address Automatically' is selected then click on [**Use the following address**], and type in an IP address that has the same first three groups (192.168.1) and a different last number to that used by the MTS Console in step 3).
   Set the Subnet Mask number to "255.255.255.0".
   Click [**OK**] and accept the new TCP and Local Area properties.
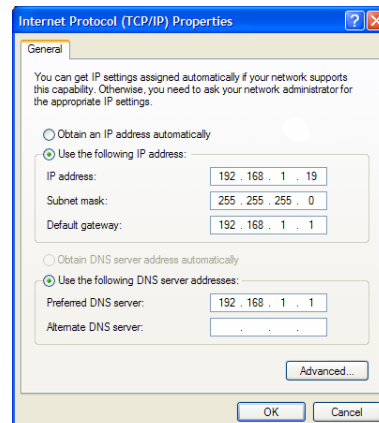
Connect your PC to the MTS Console using the crossed Ethernet cable.

8. Open the folder containing the new Upgrade files.
    Right-click on the files and select 'Send to > upload with rcFTP'
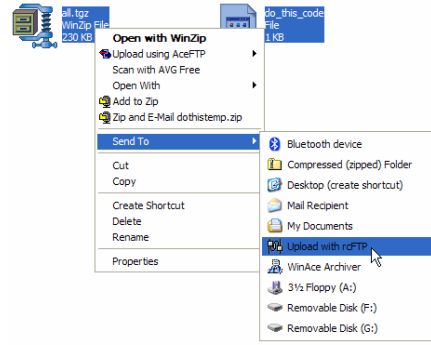
9. This opens rcFTP which needs configuration.
    Click on [**new**] to open the Profile Editor.
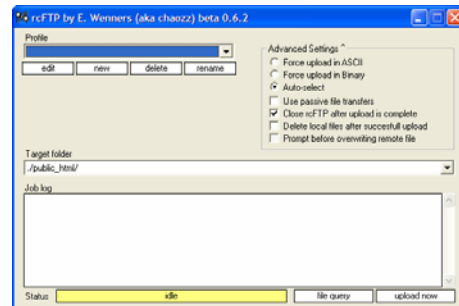
10. In the Profile Editor FTP address box, type in the IP address of the MTS Console noted at step 3.
    Click on [anonymous] to complete Login-name and Password.
    In the lower Destination folder click on [**add**].
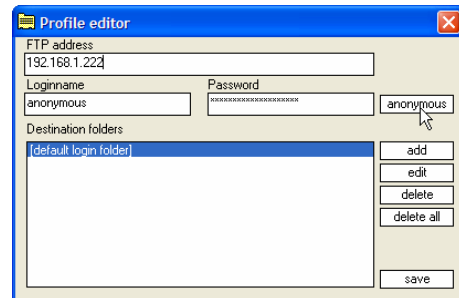
11. In the Add folder box type in "/tmp/". (If there is a dot before the first open slash then delete it) Click [**OK**].
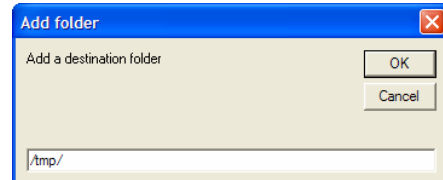
12. Back in the Profile editor click on [**save**].
    In the Save profile box give this configuration a name - type "MTS Console" and click [**OK**].
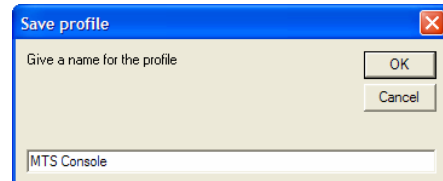
13. Finally check that the following Advanced settings are selected:
Auto-select &
Close rcFTP after upload is complete.
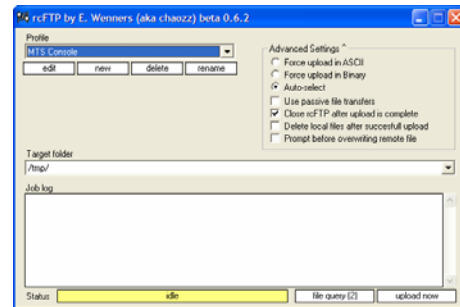
14. Click on [**upload now**] to transfer the files to the MTS Console. When the rcFTP window disappears then you have finished transferring the upgrade files.

15. On the MTS Console go to the Utilities page and touch [**Exit**].

16. The MTS console will find the do_this_code program and the associated upgrade files. The console confirms this action by displaying the Installing Upgrade screen.

On completion the MTS Console will then reboot with the new changes installed.

17. Check that the upgrade has been installed by going to the Utilities page and seeing that the Software date has changed to a newer date that that noted at stage 2.

18. Disconnect the crossed Ethernet cable from both the Console and the PC and shut down the PC.

Troubleshooting

The control system has several features, which provide an early diagnosis of faults in the control system, the tool heaters and thermocouple sensors.

If the system detects any malfunctions, in one or more of the control zones, then it displays an error message on the main page in place of a temperature value.

If the system detects any abnormal condition it displays a warning message in the Main menu

Fault and warning messages

Any of the following messages may be displayed on the Fault Indication line:

Error Message	Cause	Action
AMPS	The controller is unable to supply the current requested. (Note: This error message is most likely to be seen if the particular zone is set as a Spear type)	Isolate system supply, check loom and heater wiring continuity. Also, check the heater resistance against other known good zones to see that it is not noticeably higher than average.
ERR!	Little or no temperature rise has been detected in that zone. When the console starts to apply power it expects to see an equivalent heat rise at the thermocouple. If the Thermocouple has been trapped and pinched elsewhere in the tool or cable then it cannot see the full heat rise that occurs at the tip. If left uncorrected then there is a danger that the zone could overheat and damage the tip. Instead the circuit maintains the output at whatever level it reached when the monitor circuit detected the fault and the error message was displayed	Check thermocouple wiring, it may be reversed. Heater wiring may be faulty or element may be open circuit.
FUSE	The fuse for that zone has failed. Please Note: A fuse can only fail due to a fault external to the controller. Identify and rectify the fault before replacing the fuse. Note: The fuse detection circuit requires a continuous low level current through a high impedance bleed resistor to maintain the alarm condition. As a result the load circuit is still connected to the mains voltage supply and it is not safe to attempt to repair or replace the fuse without first isolating the circuit. If the fuse in question is mounted on a control card then it is safe to unplug the board in order to isolate the circuit and replace the fuse on the card.	Replace the fuse with one of the same rating and type, i.e. High Rupture Current load fuse. The blown fuse is located either on the control card or on the off-board triac module (If fitted).
GND	The system has detected an earth fault. (Note: this can only be detected by controllers fitted with EM Cards or MD240 diagnostics)	Check your heater wiring for a low impedance path to earth.

HELP	There is a system failure and the console does not know how to respond. (This alarm may occur if an older model console is connected to a later version cabinet. If the early version console does not recognise an alarm that has been generated by a later generation control card then it cannot display an appropriate alarm message. The console software has a routine to check incoming messages and it flags up a HELP message if such a condition arises.	Please make a note of the serial numbers for both the controller and console. Also note the console software date on the Utilities page. Contact your supplier with this information to hand.
HIGH	The water-flow sensor has detected a high flow rate.	These are both monitoring conditions only and neither will cause any shutdown or pause action. However, you should check that the coolant water system is not blocked or leaking to ensure that no overheating occurs.
LOW	The water-flow sensor has detected a low flow rate.	
LINE	No mains supply synchronisation pulses being received. The three-phase supply is used in a cross-over detection circuit to generate timing pulses for accurate phase control and firing the triac. If the phase detection fails on one or two phases then there is no pulse to use to measure phase angle and the LINE error message is generated. Meanwhile, all circuits on the healthy phases will continue to work normally.	There is a phase detection circuit on each K-Series card and a common phase detection circuit on all other controller types. Although a fault in such circuits may cause the LINE error message, such fault is very rarely seen. The most common error is either the absence of one phase or, if a plug has been re-wired incorrectly, a swapped phase and neutral. If a LINE error message occurs then switch off and isolate the controller then check supply wiring for presence of all three phases.
LINK	This will occur if the console is switched to a remote controller with a network link but it cannot establish any communication with the remote unit. The console can display the appropriate zones for the particular tool but it cannot relay any temperature information. It shows a LINK fatal error in place of the actual temperature.	Check that the network link is good and/or the remote controller is still switched on and available.
LOAD	No load on that zone. Only occurs when in manual closed loop mode where the current is pre-set. The current sensing circuit has not detected a current flow; therefore, the zone is flagged as not having a load.	Isolate the system supply and check the connections between the controller and the tool heaters. Also, check the heater for continuity
OVER	The RTD zone has detected a temperature in excess of 99°C. This is an abnormal alarm because RTD circuits can only read from 0-99 deg so a fault must be suspected and investigated. Meanwhile, no control zones are affected	Check that a different RTD has not been fitted.

Fault and warning messages

N/Z:	All the control cards are interrogated in sequence, on a working controller you can see the SCAN LEDs flashing in a sequence as each card is briefly checked for satisfactory communication. If any card fails to respond to the console then an N/Z error message is displayed for the offending zone.	If every zone shows N/Z and no cards show or flash their SCAN LEDs then check the communication lead between the console and the controller cabinet. If only one or two zones are displaying N/Z then check the card for faults. If you have recently changed any cards and put any older discrete-component cards into a new controller that has surface-mount cards then it is possible that the console's modern scan speed is too fast for the older control cards. In such a condition, check the console baud rate and try setting it to Low. If this cures the problem and you later replace the older card for a newer surface mount version then remember to reset the Baud rate back to high for optimum working.
NONE	The console has detected a control card that has no settings.	This Error message may be seen fleetingly during switch on, it should disappear after the initial card scan. If the message persists then you may need to re-apply the correct card settings on the Setup page.
REV	The card has detected an abnormal input at the T/C termination that indicates a shorted or Reversed thermocouple.	If the REV alarm persists then you should switch off the controller and investigate the offending zone. Alternatively you could slave the offending zone to a good zone until you have time to clear the fault.
RTD	The RTD monitor cannot see an input (RTD is open circuit)	Check the RTD and its wiring for a broken connection.
T/C	An open circuit thermocouple has been detected and no auto-response has been selected in the T/C Open Error column of the Setup page.	For immediate recovery you can either slave that control zone to an adjacent zone or change to open loop control. Make a note of the above action so that when the controller is free you can check to see whether the input fuse on the control card has ruptured. If the fuse is good then you may need to check the wiring for faults or even replace the thermocouple.
TRC	If a triac fails it goes short circuit and passes full load current. In such a condition you have lost control of the load and cannot switch it off from the console. The TRC alarm flags up the fault state which relies on operator intervention to manually shut the system down. Note: the triac monitor does not function in auto mode. If the triac were to fail while the zone is run in auto then the only indication will be an abnormally high zone temperature because the triac is passing high, uncontrolled current. The TRC alarm is only seen if a triac fails on a zone that is running in closed-loop manual condition.	If the triac has failed, return the controller for repair.

Warning Message	Abnormal Condition
MAN	The control zone is in manual mode.
S #	The zone is slaved to another control zone, where # represents the number of that zone, i.e. S 2 means the zone is slaved to Zone 2. The same power is being sent to both zones. In the main page, the set point displayed on the selected zone is the same as that on the slave zone.
TEST	Displayed when the zone is in diagnostic test mode.
WARN	If during the test procedure a temperature interaction is found between zones, this message is displayed.
FAIL	The zone under test has failed.

Individual Card Diagnostics

If a fault on a control card is suspected, check the LED card status lamps.

From top to bottom they are: -

SCAN   The LED flashes during normal operation to indicate data bus activity.

TC   LED is lit when the thermocouple is open circuit.

LOAD   LED indicates a supply to the heater.

FUSE   LED lit when the load fuse fails.

To remove a SM card from its slot, pull the red handles forwards and gently pull the card out. There is no need to switch off the main supply. However, if operational requirements allow, the cabinet may be isolated.

The shrouded terminals on the euroback board are live, unless the power supply is switched to OFF.

Warning

Specific Faults

Failed Thermo Couple

Either an alarm or a diagnostic test may show that a thermocouple has failed. The simplest way to temporarily overcome the situation is to run the zone with the failed thermocouple sensor as a Slave to an adjacent and similar zone. For details on how to do this refer to page 80 "Changing a zone to slave working"

Rapid Temperature Fluctuations:

The most likely cause of temperature fluctuations is extraneous voltages being picked up by the thermocouple cable, i.e. common mode. This may be due to poor earthing of the tool or a faulty heater. We recommend that all earth connections be tested.

Not able to set a Higher Temperature

This problem can occur if you try to set the temperature above the limits. Check the current setting in the Limits column on the SetUp page and revise if necessary.

Not able to set a Higher Power level.

This problem occurs if you try to exceed the percentage power level limit that has been previously set. Check the Power limits setting in the Limits column on the SetUp page and revise if necessary.

Other problems with the Tool

If you find that the Controller is not running correctly and cannot resolve the problem with either the manual or on-line help then it may help us if we can see exactly how your system is configured. To do this, have a USB Memory stick available and follow the next steps:

Export the Tool Settings

1. Open the ToolStore page
2. Select an empty ToolStore slot and use the [**Edit**] button to give it a temporary name (Temp for instance).
3. With this new tool tab active, touch [**Save**].
4. Put the storage media into the USB socket and touch [**Backup**].
5. Wait until all the data has been saved to disk.

Export Utility Data

6. Keep the Memory Stick in the USB socket and select the Utility page.
7. Touch the [**Export**] button and select the maximum and minimum temperatures for all zones and then touch [**Export**] to save the data to the USB Flash Memory.

Send us the resultant files

8. Take the Memory Stick to your computer and prepare an e-mail with a brief description of your problem.
9. Attach the Tool Settings and Export Data files to the e-mail and send it to: pms@pmssystems.com

On receipt of your mail and attachment, we can load your file into one of our own controllers and should be able to track down the problem.

CX-Series Fuses

There are supply fuses for three separate functions. In the unlikely event of a fuse failure always isolate the incoming main supply before opening the rear cabinet door or removing any panels.

Replacement Fuses

If you find that any fuse has ruptured then please make sure that you replace the faulty fuse for a new one with identical characteristics. All the correct fuse types are listed in the following tables.

Warning

Power Supply Units (PSUs)

The PSU is integrated into the main printed circuit board. It has its own fuse, which is located in a separate holder on the front edge of the PCB.

Class	20mm Glass Fuse Antisurge
Rating	315mA

Fans

The CX-Series Controller has a single fan to assist cooling. The fan has a supply fuse of the following characteristics:

Class	20mm Glass Fuse Antisurge
Rating	315mA

If the fan has stopped working then first inspect the unit to see if there are any blockages or objects fouling the impellers. Once you are certain that the fan is free to rotate then proceed to check its supply fuse. The fan fuse is located in an in-line fuse connector inside the main case

Controller Cards

The current controller card has protection fuses for both the T/C input and for the heating load output.

If the Fuse LED indicator shows that the output fuse has ruptured then the card may be easily removed and the fuse changed.

If the T/C LED indicator shows an open circuit T/C circuit then this may indicate that the input fuse has ruptured.

Output Fuse Type: HRC High Speed

Card type	Six Zone	Three Zone	Two Zone	One Zone
Fuse Rating	5A	15A	20A	30A

Input Fuse Type: Surface-mount quick-blow

Code (PMS part)	62MAQBSM
Fuse Rating	62mA

APPENDIX A

HRC Wiring Standards

The following standards only apply to controllers wired to PMS standard. Other specifications may have been stated when the controller was ordered. Please refer to the supplied specification details.

1. CONNECTION INFORMATION

1.1 Three phase Designation

Please take extreme care when connecting the controller to the three-phase supply. Incorrect connection may appear to work but can result in damage to the controller.

The controller is normally supplied according to your requirements in either a star or delta supply although some models may have a dual supply options which accepts either Star or Delta 3-phase supply.

Cable Marking	Supply Description
L1	Phase 1
L2	Phase 2
L3	Phase 3
N	Neutral
Earth Symbol	Earth

N.B. The delta supply cable does not have a neutral wire.

Cable colours may vary therefore wire up according to the Cable Markings.

1.2 Loom Thermocouple cables

RTD thermocouple cable colours and number may vary. Refer to controller documentation for details.

Type J and K are supplied as below unless otherwise specified.

Type	Positive	Negative
J	Black	White
K	Green	White

1.3 Loom Power cables

The colour of the power cables depends on whether the controller is supplied for star three-phase supply or delta three-phase supply.

Three phase type	Live (supply)	Neutral (return)
star	brown	blue
delta	brown	yellow

1.4 Alarm Output / Auxiliary Input

An option cabinet connector provides an alarm output from an internal set of relay contacts. Using an external power source the cabinet can initiate a number of warning devices whenever any zone goes into an alarm state. This is commonly used for beacons, audible alarms or informing the moulding machine. In order to capture fleeting alarm conditions, the relay is held on for about 15 seconds after the alarm condition is cleared. The contacts are rated for 5A at 240V.

An optional input can be accepted through the same connector. It may be used for Cycle Synch spear tips, Inhibit Mode, remote Boost or Standby or any other user-definable function. For exact details, consult the specification for the particular model.

Pin	Connection	Input / output
1	Auxiliary Input signal	*Dependent on Spec
2	Auxiliary Input Ground	
3	Alarm 240v contact 1	Normally Open Contacts
4	Alarm 240v contact 2	

1.5 Serial Port

A male 9 way D panel connector can be provided for an RS-232 serial port, which is used to communicate with a remote computer for data collection. The pin outs are as follows.

Pin	Connection
1	
2	Transmit
3	Receive
4	
5	Ground
6	
7	Handshake
8	
9	

1.6 USB Port

A USB port is standard on all Touch Screen Consoles for connection to a printer.

APPENDIX B

System Schematic

Glossary

Cabinet	Unit containing control electronics
Loom	Cables connecting control cabinet and tool
LED	Light Emitting Diode (Warning Lights)
Manifold	Background or runner heater
Probe	Gate control heater
Prompt	Screen text asking the user for an input
Tool	Temperature controlled mould for injection moulding of thermoplastic components
Zone	Control zone, may be probe or manifold heater
Burst fired	Also known as time proportioned, where a half wave mains waveform is used, i.e. the power is turned on when the waveform is at zero volts and the triac remains on until the next zero volt point is reached. At the next zero point the triac is re-triggered to start the next half cycle. The half waveforms are time proportioned (i.e. Off time to On time) to obtain the required temperature.
Phase Angle fired	Another method of supplying power. The power is turned on at a calculated point within the mains waveform and turned off, as the waveform crosses the zero volt point. This is done continuously for every half waveform. The technique is normally used for low voltage power control.
Open Loop	This is a method of control where power levels are set manually with no feedback of the zone temperature.
Closed Loop	Another control method where a controller receives temperature information from the zone and compares actual temperature with the required temperature or set point. The controller adjusts the power level according to the difference between these two values.
Cycle Synchronised	Also referred to as Thermal Gate Control. The probe tip heater is synchronised with a signal from the moulding machine. This activates the boost mode where the probe tip heaters are given an increase in power to melt the gate and allow injection.
On-board triac	A control card mounted device that controls the amount of energy supplied to the zone by regulating the phase angle of the AC voltage or burst firing the supply voltage.
Off-board triac	This is similar to the above but a much higher rated device for the control of zones where the power requirement is high or two outputs per zone are required, e.g. cycle synchronised or other dual voltage.

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